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BY

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WITH FOUR LITHOGRAPHIC PLATES

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PREFACE.

THE Lectures of 1880 and 1881, which form the basis of the present volume, have been enlarged since they were delivered by the addition of new cases to the tables, and by sections on diagnosis and treatment. These sections are not intended to be exhaustive treatises on either subject, but are occupied rather with general principles than with minute details. They are introduced to show how largely both diagnosis and treatment are influenced by a more precise knowledge of the pathology of disease, and in the hope of diminishing in a slight degree the reproach which is often made against pathologists of being "unpractical."

My thanks are due to those who have afforded me assistance and advice; to my colleagues, who kindly permitted me to make use of their cases; to Sir James Paget, who sought out for me his manuscript notes of many cases of cancer of the tongue;

and last, but not least, to Sir Erasmus Wilson, to whose munificence I owe the opportunity I enjoyed of delivering these Lectures on Pathology at the Royal College of Surgeons.

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CHAPTER I.

INTRODUCTION.

A LONG introduction is neither desirable nor necessary, but a short introduction is inevitable: first, to define clearly the subject of the following work; secondly, to explain and justify the manner in which it has been dealt with.

By SARCOMA I understand a tumour *of connective-tissue origin,* composed of elements which are for the most part cellular and embryonic. These elements are embedded in a matrix of intercellular substance of varying quality and quantity. The vessels run between the cells, and the cells increase in number by division.

A CARCINOMA is a tumour *of epithelial origin,* possessing generally an alveolar structure. The cells are seldom separated by a visible intercellular substance. The vessels run in the walls of the alveoli, not between the cells, and the cells increase in number by endogenous formation.

The essential difference between the two diseases lies in the difference of their origin. It might, of course, be made

in the difference of their structure, or be traced back beyond their immediate origin to the origin of the tissues from which they severally are developed. But I reject the structural division because, although most of the tumours can be easily recognised by their structure, and structure therefore plays a very important part in diagnosis, it cannot be so thoroughly relied on as difference in origin. Some of the sarcomas particularly exhibit a great tendency to imitate the alveolar structure which is generally typical of carcinoma.* I reject, too, the "embryonic theory," as it is called, because, although I believe it to be the most scientific basis of division, and that which may probably in future come to be adopted, our present knowledge of the origin of many tissues appears scarcely sufficiently established to permit the theory to be advantageously employed.

I accept the difference founded on connective-tissue and epithelial origin, because it appears to afford a much sounder and more reliable basis than any other we possess at present. It is much more comprehensive than the structural theory, less problematical than the embryonic theory.

A grave difficulty in connection with classification has been experienced in dealing with tumours which originate in endothelial elements. The endothelia are placed in the connective-tissue series; if this be correct the tumours of endothelial origin are also tumours of connective-tissue origin. And so at present they are included, for the most

* During the past two or three years I have frequently received sections or accounts of tumours of connective-tissue origin, yet presenting an alveolar structure, and have been asked whether they are not carcinomas. Some of these were undoubtedly secondary to primary tumours which had been overlooked, but others of them were as certainly primary. Let me, therefore, take this opportunity of stating that primary tumours of connective-tissue origin presenting an alveolar structure are, according to the classification I adopt, sarcomas, not carcinomas, and that I am in no way personally responsible for the eccentricity of their structure.

part, in the sarcomata. It is not improbable, however, as our knowledge increases and we learn to recognise them more certainly wherever they occur, that it may be found desirable to separate the endotheliomata from the tumours of epithelial and connective-tissue origin. It may be that some, if not all, of the atypical sarcomas are endotheliomas. For it has been found that the structure of tumours arising from endothelial surfaces corresponds much more closely with that of squamous- or spheroidal-celled carcinomas than with that of any of the sarcomas.

Several varieties of sarcoma and carcinoma are made according to the form of cell of which the tumours chiefly are composed. Thus, there are three chief groups of sarcomas: round-celled, spindle-celled, and giant-celled. And since some sarcomas consist of round, and spindle, and giant cells in varying proportion, and with them cells of other and less regular shapes, it is necessary to make a fourth group of mixed-celled sarcomas.

The ROUND-CELLED SARCOMAS are composed of round cells embedded in a granular or homogeneous basis substance, which is sometimes traversed by bands of fibrous tissue. There is no definite arrangement of the cells. The vessels are often mere fissures between the cells, but more often possess a thin wall composed of a single layer of spindle cells.

The SPINDLE-CELLED SARCOMAS consist of spindle, or oat-shaped, or fibre-like cells, generally disposed to form bands or trabeculæ, which cross, anastomose, and interlace with one another. The vessel walls are formed of one or more layers of spindle cells. Two varieties of spindle-celled sarcoma are sometimes made according as the cells are very large or very small (Pl. II, figs. 1 and 2).

The GIANT-CELLED SARCOMAS are so named because a large

portion of their bulk is made of flattened masses of protoplasm containing from two or three to thirty, forty, or even more nuclei. These are the myeloid cells of Paget. In their most perfect and typical form they occur in the tumours of bone, and almost only in the tumours of bone; for, although giant cells are found in tubercle and in the products of other morbid processes, as well as in some of the tumours of soft parts, they differ so much from the giant cells of myeloid sarcomas that it is probable they are derived from a different source and bear a different signification. The giant cells of soft textures have, for the most part, less clearly defined outlines, less coarsely granular contents, more grotesque shapes; and those of tubercle present a peculiar disposition of the nuclei, which are generally arranged in a single row towards the periphery of the cell. Around and between the giant cells of myeloid tumours there are always round, oval, or spindle cells (Plate II, fig. 7).

The MIXED-CELLED SARCOMAS require no further description than their name implies (Plate II, fig. 3).

Modified forms of these four varieties of sarcoma, particularly of the round- and spindle-celled, are not uncommon. Of these the most important are the following:

Alveolar sarcoma.—A round-celled sarcoma having an alveolar structure resembling that of carcinoma. The cells are generally of large size, and between them can often be distinguished a delicate reticulum.

Lympho-sarcoma.—The cells and reticulum of which resemble those of lymphatic glands (Plate IV, fig. 6). The cells are, however, sometimes much larger than lymph cells. The lympho-sarcomas usually originate in structures in which lymphatic or adenoid tissue naturally exists, but this is not an invariable rule.

Glioma.—The structure of which is very similar to that of the lympho-sarcomas, but the cells are usually of smaller size. The gliomas are derived from the neuroglia or connective tissue of nerve centres.

Plexiform sarcoma—Cylindroma.—A round-celled sarcoma, presenting the following peculiarities of structure :—(1) Cylinders, or irregularly-shaped masses of cells, surrounded and separated by (2) a hyaline or very finely fibrillated substance, often very abundant; (3) a polygonal form of cell; (4) an absence of intercellular material. These peculiarities of structure appear to be due to a hyaline transformation of fibrous bands or tracts of tissue throughout the tumour. The hyaline substance, swelling after it has been formed, presses asunder the intervening masses of cells, which gradually assume the appearance of cylinders or cords of cells. Owing to the pressure the intercellular substance disappears and the individual cells assume a polygonal form. The coats of vessels traversing the tumour frequently undergo a similar hyaline transformation.

Psammoma—Nest-celled sarcoma—Pearl tumour.—Not improbably all conditions of the same variety of sarcoma. The psammoma is composed of bands or trabeculæ of spindle cells or fibrous tissue, in which lie concentric bodies containing each a central calcareous mass. The nest-celled sarcoma and the pearl tumour consist of round, or more often spindle cells, in which are found cell nests, resembling the epidermic globes of squamous epithelioma.

It is probable that many, if not all, of these tumours are of endothelial origin.

Hæmorrhagic sarcoma.—A round- or spindle-celled tumour, having so great a tendency to bleed that the tumour may appear to be simply a collection of blood, or a blood cyst, so completely are its characters obscured by hæmorrhage.

Melanotic sarcomas.—Spindle- or round-celled tumours, in which pigment granules are so abundant that the tumours exhibit a black or brownish-black colour. The pigment generally lies in the interior of the cells, but in some instances is found in the intercellular material or fibrous trabeculæ.

Myxo-sarcoma—Net-celled sarcoma.—The precise nature of which is not very clear. Most of the myxo-sarcomas appear to be spindle- or mixed-celled sarcomas, containing many stellate cells. The cells are embedded in a viscid, homogeneous or granular material, which is often very abundant, so that the tumours present a jelly-like appearance. The origin of this material is very uncertain, but it is probably a result of degeneration of some of the textures of the tumour.

As there are three chief groups of sarcomas so are there also three chief groups of carcinomas; the spheroidal-celled or glandular-celled, squamous-celled, and columnar- or cylindrical-celled.*

The SPHEROIDAL- or GLANDULAR-CELLED CARCINOMAS are those which are derived from the spheroidal or glandular epithelium of the acinous glands,† the mammary gland, the pancreas, &c. The alveolar structure is generally well expressed, and the cells resemble those of spheroidal epithelium. The spheroidal-celled tumours include all those carcinomas which are commonly called hard (scirrhus, withering, tubular, fibrous) and soft (medullary, encephaloid, multicellular, acinous). The chief difference between the hard and soft carcinomas consists in the much greater

* I have made this arrangement because it corresponds with the arrangement of the sarcomas, and is in accordance with the general plan of the anatomical classification of tumours. I believe it will be found much more satisfactory for working purposes than the old arrangement of hard and soft cancers and epitheliomas.

† As we are now taught most of these are tubular glands.

quantity of fibrous tissue which the hard possess, the much larger number of cells which the soft contain; but there does not appear to be any essential difference between them (Plate I, fig. 1 and 2).

SQUAMOUS-CELLED CARCINOMAS are developed from squamous epithelium. They include all the squamous epitheliomas; indeed, epithelioma and squamous-celled carcinoma are practically convertible terms, provided the term epithelioma be not extended to the cylindrical-celled carcinomas. The cells of squamous-celled carcinoma are often easily recognised by their resemblance to those of the epidermis of the tongue and lip, and other parts. Their borders, however, are often fringed or jagged, and they vary much in size and shape. Instead of a single nucleus, many of them contain two or three nuclei. Yet their general large size, flattened shape, and decided characters, serve to distinguish them from the cells of other tumours. The alveolar structure of epithelioma is not well marked; indeed, it can be scarcely said to exist. The connection of the disease with the epithelium of the surface is generally demonstrable; and, in the masses or columns of cells which dip down from the superficial into the deeper parts, are almost always found the cell nests or epidermic globes which are justly held to be so characteristic of the disease. These bodies are composed of flattened, scale-like cells, surrounding, in a few or many layers, one or more central cells. They are not, however, confined to epithelioma or even to morbid tissues, for they may be discovered in the normal skin and tongue; but they occur much more abundantly in epithelioma, and usually attain a larger size than under other circumstances (Plate III, figs. 3 and 4; Plate IV, figs. 1—5).

The CYLINDRICAL- OR COLUMNAR-CELLED CARCINOMAS are derived from the cylindrical epithelium covering surfaces

or lining glands. The more slowly growing of them often present a structure closely resembling that of the columnar glands; but those which grow more quickly exhibit a confused appearance of irregularly shaped cavities or spaces lined with blurred and ill-formed epithelium. Although there is usually an alveolar structure, the alveoli are seldom *filled* with epithelium. These tumours have been generally classed with the squamous carcinomas as a variety of epithelioma, but they bear no closer relation to the squamous than to the spheroidal carcinomas.

Several modifications of the varieties of carcinoma are observed. The most important are the following:

Colloid carcinoma, which has usually been described as a primary disease, but which is far more probably a modified form of the spheroidal-celled carcinoma. The alveolar structure is very strongly expressed, but the alveoli contain usually, in addition to cells or groups of cells, a quantity of clear colloid material, sometimes marked with faint lines or dots parallel with the walls of the alveoli. Drops of the same transparent colloid material may sometimes be detected in the interior of the cells, whence the theory that the whole of this material is produced by a transformation of, or deposit in, the substance of the cells. Colloid carcinoma is known also by the names gelatiniform cancer, alveolar cancer. It is probable that sarcomas sometimes undergo a similar colloid change.

Melanotic carcinoma.—Although pigmentation is not so common of carcinoma as of sarcoma, melanotic carcinomas are occasionally observed. The pigment is deposited either in the cells or in the fibrous stroma.

Villous carcinoma may be mentioned merely to point out how very rarely carcinoma exhibits a villous or dendritic form of growth. Some examples of squamous and columnar

carcinoma present a papillary surface, but most of the true villous growths are papillomas or sarcomas.

It is not always easy to classify a tumour, even though its origin and microscopic structure have been carefully observed. The difference in structure between some adenomas and some carcinomas; between some fibromas or chondromas and some sarcomas; between the products of some inflammations and some sarcomas is so very minute, if indeed, there is a difference, that it is impossible to discover it. But when the details of the general structure and course of the disease are studied, together with those of microscopic structure, it is seldom that any doubt remains. Some of the most important difficulties in classification, or rather in nomenclature, are those which are due to modifications of tumours, either from development or degeneration of large portions of their substance. Thus sarcomas are very liable to organisation, and large masses of tumour may be changed into fibrous tissue, bone, or cartilage. So complete may be the transformation that it may be very difficult to distinguish the original elements of the tumour. But there almost always remain some softer portions in which the sarcoma structure still exists; and since the nature of the disease is not altered by even the most extensive transformations of the tumour substance it is not necessary to change or even to modify its name. Unfortunately, before these transformations and their import were clearly recognised, special names were given to these altered tumours. Thus, many of the ossifying and calcifying tumours were termed *osteoid cancers*, or *osteoid sarcomas*, or *osteo-sarcomas*, the tumours containing cartilage were *malignant enchondromas*, or *chondro-sarcomas*, or *osteoid chondromas*, and the fibrifying tumours were *fibrous cancers* or *malignant fibrous* tumours. Although, in describing the

osteoid cancers, Sir James Paget, more than thirty years ago, expressed an opinion that their nature would be best "expressed by calling them ossified fibrous or medullary cancers, and by regarding them as illustrating a calcareous or osseous degeneration" ('Lectures on Surgical Pathology,' vol. ii, p. 496, 1853), this suggestion has not, so far as I am aware, been acted on up to the present time; perhaps, in great part, because a few pages further on (p. 503) the same author spoke of the osteoid cancers as tumours whose "histories will be found consistent with one another, and distinct from those of the other groups of cancers." I hope to be able to prove that this is not the case, that these ossifying or calcifying sarcomas do not differ in any other way than in their ossification or calcification from the soft sarcomas of the same parts; that, therefore, there is no reason for separating them from the soft sarcomas or for distinguishing them by special names. The same holds good of the chondrifying and fibrifying sarcomas; they differ only in the amount of cartilage or fibrous tissue they contain from soft sarcomas.

The malignancy of a tumour is exhibited in three distinct ways: first, in the manner of its local extension, for it invades every tissue with which it comes in contact. Second, in affection of the lymphatic glands, those glands which lie directly in the course of the flow of lymph from the seat of the tumour towards the main lymphatic trunks. Third, in the formation of secondary tumours in various tissues and organs of the body, *i.e.* dissemination or generalisation.

Local recurrence of a tumour after removal is not an evidence of malignancy, although most malignant tumours are exceedingly prone to recur. Their recurrence is due in almost every case to incomplete removal; and the incom-

plete removal is due to the manner of their local extension.

It may, I think, be said that all sarcomas and carcinomas are malignant, but their malignancy is widely different in degree. Thus it may be exhibited in all three of the above ways, or only in one or two of them; but the most common form of malignancy, and that which probably is never absent, is that of affection of surrounding tissues. Most of the carcinomas are not provided with limiting capsules or even with clearly defined outlines; and the sarcomas, although they frequently are enclosed in capsules, almost as frequently affect their capsules, and spread through them to the surrounding tissues.

Of the causes of malignancy we are in total ignorance. Parasitism, a spermatic influence of cells, the inclusion of embryonic tissues in organised parts during the process of development, are some of the theories which have been put forward to account for it. But of the causes upon which the degree and kind of malignancy depend we are much better informed. They appear to be chiefly these two: the structure of the tumour, and its situation or seat of origin. The second is probably the more powerful factor of the two.

In order to discover the relative importance of these causes the tumours of each tissue and organ must be studied separately. The various tumours must be compared, their qualities and course considered in relation to their seat and structure. Thus, only, can a correct impression be obtained of the effect which structure exercises on the course pursued by any tumour. Thus, only, can we prove the necessity or desirability of maintaining the distinction between sarcoma and carcinoma, or even establish a sufficient reason for a continuance of the study of the histology of tumours. In

this way, only, can the laws which govern the affection of lymphatic glands and the formation of other secondary tumours be arrived at, and the errors due to the too hasty generalisations of the past be corrected.

But no single experience, however large, is sufficiently extended to embrace a complete acquaintance with all the sarcomas and carcinomas of even one tissue or organ. Even the specialists have not given us an exhaustive account of the tumour-diseases of those limited portions of the body on which they severally are at work. Therefore, it is necessary to combine the experience of many persons, and to obtain as large a number of cases as possible by collecting from surgical literature all cases of tumours which have been microscopically examined, and of which a sufficiently detailed account exists. In this manner not only may the general laws of malignancy haply be discovered, but in the meantime a fair history may be obtained of the sarcomas and carcinomas of each individual region of the body.

This scheme has been pursued in the present work, and will, I hope, be extended in another volume to the tumours of other parts.

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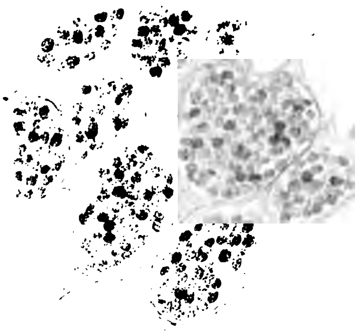

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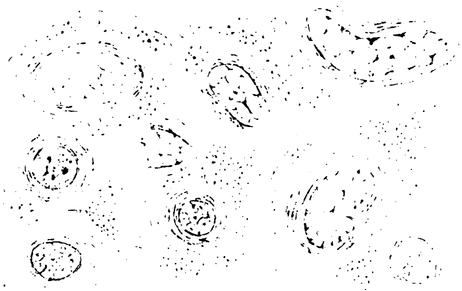

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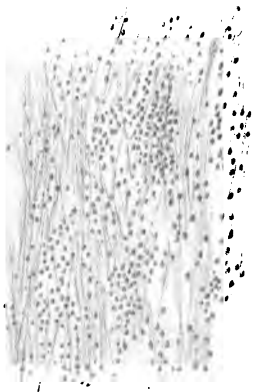

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DESCRIPTION OF PLATE I.

SARCOMA AND CARCINOMA OF THE TESTIS.

FIG. 1.—Carcinoma of the testis, showing the alveolar structure. × 90.

FIG. 2.—A portion of the above more highly magnified, showing the character of the cells. × 260.

FIG. 3.—Sarcoma of the testis, showing the new growth between the tubules. × 60.

FIG. 4.—Spindle-celled sarcoma of the testis of a child. × 60.

FIG. 5.—A portion of the above more highly magnified (× 260), exhibiting the confused structure, and round and oval cells mingled with the spindle cells.

CHAPTER II.

SARCOMA AND CARCINOMA OF THE TESTIS.

THE testis is liable to be affected both by sarcoma and carcinoma, but more frequently by sarcoma.

Only one variety of carcinoma has been hitherto observed —the spheroidal or gland celled. This presents a decided alveolar structure, and the alveoli are filled with cells resembling the epithelium of the seminal tubes (Plate I, figs. 1 and 2). Traces of endogenous formation may usually be discovered. The quantity of fibrous tissue varies greatly, but in by far the larger number of cases the cells predominate, the fibrous stroma is not abundant, and the appearances are those generally described as characteristic of soft carcinoma.* The origin of the disease has been admirably

* In the Erasmus Wilson lecture, on which this chapter is founded, I stated that I had not found on record any authentic case of hard carcinoma (scirrhus) of the testicle, nor have I found any case which, to my mind, is proved to have been scirrhus by microscopical examination. Manoury's case, of which Nepveu made the examination, I regard as a fibrous or fibrifying sarcoma ('Gaz. Hebdom.,' 1871, p. 640). For the fibrous tracts radiating forwards fanlike from the body of Highmore suggest hypertrophy of the fibrous partitions of the gland, the fine meshwork in the alveoli is not indicative of carcinoma; and the wide tracts of connective tissue separating compressed and atrophied tubules are appearances characteristic of sarcoma, not of carcinoma. Nevertheless, I am not inclined to dispute that hard carcinoma may occur in the testicle, for I do not think the matter worthy of dispute. Both hard and soft carcinoma are merely varieties of the spheroidal-celled carcinoma, and the less typical forms of each cannot easily be distinguished.

traced by Birch-Hirschfeld* in a testis, the cancerous tumour of which was still surrounded by a thin layer of the tissue of the gland. In this layer existed a series of transitional forms, from an almost normal tubule to the fully-developed alveolus of the carcinoma. The changes were effected mainly by the action of the epithelium, the cells of which multiplied, filled, and dilated the tubules, and thence spread into the surrounding tissues.

Carcinoma of the testis is prone to fatty and caseous degeneration, and large portions of its substance may be thus destroyed. It rarely becomes organised, and apparently never contains cartilage, although Kocher† states that the combination with cartilage is more common than of sarcoma with cartilage. It is difficult to understand whence this conclusion is derived, for I have not found a single case on record of a carcinoma containing cartilage, nor has an instance of the kind ever fallen under my observation.

Sarcoma appears to originate in the connective-tissue walls of the tubuli seminiferi or in the tissue between the tubules. The new growth, increasing, gradually separates the tubules more widely from each other, and at the same time diminishes their calibre and destroys their natural form (Plate I, fig. 3). But, for a long time, even in tumours of considerable size, tubules can still be recognised scattered at irregular intervals through the growth, perhaps still lined with epithelial cells or with the remains of epithelium. Round-, spindle-, and mixed-celled sarcomas occur in the testis, the two first more frequently than the last, and the modified form of round-celled sarcoma to which the term lympho-sarcoma has been applied (on account of the resemblance of its structure to that of a lymphatic gland), is fre-

* 'Archiv d. Heilkunde,' ix, 538, 1868.

† 'Pitha u. Billroth,' Bd. iii, Abth. 2, Lief. 7, 8, S. 346, 1871—75.

quently observed. Fibrous tissue is present to a greater or less extent in most sarcomas, and combinations with cartilage and mucous tissue not uncommonly occur. A single description would suffice for the course and characters of most cases of sarcoma and carcinoma, for, with certain exceptions, to which reference will presently be made, there are no means by which we can distinguish between the two diseases. Their general course may be illustrated by certain cases in which the salient features are exhibited of each disease, if not all of them, some, at least, of the most important in each case.

First, of carcinoma.

A German student, single, twenty-one years of age, whose case is very fully related by Birch-Hirschfeld* in the 'Archiv der Heilkunde,' first noticed swelling of the left testis in 1866. He could assign no cause, venereal or other, for the enlargement, and could remember no squeeze or hurt. For a while the affection seemed to grow less, or at least not to increase, and in the early part of 1867 it had made so little progress that he was considered fit for active military service. But in the spring of 1867 he was again examined, when the testis appeared as a tolerably firm tumour, perhaps as large as a small egg, smooth, and free from pain. From this time its growth, although not rapid, was continuous, and the tumour attained a considerable size. In February, 1868, he could no longer walk or even move about, but was obliged to keep in bed on account of swelling and œdema of both legs. These symptoms were shortly followed by manifest enlargement of the liver, and in May he died. At the autopsy the tumour was the size of a child's head, but by the evacuation of eight ounces of fluid from the tunica vaginalis its bulk was much diminished. It was at no part ulcerated, or even adhe-

* L. c.

rent to the scrotum. The cord was greatly thickened below, but the thickening was much less towards the internal ring. When laid open the tumour presented a perfect specimen of encephaloid cancer. The epididymis was changed in like manner as the testis. At first all the normal structure of both appeared to have been destroyed, but examination left no doubt that, opposite the corpus Highmori, a thin layer of gland structure covered the surface of the tumour. The right testis was sound. The inguinal, pelvic, and lumbar glands formed a large cancerous mass occupying the left side of the pelvis and abdomen. The liver was much enlarged, and very full of secondary growths, many of which were of large size. Both lungs contained secondary nodules, but neither in size nor number could they be compared with those of the glands or liver. I have already spoken of the minute structure of the tumour, for it is that in which Birch-Hirschfeld succeeded in tracing the process by which alveoli are formed from the tubules of the gland. Only in one particular does this case deviate from what may be regarded as the type of carcinoma of the testis. The patient was younger than the age at which the disease most commonly occurs.

A dyer, thirty years of age, married, the father of five children, the youngest of whom was but two months old, noticed two years before he was admitted to the hospital, that his right testis was the size of a hen's egg. He could not account for this circumstance, and apparently thought little of it, but the tumour continued regularly to enlarge, until at the end of a year it was tapped and six ounces of bloody fluid were removed. Six months later the tapping was repeated, but only a few drops of blood issued through the canula. Although the tumour had attained a considerable size, and was therefore wearisome by reason of its

bulk and weight, it caused the patient very little pain. He was a thin, anæmic man, with a huge tumour occupying the situation of the right testis—a tumour of oval form, fourteen and a half inches in circumference, quite smooth, elastic, tense, firmer below than at the upper part. The scrotum could be raised with difficulty off the surface of the tumour, and the superficial veins were tortuous and full. The disease extended high up along the cord, which appeared, however, to be of normal size before the internal ring was reached. Deep down in the abdomen on the same side, firm masses of irregular form could be distinguished. To relieve him of the encumbrance, but only as a palliative measure, Mr. Langton performed castration. During the operation some twenty ounces of clear yellow fluid were drawn off. The tumour, the fibrous tunic of which was still unbroken, consisted of a central soft, dark, fawn-coloured pulp, surrounded by a firmer substance of the same fawn colour. No trace of the secreting structure of the testis, or of the epididymis, could be discerned. Immediately above the tumour in the cord was a second smaller mass of like colour and consistence, but above this mass the cord seemed natural. The microscope revealed an alveolar structure, the alveoli of which enclosed large round or ovoid cells, resembling greatly the epithelium of the gland (Plate I, figs. 1 and 2). Five days after the operation symptoms of peritonitis were observed, and with these symptoms ten days later the patient died. No post-mortem examination was permitted—a two-fold misfortune; for, first, its absence destroyed the completeness of the case so far as the cancer is concerned; and, second, the cause of the inflammation of the peritoneum must remain for ever uncertain, since nothing occurred during the operation by which it could be accounted for.

As examples of sarcoma to compare with these, the following may serve:

In November, 1876, I received a tumour of the testis from Mr. Lant Smith, of Alcester, with a note to the effect that it had been, the day before, removed from the scrotum of a child, six years of age, who had come under his notice about six weeks previously. It was uncertain when the tumour first began to grow, but during those weeks it had increased one half in size. Mr. L. Smith added: "There is some uncertainty about the paternity of the boy, but a reputed father died last year from cancer of the liver. The husband of the mother is living, which renders it difficult to establish the paternity." The epididymis and body of the testis were both affected, but the cord was not involved. The tumour measured after removal three inches by one and a quarter. Externally its surface was quite smooth and unbroken; on section it was white and homogeneous, but intersected by faint fibrous bands. Its consistence was firm and equal. Everywhere the normal structure of the testis was replaced by spindle cells and coarse fibres, with which were mingled confusedly round or oval cells, granular, and of large size (Plate I, figs. 4 and 5). There was an entire absence of alveolar structure. The boy recovered from the operation, and, until July of 1879, I heard no more respecting him. Mr. Lant Smith then wrote to tell me that his patient was at the point of death. His abdomen was occupied by a large tumour extending from the right inguinal region to the cartilages of the ribs, and by a second smaller mass in the situation of the spleen. The larger tumour had first been noticed fully two years previously, some six or eight months, therefore, after castration was performed. The second tumour was of recent growth. A few days later the patient died, when, to our chagrin, his mother's hus-

band, who had learned to entertain for him the affection of a father, could not prevail upon himself to permit him to be opened.

In almost every point this case corresponds with most cases of sarcoma of the testis in children, particularly in its somewhat confused structure and absence of cysts or cartilage, in its rapid growth, and in the secondary affection of the lymphatic glands, for that I imagine was the nature of the tumour which reached from the groin to the costal cartilages. So little doubtful does this appear to be that I would even venture to deduce from it a lesson teaching of the slow progress of glandular disease, its mild action on the economy, perhaps even its power of withholding, for a period, generalisation by the blood.

A case, equally characteristic of its kind, but differing widely from the last, is that of a wood-sculptor, fifty-seven years of age, who was castrated by M. Trélat in February, 1876. His case is related by Letulle,* and I use it in preference to one very similar which I myself observed, because it is somewhat more complete. The man was the father of fourteen children. At twenty years of age he was exempted from military service on account of a slight affection of the left testis, probably only varix. With that exception he had ailed little until seven or eight years before he came under observation, when the scrotum was found to be enlarged. The growth was very slow until the last six months, but from that time became just as rapid as it had previously been slow. Before removal the testis presented the shape and size of a large kidney, a contour tuberose or bossed, a consistence very unequal. The scrotum was not adherent, and the cord was scarcely thickened. On section the tumour contained no cysts or softened portions, its

* Case 8 in Table.

upper part was firm and white, its lower tinged with red and lobed. No separation existed of the body from the epididymis. In thin sections from various parts seminal tubes could be discerned, altered in shape, nearly deprived of epithelium, and separated by adenoid tissue, of which the tumour appeared entirely to consist. Shortly after the operation the right testis became enlarged, two months later tumours formed beneath the integument of various regions of the body, and in September the patient died. The disease was widely generalised. The cicatrix of the operation was indurated, and the structures of the cord were separated by new growth; the right testis was much enlarged and hard, the inguinal, pelvic, and lumbar glands were infiltrated, and secondary growths occurred in the sternum, vertebræ, bones of the skull, and in the subcutaneous tissue. The tumours most superficial were ulcerated, and ulceration was observed of some portions of the small intestine, although no thickening of its coats about these ulcers was apparent.

If in many points the foregoing cases differ widely from one another, there are yet some points common to all. And if a larger number of cases of sarcoma and carcinoma be compared, I think it will be found that the characters which they possess in common are more numerous than those by which they are distinguished. For example, the conditions of occupation and social position, of marriage, of previous health and family history, appear to exercise no greater influence on the production of one than of the other disease. The histories of both diseases are the same with regard to cause, rapidity of growth, pain, and previous inflammation. In shape, contour and consistence, their characters are very similar. Nor is the relation of the tumour to the scrotum or the condition of the cord very helpful in diagnosis,

although carcinoma appears to affect the scrotum more often and more early than sarcoma. Even after removal it is often impossible to distinguish between sarcoma and carcinoma unless the microscope be employed, for the position of the growth may be the same in either case, each may contain cysts, each may exhibit an encephaloid appearance; and, although the presence of cartilage proves, as I believe, that the tumour is a sarcoma, the absence of cartilage does not prove it to be a carcinoma. Regarding the characters in which they differ, again, I think it will be found that the cases of sarcoma differ as markedly from one another as do the cases of sarcoma from those of carcinoma. Unfortunately I have not an equal number of cases of each disease to compare together, and, still more unfortunately, many of the cases here collected are deficient in many details. Yet it is possible to ascertain some important points, which may be shortly indicated. Only one of the patients with carcinoma was under twenty years of age—a child of two years, whose testis was removed after it had been enlarged three months. Sections of the tumour presented a marked alveolar structure, so that I believed it to be a carcinoma.* Nearly two years later the patient died, as it appeared from caries of the spine, of which many of the signs were present. But there was no abscess, and no post-mortem examination was permitted. The case is described by Mr. Marsh, and its minute characters are figured in the 'Transactions of the Pathological Society.'† Although after twenty years no age was free from its occurrence, carcinoma of the testis

* I am quite ready to admit, as my friend Dr. S. W. Gross has suggested to me, that this tumour may have been an example of a sarcoma imitating the structure of carcinoma. I am, indeed, rather inclined to believe this than to regard this case as a solitary exception to the rule that carcinoma of the testis does not occur in children.

† Case 10 in Table.

was most frequent between the ages of thirty-five and forty-five. It never affected more than one testis. The tumour was unmixed with other tissues. Affection of the glands was found in every case in which the abdomen was examined and the condition of the glands was noted. In two of the four complete autopsies the lungs and liver were the seat of secondary growths; in the remaining two cases these organs were exempt, but the supra-renal capsule or the omentum was diseased.

The cases of sarcoma are forty-one in number, most of them round-celled. Of these forty-one cases twenty died, and on these twenty subjects thirteen post-mortems were performed, while in one case the abdomen only was examined. The disease was most frequent at two periods of life: the first period extending from birth to ten years old; the second from thirty to forty years, and therefore nearly corresponding with the period during which men are most liable to carcinoma. I do not pretend to explain why both classes of tumour occurred so frequently during the third decade of life, a time during which inflammations of the substance of the testis are perhaps less frequent. But I imagine before the age of ten two causes concur to render carcinoma rare: first, the little liability to cancerous degeneration of epithelium of any part at so early an age; second, the inactive condition of the epithelium of the testis before the age of puberty. Both testes were occasionally affected by sarcoma. Many of the tumours were mixed with cartilage or other tissues. The glands were not diseased in every case in which examination was made, but were enlarged and sarcomatous in eleven of the fourteen cases in which the abdomen was opened, and the supposition of their enlargement was so strong in four other cases as to amount almost to certainty. Secondary growths

occurred in the lungs in more than half the cases, in the liver only in a single instance. The bones or skin and subcutaneous tissue, or both, were affected in five cases.

If now, instead of comparing all the cases of sarcoma with those of carcinoma, we compare separately the round-celled and the spindle-celled tumours with the carcinomas, the results are more striking. The *round-celled* tumours occurred in persons of any age between eight months and sixty-four years, but most often before the age of ten or between thirty and forty years.* A large proportion of the cases occurred, too, in persons over fifty years of age. Both testes were not infrequently affected. None of the tumours contained cartilage or any organised tissue other than fibrous. Glandular affection was absent in two of the eight cases in which autopsies were performed. The lungs were the seat of secondary growths only in two instances, yet in five cases there was widespread generalisation in the bones and skin or subcutaneous tissue. Most of the cases in which both testes were affected and generalisation was extensive, were examples of lympho-sarcoma (or lymphadenoma) of the testes.

The subjects of the *spindle-celled* sarcomas were from ten months to forty-five years old, but nearly all the cases occurred in persons under ten years old, or between twenty-five and forty years. Only one of the patients was more than forty years of age (45). In no instance were both testes affected. Cartilage was present in greater or less quantity in more than half the cases. Affection of the glands had occurred in every case in which the body was

* Calculating from a smaller number of cases in 1879 I found the largest number of cases in persons under ten years old or between the ages of fifty and sixty. That statement is amended by the examination of a larger number of cases, but the further facts with regard to age must not be lost sight of.

examined after death; and, in two cases in which no examination could be made, a like affection was indicated by the presence of a large tumour in the pelvis and abdomen. The lungs contained secondary growths in every case save one. In no instance was there extensive generalisation similar to that occurring in the fatal round-celled tumours.

The number of *mixed-celled* tumours is scarcely large enough to allow any important generalisations to be made from them.

A careful summing up of the chief differences existing between carcinoma and sarcoma of the testis, and between the varieties of sarcoma, shows that, apart from those of structure and of age of occurrence, they are for the most part differences in the manner of their generalisation. Whether the manner of their generalisation depends upon modifications of their structure is not evident, nor shall I at present even attempt to explain it. But I think I can offer an explanation of one seeming anomaly, namely, of the departure in certain cases from the general rule that the lymphatic glands are affected in both diseases. The very fact of secondary enlargement of the glands in sarcoma of the testis is contrary to the general law laid down in many text-books teaching that sarcoma does not produce affection of the lymphatic glands. But if this law be true of sarcoma generally—a point to which attention will be particularly directed in the study of tumours of other tissues and organs—it is so thoroughly reversed in the present instance, that we are even obliged to seek some explanation of those cases in which affection of the glands was absent. They are three in number,* two round celled, one mixed celled, and they present one feature in common in which they differ from all the other fatal cases, their

* Nos. 5, 13, 38.

extremely short duration. The whole course of the disease in two of them was hardly longer than two months, and in the third was only five months. Castration was not performed on either of the two patients whose disease pursued the most rapid course, therefore the exception to the rule cannot be attributed to operation. The only other case in which the total duration was less than a year was that of a child four years of age, who died about seven months after the first appearance of the primary tumour, and in whom the lumbar glands were sarcomatous and much enlarged. But the duration of this case, short as it is, is half as long again as the duration of the longest of the other three, and three times as long as that of either of the two shortest. The inference is inevitable that these three patients died ere sufficient time had been granted for affection of the glands to be developed, and that, had they lived a few months longer, each of them would have been the subject of glandular affection. The slow progress of glandular disease is exhibited in the case of the boy under Mr. Lant Smith's care, and the same case may serve to illustrate its sometimes tardy onset.

In connection with the frequent combination of cartilage with spindle-celled tumours, let me try and rescue a group of tumours, which I believe to be quite innocent, from an opprobrium which most unjustly rests upon them. I mean the cartilaginous tumours of the testis. A pure cartilaginous tumour growing from bone, or indeed from such soft parts as the parotid gland, is generally regarded, and with justice, as a quite innocent tumour. But some cartilaginous tumours, of the testis especially, have pursued a course so unexpected and so decidedly malignant, that at the present time we look with suspicion upon all cartilaginous tumours of the testis, and feel that we best consult

the interests of our art and our individual credit by refusing any but the most qualified opinion regarding the future of the subjects of such tumours. One of the best and most complete cases of malignant enchondroma of the testis is that related by Sir James Paget in the 'Medico-Chirurgical Transactions' for 1855.

Studied alone, it appears incontrovertible that this case was one of pure cartilaginous tumour running a rapidly malignant course; and at the period of its publication I can scarce perceive how any other explanation of it could have been given. But studied as one of a group, the members of which form a series of gradations between the hard and soft tumours, its pathology becomes more evident. It is not needful to recount the case in full; it will suffice to recall its salient features.* The patient was thirty-seven years of age. In January, 1855, his testis was removed on account of an enlargement which had been noticed about two years. At the time of the operation thickening of the spermatic cord was found to extend nearly to the internal ring. The tumour consisted of two main masses one above the other, and of small growths lying in the inguinal canal. The main masses were composed of nodules, tortuous, cylindriform, and knotted pieces of cartilage, embedded in a tough, filamentous, white connective tissue, and in the upper swellings were many thin-walled cysts, containing clear pellucid fluid. New growth could easily be distinguished in the lymphatics of the cord. Examined with the microscope the cartilage proved to be hyaline, the opaque, white, and softer structures showed generally a filamentous and nucleated substance, and two chief structures were found in all. The axes of the connecting threads and the central substance of the growths which they sup-

* Case 33 in Table.

ported, were composed of densely nucleated substance; their exterior of a filamentous substance composed of fusiform and thin caudate corpuscles laid parallel with one another. On the 1st of May, 1855, the patient died. Lymphatics filled with new growth were traced along the course of the spermatic vessels to a large gland containing a cystic cavity lying beside the inferior vena cava. From this gland the lymphatics passed up close beside the vein, and at one point the vein was penetrated by an outgrowth proceeding from the lymphatic vessels. Both lungs were full of large cartilaginous tumours, growths of which were discovered on the inner coat of many branches of the pulmonary artery.

M. Dauvé relates a somewhat similar case in his monograph on 'Enchondroma of the Testicle.'* A man, twenty-six years old, noticed a small hard tumour at the lower part of the right testis in June, 1859. This tumour, or the testis, slowly increased in size, until in March, 1861, it measured eight by eleven centimètres, was enormously heavy, exceedingly hard, and uniformly ovoid. Castration was performed, when the testis was found to be transformed into a large tumour composed of cartilage. As in the last case so in this, the cartilage presented numerous nodules and tubes or cylinders of pearly aspect, resembling in their form and disposition the tubules of the testis. In the lower part of the tumour there was less cartilage, more fibrous tissue; and this also was the case in the epididymis, enlarged like the body of the testis. Here and there in the cord were masses of grey soft tissue made up of fibrous elements. A few days after the operation a fungous growth appeared from the stump of the cord. Later the left lower extremity began to swell, and on June 18th, about three months after the operation, the patient died. On examination after

* Case 28 in Table.

death the pelvic and lumbar glands were enlarged, soft, and grey in colour. A large suppurating tumour existed in connection with the left kidney, but the other viscera of the abdomen, and those of the thorax, were healthy. These secondary tumours of the abdomen contained no cartilage which could be detected with the unaided sight, but with the microscope small portions were discovered. Further than this, no account of the minute structure of these tumours is recorded, for the autopsy was delayed during the hottest days of a brilliant summer, and decomposition was already far advanced.

With these two cases, a third may be included to complete the series. A groom, thirty-five years of age, was castrated by Mr. De Morgan for the removal of a tumour of the right testis.* The growth dated from a squeeze the testis had sustained against the pommel of his saddle eight months previously. Great swelling and ecchymosis followed the injury, but subsided in two months, leaving the testicle enlarged and hard. At the period at which it was removed it formed an elastic, nearly globular swelling, five and a half inches in its long diameter. It contained numerous cysts, varying in size from a small pea to a walnut, most of which were filled with liquid, but some were occupied by solid growths. They were lined with epithelium, and their walls were composed mainly of connective tissue, but in the connective tissue were scattered small deposits of cartilage. The cord was not thickened; and although the tumour was of rapid growth, and the mingling of tissues was of doubtful import, it was hoped the disease was not malignant. For a year the patient remained quite well, but from that time his health began to fail, and more than two years after the operation he died. The cord was still healthy, but a

* 'Path. Trans.,' xviii, p. 182, and xx, p. 331. Case 29 in Table.

large cystic mass occupied the right iliac fossa and lower part of the abdomen. Both lungs contained scattered cystic tumours, with nodules of cartilage in their substance; and the pleuræ were studded with firm, pink-white masses of small size. Singularly enough, the secondary growths, both of the pelvis and the lungs, contained more cartilage than did the primary tumour; but their soft parts consisted almost entirely of spindle cells.

The first and second of these cases are such as would generally be termed enchondroma of the testis; but if the third case had not been so described in the 'Transactions of the Pathological Society,' it certainly would not have occurred to me to consider it a cartilaginous tumour. Since, however, it has been thus described, I am content so far to admit its claim as to group it, for the purposes of illustration, with the two more characteristic tumours, for I believe all these tumours are essentially of the same nature, and should be referred to the same class or group.

When a tumour—a carcinoma, for example—becomes changed at various points into a fatty or cheesy substance, we regard this substance, and probably with justice, as the result of fatty or caseous degeneration of the tissues of the tumour. And even when it occurs so largely as to affect the moiety or more of the substance of the tumour, we should hardly think of describing such a tumour as a fatty or caseous growth. It still remains, as it always was, a carcinoma, some of the features or even capabilities of which may be affected by the degeneration of its substance, but whose tendencies will still be those of carcinoma. So, when a tumour—a sarcoma, for example—presents here and there tiny nodules or plates of cartilage, we regard these tiny masses, and I believe with justice, as the result of organisation of the tissues

which form the tumour; for cartilage and sarcoma tissue both belong to the connective-tissue series. The material from which one of them is formed may equally be transformed into the other. I do not pretend to explain the law in accordance with which—in a tumour of the testis, for example—one portion of this material is transformed into spindle cells, another into cartilage, and perhaps a third portion into fibrous tissue. Nor do I know why the conjunction of cartilage with sarcoma is so frequent in spindle tumours of the testis; so rare as to be almost unknown in round-celled tumours; unless, perhaps, the impulse to organisation, which in the former results for the most part in the production of spindle cells, and is there arrested, is sufficient at certain points to produce a more perfect tissue, and is even so powerful in some sarcomas as to transform nearly the whole mass into cartilage or fibrous tissue. But this transformation of its substance does not produce a proportionate effect upon the nature of the tumour; it remains what it always was, a sarcoma, the features of which may be concealed, but the tendencies of which will be those of sarcoma.

If the description of the three tumours mentioned above be referred to, it will be seen that neither of them was composed solely of cartilage. Each had a softer part or parts, consisting in the first case of what may fairly be described as round and spindle cells, in the second of "fibrous elements," in the third of what is, somewhat loosely, called "connective tissue." It was this soft tissue which in the first case extended up within the lymphatics into the pelvis, and in the second and third cases this soft tissue formed nearly the whole of the secondary tumours, so much so in one of them that the presence of cartilage could only be detected with the microscope. This

latter circumstance is the more noteworthy because the primary tumour was almost precisely similar in the amount and disposition of its cartilage to the primary tumour described by Paget. This absence of organisation, as I should regard it, of some parts of the primary and of the secondary tumours, has been often spoken of as if it were a sarcomatous degeneration of a tumour more highly organised. But there are several reasons opposed to this theory, among which may be mentioned, as perhaps the strongest, that the most recent tumours and most recent portions of the tumours are the least organised, or are not organised at all, and that there is no evidence of the previous existence of cartilage in the parts which are said to have degenerated. If the words "sarcomatous degeneration" are intended to convey that the secondary tumours are in their structure more decidedly embryonic than the primary growth, the only objection which can be raised against the expression is that it is not applied correctly.

No argument, however, will be so convincing as a comparison of these three cases, first with one of pure cartilaginous tumour of the testis, next with those of the group of spindle tumours, among which I have taken the liberty to include them.* I have among my specimens but one case of pure cartilaginous tumour.† It had been growing four years within the scrotum of a young man twenty-two years old. Castration was performed early in 1875, and

* I have also included another case of what would probably be called by some authors malignant enchondroma, No. 35. The disease, in this instance, ran an exceedingly rapid course, and produced secondary tumours of the glands and lungs and spleen. The primary tumour was classed as a fibro-enchondroma, and presented apparently similar characters to the primary tumour in M. Dauvé's case. But the secondary tumours were much softer, and appeared more like myxo-chondromata.

† No. 2783, St. Bartholomew's Museum.

less than a year ago (1879) I saw the patient alive and in perfect health. The tumour was of small size, and was composed of hyaline cartilage, which, in its aspect and disposition, resembled that of the malignant tumours, but there was no softer tissue present save a thin layer of fibrous tissue around and between the portions of cartilage.

On the other hand, it will be seen that the age of these patients is that at which sarcoma is common; that they do not differ from the other cases of the group in their relation to the scrotum, their position in the testis, their total duration, or their affection of the lymphatic glands. The only characters of difference are the thickening of the cord in two of them and consequent affection of the stump, and the affection of the kidney rather than the lungs in one—the former character an expression of greater rather than of less malignancy of the primary tumours; the latter distinguishing the case in which it occurred as much from the cartilaginous as from any of the other cases.

It would be easy, were it necessary, to adduce many cases to show how very difficult is the diagnosis of malignant disease of the testis, especially in an early stage. But the cases which have been already related for other purposes suffice also for this. The case of the German student affords a good example of the uncertainty which is often experienced in distinguishing between a chronic or specific orchitis and a tumour. The second case shows how a large quantity of fluid in the tunica vaginalis may give rise to the suspicion of hydrocele. And the history of the cartilaginous sarcoma of the testis of a groom offers an illustration of disease commencing with the appearance of a hæmatocele and inflammation.

Even when the disease is advanced, malignant tumours are apt to be mistaken for innocent tumours, or for one or

other of the affections which have just been mentioned; for their characters are exceedingly various.

Thus, some of them possess a smooth contour and oval shape; others are bossed and kidney-like. Some fluctuate distinctly; others are as hard as wood. Some again are painless; and others are the seat of continual pain and heat. The signs which can be best relied on are the following: unequal consistence; continuous and often rapid growth; the absence of translucency, and the absence of the signs of inflammation. The absence of translucency, combined with the greater weight of the tumour, generally serves to distinguish a malignant tumour from a hydrocele. The unequal consistence of different portions of the surface, together with the absence of the signs of inflammation is of great value in determining between a malignant tumour and an inflammatory swelling. And the continuous growth of most of the softer forms of tumour is rarely observed in hæmatoceles, for which they are especially liable to be mistaken.

It might be imagined that an exploratory puncture would, in every doubtful case, at once clear up the diagnosis. In some instances, undoubtedly, it does do so; when, for example, the question is between hæmatocele and malignant disease, for the former yields generally dark and altered blood, the latter bright arterial blood. But if the puncture be made in the hope of procuring cancerous material through the canula, that expectation will not be fulfilled. Mr. Curling, whose article* on "The Clinical Aspect of Malignant Affections of the Testicle" is the best yet published, relies on the effect of treatment in the diagnosis between chronic orchitis and malignant affections in an early stage, and recommends "to exhibit mercury so as to make the gums

* 'Diseases of the Testis,' 4th edition, p. 362.

slightly sore." The objection to this course is that a person suffering from malignant disease is salivated to no purpose, and valuable time is lost. For my own part, I would sooner risk an incision into an inflamed testicle (made with all due care) than delay the castration of a malignant tumour.

Fortunately, an exact diagnosis is not in every instance a matter of importance. Thus, the diagnosis between an innocent and a malignant tumour is of little consequence, provided the disease be clearly recognised to be a tumour; for the treatment is the same in either case. Again, the diagnosis between sarcoma and carcinoma is not necessary, since castration is called for in both diseases. Certainly many of the cystic fibromas and enchondromas can be distinguished by their much slower growth, the freedom from implication of the cord, and the comparatively small size of the scrotal vessels; and in some cases a diagnosis may be even made between sarcoma and carcinoma. When, for instance, malignant disease attacks the testis of a child, when the tumour evidently contains cartilage and when both testes are affected, there can be scarcely any question that the disease is sarcomatous.

It may, I think, be assumed that neither form of malignant tumour can be controlled by the administration of internal remedies. Certainly no proof to the contrary exists in the literature of medicine. The disease, therefore, must either be allowed to proceed unchecked or be attacked by operation.

Two operations have been practised with alleged success. The one, ligature of the spermatic artery, has not been very frequently performed; and all that can be said respecting it is that some enlarged testes, the nature of which is quite uncertain, have diminished in size after the artery has been tied.

The other, castration, was performed on most of the patients in the accompanying tables. Of the 56 persons thus castrated, and whose ages varied from a few months to upwards of seventy years, only 4 died from causes directly connected with the operation. Of the 52 persons who survived the operation, 21 are known to have died at some later period, in nearly every instance from recurrence or generalisation of the disease, 23 were not traced long after operation, and 8 are known to have been alive and well at least some months after castration had been performed.

Among the cases of carcinoma, No. 20, a man, forty-two years old, whose disease had existed eighteen months, was quite well fourteen months after castration, and No. 16, whose testis had been enlarged during two years, was in good health between three and four years after the operation. Among the cases of sarcoma, No. 4, who had suffered from disease of the testis for three years, and who was more than fifty years of age, was well when last seen, sixteen months later. No 23, whose tumour was a spindle-celled sarcoma, was well two years after operation, and No. 19 was well three years after castration, performed within three months of the first appearance of the tumour. These cases afford, then, ample evidence that castration may, under certain circumstances, be successful. They show too that no fixed limit can be assigned as that beyond which the operation would be useless. For the duration of disease in two of them extended to two or even three years. Each case must be, therefore, judged on its own merits, and if the scrotum and the cord are healthy, and no signs of glandular or visceral disease are present, long duration of disease of the testis need not contraindicate castration. Even when the operation is not successful in arresting the

disease it may retard its progress, and rid the patient of a weighty and often painful encumbrance.

Thus, although the records show that castration is rarely crowned with permanent success in children, since every child which was traced long afterwards had perished, apparently from malignant disease, the respite in several instances was of long duration, and the primary tumour was almost always irksome owing to its size and weight.

Affection of both testes, although a grave sign, indicating as it does, in almost every instance, a form of disease prone to rapid and extensive generalisation, must not be held absolutely to forbid operation, since one of the patients was alive and well six months after castration, and another, whose case is described by Mr. Curling, lived for two years after the second operation, nor was his death then certainly known to be due to a continuance or return of the disease.

Carcinoma Testis.

No. of case.	Age.	Cause.	Duration before operation in months.	One or both testes.	Affection of scrotum.	Condition of cord.	Part of testis affected.	Tumour simple or mixed.	Total duration in months.	Recurrence in stump.	Affection of glands.	Affection of lungs.	Affection of other parts of body, and general remarks.	Authority.
1	50	Blow in the perinæum	15	L.	Adherent	Thickened	All	Simple	—	—	—	—	—	Path. Trans., xxii, 182, 1871.
2	30	0	24	R.	,,	,,	Body	,,	24*	—	(?) Yes	—	No p.-m. examination	St. B. Hosp., Richard D., 1873.
3	49	—	36	R.	,,	0	All	,,	42	Yes	—	—	No p.-m. examination	St. B. Hosp., Joseph S., 1875.
4	24	Kick	16	R.	0	—	,,	,,	—	—	—	—	—	St. B. Hosp., Thomas H., 1875.
5	34	(?) Blow	14	R.	0	0	Body	,,	—	—	—	—	Well 7 months later	St. B. Hosp., James G., 1879.
6	39	0	6	R.	0	Thickened	All	,,	7*	—	—	—	No p.-m. examination	St. B. Hosp., James W., 1877.
7	36	—	6	L.	—	,,	,,	,,	—	—	—	—	—	Bull. Soc. Anat., s. 4, i, 130, 1876.
8	38	—	(?)	L.	—	—	—	,,	(?)	Yes	Yes	Yes	Liver, right breast	Bull. Soc. Anat., s. 4, i, 96, 1876.
9	55	—	48	R.	0	Thickened	All	,,	—	—	—	—	—	Bull. Soc. Anat., s. 4, i, 203, 1876.
10	2	—	3	R.	0	—	,,	,,	24	0	—	—	No p.-m. examination	Path. Trans., xxvi, 138, 1875.
11	21	0	No op.	L.	—	Thickened	,,	,,	18	—	Yes	Yes	Liver	Arch. d. Heilkde., ix, 538, 1868.
12	54	(?) Friction	11	R.	—	0	Body	,,	—	—	—	—	Well some months later	Bull. Gén. d. Thérap., p. 33, 1870.
13	45	—	15	L.	Ulcerated	—	,,	,,	24	0	Yes	0	Supra-renal capsule	Pitha u. Billroth, Bd. iii, Abth. 2, Lf. 7-8, 358.
14	38	0	36	L.	Adherent	Thickened	,,	,,	36	0	,,	—	Partial p.-m. examination	Path Trans, xx, 250, 1869.
15	72	—	18	L.	—	—	—	—	—	—	—	—	—	Lyon Méd., ii, 294, 1873.
16	42	Squeeze	24	L.	0	0	All	Simple	—	—	—	—	Well 3½ years later	Bull. et Mém. Soc. Chir., iv, 206 18,8.
17	38	(?)Arrested development	24	R.	0	0	,,	,,	—	—	—	—	—	Prog. Méd., p. 231, 1881.
18	47	—	12	L.	0	—	—	,,	12*	0	(?)	0	Cancer of omentum	D. Ztsft. f. Chir., xiv, 224, 1881.
19	43	0	30	R.	0	Thickened	All	,,	—	—	—	—	—	Rev. Clin. d. Bologna, p. 46, 1876.
20	42	0	18	R.	0	0	,,	,,	—	—	—	—	Well 14 months later	St. B. Hosp., Joseph D., 1880.

* Death from causes connected with the operation.

No. of case.	Age.	Cause.	Duration before operation in months.	One or both testes.	Affection of scrotum.	Condition of cord.	Part of testis affected.	Tumour simple or mixed.	Total duration in months.	Recurrence in stump.	Affection of glands.	Affection of lungs.	Affection of other parts of body, and general remarks.	Authority.
Round-celled:—														
1	35	0	7	R.	0	(?)	Body	Simple	13	0	—	—	No p.-m. examination	St. B. Hosp., Thomas H., 1878.
2	19	0	5	L.	0	(?)	All	,,	—	—	—	—	—	St. B. Hosp., John H., 1873.
3	20	0	No op.	2	0	—	,,	,,	24	—	Yes	0	Subcutaneous tissue, bones	St. B. Hosp., Charles L., 1877.
4	51	Friction	36	L.	0	0	,,	,,	—	0	—	—	Well 16 months later	Nepveu, "Tum. du Test.," Obs. viii, 1875.
5	50	—	1	R.	—	—	Epidid.	,,	5	0	0	Yes	Liver, skin	Pitha u. Billroth, Bd. iii, Abth. 2, Lf. 7, 384.
6	61	0	60	L.	0	0	All	,,	—	—	—	—	—	Nepveu, l. c., Obs. iv.
7	64	(?) Strain	2	R.	0	—	Body	,,	—	—	—	—	—	Bull. Soc. Anat., s. 3, vii, 289, 1872.
8	57	—	12	2	0	Thickened	All	,,	21	Yes	Yes	0	Subcutaneous tissue, bones	Bull. Soc. Anat., s. 4, i, 149, 1876.
9	57	—	12	2	0	,,	,,	,,	42	—	—	—	No p.-m. examination	Path. Trans., xvii, 180, 1866.
10	3	—	13	L.	0	(?)	Body	,,	24	0	Yes	0	0	Path. Trans., xi, 165, 1860.
11	5	Bruise	3	L.	0	0	All	,,	12	0	,,	—	Partial p.-m. examination	Path. Trans., xi, 161, 1860.
12	34	0	2	2	0	0	,,	,,	—	0	—	—	Bones	Arch. Gén. d. Méd., p. 339, Sept., 1879.
13	8 mos.	—	No op.	2	0	—	Body	,,	2	—	0	0	Subcutaneous tissue, bones, heart, penis	Bull. Soc. Anat., s. 3, vii, 355, 1872.
14	34	—	15	R.	0	Thickened	—	,,	—	—	—	—	—	D. Ztsft. f. Chir., xiv, 228, 1881.
15	33	Blow	48	R.	0	—	—	,,	—	Twice	(?) Yes	—	—	Phil. Med. Times, xi, 340, 1881.
16	35	(?) Squeeze	15	R.	0	0	All	,,	21	Yes	(?) ,,	—	No p.-m. examination	Phil. Med. Times, xi, 340, 1881.
17	42	(?) ,,	15	2	0	0	,,	,,	—	—	—	—	Well 6 months after removal of testes	Centlblt. f. Chir., vii, 33, 1880.
18	30	Retained testis	No op.	L.	0	—	,,	,,	33	—	Yes	0	0	Prog. Méd., p. 199, 1881.
19	61	,,	3	L.	0	—	,,	,,	—	—	—	—	Well 3 years later	New Y. Med. Jour., xxxiii, 626, 1881.
20	(?) 45	—	24	2	0	—	,,	,,	—	—	—	—	—	M. S., 1880.
21	2	0	3	R.	0	Thickened	,,	,,	—	—	—	—	—	St. B. Hosp., Alfred G., 1879.
22	35	—	11	L.	0	0	—	,,	18	0	Yes	Yes	Right heart, right kidney	Nepveu, l. c., Obs. v.

Spindle-celled:—														
23	28	Blow	11	l	0	0	All	Cart. and mucous	—	—	—	—	Well 2 years later	Nepveu, l. c., Obs. i.
24	10 mos.	—	4	L.	Ulcerated	—	„	—	—	—	—	—	—	Bull. Soc. Chir., p. 382, 1876.
25	25	—	(?)	l	—	—	„	Cartilage	—	—	—	—	—	Nepveu, l. c., Obs. ii.
26	34	0	3	R.	0	0	„	„	—	—	—	—	—	St. B. Hosp., John D., 1874.
27	6	—	3½	l	0	0	„	Simple	33	0	(?) Yes	—	No p.-m. examination	M. S., Nov., 1876.
28	26	0	20	R.	0	Thickened	„	Cartilage	24	Yes	Yes	0	Kidney	Mém. Soc. Chir., vi, 291.
29	35	Bruise	8	l	—	0	„	„	36	0	„	Yes	—	Path. Trans., xviii, 182; xx, 331, 1867, 1869.
30	30	(?) Blow	3½	l	0	—	Body	„	—	—	—	—	—	Bull.Soc.Anat., s.3, viii, 329, 1873.
31	40	—	—	R.	—	0	„	Simple	(?)	0	Yes	Yes	—	Bull. Soc. Anat., s.3, ix, 702, 1874.
32	45	0	72	L.	0	—	„	„	—	—	—	—	—	Med. Press and Circ., i, 88, 1874.
33	37	Bruise	24	l	0	Thickened	„	Cartilage	30	Yes	Yes	Yes	—	Med.-Chir.Tr., xxxviii, 247, 1855.
34	10	0	5	l	0	0	All	Simple	36	0	(?) Yes	—	No p.-m. examination	M. S., Dec., 1875.
35	4	0	1	L.	0	0	„	Cartilage	7	0	Yes	Yes	Spleen	Bull. et Mém. Soc. Chir., p. 197, 1878.
Mixed-celled:—														
36	40	0	72	L.	0	—	All	Simple	72*	—	—	—	No p.-m. examination	Gaz. Hebdom., p. 640, 1871.
37	40	Blow	48	R.	—	—	„	Cart. and mucous	—	—	—	—	—	Virch. Archiv, xliv, 83, 1868.
38	40	0	No op.	R.	0	Thickened	„	Mucous tissue	2½	0	0	Yes	Interior of heart	Wien. Med. Wochsft., s. 767, 1878.
39	30	—	5	L.	0	(?)	Chiefly epidid.	Fibrous tissue	—	—	—	—	—	Bull. Soc. Anat., s. 4, iv, 540, 1879.
40	37	—	Many	R.	—	—	All	„	—*	—	—	—	—	Langenb. Arch., xxv, 827, 1880.
41	17	0	2	L.	0	0	„	Simple	—	—	—	—	—	Bull. Soc. Anat., s.4, iii, 523, 1878.

* Death from causes connected with the operation.

CHAPTER III.

SUBPERIOSTEAL TUMOURS OF BONE.

Pathology.

My first impression on reading the admirable articles of Dr. Gross on "Sarcoma of the Long Bones,"* was that the work I had intended had been already far better done than I could hope to do it, and I therefore felt disposed not to pursue any further my investigations on sarcoma of the bones. But, on careful consideration, I determined to adhere to my original intention. For it seemed to me that the subject might with advantage be treated in a different manner, and that perhaps a more comprehensive knowledge of it might be gained by employing a different method of investigation from that employed by Dr. Gross.

I have thought fit, therefore, to consider the sarcomas of all bones, with one exception—the upper jaw, the tumours of which are often of uncertain origin; and, in accordance with the scheme set forth in the introduction, to place the various tumours which are usually collected together under the generic term "osteoid," each in the group to which the cell-growth which forms its basis appears naturally to refer it. All primary malignant tumours of bone must be regarded as sarcomas, for no epithelial elements exist normally in bone. The hard parts, the cancellous tissue,

* 'Am. Jour. Med. Sciences,' July, 1879, p. 17; October, 1879, p. 338.

medulla, nerves, blood-vessels, and lymphatics, even the endothelial lining of the vessels, belong to the connective-tissue series. The tumours which grow from bone must therefore be connective-tissue tumours, not carcinomas.*

The subject, thus simplified, would still be very complex; but, happily, it is capable of division by an easy and natural method. I mean by the separate consideration of the tumours of central and of superficial origin. I shall speak of them throughout as central and subperiosteal, for, although the latter are more probably of periosteal than of osseous origin, the term "subperiosteal" will serve to distinguish them from tumours growing from the outer surface of the periosteum, which will not be included in the present study. Of most tumours it is easy to decide the origin, but when a tumour has attained a large size, and has by its growth destroyed much of the structures in the midst of which it lies, the difficulty is often insuperable. The presence of a thin bony shell surrounding it, or the maintenance of the outline (however much thinned and softened) of the cortex through it, its position and shape, the relation of the periosteum to the bone at its extreme limit, are points to which the attention is sure to be directed in a doubtful case. Where these guides fail the case had best be laid aside as useless, or unsafe for purpose of comparison.

The subperiosteal sarcomas may be all arranged under three heads:—(1) Round-celled, (2) spindle-celled, (3) mixed-celled. These varieties of sarcoma have already been described, and it is only necessary to direct attention to the frequency with which the cells or, more commonly,

* Occasionally an alveolar structure is observed in a primary sarcoma of bone. Examples of this will presently be given. Where the structure, however, is very decidedly alveolar, and especially when it resembles a primary tumour of some soft structure, grave doubts may exist whether it be not really secondary.

the intercellular substances, become calcified or chondrified, or even ossified. These transformations are, perhaps, more frequent in the spindle- and mixed-celled than in the round-celled tumours. Even when they largely affect the appearance of a tumour they do not, however, effect a corresponding alteration in its tendencies or attributes, and therefore the practice so universally adopted of classing together all these tumours and considering them as one common group, merely because they are so calcified or chondrified, or ossified, is extremely unscientific. A violent separation is thus effected of tumours possessing a similar basis structure, and new and uncalled-for groups are formed to add to the difficulties of the study of a subject already sufficiently perplexing. Even the terms which are employed are most objectionable or have been made objectionable by the manner of employing them. The term *osteoid*, for example, implies the presence of a substance like bone yet not bone. Its use should be restricted to tumours which are calcifying, which present when macerated large, white, hard, chalk-like masses. But it is employed equally to designate those which are ossifying, which contain true bone. An osteoid cancer or sarcoma is, then, a sarcoma of bone which is either ossifying or calcifying; that is, the word osteoid is used to denote the presence of bone and of a substance like bone. If we could not distinguish between these two substances there would still exist a reason why we should call these tumours osteoid. But we can distinguish whether a sarcoma is ossifying or calcifying (Plate II, figs. 4 and 5), therefore there is no reason why we should not call it an ossifying or calcifying sarcoma. Indeed, there is every reason why we should do so, and why we should discard a term which is unnecessary, and is often inconsistently applied. Again, an osteoid chondroma should be a tumour composed

of cartilage but like bone. An osteoid chondroma, however, is usually a sarcoma, many parts of which are transformed into a substance in some respects resembling cartilage, or, rather, resembling the animal basis of a rough kind of bone after its earth salts have been removed. If it were impregnated with earthy salts it would be true bone, and would cease to be cartilage. But it contains no earthy salts, and is therefore not osteoid, at least in the same sense as an osteoid sarcoma or cancer is said to be osteoid. It is in truth a chondrifying sarcoma. The term *osteo-sarcoma* is on some accounts more objectionable than osteoid sarcoma. It may mean a soft sarcoma of bone, or a sarcoma growing in the interior of a bone, or a sarcoma which contains bone, and which grows either from a bone or from the soft parts. It is employed by different authors in all these different senses. It is therefore worse than useless, for it may mislead. To all these terms the same objection may be raised. They are not used always in the same sense, or to express the same condition. They are used inconsistently, and are therefore mischievous.

If particles of bone, or lime, or cartilage are scattered through a tumour, no modification of its name seems needful. But if a large proportion of these tissues should occur so that the characters of the tumour are materially altered by them, this alteration may be expressed by some appropriate term preceding that which applies to the tumour on account of the form of its cells. For example, this tumour,* which consists partly of dense hard substance, partly of soft succulent material, is a calcifying spindle-celled sarcoma, for the succulent material is formed of spindle cells, and the hard substance is impregnated with earthy salts, but there are no lacunæ or canaliculi. Again, this tumour, which

* Specimens exhibited during the lecture at the College of Surgeons.

presents to the eye characters almost identical, is an ossifying mixed-celled sarcoma, for the succulent material is formed of cells of various shapes, and the hard substance has the structure of the rough bone common in such tumours. A nomenclature such as this is sufficiently simple and easy of application.

The relative proportions of the subperiosteal sarcomas of various bones in the accompanying table are probably approximately correct for all bones except the pelvis and the scapula. The number of tumours of both these bones would be much larger were it not for the extreme difficulty of deciding whether their origin is central or superficial. In the pelvis this applies particularly to growths in connection with the sacrum.

The method I purpose to adopt in considering the subperiosteal sarcomas is to study the characters and conditions of their existence in each particular bone which they affect; and I think it will be seen that this method is not only advisable, but essential to a perfect knowledge of them.

The FEMUR is of all bones by far most frequently affected by subperiosteal sarcoma. It is subject to all three forms, to neither of the three in overwhelming proportion. The mixed-celled sarcomas are certainly the most numerous, but many of them were composed entirely of round and spindle cells, and might therefore, without marked impropriety, have been placed in one or other of the first two groups. The six *round-celled tumours* occurred in persons from three and a half to twenty-seven years of age, but all the patients save one were between sixteen and twenty-seven years. All the tumours were of rapid growth. The first case may be taken as a fair example of the series, especially as it is the only instance in which the disease was permitted to pursue an uninterrupted course. The tumour was a large

chondrifying and calcifying sarcoma in a woman twenty years of age. No operation was performed, and eight months after the first appearance of the growth the patient fell a victim to the disease. The tumour never ulcerated, but secondary tumours formed in the integument of the abdomen and axilla, and after death the lungs and kidney were infiltrated with new growths, some of which were calcified like the primary disease. Although amputation of the thigh was performed on No. 2, the operation can scarce be thought to have changed the course which the disease would naturally have run. Seven weeks after the operation the patient sank and died from a generalisation so extensive that there is here no parallel case. The calvaria, sternum, heart, liver, lungs, kidneys, and inguinal glands were all the seat of secondary growths. And as the primary tumour was a blood-cyst, so were the growths of which it was the parent soft, easily broken down, and filled with clotted blood. The whole duration of the disease was only fourteen or fifteen weeks, a period so short that I am almost inclined to regard it as an instance of primary general sarcomatosis. It is the only one of the six cases in which the glands were affected.

Four of these cases were such as would generally be termed osteoid, and would, therefore, be classed separately from the softer tumours. But the most careful scrutiny fails to discover that they possess in common any characters except their bony structure, which distinguish them from the tumours which contain no bone.

Most of the *spindle-celled*, like the round-celled tumours, affected the lower portion of the bone; indeed, only one of them was of the upper third. Only one died without operation (No. 12), and since many characters of the disease are well exemplified in it, the case deserves an ample record.

The patient was a married woman, twenty-seven years of age, under the care of Mr. Callender. The tumour had commenced a year before her admission to the hospital high up in front of the left thigh. Its growth, which had been slow at first, had latterly attained a fearful speed. It formed a smooth, elastic, almost fluctuating mass, but little painful and not hot, the integument covering it dusky, œdematous, and traversed by large and tortuous veins. The whole thigh was occupied from the groin almost to the knee. Until her death, two months later, she remained an inmate of the hospital. During this time the tumour continued to increase in size, and the groin glands became enlarged, but the skin remained unbroken to the end. The autopsy discovered an enormous brain-like growth springing from the bone, whose upper part was bare and rough. The periosteum was destroyed, and the tumour, infiltrating the surrounding muscles, passed up beneath the pubic arch into the pelvis and abdomen. There spreading, it attacked the bladder and the iliac veins, penetrating the walls of veins and viscus. The inguinal, pelvic, and lumbar glands were enlarged and sarcomatous, and both lungs were filled with growths. The cells which composed the tumours were rather oat- than spindle-shaped, and presented a singular uniformity in size and shape (Plate II, fig. 1). In its continuous growth, infiltration of the surrounding structures but absence of ulceration, secondary affection of the lungs but absence of secondary affection of other organs, this tumour presents all the characters we may expect to find in a spindle-celled sarcoma of the femur. Only in one important respect does it differ from all the tumours of the same sub-group. The lymphatic glands were full of the same brain-like substance as that which formed the tumour.

This rare event was probably caused by a continuous

infiltration of some of the femoral or inguinal glands, and from these the affection spread till gland after gland was transformed into a malignant mass.

Nos. 8 and 14 are interesting on account of the many points of similarity between them, and also for the points in which they differ. Both were females and of nearly equal age. The former suffered amputation through the thigh for the removal of a tumour which had been three months growing, and had not yet attained a formidable size (Plate II, fig. 2). It proved to be a brain-like mass, but broken down and mixed with semi-clotted blood—a form of the old fungus hæmatodes. Three months later she returned with recurrence in the stump, and disarticulation of the hip was practised. The second tumour, like that of which it was a recurrence, was full of black and semi-clotted blood.

The patient rallied from the operation, but in a few days began to sink, and in three weeks died—apparently not from the amputation, for the wound was well-nigh healed, but from affection of the lungs, of which symptoms had lately been evinced. The tumour for which amputation was performed on No. 14 was a calcifying and chondrifying growth, which had already existed for a year —a longer time, by full four months, than the whole duration of the former case. It seems to have been recognised during the amputation that a portion of the disease still remained in the medulla of the femur, but it was not till six months later that the new growth was actually observed. A year after the amputation of the thigh a second amputation was performed at the hip-joint, and a year after the second operation the patient died with huge masses of secondary growth in the lungs and pleuræ, and three small tumours of the lining membrane of the heart.

These two cases are so similar that there are only two features in which they manifestly differ: first, in the duration of each stage of the disease and consequently in their whole duration; second, in the nature of the tumours. The more slowly growing was composed largely of cartilage, and was calcified; the more quickly growing of brain-like vascular tissue, whose consistence was so soft and vessels so weakly walled, that more than half its bulk was composed of semi-clotted blood. It is impossible to refrain from associating the greater density and hardness of the one tumour with its slower growth and late recurrence, the greater vascularity and softness of the other, with its far more rapid development and course. This impression is, however, corrected by the instance of another tumour equally dense and hard (No. 10), a chondrifying and ossifying sarcoma. Amputation was performed in this case also when the tumour had endured a year. But when, a few days later, the patient died, both lungs were partly filled with growths of a like nature and consistence to the primary disease. These "osteoid" tumours may with advantage be compared with the tumours which consisted simply of soft tissues. It will be seen that they possessed no other characters in common than their hardened structures, nor can any valid reason be discovered why they should be classed apart.

A similar comparison may be made of the hard and soft tumours of the group of *mixed-celled* tumours (Plate II, fig. 3), and with a similar result. The sex and age of the patients and the situation of the tumours are the same in either case; the duration of disease and the results of operation are in no way different; and, although at a glance it might seem that the hard tumours only were disseminated in the lungs, closer observation will discover

that, by a somewhat singular ill-fortune, none of the subjects of the soft or simple tumours were examined after death.

Three of the patients with mixed-celled tumours were allowed to proceed to death without operation. Cases 17 and 23 resemble each other in the total duration of the disease (less than a year in each), and in the affection of the lungs which was discovered after death. But in one of them the popliteal, lumbar, bronchial, and tracheal glands were so transformed by the disease that they retained no trace of normal structure. The third case (No. 27) differs widely from the other two. The patient was an infant, the duration of the disease was very short—scarcely more than three months—yet there were more, and more widely-disseminated tumours than in any other instance among the mixed-cell growths. From the lower end of the femur first affected the tumour spread up the thigh and down beyond the knee to the tibia, the upper third of which was extensively diseased. Shortly before death the femur and tibia of the opposite side were attacked by a disease similar in kind, but of less extent. The inguinal glands on both sides were enlarged, and resembled the primary disease in appearance and consistence. The left lung was covered with numerous patches and masses of sarcoma containing bone and calcareous matter, and the bronchial glands were similarly diseased, but the right lung appears to have been healthy. It is not easy to understand the relation which this glandular affection bore to the tumours of the femur in these two cases, the only cases in which there was affection of the glands. It may be that the popliteal glands were involved in the continuous growth of the primary tumours, and that the disease spread from the popliteal to the higher groups of glands. But, in the twenty-third case, the

natural condition of the femoral and inguinal glands, and the diseased condition of those of the abdomen, render it more probable that, as in most cases of sarcoma of the bones, so in this, the blood- and not the lymph-vessels were the channels by which the infection was conveyed.

If now we consider the characters which all these cases of the femur possess in common, the most obvious are their rapid course and deadly nature. Twenty-two of them are dead, and of the remaining 6, only 2 are known to have been alive a year after operation. Certainly 6 died from the direct effects of operation, but in no fewer than 2 of these the lungs were already the seat of secondary tumours. The 10 post-mortem examinations of other cases revealed affection of the lungs in all save one (No. 11), and that patient died four months after the first appearance of the tumour in the thigh, exhausted by profuse suppuration from an incision which had been made into it some time previously. Affection of the glands occurred so rarely that it is more difficult to explain why the glands were sarcomatous than why they were not sarcomatous. Widespread dissemination was uncommon. Ossification, calcification, and chondrification were so common that they were present in more than half the cases, and with these changes softening down into cystoid spaces, with the formation in some instances of a locular structure, was not infrequently associated. Ulceration of the integuments was almost unknown; even those tumours which were permitted to grow untouched till death, did not break through the skin. The duration of disease was in most cases from nine to twelve or fourteen months, but 3 of the patients died with affection of the viscera within four months, and one lived for three years. These tumours of the femur were rare before the age of puberty, still more rare after forty years,

and occurred most frequently in persons from twelve to thirty years of age. In connection with this point let me call attention to an arithmetical fallacy into which Dr. Gross has been betrayed; into which, therefore, others may be misled. In describing each form of sarcoma he has taken the mean of the ages of a number of patients, and has assumed that this mean represents the age at which the disease will be most frequently observed. But the mean of ages does not necessarily correspond with the age at which the disease most frequently occurs. If, for example, we take the mean of the ages of these patients with spindle-celled tumours, it is found to be 23·7, but there are only 3 patients whose age is within three years of this mean age, while all the others are either younger than twenty, or older than thirty. Again, the mean age of those with mixed-celled tumours is 20·0, but 6 of the patients are under sixteen years, and 3 of them are over twenty-five. Of size, shape, or contour little can be said. Large size, fusiform shape, and smooth contour were perhaps the properties most common. But of situation there can be no question; the lower end of the bone had the decided preference, and in not a few of the cases the disease appeared to have commenced about the upper limit of the epiphysis. In some few instances the tumour was directly traced to a blow or squeeze.

The tumours of the TIBIA include all three varieties, but the spindle-celled is not largely represented. In no important respect do the three varieties differ among themselves, but in some respects they differ widely from the tumours of the femur. Thus, four of them occurred in patients of fifty years or upwards, and only one in the person of a child; the tumours often grew more slowly, and not infrequently broke through the skin and fungated; and the

whole course of the disease was milder and less markedly malignant. Thus, in three cases the tumour had existed for upwards of four years, and in a fourth case for at least two years, when amputation was performed. Two patients died without operation, one at the end of six, the other of ten, months from the outbreak of the disease; in neither case was there visceral disease. No. 35 deserves notice for several reasons. The patient was a youth of eighteen years, whose leg was amputated by Mr. Croft seven months after the lower end of the tibia had become the seat of a large, soft, and pulsating tumour. It had the consistence of firm brain, possessed a ruddy hue, and exhibited a reticulated structure, of which the trabeculæ contained bone, the meshes soft cell growth. Nearly a year after the operation the hip was amputated for a soft and spongy tumour of the femur, first noticed four months after the removal of the leg; and with this tumour was removed a group of glands whose size and colour left no doubt that they too were sarcomatous. The relation of the tumour of the femur to the tumour of the tibia is not easy to explain. Apparently it was not a recurrence of disease from incompleteness of the operation, for it did not grow in the portion of the tibia which was left behind. It was more probably a separate outbreak of sarcomatous disease, and the glands were, I imagine, affected by continuous extension of the tumour to the nearest of them.

Only in one other instance among the tumours of the tibia is there a history of glandular affection, in No. 40. Dr. Baumgarten, who published the account of it, was very doubtful of the real nature of the disease. For, in addition to the fact that the patient had been subject to glandular swellings from her childhood upwards, the structure of the tumour of the tibia bore so strong a resemblance to that of

a vast collection of tubercles, that Baumgarten was disposed to regard it as a tubercular affection. Indeed, it was not till the woman died some six or eight months after the amputation of the thigh with enlargement of the inguinal glands and a deep-seated pelvic tumour that the diagnosis of sarcoma was considered to be justified. Unfortunately, no examination was made of the body after death. The total duration of the disease is set down at more than five years and a half, but it is not certain that the tumour, whatever may have been its nature, was of such long duration. A swelling of the leg certainly had formed five years before the amputation, after a suppuration in the thigh, which followed immediately upon an attack of erysipelas. But this swelling remained apparently unchanged until nine months previous to the operation, when it began steadily to increase.

The lungs were affected only in a single instance, but it must be borne in mind that only three complete autopsies were performed. No case is recorded of widespread dissemination. In eight of the thirteen cases the tumour was situated about the upper portion of the tibia in close relation with the head; in this respect, again, the tibia differed widely from the femur.

Like the tibia, the FIBULA is most often affected at the upper end; indeed, each one of these three tumours grew about the upper end or upper third. The first and third cases resemble each other in the sex and age of the patients, in the rapid growth of the tumours, the affection of surrounding muscles, absence of lymphatic affection, and death within a year. No autopsy was obtained of No. 42, for he died at home in Wales a few days after his return there from the hospital, but the supposition is strongly in favour of affection of the lungs, the signs of which were present

before and after amputation in a continued shortness of breath and frequent hacking cough, both of which increased in severity until he died.

The tumours of the HUMERUS are not very many, but certain of the features they exhibit are so marked and singular that they should certainly be borne in mind. Most of them commenced on the shaft of the humerus; all grew with a surprising rapidity; all grew along the shaft of the bone, yet through the periosteum, which therefore could not have confined them long, into the surrounding muscles. A better example cannot be adduced than that of a child, six years old (No. 48), who had been always well and strong until the early part of 1880. There then appeared in the middle of his right arm a lump of small size, lying deep down upon the bone, owning no cause, producing no pain, and giving rise to so little inconvenience that it was regarded by the parents as an ill of minor kind. But it spread with fearful speed, so that in less than five weeks it occupied the entire arm, from the elbow to just below the shoulder. The skin was red and hot, the forearm swollen and œdematous, the tumour so soft and elastic as almost to fluctuate. A section after amputation at the shoulder-joint displayed the entire diaphysis surrounded by a brain-like growth, through the midst of which the periosteum could be traced raised from the bone like the arch of a bow. The bone was softened so that it could be easily cut or broken. The tumour extended through the muscles almost to the subcutaneous tissue. Scarcely three months elapsed before the child was brought back to the hospital with a recurrent tumour immediately below the scar, and with this he died within six months of the commencement of the malady. He was not examined after death, but Mr. Marsh, who saw him from time

to time, thought that he was suffering from visceral disease.

The malignancy of these tumours may be inferred from the rapidity and manner of their growth, yet none of them produced enlargement of the glands. Recurrence of the disease occurred in every case in which observations were recorded and recurrence could possibly take place. Only two autopsies are recounted, both of them on patients who had died from operation. In one of these, although the tumour had only been noticed for six months, the lungs were the seat of secondary growths.

The tumours of the ULNA and the RADIUS were all round-celled, and affected the shaft or upper portion of the bone. The patient with tumour of the radius is still under observation. The other two are probably dead. These two differed in age, in the duration of the disease, and apparently in the disposition of the secondary tumours. But they presented one striking similarity: when the arm was amputated at or above the middle, there were removed with it in Case 53 five tumours in the substance of the biceps muscle, and in Case 54 four tumours lying along the line of the brachial artery. The tumours which were taken from the biceps were not thought to be glandular, but those which lay along the brachial artery were said by Dr. Gross to be glandular, and to present the round-celled structure of the primary disease. In each case the axilla was free from disease, and in each remained so as long as the observation of the case continued. The situation of the tumours in the first patient renders it improbable that they were glandular; the healthy condition of the axillary glands nine months after the operation in the second patient, and the extreme difficulty of distinguishing round-celled sarcoma tissue in lymphatic glands, so little enlarged as these are

stated to have been, strongly tempts me to believe that Dr. Gross may have been mistaken in his impression of the nature of the enlargement.

Of the CLAVICLE there are two cases, both round-celled, both in males, both in young subjects. Nor does the resemblance cease here, for the growth of both was rapid; in both, the neighbouring glands appeared to be affected; in one they certainly were so, for some of them were removed when the tumour, with the affected portion of the clavicle, was resected; in the other they probably, yet not surely, were affected, for in the recurrence which took place the irregular growth might well have been mistaken for glandular enlargement. In both, the surrounding soft parts were involved in the disease; in both, the tumour bore the same opaque-white colour and cancerous appearance. The cases are distinguished by the difference in the situation of the tumours, the one being attached to the sternal, the other to the acromial, portion of the clavicle, and in the rapidity of their growth, for to attain its size, in which it scarcely doubled the lesser, the tumour of the older patient had occupied six times as long. I am not able to give the date of death, and therefore the total duration in either case; for of one the termination was not known, and of the other, although his death was ascertained, it took place in a remote region of Ireland, whence I could obtain no further information respecting him.

The tumours of the SCAPULA* again were both round-celled. The first case is remarkable for the early age at which the tumour first was noticed, for the rapid course of the disease, and for the widespread dissemination

* I have already said that the number of tumours of the scapula would certainly have been much larger had it not been for the difficulty in most instances of deciding on their origin.

which ensued. It may probably be more justly regarded as an example of general primary sarcomatosis than of primary affection of the scapula followed by dissemination. The pathology of the second case was spoiled by operation, after which the patient speedily sank and died. In neither case was there enlargement of the glands.

The three tumours of the LOWER JAW were all spindle-celled, all of female subjects, of the body of the jaw, and of rapid growth. Unfortunately, neither case is complete, No. 42 least of all, for its history was traced only up to and immediately beyond the operation. Of the first two, each is known to have died with recurrence of the disease, although resection was practised, in one of them two, in the other three, months after the first appearance of the tumour. Recurrence took place almost from the time of the operation in the former, only after seven months in the latter, a difference for which a reason may be found in the muscle invasion recorded in the first. No post-mortem examination was made in either case, but the glands appear to have been sound. It remains only to be noticed that of these three tumours one was chondrifying.

The sarcoma of the RIBS is chiefly interesting for the rarity of primary sarcoma of the ribs. It deserves attention, too, for that it attacked two ribs close to their heads, destroyed much of their structure where it grew from them, possessed no capsule, infiltrated the surrounding muscles, was excised at the end of a year, and left the patient alive, free from recurrence, and with all the signs of health nine months after operation.

We have seen, in one of the cases of the lower jaw, how widely different may be the course of a chondrifying spindle-celled sarcoma, even when, as in this instance, its bulk is

mainly made of cartilage. The rapidity of growth and quick recurrence of the one contrasts strangely with the slower growth and the effect of operation in the other. Yet perhaps some explanation may be found: first, of the different speed of growth in the different conditions of moisture and vascularity and power of resistance of the affected part; next, of the difference as regards recurrence, in the relative freedom with which removal can be effected of a tumour of the jaw and of a tumour of the back.

Since this lecture first was published,* the number of tumours of the PELVIS then collected has been more than doubled. Even now the number would be larger, especially of tumours of the sacral region, were it not for the difficulty of deciding on their origin. All of these tumours were, therefore, of the innominate bone, all of them were fatal, and all of them, save one, occurred in males. In neither of them was the fatal issue long delayed, although, of course, it is not easy to determine the date at which the tumours first began to grow. Two features in their pathology are of exceeding interest—the frequency with which the disease was disseminated in the lungs, and the frequency with which the lymphatic glands were involved. The explanation of the former lies chiefly, undoubtedly, in the close proximity of the large veins to the tumour; in two of the cases in which the autopsy was carefully conducted there is a clear account of the presence of a sarcomatous mass within the iliac vein. The glandular affection appeared to depend chiefly upon the size and manner of extension of the primary disease. The tumours, which were very large and without clearly-defined limits or fibrous capsule, grew into the adjacent glands and quickly spread from gland to gland. The smaller and more limited tumours had not yet succeeded in effecting an

* 'Lancet,' 1880, ii, p. 487.

entrance to the lymphatic system, although they probably would have done so had not their progress been arrested by the patient's death.

The bones of the SKULL are subject to all three forms of sarcoma. From whatever region of the skull they grow, whether from the vault or from the base, there appears to have been an absence of glandular affection, unless that be considered glandular affection which, except that by it certain glands were affected, differed not at all from generalisation by the blood. I mean the affection of glands which lay at a distance from the primary disease—not even in the line between it and the main lymphatic trunk. Even in Case 75, where, with multiple tumours of the skull, the cervical glands are stated to have been enlarged, the history relates that the first tumour of the skull was situated in the right parietal region, and with this the left cervical glands were noticed to be affected. There were not at that time detected any other tumours of the skull or, indeed of the osseous system, but a lump was discovered deep down in the left iliac fossa, which proved at the autopsy, three months later, to be due to sarcoma of the lymphatic glands. A diseased gland lay also in the right iliac fossa.

That there is a great tendency to widespread generalisation, in which lymphatic glands are implicated, cannot be questioned, for it was observed in half the cases. As examples, none more typical can be found than two among the round-celled tumours, Nos. 71 and 72, which deserve on other grounds a more extended notice. They are both cases of what has been called chloroma or green cancer, a rare disease, said to have been first described by Balfour, now five-and-forty years ago. Even at the present time there exist so few recorded cases that they may be counted by units. Yet the disease bears characters that can scarce be

overlooked. It commences in the bones of the skull or face, is of periosteal or sub-periosteal origin, produces always, or almost always, multiple tumours of the skull, runs a most rapid course, producing growths in unconnected and unsuspected parts, such as the bronchial and mesenteric glands, the kidneys, prostate, testes, breasts, and lungs, and kills in from three to six months. All the growths, wherever they occur, present a similar green colour and round-celled structure. Thus much at least is gleaned from the recorded cases, which have been well analysed by Huber, who, in 1878, was able to collect but seven of them.*

In some peculiarities, which distinguish them from the tumours of almost every other bone, these chloromas differ not at all from most sarcomas of the skull. Multiplicity, for instance, is so common that most sarcomas of the vault present not one, but many flattened tumours of the inner or the outer table, and this equally whether they are mixed-, or round-, or spindle-celled. They grow, too, as if simultaneously, from both aspects of the bone, so that it is rare to find a tumour of even moderate bulk upon the outer which has not its counterpart, although perhaps not quite of equal size, upon the inner surface. Yet this occurrence is not, as I believe, due to simultaneous growth, but to penetration of the bone either from the inner or the outer side. The direction of growth of any tumour is determined mainly by two factors: first, the resistance offered by the surrounding parts; and next, their capacity for contagion by the tumour elements. The resistance offered by the tight-drawn pericranium on the convex aspect, and by the dura mater within—to which must be added the intracranial pressure—must in every case be great. Neither of these membranes is easily infiltrated or destroyed by the disease. But the

* 'Arch. der Heilkunde,' 1878, xix, s. 129.

bone yields readily before the invading host of cells, its surface is eroded, its cancellous tissue filled with the new material. Its Haversian canals are widened and varicose, its cancellous spaces enlarged, and all these parts are filled with a similar tissue to that which forms the tumours. Probably, too, the infiltration of the substance of the long bones at the seat of sarcomas of superficial origin, which is rarely, if ever, absent, is only another example of the effect of similar forces.

Frequent as are tumours of the inner aspect of the bone, death from pressure on the brain is comparatively rare. While the greater part, at least, of tumours of the skull caused death within a year or little more, some of them were marked by a much slower growth and longer course. Of this the most characteristic example was a spindle-celled sarcoma of the forehead and head of a young man, nineteen years of age (No. 76), which had grown gradually until it attained a large size and helmet shape. It extended from the eyebrows to behind the parietal protuberances, and across the vault from one semicircular line to the other. Its contour was smooth, its consistence firm and elastic. At the end of two years and a half the patient died, not from the growth or generalisation of the tumour, but four days after an unsuccessful attempt by Von Rothmund to remove it. It is hardly to be wondered that the attempt failed, for, on section, the mass penetrated the bone through a series of fine pores, and was even grown into the cavum cranii on either side the falx cerebri as a tumour the size of a hen's egg. Yet the patient had betrayed no signs of derangement of the functions of the brain, if we except a slight occasional sensation of giddiness. In its minute structure the tumour consisted merely of closely massed spindle-cells, varied by the presence in its deeper parts of

stalactite processes growing into it from the surface of the bone. No secondary deposits were discovered in the body. Only in the absence of giant cells does this tumour differ from one admirably described by Sir James Paget in his lectures on tumours.* The duration, position, manner of growth, even to the projection on either side the falx cerebri, are the same in both. And in that case, as in the one which has been just recorded, there were no growths in any other region of the body. The long duration and slow malignancy of these cases is the more remarkable that they have no parallel in the spindle-celled tumours here collected of other bones, and are totally unlike the other spindle tumours of the skull. Nor can they justly be compared with these two mixed tumours of the skull, both of which existed an almost equal time, and neither of which appears to have been generalised. For the structure of these tumours differed so much from that of other mixed-celled tumours that I have been in doubt whether these are in truth sarcomata. Each of them was composed largely of fibrous tissue, mixed with cells of various shapes, sometimes collected in irregular spaces or alveoli.

The tumours of the base grew in each case from the body of the sphenoid bone, and differed only in one important respect from the tumours of the vault, that neither of them was multiple.

Before leaving the pathology of the subperiosteal tumours, it is desirable to point out certain features in which they differ, not only from the sarcomas of other tissues, but even from the central growths of bones. Those characters which are common to both central and subperiosteal tumours will be considered at the end of the chapter devoted to the pathology of the central sarcomata.

* 'Lectures on Surgical Pathology,' 1853, vol. ii, p. 221.

After removal, and on section, the subperiosteal tumours present, in the large majority of instances, a structure radiating from the bone, which, indeed, I believe, is never absent if the material of which the tumour is composed is of such a nature as to allow it to appear. Some of the tumours of the innominate bone and skull possess this structure in so eminent a degree that on section they bear a singular resemblance to masses of basaltic columns. Rindfleisch* mentions this radiation, and ascribes it to a papillary formation. But it is not a papillary formation in the sense of resembling in structure the papillæ of the skin or mucous membrane, but apparently is solely due to the manner in which the tumour grows or is developed. The chief growth takes place around the tiny vessels passing from the periosteum almost at right angles through the cortex of the bone; each of these becomes the axis of a column resting on the bone; and thus the stamp of radiation is impressed upon the tumour. A radiation of a similar kind, though usually far less perfect, occasionally exists in inflammatory new formations originating beneath the periosteum.

Ossification, calcification, and chondrification are exceedingly common. They occur in the sarcomas of all bones, less perhaps in those of the skull than any other, and less frequently in the round-celled than in the spindle- and mixed-celled tumours. In growths in which these metamorphoses are very extensive, the bulk of the hard material lies on and in close proximity to the bone from which the tumour grows.

In about one fourth of the total number of cases there was sarcomatous affection of lymphatic glands, but it must not be inferred from this that the probability of affection of

* 'Lehrbuch d. Path. Gewebelehre,' 4te Auflage, s. 544.

the glands in every case of subperiosteal tumour is as one to four. For glandular disease is almost invariably associated with the tumours of certain bones, while the tumours of other bones seldom or never implicate the glands. Thus the tumours of the femur, tibia, fibula, humerus, radius, scapula, and lower jaw scarcely ever affect the glands; those of the pelvis and the skull are quite frequently associated with glandular disease, so that half the cases in which the glands were affected were cases of tumours of these bones.

The relation of the glandular disease to the tumours of the pelvis and the skull has been already indicated. The tumours of the pelvis speedily grow in contact with and involve certain of the glands and spread from gland to gland. The tumours of the skull bear no lymphatic relation to the affected glands, which merely play a part in a generalisation of the tumour through the blood. In neither case can the relation be regarded as that which is understood when secondary affection of the glands is spoken of. The glandular disease which occurred in connection with the tumours of the clavicle was probably produced in a similar manner to the glandular disease associated with the tumours of the pelvis. Indeed, I am disposed to think that the glands are almost never directly affected through the lymphatic tubes by subperiosteal tumours. Lymphatic disease may, therefore, be regarded as a kind of accident, an accident which indeed occurs frequently in association with the subperiosteal tumours of certain bones, but only because the conditions which must inevitably result in accident are almost always present in them.

DESCRIPTION OF PLATE II.

FIG. 1.—Subperiosteal small spindle-celled sarcoma of the femur. × about 200.

FIG. 2.—Subperiosteal large spindle-celled sarcoma of the femur. × about 200.

FIG. 3.—Mixed-celled sarcoma of the femur, subperiosteal. × 260.

FIG. 4.—Subperiosteal ossifying spindle-celled sarcoma of the ilium. × 60.

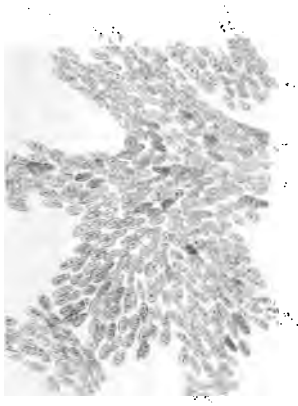
FIG. 5.—Portion of the above more highly magnified. × 260.

FIG. 6.—Central fibrifying sarcoma of the femur. × 260.

FIG. 7.—Central giant-celled sarcoma of the ulna. × 260.

Plate 2.

1.



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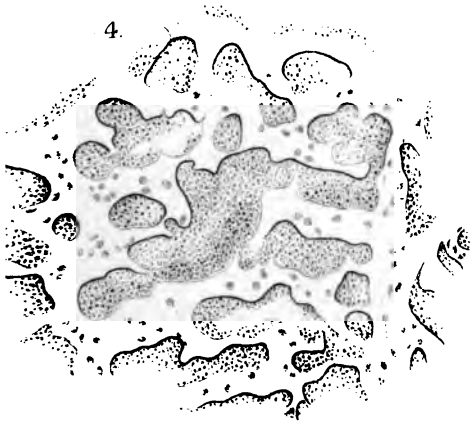

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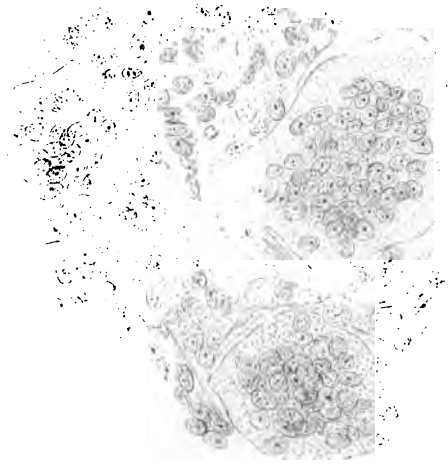

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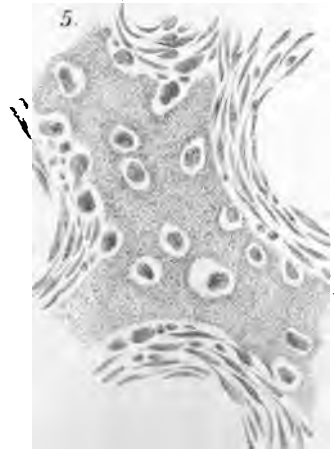


SUBPERIOSTEAL TUMOURS OF BONE.

No. of case.	Sex.	Age.	Seat.	Simple or mixed.	Duration to operation (in months).	Nature of operation.	Total duration (in months).	Recurrence of disease.	Affection of glands.	Affection of lungs.	Affection of other parts of body, and general remarks.	Authority.
FEMUR:—*Round-celled.*												
1	F.	20	3/3	Calc. and chon.	—	0	8	—	0	Yes	Skin, kidney	Langenbeck's Arch., xii, 630, 1871.
2	M.	27	Lower epiph.	Simple	2	Amp. thigh	3½	0	Inguinal	„	Calv., sternum, heart, liver, kidney	Prag. Vierteljhrsft., iv, 5, 1877.
3	M.	19	3/3	Bone spic.	3	„	11	0	0	—	No p.-m. examination	St. B. Hosp., James A., 1880.
4	M.	26	Lower epiph.	Simple	15	„	15*	0	0	—	No p.-m. examination	Path. Trans., xxvii, 265, 1876.
5	M.	16	3/3	Bone	1	„	—	0	0	—	Well 14 months later	Path. Trans., xxiii, 179, 1872.
6	F.	3½	Diaphysis	„	7	Amp. hip	21	Yes	0	—	No p.-m. examination	Path. Trans., xxx, 403, 1879.
FEMUR:—*Spindle-celled.*												
7	F.	9½	1/3 and 2/3	Simple	2	Amp. hip	—	—	0	—	—	Bull. et M. Soc. Chir., vi, 362, 1880.
8	F.	21	3/3	„	3	Amp. thigh	8	Yes	0	—	No p.-m. examination	St. B. Hosp., Emily G., 1873.
9	M.	41	3/3	„	3½	„	4*	0	0	0	0	Bull. Soc. Anat., s. 2, xii, 530, 1867.
10	F.	31	Diaphysis	Ossif. and chon.	12	Amp. hip	12*	0	0	Yes	0	Bull. Soc. Anat., s. 3, viii, 467, 1873.
11	F.	9	3/3	Simple	1	Incision	4	0	0	0	0	Jahrb. d. Kinderhlk., xii, 209, 1878.
12	F.	27	Diaphysis	„	—	0	14	—	Inguinal	Yes	0	St. B. Hosp., Catherine B., 1877.
13	F.	34	3/3	„	3	Amp. thigh	3*	0	0	0	0	Path. Trans., xxi, 340, 1870.
14	F.	18	3/3	Calc. and chon.	12	„	36	Yes	0	Yes	0	Arch. d. Heilkunde, x, 473, 1869.
15	M.	24	3/3	Ossifying	12	Amp. hip	37	0	0	„	0	Phil. Med. Times, ix, 363, 1878-79.
FEMUR:—*Mixed-celled.*												
16	M.	14	Diaphysis	Ossif. and chon.	3	Amp. hip	3*	—	0	Yes	0	Bull. Soc. Anat., s. 3, viii, 108, 1873.
17	F.	30	1/3	„	—	0	9	—	0	„	0	Virch. Arch., liv, 166 1872.
18	M.	13	Diaphysis	„	2½	Amp. hip	12	Yes	0	—	No p.-m. examination	St. B. Hosp., Sydney A., 1873.

* Death from causes connected with the operation.

Subperiosteal Tumours of Bone (*continued*).

No. of case.	Sex.	Age.	Seat.	Simple or mixed.	Duration to operation (in months).	Nature of operation.	Total duration (in months).	Recurrence of disease.	Affection of glands.	Affection of lungs.	Affection of other parts of body, and general remarks.	Authority.
FEMUR:—*Mixed-celled (continued).*												
19	M.	23	2/2	Ossif. and chon.	4½	Amp. hip	—	—	—	—	—	Path. Trans., xxi, 337, 1870.
20	M.	38	3/3	Simple	2½	Amp. thigh	9	0	0	—	No p.-m. examination	St. B. Hosp., John H., 1874.
21	F.	16	1/2	,,	9	Amp. hip	9*	0	0	—	No p.-m. examination	Lancet, ii, 217, 1878.
22	M.	27	1/2	,,	—	,,	—	—	—	—	—	Lancet, i, 221, 1866.
23	M.	24	2/2	Calcifying	—	0	9	—	Bronchial, popliteal, lumbar, &c.	Yes	0	Med. Press and Circ., ii, 15, 1874.
24	M.	24	3/3	,,	6	Amp. hip	11	0	0	,,	Liver, spleen	Path. Trans., xxiv, 183, 1873.
25	M.	14	Diaphysis	Simple	8	,,	14	0	—	—	Tumours of many parts of body. No p.-m. examination	St. B. Hosp., Percy A., 1879.
26	M.	16	3/3	Ossifying		Amp. thigh	—	0	0	—	Well a year later	St. B. Hosp., William S., 1880.
27	F.	1½	2/2	Chon. and ossif.	—	0	3½	—	Bronchial, inguinal, both sides	L.	Other femur and both tibiæ	Path. Trans., xxxi, 223, 1880.
28	M.	20	Diaphysis	Simple		Amp. hip	—	—	0	—	—	Brit. Med. Journ., i, 8, 1879.
TIBIA:—*Round-celled.*												
29	M.	53	Diaphysis	Simple	Years	Amp. thigh	Years	0	0	—	Tumour of forehead and of other calf. No p.-m.	Bull. et M. Soc. Chir., iii, 208, 1877.
30	F.	17	Upper epiph.	,,	3	,,	9	0	0	—	No p.-m. examination	St. B. Hosp., Eliza L., 1876.
31	M.	26	1/3	,,	2	,,	—	0	0	—	Well 16 months after operation	St. B. Hosp., Joseph K., 1878.
32	M.	61	1/3	,,	2	,,	—	—	—	—	—	Bull. Soc. Anat., s. 4, iv, 54, 1879.
TIBIA:—*Spindle-celled.*												Jahrb. d. Kinderhlk. xii, 214, 1878.

37	M.	19	Diaphysis	Ossifying	—	0	10	—	0	0	0	Langenbeck's Archiv, i, 166, 1860.
38	M.	24	1/3	Simple	9	Amp. thigh	10	—	0	Yes	0	Bull. Soc. Anat., s. 2, xii, 491, 1867.
39	F.	—	1/3	„	48	„	—	—	0	—	—	" Ostéo-sarcome des Membres," Schwartz, Obs. xvi, 1880.
40	F.	49	Lower 2/3	„	60	„	68	—	Inguinal & (?) pelvic	—	No p.-m. examination,	Virch. Archiv, Bd. 76, 491, 1879.
41	F.	62	3/3	„	24	„	24*	—	0	—	No p.-m. examination	St. B. Hosp., Elizabeth S., 1879.
FIBULA:—*Spindle-celled.*												
42	M.	20	1/3	Simple	6	Amp. thigh	9	0	0	—	—	St. B. Hosp., Nathaniel D., 1873.
43	F.	50	1/3	„	18	„	—	—	—	—	—	Amer. Med. Times, iii, 323, 1861.
FIBULA:—*Mixed-celled.*												
44	M.	23	1/3	Calcifying	8	Amp. thigh	12	0	0	0	In other calf and subcutaneous tissue	Path. Trans., xxii, 214, 1869.
HUMERUS:—*Round-celled.*												
45	M.	19	Diaphysis	Simple	2	Amp. shoulder	—	Yes	0	—	—	Prag. Viertijhrschft., iv, 14, 1877.
46	M.	19	„	„	3	„	3*	—	0	—	No p.-m. examination	Amer. J. Med. Sci., p. 358, Oct., 1879.
47	F.	27	„	„	4	„	16	Yes	0	—	No p.-m. examination	Path. Trans., xvii, 211, 1866.
48	M.	6	„	„	1½	„	5	„	0	—	No p.-m. examination	St. B. Hosp., George K., 1880.
HUMERUS:—*Spindle-celled.*												
49	M.	34	Diaphysis	Chondrifying	6	Resection	6*	—	0	Yes	0	Arch. d. Heilkunde, x, 469, 1869.
50	F.	26	„	Bony spic.	9	Amp. shoulder	—	—	0	—	—	Bull. Soc. Anat., s. 4, iv, 362, 1879.
HUMERUS:—*Mixed-celled.*												
51	M.	30	1/3	Bone spic.	5	Amp. shoulder	5*	—	0	0	0	St. B. Hosp., Eugene S., 1880.
52	F.	14	1/3	Ossifying	9	Amp. shoulder, removal of recurrent growth	—	Yes	0	—	Well 10 months later	" Ostéo-sarcome des Membres," Schwartz, Obs. ii, 1880.

* Death from causes connected with the operation.

SUBPERIOSTEAL TUMOURS OF BONE (continued).

No. of case.	Sex.	Age.	Seat	Simple or mixed.	Duration to operation (in months).	Nature of operation.	Total duration (in months).	Recurrence of disease.	Affection of glands.	Affection of lungs.	Affection of other parts of body, and general remarks.	Authority.
ULNA:—*Round-celled.*												
53	M.	25	1/3	Ossifying	12	Amp. arm	13½	0	5 tumours of biceps, (? gland.)	—	No p.-m. examination	Edinb. Med. Journ., xvi, 1006, 1870-71.
54	M.	2	1/3	Bone spic.	21	"	—	0	4 tumours along line of brachial artery (? gland.)	—	9 months later tumour of skull	Phil. Med. Times, x, 500, 1879-80.
RADIUS:—*Round-celled.*												
55	F.	27	2/3	Simple	(?) 6	Resection	—	Yes	0	—	—	St. B. Hosp., May W., 1881.
CLAVICLE:—*Round-celled.*												
56	M.	18	Sternal 1/2	Simple	9	Resection	—	Yes	(?) Cervical	—	No p.-m. examination	St. B. Hosp., Elger S., 1874.
57	M.	14	Acromial 1/2	"	1½	"	—	—	Cervical	—	—	Path. Trans., xxvii, 222, 1875.
SCAPULA:—*Round-celled.*												
58	M.	1mo.	Acromion	Simple	—	0	1½	—	0	0	2 of scapula, subcutaneous tissue, heart, kidneys, liver, suprarenal body (L.)	Path. Trans., xxx, 399, 1879.
59	M.	25	Body	"	2	Resection	2*	—	0	0	0	Brit. Med. Journ., i, 478, 1880.
LOWER JAW:—*Spindle-celled.*												
60	F.	18	Body	Cartilage	2	Resection	6½	Yes	0	—	No p.-m. examination	Langenbeck's Arch., xii, 607, 1871.
61	F.	29	"	Simple	1½	"	—	—	—	—	—	Bull. Soc. Anat. [illegible]

RIB:—*Spindle-celled.*												
63	M.	33	Neck	* Chondrifying	12	[Resection	—	0	0	—	Well 9 months after operation	Langenbeck's Arch., vii, 841, 1865.
PELVIS:—*Round-celled.*												
64	M.	41	Innominate	Simple	—	0	7	—	Pelvic and femoral	0	0	Bull. Soc. Anat., s. 2, xii, 334, 1867.
65	M.	25	„	„	5	Resection	5*	—	0	Yes	—	Langenbeck's Arch., xvii, 91, 1874.
66	M.	25	„	Chondrifying	—	0	20	—	Pelvic	„	Scap., verteb., heart, liver	Virch. Arch. xxxv, 503, 1866.
67	F.	11	Ilium	Bone spic.	—	0	12	—	Abdominal and bronchial	„	Skull, right femur	Bnll. et Mém. Soc. Chir., vi, 365, 1880.
PELVIS:—*Mixed-celled.*												
68	M.	33	Ilium	Calcifying	—	0	10	—	0	R.	Embolus in heart	Lancet, i, 207, 1880.
69	M.	46	Pubic	Chondrifying	(?) 5	Removal	(?) 5*	—	(?) 0	0	0	St. B. Hosp., James M., 1881.
70	M.	54	innominate, Innominate	Simple	—	0	7	—	Inguinal, pelvic, cervical	R.	0	Austral. Med. Journ., n. s., ii, 117, 1880.
SKULL:—*Round-celled.*												
71	F.	21	Multiple	Simple	—	0	6	—	Bronchial	0	Both breasts	Arch. d. Heilkunde, xix, 129, 1878.
72	M.	17	„	„	—	0	3	—	Mesenteric	0	Testis, kidneys, prostate	Arch. Gén. d. Méd., s. 5, iv, 385, 1854.
73	M.	19	Base	„	—	0	8	—	Mediastinl.	Yes	0	D. Ztscft. f. Chir., v, 133, 1875.
74	M.	28	Multiple	„	—	0	11	—	0	„	Humerus, liver	St. B. Hosp., George G., 1876.
75	F.	4	„	„	—	0	6	—	Left cervical, iliac	0	Sternum, ribs, mass in abdomen	Path. Trans., xxxi, 216, 1880.
SKULL:—*Spindle-celled.*												
76	M.	19	Frontal	Simple	30	Removal	30*	—	—	0	0	Langenbeck's Arch., x, 389, 1869.
77	M.	3	Multiple	„	—	0	3½	—	Submax., lumbar, mesenteric	0	Lower jaw, supra-renal body	Jahrbuch d. Kinderhlkunde., viii, 374, 1875.
78	M.	24	Base	„	—	0	14	—	0	Yes	Liver, subcutaneous tissue	Virch. Arch., xxxv, 413, 1866.
SKULL:—*Mixed-celled.*												
79	M.	30	Multiple	Bone	—	0	24	—	0	0	0	Virch. Arch., liv, 288, 1872.
80	M.	4	Frontal	Simple	3	Removal	30	Yes	0	—	—	Virch. Arch., lvii, 297, 1873.

* Death from causes connected with the operation.

CHAPTER IV.

SUBPERIOSTEAL TUMOURS OF BONE (*continued*).

DIAGNOSIS AND TREATMENT.

As in the study of pathology so in the study of diagnosis and treatment, it is essential that the tumours of each bone should be considered separately. What can be more useless, nay, absurd, that an attempt to schematise a diagnosis and treatment which shall be suitable alike for tumours of the tibia and skull, or for tumours of the pelvis and the humerus! Their conditions of life and growth, the diseases for which they severally may be mistaken, are not the same, and the manner and result of treatment differ totally. The same arrangement therefore will be adopted as in the chapter on pathology, and the tumours of the FEMUR will be first considered. It is, I believe, impossible to distintinguish between the three varieties of sarcoma by which the femur is attacked, nor is the diagnosis very important. But in most instances it is not very difficult to detect the presence of a sarcoma, and even in many instances to be sure that the sarcoma is subperiosteal, not central. A tumour rising somewhat abruptly from the bone at or about its lower end, affecting one side much more markedly than the other, having a lobed, irregular surface, and an unequal consistence, increasing rapidly in size, yet not associated with very evident signs of inflammation, must almost

certainly be a sarcoma. The subperiosteal tumours for the most part grow more quickly than the central, and are not limited so decidedly to the extremities of the bone; indeed, if they commence at either end, they speedily extend along the shaft.

The diagnosis of sarcomas from innocent tumours is usually very simple; the former occur much more frequently, grow much more quickly, present a much more varied consistence, and are, as a rule, much more painful than the latter. In fact, the only affections which may easily be confounded with sarcomas are chronic inflammatory affections of the bone. It might be imagined that the signs of inflammation in the latter and the absence of them in the former would be conclusive of the nature of the disease. But, unfortunately, the more rapidly growing tumours are often associated with all the local and even the constitutional signs of inflammation. An excellent illustration of this may be found in Sir William Mac Cormac's account of one of the mixed-celled tumours (No. 28). The entire thigh was occupied by a fusiform swelling, so elastic that it seemed to fluctuate. The skin was tense and pale and much warmer than that of the opposite limb. Effusion had taken place into the knee, which, with the thigh, was the seat of an excessive pain. The patient was emaciated, his eyes were glistening, and his features sunken. At times he sweated profusely, and his temperature ranged from 100° in the morning to 102° or 103° at night. In at least three cases repeated paroxysms of acute pain were noticed; and in two of them the paroxysms were accompanied with dryness of the integuments and rise of the body heat.

On the other hand, there are certain cases of inflammation of the bone or periosteum in which the signs of inflammation are so insignificant, and the appearances of tumour

are so striking, that an erroneous diagnosis of sarcoma may be made. Two such cases have been recorded by Mr. Baker in the sixtieth volume of the 'Transactions of the Royal Medical and Chirurgical Society,'* one under his own care, the other under the care of Mr. Barwell. They are described under the appropriate heading of "Necrosis without Suppuration," for in each instance a fragment of dead bone lay entombed in a cavity surrounded by thick new bone, and in neither instance was there suppuration or clear sign significant of inflammation of the bone. Within the past few weeks I have seen one more case of the same kind, which was, like the other two, mistaken for a malignant tumour. From a careful comparison of the symptoms afforded by these cases and by sarcomas, I cannot but think the error of diagnosis may for the future be avoided by directing attention to the following points:—All these cases of necrosis are of the diaphysis of the femur, and generally of the middle portion of the bone; the swelling produced by the new bone feels always very firm or hard, and generally smooth and fusiform; there has not been rapid and continuous increase of the tumour; the malignant tumours are rarely of the shaft; the consistence of those which do affect the shaft is generally very soft and almost fluctuating, or very unequal; and the increase of the tumour is invariably rapid and continuous.

When the inflammation is of the lower portion of the femur, of a chronic type, and accompanied with considerable swelling, the diagnosis may be even more difficult. During the past year a case of this kind was presented at St. Bartholomew's Hospital in the person of a boy, nine years of age, who suffered from a considerable swelling of the entire lower end of the femur. The increase of the

* P. 187.

swelling during the four months which preceded his admission to the hospital had been so regular, the temperature over it was so little raised, and the pain and tenderness were so slight, that the surgical staff in consultation expressed an almost unanimous opinion that the disease was sarcomatous. When, however, a few days later, an exploration was made with a view to amputation, a chronic inflammation of the bone and periosteum was discovered, and a kind of pus had even formed beneath the periosteum deep down in the popliteal space.

I believe that there are no means by which an accurate diagnosis can be made between these chronic inflammations which simulate tumours and the tumours which present the signs of inflammation, except careful measurements and exploration. If, in spite of perfect rest, an affected limb continues constantly to increase in size, the argument is strong in favour of sarcoma. So grave is the latter malady, however, and so small is the prospect of success if treatment be delayed, that when the evidence is equally balanced between the two diseases I am decidedly of opinion that the further evidence of gradual enlargement should not be waited for. An exploratory incision should at once be practised. Even if the affection be inflammatory, this will be attended by scarcely any danger, provided it be carefully performed.

The only treatment which offers the least likelihood of success is amputation as high as possible above the disease and as soon as the diagnosis can be made. Even then only a slender hope can be held out of ultimate recovery; for a glance at the tables will show that only 2 patients are known to have been alive a year after operation,* while 16

* In the 'British Medical Journal,' 1880, vol. ii, p. 81, Mr. Holmes has described a case of "subperiosteal" sarcoma of the femur, for which amputa-

of the remaining 20 who were amputated were known to have died. It has been already shown that 6 died directly from the effects of the operation, but in 2 of these the lungs were already affected when the patients died. Of course it is not certain that every patient who died a few months after amputation died of sarcomatous disease, for many of them died at home, where their bodies were not examined. But a close scrutiny shows that there are only two cases (Nos. 3 and 20) of which it cannot confidently be maintained that sarcomatous disease was present.

Although the prognosis of ultimate recovery is thus gloomy, it must not be imagined that no relief was afforded by amputation. Some of the patients were disembarrassed of huge and horribly painful growths, others lived for many months after amputation had been performed, and two lived each for a period of two years after operation, and eventually succumbed to malignant tumours in the lungs. Even where the primary disease was very extensive, recurrence in the stump was not common, so that a fair prospect is afforded of permanent relief of the original disease by amputation.

The tumours of the TIBIA and FIBULA may fairly be considered together, both for their diagnosis and their treatment. It is not easy to distinguish between the subperiosteal and central tumours, for both make the upper portion of the bone their seat of election. But the subperiosteal tumours are situated more often immediately below the

tion of the thigh was performed. The patient was alive and well ten years after the operation. I am much inclined to doubt, after reading this case, whether this tumour was subperiosteal. Mr. Lightfoot's notes say that the appearances "incline one to imagine the tumour to have been of intra-periosteal origin," therefore he evidently was not sure of the origin. The long duration of the pain before the appearance of the tumour is in favour of central rather than subperiosteal origin. However, I hope it may have been truly subperiosteal, for it would afford reason for a slightly better prognosis after operation.

head just where the epiphysis is joined to the diaphysis, while the central growths occupy almost always the interior of the head itself; the subperiosteal tumours grow for the most part more quickly than the central, and there is never egg-shell crackling over them like that which is occasionally felt over the sarcomas originating within the bone. Central tumours, too, pulsate more frequently than do subperiosteal.

As with the tumours of the femur so with those of the tibia and fibula, the chief difficulties lie in distinguishing between sarcomas and swellings of inflammatory nature.

Both 30 and 33 afforded excellent examples of the similarity of the diseases. The former was a patient under the care of Mr. Morrant Baker. On admission to the hospital her left knee appeared to be the seat of chronic synovitis, and the inflammation seemed to have extended to the upper portion of the tibia, which was generally slightly swollen, especially at the back and inner side. The appearances of inflammation were strengthened by the excessive pain which attended every movement of the joint. But the suspicious circumstances of the case, and those which led to early amputation, were the undue swelling behind the tibia, the unequal consistence of the tumour, and a general slight swelling and œdema of the foot and leg. An incision was made where the swelling was most prominent over the inner aspect of the bone, and, when only blood exuded, the diagnosis of tumour was felt to be quite certain. In spite of the resemblance between the two diseases, it is certain the diagnosis cannot be very difficult when it is observed that in four instances it was made sufficiently early to allow an operation to be practised within two or three months of the first appearance of the tumour. Indeed, in most instances, it was made as soon as the patient came under skilled observation. The distinguishing characters of sarcoma are the

situation of the tumour, its continuous enlargement, unequal consistence, uneven surface, and, especially, prominence in those directions in which inflammatory swellings are usually least prominent.

The chances of ultimate recovery after amputation are probably far greater for the tumours of the tibia and fibula than for the tumours of the femur. In every case in which operation was performed, save one, the amputation was made through the thigh, and in not one instance is there an account of recurrence in the stump. The lymphatic glands are not likely to be affected. The only dangers, therefore, are those due to the operation and those of dissemination. Unfortunately, the number of completed cases is very small, so that the danger of dissemination can scarce be fairly estimated. There seems every reason to believe, however, that it is far less than from the tumours of the femur. Two patients are reported to have been alive long after amputation had been performed, one of them two years, the other sixteen months.

The treatment, then, for sarcomas of either bone is amputation through the thigh as early as the diagnosis can be made.

The subperiosteal sarcomas of the HUMERUS can generally be distinguished from the central tumours by the difference in their seat and the manner of their extension. For, while the latter attack the epiphysis (almost invariably the upper) and gradually dilate it into a globular or spheroidal tumour, the large majority of the former commence on, and extend along, the shaft.

The history of commencement of the swelling as a small lump or nodule, and of its rapid growth and extension along the bone, is very helpful in the diagnosis from inflammation and suppuration; for, as the disease advances, the symptoms

of inflammation are often present in so intense a fashion, and the softness of the growth is so deceptive of fluctuation, that, were it not for the history, it would be scarcely possible to make the diagnosis. The rapid growth and extension of sarcoma of the humerus render it imperative that amputation should be performed extremely early. Although the disease was in almost every instance of the shaft, it nevertheless was necessary to disarticulate at the joint in every case, so quickly had the growth spread up towards the shoulder. Even then, recurrence in the stump took place in every case of which the further history is known.* One of the cases, however (No. 52), fortunately proves that even rapid recurrence, provided it be boldly dealt with, need not be regarded as of necessity fatal. The patient was a factory girl, fourteen years of age, whose tumour of the humerus was preceded for a short period by severe pains. A swelling then appeared a little below the shoulder, and gradually increased in size until it assumed a leg-of-mutton shape, and the arm measured twice as much at the axilla as its healthy fellow. Disarticulation of the shoulder was performed, but the tumour had extended so far upwards that portions of new growths were cut out of the muscles, and with them a fragment of a vein, having the diameter of a pen-holder, filled with a plug of tumour-substance. The operation was performed on the 20th of July, and in the following October recurrence was observed. On the 14th of November a mass of tumour was removed, and with it the neck and axillary border of the scapula and two centimètres of the acromion process. The patient made a good recovery from the second operation, and was in perfect health a year and a half later. The

* Of course in those cases in which death was due directly to the operation there was no recurrence.

number of post-mortem examinations is very small, therefore little can be said on the question of dissemination; but it appears very certain that the lymphatic glands are not liable to be affected.

Two deaths in seven cases of disarticulation at the shoulder is a large percentage of mortality, and it appears still larger when it is discovered that the patients who died were both young men in comparatively good health previous to the operation, and that both died within a few hours after it was performed from exhaustion due chiefly to hæmorrhage. I would suggest, then, that the subclavian or axillary artery be ligatured before the removal of the limb, and by thus much the risk of hæmorrhage diminished.

The diagnosis of the tumours of the RADIUS and ULNA did not offer any serious difficulty. Their slow but steady growth, in spite of the pain with which all three of them were associated, and of the greatly increased heat of the surface which was present in No. 54, prevented them from being confounded with inflammatory swellings. The diagnosis would no doubt have been less certain at an earlier period of the disease. The result of amputation in the two tumours of the ulna is not very encouraging, yet there can be no question that amputation through the arm is the proper treatment to pursue. It certainly is not likely to be followed by recurrence. That resection is not suitable for tumours such as these appears sure from the failure in the fifty-fifth case. I helped Mr. Smith to remove this tumour, which, growing from the surface of the radius, presented an encephaloid appearance, and infiltrated all the soft structures in its vicinity. We excised three inches of the radius, cut the tumour freely away, and applied a strong caustic solution to the surface of the wound. Notwithstanding these precautions the tumour speedily

recurred, and within four months amputation was performed of the limb above the elbow. The patient is still under observation in the hospital.

The only doubt which was felt in connection with the two sarcomas of the CLAVICLE was whether the tumour in the older patient was innocent or malignant, nor was this doubt fairly dispelled until the time of the operation. For the tumour grew somewhat slowly, and, owing to the firm capsule which tightly enclosed it, felt almost as hard as cartilage. It was not, indeed, a very pure specimen of round-celled sarcoma, for it contained a large quantity of fibrous tissue, to which a part of its firmness may be ascribed.

The resection was in each instance attended with great difficulty and grave danger. The operation in the case recorded by Mr. Walsham in the 'Pathological Transactions' occupied an hour and a half, and the arterial hæmorrhage was profuse. The operation in the other case was not completed without wounding the subclavian vein, which lay in close contact with the tumour. Nor was the result so favorable as to induce one to repeat or recommend it in the future, for the disease speedily recurred, and at length proved fatal.

The subperiosteal tumours of the SCAPULA may fitly be considered with the central tumour.

The three tumours of the LOWER JAW grew with such rapidity that their malignancy was recognised within a few weeks of their first appearance. Indeed, the progress of the third tumour (No, 62) was so rapid that in three months it formed an ulcerated and fungous mass within the mouth. Early as operation was performed the disease quickly recurred in both cases the future course of which is known, and in each instance proved fatal within a year.

Judging from these cases, the operation of resection, however early and thoroughly performed, does not seem likely to afford a permanent, or even long temporary, benefit.

The early symptoms of sarcoma of the PELVIS are, as might be expected, almost invariably due to pressure on the nerves. Thus, in every case save one, the appearance of the tumour is said to have been preceded for many weeks or months by pains radiating from the pelvis to the hip and thigh, and even to the knee and leg. In one case these pains were thought to denote chronic disease of the hip or knee; in several instances they appeared to be purely neuralgic, of the nature of sciatica in fact. Nor is there any means by which this latter error can be avoided unless by observing the intensity or paroxysmal character of the pain. Probably the presence of a tumour might be ascertained at a much earlier date if an examination were thoroughly conducted with the aid of chloroform, and the pelvic bones were investigated through the rectum, and, in females, through the vagina.

I fear, however early the diagnosis can be made, that these cases are beyond the reach of successful surgery. In two instances an attempt was made to remove the tumour, but both the patients died from causes connected with the operation. One of them (No. 69) was a man, forty-six years old, whose tumour formed a large and prominent mass in Scarpa's triangle. It could be traced beneath Poupart's ligament apparently into the iliac fossa. Its most superficial part was smooth, rounded, elastic, but very firm. The hope was indulged that the origin of the tumour might be limited to a small area of the inner aspect of the pubic bone, but this hope was quickly dispelled by the operation, for it covered a large portion of the pubes, the ischium, and the ilium. The surrounding muscles were involved, and

several small and separate nodules were discovered in the substance of the muscles of the thigh immediately behind and below the main mass. The new growth was scraped off the bone and all the outlying portions were removed with care. But the severity of the operation was greater than the patient's strength could bear, and in a few days he sank and died. Even had he recovered I cannot but believe that the tumour would speedily have recurred, for even if the soft structures were completely cleared of the disease the bones from which it grew were not removed.

The diagnosis of some of the multiple tumours of the vault of the SKULL was effected without difficulty. Indeed, the only affections for which they could have been mistaken were hard or soft nodes. But as the history and other signs of syphilis were absent, and the swellings continued to increase in size, the diagnosis of tumour was inevitable. In more than one case no tumour was discovered until after the patient's death, which was preceded by signs of doubtful import—by giddiness, vertigo, noises in the ears, deafness, and epistaxis.

If the exceeding malignancy of these tumours of the skull be for a moment disregarded, the hopelessness of arresting their progress by operation is yet quite evident. For the pathology of the disease has shown how the tumours penetrate the vault and project within the skull, often in the form of masses of considerable bulk. The multiplicity, too, of the tumours of the vault precludes the idea of operation. The second of the two patients who was subjected to operation certainly did not die of the attempt at removal, but the course of the disease probably was not at all altered or retarded.

CHAPTER V.

CENTRAL TUMOURS OF BONE.

Pathology.

Most of the central tumours of bone may be included in one or other of the three groups in which the subperiosteal tumours are arranged: namely, round-celled, spindle-celled, and mixed-celled. But to these three must be added a fourth group, comprising the myeloid or giant-celled sarcomas. As I am not inclined to admit many of the tumours which are now included as myeloid, I will define as clearly as I can the meaning I desire to attach to the term myeloid or giant-celled sarcoma, but it may be well before doing so to discuss for a moment the giant-cell. This body may be described as a mass of protoplasm, usually of large size, flattened, and containing from two or three to many nuclei (Plate II, fig. 7). Its form may vary considerably, so may the number of its nuclei, but large size and many nuclei are its characteristic features. Such cells may occur, not only in central, but in subperiosteal tumours, especially in close proximity to the bone. Similar cells may occur, too, in tumours of the soft parts wholly unconnected with the bones, or may be found among the products of certain inflammations, especially those of bone.*

* In these remarks on giant cells, I desire it to be understood that I am not speaking of all the different bodies which have been included of late

Many theories of their origin and nature have therefore been evolved, but the consideration of them need not long detain us here, for we are not concerned with these cells in the abstract, but with them only as they form the main part of certain tumours—I might perhaps say of certain tumours of bone of central origin, for I think I am within the truth in saying that such cells as these never occur in numbers so large as to form the bulk of a subperiosteal tumour. Their presence in such quantity in sarcomas of central origin may be explained on the theory that they are derived from the remains or still existing germs of the many-nucleated cells of fœtal marrow, or on the theory that they are connected with the destruction of the bone which invariably occurs during the growth of central tumours. Whether they are the agents by which that destruction has been accomplished, or are mere accidental products formed during, or as the result of such destruction, it is not more needful for us to discuss than it is to discuss the exact origin of the round or spindle, or mixed forms of cells, of which all sarcomas are for the most part composed. I may, however, point out certain facts connected with their occurrence in tumours of bone, and certain deductions which may be drawn from these facts.

First: they may form as much as four fifths of a central tumour, but never comprise its whole bulk, for with them are always mingled round, or more often spindle cells.

Second: a tumour which has grown far beyond the limits of the bone in which it took its origin may still be composed four fifths of giant cells.

years under the term giant cell or myeloplax. I refer only to such clearly defined and typical forms as are found in the best examples of myeloid tumours. I am particularly anxious to exclude the giant cells of tubercle, of the nature of which I hold grave doubts.

Third: a tumour of central origin may contain no giant cells, but may be formed solely of round or spindle cells.

Fourth: they are not of equal occurrence in the tumours of all bones, but exhibit a marked predilection for certain bones; the lower jaw, the femur and the tibia, above all others, and even for certain parts of these bones, as the lower extremity of the femur and upper extremity of the tibia.

Fifth: a tumour which contains them in great abundance exhibits a maroon or dark-red colour, or a fleshy colour and appearance, likened by Sir James Paget* to that of the muscular substance of the mammalian heart, and peculiar to these and no other tumours.

From these facts it may be fairly argued:

First: that the growth of giant cells, and perhaps their origin, may occur independently of the destruction of bone.

Second: that the development of giant cells does not necessarily accompany bone destruction, or, if it does, the cells must sometimes disappear with startling rapidity.

Third: that the conditions of their existence and of their growth, perhaps even their origin, are largely determined, not merely by the presence of bone, but by the presence of a certain kind or quality of bone, or by the conditions of life existing in certain bones.

Fourth: that the typical colour and appearance of a myeloid tumour are due to the presence in it of a large number of giant cells.

Fifth: that the presence of a large number of these cells may be deduced from the colour and appearance of a tumour.

For these and similar reasons, tumours which are composed largely of giant cells may be said to have established

* 'Lectures on Surgical Pathology,' 1853, vol. ii, p. 214.

a just claim to be grouped apart from other growths, as myeloid or giant-celled sarcomas—myeloid in admission of the right established by thirty years of use; giant-celled in accordance with the nomenclature of the other groups of sarcoma; and, lastly, sarcoma because of their undoubted connective-tissue origin, and their part-composition of round or spindle cells. But in this group I shall include only those tumours which are so largely constituted of giant cells that these cells produce a decided effect upon the appearance of the tumour; in other words, that they colour the tumour maroon or red. A few giant cells scattered through the substance of a round or spindle tumour can scarcely be expected to affect its course or tendencies, and there appears therefore no reason for classing such a tumour in accordance with these, its least abundant and probably least important, elements.

For the better comparison of the central sarcomas it will be convenient to employ the same order and method as were adopted in the study of the tumours of subperiosteal origin, and to consider separately the tumours of each bone affected.

Those of the FEMUR are again more numerous than the tumours of any other bone, and include all four varieties in almost exactly equal numbers.

The *round-celled* tumours exhibited the same tendency as the subperiosteal round-celled to attack the lower portion of the bone, for three of them were of the lower epiphysis, and one of the lower portion of the shaft. One case, however, was of the upper epiphysis. It is related by Mr. Bryant, in the 'Guy's Hospital Reports,' * and is interesting on many accounts, for it differed as much from the round-celled tumours as from any of the other tumours of the

* Third series, vol. xx, p. 364.

femur. It was most rapid in its course, for, although the patient died four days after resection, apparently from blood-poisoning, the disease was already widely generalised. This widespread generalisation is itself a point in which it differed from the other tumours as much in the manner, as in the fact, of its occurrence. For among the organs affected were the lymphatic glands, a circumstance so rare that in every case where it is noted I shall try with care to ascertain its cause. In this instance, the enlargement of the inguinal glands was observed before the operation was performed. Apparently it was only slight enlargement, and was regarded rather as inflammatory than sarcomatous. But after the patient's death the lumbar glands were also found enlarged, and both the inguinal and lumbar glands were described as infiltrated. One of the latter was subjected to microscopical examination by Dr. Goodhart, who said it was an ordinary lymphatic gland with its cellular element predominating. It may therefore be maintained that the glandular enlargement was really inflammatory or of the nature of simple hypertrophy. I prefer, however, to regard it as secondary to the sarcoma, the round cells of which could not well be distinguished from those forming a lymphatic gland.

The explanation of the phenomenon lies probably in the infiltrating nature of the tumour, which spread along the ligamentum teres to the acetabulum, and in all directions into the surrounding muscles—the internal obturator, internal iliac, and even the adductors—from which it could gain easy access to one of the deeper femoral glands, and travel thence along the lymphatic channels. With the exception of this case, the round-celled tumours were less malignant than the corresponding tumours of superficial origin. Their less malignancy is evidenced especially in the first and

second cases. In the former the tumour had existed eight years, in the latter twenty years, at the time of amputation, and in neither case were there any symptoms of dissemination.

Two of the cases of *spindle-celled* sarcoma are distinguished from the others by originating in the upper portion of the femur, and by their greater malignancy. One of them died from the effect of operation, a woman (No. 6), thirty-six years old, who, five months before her admission to the hospital, while walking quietly across her room, suddenly felt the right thigh crack two or three times. At the same instant the thigh became the seat of violent pain, and her progress was for the moment interrupted. From the time of this strange circumstance she suffered almost continuous pain, and soon a swelling was observed, which increased at first slowly, then with great rapidity. But for some time after the accident (if one may so speak of it) she was able to walk, although with difficulty and much pain, proving, I imagine, that the femur had not given way when it was felt and heard to crack, or at least that its continuity was not completely broken. Had there been a history of pain previous to the accident, or indeed even of discomfort, in the thigh, and had there occurred with the cracking a spontaneous fracture of the bone, the occurrence would have been an illustration of what is not uncommon in tumours of central origin—namely, fracture as an early symptom of the existence of such disease. The tumour formed a smooth, almost hard, but yet elastic swelling of the right femur just below the great trochanter. The skin was not affected, and the glands were not enlarged. Amputation at the hip-joint was performed by Mr. Callender with success so far as concerned the complete removal of the growth, but a fortnight later the patient died with symptoms of pyæmia.

The femur was fractured four inches below the upper end. The fragment above the fracture was widened out and filled with a semitransparent substance, looking and feeling like soft cartilage, in which were many cystoid cavities containing glairy fluid. The surrounding muscles for a short distance, and even the capsule of the hip, were infiltrated with the new growth, but the interior of the joint was intact. The microscope discovered cartilage of various forms, but for the most part cellular, a somewhat rare variety even in tumours (Pl. III, figs. 1 and 2). Around and even within the mass of cartilage was a quantity of round and spindle-celled tissue, the presence of which was not apparent to the naked eye. All the tissues and organs of the body were free from the disease except the right lung, the lowest lobe of which contained one small nodule bearing similar characters to the primary tumour. I have given a rather longer account of this tumour, because it is an example of what would, by many pathologists, be termed an enchondroma of the femur, and might therefore be employed to illustrate the occasional malignancy of a tumour made of cartilage. I have already given reasons for including these tumours among the sarcomas, and need now only draw attention to the rich mingling with the cartilage of spindle and other cells. In the other case (No. 8) dissemination was much more extensive, but the longer duration of the disease may help to explain the difference. The two features in this case which appear most to deserve attention are the tumour of the tibia of the same limb and the affection of certain of the lymphatic glands. The former is very rare, but I imagine this tumour bore the same relation to the tumour of the femur as do other secondary growths to the primary affection when the disease is conveyed through the medium of the blood. For it

appeared late in the course of the disease, about the time we may presume the lungs and glands became affected, and was nowhere continuous with the tumour of the femur. Of the relation which the affection of the glands bore to the original tumour I am not sure, but imagine they were affected through the medium of the blood and not the lymph, for the femoral glands were not enlarged, those of the groin scarcely at all, while the glands in the pelvis and in one axilla are said to have been extensively diseased. If the disease of the pelvic and axillary glands was of the same nature, it is obvious both sets of glands could not have been affected through the lymphatics from a single source.

The histories of the other cases are not very complete, for two of the patients were not traced after operation, and the third, who died from the amputation, was not examined after death.

All the *mixed-celled* tumours were of the lower third or lower epiphysis of the femur, and half of them contained bony spiculæ, but there was not in any instance the extensive ossification or calcification so commonly observed in subperiosteal growths. The only one among them which displayed a marked malignancy was No. 16, an account of which is published *in extenso* by Dr. Oberst. It is described as a giant-celled sarcoma, but its structure was much more round- than giant-celled. The tumour appeared to originate in the inner condyle of the femur, and a drawing of the gross characters is given to prove its central origin. From the drawing and general characters of the disease I confess, however, I do not feel convinced that it did not arise from the deeper layers of the periosteum. After it had been growing for a few months, amputation was performed through the middle of the thigh. About

four months later a tumour was removed from the inside of the thigh, a handbreath above the stump; and a month after this second operation disarticulation of the hip was practised for a tumour situated a little higher up. Whether the first of these tumours was a recurrence of the original disease Oberst was not sure, but neither it, nor the tumour for which the hip was amputated, were connected with the bone. Within six weeks of the last operation the patient died, when secondary tumours were discovered in both lungs.

A very interesting case, which is not included in these tables, came under my observation in 1875, when I assisted Sir James Paget to amputate the thigh of a gentleman between thirty and forty years of age, a member of our own profession. The disease had existed for about nine months, and occupied the lower third of the femur as a soft yellow- and green-grey pulpy substance, hollowed out in the centre by a large cystoid cavity filled with viscid fluid. Above the main growth existed a very much smaller mass in the medulla of the femur. The larger tumour was circumscribed, but not encapsuled, and thrust the soft structures aside, but apparently did not include them in its growth. The minute structure was rather that of ill-formed fibrous connective tissue than the usual cellular tissue of sarcoma (Pl. II, fig. 6), but many portions of the tumour were composed entirely of round or spindle cells. The amputation was performed sufficiently high above the disease, the appearance of which, however, was so malignant that the saddest forebodings of its future course were felt by all who took part in the operation. But Dr. H— remained quite well until the summer of 1878, when he noticed a lump high above the stump in the outer portion of the thigh where the skin was rubbed by the margin of the wooden

cup of his artificial limb. In August Mr. Marsh removed this tumour, shelling it out with ease from where it lay beneath the tensor fasciæ femoris. It is said to have been encapsuled and to have looked like the tumour of the femur, but unfortunately it was not examined with the microscope. The operation was recovered from, but during the following winter the patient was attacked several times with violent hæmoptysis, with which he seemed to be breaking up. He had at the same time a large fluctuating swelling beneath the right scapula, which was thought to be sarcomatous.

During the spring of 1879, contrary to all expectation, he slowly convalesced, and in August presented himself before Sir James Paget (in London) the picture of blooming health. The hæmoptysis had ceased, and the fluctuating swelling had entirely disappeared. Thus far the pathology of his case was sufficiently perplexing, for first it was not clear whether the second tumour bore any direct relation to the original tumour of the femur. It was not a recurrence *in sitû*, for it lay far removed from the stump; nor was it glandular, for no glands exist naturally where it was found. And next, it was not certain what relation the hæmoptysis bore to the sarcomas. It could scarcely have been due to dissemination of sarcomas through the lungs, for complete recovery took place. It was much more probably caused by a totally different disease, in no way connected with the tumours. At a later date, the complicated character of the case was greatly increased by the formation of a flattened lobulated tumour over the sternum and left side of the chest, which appeared to Sir James Paget to be a sarcoma. Gradually this tumour softened and became less lobed, and the last account stated that the medical men who had the care of Dr. H— were uncertain whether it was malignant

or a widespread suppuration* (November, 1881). I imagine, in this case, two diseases were concurrent or nearly so—the one, perhaps, tuberculous, the other sarcomatous—and that the appearances were due now to an outbreak of the latter, now to predominance of the former.

One tumour of this group was not interfered with by operation. At the end of nine months from its first appearance the patient died from broncho-pneumonia and exhaustion, but the disease was not disseminated.

The *giant-celled* tumours resembled the round-celled tumours in that neither of them was mixed with cartilage or bone or similar tissue. They differed from the round-celled tumours in their relation to the surrounding tissues, which were not involved in any case. No. 19 is distinguished by its fatal termination, and by the fact that it is the only case in which no operation was performed. Many features of its history and course are very characteristic, not only of myeloid, but of other central sarcomas of the femur. The first symptom was pain, which endured a month, when the femur gave way almost spontaneously. It was not till three or four months after the fracture that the presence of a tumour was observed. From that time, however, its growth was rapid, and five months later the patient died, as if worn out by the distress occasioned by the tumour, which yet was never very painful. The purely local nature of the disease was singularly marked. It grew from the interior of the shaft about the junction of its middle and lower thirds—a rare situation for a central sarcoma of any kind—destroyed the bone, and pushed aside the muscles, but did not involve them in its growth. Nowhere in the body was there any trace of dissemination of the tumour.

* Dr. H— died at the end of 1881. No autopsy is recorded.

Regarding now the characters common to most of these tumours of the femur, and comparing them, as, be it even unconsciously, we must do with those of the superficial growths, the most apparent and most important are their less fatal nature and often slower course. Of three patients it is recorded they were alive and well at periods respectively of nine months, sixteen months, and three years after operation. Only ten deaths are reported, but four of these were directly due to the effects of operation. Indeed, six might be said to have so died, but in two of the six visceral disease was discovered after death, therefore the fatal issue was merely accelerated by a short period. Extensive generalisation was very rare, while, on the other hand, two patients on whom no operation was performed, and whose disease pursued what may be regarded as its natural course, were free from secondary tumours. The rare occurrence of affection of the glands has been already mentioned, but attention may here be drawn to the fact that the only tumours with which enlargement of the glands was associated were both of the upper portion of the femur. Although some of the cases ran as short a course as many of the subperiosteal tumours, long duration was not an infrequent character. As examples, Nos. 1, 2, 9, and 10 may be cited. Another noticeable feature is the comparative simplicity of the structure of the tumours, for if some two or three be excluded, through the substance of which small spiculæ of bone were scattered, there remain only two whose soft tissues were mixed with cartilage, and in one of these the proportion of cartilage was scarcely more than microscopic. How far the relation of the periosteum to the subperiosteal growths induces the formation in them of bone and cartilage is difficult to estimate, but its influence is probably great. Ofttimes the situation of the

periosteum is indicated by a line of bone or earthy salts extending through the tumour. The strong disposition of central tumours to attack the lower epiphysis or the lower third, is very apparent. Lastly, many of the patients were older than those who suffered from subperiosteal tumours, the range of age extending from thirteen to fifty-seven years instead of from one to forty-one, while the distribution of cases among the decades, though chiefly in favour of the third decade, was tolerably equal.

It is peculiarly unfortunate that the only post-mortem examinations of persons who had suffered from tumour of the TIBIA were made on those who had died from the results of operation. For this reason the series is far less perfect than could be desired. Yet there are certain characters which can be clearly read and are too important to be overlooked. The scale of ages commenced at eighteen and ceased at sixty-seven—a point of difference from the tumours of the femur which might be regarded as accidental were there not a corresponding difference in the cases of subperiosteal tumour of the two bones. The absence of earthy salts or cartilage was as conspicuous in the tumours of the tibia as in the tumours of the femur. With perhaps one exception, the relation which these tumours bore to the tumours of the femur is similar to that which existed between the superficial tumours of the same bones. The exception was the rarity of ulceration of the integument covering the tumours of the tibia of central origin, which probably was partly due to their slower growth and the efficient protection afforded by the bony or fibrous capsule by which they were surrounded. The points of accordance were the slightly more advanced age of the patients already alluded to, the situation of the growth, the longer duration of the cases, and the

absence of recurrence in the stump and of affection of the glands. All the tumours, save three, grew from the upper epiphysis. Their long duration is exhibited in the column of duration to the period of operation, in the column of complete durations, and in the column of general remarks, where a statement is appended of the condition of those who were traced long after operation. The first of these columns shows that from one to two, or even many, years not uncommonly elapsed before amputation was performed. The second column shows that only two of the recorded deaths took place within a year of the first appearance of the tumour. One of these died with the symptoms of "consumption," which might of course have been due to pulmonary sarcoma; the other died from the operation. In the final column the good health of two patients is recorded, one five years and a half, the other a year, after operation. Freedom from recurrence in the stump can only be stated with certainty of a few cases, but absence of glandular affection—that is, of affection of the femoral and inguinal glands—may be safely affirmed of many cases.

The two tumours of the FIBULA may be regarded as a kind of appendix to the tumours of the tibia. They occurred during the middle period of life, were of the upper epiphysis, and both displayed a less malignancy than the corresponding subperiosteal tumours.

The malignancy of the two tumours of the FOOT is so marked and of such a kind that they must be described at greater length. One of the patients (No. 41) was a Frenchman, thirty-eight years old, who for three years had suffered from a swelling about the heel. In November, 1876, this swelling was about the size of his fist, and reached from the heel to the heads of the metatarsal bones. Beneath the heel was a deep and foul ulceration, which had often

bled, and through which a probe could easily be passed into the interior of the calcaneum. The ankle-joint was anchylosed, so that the foot was maintained in a position of equinus. He was in a condition of profound anæmia from repeated loss of blood, and very thin from anxiety and lancinating pains; so to relieve him of the disease, although the inguinal glands were obviously enlarged, amputation was practised through the leg. The entire plantar aspect of the calcaneum had disappeared, and the bone was blown out by a central tumour. None of the other tarsal bones appear to have been diseased. In February, 1877, the patient had recovered so thoroughly that a mass of glands was dissected out from the groin. But three months after the second operation he died, and then it was discovered that the liver and pylorus were the seat of secondary tumours. The other case (No. 42) is recorded by Virchow in the 'Krankhaften Geschwülste.' The patient, a morocco-leather dresser, thirty-one years of age, whose health had been always good until the early spring of 1858, suffered at that time from a sharp attack of pleurisy, from which recovery was speedy and apparently complete. At Whitsuntide he noticed a swelling of the dorsum of one foot, and at Michaelmas a second tumour appeared about the external ankle. In the spring of 1859 he began to cough and could no longer breathe with ease. These difficulties increased in severity, and in April caused his death. The second and third metatarsal bones were quite replaced by a soft medullary substance, blotched with old and recent blood, which touched the periosteum and cartilage in all directions, but did not extend beyond them. Several of the smaller tarsal bones contained similar medullary substance, which occupied the centre of each bone and left the cortex free. The osseous system, with

these exceptions, is reported to have been sound. Both lungs were the seat of secondary growths, which on the left side projected between the layers of the pleura. But the condition of the glands is the most attractive feature of the case. One popliteal gland was diseased and medullary in appearance; the lower inguinal glands were the size of walnuts and also medullary; the glands immediately above were simply hyperplastic, but here and there exhibited small medullary nodules; whilst the mediastinal glands formed a row of medullary growths. When this lecture was delivered this was the only case of central tumour of the foot I had collected, and I almost wished there had been some sufficient reason for suppressing it. For it was the only case among the central tumours in which the sole reasonable explanation of the glandular affection was that the disease has been conveyed through the lymphatic vessels. Now that a second case has occurred, bearing characters similar in this respect to those of the case related by Virchow, I cannot but think that there is an intimate relation between the bones of the tarsus and the lymphatic glands of the thigh and groin, a relation very different to that which exists between most of the bones and the lymphatic glands.

The first and second cases of the following group of tumours of the HUMERUS are also examples of glandular affection, but of a very different kind. In each case what appeared to be the primary disease grew within the upper epiphysis of the bone. Within nine months of its first appearance each of the patients died, and in both cases tumours bearing similar characters to the primary disease were found in the other humerus, in one or both femora, and in the abdominal glands; while in the second case a tumour also existed of the cranium. The striking resemblance between these cases is the more remarkable that one

of the patients was scarcely more than an infant, the other was nearly sixty years of age. The relation of the tumours of the glands to the tumours of the bones is not clear, but it is evident the disease was not conveyed in the orthodox fashion through the lymphatic vessels. It is not improbable that these are really instances of an almost simultaneous outbreak of sarcomatous disease in many parts, and that neither of the tumours was truly primary in its relation to the other growths. These multiple tumours will be presently discussed; but here it may be said that the rapid succession of certain of the tumours in Case 44 favours the acceptance of this belief.

The central tumours of the humerus differed widely from the subperiosteal tumours in their seat and manner of growth. All these tumours arose within the upper epiphysis, except one which attacked the upper third of the diaphysis, and neither of them exhibited a tendency to extend along the bone. All of them, too, were composed simply of soft tissues, save one which contained spiculæ of bone. Lastly, it should be observed that only one of the patients was under twenty years of age (and that one, perhaps, the subject of multiple primary sarcomatosis), while three were over fifty years.

The tumours of the Ulna and the Radius, whatever the variety of the sarcoma, attacked almost always the lower portion of each bone. A very modified malignancy is evident in all the cases, as well in the fatal case as in those where good health is reported long after operation. Death was due in this case to a chronic form of pyæmia, which lasted nearly three months after the diseased portion of the ulna, and (a few days later) the entire carpus had been resected. There was no recurrence of the sarcoma, nor were there any secondary sarcomatous formations.

The tumour of the METACARPAL bone is only interesting on account of the comparative rarity of the disease. It had gradually commenced to grow six months after a violent blow with a piece of iron on the back of the hand, and had blown out the bone to the size of half a hen's egg. The forefinger and metacarpal bone were entirely removed. The patient has been lost sight of since his recovery from the operation.

Central tumours of the CLAVICLE are, I believe, also very rare, for this (No. 60) is the only case I have discovered. But central tumours of the SCAPULA are probably not so uncommon as this single case (No. 61) would seem to imply. It is exceedingly difficult to be sure whether the origin of a tumour of the scapula is central or subperiosteal, so quickly are the landmarks of the diagnosis lost. Many cases, thoroughly well reported, have on this account been omitted from these tables. From inattention to this and similar points, the elaborate paper of Dr. Hermann Walder* on "Chondroma of the Scapula" is of comparatively little value; for he has mingled together cases of tumours of central and subperiosteal origin, and has compared pure chondromas with chondrifying sarcomas, of which he has collected some admirable examples.

The central tumours of the LOWER JAW are far more numerous than those of subperiosteal origin, but one of them I suspect would be more justly classified among the latter. It is the mixed-celled sarcoma, No. 66,† which occurred in a child five years of age. It grew rapidly, and at the end of two months was resected with the portion of the jaw to which it was attached. In six weeks it was again

* 'Deutsch. Ztschft. f. Chirurgie,' 1881, Bd. xiv, S. 305.

† In the original lecture this case was classed among the round-celled sarcomas, but it more properly belongs to the mixed-celled group.

removed, but after the second operation it speedily again recurred, and in seven months from the day it first was noticed the patient died exhausted. In the record of the case by Mr. Heath in the 'Pathological Transactions,' the tumour is spoken of as evidently growing from the interior of the bone, but the description does not clearly convey this impression.

Case 63 bears a special interest. The tumour had been growing for about a year in the body of the jaw of a young girl, and was enucleated by Mr. Holden from the perfectly smooth-walled cavity in which it lay. It was enclosed in a thin capsule, and had a very compact and complete appearance. It felt and split like a winter apple, but the split surface was gritty, and an attempt to make a smooth section blunted the knife. The tissue of which the tumour mainly was composed was a highly nucleated fibrous or fibroid tissue, and in the midst of this lay numerous smooth, rounded bodies, of the nature of which I was not then sure, but which were almost certainly calcareous. The case and a drawing of the microscopic structure of the tumour were published in an early number of the 'Hospital Reports,'* where it is described as a fibrous tumour. Repeated study of it has, however, convinced me that it is rather sarcomatous than fibrous, and should be classed among the sarcomas. Soon after it was removed it began to grow again, but made such slow progress that seven years elapsed before the patient applied at the hospital for relief. Even then it was not larger than the original tumour. But, as it was recurrent, Mr. Holden removed the portion of the jaw in which it grew. It presented precisely similar characters to those of the tumour first removed, save that it was everywhere adherent to (and continuous

* Vol. ix, p. 79, 1873.

with) the bone, and therefore not enclosed in a fibrous capsule. Accounts of two tumours bearing similar characters and containing similar calcareous bodies may be found, one in the sixteenth volume of the 'Pathological Transactions,'* the other in the twelfth volume of Langenbeck's 'Archives.'† Both these tumours grew within the lower jaw. A few months ago Mr. Macnamara exhibited, at a meeting of the Odontological Society,‡ a central tumour of the alveolar process of the upper jaw, in which were numerous calcareous bodies resembling those in the tumours just described. But I have found no record of the presence of similar bodies in the tumours of any other bone. From which I gather that they are probably in some way connected with the teeth, but whether they are directly derived from the structures from which the teeth are developed, or whether the formation is determined solely by the presence or proximity of the teeth, in obedience to the law which imposes on a tumour a structure somewhat similar to that of the tissues in the midst of which it grows, there is scarcely sufficient evidence to prove.

The cases of giant-celled sarcoma are singularly complete. Everyone of them was traced through many months, and more than one through several years. The first of the series may be thought to have died of myeloid disease. This was not so, for, although he suffered from three tumours, two of the jaw and one of a single rib, all of them were very small, and his death was from exhaustion connected with mollities ossium.§

The first of the two tumours of the STERNUM probably

* P. 223.

† S. 605.

‡ 'Transactions,' vol. xiii, p. 84, 1881.

§ This case is related in the 'Pathological Transactions,' vol. xxxi, p. 277, 1880.

belongs to a class to which reference will presently be made, the members of which attack several bones almost at the same time. But the second case deserves a more extended notice for two reasons:—1st. That its structure bore a strong resemblance to that of certain cases of hard carcinoma of the breast; 2nd. that the left supra-clavicular glands were enlarged and apparently diseased. The likeness which the structure of some sarcomas bears to certain carcinomas has been already alluded to, but the relation of the affection of the glands to the tumour of the sternum requires careful consideration. The primary tumour occupied the interior of the manubrium, was about the size of half an orange, was completely encapsuled, projected rather more in front than into the thorax, but not more to one side than to the other. There seemed no reason, then, why the glands above the *left* clavicle, none of which were in contact with the tumour, should be the earliest or only glands affected. On the visceral layer of the left pleura were numerous deposits varying in size from a pin's head to a pea, while the right lung and pleura were normal. It has therefore occurred to me that the connection was probably between the pleural tumours and the glands rather than between the sternal tumour and the glands, and that the sequence of events was primary sarcoma of the sternum, secondary tumours of the pleura, tertiary tumours of the lymphatic glands. A larger number of cases is, however, necessary to the elucidation of this question.*

* In his very interesting account of this case, Mr. Barling remarks that affection of the glands in association with central sarcomas of the bones is probably not so infrequent as it has been represented to be, for among the sixty-three cases of central sarcoma published in my tables there were no less than six cases of glandular affection. In acknowledging the copy of the paper which he was kind enough to send me, I took the liberty to point out that there were only five cases among my sixty-three, and that in nearly

The PELVIC tumour is of little interest unless it be compared with the subperiosteal pelvic tumours, but is then of extreme interest as it bears upon the important question of glandular affection. It did not affect the lymphatic glands, and the reason for this forbearance may probably be discovered in its relation to the cavity of the pelvis, and therefore to the lymphatic glands. Almost the whole of the sacrum and coccyx was replaced by the new growth, which infiltrated the muscles posteriorly, but was limited in front by the periosteum, which separated it from the interior of the pelvis. It did not therefore grow, as did the subperiosteal tumours, directly in contact with and into the lymphatic glands.

The tumours of the SKULL differed from the cranial subperiosteal tumours, first and most strikingly, in the much older patients they attacked, for the youngest of the four was nearly fifty years of age; second, in the fact that although three of them were of the vault, only one produced multiple tumours of the skull. This one case, too, was singular in the affection of the glands which occurred as the disease progressed; this might have been due to continuous extension of the tumour of the occiput into the nearest of them, or to participation of the glands in a general primary sarcomatous disease.

This leads me to speak of a class of cases to which reference has already more than once been made—cases in which many bones are attacked almost simultaneously by sarcomatous disease. Such, apparently, was the nature of a case recorded by Dr. Moxon in the 'Pathological Transactions.'* It is described as "colloid cancer," the characters of which

every one of these the affection of the glands was evidently *not* through the lymphatics, and was, therefore, not what is generally understood by secondary affection of the glands.

* Vol. xxii, p. 206.

it undoubtedly presented, for the tumours consisted of large alveoli filled with gelatinous material, With the exception of numerous rounded nuclei in some of the alveoli, no mention is made of cellular elements; unless, therefore, we accept these as round cells, which had escaped destructive or degenerative changes, there is nothing to guide us to a diagnosis of the variety of sarcoma to which this presumably belonged. The patient, who was only twenty-three years of age, had never during life presented any signs from which it could have been inferred that he was the subject of extensive osseous disease. He died, apparently, from hæmorrhage following the removal of some warts from his prepuce, an operation of the most trivial nature. The autopsy, however, discovered sufficient cause for death. The bladder was inflamed, the kidneys suppurating, numerous subperiosteal tumours of small size existed on the inner and outer tables of the skull; many of the vertebræ from the skull as far down as the sacrum, contained growths of larger and smaller size; seven of the ribs of the right, and four of those of the left, side were affected in a similar manner. The largest of the tumours appears to have been that of the eighth left rib; it was swollen to the size of a large plum, completely destroyed the bone where it grew within it, extended through the periosteum (which was still visible as a circular line in a section of the tumour) and infiltrated the surrounding muscles. None of the organs or other tissues of the body were affected, except some of the bronchial glands, probably by continuous infiltration from the tumours of the ribs or spine. It cannot, of course, be absolutely averred that most of these tumours were not secondary to some one among their number, but their near equality of size, the absence of symptoms indicating long duration of any of them, and the absence of secondary

affection of parts usually prone to such affection, all point to another origin than this. Probably several of the cases classed with the tumours of particular bones might more justly be grouped together as instances of general sarcoma of the bones, that which has been called by Buch* "multiple primary sarcomatosis of the medulla of bone." The cases in the table which appear to merit this appellation are two of those of the skull, one of the two tumours of the sternum, and the first two round-celled tumours of the humerus. All these tumours were round-celled, and the bones most frequently affected were the skull, the humerus, the ribs and vertebræ. Von Rustizky, in the short article in which he includes the case I have numbered 80, calls the disease in that particular instance "multiple myeloma," and regards it as a simple or innocent affection, a mere outgrowth of the medulla of the bones. But its rapidly fatal issue, the infiltrating nature of the growths, the vessels with walls composed of a single layer of round cells, are characters absolutely inconsistent with such a view. The names suggested, both by Buch and Von Rustizky, do not completely cover all the conditions of the disease. For although most of the tumours are of central origin, some of them are superficial, the tumours of the skull especially, which grow, as in Moxon's case, on the outer and inner aspects of the bone. It may be that the round- and mixed-celled subperiosteal tumours of the femur, Nos. 2 and 27, were instances of this general sarcomatous disease of bones, and the two last cases of the round-celled tumours of the pelvis, and perhaps one or more of the round-celled tumours of the skull. Grawitz has published† two very remarkable

* "Ein Fall von multipler primärer Sarcomatose des Knockenmarks," 'Inaug. Dissert.,' Halle, 1873.

† Virchow's 'Archiv,' Bd. 76, S. 361, 1879.

cases of central multiple primary sarcomatosis of bone, in each of which the formation of the tumours was accompanied and apparently preceded by pernicious anæmia. In one of these cases the anæmia immediately followed an attack of (?) typhus fever: only three months elapsed from the date of the fever to the patient's death, yet a vast number of tumours were discovered in many bones, and also in some of the soft parts, among others the mesenteric glands. All the tumours of the osseous system were of equal or nearly equal size, and all presented the characters of round-celled sarcoma or lympho-sarcoma. In the other case the whole duration of the disease was if possible less than in the first, and until the patient was examined after death the existence of a tumour-disease was not suspected. Nevertheless, there were discovered numerous tumours of several of the long bones, of two of the vertebræ, and of one rib. The tumours consisted, as in the first case, chiefly of round cells, but with the round were mingled spindle cells. Grawitz very naturally suggests that the abnormal condition of the bone marrow, which is a part of pernicious anæmia,* may be the cause of the extensive tumour disease of the osseous system. He regards the sarcomas merely as an exaggeration of the changes which invariably occur in association with pernicious anæmia, and accounts for the disseminated tumours of the soft parts, which are secondary to the tumours of the bones, by drawing a parallel between severe forms of anæmia and severe forms of leukæmia. The affection of the bones in pernicious anæmia, however, is not the only diseased condition of bones with which sarcomas are associated. In the thirty-first volume of the 'Pathological Transactions' (page 277),† a case is related in which three giant-celled

* 'Litten, Berlin. Klin. Wochsft.,' 1877, xiv, S. 257.

† The case already mentioned of giant-celled sarcoma of the lower jaw.

tumours were present in the lower jaw and rib of a patient suffering from mollities ossium. Two of the tumours had probably long preceded the general osseous disease, therefore they were not due to the disease. But it was easy to believe that tumours of a similar structure might at any moment have sprung up in the interior of many of the bones, for in their medullary cavities were discovered masses of a substance so closely resembling the giant-celled tumours that it only differed from them in one respect—that it was contained within the normal limits of the bones. The disease described by Paget under the name "osteitis deformans,"* is frequently associated with the formation of tumours of the bones. Indeed, many, if not most, of the recorded cases have died of sarcomatous disease; and this has led certain pathologists to believe that osteitis deformans may be itself essentially a tumour-disease. This opinion is, however, opposed to all that can be gathered from the clinical history and morbid anatomy of the disease, and is only supported by the frequency with which in its later stages tumours are developed. This tendency may, I think, be explained much more satisfactorily by recognising the fact that those diseased conditions of bone which are attended by the formation of a large quantity of material very rich in cells are very prone to sarcomatous degeneration, especially when, as in osteitis deformans, this material remains cellular and stored up within the bones during many years. So far from being surprised that sarcoma is of frequent occurrence in such bones, it is surely quite as surprising that these and similar conditions of the bones do not invariably proceed to the development of one or other of the different varieties of sarcoma.

In discussing the tumours of other structures of the body

* 'Medico-Chirurgical Transactions,' vol. lx, p. 37, 1877.

we shall find that multiple primary sarcomatosis is not limited to the osseous system, but is found in connection with several of the softer tissues.

Most of the characters of the central tumours of bone have been considered in treating of the tumours of individual bones; some features I have left till now in order to avoid too frequent repetition; some statements, too, on the general pathology of both the central and subperiosteal tumours, have been purposely withheld till they could be more fitly introduced. Speaking in very general terms, central tumours occur in persons older than those who are the subjects of sub-periosteal tumours; for while the latter not uncommonly attack young subjects, or even children, the former are by no means rare in persons advanced in years. Again, the central tumours grow for the most part more slowly than those which originate beneath the periosteum.

The physical conditions of the tumours previous to their removal, or to death, are interesting, especially in two particulars,—first, their occasional pulsation; second, their situation. A tumour of either origin may pulsate, but the symptom is much more common of central than of sub-periosteal tumours. It occurred in every variety of the former, only in the round- and mixed-celled subperiosteal growths; and in either case only in the tumours of certain bones—the femur, tibia, calvaria and innominate bone.* The total number of pulsating tumours of the long bones was much larger than of the other two, but the proportion

* Of course if a still greater number of cases be collected of sarcomas of the bones it is probable that pulsating tumours of other bones than those above described will be discovered. Sir James Paget has given an account of a pulsating tumour of the radius in the 'Medico-Chirurgical Transactions' for 1871 (vol. liv, p. 257). But I am sure that pulsating tumours are much more frequent in the femur, tibia, calvaria and innominate bone than in any other bones.

was greatest among the central tumours of the calvaria and the subperiosteal tumours of the innominate bone. Where the cause of pulsation could be ascertained, it was in every instance due to an abundant supply of vessels of moderate calibre, which in some cases of blood-cyst poured their blood directly into the cavity of which the tumour appeared mainly to consist.

No problem has seemed to me so difficult as the unfolding of the laws which determine the situation of sarcomatous tumours. Long bones, short bones, and flat bones are liable to sarcoma, but not all bones equally, or even all the bones of each shape in equal proportion. The long bones of the lower extremity are far more frequently attacked than the bones of the arm and forearm, while the bones of the metacarpus and metatarsus and the phalanges are but rarely affected. The flat bones of the skull, the scapula and innominate bone, are all subject to sarcoma. None of the short bones are very liable to the disease, and I have found no record of affection of the carpal bones. But this statement only very partially expresses what may be termed the power of selection exhibited by sarcomatous tumours. In the long bones they show a decided preference for the epiphyses or articular ends, and, especially the tumours of central origin, for one articular end of each long bone. In the upper extremity it is the upper epiphysis of the humerus, the lower epiphyses of the radius and ulna; in the lower extremity, the lower epiphysis of the femur, the upper of the tibia and fibula. The explanation of these singular phenomena may be attempted on various hypotheses, but none of them are satisfactory. It is possible the secret exists, not in one condition, but in a combination of conditions, one or the other of which may exercise an influence more powerful than the rest. As a fisherman ofttimes

attaches several baited hooks to the end of a single line in the hope that, one failing, another may allure his prey, so let me bait those particular ends of the long bones which are so frequently the seat of central tumours with all the conditions I can find common to them, and abide patiently in the hope that the reason which escapes me now may one day be found fixed to one or other condition, perhaps by some one more fortunate than myself. All these parts contain cancellous tissue in greater or less abundance; their position renders them liable to squeezes, blows and injuries of various kinds; in the process of development of the bones they are the parts which are the first to ossify, the last to be united with the shaft; and the direction of the nutrient artery is from them not towards them.

Although the central tumours grow thus frequently in close proximity with various joints, and entirely destroy the bone which forms the epiphysis, they rarely invade the cavity of the joint. The articular cartilage possesses a singular power of resistance or incapacity for contagion, differing in a striking manner from even the hardest bone in this respect. Long after the bone has been destroyed and the fibrous tunic broken through, the cartilage maintains its integrity, only yielding at length, in a few rare instances, to the boring force of vertical columns of cells projected into it from the tumour and penetrating it through a series of fine pores. In one or two instances a sarcoma of the tibia has destroyed the knee-joint and produced a kind of ankylosis, by following the unusual course of infiltrating the crucial ligaments, and thus extending from the tibia to the femur.

The progress and termination of both classes of tumours show that all sarcomata of bone may be malignant, but their malignancy is of widely different degrees, and dis-

played in various ways. Speaking generally, it may be said that central sarcomas are far less malignant than subperiosteal, and the tumours of bones more distant from the trunk than those of bones more near. The latter of these two statements is illustrated by the relative malignancy of the tumours of the tibia and of the femur; but certain exceptions to it must be made, as probably in favour of the tumours of the tarsus. The accuracy of the former statement may be tested as well by the cases which have come under my own observation as by the complete series of these tables. Of eighteen patients with subperiosteal tumours of various bones, of whom I have taken notes and who are included in the table, I know that fourteen are dead. Two of the remaining four have not yet left the hospital; the other two were well when last heard of, at periods respectively of twelve and sixteen months. Of eleven cases of central tumours here included I have notes of the death of four, and of slow recurrence in one during seven years after enucleation, while four are known to have been well at periods respectively of one year, three and a half years, four years, and five years and a half after operation. In addition I have described a case of mixed-celled central tumour of the femur, in which the patient was alive, though not well, six years after amputation of the thigh.*

The least degree of malignancy is infiltration of contiguous structures, much more common in subperiosteal than in central tumours, and, though generally seen in tumours which become generalised in distant parts, not a necessary precursor of this more marked malignancy. Next in order to this continuous infiltration is affection of the lymphatic glands, rarely occurring in connection with subperiosteal, still more rarely with central tumours. The

* Case of Dr. H— mentioned in this chapter.

relation of this glandular affection to the subperiosteal tumours has been already considered. It remains to discuss shortly those cases in which sarcomatous glands were found associated with tumours of central origin. Of these there are eight cases, Nos. 3, 8, 41, 42, 43, 44, 75 and 79. In the first case the disease probably gained access to the lymphatic channels by directly invading the nearest lymphatic glands. And in the last case the manner of the gland affection presumably was the same. The affection of the glands in the second, fifth and sixth cases (8, 43, 44), differed in no way apparently from the affection of distant organs which occurs through the medium of the blood. The disease of the glands of the neck in Case 75, I have already suggested, was secondary to the tumours of the pleura rather than the tumour of the sternum. And, lastly, the disease which was secondary to the tumours of the foot can only be explained on the supposition that the infecting material was conveyed through the lymphatic vessels. The last degree of malignancy is that in which growths appear in organs or tissues more or less remote from the part in which the tumour first was noticed: in most cases undoubtedly conveyed there by the blood, as when the interior of the heart or the lungs become affected; in some cases of less certain origin, as when the subcutaneous tissue or the skin is the seat of secondary tumours, and the lungs are free; and in some cases apparently due to distinct outbreaks of sarcomatous disease, either after a prolonged period of quiescence or in several parts almost simultaneously. Of all organs, the lungs are far more commonly affected than any other, and the tumours which exhibit the most marked tendency to wide-spread generalisation are the round-celled tumours. But the affection of the lungs and the generalisation of round-celled tumours are, both,

largely influenced by the situation of the primary disease. It is the round-celled tumours of certain bones which are thus liable to become widely generalised, and the sub-periosteal which are far more likely than the central tumours to affect the lungs.

Central Tumours of Bone.

No. of case.	Sex.	Age.	Seat	Simple or mixed.	Duration to operation (in months).	Nature of operation.	Total duration (in months).	Recurrence of disease.	Affection of glands.	Affection of lungs.	Affection of other parts of body, and general remarks.	Authority.
FEMUR:—*Round-celled.*												
1	F.	42	Lower epiph.	Simple	96	Amp. thigh	—	—	—	—	—	Lyon Méd., ii, 616, 1869.
2	M.	—	„	„	20 yrs.	„	20 years*	0	(?)	—	No p.-m. examination	"Ostéo-sarcome des Membres," Schwartz, Obs. xii, 1880.
3	M.	36	Upper epiph.	„	5 mos.	Resection	5 m.*	0	Inguinal and lumbar	Yes	Liver, kidney	Guy's Hosp. Rep., s. 3, xx, 364, 1875.
4	M.	28	2/3 and 3/3	„	3	Amp. thigh	—	—	0	—	Well 9 mos. after operation.	Guy's Hosp. Rep., s. 3, xx, 358, 1875.
5	F.	19	Lower epiph.	„	3	„	3*	0	0	—	No p.-m. examination	Lancet, ii, 607, 1876.
FEMUR:—*Spindle-celled.*												
6	F.	36	1/3	Cartilage	6	Amp. hip	6*	0	0	Yes	0	St. B. Hosp., Eliza D., 1874.
7	M.	38	Lower epiph.	Simple	4	Amp. thigh	—	—	—	—	—	Bull. Soc. Anat., s. 2, ix, 12, 1864.
8	M.	13	1/3	„	8	Amp. hip	10	0	Axillary, pelvic	Yes	Tibia of same leg	An. d. Char. Kr. h. Berlin, xiii, 228, 1865.
9	M.	32	3/3	Cartilage	27	Amp. thigh	27*	0	—	—	No p.-m. examination	Bull. Soc. Anat., s. 3, vii, 132, 1872.
10	M.	29	Lower epiph.	Simple	48	„	—	—	—	—	—	"Ostéo-sarcome des Membres," Schwartz, 1880, Obs. vi.
FEMUR:—*Mixed-celled.*												
11	F.	19	Lower epiph.	Bony spic.	2½	Amp. thigh	—	—	—	—	—	Path. Trans., xx, 341, 1869.
12	M.	57	Lower 1/3	Simple	4	„	6*	0	0	0	0	Path. Trans., xx, 267, 1869.
13	M.	18	Lower epiph.	„	6	„	—	—	—	—	—	Med. T. and Gaz., ii, 690, 1873.
14	M.	55	„	Bony spic.	—	0	9	—	0	0	0	Bull. Soc. Anat., s. 2, xii, 476, 1867.
15	F.	25	„	Simple	4	Amp. thigh	—	—	0	—	—	St. B. Hosp., Harriet P., 1881.
16	M.	21	„	Bony spic.	(?) 6	Amp. thigh and hip	12	Twice	0	Yes	0	D. Ztschft. f. Chir., Bd. xiv, 409, 1881.
FEMUR:—*Giant-celled.*												
17	M.	29	Lower epiph.	Simple	10	Amp. thigh	—	—	0	—	Well 16 mos. after operation	"Tumeurs à Myéloplax," Nélaton (Jos. R.), 1860.
18	M.	43	„	„	18	„	—	—	—	—	—	Arch. of Med., i, 110, 1857.
19	F.	54	2/3	„	—	0	8	—	0	0	0	Bull. Soc. Anat., s. 2, x, 658, 1865.
20	—	18	Lower epiph.	„	7	Amp. thigh	—	—	—	—	—	Path. Trans., xxv, 202, 1874.
21	F.	31	„	„	15	„	—	—	—	—	Well 3 years after operation	"Tum. à Myéloplax," Nélaton, p. 149, 1860.

TIBIA:—*Round-celled.*												
22	M.	46	Upper epiph.	„	15	„	15*	—	0	0	0	"Beiträge z. Chir.," Volkmann, s. 247, 1875.
23	M.	27	„	„	6	„	—	—	—	—	—	Med. T. and Gaz., i, 524, 1868.
24	M.	18	„	Calcified	30	„	—	—	0	—	Well 5½ yrs. after operation	St. B. Hosp., Enos. R., 1874.
TIBIA:—*Spindle-celled.*												
25	M.	30	Upper epiph.	Simple	9	Amp. thigh	9*	0	0	0	0	Siglo Medico, xxiii, 518, 1876.
26	F.	54	„	„	15	„	—	—	—	—	—	Gaz. d. Hôp., No. 73, 1864.
27	F.	43	2/3	„	24	Amp. knee	24*	0	0	—	No p.-m. examination	Guy's Hosp. Rep., s. 3, x, 159, 1864.
28	F.	65	Upper epiph.	„	3	Amp. thigh	9	0	0	—	No p.-m. examination	Path. Trans., xxix, 182, 1878.
29	M.	67	Mid. shaft	„	90	„	90*	0	0	0	0	"Ostéo-sarcome des Membres," Schwartz, Obs. xix, 1880.
TIBIA:—*Mixed-celled.*												
30	M.	39	Upper epiph.	Simple	45	Amp. thigh	54	0	0	—	No p.-m. examination	St. B. Hosp., Henry W., 1874.
31	M.	26	„	„	6	„	—	—	—	—	—	Bull. Soc. Anat., s. 2, x, 230, 1865.
32	M.	55	„	„	28	„	28*	0	0	—	No p.-m. examination	Path. Trans., xx, 278, 1869.
33	M.	45	„	„	60	„	—	—	0	—	—	"Ostéo-sarcome des Membres," Schwartz, Obs. xvii, 1880.
34	F.	45	Lower epiph.	„	25	Amp. knee	26*	0	(?)	—	No p.-m. examination	Amer. J. Med. Sci., n.s., 57, 400, 1869.
35	F.	29	Upper epiph.	„	13	Amp. thigh	—	0	0	—	Well 12 months later	"Tum. à Myéloplax," Nélaton, p. 167, 1860.
TIBIA:—*Giant-celled.*												
36	F.	32	Upper epiph.	Bone	11	Amp. thigh	—	—	0	—	—	Virch. Archiv, xliv, 322, 1868.
37	M.	31	„	Simple	15	„	—	—	0	—	—	Path. Trans., xxii, 187, 1871.
38	F.	20	„	„	72	„	—	—	0	—	—	Bull. Soc. Anat., s. 3, viii, 372, 1873.
FIBULA:—*Mixed-celled.*												
39	M.	30	Upper epiph.	Simple	27	Amp. thigh	28*	0	0	—	No p.-m. examination	Virch. Arch., xl., 286, 1867.
FIBULA:—*Giant-celled.*												
40	M.	37	Upper epiph.	Simple	12	Amp. thigh	—	0	0	—	Well 7 mos. after operation	Dublin J. Med. Sci., lxiv, 247, 1877.
TARSUS AND METATARSUS:—*Round-celled.*												
41	M.	38	Calcaneum	Simple	36	Amp. leg	42	0	Inguinal	0	Liver and pylorus	"Ostéo-sarcome des Membres," Schwartz, Obs. xxii, 1880.
TARSUS AND METATARSUS:—*Spindle-celled.*												
42	M.	31	Tarsus and metatarsus	Simple	—	0	11	—	Popliteal, inguinal, mediastinl.	Yes	0	"Krankhn. Geschw.," ii, 338, Virchow, 1865.
HUMERUS:—*Round-celled.*												
43	M.	56	Upper epiph.	Simple	—	0	8	—	Lumbar and mesen.	0	Other humerus and one femur	Virch. Arch., lix, 413, 1874.
44	M.	4	„	„	—	0	9	—	Retro-peritoneal	0	Other humerus, left femur, cranium	Phil. Med. Times, x, 502, 1879-80.
45	F.	42	„	Bony spic.	5	Amp. shoulder	12	Yes	0	0	0	Bull. Soc. Anat., s. 4, iv, 365, 1879.

* Death from causes connected with the operation.

Central Tumours of Bone (*continued*).

No. of case.	Sex.	Age.	Seat.	Simple or mixed.	Duration to operation (in months).	Nature of operation.	Total duration (in months).	Recurrence of disease.	Affection of glands.	Affection of lungs.	Affection of other parts of body, and general remarks.	Authority.
HUMERUS:—*Spindle-celled.*												
47	M.	70	Upper epiph.	Simple	—	0	(?)	—	0	0	0	Bull. Soc. Anat., s. 2, xiv, 106, 1869.
48	M.	63	„	„	1	Resection	1*	0	0	0	0	Langenb. Arch., xv, 562, 1873.
49	M.	20	„	„	3½	Amp. shoulder, clavicle, &c.	—	0	0	—	Well 10 months later	Brit. Med. Journ., ii, 617, 1880.
HUMERUS:—*Mixed-celled.*												
50	F.	44	1/3 Diaph.	Simple	12	Amp. shoulder	—	—	0	—	—	Glasg. Med. Journ., xiv, 62, 1880.
51	F.	23	Upper epiph.	„	4	„	—	—	0	—	—	Phil. Med. Times, x, 173, 1879-80.
ULNA:—*Round-celled.*												
52	F.	30	Upper epiph.	Simple	9	Resection	—	—	0	—	—	Deut. Klinik, xii, 139, 1860.
53	F.	26	Lower epiph.	„	3	„	6	0	0	0	0	Langenb. Arch., xxi, Supp., 331, 1877.
ULNA:—*Spindle-celled.*												
54	M.	20	Lower 1/2	Simple	12	Scooped out	—	0	0	—	Well 2 years after operation	St. B. Hosp., Edward D., 1878.
ULNA:—*Giant-celled.*												
55	F.	27	Lower 1/3	Simple	72	Amp. forearm	—	0	0	—	Well 4 years later	St. B. Hosp., Elizabeth C., 1875.
RADIUS:—*Mixed-celled.*												
56	F.	35	Lower 1/3	Simple	(?)	Scooped out, resection, amp. forearm	—	Twice	0	—	Well 10 years later	"Ostéo-sarcome des Membres," Schwartz, Obs. iii, 1880.
RADIUS:—*Giant-celled.*												
57	F.	28	Lower epiph.	Simple	12	Resection	—	0	0	—	Well 4 years later	Clin. Trans., x, 138, 1877.
58	F.	59	Lower 1/3	„	12	Amp. forearm	—	—	0	—	—	Phil. Med. Times, x, 501, 1879-80.
METACARPUS:—*Mixed-celled.*												
59	M.	27	2nd met.bone	Simple	24	Resection	—	—	0	—	—	St. B. Hosp., William S., 1874.
CLAVICLE:—*Spindle-celled.*												
60	M.	37	Sternal 1/3	Simple	15	Resection	—	—	0	—	—	Gaz. d. Hôp., p. 419, 1861.
SCAPULA:—*Spindle-celled.*												
61	M.	24	Spine	Simple	5	Resection	—	—	0	—	—	Path. Trans., xxvi, 170, 1875.

LOWER JAW:—*Spindle-celled.*												
63	F.	16	Body	Calcifying	12	Scooped out, resection 7 yrs. later	—	Yes (soon)	0	—	—	St. B. Hosp., Matilda D., 1872–1879.
64	M.	32	„	Calcified	120	Resection	120*	—	0	—	No p.-m. examination	Path. Trans, xix, 307, 1868.
LOWER JAW:—*Mixed-celled.*												
65	M.	18	Body	Bone	18	Resection	—	—	0	—	—	Gaz. des Hôp., p. 563, 1868.
66	F.	5	„	Simple	2	„	7	Twice	0	—	No p.-m. examination	Path. Trans., xix, 303, 1868.
67	M.	—	„	„	18	„	18*	—	0	0	—	Bull. Soc. Anat., s. 3, ix, 622, 1874.
LOWER JAW:—*Giant-celled.*												
68	M.	50	Body	Simple	—	0	84	—	0	0	Two of jaw, one of 6th rib	St. B. Hosp., John L., 1877; Path. Trans., xxxi, 277.
69	F.	38	„	„	10	Resection	—	0	0	—	Well 3 years after operation	St. B. Hosp., Jane S., 1876.
70	M.	27	„	Bone spic.	10	Enucleation	—	0	0	—	Well 2 years after operation	"Tumeurs à Myéloplax," Nélaton, 112, 1860.
71	F.	17	„	Bone	5	Resection	—	0	0	—	Well 10 months after operation	"Tumeurs à Myéloplax," Nélaton, 95, 1860.
72	F.	37	„	Simple	60	„	—	0	0	—	Well 1 year after operation	Langenbeck's Arch., xii, 609, 1871.
RIB:—*Mixed-celled.*												
73	F.	65	Shaft	Bone	—	0	36	—	0	0	Brain and head of femur	Path. Trans., xxi, 321, 1870.
STERNUM:—*Round-celled.*												
74	M.	40	Body	Simple	—	0	3½	—	0	0	Skull, ribs, vertebræ, pelvis	Path. Trans., xviii, 206, 1867.
75	M.	41	Manubrium	Fibrifying	—	0	15	—	Left sup. clavicular	L.	(On pleura, not lung). 0	Journ. Anat. and Phys., xvi, 43, 1881.
PELVIS:—*Mixed-celled.*												
76	F.	19	Sacrum	Bone	—	0	12	—	0	0	0	Wien. Med. Wochsft., s. 205, 1878.
VERTEBRÆ:—*Mixed-celled.*												
77	M.	55	2nd lumbar & adjacent	Simple	—	0	(?) 10	—	0	0	Liver	Boston M. and S. Journ., ci, 661, 1879.
SKULL:—*Round-celled.*												
78	M.	66	Vault	Bone	7	Lig.com.carotid	8*	—	0	0	0	Virch. Arch., xliv, 312, 1868.
79	M.	49	Vault, occiput	Bone spic.	—	Incision	7½	—	Cervical & submax.	0	Skull (many), liver, spleen, ribs, and clavicle	Virch. Arch., lvii, 310, 1873.
80	M.	47	Vault	Simple	—	0	7	—	0	0	Sternum, ribs, humerus, vertebræ	D. Ztsft. f. Chir., iii, 162, 1873.
81	M.	51	Sphenoid	„	—	0	(?) 48	—	0	0	One rib	Virch. Arch., lvii, 315, 1873.

* Death from causes connected with the operation.

CHAPTER VI.

CENTRAL TUMOURS OF BONE (*continued*).

DIAGNOSIS AND TREATMENT.

THE diagnosis of the central tumours of many of the bones differs so little from the diagnosis of the subperiosteal tumours that where the descriptions in this chapter appear insufficient, I would beg the reader to supply the deficiencies by reference to Chapter IV.

The central tumours of the FEMUR are much more strictly limited to the epiphyses than are the subperiosteal growths. They are, therefore, more likely to be mistaken for chronic inflammations of the cancellous tissue of the bone. But the tumours are, as a rule, more globular than the inflammatory swellings, and while the inflammation almost invariably extends to the knee-joint, this very seldom happens with a tumour, unless the disease be very far advanced. In the case of the boy described in Chapter IV, p. 72, the inflammation, although of the lower third of the bone, and of four months' duration, had not extended to the joint. The youthful age of the patient, however, strongly contra-indicated central sarcoma of the femur. Pulsation is occasionally noticed in central tumours, and is, I believe, peculiar to sarcoma, for no other disease of the femur with which I am acquainted presents this symptom. Sometimes fracture occurs spontaneously, or almost spontaneously, so trivial is the violence which causes the bone to break.

When spontaneous fracture precedes the appearance of a tumour it may be very difficult to determine its precise cause; nay, impossible, until the progress of the case has been observed. Gradually a tumour appears at the seat of fracture, generally soft and quickly growing, and the nature of the disease is evident.

The treatment of central sarcoma of the femur is very much more hopeful than of subperiosteal sarcoma. Amputation high up at an early period of the disease may be undertaken with very fair prospect of success, if not of permanent recovery, at least of long relief. Perhaps this is more certain of the giant-celled than of the other varieties of sarcoma, although the apparent difference may be due to the more complete information which exists of the further course of the patients who suffered from giant-celled tumours. The history of Dr. H—* shows how long the relief afforded by the operation may last in a case of mixed-celled sarcoma. The limitation of the disease in the large majority of cases to the lower portion of the femur is again very favorable to the success of amputation, for recurrence in the stump is almost certainly preventible.

The central tumours of the TIBIA and FIBULA are almost always of the upper portion of the bone, and are often for a long time limited to the epiphysis. They occasionally, but only occasionally, pulsate; and, as in tumours of the femur, pulsation is, I believe, a sure sign that the tumour is sarcomatous. I know that an opinion to the contrary prevails, and that some pulsating affections of the bones have been regarded as aneurismal, even after removal, on account chiefly of their sacculated aspect, of the large quantity of blood and small quantity of solid matter they contained, and of the absence of recurrence and dissemination which

* Chapter V, p. 90.

has followed amputation in certain cases. To these arguments it may be replied that sarcomata, whether central or subperiosteal, are often sacculated from the formation of large cystoid cavities within them; that we are now familiar with tumours of the soft parts which are almost wholly composed of blood (blood cysts), but yet are undoubtedly sarcomatous (and very malignant); and that freedom from disease for many years, or even complete recovery, may be purchased by amputation in cases of solid non-pulsating central sarcomas of bone. I have not yet discovered any case, the general and microscopic characters of which have been thoroughly reported, of non-sarcomatous pulsating disease.

Since the head of the tibia lies at a very shallow depth below the surface, it might have been expected that crackling (egg-shell crackling), due to the gradual thinning out of the cortex of the bone over the surface of a growing tumour, would frequently and early be felt. But this symptom is recorded of only two of the sarcomas of the tibia. Indeed, this egg-shell crackling is very seldom observed in connection with the sarcomas of the bones. It is mentioned in seven cases of those recorded in these tables, one of the femur, two of the tibia, one of the radius, and three of the lower jaw. That it was carefully sought for in other instances is shown by the fact that a definite statement often exists that no crackling could be distinguished.

As in the central tumours of the femur so in those of the tibia and fibula, the disease rarely involves the neighbouring joint, a circumstance worthy to be borne in mind in the diagnosis between sarcomas and chronic inflammations.

For all sarcomas of the tibia and fibula amputation is the appropriate treatment; through the thigh when the disease,

as usual, is situated in the upper portion of the bone, through the leg when the lower epiphysis is affected. The probable success of amputation must be estimated, not merely by the two cases in which the patients were known to be well long after operation, but also by the fact that the post-mortem examinations performed on the twenty-second, twenty-fifth, and twenty-ninth cases, discovered a perfectly healthy condition of the viscera, although the disease had existed in one of them for nine, in another for fifteen months, and in the third for between seven and eight years. So modified is the malignancy of these tumours that it is by no means certain that they may not with safety be scooped out from the hollow of the bone in which they lie. I have known one case in which this treatment was adopted by Mr. Smith for the removal of a large tumour of the tibia, and so far with success that the patient was apparently free from disease more than a year after the operation. This case would have been included in the tables, but unfortunately the account of the structure of the tumour is so defective that it could not be made use of, although there appears no reason to doubt that the tumour was a sarcoma. Frequently, however, cases do not come under treatment until the head of the bone is so far destroyed that the tumour cannot be scooped out without injuring the joint, or the bone has been too weakened ever to be again of use in locomotion.

If the two cases of tumours of the FOOT are to be regarded as typical of the disease, the chances afforded by amputation are not so good as for tumours of the bones of the thigh and leg. Indeed, the central tumours of the foot appear to be more malignant than those of any other part. But it will be better that judgment should be suspended until a much larger number of cases has been examined.

In the diagnosis of central tumours of the HUMERUS two circumstances must be always borne in mind: that the disease is almost invariably of the upper epiphysis or upper portion of the bone, and that many of the patients are of the middle period of life or even advanced in years. The tumours grow much more rapidly than the sarcomas of many other bones, but the diagnosis is not generally difficult. The absence of affection of the joint, the rounded form of the head of the bone, the continuous and often rapid growth, are all very characteristic of central sarcoma of the humerus.

For the treatment, amputation at the shoulder-joint must be practised, with free removal of any of the soft parts around the tumour which appear to be diseased. The success which may follow free removal is illustrated in a case recorded by Mr. Lund (No. 49). The shoulder had suddenly swelled three months previous to the operation, owing to a severe sprain, but the swelling did not increase during the first two months after the accident. It then began quickly to enlarge, and became the centre of considerable and widely-diffused pain. The skin was stretched over a large tumour, which spoiled the movements of the shoulder and overlapped the border of the scapula—conditions apparently very unpromising for successful operation. The entire upper extremity, the outer third of the clavicle, and the scapula were removed. Nearly a year later this patient was exhibited at a meeting of the British Medical Association, and was at that time apparently quite sound. Resection was performed in one patient (No. 48) by Professor Volkmann. An operation so considerable as removal of the joint and of the upper portion of the humerus to below the surgical neck on a man of sixty-three years old seems scarcely such as a prudent surgeon would undertake, but

doubtless Professor Volkmann was actuated by some powerful considerations which are not apparent in the history of the case. The patient died seven days after the operation, apparently from collapse, but the cause of death is not very clear. The duration of the disease is set down at one month. It is probable, however, it had existed for a much longer period, for movement of the arm had been painful and impaired at least five months before the swelling had been noticed.

It is exceedingly important to diagnose the central tumours of the RADIUS and ULNA, not only from diseases that are not malignant, but from subperiosteal sarcomas. For the treatment need not, in most cases of central sarcoma, be so severe as that required for subperiosteal growths. Fortunately the diagnosis is not very difficult. The contour of the tumour is more irregular and abrupt than the outline of inflammatory swelling; the growth is much more rapid than of any innocent tumour, and the central origin is indicated by the situation of the growth, which is almost always in the lower third of the affected bone. The giant-celled sarcoma of the ulna in the table presented characters which permitted no doubt of the diagnosis or hesitation in the treatment. It had grown very slowly during several years, very rapidly during the last four months; and, when first seen at the hospital, was of large size and nearly pyramidal shape, hard about the base but very soft and elastic at the summit, where it almost seemed to point. In spite of this and of the dusky and shining appearance of the skin, it was believed certainly to be a malignant tumour from its large size, the implication of the bone, and the history of its progress. One gland in the axilla was enlarged, but only from irritation, for it quickly subsided after the removal of the limb. Amputa-

tion was preferred to resection or enucleation, on account of the extent of the disease, and the consequent widely-spread destruction of the bone (Plate II, fig. 7). The spindle-celled sarcoma of the ulna was not nearly so easy to distinguish; indeed, I have never felt quite certain of its nature. About eighteen months before his admission to the hospital the patient strained his forearm in lifting too heavy a weight, but for a year no swelling followed the injury. At the end of a year he struck the forearm, after which a smooth tumour slowly formed where the blow had been sustained some two or three inches above the wrist. The uniformity of the swelling, the tenderness on pressure, the heat of the overlying skin, all pointed to inflammation rather than to tumour. Accordingly, after a few days' observation and a careful recording of the characters and measurements of the swelling, the man was discharged and became an out-patient. A few months later he was again admitted, when the tumour was found to be larger in every direction than on the previous occasion. Mr. Smith, under whose care he was, cut down and opened a very large cystic cavity formed by expansion of the ulna, quite smooth-walled, and filled with blood or blood-stained fluid. No solid substance lay within the cyst, but the soft structures immediately around the investing shell of bone were infiltrated by a very vascular tissue, which was removed, and proved on examination to be composed chiefly of long spindle- or fibro-cells closely packed together. The cavity was plugged, and the patient not only recovered from the operation, but has remained well ever since. That this was really a sarcomatous disease I have never felt quite confident, but the structure of the solid tissue, and the difficulty of knowing how otherwise to class it, led me to include it here.

If, before removal of a tumour of the radius or ulna there

be doubt whether it is central or subperiosteal, a free incision and digital examination should be made. For even if the disease be too extensive to admit of enucleation or resection, amputation need not be performed so near the trunk for a central as for a subperiosteal tumour. If the destruction of the bone is not too great, the tumour should be thoroughly scooped from its interior, and the cavity should be sponged out with a strong solution of chloride of zinc (forty grains to one ounce of water),* or the portion of the bone with the included tumour should be resected. A reference to the table will show that one patient thus treated was well (with a useful hand) four years after the resection was performed. Nor need recurrence be regarded as a grave disaster, likely to lead to dissemination and a fatal termination. For in one instance (No. 56) the sarcoma twice recurred, the first time after it had been scooped out, the second time after resection, yet amputation completely relieved the patient from her peril.

The central tumours of the LOWER JAW grew much more slowly than the subperiosteal tumours, but like them affected in every instance the body of the jaw. At least half the patients were over five-and-twenty years of age. The diagnosis is by no means easy between innocent and malignant tumours. Both grow slowly; both feel firm or even hard, unless the shell of bone is nearly perforated, when egg-shell crackling may be obtained; both commonly

* In the 54th volume of the 'Medico-Chirurgical Transactions' Sir James Paget strongly advocates the treatment of central innocent tumours of bones by the method of enucleation, and records more than one case of which there can be scarcely any doubt that the tumour thus treated was sarcomatous. One of these cases, No. 3, returned to the hospital in 1874 with very extensive recurrence of the tumour, which had begun to grow again three months after the enucleation. There were no signs of glandular affection or dissemination, and amputation of the forearm was performed at some distance above the disease.

affect the body of the jaw. It may, therefore, be impossible to be sure whether a tumour is a sarcoma or a cartilaginous or bony growth. The soft sarcomas, after the covering of bone has been destroyed, may be mistaken for simple or for compound cysts. In all these cases, however, an incision into the substance of the swelling will suffice to dispel uncertainty.

All central sarcomas, except those which have been permitted to attain an enormous growth, may be treated by enucleation or resection, which may be performed in almost every instance through the mouth, and thus the disfiguration of a scar prevented. Of the ten patients in the tables who were operated on two died, but in each of these the tumour was very large: in one it weighed more than four pounds, in the other it equalled the two fists in size. Both patients died from exhaustion, one of them a few hours after the operation. The success of operation in the cases of giant-celled tumours was very striking. By a fortunate chance each one of these cases was observed during many months after the resection or enucleation. Every one was well at least a year after operation; one woman, who was treated at St. Bartholomew's Hospital, three years after operation. In no case was there recurrence of the disease.

The central tumours of the STERNUM and the PELVIS are only suitable for operation if they are very small and so situated that they can be easily reached. Unfortunately very few of them fulfil these conditions. Even if they could easily be removed it is doubtful whether, in the case of the tumours of the sternum, the benefit would be commensurate with the risk of the operation, for central sarcoma of the sternum appears to be especially malignant.

The central tumours of the SKULL, if they are seated in

the bones of the vault, may be mistaken for subperiosteal tumours or for nodes. They may be distinguished from the former by their hard borders and softened centre, and by the fact that they are more often single than multiple. They may be thought to be tumours, not nodes, by their continuous growth, their occasional pulsation, their unequal consistence, and by the advanced age of many of the patients who suffer from them.

They are beyond the reach of successful operation.

CHAPTER VII.

SARCOMA AND CARCINOMA OF THE TONGUE.

THE frequency with which cancer of the tongue occurs; the uncertainty which still prevails whether the tongue is liable to be attacked by only one, or by more than one, form of carcinoma; and the lack of information respecting sarcoma of the tongue; all concurred to lead me to select this organ for the subject of the present chapter. Yet when I read the admirable article on "Carcinoma of the Tongue" in Von Winiwarter's 'Beiträge zur Statistik der Carcinome'* and the carefully written monograph by Anger,† I felt tempted to accept their statements as conclusive, and to occupy myself in working out the pathology of the tumours of some organ which has received less attention. Von Winiwarter is, however, unfortunate in his cases, which are forty-four in number and tabulated with exceeding care; for no post-mortem examination is recorded of any of them in which the disease pursued its course uninterruptedly to death. All the fatal cases which were examined after death were of persons who had died from the effects of operation or from accident. His conclusions, therefore, are not so valuable as otherwise they must have been.

Anger's cases, of which he has collected upwards of 220,

* Stuttgart, 1878, S. 203.

† "Du Cancer de la Langue," 'Thèse d'Agregation,' Paris, 1872.

do not seem to have been always microscopically examined, and, strangely enough, he has scarcely a word to say on the generalisation of the disease. I have therefore deemed it desirable to collect every case of which I could find an account of the microscopical examination, and from these to work out anew the life history of sarcoma and carcinoma of the tongue.

The records of surgery have furnished but a single instance of sarcoma, while, on the other hand, I have been able to collect eighty cases of carcinoma. It will be well to consider first the solitary case, the claims of which to be regarded as true sarcoma may possibly be questioned. It is reported by Professor Jacobi, of New York, in the 'American Journal of Obstetrics' for 1870.* The tumour was congenital, and when noticed, the day after the child was born, was as large as a hazel nut. Its growth was tolerably rapid, for when Dr. Jacobi removed it with the galvano-caustic loop between two and three months later it had attained the size of a walnut. It was seated in the left and middle portions of the dorsum of the tongue, where it projected as a firm but elastic rounded mass, deeply grooved and ulcerated on the surface. The section was uniform, except about the centre, where the uniformity was broken by the presence of a small cyst. Apparently there was no capsule, for none is mentioned, while the external portions of the tumour are stated to have contained a great deal of muscular tissue. The microscopical examination appears to have been most carefully conducted; it resulted in the discovery of a tissue composed partly of round, but chiefly of spindle cells, with but little intercellular substance, so that the name "sarcoma fuso-cellulare" was applied to it in accordance with what was believed to be the classification

* Vol. ii, p. 81.

of Virchow. The infant recovered from the operation, which appeared to have been successful in removing the whole of the disease, and there the record ends; but my interest in the case was so great that it led me to write to Dr. Jacobi in the hope of receiving some further information respecting it. He was kind enough to reply to my inquiries that four or five months after the operation the child was quite well, but that since then, owing to the departure of the parents from the city, it had not been heard of. There are several reasons why the nature of this tumour should be regarded with suspicion, although its structure seems to have been undoubtedly sarcomatous. The rarity of sarcoma as a congenital disease, the fact that at present this appears to be the only sarcoma of the tongue on record (except one in the tongue of a cow, reported by Siedamgrotski*), the absence of recurrence or of glandular affection, and the probability that embryonic tissues such as those of which this tumour was composed have not the same signification in a fœtus, or in a child so little removed from fœtal life, as they have in older patients. In any case this tumour affords no suitable material for a comparison of sarcoma and carcinoma of the tongue, and may therefore, so far as our immediate purpose is concerned, be disregarded.

Not less peculiar than the absence of sarcoma is the fact that only one kind of carcinoma appears primarily to affect the tongue. Cases have occasionally been described of soft, or even hard, carcinoma. But either no microscopical examination has been made, or the account of the minute structure completely disproves the assertion of the nature of the tumour. An example of this may be found in the twentieth

* Canstatt's 'Jahresbericht,' 1873, ii, 607. In the museum of St. Bartholomew's Hospital is a section of a tumour of the tongue of a cow, apparently also sarcomatous.

DESCRIPTION OF PLATE III.

FIG. 1.—Central chondrifying sarcoma of the femur, exhibiting characters of cellular cartilage. × 260.

FIG. 2.—Another portion of the same tumour. × 260.

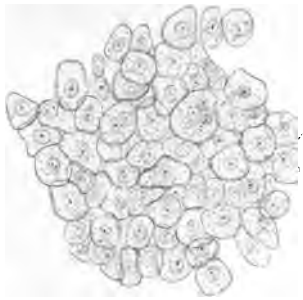
FIG. 3.—Epithelioma of the tongue, showing characters of cells and cell-nests. × 200.

FIG. 4.—From the deeper parts of an epithelioma of the tongue, showing arrangement of columns of cells. × 200.

FIG. 5.—A section of a tongue, the seat of chronic superficial glossitis, showing the thinning of the epidermis and absence of papillæ. × 8.

FIG. 6.—Another section of the same tongue on the confines of an epithelioma, showing irregular dipping down of columns of epithelium. × 8.

1.



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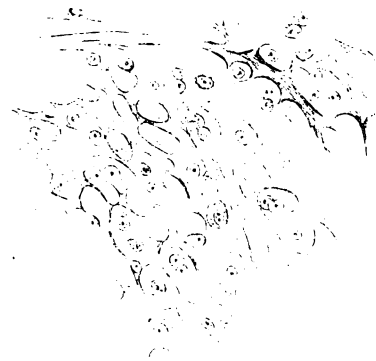

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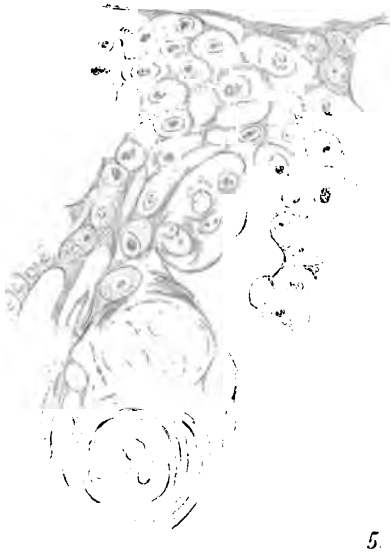

4.

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6.

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volume of the 'Pathological Transactions,'* where the drawings of a "medullary cancer" betray a well-marked squamous epithelium, and even an imperfect cell-nest. Nearly all authors are of late years agreed that the tongue is liable to epithelioma alone of all the forms of carcinoma, and it may not be amiss to direct attention to what looks almost like an eccentricity of disease, which orders in an organ, in which malignant disease is not uncommon, that only one kind of carcinoma shall have its origin. For all the materials are at hand for the making of other forms of tumour—connective tissue in abundance, both beneath the surface and infiltrated through the substance of the organ, fit for the manufacture of sarcoma, and plenteous mucous glands, whose acini are filled with epithelium of the kind from which spheroidal-celled carcinoma is believed to grow. Situated in the midst of numerous vessels, kept almost always warm, subjected to many insults and to varying degrees of pressure, these tissues would seem to be, of all others, marked out as best adapted to enter upon the disorderly course of malignant growth. Yet, for some hidden reason, it is evidently well-nigh impossible for any of them, save those which constitute the epidermis, thus to run astray.

Nor is this the only point in which the tongue, in its relation to malignant tumours, appears to lie under some strange spell. No obvious difference can be discerned between the tongues of males and females, but the former are so much more frequently the seat of epithelioma than the latter that these tables exhibit a disproportion of nearly six to one. This difference may, perhaps, be thought capable of explanation by differences in the habits of men and women, by the frequency with which men drink and smoke, and by the comparative frequency with which their tongues

* Page 157.

are the seat of syphilitic ulcerations. But epithelioma of the tongue occurs in men who neither drink nor smoke nor exceed in any way, while the most masculine women, and they who are guilty of numerous excesses which affect the tongue, escape unharmed by carcinoma. If we admit, too, what indeed appears frequently to be the case, that the exciting cause of epithelioma is the rubbing or abrasion produced by a sharp or decaying tooth, it can scarcely be maintained that slight injuries or carious teeth are six times more numerous in men.

Besides the troubles due to rough teeth or plates of artificial teeth, there are some conditions of the surface of the tongue which are recognised as in certain instances decidedly leading on to carcinoma, conditions called by various names, as ichthyosis or psoriasis. With these may be classed the chronic superficial glossitis described by Clarke,* not merely because it, like ichthyosis and psoriasis, may lead to epithelioma, but because, from reasons which I have expressed elsewhere,† I believe with Clarke that all these diseases are alike inflammatory. Whether they are the exciting as well as the predisposing cause of epithelioma there is little evidence to show; for the history in most cases tells only of an ulcer appearing in the diseased parts as many ulcers have appeared before, and differing from the previous ulcers only in its further course; or of an almost sudden increase of the structures of an ichthyotic tongue, preceded by no symptoms indicative of so great a pathological transition. The structural changes which mark the transformation from inflammation or simple hypertrophy to squamous carcinoma have been described by Mr. Eve,‡ with whose account I

* 'Diseases of the Tongue,' p. 103, London, 1873.

† 'Med. Chir. Trans.,' vol. lxi, p. 51, 1878.

‡ 'British Medical Journal,' 1880, ii, p. 387.

entirely concur, for I worked them out several years ago in connection with the histology of chronic superficial glossitis. They consist in a gradual increase and elongation downwards of columns of epithelial cells—those which exist between the hypertrophied papillæ, or between the points where once papillæ stood (Plate III, figs. 5 and 6). These columns gradually burrow more deeply into the subjacent textures, and cell-nests are sometimes found within them, until, but at what precise moment I know not, the nature of the disease is changed and epithelioma is established. Like the epithelioma which they precede, these conditions are far more frequent in men than women. Thus, of the seventeen cases in which they are recorded here, all occurred in men.

Squamous carcinoma of the tongue is very rare before the age of thirty or after seventy years, so rare indeed in persons under thirty that the only exceptions here are two, in each of which the patient was twenty-nine. Between forty and sixty years of age the cases are most numerous and very evenly distributed. Any part of the tongue may be affected, but the sides and borders are far more frequently attacked than the central parts or base or tip. Very rarely both sides are affected by separate carcinomas, either simultaneously or after a short interval. Two such cases are here included, one reported by Hutchinson, the other by Fairlie Clarke (Nos. 6 and 63). In both, the surface of the tongue had been for many years the seat of chronic inflammation, in one of them leading to the formation of opaque white patches, in the other often proceeding to ulceration. Mr. Hutchinson's patient, when he first came under notice shortly before the operation, had a growth on the left side of the tongue, as large over as a shilling, and a similar growth on the right side, but only one third as large.

In Mr. Clarke's case, the removal of the affected portion of the tongue was followed two months later by the formation of a cancerous ulcer on the other half of the tongue.

Two principal modes of outbreak have long been recognised. In the first a small lump or nodule forms immediately beneath the epidermis, never, so far as I am aware, deep down in the substance of the organ. In the second a fissure or ulcer appears, often looking like a simple ulcer, but changing its characters as it grows larger. Various modifications of these beginnings may, however, be observed. Instead of the lump, a raised plaque or tubercle; in place of the ulcer, a pimple or pustule, or a blister, either of which, breaking down, speedily forms an open sore. In whatever way the disease begins, the interval is seldom long before ulceration is observed; indeed, so common is ulceration that only in three instances is there a specific statement of its absence (11, 69 and 73). In the first after four months the tongue is described as hard and wrinkled, with its muscular tissue transformed into an opaque and whitish mass; in the second the surface was raw and very warty; while the disease in the third case consisted only of a prominent compound wart of a few weeks' duration. In seventy-three cases the presence of ulceration is actually noted, and yet I think there need be no surprise that it is so common; for in a tumour growing close to the surface of the tongue and having its central or most superficial parts but ill-supplied with blood, it would be more strange if ulceration were the exception, not the rule. The induration which invariably occurs about the base or edges of the ulcer is easily understood by remembering that the disease is essentially a tumour, and that the ulcer is merely a destruction of a portion of the tumour.

This destruction may proceed so rapidly, and may extend

so widely and so deeply that only the thinnest layer of the tumour-substance still remains unbroken. But, after removal of the tongue, its textures, naturally so soft and pliable, can almost always be seen infiltrated or replaced for a variable distance by an opaque white substance, which generally permits small plugs of softer yellowish material to be squeezed from the surface of the section. The infiltration may extend through the corium of the mucous membrane into the muscular tissue, and may vary from a line to nearly an inch in thickness. Those cases which have been taken for soft carcinoma have been the more bulky and softer varieties of epithelioma, which, spreading quickly downwards into the substance of the tongue, sometimes form tumours of considerable size. The hardest forms of epithelioma, on the other hand, may well be mistaken for scirrhous cancers, for their consistence is often so firm as to be even gristly. The margin of the opaque-white substance is for the most part sufficiently distinct, and is often frayed or almost radiating.

The microscopic characters of epithelioma of the tongue are those of epithelioma of other parts. Processes of epithelium dip down from the epidermis into the subjacent tissues. These processes, however numerous they are or large they may become, do not usually combine to form a continuous mass or solid block of epithelial cells, but become connected at short intervals by horizontal bars of cells so as to enclose what look like areas of irregular form. These areas are really spaces, communicating freely between the anastomosing bands of epithelium, filled with the altered tissues of the tongue infiltrated with leucocytes. However deeply the disease extends, a somewhat similar disposition is observed; these same processes of closely-packed cells, constantly varying in thickness, sometimes varicose, or, like

a tree root, gnarled, penetrate the structures of the part. The outlines of the processes are for the most part very clearly defined, and while the cells occupying their central parts or axes are irregularly massed together, those which are peripheral often assume the form and disposition of a row of stunted, and not too even, columnar epithelium (Plate III, fig. 4). The appearances thus presented are suggestive of growth within some pre-existing channels, and recall the drawings and descriptions by Köster* of the growth of epithelioma of the skin or lip. But whether, as he avers, this disposition depends on growth within the lymphatics I do not know. Cell-nests may be discovered without difficulty in almost every epithelioma of the tongue (Plate III, fig. 3). Often large and well formed, they rarely present the horny and finely-stratified appearance of similar structures seen in squamous carcinoma of the skin, but rather resemble the cell-nests which may be observed in the epidermis of the normal tongue.

As epithelioma gradually extends, both speech and deglutition, hitherto but little interfered with, become more and more embarrassed, and salivation is often most distressing. But the degree and kind of functional disturbance largely depend on the direction in which the disease extends. Those cancers which are situated on or beneath the border of the tongue gradually infiltrate the floor of the mouth, bind down the tongue, and render every attempt at movement exquisitely painful. Filling the intervening space, they next attack the gum and, if not prevented by some accident, the bone beneath it; and this, becoming soft and carious-like, loses its hold upon the teeth, which one by one drop out. The sublingual and submaxillary salivary glands are in some instances affected, probably by

* 'Die Entwicklung der Carcinome und Sarcome,' Wurzburg, 1869.

direct extension of the disease. But no definite line can be laid down as certain to be followed in the continuous extension of any given epithelioma; nor, conversely, can it be maintained that the seat of origin of a carcinoma of the tongue will necessitate extension in a given direction. Allowance must be made in individual cases for differences in consistence and other characters of the part attacked and of the surrounding tissues. For here, I imagine, as in all similar cases, continuous extension of disease is mainly influenced by the resistance offered to such extension, and by the liability of the invaded tissues to contagion. With the extension of infiltration there occurs in nearly every instance a simultaneous widening and deepening of the ulceration, until it sometimes happens that an artery is opened; or, short of this, repeated capillary or venous hæmorrhage takes place. Death from such a cause, however, is not very usual. Of the unoperated cases, two died from this cause; and of those in whom death followed recurrence, only one is distinctly stated to have so perished.

The commonest cause of death in all cases of epithelioma of the tongue appears to be exhaustion and inanition from pain, abundant and fetid discharge, and inability to swallow sufficient food. With these conditions is not infrequently associated a form of pneumonia, sometimes of a pyæmic nature, sometimes due, in part at least, to the dribbling of discharges down the imperfectly protected air-passages, and always predisposed to by the weakened condition of the patient. The constant pain radiating to the ear and side of the face and head, the foul discharge, and the increasing hindrance to the acts of swallowing and breathing, combine to render death from cancer of the tongue so hideous that I agree with Weber* that in most

* 'Pitha u. Billroth,' Bd. iii, Abth. 1, Lief 2, S. 329.

cases he is fortunate whose misery is cut short by a timely hæmorrhage. But whoever will know more of the horrors of the slow and certain siege of a man's life laid by this desperate disease, so placed that it cuts off or poisons all supplies of air and food, and of the fortitude and resignation with which these miseries may be endured, will find them fully set forth in Wilson's account of the life or rather the death of that distinguished member of our profession, Dr. John Reid.*

It is not easy to estimate the natural duration of this disease, for it is liable to be modified by various conditions. For instance, it is obvious that extreme age or general debility will largely diminish the capacity for resistance. Thus, among the few unoperated cases the shortest duration was in an old and feeble person, a woman of seventy-eight years, who died five months from the beginning of the disease. The difficulty is not lessened by the uncertainty which often prevails of the precise date of origin of the epithelioma. In one, at least, of the cases (No. 4) in which the total duration is set down at seven months, the accuracy of the assigned date of commencement of the disease admits of grave doubt, for the affection of the tongue and enlargement of the glands are said to have been first noticed simultaneously. Of the eight unoperated cases in which the duration is stated, neither of the patients lived longer than eighteen months, and six died within twelve months.

Affection of the glands is noted in forty-two cases, which may be thus divided:—ten in which no operation was performed, eight in which the glands were obviously affected at the time of operation, fourteen in which the epithelioma recurred, and the glands became diseased, and ten in

* 'Life of Dr. John Reid,' by George Wilson, M.D., Edinburgh, 1852.

which, without recurrence of the primary disease, the glands became affected. The glands liable to secondary affection are numerous and constitute several different groups, the sublingual, submaxillary and cervical, all of which, however, are closely connected. Cancers of either half of the tongue generally affect, as might be expected, the glands of the corresponding side of the neck; but occasionally the glands on both sides are affected, while the primary disease is still apparently limited to one half of the tongue. I say *apparently* limited, because it is probable that the disease has really crossed the middle line, perhaps at some depth below the surface, and has thus been brought in close relation with the lymphatic channels of the side opposite to that on which it first broke out. Again, while cancers situated farther forwards affect most frequently the anterior group of glands, and cancers farther back affect the glands at the angle of the jaw, I concur with Von Winiwarter that no invariable rule can be proved to be observed in this respect. The precise gland or group of glands which will first become affected must depend, of course, upon the anatomical relation of the part of the tongue which is diseased with the lymphatic glands, and the difficulty which at present exists in defining the situation in which glandular disease will first occur is due, I doubt not, rather to want of accuracy and detail in recording observations than to variations in anatomical arrangement. One important point, however, may I think be established from these tables: namely, that glandular affection is a necessary accompaniment of epithelioma of the tongue, provided the disease be permitted to pursue an uninterrupted course. As in malignant disease of the testicle, so in carcinoma of the tongue, it is not a question of mere chance or choice whether a certain tumour will affect the

glands or not. Every malignant tumour of the testis and every epithelioma of the tongue will inevitably affect the lymphatic glands unless its progress be arrested by some kind of accident. A somewhat similar proposition was made by Mr. Hutchinson* more than twenty years ago for epithelioma generally, but, even if it be true, it was impossible at that time to support it by a sufficient weight of evidence. I shall endeavour to prove it now for epithelioma of the tongue, not only by a reference to those cases in which no operation was performed or in which recurrence after operation was observed, but by a careful consideration of certain other cases in which the glands are reported to have been healthy at the patient's death.

Of the ten cases in which no operation was performed, in every one there is a record of glandular affection.

Of the twenty-seven cases of recurrence after operation, the glands became affected in fourteen, and in one more (No. 16) the recurrence took place in the site of removal of an enlarged gland which was taken away together with the primary disease. Nine of the remaining twelve were fatal, but in neither of them was a post-mortem examination made, and in neither of them is there any record of the condition of the glands. The result in three cases and the condition of the glands is unknown.

Only in four fatal cases is there a definite statement that the glands were healthy after death. These cases are numbered 12, 15, 23, and 27. No. 12 was the case of a woman who was operated on at St. Bartholomew's Hospital in 1875 for a very small epithelioma of only about a month's duration, a cup-shaped prominent ulcer with an indurated base. It was very freely removed with the knife, and she returned to her home in Hertfordshire. Last year (1880),

* 'Brit. Med. Journal,' 1860, vol. ii, p. 334.

not having heard of her since the operation, I wrote to her medical attendant, who replied that she had died in 1879, but of a disease in no way connected with the affection of her tongue, which had never returned or caused an enlargement of the lymphatic glands. No. 15 was treated by operation when the disease of the tongue had been noticed four months. This man also was an inmate of St. Bartholomew's Hospital, where, five days after the operation, he died from repeated hæmorrhages from the stump. The autopsy discovered no affection of the glands or of any portion of his body. The third case (No. 23) was published by Mayer in the 'Wiener Medicinische Wochenschrift,' and is of interest for several reasons. The patient was an unmarried lady of forty-three, who first noticed in October, 1868, a little fissure on the left border of the tongue, which she attributed, no doubt with truth, to the scraping of a caoutchouc tooth-plate which she had not long begun to wear. The fissure gradually assumed the appearance of an ulcer, and after remaining sore for some weeks, quite healed up under the influence of a caustic. But in March or April, 1869, it again broke out and rapidly increased in size, and the entire left half of the tongue as far back as the circumvallate papillæ became thickened and infiltrated. The affected portion of the tongue was freely removed with the écraseur and knife in May, and ten days later the patient died of tetanus. While, therefore, the duration of the disease is set down in the table as seven months, which includes the duration of both ulcers, the real duration may be much less than this, and more probably dates from some period between the formation of the first and second ulcer. In this case, as in the last, there was an absence of glandular enlargement and of all other secondary affection. The last case of the series resembles the second and

third in the fact that death occurred as the result of operation. It resembles all three of the preceding cases in the short duration of the disease at the time of operation (three months), and in the absence of all secondary disease. Let it be understood that these are the only cases, except those of recovery from the disease, in which the absence of glandular affection is distinctly stated; on the other hand, that all the fatal cases, either without operation or with recurrence, in which the condition of the glands is noted, were complicated with glandular disease; and I think it will be admitted that the assumption is not without grounds that affection of the glands is a necessary accompaniment of this disease.

The period at which the glands become affected cannot, I think, be calculated from the facts before us. For, setting aside the uncertainty which prevails respecting the exact date of origin of the primary disease, and admitting that the glands may sometimes be the seat of epithelial disease before they become obviously enlarged, the date at which their enlargment first was noticed is not recorded in the large majority of these cases. Practically it is of the utmost importance to know, not so much when the glands become diseased, as—what is perhaps the equivalent of this —up to what period they are still free from disease. On this point the only information which can fairly be obtained is afforded by those cases in which patients died with healthy glands, or are reported free from disease many months after operation. The duration to the date of operation in these cases, if correct, must furnish information of the possible time during which, under certain conditions, the glands may remain intact. Unfortunately these cases include the large majority of those in which so much doubt existed of the duration of disease to the time of operation that in several

of them it could not be given. In four of them, however, a date is assigned, although in one of the four it is accompanied by a sign denoting uncertainty. In that case (No. 25), in which the duration is estimated at two years, several glands were actually enlarged at the time of operation, and were removed together with the tumour of the tongue. The microscopical examination of the latter discovered the characters of well-marked epithelioma, in which were small concentric globes, but the glands did not possess a similar structure. In No. 35, for the notes of which I am indebted to Sir James Paget, who was so kind as to furnish me with his manuscript notes of several cases, the disease had apparently existed nine months when the ulcer, which measured an inch by half an inch, but did not penetrate more deeply than about a line, was freely cut out. This ulcer had formed in consequence of the rubbing or grating of a carious tooth, and had gradually increased in size until, at the end of six months, the tooth was drawn. From this time its progress appeared to be arrested; but as its base and borders were indurated and it did not heal, and as a gland by the side of the facial artery was slightly enlarged and firm, it was deemed advisable to remove the ulcer. After the operation the enlargement of the gland slowly subsided, and more than six years later the patient was alive and well. In Case 5, where a history of six months' duration is attached, a similar description is given of the subsidence of an enlarged gland; but the recovery can scarcely be claimed as permanent, for the patient was only traced seven months after the operation. Nevertheless, I am glad to be able to mention one authentic case, for it shows that, however we may explain the enlargement, a gland enlarged in association with an epithelioma may possibly subside; and this is a kind of off-set against the fear

I expressed a few moments since lest glands might sometimes be already epitheliomatous when no enlargement of them could be yet detected.

The question of dissemination of the disease is not less important than that of affection of the glands, but the facts relating to it are very disappointing. For in the forty-five fatal cases only fifteen autopsies were performed, or rather are recorded, a number quite insufficient to allow of the induction of any comprehensive laws.* The only fact which they appear conclusively to prove is the possibility of dissemination of epithelioma of the tongue, a fact already well established. On the first glance I thought too they showed that dissemination, though it be possible, is yet uncommon. But a closer study of them obliged me to admit that even this could not be absolutely stated. Applied to secondary affection of the lungs, which lie in the direct line of the returning circulation, it may indeed be true. Of fifteen fatal cases in which they were examined secondary affection was discovered only in three. In one of the three (No. 67), new growths, all bearing the characters of epithelioma, were also found in the right auricle and ventricle of the heart (rendering it almost certain that the disease was conveyed through the medium of the blood) and in the liver. The twelve cases in which no affection of the lungs was present include six cases in which the disease pursued its course unchecked by operation to death, and two in which there was secondary affection of other organs, not the lungs. But if all the cases in which cancer was found in other

* In two of the cases described by Thiersch (Nos. 59 and 60) the lungs apparently were examined after death, for hepatisation of them is spoken of, but no detailed account exists in either case of the post-mortem examination. This is the more unfortunate, because Thiersch is so well qualified, from his extensive knowledge of the subject, to have afforded a most perfect account of them.

parts of the body than the tongue and glands be taken a very different conclusion may be arrived at, for they comprise no fewer than seven out of the total of fifteen cases. And even this comparative malignancy is made to appear still greater when it is observed that five of the eight cases died from the immediate effects of operation, practised in almost every instance at an early period of the disease. There remain, therefore, only three cases out of the fifteen in which it seems that disseminated tumours could reasonably have been expected to occur. Thus far the assumption is markedly in favour of generalisation of epithelioma of the tongue, and the experience derived from the foregoing study is so opposed to that of other observers, particularly of Anger and von Winiwarter, that the difference seems only such as can be accounted for on a supposition of the kind suggested by Paget many years ago,* that epithelioma is more malignant in this country than elsewhere. The cases, however, from which this table is compiled are gleaned from many records, and to these fifteen the French and German archives furnish a fair contingent.

But now let me try and modify the effect of these numerical results by a separate study of certain of the cases in which it seems more probable the various tumours were not secondary to the cancer of the tongue. Thus No. 2, a man of sixty-six, died sixteen months after the first appearance of the affection of his tongue, and the only organ in which cancerous disease was found was the left supra-renal body, enlarged to twice the size of its healthy fellow capsule, and converted into a firm, almost fibrous-looking, cream-coloured substance, here and there broken down into a ragged cavity. But the microscopic characters were not conclusive of the nature of the cancer. Again,

* 'Pathology,' 1853, vol. ii, p. 470.

No. 9, reported by Leroux, was a man of fifty-eight, who died from the combined effects of a cancer of the tongue and a stricture of the œsophagus. The duration of the former was uncertain, but symptoms of the latter had existed for about a year. The right half of the under aspect of the tongue from the tip to the epiglottis was the seat of deep epithelial ulceration, which extended to the neighbouring gum. And at the gastric end of the œsophagus was a stricture, also epitheliomatous. Between these two areas of disease was healthy mucous membrane, and no other tissues or organs of the body were affected save the glands. Leroux suggests, with what seems perfect justice, that the two cancers bore no direct relation to each other, but were merely contemporaneous. In No. 31 the primary epithelioma of the tongue was very completely removed with the écraseur. Although no recurrence took place within the mouth, the disease attacked the submaxillary and cervical glands, and two years after the operation caused the patient's death by opening the carotid artery. The only parts of the body in which secondary disease was found were the seventh right rib, the bony substance of which contained "two cancerous tumours," and the liver, in which were many "cancerous points." Unfortunately, these growths of the rib and liver were not subjected to microscopical examination, but the rib is certainly not a situation in which we should expect to find secondary epithelial tumours. Last of the dubious cases (No. 52) is one recorded in the 'Lancet' in 1873, in which, four months after its first appearance, an epithelioma of the tongue was removed by an oblique incision. Within five weeks of the operation the patient died from suppuration of enlarged lymphatic glands in the neck, and from affection of the internal organs. For the post-mortem exami-

nation discovered cancerous masses in the heart, the liver, and the right supra-renal capsule. These masses were examined microscopically, and the report was to the effect that those of the liver resembled encephaloid; those of the heart, the glands, and supra-renal body, scirrhus; while the ulcer of the tongue was undoubtedly epithelial. Although it is difficult to believe that this patient was the subject of several primary and simultaneous outbreaks of carcinoma, it is almost as difficult to believe that the tumours of the internal organs were all secondary to an epithelioma of the tongue of such a short duration, especially as in all, save one, of the other instances of secondary affection, the disease was of at least a year's duration. Four of the seven cases of apparent generalisation are then of very doubtful quality, and by thus much is the proportion of cases in which generalisation can be absolutely proved to have occurred diminished. The lesser proportion is, I suspect, far nearer to the truth; for, in order to extend my series of completed cases, I examined carefully the published records of the cancer department of the Middlesex Hospital,* where special opportunities are enjoyed for the study of such cases. From these records I collected nineteen cases of patients who had died from "cancer or epithelioma of the tongue" either unoperated or recurrent. In every case the lymphatic glands were cancerous; in only two of them were there secondary deposits in other organs; in the one case a solitary mass of small size in the liver, in the other many growths in the pleuræ or lungs. In the former instance the disease had existed for about one, in the latter for between two and three years, but during that period more than one operation had been

* Reports for 1867, 1870, 1872, 1873, 1874, 1875, 1876, 1877, the only volumes accessible to me at the time.

practised. I wish I could have incorporated these nineteen cases in my tables, but unfortunately they lack reports of microscopical examination, so I can only use them as a kind of auxiliary forces which have nevertheless rendered signal assistance at a critical juncture.

From all that has been said thus far, it may be seen that I regard epithelioma of the tongue—apparently the only form of carcinoma which grows there, and not improbably the only form of malignant tumour of the tongue—as a disease which, uninterrupted by accident or operation, will destroy the substance of the organ, gradually eat into the surrounding structures, inevitably affect the lymphatic glands, but which probably only rarely affects more distant parts. I regard it, too, as a disease exceedingly dangerous to life, not on account of its tendency to dissemination, but because of the position it occupies, the rapidity with which it ofttimes spreads, and the comparatively early period at which it probably affects the glands. For all practical purposes, indeed, it is a local malady, often certainly of wide extent, involving the tongue, the neighbouring parts, and one or two or many glands. But still it is limited to these parts, if not throughout its entire course, yet probably for about a year. From this reasoning it follows, therefore, if the disease be freely enough removed, the patient may be permanently cured, although he may, by reason of some predisposition in the parts which remain behind, be more liable than another person to a second and separate outbreak. Let us see how far this reasoning is borne out in practice. In ten instances a record is appended in the final column of this table of the healthy condition of the patients some time after operation. In three of these the period thus recorded was less than a year. A permanent cure can scarce be claimed in either of the three. But in

the shortest of the remaining seven a period of seventeen months had elapsed between the operation and date of the last report. And these seven cases may be increased to eight by the addition of No. 12, in which the patient died four years after the operation, but of a different disease. It has been already remarked that the duration to the time of operation in many of these cases is unknown. In most of them the disease was very limited in extent, so that it could with ease be thoroughly removed. But this was not so in all. One (No. 25) is especially worthy of note. In May, 1876, Mr. Rushton Parker removed, by a very extensive operation, an epithelioma of the left border and side of the tongue about an inch and a half long, which extended to the molar gums of the upper and lower jaws, and even to the cheek. The cheek was split, the facial and lingual arteries were tied, and the left half of the tongue, a portion of the upper and lower jaws, and the diseased tissues in the cheek removed. More than this, some of the submaxillary glands of the same side, which felt enlarged and hard, were taken out. The cancerous nature of the glands was not satisfactorily proved by the microscope, but no doubt existed of the nature of the primary disease, in which concentric globes or cell-nests were discovered. The patient, a wiry man of fifty-eight, recovered from the operation, and was quite free from disease in November, 1877. Another case* I mention chiefly perhaps because it is one of which I made the general and microscopical examination after the operation, and therefore took a special interest in. Four years ago Sir James Paget removed with the écraseur the anterior two thirds of the tongue of a gentleman who for many years had suffered from chronic superficial glossitis, but

* Case 41.

lately a lump had formed and rapidly increased in size. About two inches from the tip, and just to the left of the middle line, was a raised tuber about an inch across, extending deeply into the muscular substance. It proved to be a well-marked epithelioma with numerous cell-nests. The line of incision had passed completely behind it, leaving a sufficient margin of healthy-looking tissue. This gentleman was quite well when seen in August of the year 1880. These cases are sufficient to prove the possibility of cure by operation. And other cases show how operations carefully planned and executed may retard the course of the disease, although repeated outbreaks after long intervals of respite at length prove fatal. Of such a kind is No. 33, in which nine months after its first appearance a small ulcer, three-fifths of an inch in diameter, was removed from the right border of the tongue, together with a quarter of an inch of the surrounding healthy structures. Six years afterwards the scar, which was become thickened and warty, was removed. Again, in two years the scar and the surrounding parts were cut out on account of cancerous ulceration, and in the beginning of the following year the patient died from extensive recurrence of the disease. It can scarcely be imagined that the second appearance of the disease was an ordinary recurrence due to incomplete removal of the original ulcer. It must rather be assumed to have been a separate outbreak of disease in a patient predisposed to it, or who may be said to have already exhibited a capacity for developing carcinoma. Its occurrence in the scar is an example of the manner in which epithelioma often attacks scar tissue.

Even those cases in which operation has been too long delayed, so that, without recurrence of the primary disease, the glands become enlarged within a short period of the

operation, may very advantageously be compared with the unoperated cases. Seven of them were fatal, and of these seven the shortest duration was twelve months, the longest durations twenty-two and thirty months.

Provided only the disease of the tongue can be removed with a fair prospect that it will not recur, there seems scarcely a condition which may not be benefited by operation, for the most foul and loathsome ulceration of affected glands below the chin and in the neck is not nearly so terrible as an advanced cancer within the mouth. Unfortunately recurrence is very difficult to guard against, for the progress of the disease is in many instances very rapid, the diagnosis is not always easily made, and people who suffer from cancer of the tongue are inclined to defer the operation until the disease has become a source of serious inconvenience or pain. It will be seen that there is a history of recurrence in five and twenty cases, a very large proportion when all those are excluded from the tables in which no operation was performed, or in which death resulted from operation, or which were not traced after operation. Many of these recurrences were of course due to the extent and situation of the disease, but others of them were as certainly due to the insufficient character of the operations practised for its removal. It is essential that not only the visible disease should be removed, but that an area of about a quarter of an inch of the healthy-looking tissues around it should also be removed. The desire to save one half of the tongue, the inclination to diminish so far as possible the magnitude of the operation, the disinclination to employ any procedure which entails a wound of the face or floor of the mouth, are some among the causes which tend to incomplete removal of the disease. It scarcely lies within the scope of this paper to discuss the

various operations by which a portion or the whole of the tongue may be removed. The particular method chosen depends rather upon the individual preferences of the operator than upon any real advantage which can be claimed for one method over every other. I may own, however, that I prefer the knife for the removal of the anterior portion, and the écraseur for the removal of one entire half or the whole of the tongue. The method described by Mr. Morrant Baker* is an exceedingly good one, and division of the cheek should be practised to the anterior border of the masseter in every case in which it appears doubtful whether the disease can thoroughly be removed through the mouth. The cord loop of the écraseur cuts easily through the muscular structures, and the last portion of tissue left undivided in the loop in each half (removed separately after splitting the tongue) contains the lingual artery, which can and should be tied. The hæmorrhage during the performance of the operation is very little, and it is a source of great satisfaction to the operator to know that the lingual artery is safely included in a ligature.

It will be seen by referring to the table that eight persons died from the direct results of operation, and further, that five of the eight died from pneumonia. This has long been recognised as the chief danger incurred in the removal of the tongue, and it is generally admitted that the inflammation of the lungs is due, in part, to the oozing of discharges down the imperfectly protected air-passages, or to poisoning of the air which passes over the surface of the wound. On this account, and for greater safety during the operation itself, Mr. Arthur Barker† has

* 'Lancet,' 1880, vol. i, p. 559.

† 'Lancet,' 1879, vol. ii, p. 234.

recommended the performance of tracheotomy and the wearing of the tube until the healing of the tongue is completed. Others have recommended an incision, and drainage through the floor of the mouth. Where an opening through the floor of the mouth is necessary to a complete removal of the disease, it should certainly be employed for drainage. But unless it be thus necessary, the operation of tracheotomy, with the employment of Trendelenberg's tube, is to be preferred, since it prevents the passage of blood down the trachea during the operation, a danger in itself, and I feel assured an important addition to the causes of pneumonia.

In all considerations connected with operation it must not be forgotten that the smaller the area of disease, provided it be accessible and can very freely be removed, the less is the probability of recurrence; and the earlier the operation is performed, the less is the likelihood of affection of the glands. Therefore it is essential that an accurate diagnosis should be made at the earliest possible period of the disease.

For this purpose I have made careful notes of the characters of cancerous ulcers of the tongue, and have compared them with those of tuberculous and syphilitic ulcers —the only diseases for which they are really liable to be mistaken. Although in most instances, especially when the disease is far advanced, there is no difficulty in distinguishing the cancerous ulcer by its raised, everted, sinuous border, and the surrounding induration, often widely spread, the diagnosis is in other cases quite impossible. For some cancerous ulcers are deficient in these, their most distinctive characters, while, on the other hand, some tuberculous and syphilitic ulcers so closely imitate them that confusion is certain to occur. Since no absolute reliance

can be placed on the general features of the disease, and valuable time is often lost while anti-syphilitic and other remedies are administered, I strongly recommend that the microscope should be employed. By its means the diagnosis can with certainty be made in the more advanced cases of disease, no matter how indefinite are the general characters of the ulceration. And in quite early conditions of disease, in which hardly more than a suspicion of epithelioma yet prevails, although I cannot speak with absolute confidence of all cases, I have not yet failed by means of the microscope to distinguish between cancerous and other ulcerations. The method of procedure is perfectly simple and requires only a very limited acquaintance with the complex art of modern microscopy. Scrape the clean surface of the ulcer gently with a knife, and place the scraping in a drop of water on a slide. Examine first with a low then with a higher power (4 and 7 Hartnack, or $\frac{1}{8}$ in. and $\frac{1}{4}$ in. English). The scrapings of cancerous ulcers contain always numerous epithelial cells, in addition to pus- and blood-corpuscles and *débris* of food and schistomycetes. But the epithelium differs widely from the healthy epithelium of the tongue. The cells vary much in shape and size, and often present singularly distorted forms; their nuclei are always much larger than those of normal cells, and sometimes there are several nuclei, or even nucleated cells within the larger cells; while a greater or less quantity of granular material always occupies the interior of the cells. Not infrequently cell-nests or fragments of cell-nests may be observed. The appearances thus presented are figured in the plate (Plate IV, figs. 1 and 2). They are, so far as I have hitherto discovered, peculiar to epithelioma, and therefore distinctive of epithelial ulceration. They have never been absent in any case of epithelioma of the tongue which I have care-

DESCRIPTION OF PLATE IV.

FIG. 1.—Scraping from an epithelial ulcer of the tongue, showing pus- and blood-corpuscles and altered epithelial cells. (Oc. 3, obj. 7.)

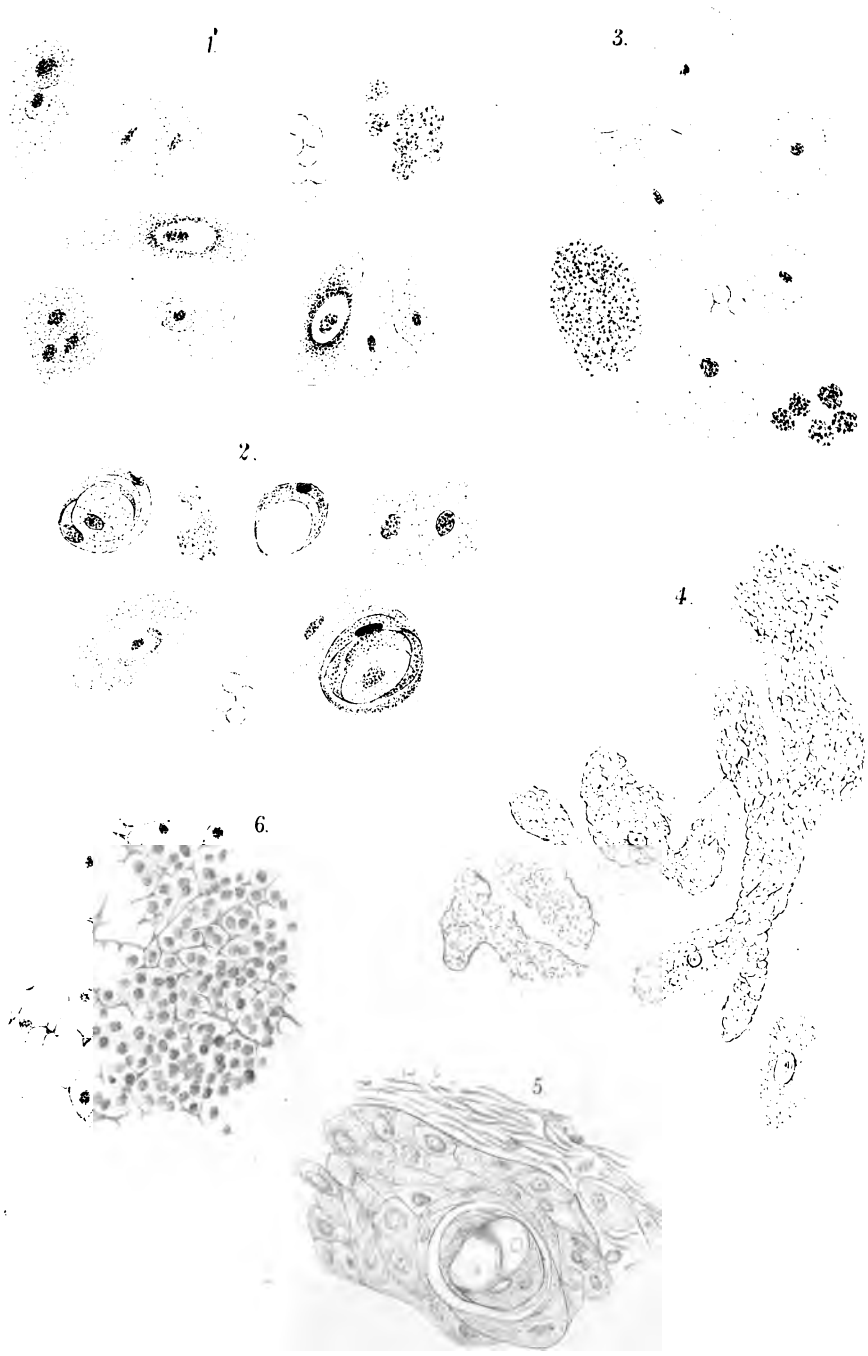
FIG. 2.—Scraping from another epithelial ulcer of the tongue, showing cell-nests. (Oc. 3, obj. 7.)

FIG. 3.—Scraping from an extensive tertiary syphilitic ulcer of the tongue, showing blood- and pus-corpuscles, epithelium, and a micrococcus mass. (Oc. 3, obj. 7.)

FIG. 4.—From an epithelioma of the œsophagus, showing columns of epithelial cells in the deeper parts. × 90.

FIG. 5.—A portion of the above more highly magnified. × 260.

FIG. 6.—From a round-celled or lymph-sarcoma of the tonsil. × 260.



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fully examined; nor have I ever observed similar appearances in the scrapings of syphilitic and tuberculous ulcers (Plate IV, fig. 3). These contain pus- and blood-corpuscles, *débris* of food, schistomycetes, and even epithelium. But the epithelium bears no resemblance to that derived from the cancerous ulcers. It is well formed, of more equal size and regular shape, not granular; and the nuclei are exceedingly small in comparison with the large size of the cells.

Note.—I am not yet sure that this method can be employed with success in those rare cases in which there is no ulceration of the disease.

Carcinoma of Tongue—Epithelioma—Squamous-celled Carcinoma.

No. of case.	Sex.	Age.	Cause.	Seat.	Ulceration.	Duration to operation (in months).	Nature of operation.	Total duration (in months).	Cause of death.	Recurrence.	Affection of glands.	Affection of lungs.	Affection of other parts of body, and general remarks.	Authority.
1	M.	55	—	Root	Yes	No op.	0	7	Exhaustion	—	Yes	—	No p.-m. examination	Path. Trans., iv, 121, 1853.
2	M.	66	—	Whole	„	„	0	16	„	—	„	0	Left supra-renal body	Path. Trans., x, 272, 1859.
3	M.	middle	—	Rt. border	„	6	Knife, division of symphysis	—	—	—	—	—	—	Path. Trans., xii, 223, 1861.
4	F.	55	—	Lt. border	„	No op.	0	7	Exhaustion	—	Yes	Yes	0	Path. Trans., xii, 46, 1861.
5	M.	60	—	„	„	6	Ecraseur, section of jaw	—	—	—	—	—	Well 7 months later	Path. Trans., xx, 157, 1869.
6	M.	54	Supl. glossitis	Ant. half	„	6	Ecraseur	14	Dis. glands	—	Yes	—	No p.-m. examination	Path. Trans., xxvi, 98, 1875.
7	M.	59	—	Dorsum	„	No op.	0	18	Exhaustion	—	„	0	0	Path. Trans., xxiv, 111, 1873.
8	M.	52	—	Left side	„	7	Tongue and glands	—	—	—	„	—	—	Path. Trans., xxvii, 144, 1876.
9	M.	58	—	Rt. border	„	No op.	0	12	Hæmorrhage, &c.	—	„	0	Epithelioma of cardia œsophagi	Bull. Soc. Anat., s. 4, ii, 130, 1877.
10	M.	42	Rough teeth	Right side	„	8	Ecraseur, ½	16	Hæmorrhage	Yes	„	0	0	St. B. Hosp., Thomas D., 1878.
11	M.	56	—	Ant. half	0	4	Ecraseur	—	—	—	—	—	—	Bull. Soc. Anat., s. 3, ii, 294, 1867.
12	F.	41	Sharp tooth	Border	Yes	1	Knife	48	Not epithelioma	0	0	—	No p.-m. examination	St. B. Hosp., Rose T., 1875.
13	M.	39	—	Lt. border	„	5	Ecraseur	11	Recurrence	Yes	Yes	—	No p.-m. examination	St. B. Hosp., Horace K., 1874.
14	M.	48	Supl. glossitis	Rt. border	„	6	„	12	Dis. glands	„	„	—	No p.-m. examination	St. B. Hosp., Henry S., 1878.
15	M.	62	„	„	„	4	„	4	Pneumonia, &c.*	0	0	0	0	St. B. Hosp., Thomas W., 1876.
16	M.	52	Psoriasis	Lt. border	„	3	Ecraseur, ½ tongue and 1 gland	12	Dis. glands	In gland	Yes	—	No p.-m. examination	St. B. Hosp., John H—t, 1879.
17	M.	40	Syph ulceration	Left side	„	(?)	Ecraseur	(?)	Recurrence	Yes	—	—	No p.-m. examination	St. B. Hosp., John W., 1876.
18	M.	75	Supl. glossitis	Right side	„	1½	„	15	Dis. glands	0	Yes	—	No p.-m. examination	St. B. Hosp., Robert E., 1877.
19	M.	51	Rough teeth	Lt. border	„	3	Knife	8	Hæmorrhage, &c.	Yes	„	—	No p.-m examination	St. B. Hosp., James B., 1877.
20	M.	48	Rough tooth	Rt. border	„	(?)	„	—	—	—	—	—	Well 2 years later	St. B. Hosp., John H., 1878.
21	M.	44	„	Right side	„	2	Ecraseur	10	Exhaustion	Yes	—	—	No p.-m. examination	St. B. Hosp., George S., 1878.
22	F.	32	Sharp tooth	Lt. border	„	7	½ tongue	17	Hæmorrhage	—	Yes	—	No p.-m. examination	St. B. Hosp., Elizabeth L., 1879.
23	F.	43	Tooth-plate	„	„	7	Ecraseur, ½	7	Tetanus*	0	0	0	0	Wien. Med. Wochsft., xix, 1513, 1869.
24	M.	59	Supl. glossitis	Dorsum	„	4½	Ecraseur	—	—	—	—	—	—	Med. T. and Gaz., ii, 682, 1878.

25	M.	58	—	Lt. border	„	(?) 24	Free removal	—	—	—	—		Well 18 months later	Med. T. and Gaz., ii, 590, 1877.
26	M.	50	Ichthyosis	Dorsum	„	(?)	Ecraseur	—	—	—	—		Well 9 months later	Brit. M. Jour., i, 231, 1874.
27	M.	53	Sharp tooth	Right half	„	3	„	3	Pneumonia*	0	0	0	0	Brit. M. Jour., ii, 584, 1869.
28	M.	54	0	Lt. border	„	2½	Knife	—	—	Twice	—		—	Lancet, ii, 144, 1872, & ii, 677, 1871.
29	M.	47	Psoriasis	Rt. border	„	(?)	Cautery	—	—	—	—		Well 1¾ years later	Schläpfer, "Volst. Extirp. Zunge," s. 128, 1878.
30	M.	46	Bit tongue	Dorsum	„	No op.	0	—	—	—	Yes		—	Anger, 'Cancer de la Langue,' p. 41, 1872.
31	M.	61	—	„	„	6	Ecraseur	30	Dis. glands	0	„	0	Seventh right rib, liver	Anger, l. c., p. 23.
32	F.	42	—	Left underside	(?)	(?) 2	„	—	—	—	—		Well 3½ years later	Sir Jas. Paget, M. S., S. S.
33	F.	29	Decayed tooth	Rt. border	Yes	9	Knife	108	Recurrence	3 times	—		No p.-m. examination	Sir Jas. Paget, M. S., E. S.
34	M.	57	0	Left side	„	12	Ecraseur	18	„	Yes	—		No p.-m. examination	Sir Jas. Paget, M. S., J.
35	M.	36	Rough tooth	Rt. border	„	9	Knife	—	—	—	—		Well 6 years later	Sir Jas. Paget, M. S., G. P.
36	F.	37	0	Left half	„	No op.	0	(?)12	Exhaustion	—	Yes	Yes	0	Sir Jas. Paget, M. S., E. H.
37	M.	68	Ichthyosis	Dorsum	„	(?)	Knife	(?)	Recurrence	Yes	—		No p.-m. examination	Sir Jas. Paget, M. S., A. E.
38	M.	59	0	Right side	„	4	„	—	—	—	—		—	Sir Jas. Paget, M. S.
39	M.	45	—	Left side	„	7	„	22	Dis. glands	0	Yes		No p.-m. examination	Sir Jas. Paget, M. S., J. H.
40	F.	78	—	Right side	„	No op.	0	5	Exhaustion	—	„		No p.-m. examination	Sir Jas. Paget, M. S.
41	M	57	Supl. glossitis	Dorsum	„	(?)	Ecraseur	—	—	—	—		Well 3½ years later	Sir Jas. Paget, M. S., M.
42	M	64	—	Lt. border	„	4	Ecraseur, ½	10	Recurrence	Yes	—		No p.-m. examination	St B. Hosp., M. S., W. B.
43	M.	38	—	Right side	„	8	Galv.-cautery	8	Cellulitis *	—	Yes		No p.-m. examination	Med. T. and Gaz., i, 112, 1876.
44	M.	44	—	Left side	„	2	Ecraseur	—	—	Twice	—		—	St. B. Hosp., R. M., 1872.
45	F.	60	Burnt tongue	Lt. border	„	4	„	14	Recurrence	Yes	—		No p.-m. examination	St. B. Hosp., J. M., 1877.
46	M.	39	"Indigestion"	Rt. border	„	8	Knife	19	Hæmorrhage, &c.	„	Yes		No p.-m. examination	Bennett, "Cancerous and Cancroid Growths," p. 129, 1849.
47	M.	50	—	Left side	„	3	Ecraseur	—	—	—	„		—	Bull. de Thérap., li. 409, 1856.
48	M.	68	0	Lt. border	„	7	Ecraseur, ½	—	—	—	—		—	Gaz. d. Hôp., p. 603, 1862.
49	M.	67	0	Dorsum	„	12	Ecraseur	—	—	—	Yes		—	Deut. Klinik, s. 312, 1856.
50	M.	56	(?) Sharp tooth	Right side	„	2	Galv.-cautery	2½	Pneumonia *	—	„	0	0	Lancet, ii, 80, 1873.
51	M.	66	0	„	„	2	Ecraseur	—	—	—	—		—	Lancet, ii, 7, 1878.
52	M.	53	—	Left side	„	4	Knife	5	Dissemination	Yes	Yes	0	Heart, liver, rt. suprarenal capsule	Lancet, ii, 803, 1873.
53	M.	34	"Foul pipe"	Rt. border	„	(?) 2	„	—	—	—	—		—	Lancet, ii, 439, 1872.
54	M.	43	—	Right underside	„	5	Knife, section of jaw	—	—	„	Yes		—	Lancet, i, 803, 1873.
55	M.	46	Wound	Left side	„	3	Galv.-cautery	—	—	„	„		—	Lancet, ii, 80, 1873.
56	M.	60	—	Dorsum	„	5	„	—	—	—	—		—	Schläpfer, l. c., s. 125.
57	M.	52	—	„	(?)	(?)	Knife, section of jaw	—	—	—	—		Well 10 months later	Lancet, i, 115, 1865, and i, 87, 1866.
58	M.	44	"Smoking"	Right half	Yes	6	Knife	12	Dis. glands	0	Yes		No p.-m. examination	Thiersch, "Der Epithelialkrebs," s. 293, 1865.
59	M.	41	0	Lt. border	„	6	—	12	Pneumonia, &c.*	Yes	—	0	Only condition of lungs mentioned	Thiersch, l. c., s. 294.

* Death from causes connected with the operation.

Carcinoma of Tongue—Epithelioma—Squamous-celled Carcinoma (*continued*).

No. of case.	Sex.	Age.	Cause.	Seat.	Ulceration.	Duration to operation (in months).	Nature of operation.	Total duration (in months).	Cause of death.	Recurrence.	Affection of glands.	Affection of lungs.	Affection of other parts of body, and general remarks.	Authority.
60	M.	62	Rough tooth, &c.	Dorsum	Yes	8	Knife	8	Pneumonia *	0	—	0	Only condition of lungs mentioned	Thiersch, l. c., s. 294.
61	F.	51	—	„	„	4	„	12	Dis. glands	0	Yes	—	No p.-m. examination	Thiersch, l. c., s. 293.
62	M.	50	—	Lt. border	„	18	„	26	Recurrence	Twice	—	—	No p.-m. examination	Thiersch, l. c., s. 292.
63	M.	38	Supl. glossitis	Left side	„	3	Ecraseur	9	—	0	Yes	—	No p.-m. examination	Med.-Chir. Trans., lvii, 161, 1874.
64	M.	52	0	Dorsum	„	No op.	0	(?)	Hæmorrhage, &c.	—	„	0	0	Bull. et Mém. Soc. Chir., ii, 202, 1876.
65	F.	44	—	Right half	—	(?)	Ecraseur	—	—	Yes	„	—	—	Langenbeck's Arch., xxv, 153, 1880.
66	M.	43	Ichthyosis	Dorsum	Yes	2	„	9	Recurrence	„	„	—	No p.-m. examination	Clin. Trans., ii, 1, 1869.
67	M.	54	—	„	„	12	Knife	14	Dissemination	„	„	Yes	Right heart, liver	Virch. Arch. xxix, 165, 1864.
68	M.	48	—	Lt. border	„	4	Ecraseur, ½	8	—	0	„	—	No p.-m. examination	St. B. Hosp., E. H., 1880.
69	M.	64	Supl. glossitis	Left side	0	(?)	Galv.-cautery	(?)	—	—	„	—	No p.-m. examination	St. B. Hosp., W. C., 1880.
70	M.	29	0	Lt. border	Yes	No op.	0	18	Exhaustion	—	„	—	No p.-m. examination	St. B. Hosp., A. O., 1880.
71	M.	55	New tooth-plate	Rt. border	„	6	Ecraseur, ½	10	Unknown	0	„	—	No p.-m. examination	St. B. Hosp., H. F., 1880.
72	M.	46	Supl. glossitis	Left side	„	(?)	Ecraseur	—	—	—	„	—	—	St. B. Hosp., L. R., 1880.
73	M.	68	—	Tip	0	Short	Knife	—	—	—	—	—	—	St. B. Hosp., A. R., 1881.
74	M.	43	—	Right underside	Yes	5	Scissors	—	—	—	—	—	—	St. B. Hosp., J. McD., 1881.
75	M.	50	—	Left half	„	9	Ecraseur	9	Hæmorrhage, &c.*	—	Yes	0	0	St. B. Hosp., B. P., 1881.
76	M.	50	Supl. glossitis	Lt. dorsum	„	—	„	—	Exhaustion	Yes	„	—	No p.-m. examination	M. S., H. T. B.
77	M.	68	—	Lt. border	„	11	„	—	—	—	—	—	—	Gaz. d. Hôp., p 371, 1880.
78	M.	49	Ichthyosis	Rt. dorsum	„	6	Knife	—	—	—	—	—	—	Med. T. and Gaz., i, 871, 1880.
79	M.	52	(?) Ichthyosis	Lt. dorsum	„	2½	Scissors	—	—	0	0	—	Well, 17 months later	Whitehead's "Excision of the Tongue," 1881.
80	F.	49	—	Left side	„	8	Ligature	—	—	Yes	Yes	—	Slowly dying 7 months after operation	Med. T. and Gaz., ii, 454, 1860.

* Death from causes connected with the operation.

CHAPTER VIII.

SARCOMA AND CARCINOMA OF THE ŒSOPHAGUS.

THE almost certain expectation of being able to obtain an ample number of completed cases induced me to study the pathology of sarcoma and carcinoma of the œsophagus. But hardly less powerful was the influence produced by a perusal of Dr. Braun's account* of the brilliant success which attended an operation performed by Czerny between three and four years ago—the excision of an epithelial carcinoma of the upper portion of the tube. I am not sure whether the suggestion of such an operation emanated from Billroth, but I think I am correct in believing that Billroth was the first person to prove that it could be performed without excessive danger to the patient's life. For in 1872† he published a short statement of two cases in which a portion of the œsophagus was resected in dogs, one of which died from an accident a few days after the operation, the other lived and thrived until it was killed three or four months later. Billroth does not, however, appear to have put in practice on the human subject the experience gained from animals. This was reserved for Czerny, at whose Klinik in April, 1877, a countrywoman presented herself, fifty-one years old, poorly nourished, but otherwise in fair condition, seeking for relief. For nearly

* Czerny's 'Beiträge zur operativen Chirurgie,' S. 41, 1878.

† Langenbeck's 'Archiv,' Bd. xiii, S. 65, 1872.

five months previously she had suffered from difficulty in swallowing, but at first had thought little of it, for in 1875 a similar difficulty had existed for a while, then ceased spontaneously. But now it gradually grew worse till she could no longer swallow solid food. A soft, easily-bleeding swelling could be felt with the finger far down the pharynx, causing so great obstruction that a bougie could not be passed beyond it. No glandular enlargement was detected. On the 2nd of May Czerny cut down on the left side of the neck, as for œsophagotomy, and completely removed six centimètres of the upper end of the œsophagus. The resected portion included the whole of the disease, an epithelial ulcer which involved the tube in its entire circumference, but had not at any point penetrated the muscular coat. The stomach end of the divided œsophagus was fastened to the edges of the opening in the neck, and through it food was introduced by means of a funnel into the stomach. She recovered and left the hospital, and five months later came to report herself as "quite well and at work in the fields, able to feed herself comfortably through the funnel and tube." Indeed, so satisfied was she with her condition that she steadfastly refused the further operation which Czerny had planned for bringing together the divided ends of the œsophagus.

Only one case of sarcoma has come under my notice, that reported by Dr. Chapman in the 'American Journal of the Medical Sciences' for 1877.* A Mrs. M—, æt. 45, died some eight or nine months after the first appearance of symptoms indicative of stricture of the œsophagus. They had not differed in any way, so far as was observed, from those attending any other form of malignant stricture, but after death the walls of the inlet of the canal were

* Vol. cxlviii, p. 433.

greatly thickened and infiltrated, and perforated at one point by a small orifice which led into the interior of an oval tumour lying to the right side of the œsophagus, and having generally an alveolar build. Whether this was an enlarged gland does not seem to have been certain, but below it, and still to the right side of the œsophagus, lay another tumour, of whose glandular origin no doubt was entertained. Microscopical examination of the walls of the œsophagus where they were thickest showed that the epithelial layer was wanting, that the corium was transformed into a tissue partly of round and partly of spindle cells, and that the submucous layer was composed of a dense mass of spindle cells forming alveoli filled with large oval cells. The gland had a similar structure to the primary disease. A single case of sarcoma such as this may be regarded as a pathological curiosity, showing what nature is capable of rather than what she does of habit. Almost in the same light may be regarded all forms of carcinoma of the œsophagus except the squamous-celled (epithelioma), for by the tables it may be seen that three varieties yield only five cases, while the squamous-celled furnishes no less than fifty-four. In this preference, if it may be so called, for epithelioma the œsophagus resembles the organ last discussed (the tongue), but the exclusion of other kinds of carcinoma is not so rigidly maintained. Other points of strong resemblance may be found in the relation which these organs severally bear to malignant tumours. Thus, four-fifths of the fifty-four cases occurred in males, a proportion similar to that given by most authors who have written on this subject, and I believe quite inexplicable on any hypothesis which has been yet advanced. For example, the liability to the disease attributed to spirit drinkers here rests on the support of a

solitary case, and the coarser habits of men in eating and in swallowing can scarcely claim to exercise so powerful an effect among the humble classes from which most of these cases have been drawn. Again, no case is here recorded of a patient less than thirty years of age, and only one of a person under thirty-five. From thirty-five to seventy the disease was not uncommon, and one man was eighty-four years old. But more than a fourth of the total number of cases were of persons from fifty-five to sixty years, and half the cases belong to the period of fifty to sixty-five.

The precise seat of disease has been during many years a subject for discussion. While Morell Mackenzie* assigns nearly half his cases to the upper third, and makes the lower third the least frequently affected, Zenker and Ziemssen† think the lower third is the most common, the upper third the least common, seat of cancer, and Petri‡ finds that half his cases were of the lower third. I hoped I might be able, from the cases in these tables, to cast some weight into the scale on one or the other side, but find I cannot do so; for, although undoubtedly in by far the larger number of instances the disease occurred in the upper than in the middle or lower thirds, the point of junction of the middle and lower thirds was three times more often attacked than that between the two upper thirds, so that, if the canal be divided into halves instead of thirds, the number of cases affecting each half is very nearly equal. It is possible, as Mackenzie has suggested, that the German writers have excluded from their consideration those cases in which the disease was of the lowest

* 'Medical Times and Gazette,' 1876, vol. i, p. 649.

† 'Ziemssen's Handbuch,' vii, Heft. 1, S. 168, 1874-77.

‡ 'Ueber 44 im Pathologischen Institut zur Berlin in der Zeit von 1859 bis zum März 1868 vorgekommene Fälle von Krebs der Speiseröhre.' Berlin, 1868.

portion of the pharynx and the upper portion of the œsophagus, but this limitation appears scarcely to be necessary. The narrowing at the inlet and outlet of the œsophagus and that produced by the crossing of the left bronchus do not appear to exercise a large influence on the seat of the disease. Certainly the cases in which the cardia or middle of the tube were affected are not very numerous. At the same time it must not be forgotten that in a certain proportion of the cases it is not easy to decide where the disease actually commenced, for no kind of examination with which we have thus far been familiar* has enabled us to distinguish more than the presence or degree of obstruction which exists, and the obstruction generally corresponds with the limit of the disease rather than with the point where it began. The extensive disease often found after death, occupying a wide area of the œsophageal wall, affords scarcely more than a clue to the precise seat of origin, which can hardly with safety be assumed to correspond with the centre of the diseased area, or even with its most deeply ulcerated part.

Ulceration is so frequent that its presence is noted in forty-nine of the fifty-four cases. Its characters are not more constant than those of epithelial ulceration elsewhere, but generally a raised sinuous or wavy border, sometimes everted, sometimes overhanging, and an uneven, ragged, or flocculent surface prevail. The induration so characteristic of epithelial ulceration of other parts is also, I think, always present. In some instances a more definite tumour is observed, and the ulceration may rather be described as breaking down of this. As it is impossible to speak with certainty of the precise seat, so in the large

* I cannot yet say what the œsophagoscope and gastroscope may enable us to do.

majority of cases it is impossible to be sure of the manner in which the disease begins. From analogy it may be assumed that it commences as a plaque, or lump, or ulcer, or a fissure, as it is seen to do in other parts, and spreads both widely and deeply in various directions. But the facts at my disposal are not sufficient to warrant a more detailed description of its origin and course. On this account I have been the more struck by the clear description given by Zenker and Ziemssen,* whose facilities for observation do not appear to have been greater than my own. These authors tell of how the disease begins sometimes in an island shape, sometimes in the form of a girdle, and of how the island shape generally by-and-by becomes a girdle. They tell also of how the smaller island-forms do not give rise to symptoms, because no stricture is associated with them, but they do not tell, what would have been of some interest to hear, of how this knowledge was obtained. In at least half the cases in our table the description either intimates or tells directly of ulceration completely encircling the canal, but only rarely in a simple girdle shape, for often the disease was widely spread above or below the point at which it occupied the whole circumference. Seven times the anterior or posterior wall was the seat of an ulcerated area. In the remainder of the cases the account of the general characters presented by the disease is not sufficiently clear to admit of more than a very uncertain inference respecting them, as when, for example, a ragged ulcer is said to have occupied the upper or lower third of the œsophagus. Certainly sometimes small plaques or islands have been found in close proximity with the principal area of disease, or scattered more numerously and widely beyond it. But these are almost

* L. c.

universally regarded as of secondary origin, and Zenker and Ziemssen have spoken of them as due to dissemination of the primary disease, probably by the conveyance of cells capable of proliferation through the sap streams, or by reason of their own amœboid movements.

The disease seldom remains limited to the walls of the œsophagus, but infiltrates the surrounding structures—the trachea, bronchi, lungs, and arteries—or spreads into the connective tissue of the neck or mediastinum. Only in seven instances was it limited to the œsophagus, and in the most prolonged of these cases in which the duration of the disease is noted the symptoms had endured only for four months. The trachea is more often grown into than any other structure, the lungs more often than the bronchi, and, for some reason, not easily explained, the right lung much more often than the left. The aorta, although it lies close to the œsophagus along a great portion of its course, is comparatively seldom affected—only four times in the entire series of cases, an exemption probably explained by the yielding of its calibre and the resisting nature of its coats. In most instances the affection of the surrounding parts is not merely an incorporation of them in the gradually extending growth, but the ulceration belonging to the primary disease widens or deepens as the disease advances, and plays an important part in its later progress. Thus, ragged openings are formed in the bronchi or trachea, and every act of swallowing or attempt to swallow is attended with a violent fit of coughing or attack of suffocation; or the aorta or another vessel is opened, and death from hæmorrhage ensues; and even growth into the lung or the connective tissue often produces extensive suppuration. In the growing mass or suppurating cavity connected with its growth other important structures are not

infrequently involved, as the recurrent laryngeal and pneumogastric nerves, leading in the one case to hoarseness or loss of voice, and in both cases indirectly to various affections of the lungs.

From one or other of these causes the course of the disease is often greatly shortened, so that they who died of inanition furnish scarcely so many as half the fatal cases. In this manner five died of hæmorrhage, five of suffocation, and ten of various diseases of the lungs. Some of these, it is true, had already far outlived many of those who died of inanition, which proved fatal in some instances within three, or at the most four, months after the symptoms first attracted notice. The longest duration in any case was sixteen months, and only one patient lived so long as this. Of thirty-nine cases in which the total duration is noted twenty-one died before six months had elapsed, and only seven lived up to or beyond the period of a year. The exact cause of death from inanition, as it is commonly termed, is not always at once apparent. It is not merely that the power of swallowing solids is destroyed and difficulty is experienced in taking even fluid food, for persons suffering from simple stricture of the œsophagus so tight that fluids will not easily pass through, yet live for many years, nor is the pain or distress occasioned by the ulceration alone sufficient to account for death. The inanition is, I doubt not, rather exhaustion due to a combination of these and other causes—hunger, pain, cough, and the like. Among the less common of these causes may be mentioned tubercle, neither of frequent occurrence nor generally affecting any organ save the lungs, but still, in those cases in which it does occur, undoubtedly hastening on the fatal issue.

The microscopical characters of œsophageal epithelioma correspond with those of epithelioma of other parts, and its

derivation from the epithelial lining of the œsophagus appears quite certain. The steps by which the latter is effected have been described by Carmalt in 'Virchow's Archives,'* who found, in each of three cases which he examined for the purpose, that the elements of the carcinoma could be traced directly to their connection with the epidermis, generally with the deeper layer. The cells of which the tumour is composed resemble, too, the younger cells of squamous epithelium, and the cell-nests or epidermic globes so characteristic of the disease are almost always present (Plate IV, fig. 5). I have observed a similar disposition of the epithelial processes to that described in epithelioma of the skin and tongue—a disposition calling to mind new growth in previously existing channels—but I am not so sure of its universal occurrence here as in the tongue, for my opportunities of investigation have been far fewer (Plate IV, fig. 4).

The lymphatic glands were obviously diseased in twenty-nine of the fifty-four cases, or rather the fact of their disease is mentioned in twenty-nine cases; and, although this may seem a large proportion, I am so little contented with it that I have carefully analysed the remaining twenty-five cases to discover, if possible, what singular cause prevailed to preserve the glands from affection by a disease which evidently has ready access to the lymphatic vessels. But before entering on this question it may be well to refer to an important paper in 'Langenbeck's Archives'† which bears upon the subject. From an epithelioma occupying the upper part of the œsophagus and involving the entire circumference of the tube, Gussenbauer, the author of this paper, found a slightly indurated cord, three inches and a half long, extending down to a bronchial gland between

* Band lv, S. 481, 1872. † Band xiv, S. 561, 1872.

the trachea and œsophagus. The gland was of ordinary size and looked like a normal organ, but it was more resistant than its fellow glands. It was subjected to careful microscopical examination, and sections were made of the indurated cord the whole way down from where it left the epithelioma to where it joined the gland. The structure of epithelial carcinoma was evident throughout. But, contrary to what might have been expected, the lymphatics were not the channel through which the affection was conveyed. Indeed, Gussenbauer was not certain whether they took any part in the morbid process; and if they did so, it was only by the transformation of the cellular elements of their walls, for their tubes remained pervious and unchanged. The blood-vessels, on the contrary, were filled with clotted blood, and the cells forming their walls, including even the muscular fibres, were transformed into cancer cells; the cellular structures of the adjacent connective tissue were altered in like manner; and thus strings and groups of cancer cells were formed. In the substance of the gland corresponding changes were observed; the cells of the walls of the blood-vessels and of the connective tissue were the elements in which changes were most manifest, the lymph corpuscles appeared also in some parts to be transformed into cancer cells, while the lymph path remained free from cancerous change, at least till all the other structures were affected. No other gland than this was implicated, and the organs were free from secondary disease. It would be easy to pass over this account as unworthy of credence, because the changes described in it have not been yet confirmed by other observers, but I am unwilling to do this, because it is, so far as I am aware, the only instance in which a microscopical examination has been made in so methodical a manner of the tissues between a primary

cancer and an affected gland. It has, of course, long been known that the cancerous elements cannot in many cases be discovered in the lymphatic vessels even when obvious affection of the glands exists, and it has not been regarded as necessary on theory that the disease should be traced within the connecting channels. But, whenever decided induration has been noticed along what was believed to be the course of these channels, it has almost naturally been assumed that the lymphatic vessels were plugged or filled with the elements of cancer. Indeed, in some instances* long lines or cords of plugged lymphatic vessels, or what were taken for lymphatic vessels, have been dissected out.† In this case, however, Gussenbauer found the lymphatics free and almost every other tissue involved in the disease, and he therefore thought that an important modification of our views respecting the epithelial origin of carcinoma and the manner of its extension may be necessary. Let us admit that the observations here recorded are correct, and that the disease in this instance reached a lymphatic gland by a particular route and in the manner described, it does not follow that this is to be regarded as the ordinary route and manner or this case is to be regarded as any other than an extraordinary case. Even here, all that is necessary is to assume, what has been long ago assumed, that cells which are not epithelial may, under certain conditions, when in contact with morbidly-affected epithelial cells, become affected by similar morbid changes, and be capable of transmitting such changes to those cells which lie in contact with them or are derived from them; in other words, an epithelial contagion.‡ Why the disease

* 'Path. Trans.,' vol. vi, p. 183.

† 'Med.-Chirurgical Trans.,' vol. xxxviii, p. 247, 1855.

‡ I am not at all inclined to accept this theory of "epithelial contagion."

in this particular instance should have chosen so devious a course is certainly most difficult to understand, but not more difficult than many other unsolved problems in connection with malignant growths. The feature of the case which interests me chiefly is the mere accident which led to the discovery of glandular disease; for the finding of the indurated cord drew Gussenbauer's attention to the increased resistance of the bronchial gland, and the gland, examined microscopically, proved to be epitheliomatous. This is the feature I desire to make most prominent, for it may help to explain the number of cases in which no mention is made of the condition of the glands. Unless they are of considerable size, and thus obtrude themselves on the attention of the observer, they are liable to be overlooked. As an example of this, an epithelioma of the œsophagus was shown me not long ago by a surgeon who had made the post-mortem examination of a patient who had died from exhaustion engendered by the disease. It was said that the lymphatic glands were not affected. But when we came to dissect carefully the loose tissues still adhering to the diseased parts and lower portion of the tube, we discovered two glands enlarged to double their natural size, much firmer than the normal glands, and white and opaque on section. Both proved to be the seat of secondary epithelioma. The twenty-five cases in which glandular disease is not recorded are thus made up :—Eleven in which no report is made of their condition, either from want of due care in examining or recording, or from lack of permission to perform a sufficiently complete autopsy, or from some similar cause; seven in which uncertainty prevailed whether the glands were really affected or not, sometimes because no microscopical examination was made, sometimes because the surgeon was not sure whether

isolated or connected masses met with beyond the primary disease were altered glands; and seven cases in which a definite statement exists that the glands were normal, or that no secondary disease was present. These are the cases which claim our most serious consideration. They are Nos. 3, 8, 28, 29, 41, 42, and 48. No. 3, a coachman, of temperate habits, died, worn out by the disease, three months after the symptoms first were noticed. The ulcer, measuring an inch across, was everywhere limited to the walls of the œsophagus, except at one point, where it had become adherent to the lung. No. 8 died from suffocation when it was not certain whether the symptoms were only of a few weeks' or of several months' duration, and all details of the case are very scanty, No. 28 is the case already related more fully, in which resection of the disease was so happily effected. On No. 29 gastrotomy was practised when the carcinoma was believed to have been in existence between two and three months, and thirty-two hours after the operation the patient died. No. 41 is in some respects the most important of the seven, for the duration (six months) is the longest recorded in any case in which the glands were not affected. The case is published in the 'Pathological Transactions' by Dr. Balding. The patient died from hæmorrhage from an opening in the right subclavian artery, due to the extension of an ulcer, an inch and a half long, completely encircling the œsophagus an inch and a half from its upper end. The margins of the ulcer were very irregular, in some places elevated and indurated, and the suface was ragged and more than half covered with slough. Dr. Balding stated that no secondary affection was present; and partly on this account, partly on account of the uncertain characters of the ulcer, grave doubts were entertained whether the disease was in reality malignant.

The specimen was referred to the Morbid Growths Committee, which decided that there was no evidence to prove its cancerous nature; but, dissatisfaction having been expressed with this report, it was referred to another section of the same committee, which, as a higher court, reversed the first decision, and said the disease was epithelioma, giving as the grounds on which this finding was obtained that every part of the ulcer contained epithelial cells, blood cells, and laminated capsules (cell-nests). I might well have omitted this case as one the pathology of which is not clear, and have assigned as a reason to myself for doing so that one of the names appended to the first report was that of the present distinguished President of the Pathological Society,* but the evidence furnished in the second report is to my mind overwhelming, and I accept it as a case of squamous-celled carcinoma (epithelioma) in which affection of the glands was overlooked, or had not yet occurred. And this solution I prefer to that suggested by Zenker and Ziemssen,† that in similar cases the lymphatics from the affected portion of the œsophagus open directly into the thoracic duct without previously passing through lymphatic glands. The duration of No. 42 was only two months and about two weeks; and No. 48 died about four months after the symptoms first declared themselves. Thus, with the exception of No. 41, none of these patients lived longer than four months after the outbreak of the disease, and even No. 41, at the end of six months, was carried off by the accident of an attack of hæmorrhage. That affection of the glands may be delayed for a period nearly as long as this is proved in the case of recovery after resection, where the primary epithelioma had existed for about five months; and I have already men-

* 1881. † Loc. cit.

tioned a case in which, at the end of nine months, the glands were so little enlarged that they failed at the post-mortem examination to attract attention. That affection of the glands, on the other hand, may sometimes commence much earlier than this, cannot be doubted. For in six of the cases in which the glands are reported as enlarged, the duration of disease was, in each case, less than four months. In nearly all the remaining cases it was six or more months. Here, then, as in the malignant affections of other parts, the number of glands affected, and the degree of their enlargement, depend not simply on the duration of the disease, but are evidently liable to be modified by various influences. The affected glands are generally those which lie in the neighbourhood of the primary disease, yet sometimes it happens, as in Gussenbauer's case, that glands lying at a distance almost remote from the epithelial ulcer of the œsophagus are first or solely affected.

Dissemination of the disease is, I think, clearly shown to be of rare occurrence, for there are only five cases in which it is recorded. But there is a kind of dissemination not so uncommon and not so easily accounted for—a condition in which numerous nodules, generally very tiny, are found in the mucous or submucous tissue of the œsophagus. In at least eight of the cases these nodules or tubercles are described, sometimes lying in the tube above the primary disease, sometimes below it, and, though never widely separated from the primary disease, often spreading over a wide area of the œsophagus. Thus, in one instance they covered the epiglottis and back of the tongue, and in another extended several inches down the œsophagus until they reached the stomach. They appeared in every case to be of the same nature as the primary disease, and once certainly, where many of them existed in the submucous

tissue along the entire length of the œsophagus, and were examined with the microscope by Robin and Buquoy,* they were found to be distinctly epitheliomatous. It has been suggested that they are secondary growths, the germs of which are carried by the blood- or lymphatic-vessels situated in the substance of the œsophageal walls. But I am not aware of any system of lymphatic vessels disposed thus longitudinally along the œsophagus from end to end, and the evidence is not in favour of the theory of transmission through the blood-vessels; nor do I think it likely that they are due to separate outbreaks of primary disease. It seems more probable that they are the result of continuous extension of the primary disease beneath the mucous membrane, not in a thin and widely extended layer, but rather in the form of fine cords or lines, which here and there break forth in more exuberant growth. Setting these cases aside as of doubtful import, and excluding one case in which the tongue was the seat of a simultaneous outbreak of epithelioma, and another in which the thyroid body was affected, probably by continuous extension of disease, there remain but five cases of general dissemination, namely, Nos. 2, 12, 18, 34, and 42. First, it will be noticed that in four of these five cases the lungs were the seat of secondary growths. Indeed, in another instance (Case 5) some tubercles of doubtful nature were observed in the apex of the left lung; but, as they were surrounded by hepatised lung, and were not proved by microscopical examination to be epitheliomatous, it will be safer to omit this case. It will scarcely excite surprise that the lungs, where the blood returning from the primary disease first meets with capillary vessels, should be so frequently affected, and yet I am disposed to think that this is not the

* 'Bull. Soc. Anat.,' 1855, p. 280.

true explanation of their affection. First, because in one of the four cases (No. 42), recorded by Moxon, the appearances presented led to the belief that the disease was conveyed through the trachea and bronchi rather than by the blood. An epithelioma projected from the œsophagus through the wall of the trachea in the form of many low elevations, apparently not yet broken down, and the lower lobe of each lung was the seat of several small growths situated, not as usual towards the surface, but deep down in the substance of the lung, where a small bronchus could be traced to each, and each appeared to occupy the centre of a lobule. Dr. Moxon therefore thought the germs or cells or tiny masses from which these growths arose had been carried through the bronchi by the inspired air. Second, in two other of the cases (Nos. 2 and 12), the right lung only was the seat of secondary pulmonary growths, which in one of them consisted of a single nodule, in the other of several nodules situated in the lower lobe, and in both cases the trachea was perforated by the primary epithelioma. Affection of a single lung, and that the right lung, is quite consistent with the theory of conveyance by the air, almost inexplicable on the theory of conveyance by the blood. There remains, then, only No. 34, in which there appears no special reason to suppose conveyance by the air, for the trachea was not perforated and both lungs were secondarily affected. In this case the extensive disease of the œsophagus, destroying more than three inches of its length, had extended into the pericardium, the left auricle, and part of the left lung. These points in connection with affection of the lungs assume the greater importance, because they tend to show how little disposed these organs are to favour the growth of epithelioma derived from the œsophagus, and how they will not even

permit it unless under some singularly favouring conditions. With the blood-vessels always prepared, and the trachea or bronchi grown into in half the cases, there are yet only four instances of pulmonary growths, and in three of the four it seems more than probable that the affection was conveyed through the air passages.

Again, it will be observed that, with the exception of one case, these four are the only cases in which any other organ than the lungs was secondarily affected. And further, that, in three of the four, other organs besides the lungs were the seat of secondary growths. Thus, in No. 2, in addition to the solitary growth in the right lung, there existed a single tubercle in the left kidney, said to have been "composed of elements resembling the other cancerous structures." In No. 12 a musculus papillaris of the right ventricle contained a knotty growth; in the substance and on the upper surface of the liver were many cancer masses, and similar growths were found in the lesser omentum, the mesentery, and on the anterior aspect of the stomach. In No. 34 the head of the pancreas, the adjoining surface and parts of the substance of the liver, the suprarenal capsules, and the stomach near the œsophageal opening, were all the seat of secondary growths. Well might one wish for ten times as many cases from which to solve more readily the problems raised by a knowledge of these few facts. Is it not probable that the lungs are more easily affected through the air passages than through the blood-vessels because larger fragments of the primary disease are conveyed into them through the former? May we infer that, though the lungs are unwilling to become the foster-parents of œsophageal epithelioma, some other organs of the body, notably the liver, gladly accept the burden whenever an opportunity is afforded them of obtaining the necessary materials?

Or, are we to believe that these patients possessed the cancerous disposition in so strong a measure that the disease readily took root and grew in various organs? In the case in which the lungs were free and the liver and kidneys were affected (No. 18), the primary epithelioma occupied the œsophagus immediately above its cardiac orifice, and behind the cardia lay a large mass of cancerous glands adherent to the stomach and left lobe of the liver. Several of the abdominal glands were affected, and ample opportunities thus were given for the spread of the disease. Petri* pointed out in 1868 that probably, in those cases in which the liver alone is affected, the disease is conveyed through the radicles of the portal system, for in the four cases in which he had noted this condition the primary tumour was, in every instance, seated extremely low down in the œsophagus. The general conclusions drawn by Petri from a study of forty-four cases of cancer of the œsophagus have received so much attention from other authors that I feel almost as if my duty were to apologise for having taken so little notice of them. Believing in the importance of his monograph, I took pains to obtain and read it, and was greatly surprised to find that no definite statement is made that the growths were microscopically examined, that the general account of the post-mortem examination is frequently wanting, that some of the "cases" appear to be no more than descriptions of specimens preserved in spirit, and lastly, that the histories are not recorded. Yet the conclusions are stated as though they were deduced from a series of complete cases.

Of other varieties of carcinoma there are only five instances, but all apparently well authenticated, and therefore sufficient to disprove the statements of certain of the German pathologists,† that only one kind of carcinoma affects the

* Loc. cit. † Zenker and Ziemssen, Petri.

œsophagus. I have included the first four of them under the heading *spheroidal-celled* carcinoma. Three of these are described in their respective reports as hard cancer, the fourth as soft carcinoma. The hard cancers are said to have presented a well-marked alveolar structure, and in one of them the mucous glands were thought to be the point of departure of the disease. The duration of the third case is not known, for the patient was too weak to communicate the history of his illness during the two days he was an inmate of the hospital before his death; but the duration in each of the first two cases was much longer than in the most prolonged of the cases of epithelioma. Even at the end of two years the second case does not seem to have completed its course, for neither the glands nor any of the organs were the seat of secondary growths. And in the first case, although the disease was believed, on what appear to be sufficient grounds, to have existed for upwards of three years, only a few small nodules were found in the lungs and one small tumour in the liver, while the condition of the glands is not recorded.

The soft carcinoma (No. 4) pursued a very similar course to that of many of the epitheliomas, and caused death by inanition within nine months. The tumour formed a mass about one inch and a half long, and grew beyond the trachea into the structures about the arch of the aorta. Dr. Joseph Coats, of Glasgow, made the microscopical examination, both of the primary disease and of the enlarged glands at the cardiac end of the lesser curve of the stomach. The structure was the same in all parts, the structure "of medullary cancer and not of the epithelial form which is usual in the œsophagus."

The case of colloid cancer rests on the authority of Dr. Bristowe and the Morbid Growths Committee of the Patho-

logical Society, in the nineteenth volume of whose 'Transactions' it is described at length. It presented the general characters of colloid cancer in its honey-combed or alveolar structure containing a viscid mucus or jelly-like material. The entire thickness of the lower half of the œsophageal wall was affected and the cardiac orifice of the stomach had not escaped. In the upper half of the œsophagus were several apparently isolated patches of a similar growth. Many glands, both in the chest and the abdomen, were extensively diseased, and to some of them the lymphatic vessels, enlarged and filled with the same colloid material, could be traced. Uncertainty prevailed respecting the condition of the lungs, the surfaces of which were mapped out by ramifying vessels, probably lymphatic, containing a white material, and here and there were large white areas of irregular shape connected closely with this network. A similar disposition existed around the main bronchi and pulmonary vessels, and was prolonged upon their ramifications through the whole substance of the lungs, but no definite tumours were present. We are reminded in this description of the account given by Moore* of the flow back of cancerous material within the lymphatic tubes when the course of the lymph has been obstructed. And since the bronchial glands are said to have been extensively diseased, it appears not improbable that such is the explanation of the condition of the lungs. Of the precise nature of the disease it is difficult to form a just conclusion, but there can be little doubt it deserved the name of colloid cancer as certainly as any specimen of colloid cancer ever does.

In the diagnosis and treatment of malignant disease of the œsophagus it is not necessary to separate the different varieties of carcinoma. It is only necessary to remember

* 'St Bartholomew's Hospital Reports,' vol. iii, Art. 5.

that the duration of speroidal-celled carcinoma may be two or three times as long as that of squamous-celled carcinoma, and to beware, therefore, of too hastily deciding that a stricture is not malignant because the symptoms have extended over a longer period than usual. The earliest and chief symptoms of carcinoma are those of obstruction to the passage of food. In some cases the obstruction is so slight that it merely produces a little pain during swallowing, or the patient complains of "feeling the food passing down the tube." In other and more numerous cases difficulty is gradually experienced in taking solid food, but fluids are still swallowed easily. In the course of a few weeks, however, even fluids cannot be swallowed without difficulty. With the dysphagia there is often associated vomiting, sometimes only of food which has been taken a short time previously and which had lain perhaps for an hour or more immediately above the stricture, sometimes of large quantities of viscid and frothy fluid, which is occasionally tinged with blood. The symptoms are usually developed rapidly, and emaciation is of early and rapid occurrence. In a few very rare instances the onset of the symptoms has been quite sudden, and the patient has been apparently in the enjoyment of sound health when he has suddenly found it impossible to swallow a fragment of solid food; from that time the taking of solid food has been no longer possible.* In the later stages of the disease dyspnœa and cough are not uncommon, and if the carcinoma has opened into the trachea or a bronchus violent cough and threatened suffocation may attend the swallowing of food.

Symptoms such as these, occurring in a man between fifty and sixty years of age, are almost certainly due to a

* 'Lancet,' 1881, vol. i, April.

malignant stricture, unless indeed there be a clear history of some traumatic cause of stricture, such, for instance, as the swallowing of corrosive liquid. It has already been pointed out that the disease is not common in women, and that it does not occur in either sex before the age of thirty or thirty-five years. It is not therefore likely frequently to be mistaken for spasmodic stricture, which occurs most often in females before the age of forty.

As a rule no tumour can be seen, or felt by palpation in the neck, but sometimes the deep cervical glands or those above the clavicle are distinctly enlarged and hard.

Although palpation is rarely serviceable, auscultation is often very valuable as an auxiliary to diagnosis. An indistinct grating sound is heard during the swallowing of liquids when the stethoscope is applied below the stricture. And when the disease is more advanced this grating is replaced by a confused and prolonged bubbling sound.* If a bougie be passed a stricture can of course without difficulty be detected; and if a bougie with a depression near its end be employed, some of the material of which the stricture is composed may be obtained for examination. A microscopical examination of this material or of that which has been brought up by vomiting will often decide at once the nature of the disease, if it be epithelioma. For not only is the character of the cells distinctive, but cell-nests may be discovered in the ejecta.

A very valuable sign of carcinoma is paralysis of one, or of both, of the vocal cords, for it is frequently present in cases of malignant stricture, rarely, if ever, in connection with other forms of stricture. This symptom, which depends upon entanglement of one or both of the recurrent

* Hamburger, 'Klinik d. Œsophaguskrankheiten,' Erlangen, 1871. Morell Mackenzie, 'Med. Times and Gaz.,' 1876, vol. i and vol. ii.

laryngeal nerves, is therefore only associated with strictures of the upper half of the œsophagus. It may be delayed till the disease is far advanced or may occur as a tolerably early sign. Strictures situated very high up in the œsophagus may occasionally be seen with the laryngoscopic mirror, or, as in Czerny's case, may be reached and felt with the finger through the mouth.

The œsophagoscope of Mackenzie* and the gastroscope of Mikuliczt have been in use so short a time that it is not easy to speak decidedly of their merits.

It will be seen that the only case in which a cure of the disease was effected was that which is described in the beginning of this chapter. Even here the cure cannot be regarded as complete, for the history only extends over five months after the performance of the operation. Nevertheless the relief afforded by resection appears to have been so great that there can be no question that resection should be performed whenever a suitable case presents itself. Unfortunately suitable cases are probably very rare. For, first, the disease should not be situated lower down in the œsophagus than a point which lies immediately beyond reach of the finger, in other words, its upper fourth or fifth. Second, the disease should not have spread through the wall of the œsophagus into the surrounding structures. Third, the glands must not be affected by the disease. A glance at the tables will show how very seldom these three conditions are combined even in cases in which the symptoms of disease have only existed for three or four months. Only one third of the total number of cases were of the upper third of the œsophagus, and so rapid is the spread of the disease that unless operation had been performed within two, or at the

* 'Lancet' and 'British Med. Journal,' 1881.

† 'Centralblatt f. Chirurgie,' Oct. 29, 1881.

most three, months of the first appearance of the symptoms, it could scarcely have been performed in any case with a fair prospect of success. In one instance (No. 17) resection was attempted when the symptoms had endured eight months. But the structures surrounding the œsophagus, including the thyroid, were involved, and a large mass of glands existed in the region above the clavicle. The operation, therefore, was abandoned and four days later the patient died.

Other than resection, no operation holds out the least likelihood of cure. The treatment therefore is, in the very large majority of instances, purely palliative. And since the most acute distress is caused by the difficulty of swallowing, the palliative measures are for the most part directed to the relief of this dysphagia. I am afraid in most cases the passage and retention of a catheter is the best means which can be adopted, for attempts to dilate the stricture are seldom successful and are always very dangerous and painful. When the dysphagia has become very great, a long gum-elastic catheter should be introduced and its upper end allowed to protrude from the mouth. Through this, by means of a funnel, food may be introduced into the stomach, and thus the worst pangs of hunger and much pain may be prevented. The catheter will require to be changed at least once a week, and probably more often. The change may generally be effected without difficulty, but the first introduction is not infrequently so difficult that it cannot be accomplished without an anæsthetic. It is scarcely necessary to observe that, whether an anæsthetic be employed or not, the catheter should be warmed and softened and should be used with the greatest caution, for the floor of a malignant ulcer

is liable to be ruptured by a very moderate degree of force.

Œsophagotomy, which would afford a more direct and larger access to the stomach, is very seldom applicable to cases of malignant stricture of the œsophagus. For the disease, even when it attacks the upper portion of the tube, almost always extends too low to allow an opening to be made below it. It was performed only in three of the cases in the tables, and each one of the three died within two days of the operation.

Nor does gastrotomy at present offer a much better prospect of relief, except by the almost certain hope which it affords of a quickly fatal issue. Only two cases are recorded here, and in both death followed within two days. Gastrotomy has been several times successfully performed for innocent stricture, but has been peculiarly fatal in cases of malignant stricture, owing probably in great measure to the exhausted and emaciated condition of the patients before they were submitted to operation. I have not myself performed either œsophagotomy or gastrotomy for cancer of the œsophagus, but have seen both operations performed for cases which are not included in these tables. The operator was forced to abandon the attempt to open the œsophagus, for, although the disease was of the highest portion of the œsophagus, it extended down the tube too far to allow an opening to be made.

The patient whose stomach was opened lived for several days, then died of exhaustion and a low form of peritonitis.

No. of case.	Sex.	Age.	Seat.	Ulceration.	Affection of surrounding parts.	Total duration (in months).	Cause of death.	Affection of glands.	Affection of lungs.	Affection of other parts of body, and general remarks.	Authority.
SQUAMOUS-CELLED-EPITHELIOMA.											
1	M.	40	2/3—3/3	Yes	Connective tissues	12	Gangrene of lung, &c.	Yes	0	0 (Tubercle of lungs)	Deininger's "Epithelialkrebs im Œsophagus," 1860.
2	F.	38	Middle	„	Perf. trachea	7	Inanition	„	R.	Left kidney	Habershon's "Diseases of the Abdomen," 3rd ed., p. 95, 1878.
3	M.	57	Cardia	„	Right lung	3	„	0	0	0	Habershon, l. c., p. 96.
4	M.	47	1/3	„	Perf. trachea	—	Operation, gastrotomy	Yes	0	0	Habershon, l. c., p. 102.
5	M.	50	1/2	„	„	8	Pneumonia, &c.	„	(?)	0	Habershon, l. c., p. 97.
6	M.	44	1/2	„	„	(?)	Operation, œsophagotomy	„	0	0	Langenbeck's Arch., xiv, s. 562, 1872.
7	M.	45	1/2	„	Connective tissues	(? 3)	Gangrene of lung	„	0	0	Habershon, l. c., p. 90.
8	M.	64	Cardia	0	0	(?)	Suffocation	0	0	0	Path. Trans, xxiii, p 115, 1872.
9	M.	52	1/3	Yes	Perf. trachea	4	„	Yes	0	0	Bull. Soc. Anat., p. 296, 1861.
10	M.	59	3/3	„	0	4	Inanition	„	0	0	Bull. Soc. Anat., p. 42, 1863.
11	M.	52	3/3	„	Aorta torn	Many	Hæmorrhage	(?)	0	0	Bull. Soc. Anat., p. 299, 1861.
12	M.	38	1/3	„	Perf. trachea	6	Pneumonia, &c.	Yes	R.	Right ventricle, liver, mesentery	Virch. Arch., 29, s. 168, 1864.
13	M.	72	Middle	„	0	—	—	„	0	0	Jena. Ztschft., v, s. 169, 1870.
14	M.	59	„	„	Perf. trachea, &c.	—	Inanition	„	0	0	Jena. Ztschft, v, s. 168, 1870.
15	M.	55	1/2	„	„	8	Gangrene of lung	—	—	—	Boston M. and S. Journ., xcv, p. 630, 1876.
16	M.	40	2/3—3/3	„	Aorta, right lung	7	„	—	—	—	Deut. Med. Wochscft., v, s. 153, 1879
17	M.	42	1/3	„	Thyroid body, &c.	9	Inanition	Yes	0	0	Deut. Ztschft. f. Chir., vii, s. 379, 1877.
18	F.	55	3/3	„	Right pleura	6	Pleurisy	„	0	Liver and kidneys	Glasgow Med. Journ., 2nd ser., iv, p. 264, 1872.
19	M.	60	2/3—3/3	„	Trachea, &c.	6	Inanition	—	0	0 (Tubercles of lungs)	Bull. Soc. Anat., p. 190, 1871.
20	M.	46	Middle	„	Left bronchus, &c.	5	„	Yes	0	0	Bull. Soc. Anat., p. 73, 1873.
21	M.	56	1/3	„	Trachea, &c.	Short	„	„	0	Thyroid (? epitheliomatous)	Bull. Soc. Anat., p. 451, 1873.
22	M.	64	1/3—2/3	(?)	Right lung	4	„	—	0	Partial post-mortem examination	Bull. Soc. Anat., p. 225, 1873.

Carcinoma of the Œsophagus (*continued*).

No. of case.	Sex.	Age.	Seat.	Ulceration.	Affection of surrounding parts.	Total duration (in months).	Cause of death.	Affection of glands.	Affection of lungs.	Affection of other parts of body, and general remarks.	Authority.
23	M.	40	1/3	Yes	—	12	Inanition	Probably	0	0	Wiener Med. Wochensft., xxiii, s. 773, 1873.
24	M.	56	Middle	,,	Aorta, &c.	8	,,	Yes	0	0	Arch. d. Heilkunde, xvi, s. 282, 1875.
25	M.	84	,,	,,	Lung	(?)	,,	,,	—	— Old stricture at cardia	Guy's Hosp. Rep., s. 3, xvii, 414, 1872.
26	M.	40	1/3	,,	Perf. trachea	13	Abscess of lung, &c.	—	—	—	Dublin Journ. Med. Sci., lxii, p. 70, 1876.
27	F.	42	2/3—3/3	,,	Perf. trachea, &c.	5	Hæmorrhage	Yes	0	0	Bull. Soc. Anat., p. 280, 1855.
28	F.	51	1/3	,,	0	—	—	0	—	Resection of the disease successful	Czerny's "Beiträge zur Opn. Chirurgie," s. 41, 1878.
29	M.	57	2/3—3/3	,,	Perf. right bronchus	3	Operation, gastrotomy	0	0	0	London Hosp. Rep., iii, p. 218, 1866.
30	M.	60	Middle	,,	Trachea, &c.	7	Suffocation	(?)	0	0	Bull. Soc. Anat., p. 431, 1878.
31	M.	59	1/3	0	0	3	Inanition	Yes	0	0	Bull. Soc. Anat., p. 419, 1874.
32	M.	40	2/3—3/3	Yes	Aorta, rt. pleura, &c	6	Suffocation	(?)	0	0	Bull. Soc. Anat., p. 411, 1876.
33	M.	56	2/3—3/3	,,	Perf. trachea	9	Inanition	—	0	—	D. Arch. f. Clin. Med., xviii, s. 496, 1876.
34	F.	63	Middle	,,	Right lung, pericardium, left auricle	16	Gangrene of lung	Yes	Yes	Stomach, pancreas, liver, suprarenal capsules	Habershon, l. c., p. 92.
35	F.	—	Cardia	,,	Connective tissue	8	Pneumonia, &c.	,,	0	0	Virch. Arch., xx, s. 142, 1861.
36	F.	44	1/3	,,	,,	5	Inanition	,,	0	0	Path. Trans., vi, p. 183, 1855.
37	M.	70	Cardia	,,	—	12	Pleurisy, &c.	Probably	0	0	Path. Trans., vii, p. 188, 1856.
38	M.	61	2/3—3/3	,,	0	4	Inanition	Yes	0	0	Path. Trans., x, p. 142, 1859.
39	F.	49	1/3	,,	Perf. trachea	7	—	—	—	—	Path. Trans., x, p. 130, 1859.
40	M.	51	Middle	,,	Perf. trachea and 1st intercostal artery	Several	Hæmorrhage	—	—	—	Path. Trans., ix, p. 202, 1858.
41	M.	65	1/3	,,	Perf. rt. subclavian artery	6	,,	0	0	0	Path. Trans., ix, p. 194, 1858.
42	M.	48	1/3—2/3	,,	Trachea	2½	Bronchitis	0	Yes	0	Path. Trans., xx, p. 28, 1869.
43	M.	59	1/3	,,	Perf. trachea	6	Inanition	Yes	—	—	Path. Trans., xxii, p. 129, 1871.
44	M.	69	1/3	,,	Larynx, &c.	(?)	—	—	—	—	Path. Trans., xii, p. 104, 1861.
45	M.	56	3/3	,,	Connective tissue	6	Inanition	Yes	0	0	Path. Trans., x, p. 165, 1859.
46	M.	64	1/3	,,	Perf. trachea	Several	Hæmorrhage	(?)	—	—	Path. Trans., xxvi, p. 91, 1875.
47	F.	42	1/3	,,	Connective tissue	9	Exhaustion	Yes	0	0	Path. Trans., xxv, p. 113, 1874.
48	F.	31	1/3	—	Trachea	4	Inanition	0	0	0	Path. Trans., xxv, p. 112, 1874.
49	M.	67	2/3—3/3	Yes	Pleura, pericardium, &c.	(?)	,,	Yes	0	0	Bull. Soc. Anat., p. 333, 1877.

50	M.	58	3/3	„	Pleura	12	„	—	0	Epithelioma of the tongue. (Tubercle of lungs)	Bull. Soc. Anat., p. 130, 1877.
51	M.	59	3/3	„	Trachea, rt. lung, &c.	4	Exhaustion	Yes	0	0	Berlin. Klin. Wochsft., v, s. 321, 1868.
52	M.	68	2/3—3/3	„	0	3	Suffocation	(?) 0	0	0	Gaz. d. Hôp., p. 367, 1867.
53	F.	52	1/3—2/3	„	Trachea	13	Inanition	Yes	0	0	Fritsche's Inaug. Dissert., s. 74, Berlin, 1873.
54	F.	60	3/3	—	—	4	„	—	—	—	Dublin Journ. M. Sci, lxix, p. 58. 1880.
SPHEROIDAL-CELLED.—*Hard and Soft*:—											
1	M.	65	1/3	(?)	Trachea, thyroid	39	Inanition	—	Yes	Liver (1 nodule)	D. Ztscft. f. Chir., vii, s. 384, 1877.
2	M.	54	Middle	Yes	Perf. trachea	23	„	0	0	0 Tubercle of lungs	Würzb. Med. Ztscft., iv, s. 349, 1863.
3	M.	53	1/2	„	—	(?)	„	Yes	0	0 „	Bull. Soc. Anat., p. 19, 1879.
4	M.	45	Middle	(?)	Arch of aorta	9	„	„	0	0	Glasgow Med. Journ., 2nd ser., iv, p. 402, 1872.
Colloid:—											
1	M.	45	2/2	Yes	Stomach	4	Exhaustion	Yes	(?)	—	Path. Trans., xix, p. 228, 1868.

CHAPTER IX.

SARCOMA AND CARCINOMA OF THE TONSIL.

FEW as are the cases in the accompanying table, they have cost nearly as much labour to collect as the very much larger number of those of the other tissues and organs, for primary malignant tumours of the tonsil are extremely rare; and, as the same exclusive method has been adopted as with the tumours of other parts, of using only those cases which have been microscopically examined, even the small number of reported cases has been rendered seriously smaller. But I would venture to suggest that these twelve cases are as thoroughly representative of all sarcomas and carcinomas of the tonsil as the fivefold larger number is of all malignant affections of the œsophagus, or the eighty cases of all similar diseases of the tongue, and that the conclusions furnished on certain points are quite reliable.

It need excite no wonder that round-celled sarcoma is the most common of the malignant tumours which affect the tonsil, in which so large a quantity of round-celled tissue naturally exists, and that a delicate reticulum is often found between the cells similar to that of the adenoid tissue of the tonsil (Plate IV, fig. 6). Nor need we be surprised that spheroidal-celled carcinoma, which probably has its origin in the glands in the submucous tissue is the least common of these tumours. In the cases before us the sar-

comas and spheroidal carcinoma formed in every instance distinct and prominent tumours, but the epitheliomas acted after their kind, breaking down into deep and foul ulceration. No matter what was the nature of the disease it invariably infiltrated the adjacent structures, most frequently the palate or palatine arches. Every case ran a rapid course. In every case save one the glands are known to have been diseased. This is of the more importance, because the primary disease in three-quarters of the cases was sarcomatous, and therefore another clear example is afforded of sarcoma producing secondary affection of lymphatic glands. Nor was the glandular affection delayed until the primary disease was far advanced, for in more than one instance the enlargements in the neck appeared within two or three months of the outbreak in the throat.

Very little information is afforded on the subject of dissemination, either of the sarcomas or of the carcinomas, for the complete post-mortem examinations of the former are only three, and the total number of cases of the latter is so small that no conclusions of any moment can be drawn from them. It may be seen, however, that in all the examinations of sarcomatous disease there were tumours of other organs, though not of similar organs in each case, and that in only one of the cases were the lungs affected. A fact bearing on this question of dissemination may be found in those cases in which the tonsil is affected, as if simultaneously with many other organs, by round-celled sarcomatous disease or lympho-sarcoma. I have seen one example of this in a child, and a very good instance of it has been published in the 'Pathological Transactions'* by Dr. Moxon, who found in the body of a man, sixty-one years old, enlargement of the right tonsil, of the cervical, medias-

* Vol. xx, p. 369, 1869.

tinal, bronchial, lumbar, and iliac glands, of some of the glands at the root of the tongue, and of the spleen, which contained an enormous number of tiny growths. All the tumours were brain-like in appearance and presented the characters of round-celled or lympho-sarcoma. The man died shortly after an attempt to remove some of the glands of the neck, and, as the existence of extensive disease of other structures had not previously been suspected, the relative duration of the disease in different parts of the body was not ascertained. The rapidity with which enlargement of the glands followed enlargement of the tonsil, the rapid and widespread dissemination of the disease, and the structure of the tumours, may seem to suggest that some of the cases in the table were in truth cases of primary multiple sarcomatosis or of lymphadenoma rather than of primary sarcoma of the tonsil. I am not, however, disposed to admit that Dr. Moxon's case was one of lymphadenoma, nor am I at all inclined to regard most of the cases in the table as cases of lymphadenoma, or even of primary multiple sarcomatosis. For the tonsil was first noticed to be enlarged, then followed after a distinct interval the glandular affection, and lastly, the dissemination. In each of these cases, too, certain of the organs secondarily affected differed in structure from the tonsil and the glands; thus, in one the lungs, in another the thyroid body, in the third the liver, was the seat of secondary growth. If these cases be refused admission into the category of true primary tumours on account of their structure and of the nature of the organ first attacked, reasons equally cogent may be found for excluding a large number of cases from the series of round-celled tumours commencing in other organs.

The spheroidal-celled carcinoma and most of the sarcomas, after removal, exhibited the brain-like appearance

of encephaloid cancer, so that with the naked eye the sarcomas could not have been distinguished from the carcinoma. Two or three of them presented a grey or fawn colour, but even these were as soft and easily broken down as a portion of the brain.

Three of the subjects of sarcoma were under twenty years of age, but only by a year or two; the other six were from thirty-four to fifty-three years old. One of the patients with carcinoma was very advanced in years, an old woman who died within three months of the first outbreak of the disease from exhaustion due to repeated bleedings, no one of which was severe. Hæmorrhage was the immediate cause of death in several of the sarcomas, both those which were not operated on and those which were recurrent; but, strangely enough, neither of the epitheliomas, although they ulcerated deeply, produced dangerous hæmorrhage.

Very little difficulty was experienced in deciding on the malignancy of the disease in any of the recorded cases. The affection, in every case save one, of a single tonsil, the continuous and often rapid growth of the tumour, the implication of the adjacent structures, rendered the diagnosis easy. In the only case I have seen during life where I have been able to verify the diagnosis by microscopical examination of the growth (No. 4), the tumour, at the end of three months, projected from between the arches of the palate as a globular mass, the size of a racquet ball, livid, firm, elastic, and smooth, except where the summit was slightly roughened by superficial ulceration. Two other cases I have seen of which the diagnosis appeared equally sure, but the tumours could not be removed, and the patients were no longer under my care at the period of their death.

The tumour of No. 4 was removed with the écraseur, or, rather, that portion of it which projected was removed, for there is little doubt that the base was left behind. Within six weeks it grew again, and the glands, one or two of which were enlarged at the time of the operation, quickly increased in size. Three months after the first operation a second similar removal was effected for the sole purpose of rendering deglutition more easy. A few months later the patient died, but his death took place in the country and the body was not examined. Six of the cases were treated by operation, two with the galvano-cautery, one with the thermo-cautery, one with the écraseur, and two by incision through the side of the neck. The first operation with the knife was performed by Dr. Cheever, of Boston, for removal of the left tonsil of a sailor, thirty-four years old (Case 8). A longitudinal incision was made over the spot where the tumour could be deeply felt, and after a troublesome dissection the tumour and the diseased lymphatic gland which lay external to it were completely taken away. The patient made a good recovery from the operation, but his further progress is not recorded. Dr. Cheever has since published another similar case,* but I could not be sure of the classification of the tumour, and therefore have not included it here. A very large operation of the same kind was practised by Professor Czerny (Case 3), who first performed tracheotomy, and then removed through Cheever's incision a very extensive disease of the left tonsil, which involved the posterior palatine arch and the left half of the palate as far as the uvula. To complete the operation it was found necessary to divide the lower jaw. The disease speedily returned in spite of the apparent completeness of the removal, and within three months Dr. Heinrich Braun repeated Czerny's

* 'Boston Medical and Surgical Journal,' vol. xcix, p. 133, 1878.

operation, merely, however, to procure a temporary relief from the misery produced by the presence of the tumour. for in a few days the patient died, and although the immediate cause of death was secondary hæmorrhage, widespread generalisation had taken place throughout the body. Of the later result of one of the operations with the galvano-cautery no information is within my reach. But of the other I know that the disease returned immediately. In fact, the removal appears to have been undertaken as a palliative measure, for the glands were undoubtedly enlarged at the time of the operation. The only successful case was that in which the thermo-cautery knife was used (No. 2). The patient was an employé in the posts, apparently not of a robust constitution, for he was subject to bronchitis and ophthalmia. About November of 1878 he noticed that his right tonsil was enlarging, but with very little pain or inconvenience. At the end of November it is described as a rounded tumour, as large as a walnut, covered by mucous membrane, moderately firm, and apparently not involving any of the surrounding structures. No description of it is given after that date, although it was not till the 8th of February, 1879, that it was cut out with the thermo-cautery knife. Its characters after removal were not such as to reassure the operator, for it possessed a grey-rose colour and very friable texture, had infiltrated the subjacent muscle, and was microscopically an undoubted specimen of lymphadenoma or lympho-sarcoma. Yet two years after the operation Dr. Gorecki,* who reported the case, wrote me word that the patient was quite well and free from the disease.

* Let me here express my thanks both to Dr. Braun, of Heidelberg, and to Dr. Gorecki, of Paris, for their courtesy in replying to my letters, and thus rendering complete two of the most important cases in this chapter.

Had it not been for this case malignant tumours of the tonsil must have been regarded as entirely beyond the hope of cure by operation. But since none of the patients died from the operation, and since several of them experienced great relief from the removal of the obstruction in the fauces, there can be no reason why the tumour should not be removed as a palliative measure. With, however, such faint probability of complete recovery, the major operation through the neck can scarcely be recommended, particularly when it is remembered that the only successful case on record is that in which the tumour was removed through the mouth.

Sarcoma of the Tonsil.

No. of case.	Sex.	Age.	Seat.	Duration to operation (in months).	Nature of operation.	Total duration (in months).	Recurrence.	Affection of glands.	Affection of lungs.	Affection of other parts of body, and general remarks.	Authority.
1	M.	18	L.	6	Galvano-cautery	—	—	Cervical	—	Well a month after operation	Aertz. Bericht k. k. Allg. Krank. Wien., 1878 for 1877, s. 151.
2	M.	46	R.	3	Thermo-cautery	—	—	0	—	Well two years after operation	Le Practicien, 1879, p. 177.
3	M.	34	L.	3	Knife	6	Yes	Cervical	Yes	Walls of intestine, peritoneum, mesenteric glands	Czerny's Beiträge zur Operativen Chirurgie, 1878, s. 60.
4	M.	53	R.	3	Ecraseur	9	Twice	„	—	No post-mortem examination	St. B. Hosp., Thomas R., 1877.
5	M.	17	L.	—	0	9	—	„	0	Right tonsil, thyroid body	Gaz. Med. Ital. Lomb., 1870, p. 17.
6	M.	18	R.	—	0	3	—	„	—	Partial post-mortem examination	Patholog. Transactions, xxiv, p. 90, 1873.
7	M.	53	R.	5	Galvano-cautery	8	Yes	„	—	Partial post-mortem examination	Patholog. Transactions, xxix, p. 243, 1878.
8	M.	34	L.	6	Knife	—	—	„	—	—	Boston Med. and Surg. Journal, 1869, p. 64.
9	M.	53	L.	—	0	2½	—	„	0	Liver	Langenbeck's Archiv, xviii, s. 150, 1875.

Carcinoma of the Tonsil.

Spheroidal-celled (Soft):

1	F.	82	R.	—	0	2½	—	Cervical	0	0	Ann. des Mal. de l'Oreille, &c., iii, p. 108, 1877.

Squamous-celled (Epithelial):—

1	M.	55	L.	—	0	2	—	Cervical	0	0 (Tubercles of lungs)	Bull. Soc. Anat., 3 s., vii, p. 322, 1872.
2	M.	46	L.	—	0	4	—	„	Yes	Liver, spleen	Pierin's "De l'Epithelioma de l'Amygdale" (thèse), p. 22, 1879.

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