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SURGICAL DIAGNOSIS

TUMORS.

PROFESSOR A. LÜCKE.

STRASBURG.

TRANSLATED BY

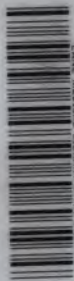
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## THE SURGICAL DIAGNOSIS OF TUMORS.

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GENTLEMEN, there is no doubt, I believe, that you are accustomed to rank those pathological formations commonly called tumors in a wholly different order among the pathological phenomena in the body from that which was assigned to them by the generation of students to which I belonged. Much labor, and abstraction from established prejudice, have been required to bring us to the position which we now occupy in regard to the tumors. Although we must confess, that while in this branch of pathology, much is still left for investigation, and the views of students are by no means unanimous, still the study of tumors has, if I may say so, certainly advanced out of the stormy period. Writing upon this subject — which was at one time enormous, and reflected the contradiction of opinions, and the competition in discovery and exhaustive investigations — has given place to quiet work at this chapter; and we have reached a resting-place, as it were, on

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the height we have to climb, upon which we can draw breath, and look back over what we have already won.

Opinions concerning the pathology, and especially concerning the genesis, of tumors, must be various. There is in pathology as yet no finished chapter. We are everywhere in the midst, or rather, often at the commencement, of our labor. But all that has been accomplished in the way of pathological anatomy and clinical observation has already led to very tangible results in practical treatment; and in my opinion we have made most important advances in the *certainty of diagnosis of tumors*.

It would be difficult for you to-day to form an idea of the uncertainty with which the examination of a tumor was formerly undertaken. This was especially due to the fact that it was the universal opinion that we here had to do with something wholly strange and peculiar, for which our ordinary methods of diagnosis were insufficient. Hence the most general diagnosis was satisfactory. And now, wherever ideas of pathological anatomy are not incorporated in a physician's flesh and blood, you still hear the simple diagnosis made of "a tumor." Pathological anatomy has, then, been mainly instrumental in clearing up our views, and in bringing the tumors within the reach of clinical diagnosis; for we have attacked the new growths with the same diagnostic methods and means used in other

forms of disease; and the services which *Virchow* has rendered in this direction cannot be too highly estimated.

I confess to you, that, when I first had to step forward as a clinical teacher, I was not over-pleased at facing the tumors, although I knew that I had duly worked out their anatomical relations. A saying of *C. O. Weber*, that an error in the diagnosis of a tumor was with him a rarity, seemed to me to contain too much self-confidence. Only after a long personal clinical experience can I say that *Weber* was right. It is possible, in all but a constantly diminishing minority of cases, to determine the histological character of tumors before their removal or anatomical examination. And we must note, that while on the one side the anatomical investigation of tumors was the indispensable condition to their proper understanding, the other factor, clinical observation, is not to be under-estimated. Clinicians, provided with the weapons of anatomy, have long been able to observe tumors through their whole course with unprejudiced eyes: they must now, therefore, be in a position to bring the anatomical in unison with the clinical observations, and so, out of the clinical facts, be able to draw an inference as to the structure of a new growth.

The clinician has a decided advantage over the anatomist in the recognition of the characteristics of a



tumor ; for he has the living material itself before him, in which many properties are to be observed which are absent after death, or removal of the part, and these, properly interpreted, form most valuable diagnostic signs.

We must not, however, seize upon the clinical diagnosis superficially, and presume to found a classification of tumors upon purely clinical characteristics, as has mistakenly been done from time to time. A proper clinical classification must always coincide with the anatomical ; for, in the end, all clinical knowledge rests upon anatomy and physiology. I believe, then, that we can gradually escape more and more from the purely clinical nomenclature, and in time give up certain current names, such as cancer, sarcoma, &c. : for, in Germany at least, the clinical division of the new growths has generally given place to the purely anatomical system ; which movement I have, I believe, helped not inconsiderably.

Before we take up our subject proper, it is doubtless of importance for its right understanding, to come to an agreement concerning certain fundamental ideas and principles. And first we must properly define the *idea of tumor*.

We are, as yet, not far enough advanced to be in the position to characterize the group of diseases which we call tumors, in accordance with etiological considera-

tions, and so to be able to place them, perhaps, in a like line with the products of inflammation.

The true etiology of the new growths rests as yet on a feeble foundation: therefore, in fixing the limits of this group of diseases, we must keep to other considerations, by the application of which we are able definitely to separate the tumors from other new formations.

The idea of *new growth* we must hold fast; and with this view, in my exposition of the meaning of *tumor*, I have excluded a large group usually reckoned among them, namely, the cysts. This I have done, because there are no cysts which are not to be referred back to other pathological processes,—either to retention of secretion (which may be due to the closure of ducts by inflammation), or to extravasation or exudation. If we exclude the cysts, I believe that the definition which I have formerly given is the most applicable; namely, *Increase in size through the new growth of tissue by which no physiological end will be gained.*

In accordance, then, with what I have just said, I classify the tumors as follows:—

I. THE CYSTS.

II. THE REAL NEW GROWTHS.

A. *New growths in the type of connective tissue.*

1. Type of normal connective tissue.

a. Fibroma (and Myoma).

- b. Lipoma.
- c. Chondroma.
- d. Osteoma.
- 2. Type of embryonic connective tissue.
  - a. Myxoma.
  - b. Sarcoma.
- B. *New growths in the type of epithelial tissue.*
  - a. Carcinoma.
  - Appendix: Melanoma.
- C. *New growths in the type of more highly developed tissues.*
  - a. Papilloma.
  - b. Angioma.
  - c. Neuroma.
  - d. Adenoma.

I have good reason, looking from the stand-point of the surgical clinician, to be well pleased with this classification; for the first and main question in every case is, In what tissue did the tumor originate? That is conclusive for its pathological character, and consequently for the diagnosis; and, through the above arrangement, we are directed, for our understanding of the real new growths, to that very thing, — to give our attention to the parent tissue of a neoplasm. And, if we have recognized from whence a tumor has started, then we have made the better half of the diagnosis.

In advancing this view I have really acknowledged to you that I am a supporter of the theory of *Thiersch* and *Waldeyer*, — of the blastodermic theory, if you will.

I am a believer in this theory as well on clinical as on histological and embryological grounds. Although I must confess that the embryological as well as the histological side of the blastodermic theory is much disputed, still I can assert that clinical experience speaks greatly in its favor, and I must especially add, that this theory has greatly facilitated most important advances in certainty of diagnosis.

I to-day hold firmly to the principle, that tumors of the connective tissue series, remain always within the type of that tissue, and that epithelial tumors can only originate from epithelial cells. Further, in the majority of cases, the new growths remain within the type of their parent tissue, even in the details of their structure; so that from cartilage arise cartilaginous tumors, and fatty tumors from fat cells. In the epithelial class they retain their character even more closely; thus, cylindrical epithelium gives rise to cylinder-celled carcinoma, of which the secondary nodules usually preserve the same type; and glandular epithelium always reproduces itself in a carcinoma in the same form, and, even in the secondary tumors, often has the same arrangement as in the original gland. Pigment-cells, whether connective tissue or epithelial, have the peculiar property of always producing pigment,—a power which even the immediately contiguous cells do not possess; thus, if they form neoplasms, these consist of pigmented cells, in short, are melanotic tumors.

Tumors do not, in my opinion, present transition forms from one type of tissue to others. Mixed forms are possible; and we see such, for example, in the melanomas, when these grow in a pigmented nævus in which the cells of the Rete Malpighii as well as those of the subcutaneous connective tissue, are capable of producing pigment: in this case, melanomas can arise which are composed of both sarcoma and carcinoma cells.

It is comprehensible, too, that a papilloma, bearing upon a connective tissue base a rapidly-growing epithelium, will, if the epithelium grow downward into the connective tissue, be converted into a carcinoma; or that an adenoma, through the hypertrophy of the connective tissue frame-work, will take on the character of a fibroma or of a sarcoma: but in these cases we have no change from a connective tissue to an epithelial type.

If, now, this principle is true, you will easily understand how much our diagnosis gains in certainty, in that we can say: this growth has developed in such and such a tissue, and therefore must follow such and such a type.

I speak here naturally only of primary growths, since secondary nodules of the so-called malignant tumors are confined to no type of tissue. To give an example: you know that the bones are in no way connected with

the outer and inner blastodermic membranes, you can therefore affirm that no primary tumor in bone can be epithelial in character, in short, that there is no such thing as a bone cancer. On this point, a thousand facts of clinical experience support the theory. The cases which we know of primary cancer of bones, always occur in superficial bones, especially in the upper and lower jaws, and I once saw such a growth develop in the tibia. In these cases, the cancer grows directly from the mouth, or antrum, into the bone, or it may originate, as in my case of cancer of the tibia, from a wen which has been incompletely extirpated, where the part left behind has grown into and destroyed the bone. The epithelium can, too, grow along an old fistulous canal, leading to a necrosis, or caries, and in this way can penetrate the bone, and give rise to a cancer in it. This course of things has been often recognized, and I have myself seen such cases.

Since, then, experience teaches that primary cancer of bone occurs only under wholly exceptional circumstances, we should, if we were to find an evident cancer in the femur, immediately search carefully, and see if there were not somewhere, as, for example, in the thyroid gland, a primary nodule; and, even if no primary nodule was found, we should have to consider the case an exception, which would certainly not alter the rule, and for whose occurrence we should have to seek

further reasons. I have gone at length into this point, because any one may be surprised by such an anomaly, and, in some region where he is accustomed always to find a certain form of tumor, may find a growth which is to be regarded as heterotopic.

Heterotopy of tissue has already been shown to be very limited: within the same type of tissue, however, it occurs oftener; so that we find cartilage and mucous tissue in fully developed connective tissue, &c.

This point brings us immediately to the consideration of a matter important for the study of tumors, and especially for the clinical diagnosis. I refer to the typical occurrence of certain kinds of tumors in certain parts of the body.

*Hüter* rightly observes, in his "General Surgery," that surgeons ought to write a regional history of tumors. It is, in truth, one of the greatest gains which an extended clinical experience brings us, that we have learned to recognize the character of a tumor from its exact situation. This is a gain which could be most certainly established by statistics, and which, for certain parts, has been established. The excessively common appearance of cancer on the under-lip and in the female breast, and the favorite occurrence of myoma and fibroma in the uterus, are well-recognized and valuable aids in diagnosis. If we are aware of the frequency of their occurrence, we need but a fe



further diagnostic signs to enable us to give a confident opinion as to the nature of the tumor.

In the cases mentioned, the histological explanation of their appearance meets with no difficulty: the tumors are not to be considered heterotopic.

There are, however, in other localities, tumors which are again and again to be found in the same place, and yet are histologically to be regarded as heterotopic. I am accustomed in my clinic to call them regional tumors, because I consider that they must have a real relation with the region in which they occur.

I must here introduce an example, taken, not from the ranks of the real tumors, but from those of the cysts: I refer to the dermoid cysts.

These are confined to certain fixed regions,—median line of head, neighborhood of eye, sides of neck, testicles, ovaries. If you find cysts in these places, you can almost blindly assert them to be dermoid cysts, and you will be right in the majority of cases.

In the neighborhood of the angle of the jaw we find a particular form of tumor very frequently: the enchondroma. Sometimes they are subcutaneous, sometimes connected with the parotid, less often with the submaxillary gland. They are never in direct connection with cartilage, and must therefore be regarded as heterotopic. The frequency of their occurrence in this place is, however, so great as to be a material help in diagnosis.



Again: we find myxomas surprisingly often in the neighborhood of the foramen ichiadicum. These frequently grow into the pelvis, or implicate the sacrum in their growth, and at times occur in form of myxoma lipomatodes. Whence this mucous tissue develops I cannot say, certainly not from the subcutaneous fat.

A part especially noted for the frequent occurrence of tumors is the crural region. Here, again, myxoma lipomatodes is not uncommon, alternating with true lipomas. This, too, is a classical seat for the parosteal osteosarcomas. Most of the cases of these latter tumors which I have seen, and which are to be found in the literature of the subject, have been observed in this region. In this same situation I once extirpated a great cysto-adenoma deeply seated, and not connected with the skin.

In the axilla, in women, we find tumors which we can call adenomas, which are wholly unconnected with the breast, or at least easily separated from it, and in which cancer may afterwards arise.

This ever-recurring appearance of similar forms of tumor in certain localities, which gives us an excellent aid in diagnosis, must make us feel that it is not merely a chance occurrence, but is in accordance with some law; although as yet the real reason for it has not been fully established.

The law governing the appearance of the dermoid

cysts is most readily found. They appear at those places where, in embryonic life, clefts exist in which reflections of the blastodermic membrane normally occur, and where, therefore, such irregular reflections may appear; for that the dermoid cysts are nothing but reflections of the normal skin, is commonly recognized.

I entertain the opinion that the heterotopic occurrence of enchondromas in the neighborhood of the jaw must be explained by the fact, that, during the formation of the ear and salivary glands, portions of embryonic cartilage are enclosed, which develop later into tumors.

I can give no similar explanation for the occurrence of myxo lipomas in the buttock, or of osteosarcomas and other tumors in the crural region. For this I must refer you to the embryologists and histologists, who can possibly at some time explain it.

So much, however, I will say, that for a long time I have thought that such heterotopic growths as develop entirely without any physiological or pathological irritation (which plays so large a part in the causation of cancers) may have their origin from germs earlier enclosed in the part. We know very well that parts existing out of their proper anatomical situation are especially disposed to the formation of tumors: this is well shown in the history of cryptorchism. An example of cellular elements being enclosed in advanced life,

is seen in a carcinoma which develops from a cicatrix, or within a bone which has been penetrated by old fistulous canals. That the development of such enclosed portions of tissue takes place but slowly, and often follows physiological laws, is well known; thus the dermoid cysts appear at or after puberty. The adenomas of the breast lying near the axilla, which are nothing but misplaced breasts without ducts or nipples, also grow at the time of puberty, or during the first gestation. We cannot wonder, then, that the enchondromas about the salivary glands, too, develop rather late, and that this is also the case with tumors of the crural region, although these, as a whole, appear quite early, generally before the twentieth, and in almost all cases before the thirtieth to thirty-second year.

I am sure, gentlemen, that this belief of mine, that such heterotopic and regional tumors must develop from germs of tissue early enclosed in the part, will meet with much opposition, since the proof of it is hard to give. I was lately much interested to read of a case of congenital myoma of both kidneys, described by *Professor Cohnheim*,<sup>1</sup> which he explains by supposing an embryonal inclusion of tissue to have occurred; just as I, in the case of the teratomas of the testicles and ovaries, have looked for an explanation to the very complicated series of events in the formation and mi-

<sup>1</sup> Virchow Archiv. Bd. 56, Heft 1.

gration of the sexual organs. Experimentally, these matters have been investigated by *van Dooremaal*,<sup>1</sup> with considerable success; and it is through experiments that the explanation of these conditions must be sought. This is already undertaken by *Dr. Zahn*, and we may expect speedy communications from him. To return now to our subject proper: we can then say that most tumors are to be judged according to the character of their parent tissue, and that the heterotopic growths are connected especially with certain localities, so that clinical experience supplies very sure points for their diagnosis.

If we now will seek further diagnostic helps, we can call to our aid *the occurrence of tumors at various ages*.

The tendency to produce growths seems to be not always alike in the different blastodermic membranes. Experience shows that growths of the connective tissue type occur, in the majority of cases, in the first half of life,—before the thirty-fifth year. The epithelial tumors, on the other hand, occur after this time. Exceptions to this rule are rare for the epithelial new growths; more common in those of the connective tissue series. Still this rule is so sure, that it is safe, for example, in the case of tumors of the female breast, to affirm, that, after the thirty-fifth year, other tumors than cancers are almost unheard of. In applying this

<sup>1</sup> v. Græfe's Archiv., f. Ophthal. ix. 356-372.

rule, the time must be reckoned from the first development of the tumor. Cancer of the lip may be considered an affection of old age.

On the other hand, we see sarcomas appear early. Young people succumb to them. Osteosarcomas occur certainly oftener in youth, yet are also observed later. Fibromas distribute themselves over the whole of life.

The development of many tumors is connected with the physiological phases of life. Thus most of the enchondromas which are not heterotopic, and the greater part of the osteomas, are to be referred to the period of most active development of the skeleton. The lipomas, when not congenital, or due to determinate local irritations, appear preferably in the so-called best years of life, coincident with a general development of the adipose tissue. The age of puberty ushers in the development of dermoid cysts and congenital adenomas of the sexual organs. Angiomas belong to extreme youth, in fact, in the majority of cases, are congenital.

While we believe, then, that we find in the physiological stages of development a plausible explanation for the occurrence of some tumors at certain ages, this is more difficult for the two great groups of connective tissue and epithelial growths. If we follow *Thiersch*, we are to suppose, that, late in life, the connective tissue frame-work of the body, which carries the vessels and

nerves, becomes in a way exhausted, so that it is no longer disposed to hyper-production, and that it further ceases to oppose a sufficient resistance to the encroachment of the epithelium, when the latter, acted upon by some irritation, is excited to proliferate: thus the epithelium is able to force its way into the deep parts. By this theory, cases of abnormally early occurrence of cancer can be explained.

Next to the age of the patient, the course of the tumor is of importance, especially its rapidity of growth and size.

The tumors of most rapid growth are those which are best nourished, and whose cells have the greatest vitality. Such are the tumors of the connective tissue series, and especially the cellular connective tissue tumors, the sarcomas, and myxomas. The growth of sarcomas, especially in the earliest years of life, is often almost as rapid as that of an acute abscess, and they will, at times, even be mistaken for these. Their blood supply is as good as that of young granulations, with which they have many points of similarity: granulation tissue can, in fact, be taken as a physiological prototype of sarcoma.

In sarcomas the vessels run freely between the cells, and their extended sprouting meets with no opposition in the cellular masses; so that, while the young connective tissue cells are in themselves possessed of great

vitality, they become still more so through the growth of the vessels which go along hand in hand with them. Therefore the sarcomas can grow rapidly to very large tumors before they show a tendency to break down, which is inevitable when they become too far removed from their parent tissue. The forms of sarcoma to which we have here especially referred are the round and spindle-celled sarcomas of the soft parts.

The myxomas, and especially the recurrent forms of the same, are the only tumors which grow as fast as these. Their cells are less in need of an abundant blood-supply even than those of the cellular sarcomas. They are nearest allied to simple protoplasm, and it is indeed astonishing to see what a slight vascular connection with the parent tissue large, rapidly-growing myxomatous tumors often have.

The other tumors of the connective tissue series, which are made up, not of cells alone, but of well-formed tissues, grow, on that account, much more slowly. Such are fibromas, lipomas, enchondromas and osteomas. The osteosarcomas, if they produce bony tissue, do not grow with especial rapidity: if they produce only cells, as is the case with many central forms, their growth is then a rapid one, as in sarcomas of the soft parts.

All of the above-named tumors can reach a great size, and the lipomas and osteosarcomas especially can form huge tumors.



The epithelial structures of the body are dependent upon the connective tissue for their nourishment: purely epithelial growths can therefore attain but a limited size, and break down rapidly if they reach too great a distance from their matrix. Look at the wens. The nearer to the centre the epithelial masses, the more certain are they to undergo regressive metamorphosis, and form the well-known caseous material.

An epithelial tumor can exist only when the growth of epithelium stretches down into the connective tissue, where naturally it finds enough nourishment, or when the irritation extends to the connective tissue, and its growth accompanies that of the epithelium, which is thus supported on a vascular connective tissue network. Without this frame-work of connective tissue, a cancer cannot exist; and we see how its nourishment is provided for, like the normal nourishment of epithelium, by penetrating septa of connective tissue, — papillæ.

Cancers can form large tumors, then, if they penetrate an organ, and push aside or take the place of its tissue. As soon, however, as they show an inclination to form solid masses, their growth is limited; and they come to ulceration much sooner than sarcomas. Cancers are, then, tumors of moderate size and of slow growth, since for their increase the co-operation of two forms of tissue is required. If the epithelium grows too rapidly, it must perish, and fatty degeneration and ulceration



supervenes: if the connective tissue frame-work grows too vigorously, the epithelium is compressed, owing to the changes (shrinkage), well recognized in the formation of cicatrices in young connective tissue; it thus, as in the other case, perishes (scirrhus).

You see, then, that the rapid formation of growths, and their power of producing larger or smaller tumors, can be of very great value for the diagnosis. We have already mentioned the tendency to breaking down, to ulceration, because it is in direct connection with the kind of growth. The purely ulcerative form is peculiar to cancers, and in this connection the influence of locality is especially to be regarded, since the early induction of ulceration is usually caused by some irritation or other.

Gentlemen, during its growth a tumor may bear various relations to the parts about, and, in the examination of a tumor, it must always be your first effort to assure yourselves most accurately of the nature of these relations. You will then see that these growths either push the neighboring parts aside, or force their way into them, blend with them, as it were. These two typical points of difference are of the greatest importance for the recognition of the clinical significance of a growth; for through the consideration of them are the forms of new growth, known for ages as benignant or malignant, to be distinguished from each other.

The character of malignity was assigned to a tumor by the old pathologists when it had the property of producing tumors like itself in parts at a distance from its original location; in other words, of becoming constitutional,—an expression to which you are now well accustomed, especially in the study of syphilis. Formerly they confounded cause and effect, and used to say that the primary tumor was the expression of a constitutional disease. If we now analyze the facts according to our present knowledge, we find that the benignity or malignity of a growth is really dependent upon its relation with the parts around. Those tumors which press parts to one side are benignant growths; they can indeed contract adhesions with the parts about (this happens always, however, as the result of inflammation); they can cause erosion of bone, which is always through pressure, as occurs in the case of large aneurisms; they can produce atrophy in neighboring muscles; by pressure on nerves can cause painful sensations: but all this occurs as by the action of a foreign body upon the tissues. While the growth of the tumor remains contained within itself, it forms a whole, and remains so through its entire existence.

In other tumors you cannot, even early in their growth, recognize a well-marked boundary. As early as they are to be felt, they have the character of an infiltration. These can certainly grow outwards, but

they at the same time penetrate in deeply, and spread along the surface; they substitute themselves for the tissues, and grow through them; or forcing their way amongst them, and uniting with them in a mass, they thus form tumors. These are the malignant growths; for they do not confine themselves to one place, but form, as I have said, secondary tumors, or show, at least, the power of reproducing themselves on the spot from which they are believed to have been thoroughly removed.

The cellular tumors form the main part of this class of malignant tumors. It is now no longer so difficult to form an idea of the process by which these growths attain the special character of constant recurrence. There is no longer the least doubt that young connective tissue cells have the power of motion, and that in this way young sarcoma-cells (to speak of these first) can creep forward through the tissues, and thus finally get into the lymph-current, which carries them through the lymph-glands into the blood, where they can finally plant themselves all about, and produce new tumor-cells. This occurs oftener in the department of the lesser circulation. They can, too, remain sticking in the lymph-glands, though this happens but seldom to sarcoma-cells, for they are ordinarily not large enough to be arrested here. We can picture to ourselves an exactly similar occurrence in the case of the epithelial

tumors, since it is now shown that young cancer and epithelial cells have likewise the power of movement, and can wander. The young epithelial cells, however, are considerably larger than young connective tissue cells: when, therefore, they get into the lymph-current, they are ordinarily arrested at the first lymphatic gland, and here sow themselves, and form secondary cancers, from which, then, tertiary deposits may start out.

In this varying property of tumor-cells, by which some wander through lymphatic glands, while others make them the seat of secondary growths, you have, then, a criterion for the character of the primary tumor, which will be applicable in most cases.

I must not tarry too long here over the other possibilities of the transplantation of the primary tumor: I will only recall to your minds that the growth of a tumor into the tissues leads to emboli of masses of the tumor when the veins have been penetrated. A belief in the existence of infecting juices is at present no longer necessary.

The local power of recurrence of tumors may be due to the fact, that, owing to the impossibility of recognizing their limits at the time of extirpation, they were not thoroughly removed; and, owing to this circumstance, other non-cellular tumors — such as diffuse lipomas, fibromas, adenomas, and angiomas — may return after removal. The cellular tumors have the greatest

power of recurrence, because the already-established minute collections of cells about the primary nodules cannot be recognized by the eye, and are therefore left to further growth.

As you are involuntarily reminded of the prognosis during the consideration of the above-mentioned points of diagnosis, I will here enumerate the tumors in their clinical order of malignity.

First stand the cellular sarcomas, with the exception of the giant-celled sarcoma, which owes its exceptional benignity to the fact that it is composed of very large cells. By cellular sarcomas I mean, then, the round-celled sarcoma, with which belongs the myeloma (myeloid osteosarcoma), also the spindle-cell sarcoma and the melanoma.

In the second rank of malignity are the cancers, the large-celled osteosarcomas, the myxoma, the myxoma lipomatodes, and the enchondroma myxomatodes. These are the really malignant tumors, whose cellular nature is the measure of their character. To this list are to be added, as locally recurrent, the giant-cell sarcoma, the adenosarcoma, and fibrosarcoma, also certain fibromas and adenofibromas.

The other tumors are benignant.

We have, by the above considerations, already obtained a series of aids for the differential diagnosis of tumors, which were drawn especially from their physio-



logical relations. We have still to consider the physical characteristics and anamnestic signs.

We will first turn to the characteristics which we can learn with the eye. Of these the *color* is first to be mentioned. This can be seen only in cutaneous and subcutaneous tumors, or in such as are situated in cavities which are accessible and can be explored with the eye.

The pigmentation of a new growth will at once make itself evident, and the melanomas are thus easily recognized. They can be confounded at the most only with vascular tumors which are covered with healthy skin, and of these especially with the angioma cavernosum, with which, however, beyond this similarity in color, they have not many characteristics in common. The simple angiomas are quickly recognized, for the newly-formed vessels are easily made out. Inspection enables us also, by the change in color of the skin, to recognize its relation to the tumor lying beneath it. It is often shining, which indicates a high degree of tension; sometimes slightly reddened, which is to be referred to commencing ulceration; it may be deprived of pigment, which occurs in case of cicatricial contraction.

The eye acquaints us further with the *size* of a tumor, the significance of which has already been considered; but, most important of all, it tells us its *shape* and the

*condition of its surface.* The form of a tumor is indeed too much governed by chance to be of much value in diagnosis.

Tumors which occur in cavities, have very commonly a pedunculated form: this is especially true of tumors of the mucous membranes, which were formerly summed up under the name of the polypi. This resemblance in form allows us to draw no conclusion as to the quality of a tumor. Polypoid tumors of the rectum may be adenomas as well as carcinomas, and the same is true of those of the nasal cavity. Hardly a single kind of tumor has the like form under all circumstances. The papillomas alone appear to possess something characteristic in their fissured villous appearance: even in this, however, certain forms of cancer resemble them.

It is different with the *condition of the surface.*

Many tumors are smooth, as are most cysts, and approach the globular form: others are lobulated, as is the case with the lipomas and adenomas. Some are covered with great lumps and knobs, like many of the osteomas and fibromas: others, again, are covered with smaller prominences, such are the enchondromas. The malignant tumors are in this respect, perhaps, the most irregular. Often, in consequence of the manner of their growth, they conform for a long time to the shape of the part in which they grow, so that this part seems only increased in size. They may, especially the sar-

comas, preserve for a long time a smooth surface; then, however, they may become nodulated, and covered with prominences, and, if they have any characteristic, it is the rapid appearance of isolated nodules, which grow up often in a globular shape, then quickly adhere to the skin, and lead to ulceration.

If we see that an ulceration has appeared upon a tumor, we shall be first led to think that the skin has been involved in the morbid process, in short that we have before us a malignant tumor. If the skin in the neighborhood is discolored and infiltrated, and the ulcer elevated, this diagnosis is pretty safe; for other tumors cause atrophy of the skin really through pressure; it is not infiltrated, but has rather become thinned, and then gangrenous; its edges, therefore, are undermined, and beneath them the body of the tumor is visible: this may itself be ulcerated. The osteomas, enchondromas, and lipomas act thus.

Some tumors are translucent, and we must give especial prominence to this characteristic, which has hitherto been recognized only in those with fluid contents. This character can be investigated only when the tumor is to a certain degree isolated from the surrounding parts, most conveniently in tumors in the scrotum. All slightly colored fluids are translucent, if they are not contained in too thick a sac. Serum, mucus, colloid, and even fluids containing cholesterine and



spermatozoa, allow the passage of light. I will add that chronic abscesses, too, in which the cellular elements of the pus have settled to the bottom, are at times translucent.

Of the solid tumors, sarcoma tissue of uniform consistency and myxomatous tissues are translucent. This character is also found in many lipomas and in simple hypertrophies of the lymph-glands.<sup>1</sup>

I have lately turned my attention anew to this matter of the translucency of tumors, being led to do so by an error in diagnosis. I believe that we must do much more work on this chapter of surgical diagnosis, and there will especially be no difficulty in finding proper methods for a more intense illumination of the tumors which we examine. In the mean time I must warn you not to consider all translucent tumors as necessarily having a fluid contents.

Although, gentlemen, you can in many cases make the diagnosis of a tumor with the eye alone, still you will rarely go without a *tactile examination*. In making this, it is seldom necessary to test the degree of tenderness by strong pressure on the new growth, since this is ascertained during the examination of other points. One of the most important of these is to ascertain the *consistence* of the tumor. For this purpose, it is a good plan to fix the tumor as far as possible with one hand,

<sup>1</sup> See Centralblatt f. Chirurgie, 1875, No. 47.

or, if both hands are needed for the examination, to have it held by an assistant.

The hardest tumors are those which are bony or calcified, — the osteomas and calcified chondromas and fibromas; then come the periosteal and central osteosarcomas, in which the bony shell is often, however, yielding; then follow the fibrous tumors, fibromas, and scirrhus cancers. The tumors of elastic hardness are the enchondromas, most primary carcinomas before softening has commenced in them, and again some of the fibromas, also giant-celled and fibro sarcomas.

Of elastic softness, are the soft fibromas, adenomas, lipomas, and cysts with thick walls. Finally, we must designate as soft, most sarcomas, myxomas, cancers which have softened, and many secondary tumors.

Tumors with fluid contents actually *fluctuate*. Such are especially the cysts, — cysto-adenomas and cysto-sarcomas. But, further, the soft cellular tumors with abundant intercellular substance, which were formerly called medullary tumors, also give a sort of fluctuation, so-called pseudo fluctuation, which we cannot always distinguish with certainty from real fluctuation. This is easily explained; for the feeling of fluctuation depends upon a molecular shifting of the contents of the tumor from under the finger which presses towards the other, and this shifting takes place in soft, cellular, juicy sarcomas and myxomas, as well as in small tumors with

fluid contents. To allow the feeling of a wave in a tumor, it must hold a great quantity of fluid, and have, besides, a yielding wall.

If a tumor is very tense in its capsule, or lies under strongly-stretched fasciæ, it is often very difficult to decide whether we have real or pseudo fluctuation. The same may be said of very movable tumors, which retreat before the examining finger. It is evident that the deep situation of a tumor makes it often difficult to recognize its consistence, and in such case it is plainly allowable to use the acupuncture needle, and to make an exploratory puncture. -

A practised tactile sense in the ends of the fingers is certainly necessary for this kind of examination, and this sense can be greatly educated in the recognition of finer shades of difference, so that you will do well to give your fingers this sort of education, especially your forefinger, which is most apt in all sorts of investigations, both from its anatomical predisposition, and from the practice which it gets in daily life.

In the tactile examination of a tumor you must also turn your attention immediately to the question of pulsation, by which, mainly, aneurisms are to be distinguished from tumors. It is true there are pulsating tumors, and also those to which pulsation is imparted from neighboring vessels, and it is often very difficult to distinguish between them. In relation first to the pul-



sating tumors: these are either sarcomas of the soft parts, or of bone. We find in these tumors no vessels of great size: on the other hand, we find a great vascularity, with small arterial and especially capillary vessels running between the soft-cell masses of the tumor without a special connective tissue frame-work. The walls of the vessels in many such pulsating central tumors of the bone are thickened by cellular growths, in like manner as we often see them in simple angioma; so that they could almost be regarded as central angioma of bone, did not their subsequent history coincide with that of sarcoma.

The fact that in these tumors, consisting essentially of interwoven capillaries, a pulsation is felt, and even a kind of bruit is heard with the stethoscope, may be explained as follows: the vessels run directly between the soft yielding cells with fluid or protoplasm like intercellular substance; so that the shock coming from the heart meets with no resistance such as is offered in the fully formed connective tissue which accompanies the vessels even in cancer. The condition is similar to that causing pulsation of the brain, or of granulations; which latter, surgeons so often see if a fluid rests upon a granulating surface. As the tumors here under consideration resemble sponges in their construction, they can, like these, be made smaller by pressure; and this property, taken together with the pulsation, makes it,

under some circumstances, extremely difficult to distinguish such tumors from aneurisms. Their seat, the manner of their occurrence, and their course, will certainly, in most cases, assist one to a correct diagnosis; and in general we can say, that, if we have a tumor in bone, the aneurisms can be excluded, since the medullary cavity of bone cannot be the seat of a spontaneous aneurism; but tumors arising here must be regarded as central osteosarcomas. There are, however, rare cases in which, especially after a previous injury, the diagnosis between pulsating sarcoma and aneurism is impossible.

Pulsation is imparted to tumors lying over large arteries, especially when pressed upon by the tension of the parts over them. In these cases, the aneurismal bruit is absent; and, since the apparent pulsation is caused by the motion of the tumor, the diagnosis is generally easy to make, particularly in cases, in which the tumor can be raised or pushed off of the artery. It is more difficult when the tumor can retreat from pressure toward some cavity, thus making it appear as if its contents could be pressed out.

The angiomas share with the highly vascular sarcomas the property of emptying out a part or the whole of their contents under continued pressure: indeed, they possess this characteristic in a much higher degree. The cavernous angiomas are especially of this character, and to these we may add the lymphangioma caverno-

sa, — a rare, frequently congenital, sometimes acquired form of tumor.

We have for cavernous tumors one characteristic sign, in the manner in which they refill after being emptied. This does not take place by a series of impulses, as in the sarcomas and aneurisms, but slowly, swelling up like a compressed sponge when laid in water. Mistakes can only arise when a tumor can be pressed back into a cavity or between yielding tissues, and again emerges on removing the pressure, or in tumors with fluid contents, which can be emptied towards some cavity. In this connection, abscesses are particularly to be considered, especially cold abscesses, the recognition of which will be possible from other signs.

While handling a tumor, we may feel *crepitation* in it: this appears as a soft crackling, so-called parchment crepitation, if a thin shell of bone is bent in. We find this in many osteosarcomas which have only a thin bony capsule, in many similarly constituted chondromas, in cysts of bone, and also in other tumors, arising in the centre of bones or in cavities in them, which have expanded their bony capsule to a thin shell. A coarse, hard crepitation is felt in tumors which have a bony or calcareous frame, which is moved or broken by our pressure, or may be found in cysts which contain concretions.

It is naturally very important during your tactile



examination to give attention to the *relations of the tumor to the surrounding parts*. I will not repeat what has been already said concerning the relations of benignant and malignant tumors to their parent tissue: I will only indicate the points of practical interest which meet us in this examination. First of these in importance comes the question of prognosis, especially in reference to eventual operation. If the tumor is adherent to the skin, we cannot save the same: if it is adherent to deep-lying parts, we must make up our minds to include them in the operation. In this connection, the mobility of the tumor must be accurately studied, which is by no means easy with large and deep-seated tumors. Mistakes may occur through the mobility of masses of the tumor among themselves, or of lobes upon each other; or we may overlook a deep-seated pedicle; or, finally, we may move some important organ with the tumor; which displacement, indeed, on the other hand, may make itself known through disturbances of function, as in case of the larynx or trachea. Tumors are most firmly fixed when they are connected with bones or fasciæ. Adhesion with the muscles generally allows a certain degree of mobility, since the muscles themselves are movable. Tumors located in the soft parts are naturally most movable when they are encapsulated, and have as slight vascular connections as possible. Thin, long pedicles do not hinder mobility.

It is of the greatest importance to determine the relations of a tumor with the vessels and nerves. If these have not been made out beforehand, the operator may meet with most unpleasant surprises while dissecting out the tumor. Peripheral oedema points to pressure on or implication of the veins by the growth; and such implication may lead to the most serious results, if, for example, you cut into the external, or even the internal or common, jugular in the neck; on which account in this particular region you must proceed with the greatest caution. That tumors may originate in the walls of the veins themselves is well known, especially for secondary growths, and among these notably for the secondary melanomas: therefore, in operations upon these, their relations with the veins must be most carefully regarded.

Since it is not always easy, in case of large tumors, to assure one's self as to their relations with the larger arteries, it is advisable, under such circumstances, to begin the operation by laying bare the afferent vessel, so that it may be possible, in case of necessity, to tie it without delay.

The relation with the nerves can be made out only in rare instances from their functional disturbances. *Pain* in tumors has long been used as a diagnostic sign of cancer; and indeed we find that spontaneous pains occur very often in some cancers. We know that this



is the case for the majority of cancers of the breast and uterus; while cancers of the lip, for example, seldom exhibit this phenomenon. Besides these, only tumors of the nerve-sheaths and real neuromas, such as occur in amputation stumps, are known to be spontaneously painful. I once encountered a lipoma that was so.<sup>1</sup>

All tumors can be painful if they press upon a nerve in a locality where it cannot escape. Further: a tumor in which an inflammatory process has arisen, will be painful. Cancers and tumors of nerves, too, are often painful on pressure; while sarcomas, as a rule, are not tender.

If disturbances of function have occurred in the part supplied by a nerve which is in connection with a tumor, its trunk is usually involved in the growth, or at least strongly compressed; but paralysis—especially motor paralysis—dependent upon the pressure of a tumor, is quite rare. Disturbances of sensibility are more often observed, though at times of but slight degree. I would remind you here of the appearance of paralysis in the functions of the vagus nerve, which occur, in connection with goitre and with cancers of the thyroid gland.

Further, do not forget to settle the relations of tumors with *neighboring cavities*. With tumors of joints this is easily done: it is more difficult, and errors are more hazardous, in tumors of the abdominal wall, of the

<sup>1</sup> Correspondenzblatt f. schweizer Aertzte, 1872, No. 3.

pelvis, of the rectum, and of the bony chest wall. Such errors have been fatal in tumors of the skull, especially in cysts, which may be confounded with hernia cerebri, also with cancers of the upper jaw and of the orbital and nasal cavities, which often destroy the base of the skull, and expose the brain.

We have here, indeed, overstepped the boundaries of tactile examination, and a part of the above-mentioned relations can be recognized only through the occurrence of certain functional disturbances, and from the testimony of the subjective sensation of the patient.

On the other hand, however, the bounds of tactile examination must be stretched still further, and you must not be satisfied with feeling of the tumor from without, but must, when necessary, also examine through the natural cavities of the body; and the method devised by Professor *Simon* for the examination of the lower part of the abdominal cavity from the rectum is of great importance in the diagnosis of tumors.

We can, finally, in a wider sense, reckon catheterization as part of the tactile investigation, as we can, through it, ascertain the relations of tumors to the bladder and urethra.

Here, too, belongs the acupuncture,—the examination of the tumor with a longer or shorter needle. We shall ordinarily not use this method to ascertain the

consistence of a tumor, but to acquaint ourselves with its limits on sides not accessible to the finger, and in this direction it can yield us valuable results: we can especially determine the bounds of the destruction of a bone by a tumor pressing upon it. In the application of the acupuncture you must use great care, if you explore towards cavities of the body, especially towards the brain, or if large vessels could be injured.

It is hardly necessary to again remind you that all the lymph-glands near tumors must be carefully examined.

*Auscultation and percussion* are of value in many cases. In connection with the first, remember what has been said about the pulsation of tumors: the latter I would add to the methods of examination of the cavities of the body, where it can help us determine the boundaries of a tumor: moreover, the diagnosis between herniæ and tumors is much assisted by the use of percussion.

I will remind you here, also, that the ophthalmoscope and laryngoscope are invaluable for the investigation of tumors affecting these parts; and with these we close our list of the means of examining tumors which can be gained through our senses and the physical methods at our service.

One further method, nearly allied to acupuncture, which is in a certain sense an operative procedure, is

the so-called akeidopeirastie. We understand by this a method by which we obtain from the deep parts of a tumor a piece for microscopical examination. This should be done with a little trocart-like instrument. Of these, the harpoon of Middeldorpf is best known. Although this proceeding seems so rational, it has practically come but little into use; for, in the first place, with ulcerated tumors, if it seems necessary, we can obtain a piece more easily with the scissors or knife. Further, hard tumors and those with hard shells must naturally be left aside; and, finally, it is rarely possible to make a sure microscopical diagnosis from the fragment obtained, since the harpoon generally brings out only uncharacteristic tissues, such as connective tissue, fibres, and broken-down cells. The microscopical diagnosis frequently offers difficulties when we make sections from a tumor after its removal: how uncertain, is, then, the diagnosis from a scrap of tissue obtained at random! I believe, therefore, that it will not be worth your while to obtain a special instrument for this purpose.

Allow me, in closing, to again repeat connectedly the course which I advise you to pursue in the diagnosis of tumors, adding something perhaps here and there.

After you have convinced yourselves of the presence of a tumor, and have immediately directed your

thoughts to the tumors especially apt to occur in that locality, you will first make your ocular inspection, and then proceed to the manual manipulations, and to the testing of the translucency, consistence, and so forth. When you have applied all the means of physical diagnosis, you examine the subjective symptoms of the patient, and finally investigate the etiology. *Heredity* occupies here the first place, and deserves a short consideration, although our knowledge on this point is not very far advanced: we only know that inheritance through several generations has been observed, especially in the cancers, and every experienced surgeon will know of cases in his own practice where parents and children were afflicted with carcinoma.

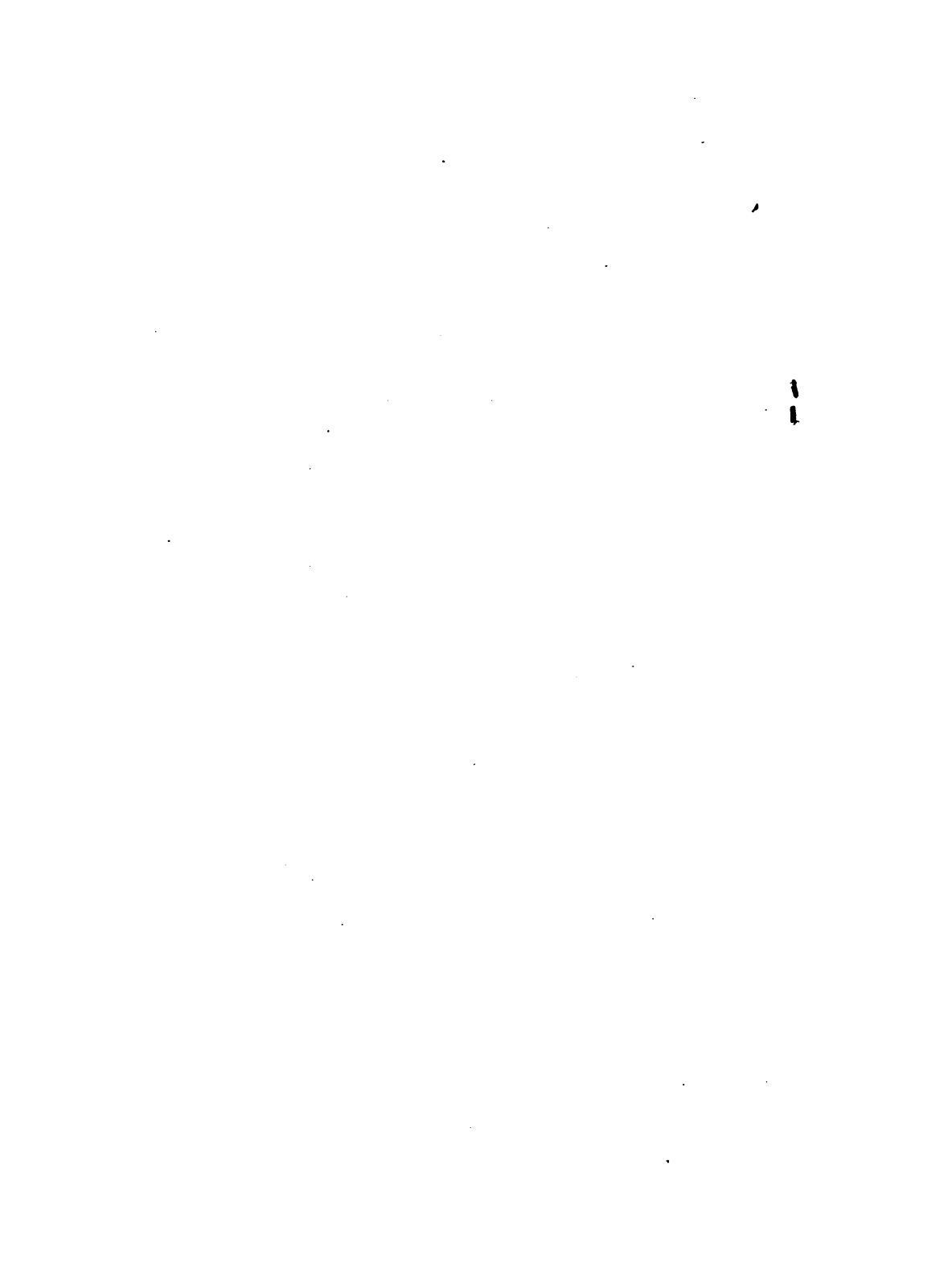
Of the heredity of sarcoma we know nothing. The chondromas, osteomas, and neuromas are oftenest inherited. We shall not be able, then, to obtain much assistance in diagnosis from heredity. The age of the patient is, as you know, of importance, and also the course and method of development of the tumor. You will often meet the statement of patients, that a tumor followed this or that injury. I certainly believe we have every reason for pushing the investigation of the local irritations which give rise to tumors. They belong to the most important etiological forces in the development of tumors. For diagnosis, they cannot be used by us as they would be, if definite irritations gave

rise to definite forms of tumor, which is by no means the case. Irritations acting but once, such as a thrust or blow, as well as continuous irritations, like pressure, friction, and the action of secretions, are assigned as causes for the most various benignant and malignant tumors. The tissue which is irritated will, in accordance with a wider general predisposition, give rise to the form of tumor which it can by its nature originate.

Herewith, gentlemen, I believe that I have laid before you as fully as possible the outlines of a general diagnosis of tumors from the surgical stand-point. I am aware that I could, perhaps, have spoken of the recognition of secondary tumors in the inner organs; here, however, your knowledge of the diagnosis of diseases of the internal organs must come to your rescue. This investigation is of importance, because, if we are sure of the existence of such secondary tumors, surgical interference must generally be given up.

A diagnosis of a tumor based on sure principles will make the decision for a capital operation easier, and will make it less difficult for you to decide in unsuitable cases to abstain from interference,—a decision so sad to a surgeon.





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