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EXERCISES
IN
EQUINE SURGERY

BY

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TRANSLATED BY

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FORMERLY VETERINARIAN IN THE FLORIDA AGRICULTURAL COLLEGE AND
EXPERIMENT STATION, VETERINARIAN TO PURDUE UNIVERSITY
AND AGRICULTURAL EXPERIMENT STATION

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AUTHOR'S PREFACE.

At the Alfort Veterinary School, the exercises in equine surgery are given during the scholastic year, on Monday of each week from half past six in the morning to five in the evening. All operations are made upon the cadaver except those made upon the animal while in a state of anæsthesia secured by an intravenous injection of chloral hydrate. Nevertheless, in order to broaden the field of application of the rules here presented, we have looked upon a great many as if they were being effected for a therapeutic object and upon the horse as being able to give those reactions which are to be met with in practice.

Most of the figures are from the crayon of M. G. Nicolet and taken from the *Traité de Thérapeutique chirurgicale des animaux domestiques*, which we are publishing with M. Almny, assistant professor at the Alfort Veterinary School, and have been drawn from the collection of photographs gathered by the pupils connected with the laboratory of clinical surgery.

P. J. CADIOT.

PREFACE.

When "*Exercices de Chirurgie Hippique*" was published I obtained, while abroad last summer, authorization from Prof. P. J. CADIOT to render it into English.

Upon my return to the United States, however, I was informed a translation had already been prepared by Prof. A. W. BITTING, as the subject of his thesis previous to his graduation from the Veterinary Department of the Iowa State College (Ames, Iowa).

To Prof. BITTING, therefore, belongs the principal credit of the work, to which I have only contributed some corrections and additions, as suggested by the French author.

Though many of the subjects treated already have their places in the various works on operative surgery, it is hoped that the special processes used for some operations at the world-renowned French School of Veterinary Medicine, as presented in this little work, will not fail to prove of some value and advantage to American and English veterinary students, as well as to practitioners.

A. LIAUTARD.



EXERCISES

IN

EQUINE SURGERY.

RESTRAINT.

I.—Restraint of the Horse in a Standing Position.

Pass the lead strap through the mouth, and around the lower jaw; apply a twitch to the superior lip; raise a foot

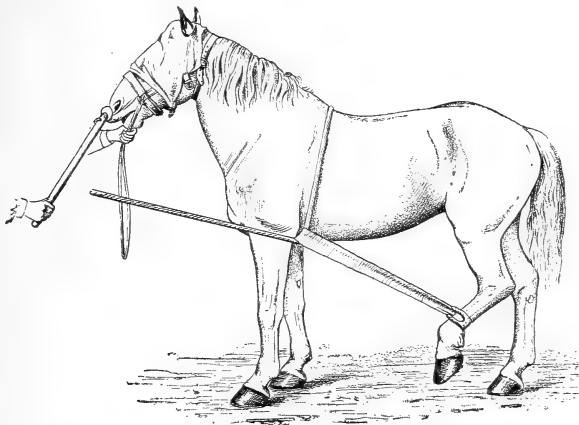


Fig. 1—Posterior limb raised and carried forward by means of a rope.

or bring a posterior member forward by means of a rope (fig. 1). Hobble both posterior limbs; pass the line between the

fore limbs, in front of the right shoulder over the withers, and to the left side; cross it and have it drawn forward by an assistant (fig. 2). With Le Goff's hobbles secure three

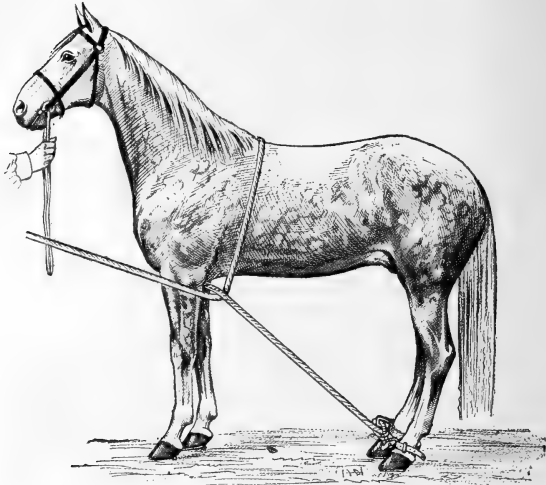


Fig. 2.—Restraint of the posterior limbs.

limbs, the two anterior and a posterior, if you operate upon the anterior part of the body, the neck, or the head; the two posterior and an anterior if you operate upon the hind quarters.

II.—Restraint of the Horse in the Recumbent Position.

To cast the animal, prepare a bed of straw upon the floor and have an assistant hold the head. Twitch or pass a strap through the mouth, and around the lower jaw. Raise a fore foot, and apply the hobbles to all the limbs, the buckles out-

side, the rings of the two anterior turned backward, those of the posterior turned forward, and the line lock on the anterior limb on the side opposite to that on which you wish him to lie. Pass the line through the ring of the hobble on the posterior limb corresponding to the raised foot, then

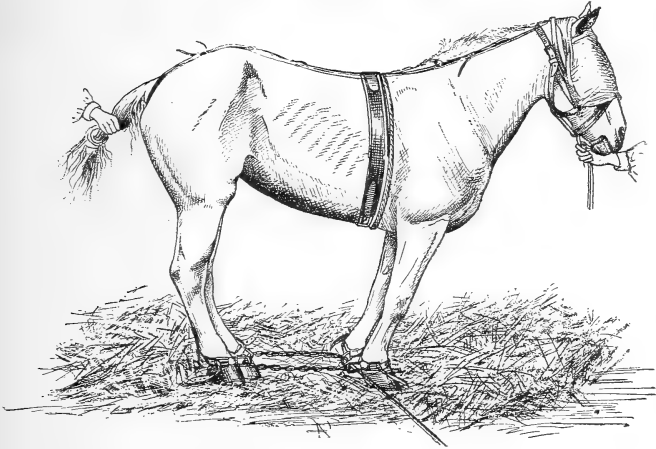


Fig. 3.—Casting the horse. Ordinary procedure.

successively through that on the other posterior limb, the opposite anterior limb, and finally through that to which it is fixed, and have it drawn moderately by the assistants. Throw a rope over the trunk, back of the withers, which is to be held by two assistants on the side on which the horse should fall. Another assistant seizes the tail, and is to act in the same manner as those holding the rope. Diminish as much as possible the base of support; bring the limbs together by making the horse back, or successively carry the two posterior limbs forward; when in this condition the hobble line should be gradually drawn (fig. 3). At a convenient signal there should be common action; the extremities are brought

together; the animal, feeling his danger, immediately bends



Fig. 4.—The right anterior limb is carried above the corresponding posterior.

the joints of the limbs, the traction exercised upon the trunk, tail, and head overcomes the equilibrium of the body. The



Fig. 5.—The right posterior limb is carried above the corresponding anterior.

horse should fall upon the bed, or rather lie on it, from hind

to front quarters, or in the reverse direction. Secure the line by a double knot, or by the hobble lock.

If you wish to displace an anterior limb and carry it over the superficial posterior limb, fix a rope to the canon of the first, pass it from above to below on the inferior part of the leg, then continue from the rear forward, from below to above the forearm of the displaced limb, and hold the rope in the direction of the withers after having unhobbled the limb (fig. 4). Secure it to the posterior by two turns crossed as an X, one turn horizontal and a circular turn.

If a posterior limb is to be secured above the anterior superficial, fasten a rope upon the canon of the first, pass it around the fore limb from above downward, at the inferior third of the forearm, then bring it back under the posterior limb, and draw perpendicular to the vertebral column, after having disengaged the extremity of the limb to be displaced (fig. 5). Another rope fixed above the knee will prevent the first from slipping.

GENERAL OPERATIONS.

I.—PHLEBOTOMY.

General Directions.—To puncture a vein, take a fleam, a straight bistoury, or a lance; assure yourself that the point of the instrument is in proper condition, well sharpened; if you bleed with a fleam, a bleeding stick is needed. Moisten and smooth the hair, or cut it with the scissors at the point where you wish to open the vessel. To arrest the hemorrhage, use a pin and some British thread; make a common ligature, the thread being preferable to a lock of hair.

Secure in a manner convenient for the operation; take the most favorable position to secure enlargement of the vein and protection from the animal's actions. The bleeding requires

only one essential step—the opening of the vessel. If there is failure the first time, give a second cut at the same point as the first, for the fleam may not have penetrated to the vein.

When the vessel is opened and in condition so that the blood flows, avoid displacement of the skin; if the two orifices, veinous and cutaneous, do not correspond, the bleeding will be irregular; you would have a thrombus. To close the vein, bring together the two cutaneous lips of the puncture, by exercising traction upon the skin, with the thumb and finger of the left hand, pierce them in the middle with a pin, make one ligature of thread with a straight knot, or of hair with the bleeding knot; cut the thread or hair a centimeter from the knot, and bend over the point of the pin.

1.—Bleeding from the Angularis.

Restraint.—Hold the head in line with the axis of the body, and cover the eye on the corresponding side.

TECHNIQUE.—The vein descends from the internal angle of the eye towards the extremity of the zygomatic spine; it is plainly noticed on a level of the fleshy portion of the supero-maxillo-labialis; it is there that one may puncture with a lance or straight bistoury.

When bleeding on the left side, compress the vein with the thumb of the left hand a little below the point to be opened; puncture from below upward with the other. On the right side, make the compression with the right thumb, and the puncture with the left hand.

2.—Bleeding from the Jugular.

Restraint.—Pass the lead strap through the mouth and around the lower jaw; extend the head and carefully carry it to the side opposite to that on which you wish to bleed; the assistant should cover the eye on the side corresponding with one of his hands.

TECHNIQUE.—Puncture the jugular at the union of the middle third with the superior third of the neck, using a fleam.

When bleeding on the left side, place yourself a little in front of the corresponding anterior member outside of the

limit of its movement; carry the left hand, armed with a fleam, in the jugular groove a little above the middle of the neck, compress the vein to provoke its distention by stasis; it is necessary to make slight movements with the hand parallel with the vessel, in order to clearly distinguish the sanguinous column by its undulations; the point of the fleam is placed exactly over the vessel; puncture it with the right hand by a stroke of the bleeding stick upon the instrument. When bleeding from the right side, hold the fleam with the right hand, and strike with the left. At the flow of blood, withdraw the instrument.

During the time of bleeding, continue the compression, in order to prevent the admission of air into the vein.

To arrest the hemorrhage, remove the pressure, and at the same time bring the lips of the wound together with the thumb and index finger; place one pin in their middle, a half-centimeter from the edges, after which complete the ligature.

3.—Bleeding from the Cephalic Vein.

Restraint.—Hold the head slightly to one side of the axis of the body; raise the anterior member on the opposite side to that on which you operate.

TECHNIQUE.—Search for the cephalic vein in the interstice which separates the arm from the forearm; it passes from the rear forward, over the superficial band of the coraco-radialis. An exploration of the region permits one to easily recognize the situation of the vessel, even when it is not very apparent. It is useless to try to provoke distention, as the blood will pass by way of the basilic vein.

With the fleam puncture the vein over the region of the superficial band of the radialis or immediately within it. When operating on the left side, take a position near the corresponding anterior member; the right hand holds the fleam; it finds a point of support upon the inferior part of the mastoido-humeralis, towards the middle of the antero-external face of the arm; the point of the instrument is placed over the axis of the vessel, or a little obliquely; the left hand strikes a light blow upon the handle. When

operating upon the right side, hold the fleam with the left hand, and strike with the other.

Arrest hemorrhage as in the jugular operation.

If the blow with the bleeding stick has been given strongly, and the vein transpierced, a voluminous thrombus is the result.

4.—Bleeding from the Subcutaneous of the Forearm.

Restraint.—The same directions as for phlebotomy of the cephalic vein.

TECHNIQUE.—Open the vessel with the lance or straight bistoury. When operating upon the left, place yourself facing the member; provoke distention of the vein by compression a little above the point where you wish to operate, using the thumb of the left hand, the other fingers being applied upon the extensors of the foot; puncture quickly from below upwards with the left hand. If you operate on the right, compress the vessel with the left hand and open it with the other.

Arrest hemorrhage as in the jugular.

5.—Bleeding from the Subcutaneous Thoracic Vein.

Restraint.—Hold the head in line with the axis of the body, raise the fore foot on the side opposite to that on which the vessel is to be opened.

TECHNIQUE.—The subcutaneous vein of the thorax is easily seen in its anterior portion, to the rear and a little above the elbow. Puncture it at a hand's-breadth from the elbow, *opposite an inter-costal space.*

When bleeding from the left, place yourself against the corresponding anterior limb, back turned toward the head, the right hand armed with a fleam held horizontally; compress the vessel immediately back of the extensors of the forearm; the left hand carried vertically gives a slight blow upon the instrument with the bleeding stick. To puncture the right vein, hold the fleam with the left hand and strike with the other.

If the bleeding is performed over a rib, the blade of the instrument is nearly always broken on the bone; the vein is transpierced; a large thrombus is the result.

6.—Bleeding from the Saphena.

Restraint.—The head is maintained nearly upon the median line; take a position in the rear or in front of the posterior limb opposite to the one on which phlebotomy is to be practiced.

TECHNIQUE.—With the fleam, puncture the vein over the flat side of the thigh. There are two methods:

Bleeding at the Left Saphena.—1. Hold the right posterior limb backward; instruct the assistant to hold firmly as for an operation in shoeing; take a position below the right flank, the knees flexed; the left hand, which holds the handle by its extremity, takes the superior part of the internal face of the leg as a point of support; avoid compressing the vein; the blade of the instrument is placed over the axis of the vessel, the right hand gives the stroke with the bleeding stick.

2. Hold the right posterior limb forward with a rope; take a position back of the left limb near the median line; the left hand holding the fleam (handle downward), take as a point of support the superior part of the flat side of the thigh (the region uncovered by the displacement of the right leg), and compress the vein; the right hand gives the stroke with the bleeding stick.

Bleeding at the Right Saphena.—The left posterior limb may be held securely backward; take a position under the left flank, hold the fleam in the right hand and strike with the other. If the limb is carried forward, take a position in the rear, hold the fleam in the right hand and strike with the left.

Arrest hemorrhage as in the preceding operations.

7.—Bleeding from the Toe.

Restraint.—Raise the foot on which you wish to operate. If the subject is irritable, apply a twitch to the upper lip.

TECHNIQUE.—Pare the plantar region, thinning the sole thoroughly at the anterior part; hollow out the toe, and cut a groove in the commissural zone; then, either with the point of a sage knife, or of a bistoury—the back of the instrument turned towards the heel—or a narrow drawing knife, section the tegumentary membrane and the arch of the vascular circumflex at the bottom of the groove.

If the hemorrhage persists too long, arrest by a compress bandage.

8.—Bleeding from the Palate.

Restraint.—Open the jaws with a speculum, apply a twitch, or simply hold the head moderately elevated.

TECHNIQUE.—Be sure to puncture the network of sub-mucous veins opposite the fifth or sixth palatine groove. (The anastomosis of the palatine artery corresponds very nearly to the third groove.)

With the left hand the tongue is seized and drawn out of the mouth through the interdental space, and is held immovable. With the bistoury carried into the mouth, point upward, cutting edge forward, make a deep incision of half a centimeter in the median line of the palate; prolong the incision to a centimeter in length.

If the hemorrhage does not cease spontaneously, take a splint fifteen centimeters long, roll linen about it in such a manner as to form a mat compress, apply this transversely upon the palate, on a level with the wound, then fix it in position by two bands tied to the extremities of the cross piece and to the nose-band of the halter.

II.—ANAESTHESIA.

Intravenous Injection of Chloral Hydrate.

Restraint.—Cast the animal on the side opposite to that on which you operate; hold the head extended upon the neck.

Instruments.—Scissors, capillary trocar, apparatus of Dieulafoy, solution of chloral of one to three (1:3).

TECHNIQUE.—Operate at the point where bleeding is usually practiced; take a position in front of the neck; clip the hair. An assistant should compress the vein at the inferior portion of the neck. The skin is stretched by exercising a little traction towards the head; with the left hand, if operating on the left side, with the other if operating on the right, puncture the vein with a single thrust of the trocar held obliquely downward and backwards, the point exactly placed on the vessel. The puncture may also be made by two steps: first penetrate the skin, then the wall of the vein. The trocar is withdrawn from the canula; the blood flows in a jet from the canula, if its extremity is well in the vein. Cease exercising compressor.

upon the vessel at the inferior part of the neck. An assistant holds the canula inclined upon the neck well secured.

Introduce into the canula the adjustment connecting the rubber tube, work the cock corresponding, and slowly push into the vein the quantity of chloral necessary for anesthesia (30 to 40 grams, depending upon the size of the subject). (Nocard.)

Remove the canula, wash off the small quantity of blood that proceeds from the opening; after withdrawing, avoid raising the skin.

III.—SETONS.

Tape setons and *rowel setons* are used. For the first, a subcutaneous course of variable length is made, in which is passed a band or ribbon. In the other, a ring, or a piece of leather made into a circle, is introduced beneath the bare skin.

The majority of the operations are very painful, provoke a lively resistance and necessitate a careful restraint (hobbles, ropes) if the animal is not given an anaesthetic.

A.—Setons of Tape.

General Rules.—Use the seton needle, scissors and convex bistoury and the tape. Take a tape 60 to 80 centimeters in length; at one of its extremities fold it several times in such a manner as to make a knot of five centimeters. The course for the seton should be made in the subcutaneous connective tissue, in general following the direction of the hair. The length determined, at its extremities, make two incisions of two and half to three centimeters in the body of the seton. Afterwards take the needle, seize it near the blade, the index along one of its faces, preferably the concave; introduce it into the first incision, engage it in the connective tissue, push it forward, holding the instrument in the full hand, the index always extended upon the handle near the cutaneous opening; with the free hand raise the skin in front of the point of the instrument, either in folds or by exercising traction upon the hair.

Avoid puncturing the skin or the muscles beneath. Direct the instrument toward the second incision. Arriving at this point, direct the blade outward, engage the end of the tape in the eye, and withdraw the instrument; the seton is in place. It only remains to disengage the end of the tape from the eye of the needle and make a knot resembling that on the other end. Do not tie the two extremities of the tape; it is bad practice.

The operation can be made with the seton needle alone. Hold it as has already been directed; the needle is introduced at the base of a cutaneous fold, which is held transversely to its direction by the thumb and index finger of the free hand. By an energetic thrust, cause it to penetrate the skin and implant it in the subcutaneous connective tissue, where you make the course afterward. The course is completed and the needle brought out by a quick movement after having inclined it in such a way that its point is directed towards the skin, using the scissors as a point of support in front of and below the point of the needle. The manner of passing and fixing the tape is the same as in the first procedure.

More often a single incision is made—that which permits the introduction of the needle—and, the hollow course, the opening from it being made in passing towards the skin.

With the seton needle, having an eye in the heel, one can pass the tape introduced in that orifice and draw out the needle by its blade; but the other method is preferable.

1.—Seton in the Breast.

Restraint.—Twitch the superior lip; raise the posterior limb on the same side on which you wish to operate, or hobble the anterior limb of the same side, or apply the hobbles of LeGoff.

TECHNIQUE.—If only one seton is to be inserted, pass it over the median line from the anterior part of the sternum to the region of the passage of the girth.

If two are used, pass them on each side of that line, within the cephalic vein, at some distance from the limbs, over the median portion of the enlargement of the sterno-humeral muscle, even to the passage of the girth, and cause them to slightly converge backward.

Place yourself a little in front of the right fore limb (hobbled). Instead of implanting the needle in the skin at first, it is preferable to make a short incision parallel to the seton. Take the needle in the right hand; with the other lift the skin to favor the progression of the instrument; arriving at the point where it is to come out, the blade is passed toward the skin, while the scissors, held in the left hand, are applied strongly against it. Always proceed in this manner if only one seton is placed. If two are used, you may pass each without changing position, remaining in front of the right limb; you may also, in order to pass the seton on the left side, take a position in front of the corresponding member, after having hobbled it.

2.—Seton in the Neck.

Restraint.—Twitch; hobble both fore limbs.

TECHNIQUE.—Insert at the anterior part of the neck, in a vertical direction or slightly oblique upward and forward, two parallel setons at a distance of about ten centimeters from each other. Make two small incisions through the hair on the side of the neck, over the enlargement formed by the mastoido-humeral muscle, and a little above the jugular groove. If operating upon the left side, hold the needle in the right hand, pass it from below upward in the direction which has been indicated, and make the opening three fingers' breadth from the mane; press over the skin in front of the point with the scissors; pass the tape and withdraw the instrument.

When operating upon the right side, manipulate the needle with the left hand.

3.—Seton in the Jaw.

Restraint.—Twitch; raise an anterior limb.

TECHNIQUE.—Upon the flat side of the jaw, at a hand's breadth from the posterior border of the maxilla and from the zygomatic crest, make a short incision in the direction of the hair. If operating upon the left side, hold the needle in the right hand, pass it parallel to the crest and make the

opening several centimeters in front of its extremity. Pass the tape and withdraw the instrument.

If the operation is made upon the right, manipulate the needle with the left hand.

4.—Seton in the Shoulder.

Restraint.—Twitch the upper lip; hobble both fore limbs, or raise the anterior limb on the side opposite that on which you wish to operate.

TECHNIQUE.—Apply two setons, the one in front of the scapulo-humeral articulation, the other on the external side of the joint. Place yourself in profile near the limb, back turned toward the rear.

If the seton is to be placed in the left shoulder, manipulate the needle with the right hand. Pass the anterior seton in two steps. Make an incision of three centimeters through the skin in front of the articulation; introduce the needle, passing downward and backward, in the subcutaneous connective tissue of the arm, along its anterior face, and bring the blade out with the assistance of the scissors at fifteen centimeters from the incision. Insert the tape and withdraw the instrument. Then, at the limit of the inferior third and of the middle third of the cervical border of the shoulder, make a new incision; introduce the blade of the instrument and pass it downward and forward towards the first incision; bring the blade out, insert in its eye the superior end of the tape and withdraw the needle.

The posterior seton requires only one step. Ten centimeters above the articulation, and a little back of the first seton, make one incision; introduce the needle, make it traverse vertically to just ten centimeters below the joint; perforate the skin at this point with the assistance of the scissors, insert the tape in the needle, and withdraw it.

In the operation upon the right shoulder, manipulate the needle with the left hand.

5.—Seton over the Ribs.

Restraint.—Twitch the upper lip; hobble both anterior limbs, or hobble the one on the side opposite that on which you operate.

TECHNIQUE.—Pass two setons upon each of the thoracic walls, one ten to fifteen centimeters behind the posterior border of the extensor muscles of the forearm, the other eight to ten centimeters posterior to the first; they should extend from above to a little below the middle third of the thorax. Do not prolong them beyond the spur vein. Give them a vertical disposition over the fleshy portion; pass them along an intercostal space over the lean flesh.

If you operate on the left side, place yourself on a line with the anterior limb, the back turned toward the animal's head; make two small vertical incisions in the skin at the superior part of the costal region near the border of the ilio-spinalis, one for each seton.

Hold the needle in the left hand, insert it in the first incision, and make it penetrate under the skin of the costal wall, point outward, to within a few centimeters of the spur vein; with the assistance of the scissors make an opening at this point; insert the tape in the eye of the blade, and pass it through the course by withdrawing the instrument. Manipulate in like manner for the seton in the other side.

When operating on the right side, assume a position on a line of the corresponding anterior limb, and hold the needle in the right hand.

6.—Seton in the Haunch.

Restraint.—Twitch the superior lip; hobble both posterior limbs.

TECHNIQUE.—Pass two setons vertically on a level with the coxo-femoral articulation from eight to ten centimeters from each other—one in front, the other behind the joint. Give them a length of about thirty centimeters.

Take a position a little in front of the limb, and make two short vertical incisions at the same height and ten to fifteen centimeters above the articulation. If operating upon the left, hold the needle in the left hand; introduce it into the first incision, pass it vertically or a little obliquely backward, and pierce the skin ten to fifteen centimeters below the articulation. Insert the tape and withdraw the instrument. Proceed in the same manner for the other side.

To operate upon the right haunch, manipulate the needle with the right hand.

In case the deep muscles are badly atrophied and the enlargement of the articulation very pronounced, make the incisions on a level with the articulation, and operate by two steps, as for the anterior seton of the shoulder.

7.—Seton in the Buttock.

Restraint.—Twitch the upper lip; hobble both posterior limbs; the line is passed between the anterior limb, continued over the withers, crossed and held by an assistant.

TECHNIQUE.—Pass a single seton in the rear of the buttock. Take a position against the member, the back turned towards the animal's head; make a short vertical incision in the superior part of that region, immediately below the enlargement formed by the ischiatic tuberosity. If you operate on the left side, hold the needle in the left hand, pass it in a slightly oblique direction downward and inward, just to the superior part of the leg; bring out the blade at this point, insert the tape and withdraw the instrument.

When operating on the right side, take a position against the corresponding member, and hold the needle in the right hand.

8.—Seton in the Stifle.

Restraint.—Cast the animal upon the side opposite to that on which it is desired to operate. Carry the limb forward in extension with a rope fixed above the hoof or upon the canon.

TECHNIQUE.—The seton, which should be twenty or thirty centimeters in length, is passed in front of the stifle. The great mobility of the skin which covers the patellar articulation renders it necessary, if one would place the seton exactly on a level with it, to mark the limits before the animal is cast, in order to make the two incisions for the entrance and exit of the needle; the first, ten to fifteen centimeters above the center of the joint; the second, ten to fifteen centimeters below the joint. If you operate upon the left limb, hold the needle in the right hand, point towards the skin; insert it into the superior incision and direct it towards the other, and be

careful to avoid wounding the synovial capsule. If you operate upon the right stifle, hold the needle in the left hand.

9.—Ventral Seton.

Restraint.—Twitch; hobble both posterior limbs; raise the left fore limb. If the subject is very irritable, operate upon the animal cast upon the right side.

TECHNIQUE.—If the operation is made in the standing position, place yourself in the rear of the right fore limb, the knees bent. Even with the the xiphoid appendix and upon the median line, make a transverse fold of skin, incise it, hold the needle solidly in the right hand, *point outwards*, introduce it in the connective tissue and pass it along the *linea alba* ten centimeters of the sheath in the horse, or to the *mammae* of the mare: make it come through at this point with the assistance of the scissors; insert the tape and withdraw the instrument.

If you operate upon the animal lying upon the right side, manipulate the needle with the right hand.

B.—Rowel Seton.

The rowel seton is applied on a level with the superior articulation of the limbs, notably those of the shoulder and haunch.

Instruments.—Convex bistoury, curved scissors, ring of hair or rubber six to seven centimeters in diameter.

TECHNIQUE.—With the convex bistoury make an incision of three or four centimeters on a level with the articulation; with the curved scissors detach the skin from a circular surface, within the incision from the inferior radius. Introduce the leather or rubber ring, after having folded it twice. Unfold it within the cavity.

IV.—LIGATION OF VESSELS.

Instruments.—Scissors, convex and straight bistouries, dissecting and hemostatic forceps, director, British silk thread, cat-gut or linen tape, Deschamp or Cooper needles, and a needle to suture.

General Directions.—The operation consists of three steps: 1st, incision of the tissue which covers the vessel; 2nd, isolation of the vessel for a centimeter by use of the dissecting forceps, bistoury, and probe director; 3rd, application of the band.

If the thread is absorbable (cat-gut), the ends are cut near the knot; if linen or silk thread is used, one of the ends should be cut near the knot, the other remaining outside of the wound, serving to remove the ligature when it becomes free. In general, wounds of the veins require only one ligature; they should be made beyond the wound or upon the periphery. For arteries, two ligatures are ordinarily applied; one above the wound, the other below.

1.—Ligation of the Jugular.

Restraint.—Cast the animal on the side opposite to that on which you wish to operate; extend the head upon the neck; twitch the upper lip.

TECHNIQUE.—Operate at the superior part of the jugular groove, a little below the point where the vein receives the glosso-facial. Clip the hair, make a cutaneous incision of four or five centimeters over the axis of the vessel and dissect the underlying connective and muscular tissues. With the point of the director lacerate the perivenous cellular tissue along the line of incision; make the exposure of the vein, detaching it from the adjacent tissue by always moving the point of the director parallel with the vessel.

Pass a double British thread or linen tape under the vein; draw the ligature tightly and secure it by a straight knot. Cut one of the ends close to the knot, preserve several centimeters of the other and let it extend outside.

Unite the lips of the cutaneous wound at two points by sutures.

2.—Ligature of the Glosso-facial Artery.

Restraint.—Twitch; raise the anterior limb on the side opposite to that on which you operate.

TECHNIQUE.—It is easy to see the artery upon the cheek along the anterior border of the masseter, in front of the vein

and Steno's duct. Make an incision of three centimeters along the line of the vessel; divide the skin, cutaneous muscle and cellular tissue; with the director isolate the artery, slip a thread under it and tie.

3.—Ligature of the Carotid.

Restraint.—Twitch; raise the fore limb on the side opposite to that on which you wish to operate, or hobble both limbs.

TECHNIQUE.—Clip the hair; make an incision of six centimeters intersecting the skin, adjacent muscular, connective and subcutaneous tissues, in the jugular groove immediately above the vein. With the thumb of the left hand introduced into the wound, push aside the anterior lip, and at the same time displace the jugular vein; afterwards section the sub-scapulo-hyoidean muscle, and lay down the bistoury. With the index finger lacerate the pericarotidean connective tissue, seize the artery (fig. 19), and compress it on a level with the opening, separate the inferior laryngeal nerve which is joined to it in front, then the cord formed by the great sympathetic and pneumogastric which lies upon its posterior face.

If the artery is simply opened, have it held by an assistant, who compresses it between the thumb and index finger on a level with the perforation; apply the first ligature below the wound and the other above.

When the vessel has been completely sectioned, prolong the incision above and below, exposing the two ends and ligate successively.

4.—Ligature of the Intercostal Arteries.

Restraint.—Twitch; raise the anterior member on the side opposite to that on which you wish to operate.

TECHNIQUE.—The intercostal arteries lie at full length in the fissure along the posterior border of the ribs, and are in front of the corresponding nerves. When arterial blood escapes from a wound in the intercostal space, it is the artery of the anterior rib that is wounded.

Make a cutaneous incision from three to four centimeters in length along the posterior border of the rib, divide the subcutaneous layers and the external intercostal muscle; with

the point of the director or of a bistoury, separate the artery from the connective tissue, which surrounds it, pass the thread under it and bind tightly. If the vessel is cut, seize the superior end and ligate it.

5.—Ligature of the Saphena Artery.

Restraint.—As for phlebotomy of the saphena vein; or throw the animal on the same side as the leg to be operated upon, carrying and securing the opposite hind leg forward with a rope.

TECHNIQUE.—With a cut of the bistoury, divide the skin parallel to the saphena vein. Isolate the artery with the director, slip a thread below it and tie. If it is severed, prolong the incision upward, seize the end with the forceps and afterwards make the ligature.

6.—Ligature of the Plantar Artery.

Restraint.—The same situation as for plantar neurotomies, high or low, according as it is practiced above or below the fetlock. (Figs. 49 and 50.)

TECHNIQUE.—Make a cutaneous incision of three centimeters on a line with the vessel. Divide with precaution the subcutaneous connective tissue, the sheath or aponeurosis of the plantar cushion, according to the place at which you operate. The artery is exposed; isolate with the director and make an ordinary ligature.

V.—SUTURES.

General Directions.—Clip the hair upon the lips of the wound, cleanse it, bring the edges together with the fingers, and use that suture which is most convenient.

In incised wounds in which the tissue is not destroyed and the edges are clean, union is easy; where the wound is of irregular nature, sutures should only be taken with certain precautions. In general, such incised wounds may be corrected; if the flaps are stretched, the first suture should be near the center of the lips.

When the wound is irregular, sinuous or angular, begin by taking the stitches on a line with the most elevated part, or the angles. Penetrate the lip obliquely, supporting it with

the forceps where the needle penetrates from without to within, pressing upon the other with the thumb and index finger of the free hand on each side of the point where the needle should come through. The stitches should be placed at regular intervals; those which pass through the lips at the same depth should penetrate at an equal distance from the edge of the wound; if you employ deep sutures, make the points of entrance and exit of the needle farther from the edges of the lips. Pass all the threads first, afterwards commence by tying those in the middle or those at the angles, and place the knots as far as possible from the wound over the upper lip. In tying the threads avoid equally insufficient tension which permits the lips to gape, or an excessive tension which provokes tearing.

1.—Interrupted Suture.

Ordinary curved needles or Reverdin needles; linen or silk thread.

TECHNIQUE.—Prepare as many threads as you wish to make points of suture. If you use an ordinary needle, pass the first thread through its eye, pierce one of the edges of the wound from without to within, and the other from within to without. Use the same procedure with the other threads. You may also use only one needle and a long thread. Pass it in the lips of the wound, cut it with the scissors, leaving sufficient ends to make the first suture. Proceed in like manner for the other sutures.

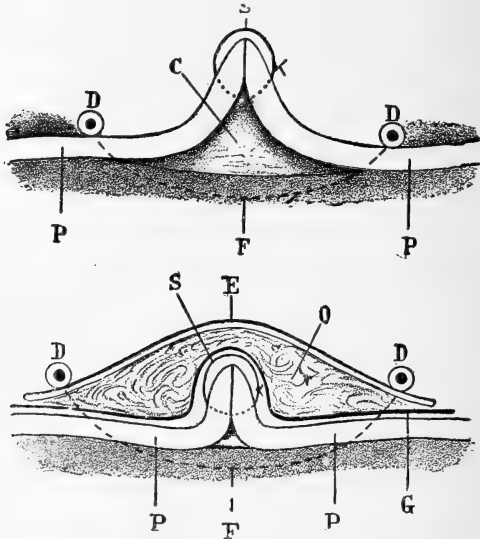
If you use a Reverdin needle, penetrate one of the lips from without to within, the other from within to without; slip the thread in the eye and pass it through the lips of the wound in withdrawing the needle.

2.—Continuous Suture.

Ordinary curved needle and linen or silk thread.

TECHNIQUE.—Thread the needle with a thread sufficiently long to make all the stitches, and terminate with a rosette knot. Pass through the lips a little obliquely at one of the extremities of the wound, the first lip from without to within, and the other from within to without; implant the needle

again into the first lip at the same distance from its edge as the first stitch, and about a centimeter from it; make the exit in the opposite lip on a line in an oblique course parallel to the first. Continue this to the other end of the wound. Secure the thread by a rosette knot.



Figs. 6 and 7.—Bayer's Suture.*

S, suture; C, traumatic cavity; F, deep thread; DD, quills; G, gauze; O, wadding; PP, skin; E, splint.

3.—Twisted Suture.

Long steel pins with flat heads, linen thread.

TECHNIQUE.—The lips are brought face to face, insert a pin perpendicular to the wound three millimeters from the edges,

* Bayer, *Lehrbuch der Veterinär Chirurgie*. Wien, 1890.

through the first lip from without to within, and through the other from within to without. In the same manner pass other pins at intervals of about a centimeter. Engage a loop of the thread under both ends of the first pin; carry the ends of the thread toward opposite ends of the pin, crossing it above the wound; pass it again under the pin in such a manner as to form a figure 8; repeat three or four times, then unite the ends by a straight knot or a rosette.

Apply a similar ligature to all the pins. Cut them near the stitches.

4.—Quilled Suture.

Ordinary curved needle with large eye, silk or linen thread; wooden pins, red rubber tube or small gauze cylinder.

TECHNIQUE.—With a needle and double thread pierce the lips of the wound as in the discontinuous suture. Repeat for the other stitches. Upon one of the lips of the wound their extremities are disposed as loops. Slip the wooden pin, rubber tube or roll of gauze in these loops, draw the other ends of the thread to fix the first end; after having divided them, tie them against a similar pin until they are firm.

5.—Dossil Suture.

(a) *First Procedure*.—A curved needle with a thread having a ball of wadding or a small roll of tape or gauze attached to one end is needed.

TECHNIQUE.—With a needle and double thread pass from without to within through one of the lips of the wound at about a centimeter from its free edge; draw the thread so that the dossil is just against the skin. Pass a thread in the same manner at a point corresponding on the other lip. In this way make a certain number of stitches. Afterwards unite the corresponding threads quite firmly.

(b) *Second Procedure*.—Heilister needle, dossils of fifteen centimeters cut obliquely at one end, and bearing a knot at the other.

TECHNIQUE.—Pierce one of the lips of the wound from within to without with the needle, insert an end of the dossil in its eye and pass it by withdrawing the instrument. In the same manner pass the dossil in the other side at a point

corresponding to the first. Dispose four, six or eight in this manner, draw them tightly and tie over a roll of gauze.

6.—Bayer's Suture.

This is convenient for those wounds with uncovering of the skin where there is disruption of the subcutaneous tissue.

Instruments.—Needles and thread, drain, quills, gauze, wadding and splints.

TECHNIQUE.—Unite the lips of the wound by separate silk stitches, being careful to take a sufficiency of the skin along adjoining edges to bring the deeper structures together in such a manner as to produce a crest a centimeter and a half high (fig. 6). Fix a rubber drain at the inferior angle of the wound. On a level with its limits pass, deeply perpendicular to the cut, three double threads, and make a quilled suture. Cover the region of the operation with a layer of gauze, then a layer of wadding, and compress the whole by means of splints, the extremities being secured under the quills; the skin is then exactly secured on the subcutaneous tissue; there is no dead space (fig. 7).

VI.—CAUTERIZATION.

Instruments.—Ordinary cautery for lines or points, heated by charcoal, coke, or by means of a blast lamp; Paquelin's thermo-cautery, cautery of Paquelin de Place, or zoöcautery.

Restraint.—To cauterize the various regions of the trunk, and the external face of the limbs, the animal is restrained in the standing position, if not too irritable, by employing the twitch, raising a limb, or using the hobbles. To cauterize the two faces of one or more members, operate upon the animal while cast. If the cautery is applied to only one member, always begin on the internal face. If two limbs are to be operated upon, cauterize the internal face of one and the external face of the other. If two limbs are cauterized, operate upon the internal face of one and the external face of the other. When the horse is turned, it is important to take precautions to prevent bruising the external region already cauterized.

The limb to be operated upon should be immovable, well secured, and the region of the operation well exposed.

1.—Line Cauterization.

TECHNIQUE.—Use cauteries having the inferior edge regular, thin, not sharp; very gradually convex the greater part of its extent, curved most at its extremities (angles blunt). Before placing the hot cautery upon the part, brush with a file, or rub it upon a brick to remove the scales to prevent them attaching themselves by their sharp edges. After having clipped the hair, trace the lines with the cautery at a dull red heat. The lines should be a centimeter and a half apart, parallel, obliquely, or perpendicular to the direction of the hair. The surface cauterized should always be of greater extent than the diseased part.

If it permits of a series of lines in diverse directions and unequal extent, the lines should neither cross nor unite; all those of the same series should commence and stop a half centimeter from the first line of the neighboring series. The series of lines in different directions should not be uselessly multiplied; two or three are sufficient in all cases.

To complete the firing, use cauteries of a cherry red, never to a white heat; pass successively in all the lines of the same series, holding the instrument perpendicular to the skin, exercise only a gentle pressure upon the handle, and never go against the direction of the hair. When you take a hot cautery, pass it rapidly in the first series of lines, slacken the movement little by little as the instrument cools. Do not pass it twice successively in the same line with only a very brief interval; before reapplying the hot iron let the heat you have deposited radiate for a time in the subcutaneous tissue.

The three degrees of cauterization are characterized by the following signs:

First degree or light firing: Superficial grooves of yellowish brown color, and at the bottom may be seen several drops of serosity. *Second degree or ordinary firing*: Deeper grooves of yellowish gilt color, abundant serosity at the bottom and softening of the adjoining epidermis. *Third degree or severe firing*: Furrows are deep and the walls are of a pale yellow color; serosity is very abundant in the lines and drops upon the cutaneous bands which separate them.

For *light firing*, to proceed methodically, pass five or six times in the lines; for *ordinary firing*, eight to ten times, and for *severe firing*, twelve to fifteen times.

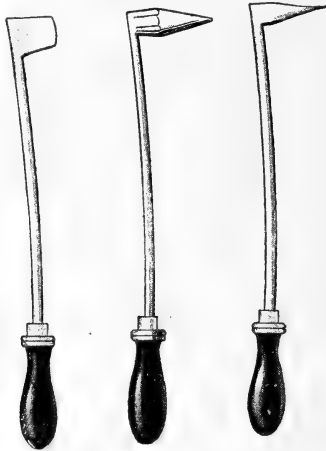


Fig. 8.—Cautery for lines.—Cautery for points.—Cautery for fine points.

2.—Cauterization in Superficial Points.

The operation may nearly always be made upon the animal while standing, with a twitch applied to the upper lip.

TECHNIQUE.—Select an olivary or conic blunt point cauterity about three millimeters in diameter (fig. 8); heat to a sombre red to mark the points, and to a cherry red to effect the cauterization.

Dispose the points in quincunx (fig. 9), that is, those of one row corresponding to the intervals of those of the adjacent row, at equal distance of a centimeter to a centimeter and a half from each other. Nevertheless, they may be brought closer together toward the center of the lesion to concentrate

the cauterie, and increase the space towards the periphery. Pass successively over the different rows of points, avoiding passing twice in succession in the same line. One gradually augments the duration of the application of the cautery to the same degree as it cools.

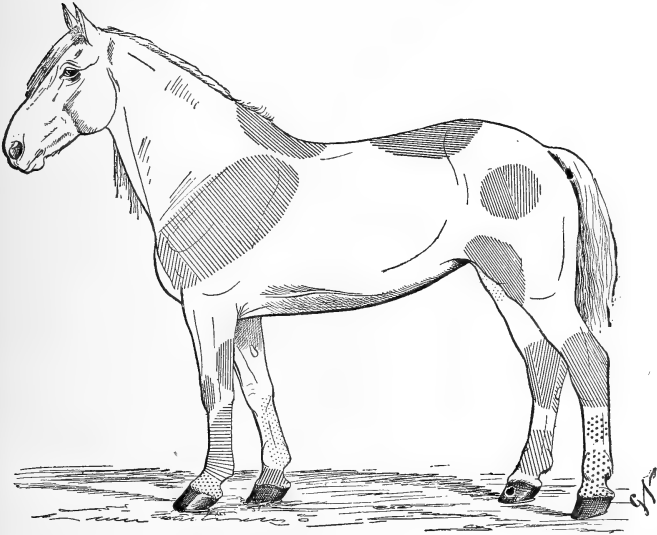


Fig. 9.—The principal regions where the cautery is ordinarily applied. Canon, fetlock, pastern, and coronet of the left posterior limb; fired in superficial points; pastern and coronet of the left anterior limb fired in fine points; tendon and stifle of the right limbs fired with the needle.

For the degree of firing the same signs are present as in line firing.

Apply the cautery five or six times for light firing, eight to ten for ordinary firing, and twelve to fifteen for severe firing.

3.—Firing in Fine Penetrating Points.

TECHNIQUE.—Use a cautery with a slender point two millimeters in diameter. (Fig. 8). The points are disposed alternately, having interspaces of eight to ten millimeters. Pass the cautery successively in the different rows of points, and exercise sufficient pressure upon the handle to penetrate the skin with two or three cuts of the cautery. The iron should not pass the deep subcutaneous tissue.

4.—Firing with Needles.

TECHNIQUE.—Use a cautery with a slender point two millimeters or more in diameter, or one of the instruments especially constructed for the purpose.

The points disposed alternately, should have interspaces of five to ten millimeters, depending upon the extent of the surface to be cauterized and the degree of firing. At the first cut, pierce the skin and make the instrument penetrate into the diseased tissue; fibrous, synovial, tendonous or osseous tissue. Pass one, two, or three times successively in the different rows of points. For the synovial, give only one application of the instrument.

5.—Sub-cutaneous Cauterization.

Instruments.—Convex bistoury, forceps, retractors, and point or button cautery. (Fig. 10.)



Fig. 10.—Button Cauteries.

TECHNIQUE.—*First step: Incision and laying back the skin.* Clip the hair with the scissors or destroy it on the surface with a cautery, make an incision of eight to ten centimeters in the

skin in a vertical direction, or in the direction of the hair. Dissect the skin on each side, exposing the underlying tissue for a sufficient extent; apply wet clothes over each of the lips and hold to one side by means of the retractors. (Fig. 11).

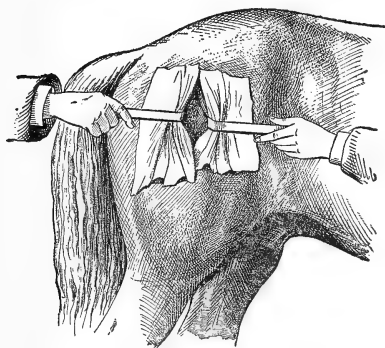


Fig. 11.—Subcutaneous Cauterization. (After Lanzillotti Buonsanti.)*

Second step: Application of the Cautery. Apply a certain number of superficial points of greater or less depth upon the naked subcutaneous tissue.

If you employ the button cautery (fig. 10), cauterize a thin layer of the tissue.

* Lanzillotti Buonsanti, *Trattato di Tecnica e Therapeutica chirurgica*. Milano, 1889.

NECK.—THORAX.—ABDOMEN.

I.—HYOVERTEBROTOMY.

Restraint.—Cast the subject on the side opposite to that on which the operation is to be performed. Hold the head moderately extended upon the neck after having removed the halter. (The operation may be practiced upon the animal standing, after placing a twitch upon the lower lip.)

Instruments.—Scissors, curved and straight bistouries, forceps, retractor, S sound, tape and drain.

TECHNIQUE.—*First step: Incision of the skin and dissection of the tissues which cover the guttural pouch.*—After having clipped the hair, make a cutaneous incision of three or four centimeters immediately in front of the atlas, at the middle third of the border of that bone.

The skin is gently drawn forward and downward in such manner that the superior angle of the incision corresponds to the tendon of the complexus minor; divide within the extent of the cutaneous wound, the sub-parotidean aponeurosis, and avoid wounding the gland and the auricular vein; if you come upon the branches of the first and second pair of cervical nerves, remove or divide them with the bistoury.

With a retractor, an assistant draws the anterior lip of the incision forward (skin, gland and aponeurosis). Insert the index, dorsal face outwards, under the aponeurosis, detach it from the subjacent planes (small oblique of the head, stylo-hyoidean muscle), execute lateral movements with the finger, pushing it *forward*.

As soon as the exposure is sufficient, the index perceives this point—in front, the enlarged portion of the great branch of the hyoid; in the rear, the styloid apophysis of the occipital; between the two, the muscular plane formed by the stylo-hyoidean and the digastric. (Fig. 12.)

Second step: Puncture.—Exercise sufficient traction upon the retractors to enlarge the wound and permit seeing to the

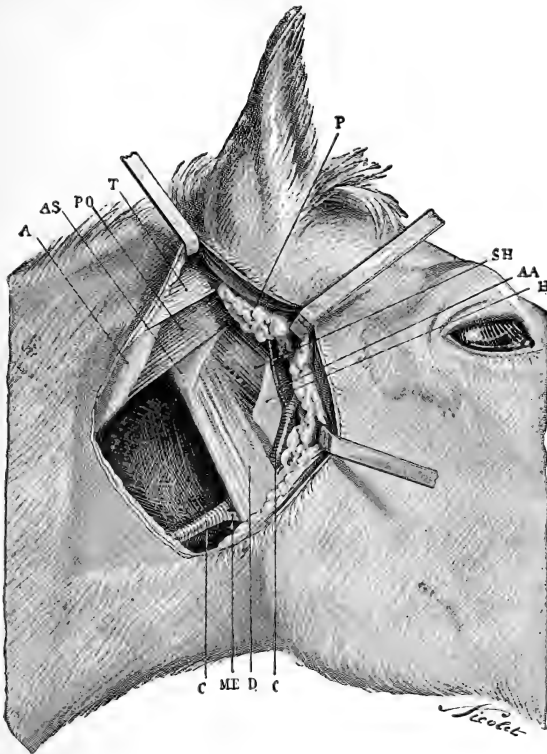


Fig. 12.—Hyovertebrotomy. Parotid Region.

P, parotid; **T**, tendon of the complexus minor; **A**, atlas; **P. O.**, small oblique of the head; **A. S.**, styloid process of the occipital; **H.**, great branch of the hyoid; **S. H.**, stylo-hyoidean muscle (occipito styloidean of Chauveau and Arloing, great kerato-hyoidean of Girard); **D.**, digastric muscle; **C. C.**, carotid artery; **M. E.**, external maxillary artery; **A. A.**, posterior auricular artery.

depth of the field of operation, particularly the fibers of the stylo-hyoidean, obliquely directed downward and forward. The deep face of this small muscle is covered by the mucous of the guttural pouch. Its center is a little above the postero-inferior angle of the branch of the hyoid, where the puncture should be made. Hold the bistoury in an oblique direction downward and forward, the cutting edge turned toward the commissure of the lips; carry it in the wound, the point applied to the center of the stylo-hyoidean muscle, the blade parallel to the fibers of that muscle; puncture it, make the blade penetrate a centimeter into the pouch and withdraw the instrument immediately. If the puncture is made too deep, one may strike the internal carotid or the branches of the neighboring nerves (spinal, pneumogastric, or superior cervical ganglion of the great sympathetic). If the cutting edge of the bistoury is directed upward, there is danger of wounding the facial nerve and posterior auricular artery; if turned downward, the external carotid is menaced. Engage the index finger in the puncture and enlarge it.

Third step: Counter Opening.—Introduce in the pouch one extremity of the S sound; carry the other extremity toward the ear in such manner as to give the instrument a direction nearly parallel with the parotid; then push it under the gland towards the inferior border; also make it penetrate the bottom of the guttural pouch, the sub-parotidean connective tissue, and carry the extremity to the inferior border of the gland, in the angle formed by the jugular and glosso-facial. When the extremity of the sound appears at this point, give it issue by making a short incision parallel to the inferior border of the parotid, in the skin and sub-cutaneous aponeurosis, raised by the instrument. In the same manner, gradually prolong it forward and pass the tape or the drain by withdrawing the instrument.

II.—TRACHAEOTOMY.

Restraint.—Avoid injury by the front feet. Twitch the upper lip; hobble both fore limbs (ordinary hobbles or Le-

Goff's hobbles), or restrain the animal in the traxis and fix the anterior members against the posts.

Instruments.—Curved scissors, convex and straight bistouries or sage knife (right) with a thin blade; anatomical forceps, three tenaculums, one of which is pointed, and a tracheotomy tube.

TECHNIQUE.—*First step: Incision and dissection of the tissues which cover the trachea.*—The head is held much elevated. Take a position in front of the subject; clip the hair for a length of ten centimeters over the anterior aspect of the neck at the limit of the middle and superior thirds. With the convex bistoury make a vertical incision of five or six centimeters in the skin. With a second cut of the bistoury separate the sterno-hyoidean and sterno-thyroidean muscles upon the median line; these muscles and the cutaneous lips should be divided by means of the tenaculums held by two assistants; the connective tissue which covers the anterior face of the trachea is raised with the forceps; divide it upon the median line, follow by two cuts with the bistoury given flatways, the one to the right, and the other to the left, detaching it from the trachea over the prominence of two rings; the connective laminae are included in the retractors and the rings to be cut are bare.

Second step: Extirpation of part of two tracheal rings.—Implant the sharp pointed tenaculum from left to right in the inter-annular ligament; hold it with the left hand. To the left of the hook and near to it, make a puncture with the straight bistoury or the sage knife; with the cutting edge, near the point, by a saw-like movement, divide from left to right the superior ring, making the incision semi-elliptical; follow by an incision in the inferior ring, dividing it in the same manner from right to left. Return to the starting point; the instrument has excised the elliptical bit of trachea which rests upon the point of the tenaculum. You may also cut each portion of the circle in two steps; implant the blade of the bistoury horizontally in the middle of the superior ring, and divide it by making successively two curved incisions, the one to the left and the other to the right. The same manipulation for the inferior ring. (Fig. 13)

Third step: Introduction of the tube.—First introduce the inferior portion of the tracheotomy tube and follow by insert-

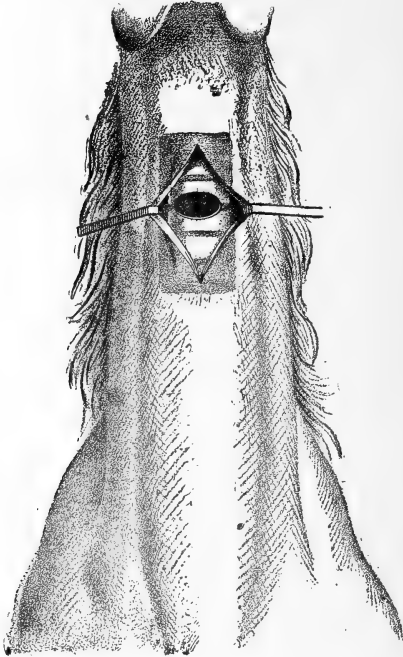


Fig. 13.—Tracheotomy.

The incision is prolonged above and below. Tracheal opening made by an incision parallel to the two rings.

ing the ascending portion; secure it by turning the pin. If the tube moves, secure immobility by rolling a little tow upon the external tube between the opening and the skin.

III.—LARYNGEAL TRACHAEOTOMY.

This consists in the introduction of a tube at the origin of the trachea by an opening made in the crico-tracheal ligament.

Restraint.—The same as for tracheotomy.

Instruments.—Scissors, bistouries, forceps, retractors and special tracheotomy tube, having a light, short canula.

TECHNIQUE.—This comprises three steps:

First step: Incision of the skin and muscles.—The head is held elevated by an assistant; take a position in front of the neck and explore the region of the larynx. Discover the crico-tracheal ligament; clip the hair over the region; then make a cutaneous incision on the median line, from in front of the anterior border of the cricoid to the third tracheal ring; divide the layer formed by the sternal and subscapulo hyoidean muscles, apply the blunt tenaculums or retractors, and turn aside the lips of the wound.

Second step: Incision of the crico-tracheal ligament.—With the bistoury held horizontally, section the crico-tracheal from left to right to the extent of five centimeters.

Third step: Application of the tube.—In the large gaping opening, insert the tube as in ordinary tracheotomy.

IV.—ARYTENECTOMY.

Restraint.—Hold the animal upon its back by means of a solid crosspiece passed between the hobbles of the anterior and posterior limbs. The head should be extended upon the neck in the same axis.

Instruments.—Straight, curved and knee bent scissors, convex blunt pointed bistouries, speculum, long rat-tooth forceps, tampon canula, curved needle fixed to a handle, and catgut.

TECHNIQUE.—It comprises four steps:

First step: Incision of the skin and muscles which cover the trachea.—Clip the hair over the region of the larynx and superior part of the trachea. With the convex bistoury incise the skin, the muscles which cover the larynx and prelaryngeal connective tissue, upon the median line to the thyroid body and third tracheal ring.

Cold applications are sufficient to arrest ordinary hemorrhage.

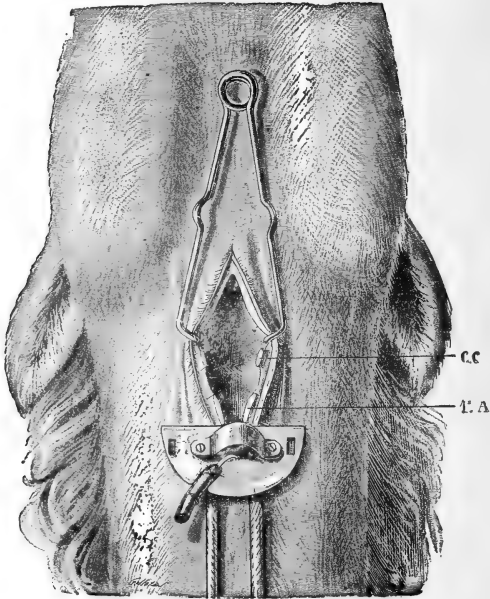


Fig. 14.—Arytenectomy.

The second step is accomplished, the crico-thyroidean ligament, the cricoid cartilage, the crico-tracheal ligament and the first two rings of the trachea are sectioned. The tampon canula and speculum are in position. CC, cricoid; 1st A, first annular ring of the trachea.

If one or more arterioles are sectioned, use torsion on the ends.

Second step: Incision of the larynx and the first rings of the trachea. Introduction and fixation of the tampon canula.—

Implant in the crico-thyroidean ligament, upon the median line and immediately in front of the cricoid, the convex bistoury held vertically with the cutting edge to the rear; cut upon the median line, from front to back, the cricoid cartilage, the crico-

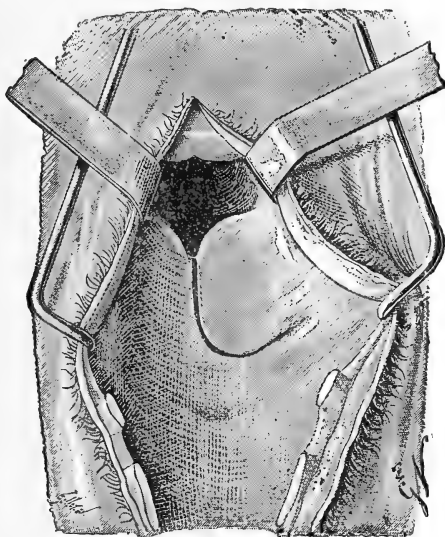


Fig. 15.

Third step: (a) Incision of the mucous membrane, along the superior and posterior borders of the arytenoid. For clearness of demonstration, the incision of the second step is prolonged in front just to the middle of the epiglottis, and back just to the fourth annular ring of the trachea-

tracheal ligament and the first two rings of the trachea; afterwards complete the division of the crico-thyroidean ligament from back to front and avoid wounding the vocal cords; apply the speculum, include the mucous membrane on a level with the crico-tracheal ligament; insert the tampon canula and hold it backward by means of a band passed under the pavilion. (Fig. 14.)

Third step: Excision of the left arytenoid cartilage.—With the blunt-pointed bistoury incise the mucous membrane along the superior and posterior borders of the arytenoid (fig. 15); with the straight scissors cut the vocal cord at its insertion to

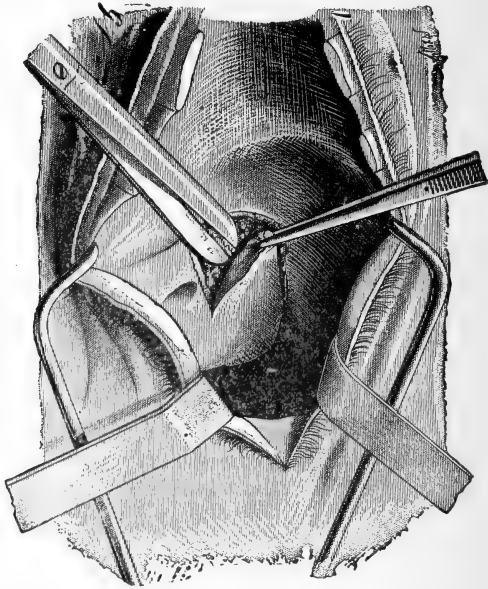


Fig. 16.

Third step: (b) Dissection of the arytenoid at its inferior border and external face.

the cartilage, dissect it by small cuts from back forward, sectioning the mucous membrane along its inferior border, and the muscular fibers inserted upon its external face (fig. 16); then, with the scissors held vertically, divide from above to below, the mucous membrane which forms the anterior border.

The arytenoid is held immovable with the forceps; section it from without to within near its articular angle by using the blunt bistoury held in a gently oblique direction downward

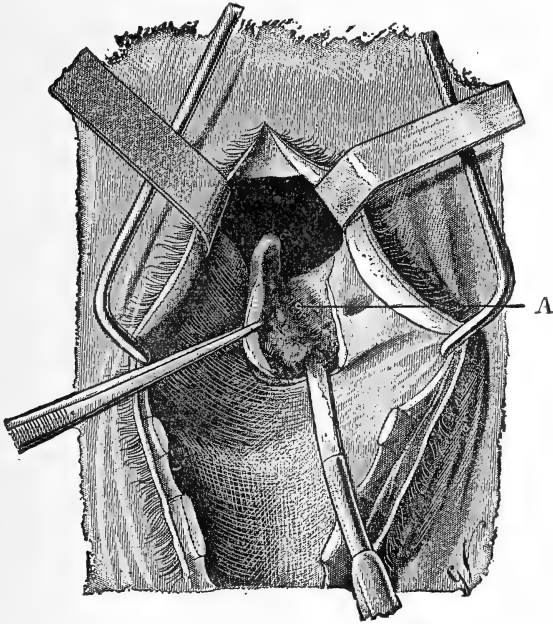


Fig. 17.

Third step: (c) Section of the arytenoid near its articular angle.
A, laryngeal branch of the thyroid artery.

and forward (fig. 17); afterward lift the cartilage with the forceps, hold the curved scissors vertically, pass them under the posterior part, the flat face upward, and detach the fibers inserted to it; (fig. 18); finally cut the mucous membrane on a level with the arytenoid beak. (Fig. 15.)

Suture.—Use a thread of catgut thirty-five to forty centimeters long; the needle is carried over the anterior lip of the wound, a centimeter and a half from the median line; then make it pierce the mucous membrane from front to back, then

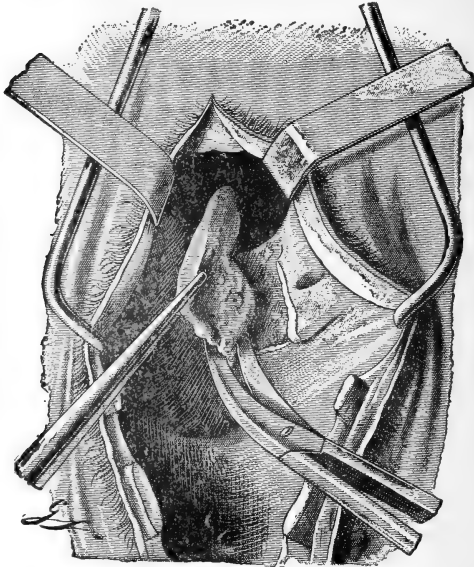


Fig. 18.

Third step: (d) Excision of the cartilage by means of the curved scissors.

to a corresponding point on the posterior border; with a forcep seize the thread and bring one of the ends out; withdraw the needle, its eye being furnished with the other end of the thread. Unite the two ends of the thread with a straight knot without exercising traction upon the mucous membrane.

Apply one or two other stitches in a similar manner (Moller). Figs. 16 and 17.

Dressing.—Place within the laryngeal cavity two rectangular tampons of gauze marked by threads; remove the dilator; suture the deep pre-laryngeal muscles, using care to pass any of the threads in the tampon near their border, in order to secure them solidly; then suture the skin. (Fig. 18.)

V.—CATHETERIZATION OF THE ŒSOPHAGUS.

Restraint.—If it is desired to operate on the animal standing, hobble both fore limbs, apply a twitch to the superior lip and hold the head in extension in order to efface the angle which is formed on the axis of the bucco-pharyngeal cavity, and the cervical portion of the œsophagus.

The operation is simple when the animal is cast. In that attitude the head should also be extended upon the neck.

Instruments.—Mouth speculum and long catheter of small calibre, terminated by an olivary enlargement.

TECHNIQUE.—The tongue is brought out of the mouth and held to the right or left by an assistant; put on the speculum and have it maintained in position by another assistant. The probang, covered with vaseline or oil, is held in both hands. It is engaged in the opening of the jaws, and made to penetrate to the depth of the bucal cavity and to the veil of the palate. Avoid displacements which provoke movements of the tongue. Arriving at the bottom of the mouth, the probang is arrested by the veil of the palate—a resistance easily overcome by a gentle effort. At the entrance of the œsophagus there is another resistance; if the instrument is carefully held upon the median line, it suffices to push carefully to clear the œsophageal orifice. Then the probang, passed with the right hand, slips through the left and descends rapidly along the œsophagus. At the last portion of the conduit, where the muscles lie very thick, the progression of the instrument is often slackened a little, but without exerting violent movements one arrives at the cardiac orifice; a sensation of overcoming resistance indicates the entrance of the probang into the stomach; the stylet is withdrawn and an escape of gas is the result.

VI.—OESOPHAGOTOMY.

Restraint.—Apply a twitch, hobble the fore feet, or use LeGoff's hobbles on both hind feet and the left fore foot.

Instruments.—Straight and curved scissors, straight and convex bistouries, director, dissecting forceps, fine needle and thread.

TECHNIQUE.—*First step: Incision of the layers which cover the oesophagus.*—Make the operation on the left side at the inferior third of the neck, where the oesophagus is applied to the left face of the trachea. Clip the hair in the guttural groove for a length of fifteen centimeters. Make an incision of ten centimeters in the skin immediately above the jugular; follow with division of the cutaneous muscles and of the anterior part of the mastoido humeral. With the left thumb introduced in the wound, separate the anterior lip of the incision from the jugular, then from the carotid when dissecting the connective tissue on a level with that artery. Incise the laminae of cellular tissue which sheaths the oesophagus with a bistoury; do not tear the tissue with the fingers, and above all, avoid detaching it below the inferior angle of the wound.

Second step: Isolation of the Oesophagus. The oesophagus has not the firm consistence which it presents in the cadaver; in the living animal it is weak, soft, very mobile; often the fingers manipulate it without recognizing it. When the connective tissue layers, which envelop it, are entirely divided, its anatomical situation is almost invariably upon the left side of the trachea, permitting of immediate recognition. Seize it between the thumb and index of the right hand, bring it out and pass the curved scissors under it, point forwards.

Third step: Puncture and removal of constriction. The thumb of the left hand compresses the oesophagus upon the scissors; with the point of a bistoury held in the right hand, make a short incision of the muscular and mucous coats; through that opening insert a director with groove turned outward, in the superior part of the oesophagus; hold the director with the left hand, slip in the groove the back of the bistoury, relieve the constriction of the oesophagus,—mucous and muscular—for the length of several centimeters. When

the œsophagus is compressed over the scissors the deglutition

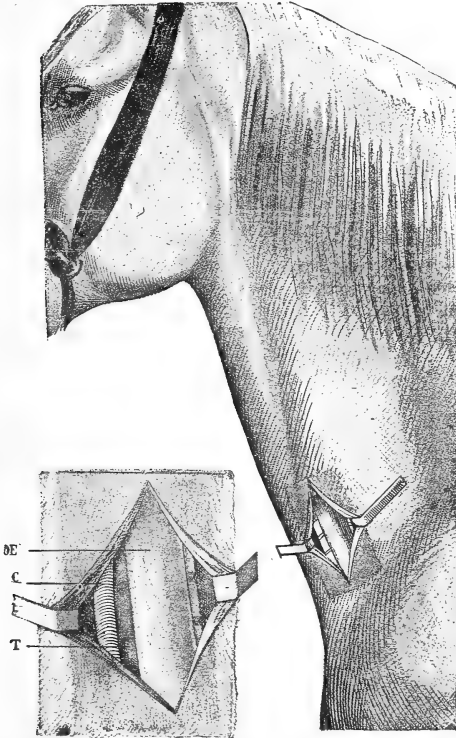


Fig. 19.—(Esophagotomy.

T, trachea; O. E, œsophagus; C, carotid.

caused by a little saliva or a draught of liquid permits of making, by a single cut of the bistoury, the puncture and

relief of constriction, without any danger of piercing the opposite mucous wall.

Fourth step: Suture.—With the oesophagus lying upon the scissors, by means of the forceps and fine needles, suture the mucous coat alone. The ordinary overcast suture is sufficient. (Colin).

If fluids collect in the inferior part of the wound, incise the skin and adjacent layers to the bottom of the cul-de-sac.

VII.—CERVICAL DESMOTOMY.

Restraint.—Cast the animal; twitch the upper lip; hold the head extended.

Instruments.—Scissors and tenotomy knives.

TECHNIQUE.—Make the operation at any point whatever at the superior part of the neck, along the cervical ligament. Clip the hair, implant the blade of the straight tenotome in the deep part of the neck, immediately in front of the inferior border of the cervical cord; introduce into the wound the curved tenotome, turn the cutting edge toward the ligament and cut it after having flexed the head.

VIII.—RE-SECTION OF PART OF THE SPINOUS PROCESSES OF THE WITHERS.

Restraint.—Cast the animal; twitch the superior lip.

Instruments.—Scissors, bistouries, sequestrum forceps, scissors bent on the flat, rubber drain, wadding, needles and thread.

TECHNIQUE.—Clip the mane and hair over the withers and posterior part of the neck. At the summit of the withers make a median cutaneous incision fifteen to twenty centimeters long. Separate from each side the layers of musculo-aponeurosis that are attached to the superior part of the spinous apophysis (the aponeurosis of the cervical and dorsal trapezins, rhomboideus, aponeurosis common to the splenius, the complexus minor and the anterior serratus.) Take up with the forceps, and ligate the principal vessels that bleed.

With the bistoury or a sage knife, cut the supra-spinous ligament transversely in front and rear of the apophysis to be

excised. With the chisel and hammer make the resection two or three centimeters from the top of the isolated segments. At the bottom of the wound and anteriorly make a lateral counter opening; insert a drain and attach it to the skin. Bandage with wadding. Make a dossil suture.

IX.—THORACENTISIS.

Restraint.—Twitch; raise the anterior limb on the side opposite that on which you wish to operate.

Instruments.—Convex bistoury and capillary trocar.

TECHNIQUE.—With the horse, the effusion in the pleura is nearly always double, for, with very rare exceptions, the two pleural cavities communicate; one limits himself to the puncture of the right pleura.

Place yourself on a line with the hypochondriac region. Clip the hair near the seventh intercostal space a little above the spur vein, and make a short vertical slit (button-hole) with the bistoury. Take the trocar and canula, hold it in the right hand, fix it solidly against the palm with the thumb and index finger guided along the canula, the point passing two centimeters beyond the ends of the fingers; within the lips of the wound, make it penetrate perpendicularly into the thorax by a double movement of pressure and torsion. Afterwards withdraw the trocar from the canula.

If you puncture the left side, operate within the eighth intercostal space and hold the trocar in an oblique direction from front to rear.

X.—PARACENTISIS.

Restraint.—Twitch; raise the left posterior limb.

Instruments.—Convex bistoury and capillary trocar.

TECHNIQUE.—Puncture of the abdomen may be made on the median line at equal distance from the pubis and xiphoid appendix of the sternum, or at the dependent portion of the left flank.

After having clipped the hair over the region selected for operation, make a small incision in the skin. Take the capillary trocar and canula, hold it as directed for thoracentesis

and take a position on a line with the left hypochondriac region, the knees bent; make the penetration into the abdomen by a double movement or pressure and rotation. Seize the canula with the thumb and index of the left hand; withdraw the trocar with the other.

XI.—ENTEROTOMY.

Restraint.—Twitch; raise the right fore limb.

Instruments.—Convex bistoury and trocar of small calibre (nested trocar).

TECHNIQUE.—To puncture the caecum, the place to be selected is the hollow of the right flank at equal distances from the angle of the haunch, the last rib and the transverse processes of the lumbar vertebrae, or a little above this point.

Take a position facing the flank, clip the hair over the point where you wish to operate, and make a small incision with the bistoury. Hold the trocar in the left hand perpendicular to the surface of the flank, the point carried into the incision; with one stroke given upon the handle with the palm of the right hand, make the instrument penetrate into the flexure of the caecum. Hold the canula in the left hand, withdraw the trocar with the other.

XII.—CATHETERIZATION OF THE URETHRA IN THE HORSE.

Restraint.—Apply a twitch to the upper lip, hobble the posterior limbs, pass the line between the anterior limbs, cross it and have it held by an assistant.

Instruments.—Long catheter of gum-elastic or of rubber, furnished with a stylet and coated with vaseline.

TECHNIQUE.—After having emptied the rectum, take a position even with the right flank, engage the right hand in the sheath, seize the head of the penis; by gentle and continued traction bring that organ out, and have it held by an assistant. Take the catheter provided with a stylet, introduce the slender extremity into the urethral tube and pass the instrument slowly into the urethra to the level of the ischial curve; to make the passage more easy in that region, withdraw the

stylet for a length of fifteen centimeters; the canula curves inward and becomes engaged within the pelvic portion of the urethra; repass the stylet and continue the catheterization until the catheter arrives in the bladder. If the catheter is too rigid to curve inward at the ischial curvature, exert very gentle pressure upon its extremity while an assistant passes it; or, perhaps engage the hand in the rectum and guide the catheter to the bladder. The stylet is withdrawn, the urine flows. It is rarely necessary to effect pressure upon the bladder by the hand introduced in the rectum.

The retraction of the catheter offers no difficulty; it is sufficient to exercise gentle traction associated with semi-rotary movements. The re-introduction of the stylet is useless.

In practice the operation should always be made aseptic.

XIII.—URETHROTOMY.

Restraint.—The same preparatory measures as for catheterization. Hold the tail elevated on the median line.

Instruments.—Straight bistoury, director, lithotomy forceps, and a syringe provided with a slender canula.

TECHNIQUE.—The operation is performed at the superior part of the perineum on a level with the urethral curvature.

Empty the rectum; an assistant secures the penis; fill the syringe, engage the canula in the inferior part of the urethra, direct the assistant to compress the head of the penis upon the base of the canula, but permitting the orifice of the syringe to be free. The operation consists of two steps.

1st. *Large puncture of the urethra.*—While the assistant is injecting the liquid in the urethra, place yourself behind the horse and watch the distention of the canal (fig. 20). When the part where you wish to operate appears well in relief, discontinue the injection. The assistant who holds the penis continues the compression, and, by occluding the urethral opening, prevents the escape of the liquid. The operatory act essential to urethrotomy is one of extreme simplicity. It consists in the puncture with division of the urethral wall. It should be accomplished at a single step. With the left hand exercise gentle traction below upon the skin of the perineum,

The straight bistoury is held as a reversed fiddle bow in a slightly oblique direction upward and forward; it is implanted deeply upon the median line, immediately above the ischial arch, in the axis of the enlargement formed by the distended urethra. The penetration of the canal is made known by the

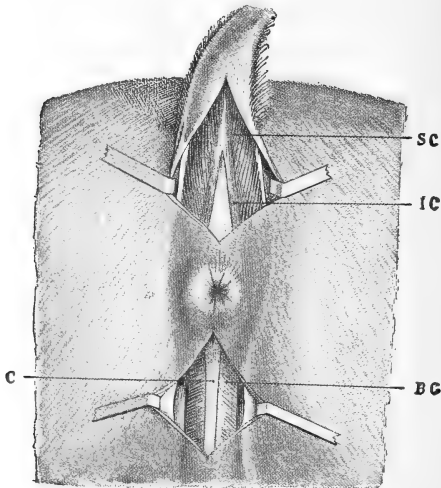


Fig. 20.—Perineal and Caudal Region.

C, Suspensory ligament of the penis; C B, bulbo-cavernosus muscle; S C, inferior sacro-coccygeal muscle; I C, ischio-coccygeal muscle.

escape of a jet of liquid. Whether the animal retracts or not, do not withdraw the instrument quickly in the direction which you have given it at the time of the puncture. Bring the hand upward, divide the superior wall of the canal and the tissues which cover it for a length of two or three centimeters. If the puncture is too small, introduce a director, groove upward, upon the index of the left hand, and with the straight bistoury effect the division. The hemorrhage is not profuse

except in case the bulbar artery is cut. In that case, tamponize or make a mediate ligature at the superior extremity.

Second step: Introduction of the lithotomy forceps in the bladder.—Apply the radial border of the left hand palmar surface upward, upon the perineum, immediately below the puncture. The lithotomy forceps are held in the right hand, with the concave edge of the spoon turned down, introduce it into the wound and slip over the palmar surface of the left hand, then engage it in the intra-pelvic portion of the urethra and in the bladder. You may also guide the instrument upon the index introduced in the canal.

XIV.—INGUINAL KELOTOMY.

Restraint.—Cast the animal on the side opposite to that on which you wish to operate. Afterwards place it in the same position as for effecting perforation of the inguinal canal, the posterior superficial limb maintained upon the corresponding shoulder or brought into a state of abduction by two ropes, one fixed in the direction of the neck, the other perpendicular to the vertebral column.

Instruments.—Scissors, concave and straight bistouries, S sound, director, blunt pointed bistoury, catgut or clamp and castration forceps.

TECHNIQUE.—Introduce an intestinal loop into the vaginal sheath, in the following manner: Effect laparotomy on a line with the left flank; draw a loop of small intestine out of the abdominal cavity; tie it to the S sound with a dossil, which is passed around it and through the eye of the sound; introduce the other extremity of the sound in the abdomen; pass it into the vaginal sheath until it arrives at the bottom; puncture the scrotum when it comes in contact with the wall and draw it out at this point; it carries the intestinal loop to which it is attached with it; an artificial intestinal hernia is thus produced. Cut the tape and unite the two ends with a string; afterwards the loop may be re-introduced into the sheath if it should get out.

First step: Incision of the scrotum and enucleation.—Accomplish the incision and enucleation as in castration by the use of clamp in the covered operation.

Second step: Incision of the vaginal sheath.—With the

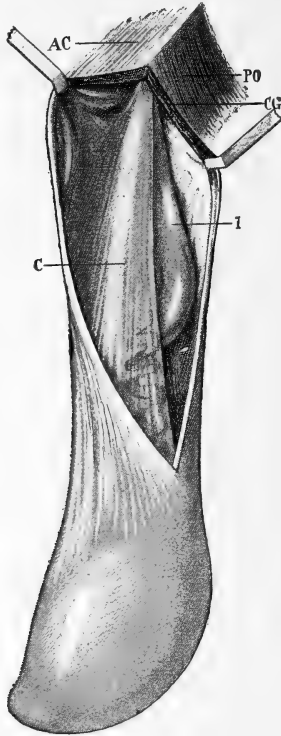


Fig. 21.—Strangulated inguinal hernia. The external wall and the vaginal sheath are incised.

AC, crural arch; PO, small oblique muscle of the abdomen; CG, incision of the sheath (external face); I, intestine; C, testicular cord.

point of a convex bistoury make a straight incision in the

three deep layers of the scrotum towards the posterior extremity of the testicle; engage the director in the incision parallel to the inferior border of the gland; the groove should be turned toward the envelopes; divide it from within outward by slipping a straight bistoury in the director. The testicle and intestine are thus exposed.

Third step: Dividing the neck of the sheath.—Towards the middle of each of the lips, resulting from the division of the deep envelopes of the scrotum, or upon the double lips of the scroto-dartois layers, apply artery forceps having large jaws, and have an assistant spread them apart. If you operate upon the left, carry the index of the left hand, pulp upward, to the bottom of the sheath and engage it in the ring; afterwards slip the flat side of a blunt-pointed bistoury upon the palmar face; when its point passes through the ring, execute a quarter of a revolution on the axis of the instrument in such manner as to turn the cutting edge outward against the serous membrane; by a gentle sawing movement, divide the ring.

Fourth step: Reduction.—The lips of the sheath are always held apart and the testicular cord moderately stretched; return the intestinal loop into the abdomen by gentle pressure frequently repeated, beginning at its superior part.

Fifth step: Ligature or application of a clamp.—Bring down the lips of the sheath against the cord, tie it, or fix the clamp high upon the cord and covering, and cut off the testicle two centimeters below.

If you wish to use torsion upon the sheath,—an excellent operation to efface the opening just at the ring and avoid a recurrence in the case of chronic inguinal hernia,—modify the second and fifth steps as follows: 1st, enucleate the scroto-dartois as high as possible; 2d, cover the cords with the deep envelopes and execute two or three turns upon its axis before applying the clamp.

XV.—CASTRATION OF THE HORSE.

Restraint.—Cast the animal upon his left side; apply the twitch to the upper lip; attach a rope to the canon of the right posterior limb, pass it from above downward under the neck, then from before backward over the adjacent part of the loop and under the limb to be displaced; unhobble the limb and by drawing upon the rope, perpendicular to the vertebral column, bring the foot on a line with the shoulder of the corresponding fore limb; slip the rope toward the fetlock and pass it around the canon. Two assistants should be instructed to maintain the line in that position.

General Directions.—Be assured that there is no chronic inguinal hernia. Except while proceeding with the torsion, the operation should be rapidly executed. Begin with the inferior testicle.

1.—Castration with Clamps.

Instruments.—Convex bistoury, scissors, clamps, cord or metallic rings, forceps, etc.

First step: Castration with the Testicles Covered.

TECHNIQUE.—*First step: Prehension of the Testicle.* The left hand, with the fingers extended, the thumb separated from the index, the palmar face applied to the skin, is placed in front of the enlargement formed by the gland; the right hand, with the fingers disposed in the same manner, is placed behind. Bring the hands together, engaging them deeply under the testicle. With the left hand enclose the cord at its superior part. When the testicle is well down the cord should be immediately seized. If the gland makes a half turn upon the cord, return it to the normal position before securing it.

Second step: Incision of the scrotum, the dartois and the sub-dartois connective tissue.—With the convex bistoury held as a fiddle bow, incise the scrotum and dartois the full length of the inferior border of the testicle by a single act.

The compression exercised by the fingers of the left hand should bring out the testicle covered by the deep envelopes. With a gentle hand incise the sub-dartois connective layers; the aponeurosis of the cremaster muscle appears with its nar-

cous color; the action of the bistoury is marked upon its superficial fibers.

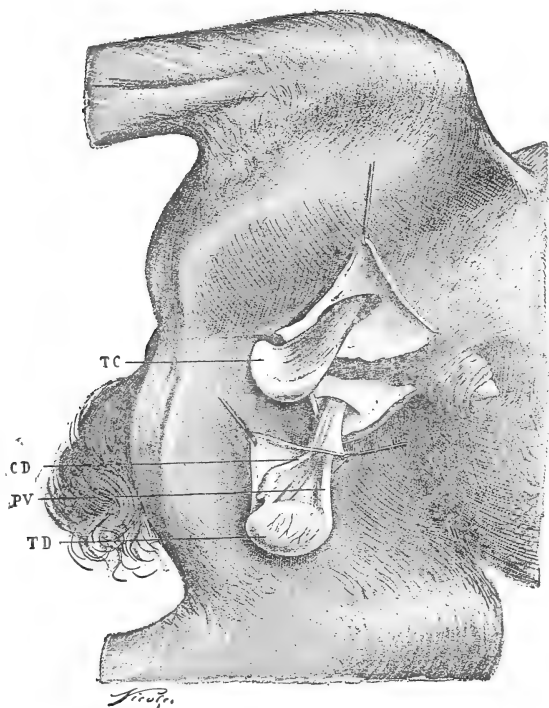


Fig. 22.—Testicle and cords.

T C, covered testicle; T D, exposed testicle; P V, vascular portion of the cord; C D, vas deferens.

Third step: Enucleation of the testicle.—Lay aside the bistoury; with the fingers of the right hand introduced in the

wound, the thumb on the same side as the left, by a double pressing and spreading movement engage them between the sub-dartois connective tissue and the fourth layer, which is formed without by the cremaster and within by the fibrous tunic.

Seize the testicle with the right hand, the thumb applied upon the superior face and the fingers upon the inferior; with the thumb and index of the left hand, liberate the cord high in front and laterally, from the incised tissues. Take the cord in the left hand, the thumb applied upon the cremaster; with the index or the thumb of the right hand, perforate and tear the dense connective tissue which tightly unites the epididymis to the dartois in the rear of the testicle.

Fourth step: Application of the clamps.—The testicle is held in the right hand, thumb above, and the superficial envelopes removed for four or five centimeters beyond the epididymis; put on the clamp with the left hand; proceed from before backward upon the inferior part of the cord, and pinching the epididymis and also the scrotum; that hand should also bring the two parts of the clamp together behind the cord. An assistant slips a loop of cord, having a knot as for phlebotomy, over the branches of the clamp; the right hand holds the ends. The assistant applies the clamp forceps and brings them together with considerable force. To direct the movements and to avoid pulling on the cords, place the right hand upon the forceps and draw the twine tightly with the left. Tie with a straight knot. Remove the forceps and cut the twine a centimeter from the knot. Instead of using twine to bind the clamp you may use clamps having conic branches; bring them together with the forceps and secure them by slipping on metallic rings.

The same manipulation for the other testicle.

2.—Castration with Uncovered Testicles.

TECHNIQUE.—The first step is effected in the same manner as in castration with covered testicles.

Second step: Incision of the envelopes.—With the convex bistoury held like a fiddle bow, make a long incision through

all the envelopes that comprise the parietal layers of the vaginal sheath. One or two cuts with the bistoury should be sufficient to effect this division.

Third step: Enucleation.—Hold the testicle in the right hand, remove the envelopes with the left; then the thumb and index seizes the cord at its inferior part. The right hand makes a liberal thrust at the cord on a level of the white muscle, a little beyond the epididymis, with the straight bistoury, the cutting edge turned backward, and section the posterior part of the cord.

Fourth step: Application of the clamp.—Place it a little higher on the cord than in the covered operation.

Fifth step: Excision of the testicle.—Amputate the gland by cutting the cord immediately above the epididymis. The same manipulation for the other testicle.

3.—Castration with the Cords Covered.

TECHNIQUE.—The first step is effected in the same manner as in the castration with uncovered testicle.

Second step: Incision of the envelopes.—First divide the scrotum and the dartois over the middle or posterior third of the testicle; afterwards make an incision in the deep envelopes of a little less extent.

Third step: Enucleation of the testicle.—Exercise pressure with the fingers of the left hand upon the two faces of the gland; this pressure, little by little, causes the testicle to project between the lips of the incision, at the same time the envelopes return unequally upon the cords; the scrotum and dartois are easily separated from the deep envelopes, which surround the front and sides of the testicle—the fibrous tunic covered by the cremaster and the sub-dartois layers.

Continue exercising pressure with the left hand; soon the incision in the fibrous and serous tunics enlarge; the testicle comes out.

Fourth step: Application of the clamp.—The clamp should be placed over the cord covered with the inferior part of the deep envelopes (serous and fibrous tunic, and cremaster). The scrotum and dartois are folded above, the left hand seizes the

extremity of the epididymis and exercises traction behind upon the deep envelopes; the thumb is carried into the anterior vaginal cul-de-sac, draws downward and forward in the same manner near to the epididymis. An assistant places the clamp from before backward upon the cord thus covered.*

There is nothing particular as to the mode of securing the clamps.

Fourth step: Removal of the testicle.—Amputate by cutting the cord two centimeters above the testicle.

2.—Castration by Limited Torsion.

Instruments.—Convex and straight bistouries, forceps, artery forceps, catgut or silk.

(a).—Torsion by Two Incisions.

TECHNIQUE.—Effect the *first, second* and *third* steps as in castration with clamps, with testicles uncovered.

Fourth step: Torsion and rupture of the cords.—The testicle is supported with the left hand; apply the stationary forceps below over the vascular portion of the cord four centimeters above the epididymis; seize that part between the jaws of the forceps, secure its limbs by a hook with which it should be provided, and have it held by an assistant.

Then take the movable forceps, grasp the cord a centimeter below the stationary forceps; bring the branches together tightly and secure them. Twist the cord from left to right, making a pivot upon the fixed forcep. Ten to fifteen turns, depending upon the size of the cord, will be sufficient to completely rupture the cord. If the torsion has been effectual, there will be no hemorrhage. If the blood flows, apply the artery forceps upon the testicular artery or ligate it.

(b).—Torsion by only One Incision.

TECHNIQUE.—*First step: Prehension of the left testicle.*—The testicle is grasped with the left hand and brought near the center of the scrotal pouch.

* DEGIVE, Castration par le procédé à cordous couverts. *Annal. de med. vet.*, 1889, p. 30.

Second step: Incision of the scrotum and dartois.—Make an incision in these membranes, upon the median line, at the posterior part of the scrotum, sufficiently large to permit the eventration of the testicle.

Third step: Incision of the deep envelopes.—Incise these membranes backward towards the posterior extremity of the testicle by making a straight incision corresponding to that in the scrotum and dartois. Lay aside the bistoury, and cause the eventration of the testicle by pressing upon it with the left hand and seizing it with the right.

Torsion is made either upon the whole cord or only upon the vascular portion.

The same manipulation for the other testicle.*

3.—Aseptic Castration.†

Instruments.—Convex bistoury, silk or large catgut, and suture needle. Observe all precautions that are necessary for asepsis.

TECHNIQUE.—*First method.*—Effect the first, second and third steps, as in the castration, by means of clamps, with testicles uncovered.

Fourth step: Ligate.—At two or three centimeters above the epididymis, bind the cord and draw tightly.

Fifth step: Removal of the testicle.—Cut the cord a centimeter below the ligature.

Sixth step: Suture.—Unite the scroto-dartois lips by interrupted sutures, and cover the cut by a layer of collodion and iodoform.

The same manipulation for the right testicle.

Second method.—Make a median line incision of the superficial envelopes and apply the ligature upon the covered cords. Suture and close.

Third method.—Divide all the envelopes and ligate the uncovered cords. Suture and close.

* JACOULET, Castration par torsion bornée. Bull. de la Soc. cent. de med. vet., 1893, p. 45.

† BAYEE, Castration unter antiseptischen Cautelen und Heilung per primam intentionem. Monatsschr. des Vereines der Thierärzte in Oesterreich, 1881, p. 163.

XVI.—CASTRATION OF THE CRYPTORCHID.**(a).—By Perforating the Inguinal Canal.**

Restraint.—Cast the animal on the side opposite to that on which you wish to operate; by means of a rope carry the posterior superficial member forward over the corresponding shoulder, or hold it in abduction as for inguinal hernia by

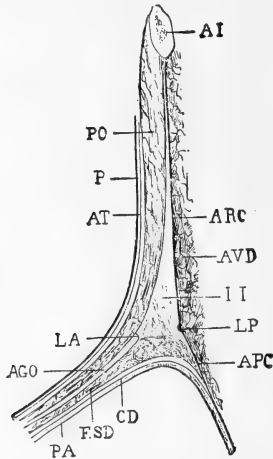


Fig. 23.—Section of the walls of the left inguinal canal made in a line from the middle of the inferior inguinal ring to the external angle of the ilium. Inner segment.

P A, skin; C D, dartois tunic; F S D, sub-dartoid connective tissue; A G O, aponeurosis of the external oblique; L A, posterior margin of that ring; I I, inguinal canal filled with connective tissue; P O, internal oblique muscle; A T, aponeurosis of the transverse muscle; P, peritoneum; A R C, crural arch; A P C, crural fascia; A I, external angle of the ilium; A V D, section of the muscles covered by the crural arch.

means of two ropes, one drawn in the direction of the neck and the other perpendicular to the vertebral column.

1st.—Belgian Operation.

Instruments.—Convex bistoury and artery forceps.

TECHNIQUE.—*First step: Incision of the scrotum and dartois and dissection of the sub-dartoid tunic.*—With the convex

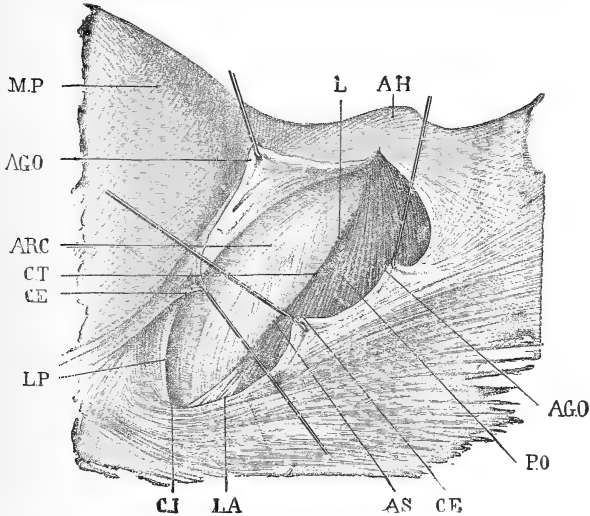


Fig. 24.—Inguinal interstice seen from the flank. The external commissure of the inferior inguinal ring is sectioned. The great aponeurosis is divided a little in front of the line where it is doubled. The small oblique is removed from the crural arch just at the internal commissure of the interstice.

A R C, Crural arch; P O, Small oblique muscle; C T, Internal commissure of the inguinal passage; A G O, Aponeurosis of the great oblique incised, its edges separated; C I, Internal commissure of the inferior inguinal ring; C E, External commissure sectioned; L A, Anterior lip; L P, Posterior lip; A S, Dotted line indicating the situation of the superior inguinal ring; L, Dotted line showing the height at which the opening should be made in the operation on the abdominal cryptorchid; A H, Angle of the haunch; M P, Posterior limb held in abduction.

bistoury make an incision of twelve to fifteen centimeters from before backward in the skin and dartois. Then, near the

center of that ring and following the same line, make a small

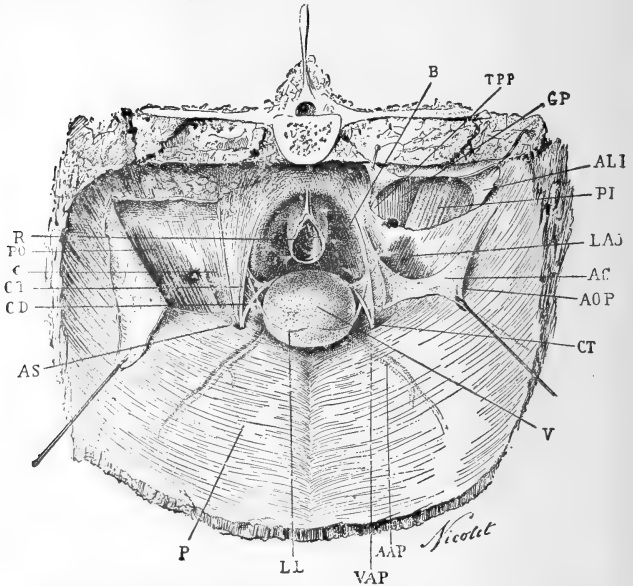


Fig. 25.—Transverse vertical section of the posterior abdominal region, showing part of the sub-lumbar ilial and pre-pubic regions (normal stallion).

P, peritoneum; A A P, posterior abdominal artery; V A P, posterior abdominal vein; A S, superior annular ring; C T, testicular cord; C D, vas deferens; A O P, tissue layer enclosing the superior border of Poupart's ligament, the posterior border of the internal oblique, the cremaster, the sub-peritoneal layer and peritoneum; A C, Poupart's ligament turned downward; its deep face; L A J, long abductor of the leg; A L I, lumbo-iliac aponeurosis; P I, iliacus; G P, psoas-magnus; T P P, tendon of the psoas parvus; B, pelvic cavity; R, section of the rectum; V, bladder; L L, lateral ligaments of the bladder with obliterated umbilical ligaments.

incision in the sub-dartoid connective fascia; introduce the

thumbs back to back and enlarge it by spreading. In this manner divide it throughout its extent to the inferior inguinal ring.

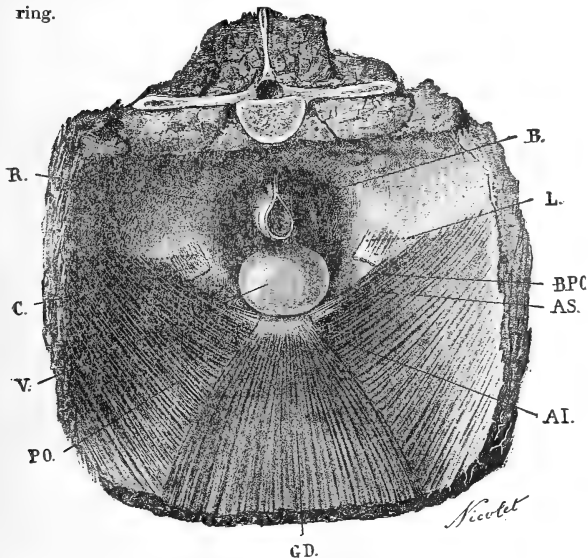


Fig. 26.—A vertical transverse section of the posterior abdominal region, showing the superior insertion and disposition of the internal oblique and cremaster muscles as seen from in front. The peritoneum, the sub-peritoneal layers and the transverse muscle are removed.

PO, internal oblique muscle; BPO, its posterior border; C, superior part of the cremaster (that muscle is cut within a few centimeters of its origin); GD, great straight abdominal muscle; AI, dotted line, indicating the position of the inferior inguinal ring; AS, dotted line corresponding to the superior inguinal ring; L, dotted line traced at the height where the hand reaches the peritoneum in operating upon the abdominal cryptorchid; B, pelvis; V, bladder; R, rectum.

Second step: Penetration of the deep layers of the abdominal wall.—Use the right hand if you operate upon the right

side, and the left if you operate upon the left. The fingers are arranged as a cone, the hand is introduced into the

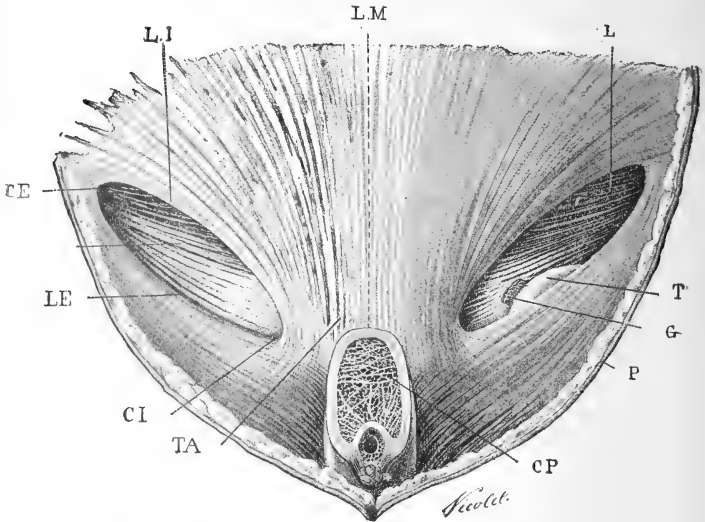


Fig. 27.—Prepubian and inguinal regions as seen from below. The figure shows on each of the median line, the inferior inguinal ring and the entrance to the inguinal canal.

CI, inner commissure of the inferior inguinal ring; **CE**, external commissure of the same ring; **LI**, internal lip; **LE**, external lip; **PO**, internal oblique muscle; **T**, testicle covered by the vaginal tunic, and descended as far as the inferior inguinal ring (inguinal cryptorchid); **G**, fibrous band, representing a remnant of the gubernaculum; **L**, dotted line, showing the situation and direction of the opening made in the internal oblique in the Danish method, as described by Bang and Møller; **TA**, common tendon of the abdominal muscle; **CP**, section of the penis; **P**, skin; **LM**, dotted line traced upon the median line.

inguinal canal within the ring, the elbow directed toward the pubic symphysis, and the extremities of the fingers in contact

with the crural arch. Direct them outwards toward the external angle of the ilium, straight to the lumbar arch, or a little to the rear. In passing through the canal, make progression by executing a double movement of propulsion and semi-rotation, with gradual spreading of the fingers, and avoid injury to the internal commissure of the canal. Separate in this way Poupart's ligament and the small oblique muscle to the bottom of the inguinal canal. On arriving there the peritoneum is recognized and the intestinal loops are felt through that membrane.

Penetrate the serous membrane by pushing strongly upon the end of the index or tearing it between the thumb and finger. Enlarge the opening in the same manner as used for penetrating the canal, until two fingers or the whole hand can be introduced into the peritoneal cavity.

2.—Danish Method.

Instruments.—Convex bistoury, director, curved needles and silk thread.

TECHNIQUE.—The first step is the same as in the Belgian method.

Second step: Perforation of the internal oblique muscle.—Tear the connective tissue at the inguinal opening as in the Belgian method. Expose the small oblique muscle toward the external commissure of the canal and at a certain height. When the muscle is well stretched toward the end of an inspiration, perforate it with the spatulate end of the director by making a simple button-hole-like incision parallel to the fibres; enlarge it, always using the director, sufficiently large for the introduction of two fingers. If you operate upon the left, introduce the index and great finger of the left hand in the muscle wound. When the abdominal wall is stretched at the close of an inspiration, perforate and pass through the peritoneum by active pressure upon the fingers. Enlarge the wound parallel to the muscle fibers if you wish to introduce the hand into the abdominal cavity. If the intestine tends to escape apply a very wet tampon.

If you operate upon the right side perforate the abdominal wall with the index and large fingers of the hand corresponding.

(b)—**Laparotomy.** (See page 72.)

XVII.—AMPUTATION OF THE PENIS.

Restraint.—Cast the animal upon the left side; the right posterior limb is carried on a line with the corresponding

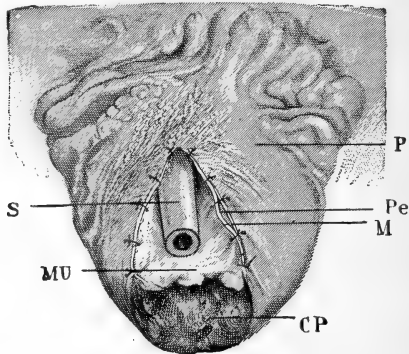


Fig. 28—Amputation of the penis.

P, penis; CP, cut portion of the penis, corpus-cavernosum; MU, mucous coat; M Pe, mucous and skin sutured; S, catheter introduced into the urethra.

shoulder as for castration, and held in that position by two assistants.

Instruments.—Bistouries, ordinary forceps, artery forceps, fine needles and thread, and director.

TECHNIQUE.—An assistant seizes the head of the penis, and draws it moderately; another exercises gentle traction upon the skin towards the base of the organ. Make a circular incision upon the superior and lateral faces of the penis, limiting it at the line of incision between the lateral and inferior faces.

This incision is completed by two others which start at its extremities, converge backward and unite upon the median line five centimeters further. Within the area of the triangular strip thus limited, excise the tissues which cover the urethra. Expose it, dissect it a little beyond the circular incision and cut it transversely one to two centimeters in front of that incision. Introduce a director into the exposed portion, with its groove turned toward the inferior wall, and with a bistoury guided by the director, divide that wall upon the median line. Unite the mucous lips to the corresponding skin by discontinuous stitches. (Fig. 28). Cut the body of the corpus-cavernosum transversely with the circular incision, tie the dorsal artery, bring down the skin in front of the stump, bring their lateral edges together upon the median line and take two or three stitches.

You may also make the section of the corpus-cavernosum first, then dissect the urethra, split it, and suture to the skin. The dissection of the urethra is facilitated by the introduction of a catheter in the canal.*

XVIII.—CATHETERIZATION OF THE URETHRA IN THE MARE.

Restraint.—The same general directions as for passing the catheter in the horse.

Instruments.—Metallic or gum elastic catheter about twenty centimeters long.

TECHNIQUE.—The urethral opening is situated ten to fifteen centimeters from the entrance of the vulva, below a large valve stretched transversely across the inferior wall of that cavity at its entrance into the vagina. Conduct the index of the left hand to the opening by spreading the lips of the vulva; slip a catheter along the finger; engage it in the urethral canal

*This method, described in human surgery, is superior to all others; if well executed it avoids stricture of the urethra. Prior to us HARRISON had recommended it upon the horse. (*The Veterinary Journal*, 1885, p. 1.) Prof. A. Liautard has been performing it also since 1879-80.

and pass it into the bladder. There is no folding of mucous membrane to arrest the instrument in the mare as in the cow.

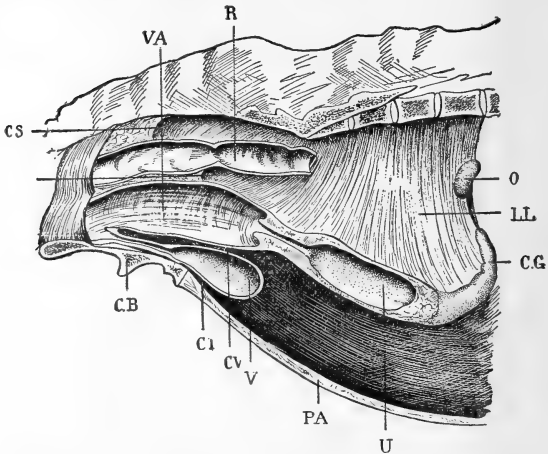


Fig. 29.—Vertical median antero-posterior section of the uro-genital organs of the mare.

O, ovary; C G, left cornua; U, uterus; L L, broad ligament; V A, vagina; V, bladder; R, rectum. C R, recto-vaginal cul-de-sac; C V, vesico-vaginal cul-de-sac; C R, superior cul-de-sac; C I, inferior cul-de-sac; C B, section of the pelvis; P A, abdominal wall.

XIX.—OVARİOTOMY.

Restraint.—To operate upon the animal while lying down, secure the limbs in the hobbles. (The manipulations are executed perhaps with greater ease when the animal is controlled while standing, in the post travis, the posterior limbs being fixed to the posts by ropes, the tail held elevated on the median line or tied to a rope which passes over the cross-bar of the travis back of the quarter.)

Instruments.—Bistoury cache and ecrasure (fig. 31).

TECHNIQUE.—*First step: Puncture of the vagina and enlarge-*

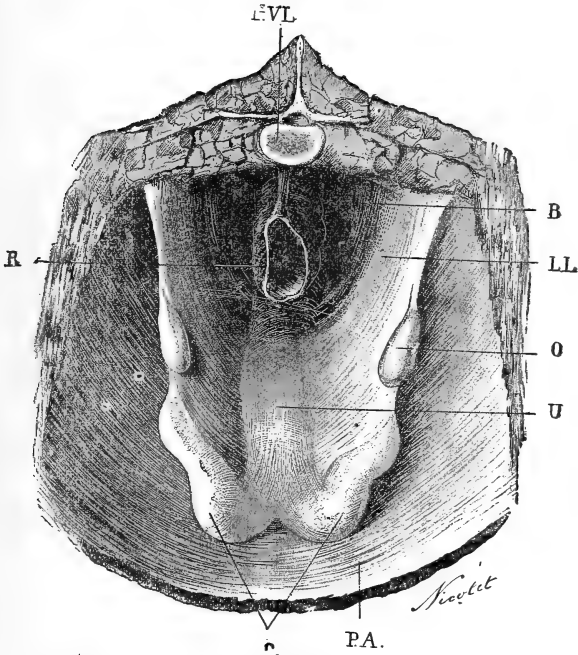


Fig. 30.—Transverse section of the posterior abdominal region, made in front of the first lumbar vertebrae, showing the position of the uterus, its superior face, and insertion of the ovaries to the broad ligament as they occur in the mare.

O, ovary; C, cornua; U, uterus; L L, broad ligament; R, section of the rectum; B, pelvis; P A, abdominal wall; 1st V L, first lumbar vertebrae.

ment of the opening with the fingers.—Explore the vagina and cause its dilation. When the walls are stretched withdraw the

hand; take the bistoury with the blade returned and carry it to the bottom of the vagina.

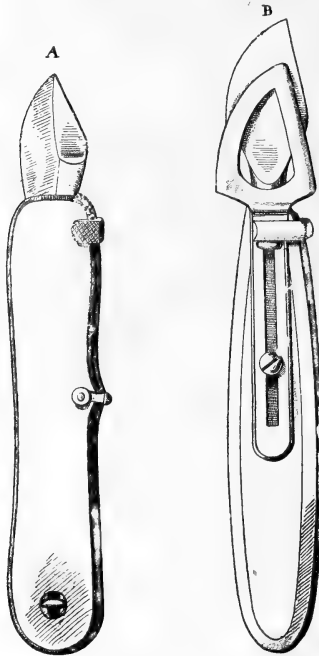


Fig 31.—Bistoury cache.

A, bistoury with movable blade; B, bistoury with guard.

At one or two fingers' width from the os uteri make a short puncture on the median line of the vaginal wall. To accomplish this, hold the bistoury in the full hand in a nearly hori-

zontal or slightly oblique direction, point forward; project the blade for its whole length with the thumb, follow with a brisk arm action, carrying the blade forward; return the blade and explore the wound; if the perforation is complete, withdraw

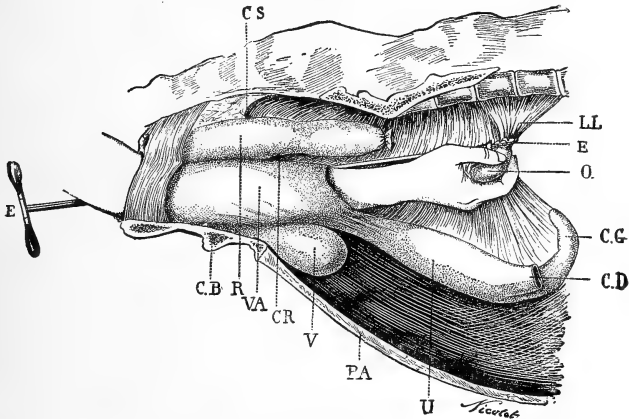


Fig. 32.—Antero-posterior section of the abdominal cavity and pelvis, made on the median line, showing the genital organs in the mare. Ovariotomy. Second step: Removing the left ovary; the instrument is in position, the chain surrounds the ovarian ligament; the gland is held in the right hand.

O, ovary; U, uterus; V A, vagina; C D, section of the right cornua; C G, left cornua; L L, broad ligament; E, ecrasure; R, rectum; C R, recto-vaginal cul-de-sac; C S, superior cul-de-sac; P A, abdominal wall; C B, section of the pelvic bone.

the instrument; if the peritoneum is not pierced, give it a second cut with the bistoury.

After having laid the instrument aside enlarge the opening with the fingers until it will permit the entrance of the whole hand into the peritoneal cavity. To arrive at the ovary on one side or the other, follow the uterus and the corresponding cornua; at its extremity you will find the gland.

Second step: Seizing, and removal of the ovary.—The hand is maintained in a line with the vaginal perforation; pass the ecrasure along the forearm and guided by the hand to the ovary. With the fingers dispose the chain in the form of a loop, enclosing the ovary. Seize the ovary below the chain and cut the pedicle by a slow movement of the ecrasure (fig. 32). Remove it from below and bring the gland out in the hand.

The same manipulations for the other ovary.

XX.—LAPAROTOMY.

Restraint.—Cast the animal upon the right side, draw the left posterior limb backward.

Instruments.—Scissors, bistouries, artery forceps, director, drain, needles and thread to suture.

TECHNIQUE.—Clip the hair and shave the skin on the flank. Cover the region with a wet, aseptic towel. Make an incision of about ten centimeters, dividing the skin and sub-cutaneous aponeurosis, in the region a little in front and below the angle of the ilium. Give it the direction of the fibers of the ilio-abdominal muscle. With the fingers or spatulate end of the bistoury, perforate the small oblique, the transversalis and peritoneum. Enlarge the opening in the same manner already indicated for the castration of cryptorchids by the Danish method. (See Cryptorchid.)

Effect those manipulations in the abdominal cavity proper to the operation you wish to practise.

Make the muscular sutures of catgut and skin sutures of silk, securing the drain in the inferior angle of the wound.

XXI.—INTESTINAL SUTURES.

For these sutures use fine curved needles, or Reverdin needles, which are curved to the left, and zero silk thread.

1.—Jobert's Sutures.

TECHNIQUE.—Place the threads transversely to the lips of the wound at intervals of six millimeters, by proceeding in the

following manner:—Make the needle perforate the intestinal coats from without to within a centimeter from the edge of the wound; make the needle come out again through the same lip four or five millimeters from the edge; pierce the other lip from without to within at four or five millimeters from the edge and bring the needle out a half centimeter further. One repeats this with all the threads, ties them successively and cuts the ends near the knots. The edges of the wound are turned in-

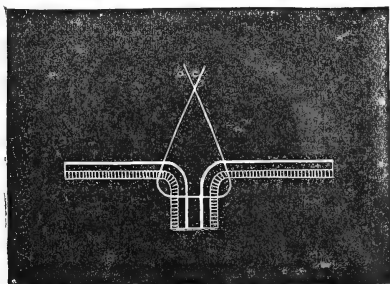


Fig. 33.—Jobert's Suture.

The thread passes through the three intestinal walls; the ends are curved; the lips of the wound are brought together by their serous faces. (After Chaput.)

ward and the lips are brought closely together by their serous face. (Fig. 33.)

2.—Lembert's Suture.

TECHNIQUE.—The needle is inserted about eight millimeters from the edge and *only penetrates the serous membrane*; it is then passed perpendicularly to the axis of the wound within the muscular layer and brought out two to four centimeters further by piercing the serous coat from within to without.

Take the stitch in the other lip by beginning two to four

millimeters from its free edge, traverse it in the same manner and bring it out as many millimeters further.

Take all the stitches that are necessary in this way, afterwards tie the threads in succession.

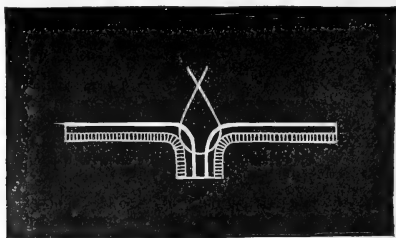


Fig. 34.—Lembert's Suture.

The thread is passed through the serous into the muscular coat; the ends are crossed; the lips of the wound are brought together by their serous faces. (Chaput.)

This suture is preferable to that of Jobert; the threads do not penetrate the mucous and it is not infected. (Fig. 34.)

3.—Gely's Suture.

TECHNIQUE.—Take a long silk thread and put a fine needle on each end. With one of the needles penetrate the intestinal wall from without to within a little outside of and back of one of the angles of the wound; make the return from within to without parallel with the wound and five or six centimeters further ahead. Execute the same manipulations on the other side with the other needle; cross the threads. The left is passed over to the right, and *vice versa*. (Fig. 35.) Each needle is introduced into the hole made by the returning needle or a little in front. This manipulation is continued to the other end of the wound. The stitches should be closed to a proper degree in the order in which they are made. The serous faces

will exactly come back to back if the suture is correct. Tie the two ends and cut near the knot,

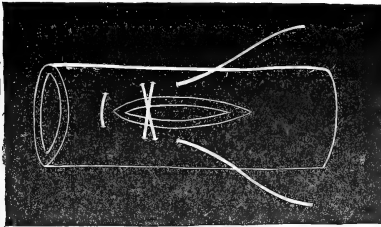


Fig. 35.—Gely's Suture.

4.—Czerny's Suture.

TECHNIQUE.—It is Lembert's suture modified by making two rows of stitches one above the other. Make the first row of stitches traverse the serous and muscular layers at their edges

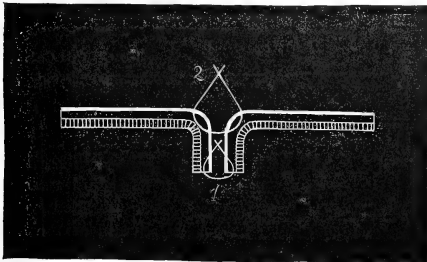


Fig. 36.—Czerny's Suture.

1, Sero-muscular row, the threads passing across the muscular or cellular layers; 2, sero-serous row. (Chaput).

(fig. 35). Make the second row eight to ten millimeters from the first. The two lips are maintained in contact for at least a centimeter by the non-perforating sutures.

5.—Chaput's Sutures.

TECHNIQUE.—Throughout the extent of each lip separate the mucous and muscular layers for a centimeter from the

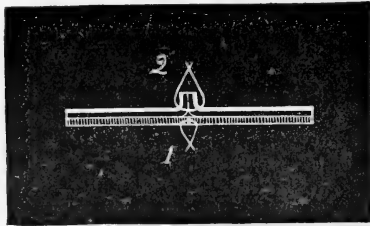


Fig. 37.—Suture for Abrasion. First method.

1. Muco-mucous suture; 2, Suture for abrasion.

edge. Place the first system of non-perforating sutures in the mucous coat after excising or turning into the intestine the detached part (muco-mucous suture). The second line of

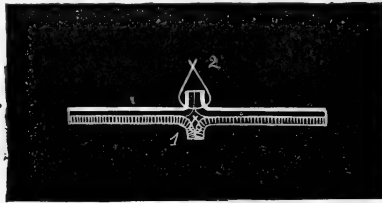


Fig. 38.—Suture for Abrasion. Second method.

1, Muco-mucous suture by infection; 2, Suture for abrasion

sutures perforate the serous and mucous coats (musculo-muscular sutures). (Figs. 37 and 38.)

This suture should be employed in case of complete section

of the intestine. For the posterior semi-circumference of the intestine, the threads for the mucous sutures are knotted inside; for the anterior semi-circumference they are knotted outside. Above the muscular row of stitches one should make

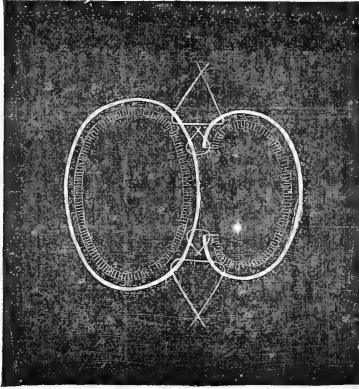


Fig. 39.—Simple Intestinal Graft.

The wound is united by two series of non-perforating sero-serous sutures.

a third row of stitches in the serous layer (surety sero-serous suture).

When the wound is accompanied by a loss of substance the intestinal graft gives excellent results. With regard to the perforation, place the wounded loop against a part about twenty centimeters above or below. Unite the lips of the wound to the portion which is to serve as a graft by two series of sero-serous non-puncturing stitches. (Fig. 39.)

HEAD.

I.—EXAMINATION OF THE EYE.

Restraint.—Hold the head immovable with or without the use of a twitch.

Place yourself a little in front of the subject, on the same side as the eye to be examined.

1.—Test of the Pupil.

Bring the animal into a well lighted place. During the whole operation an assistant should cover the unexamined eye with his hand. Lower the upper eyelid over the eye to be inspected; hold it down, keeping the globe covered for some time, also exercise a little friction over it, then uncover quickly by withdrawing the hand. If the iris possesses its mobility, the pupil dilates when obscured and contracts rapidly on exposure to light. If the movements are not accomplished, or very slowly, the iris is altered.

2.—Examination with the Ophthalmoscope.

Place a mydriatic substance in the eye (sulphate of atropine 1:100).

Instruments.—Ophthalmoscope and lens, speculum, candle or oil lamp.

a.—Examination of the Eye by direct Illumination.

Proceed in full day light, by reflecting the sun's rays upon the eye by means of a concave mirror (Follin's ophthalmoscope); or, it is preferable to operate in a dark box-stall, and employ artificial light from an ordinary paraffin candle, or oil lamp. An assistant holds the lamp in front and to the right of the head if the left eye is to be examined; to the left, if the right eye is to be examined. When the mydriatic effect is obtained, inspect the eye after having put the speculum in place; you should distinguish alterations of Decement's membrane, the iris, crystalline lens, and of the deep portion of the eye. If it has been attacked by periodic ophthalmia you detect posterior synechia or traces of synechia.

b.—Examination by Oblique Light.

Operate in a dark box. Have an assistant hold the lamp on the side corresponding to the operation, on a line with the anterior part of the neck. With the lens interposed between the lamp and the eye, concentrate the rays upon it. By gradually changing the position of the lamp and lens alterations of the cornea, Decement's membrane, the iris and crystalline lens can be readily distinguished and synechia or its vestiges recognized.

II.—PUNCTURE OF THE CORNEA.

Restraint.—Apply a twitch to the upper lip; raise the anterior foot on the side opposite that on which you operate.

Instruments.—Speculum, lanceolate needles mounted in a handle, or ordinary suture needles.

TECHNIQUE.—Render the eye insensible by the use of cocaine; apply the speculum and fix the globe. Puncture the cornea obliquely near its periphery, by introducing a needle parallel with the iris; separate the lips of the wound by turning the needle a quarter of a revolution upon its axis.

After removing as much of the fluid as desired, return the needle to its first position and withdraw it.

With the keratome or the trocar, etc., it is sufficient to make an oblique puncture of the cornea; the fluid flows through the groove of the keratome or the canula while in place.

III.—OPERATION FOR CATARACT.

It is necessary that the animal be held in a couching or recumbent position.

Restraint.—Cast the animal on the side opposite that on which the operation is to be made. Secure general anesthesia. Dilate the pupil by instillation of a solution of atropine.

Instruments.—Eye speculum, needle with a fine handle and terminated by a lance-like point (Dupuytren or Scarpa needles).

TECHNIQUE.—A. **When couching.** The lids are separated and the eye fixed. The needle is held as a pen in writing, in an oblique direction from below upward, and slightly back

to front, the point horizontal, the convexity turned upward; implant it in the sclera five millimeters from the cornea and a little below the transverse diameter of the eye. At the time all the curved portion of the needle has been introduced, execute a quarter of a turn of the instrument upon its axis in such manner that its convexity turns toward the cornea. Carry its extremity towards the superior part of the crystalline lens and avoid wounding the iris; apply the concavity against the summit of the lens, and, by a see-sawing movement, bring it down in the field, force it downward and backward below the visual axis, and into the vitreous body. Retain it there for some time to prevent it ascending again and withdraw the instrument after returning it to the horizontal position. When the operation is well executed the anterior face of the crystalline lens is turned downward.

B. When reclining. Introduce the needle in the eye and carry it to the crystalline lens as directed when the animal is couching. Instead of displacing the lens directly from above downward, make the sea-sawing motion backward in the vitreous humor; lay it upon the floor of the eye in such manner that its anterior face will be turned upward.

Hold it there for a few moments to prevent it returning and withdraw the needle after returning it to the horizontal position.

IV.—EXTIRPATION OF THE EYE.

Restrain the animal as in the operation for cataract. (In practice general anesthesia is not necessary; it suffices to make five or six injections of a solution of cocaine of 1-100 around the globe in the connective tissue).

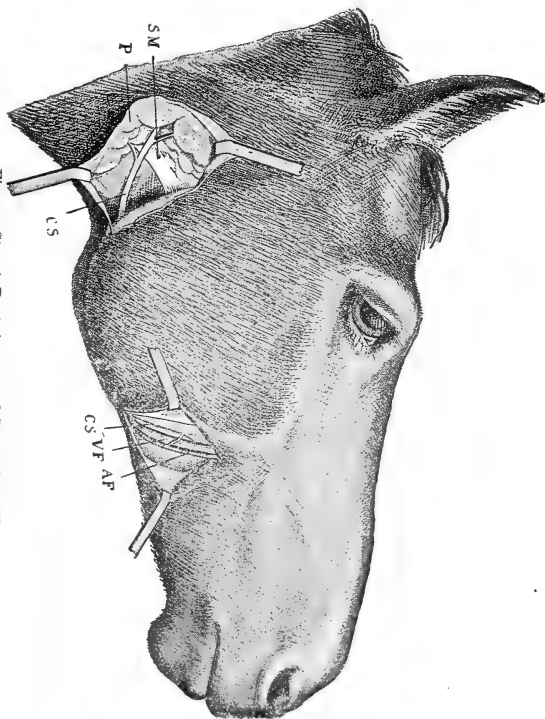
Instruments.—Forceps, straight bistoury, and curved scissors.

TECHNIQUE.—*First step: Incision of the Conjunctiva.*—Incise the conjunctiva along the entire periphery of the eye; separate it from the winking bodies, the lids, and turn them outwards. If the globe is very large divide the external angle.

Second step: Removal of the Eye.—Plunge the straight bis-

toury, held as a pen and cutting edge out, between the ocular globe and the orbit near the internal angle. Make the

SM, tendon of the sterno-maxillaris; P, parotid; CS, Steno's duct; VF, facial vein; AF, facial artery.



penetration to the bottom of the cavity; detach the inferior part of the ocular globe by shaving from within to without to the external angle of the eye, along the inferior semi-circum-

ference of the orbit. Carry the bistoury back to the internal angle by shaving the superior semi-circumference. The eye is now only attached by the optic nerve and straight muscles. Introduce the curved scissors, concavity turned toward the ball, to the bottom of the cavity at the external angle, and with one cut section the nerve and muscles.

V.—LIGATURE OF STENO'S DUCT.

Restraint.—Cast the animal on the side opposite to that on which you wish to operate. Hold the head extended upon the neck by means of a halter.

Instruments.—Bistoury, forceps, director, needle and thread.

TECHNIQUE.—*Ligature upon the jaw.*—After turning from within to the outside of the inferior border of the maxillary, Steno's duct rises along the anterior aspect of the masseter behind the glosso-facial vein, there passes under it and the artery to the opening within the bucal cavity. (Fig. 40.)

Make a short incision at two fingers' width from the maxillary border and a centimeter behind the glosso-facial artery; divide the skin, the cutaneous muscle and use precaution in dissecting the adjacent connecting tissue layers. The duct appears below as a narrow flat white cord. It has only to be isolated and tied; at the same time avoid wounding the vein.

Ligation behind the maxilla.—At one to two centimeters behind the ascending branch of the maxillary, near the inferior angle of the parotid and on a line with the sterno-maxillaris, make an incision of three or four centimeters through the skin and cutaneous muscle in a gradually oblique direction downward and forward; continue cautiously by dividing the cellular layer in which the duct is located; lay it bare, isolate, and ligate.

VI.—TREPHING.

Restraint.—Cast the animal on the side opposite to that on which you wish to operate. Hold the head in extension upon the neck. Twitch the upper lip. Remove the bridle or halter.

Instruments.—Bistoury, forceps, raspitory, trephine, long or paring knife.

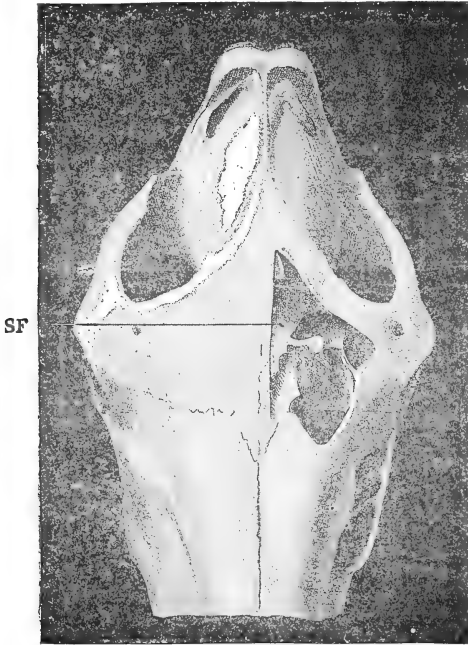


Fig. 41.—Head, anterior face; SF, frontal sinus.

1.—Trephining the Frontal Sinuses.

Trephine the frontal sinuses between the internal angle of the eye and the median line at equal distances from these two points.

TECHNIQUE.—*First step: A V-shaped incision and dissection of the narrow cutaneous strip.*—Make two oblique incisions downward and forward. They should converge and unite at their inferior extremity. With the forceps and straight bistoury, dissect the narrow cutaneous strip and also its bound-

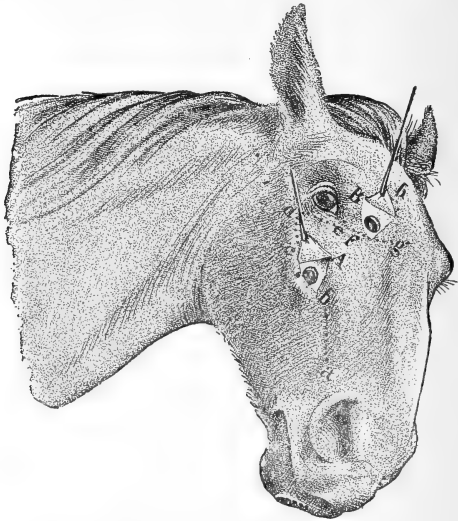


Fig. 42.—Trepining. Large opening of the Sinus. Repulsion of the Molars.
 A, Trepination of the inferior maxillary sinus; B, trepination of the frontal sinus; E D C, line for incision for opening the large maxillary sinus; f g h, line of incision for opening the large frontal sinus; a b, line of incision for the repulsion of the first molar teeth.

aries. Scrape the osseous surface over an area corresponding to the diameter of the trephine to be used.

Second step: Trepining.—Prepare the trephine, the point of the pyramid lowered some millimeters below the crown and the guard set at one centimeter; the strip of skin is seized with the forceps and held by an assistant. The point of the pyramid is placed in the center of the uncovered bone. Impart a

boring or rotary movement which causes the pyramid and saw to successively penetrate the bone. In a few moments the bone is divided. If the crown does not carry a guard, exercise only moderate pressure upon the instrument when the section is about complete. Frequently the round osseous section remains attached in the crown; if it escapes into the sinus, withdraw it with the forceps. Remove the long roughened particles of bone that project into the opening, with a long blade or paring knife.

2.—Trephining the Superior Maxillary Sinuses.

Operate in the angle formed by the inferior eyelid and the zygomatic crest, at equal distance from these points.

The V-shaped incision has its summit corresponding to the angle formed by the inferior orbicular muscle and the zygomatic crest.

3.—Trephining of the Inferior Maxillary Sinus.

Make this a little in front of the zygomatic crest; in the old horse, nearly on a level with the inferior extremity of that crest; in the young (where the sinus is larger and descends further), a little higher and farther beyond the crest.

The technique is the same as for the preceding operations.

Introduce the curved scissors into the opening of the inferior maxillary sinus, and make communication with the superior by tearing down the delicate osseous structure which separates them.

4.—Large opening of the Sinuses for the removal of Benign Tumors.

Lay bare the greater portion of the frontal sinus by detaching a flap of skin which is limited within by an incision made from above downward near the median line, and parallel to it, and by another drawn from the internal angle of the eye in an oblique direction from back forward to the first. Uncover the maxillary sinuses in the same manner by prolonging along the zygomatic crest and in front of the inferior eyelid, the two incisions made for trephining the superior maxillary sinus. (Fig. 42.) With a large sized trephine make three,

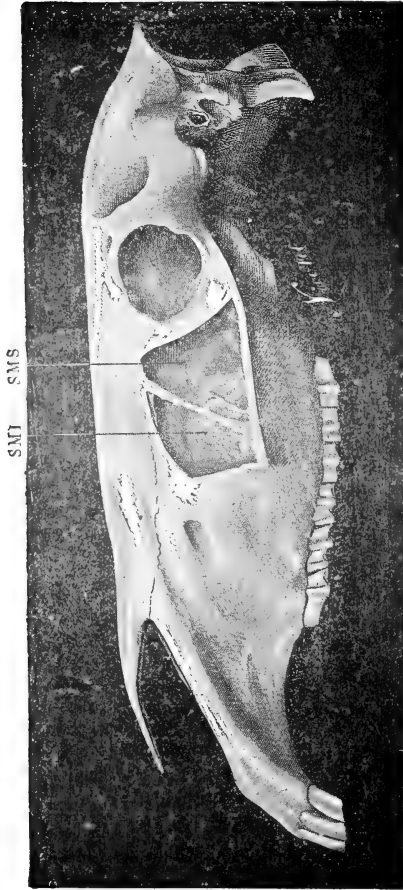


Fig. 43.—Head, Left Lateral Face, Maxillary Sinus.
SML, inferior maxillary sinus; SMS, superior maxillary sinus.

four or five overlapping openings over the bare bone; remove the projecting osseous inter-arches to make the outline regular.

VII.—REPULSION OF THE MOLARS.

Restraint.—The same as for trephining.

Instruments.—Scissors, bistoury, forceps, trephine, chisel or paring knife, gouge and repulsor.

TECHNIQUE.—*A.*—*Repulsion of a superior molar.*—*First step:*—*Incision and laying bare of the skin.*—Make a large V-shaped incision through the skin over the jaw on a level with the deep extremity of the tooth you wish to remove. Free the small strip of skin and also the edges and rasp the bony surface thus exposed.

Second step:—*Trephining of the superior maxillary.*—Make three tangent openings in the external bony wall, two parallel to the maxillary opening and the third in front of the first. Trim the opening with the chisel or paring knife.

Third step:—*Repulsion of the tooth.*—Spread the jaws with a speculum and have it retained in position by an assistant. The repulsor is placed on the root of the tooth to be removed, parallel to its direction. The assistant gives light blows to the repulsor with a hammer. Seek to discover the effect produced with the free hand. Ordinarily a few blows suffice to loosen the tooth and drive it from its alveolus. Seize it with the long forceps or with the hand introduced into the mouth between the branches of the speculum.

B.—*Repulsion of an inferior molar.*—The technique is the same as for the superior molars; but because of the danger of fracturing the inferior maxillary bone the assistant should strike very lightly upon the repulsor.

When operating upon one or the other jaw, and you do not wish to expose a tooth to blows other than the one which should be acted upon, it should be remembered that *the roots of three anterior molars of each jaw are directed slightly forward; that those of the other three are directed slightly backward.* (Fig. 44.)

VIII.—AMPUTATION OF THE EAR.

Restraint.—Cast the animal on the side opposite that on

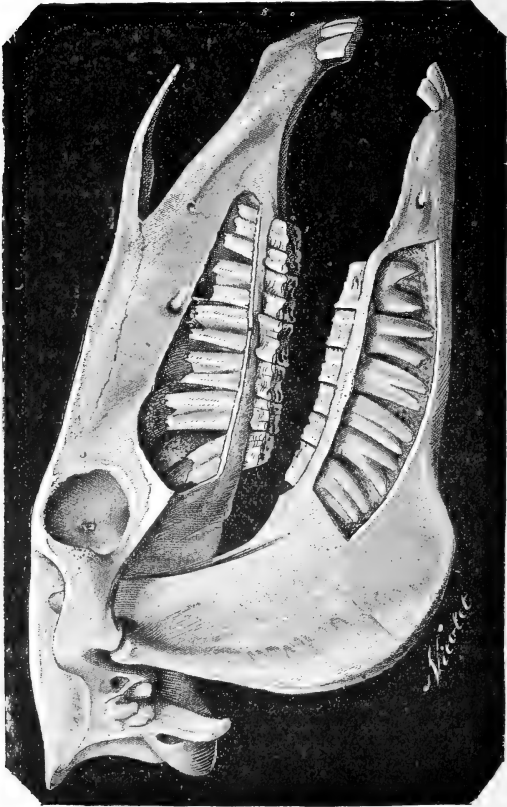


Fig. 44.—Position of the Molar Teeth.

which you wish to operate. Hold the head extended upon the neck.

Instruments.—Scissors, bistouries, dissecting forceps, artery forceps, needles and thread.

TECHNIQUE.—After having clipped the hair over the base of the ear and periauricular region, make a circular incision, only dividing the skin, two centimeters from the base of the conchal cartilage. While an assistant draws the ear successively, backward, downward and forward, dissect out the concha, detaching it from the parotid gland and the scutiform cartilage cutting the parotido-scuto and cervico auricularis muscles; take up the posterior and anterior arteries with the artery forceps. The concha is isolated to its base, excise it by a cut of the bistoury through the fibrous ligament which attaches it to the annular cartilage. Tie the auricular arteries and remove the forceps. Introduce a small tampon of wadding in the auditory conduit and suture the lips of the wound.

TAIL.

I.—AMPUTATION.

Restraint.—Twitch the upper lip; hobble both posterior limbs; the line is passed forward between the two fore limbs over the withers and side is crossed and held by an assistant.

Instruments.—Docking knife or a well sharpened paring knife, block and mallet, tail burner or rubber cord.

TECHNIQUE.—One ordinarily sections the tail ten to fifteen centimeters from its free extremity. The hair is combed and cut circular about five centimeters from the point where the incision is to be made; unite in two lateral plaits that on the superior part of the tail and fasten them upon the base of the organ; towards their extremity knot the hairs of the inferior part. When that is done, prevent hemostasis by applying the rubber cord a little above the line of section.

Take a position to the left of the subject, a little behind the corresponding posterior limb. An assistant holds the tail

horizontally. If the docking instrument is used, hold the female branch in the left hand, and in such a manner that the portion to be cut lies in the concavity of the armature. Cut the tail a little below the ligature with a single cut, by bringing the two branches of the instrument together quickly and forcibly. If the rubber cord is sufficiently tight there will be no hemorrhage.

When the ligature is not applied, the blood escapes in jets from the gaping orifice of the coccygeal arteries. Arrest the hemorrhage by cauterizing with the tail burner heated to a cherry red. Hold the caudal stump in the left hand and apply the cautery for several minutes against the tail, the orifice in the instrument corresponding to the vertebræ; imprint it there by several movements of semi-rotation (Peuch).

In default of a docking instrument, place a block under the tail, at the point where you wish to section it. Apply the sharp cutting edge of a paring knife or analogous instrument and divide it by one stroke of the mallet.

II.—CAUDAL MYOTOMY.

Restraint.—Twitch; hold the head elevated; hobble the posterior limbs, the line is passed forward between the fore limbs over the withers to the side, crossed and held by an assistant.

Instruments.—Convex bistoury and rat-tooth forceps or tenotomes.

TECHNIQUE.—METHOD BY LONGITUDINAL INCISIONS.—Hold the tail well elevated upon the median line, turning it over the group. Take a position behind the subject. Two longitudinal enlargements formed by the depressor muscles are visible upon the inferior face of the tail (See fig. 20). With the convex bistoury make an incision of six or eight centimeters from above downward exactly in the axis of the muscles, being careful to begin high enough to leave a space of three fingers' width between their extremities and the base of the appendix. You may also make two short transverse incisions wholly on the outside of and on a line with the limits of the muscular portion that is to be excised. These are united to the longitudinal incision. (Trasbot.) The skin and the coccygeal

aponeurosis is divided, the enlargements of the two depressor muscles are between the edges of the incisions.

Seize one of the muscles with the forceps held in the left hand; with the convex bistoury separate the deep layer outwardly, cut it transversely near the inferior angle of the incision, dissect its internal side, avoid wounding the median coccygeal artery, finally remove the section at the superior part of the incision by a cut of the bistoury given from below upward.

Excise the other muscle by essentially the same manipulations.

The preceding operation is simple, easily executed and gives good results.

SUBCUTANEOUS METHOD. — *First step:—Puncture.*—The place selected is at a hand's breadth from the base of the tail. Clip the hair upon the lateral faces, at the points of operation. To section the depressor muscle on the right side hold the straight tenotome in the right hand; upon the side of the tail at the limit of the enlargement formed by that muscle, it is said on a level with its deep layer, apply the point of the instrument; puncture the skin and coccygeal aponeurosis, and make the blade of the tenotome penetrate flatwise under the muscle.

Second step:—Section.—Withdraw the instrument and introduce the curved tenotome into the wound; pass it under the muscle until you reach the median line with its blunt point, then execute a quarter revolution, turning its sharp edge towards the muscle, seize the muscle with a full hand, apply the thumb over the enlargement formed by the depressor, cutting it from within to without in respect to the skin.

To section the depressor muscle on the left side operate with the left hand.

If there is hemorrhage apply a bandage with moderate compression. Fix the layers of wadding by turns of a band applied near the base of the tail.

LIMBS.

I.—TENOTOMY.

General Rules.—Make all tenotomies upon the animal while cast. Place the limb in the most favorable attitude for the most rapid section of the tendon to be cut. If it is desired to have the limb extended, this may be accomplished by means of a rope. Except for the section of the cunean branch, always employ the subcutaneous procedure, and make only a short incision in the skin.

1.—Supracarpal Tenotomy.

Restraint.—Cast the animal upon the side opposite that on which you wish to operate. Apply a twitch to the upper lip. Hold the limb by means of two ropes, one placed at the superior part of the forearm and held backward, the other secured to the canon or fetlock and drawn forward.

Instruments.—Curved scissors and tenotomes.

TECHNIQUE.—1. *Section of the tendon of the oblique flexor of the metacarpus.*—Take a position with the knees upon the ground in front of the limb and on a line with the forearm. The tendon is very apparent towards its inferior extremity, a little above the knee. Clip the hair in that region. With the straight tenotome make a short incision through the skin and aponeurosis on a line with the anterior border of the tendon, three or four centimeters above the supracarpal bone. Pass the curved tenotome into the puncture flatwise, from before backwards under the tendon, until its blunt point will have proceeded to the posterior border of the cord. Execute a quarter of a turn of the instrument upon its axis in such a manner as to bring its cutting edge against the deep face of the tendon; grasp it with a full hand, press with the thumb against the point under the skin and a little behind the tendon. Draw upon the ropes. By a gentle see-saw movement cut the tendon and antibrachial aponeurosis from within to without.

2. *Section of the tendon of the external metacarpus*—By means of the straight tenotome, make a short puncture in the

skin and adjacent aponeurosis four or five centimeters above the supracarpal bone and immediately in front of the tendon. By means of this opening engage the curved tenotome flatwise under the tendon. Draw upon the ropes. Cut the tendon and the aponeurosis in the same manner as in section of the oblique flexor. (Fig. 45).

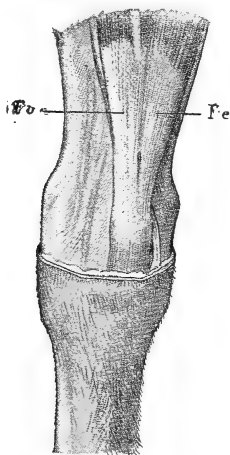


Fig. 45.—Inferior part of the forearm, knee and superior part of the metacarpus (posterior face).

F o, oblique flexor of the metacarpus; F e, external flexor.

2.—Plantar Tenotomy.

When practicing section of the perforans or the perforatus, or of the double tenotomy, the place to be selected in the forelimbs is one to two centimeters below the middle part of the canon; for the posterior members it is exactly at the middle of the canon (the inferior cul-de-sac of the carpal sheath is situated a little further down than that of the tarsal sheath).

In the anterior limbs the lateral artery of the canon passes along the internal border of the tendons, and may be wounded. In the posterior limbs, in the superior two-thirds of the sheath it is situated on the posterior face of the canon immediately in front of the external metatarsal; there is no danger attending it.

Restraint.—In the anterior as well as the posterior limbs operate upon the external face. Cast the animal upon the opposite side; leave the limb in the hobble; secure it by two ropes, one at the inferior part of the forearm or the leg, depending whether you operate upon an anterior or posterior limb; the other upon the fetlock; the first held backward and the second forward.

Instruments.—Scissors and tenotomes. ¹

TECHNIQUE.—1. *Section of the Perforans.*—*First step: Puncture.*—Take a position with the knees upon the ground in front of the fore-limb on a line with the fore-arm, or in the rear of the posterior member on a line with the hough. Prepare the region; implant the blade of the straight bistoury between the two tendons, or, if they are altered and con-founded, at the posterior third of the indurated mass which they constitute. Avoid perforating the skin on the opposite side.

Second step: Section.—Withdraw the straight tenotome and slip the blade of the curved tenotome in its place. Execute a quarter of a turn upon the axis of the instrument to permit its cutting edge to come in contact with the perforans; seize it with a full hand, press with the thumb against the canon as a point of support; draw upon the rope, and cut the tendon from the rear forward by a double see-sawing movement. A slight noise and the separation of the tendon indicates that the section is complete.

2. *Section of the Perforatus.*—Make a short incision in the skin at the same point as for section of the perforans. Introduce the curved tenotome flatwise behind the tendon in the subcutaneous connective tissue, direct the cutting edge against the tendon and cut it from the back forward.

If you make a double tenotomy, cut the perforans first and

then the perforatus, proceeding in the manner already explained.

Apply a light compress bandage upon the canon.

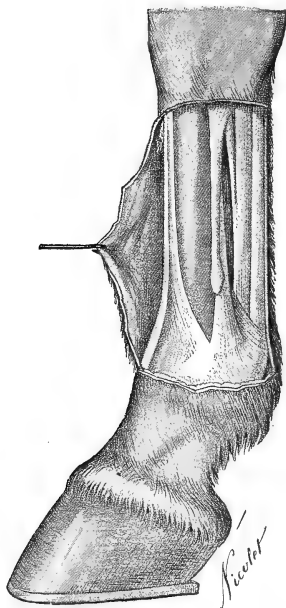


Fig. 46.—Metacarpal region.

Suspensor ligament of the fetlock, carpal check, perforans and perforatus.

3.—Cunean Tenotomy.

Restraint.—Cast the animal upon the side upon which you wish to operate; secure the posterior superficial member upon the corresponding fore limb above or below the knee.

Instruments.—Curved scissors, convex bistoury, rat-tooth forceps, suture needle furnished with a thread, or a tenotome.

TECHNIQUE.—The cunean branch is disposed obliquely from before backward, and above downward on the internal face of the hough, a little above the prominence which marks the inferior limit of that region (fig. 47); it is easily detected as it passes under the skin. In the case of spavin it is very voluminous, but never entirely covered by the osseous neoformation, which is hollowed into a canal-like depression, at the bottom of which is situated the tendon.

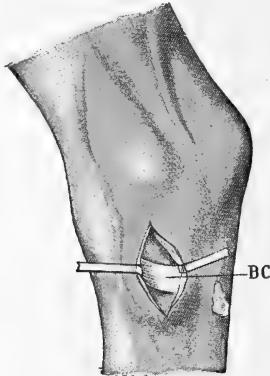


Fig. 47.—Internal face of the hough.
BC, cunean branch.

Old Method.—After having clipped the hair over the inferior portion of the internal face of the hough, make an incision in the skin of three or four centimeters over the axis and perpendicular to the tendon; follow by incising the subcutaneous connective tissue; introduce the point of the curved scissors (disposed on the flat surface, concave face outward) from above downward under the tendon, which you find thus disposed, and cut it with the bistoury.

Unite the cutaneous wound by two stitches.

Subcutaneous Method.—Make a short transverse puncture through the skin over the axis of the internal face of the hough on a level with the inferior border of the tendon. If you make the section with a tenotome having a concave cutting edge, introduce the blade flatwise under the tendon and cut it from within outward, and avoid incising the skin; if you operate with a tenotome having a convex cutting edge, engage the blade flatwise between the skin and tendon, and cut it from without to within.

4.—Tenotomy of the Lateral Extensor of the Phalanges.

Restraint.—Cast the animal upon the side opposite the member on which you wish to operate; leave the limbs in the hobble.

Instruments.—Curved scissors and tenotomes.

TECHNIQUE.—In the posterior limb the tendon of the lateral extensor of the phalanges is united with that of the anterior extensor toward the middle of the metatarsi. In the superior part of that region the two tendons as they pass under the skin are easily detected.

Make the operation a few centimeters from the union of the two tendons about three fingers' width from the middle of the canon. Puncture the skin even with the external border of the canon and insert the straight tenotome under it. Introduce the blade of the curved tenotome in the puncture, directing the cutting edge of the instrument against the tendon, and cutting it from within to without. Flexion of the phalanges, secured by drawing backward upon the rope attached to the pastern, favors section of the border.

II.—DESMOTOMY.

1.—Metacarpal Desmotomy.

Restraint.—Cast the animal upon the side opposite the limb to be operated upon, leave it in the hobbles; attach a rope to the inferior part of the forearm and another to the pastern.

Instruments.—Scissors and tenotomes.

TECHNIQUE.—Make the operation a little above the inferior extremity of the small metacarpals or the metatarsals at a point where the suspensor of the fetlock is well drawn (fig. 46), and at some distance from the superior cul-de-sac of the sessamoid sheath.

Implant the straight tenotome between the suspensory ligament of the fetlock and the perforans; insert the blade of the curved tenotome in the incision, turn the cutting edge against the suspensory ligament and cut forward, after having drawn the ropes as for plantar tenotomy.

2.—Patellar Desmotomy.

Restraint.—Cast the animal upon the same side as the limb on which the operation is to be performed; fasten the superficial posterior limb upon the inferior part of the corresponding fore limb.

Instruments.—Scissors and tenotome.

TECHNIQUE.—The internal tibio patellar ligament (fig. 48) is easily distinguished on exploration of the internal face of the stifle. At one centimeter above the superior margin of the tibia, immediately behind the ligament, puncture the skin with the straight tenotome, and, *holding it very obliquely, make the blade penetrate under the ligament*, to avoid wounding the synovial capsule. At the same time the instrument is withdrawn pass the blade of the curved tenotome in the puncture; turn the cutting edge against the ligament and cut from within to without.

III.—NEURECTOMY.

General Rules.—The diverse neurectomies are performed upon the animal adjusted in the decubital position. If the operation is made on the external side of the limb, the horse is cast on the side opposite that member; if it is made on the internal side, it should be cast on the side corresponding to the member; if the operation is bilateral, the operation is first made upon the inside.

Instruments.—Scissors, two bistouries, rat-tooth forceps, and needle furnished with thread are the only instruments

that are indispensable; but it is convenient to have a dilator or retractor, a director and artery forceps.

The operation comprises four steps: 1st, incision of the skin; 2nd, dissection of the subcutaneous tissues and isolation of the nerve; 3rd, resection of a part of the nerve; 4th, suture.

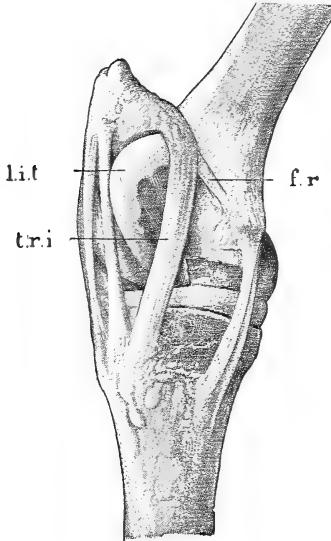


Fig. 48.—Femoro-tibio-patellar articulation.

Lit, internal lip of the femoral trochlea; tri, internal tibio-patellar ligament; f r, femoro-patellar ligament.

1.—Plantar Neurectomy Below the Fetlock. (Phalangeal Neurectomy.)

Restraint.—The operation should always be made upon both plantar nerves. Begin with the internal. The horse should be cast upon the same side as the limb to be operated upon.

If it is an anterior member, fix it above the hough of the opposite posterior member; if upon a posterior member, carry it above the knee on the opposite fore limb.

TECHNIQUE.—*First step: Incision.*—If the phalangeal region is neither infiltrated nor indurated, it is sufficient to explore the lateral face with the pulp of the thumb to find at the posterior part the *ligament of the plantar cushion* and the adjacent vasculo-nervous cord. There make the line of incision (fig. 49). If there is infiltration or induration, and these organs cannot be found, the incision should be made at the limit of the lateral and posterior faces of the pastern, following the axis of the first phalanx and at the superior third of that bone (above the ligament), or at the inferior third (below the ligament).

With the hair clipped and the skin shaved, make a cutaneous incision of two and a half to three centimeters with the convex bistoury; divide the adjacent cellular tissue; if you come upon the ligament, prolong the incision a little above or below.

Second step: Dissection and isolation of the nerve.—Seize the the connective tissue layers, which form a kind of sheath common to the digital artery and plantar nerve, gather it in folds transversely to these organs, and divide it with the point of the bistoury. Isolate the nerve for a centimeter and a half, always with the bistoury if you have a sure hand, and with the director if you are afraid of wounding the artery. It is situated immediately in front of the nerve and the vein about a centimeter in front of the artery. The vein is exposed in the wound when the incision is made too far forward,—an error frequently committed by beginners.

The execution of this step is facilitated by the use of a dilator or retractor. If the blood flows and soils the parts, an assistant drains the field of operation.

Third step: Resection.—The nerve is seized with the forceps; slip the blade of the bistoury under it flatwise, turn the cutting edge upward, section it with one cut at the superior angle of the wound. Afterwards cut it at the inferior angle of the incision, removing from a centimeter to a centimeter and a half of tissue.

Fourth step: Suture.—Unite the lips by one or two stitches, according to the extent of the incision.

Cover with flannel, replace the limb in the hobble, turn the animal, and after re-securing the member in a convenient position make the operation upon the opposite side.

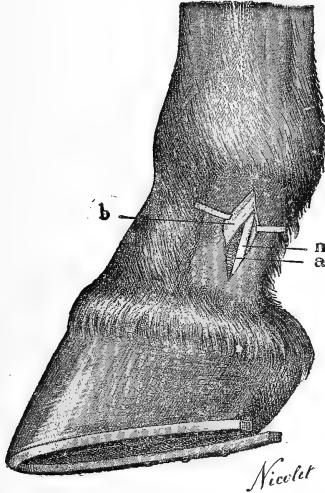


Fig. 49.—Plantar neurectomy below the fetlock.

b, ligament of the plantar cushion; a, digital artery; n, plantar nerve.

2.—Plantar Neurectomy above the Fetlock. (Metacarpal or Metatarsal Neurectomy.)

Restraint.—The limb should be shackled as for the preceding operation, being careful nevertheless to attach the rope sufficiently high upon the canon that the inferior part of that region remains uncovered.

One may also unite the limb to be operated upon with its congener with a rope in figure 8; unhobble the first and carry

it forward (anterior limb) or backward (posterior limb) by means of ropes, the lines drawing on it in contrary directions.

TECHNIQUE.—When the fetlock and the inferior part of the canon are clean (free from connective tissue or indurations), the nerve is easily recognized on exploration with the pulp of the thumb, on the lateral face of the tendons a little above

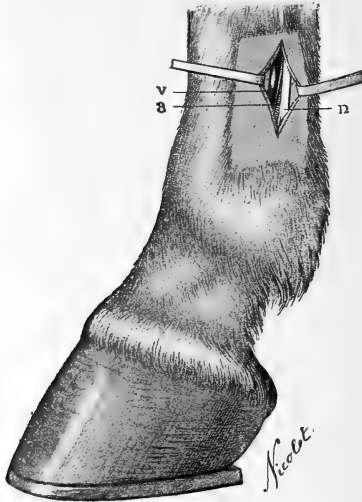


Fig. 50.—Plantar neurectomy above the fetlock.

V, collateral vein of the canon; A, collateral artery of the canon;
N, plantar nerve.

the fetlock. The plantar nerve passes along the border of the perforans. On the internal side of the anterior leg the collateral artery of the canon (continued by the digital) is situated a little deeper; on the external side, the digital arrives in the neighborhood of the nerve immediately above the fetlock. (Fig. 50.)

If the engorgement of the region does not permit the recognition of the nerve, the line of incision should be determined by the border of the cylindrical mass that forms the tendons. As in phalangeal neurectomy, when the nerve is not recognized the incision is often made too far forward.

When the synovial capsule of the fetlock is distended, perhaps the nerve is displaced, carried more or less to the rear. The operation in that case should be made above, or below the distended cul-de-sac.

The same technique as for phalangeal neurectomy.

3.—Median Neurectomy (antibrachial neurectomy).

Restraint.—Cast the animal upon the same side as the member to be operated upon. Carry it forward with a rope after having engaged the other fore limb above the hough over the corresponding posterior limb.

TECHNIQUE.—You can easily perceive the median nerve on the internal face of the elbow, directed downward and a little backward; it crosses the artery at a very acute angle, towards the posterior face of the radius, to become imbedded under the mass of flexor muscles (fig. 54). The principal vein is situated in front of the artery. Make the operation on a level with the inferior part of the elbow joint, or immediately behind the superior extremity of the radius, towards the summit of the interstice which separates on that bone the flexor muscles from those of the forearm.

First step: Incision.—Clip the hair; divide successively the skin, the subcutaneous connective tissue, and the sternal aponeurosis for a length of five centimeters. Towards the inferior angle of the wound make a short incision of the antibrachial aponeurosis; under this, engage the director, groove outward, from below upward, parallel to the nerve; with the bistoury thus guided, incise the aponeurosis from within to without (Peters). To effect that division the blunt-pointed bistoury may also be used. Afterwards take away a semi-elliptical part from each lip of the aponeurosis; the nerve is very largely exposed (Möller). Separate the edges of the wound by two retractors.

Second step: Dissection of the sub-aponeurotic layers and isolation of the nerve.—This step of the operation is somewhat difficult. Avoid wounding the radial veins. If, under the influence of the movements, the nerve has been displaced, it will be brought upon the line of incision by gradually changing the position of the limb by carrying it backward or forward. By means of the forceps and the bistoury, or with the director, isolate the nerve and carry it above the director.

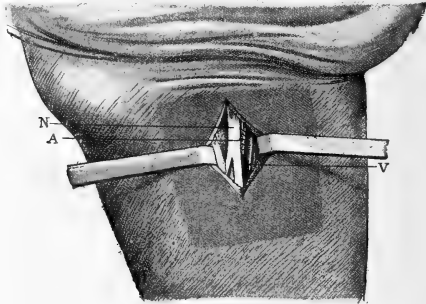


Fig. 51.—Median neurectomy,
N, median or cubito-plantar nerve; A, posterior radial artery;
V, one of the posterior radial veins.

Third step: Resection.—Cut the nerve with the bistoury or scissors at the superior angle of the wound, resect it about two centimeters on the inferior part.

Fourth step: Suture.—Unite the lips of the wound by two or three separate stitches.

4.—Sciatic Neurectomy (tibial neurectomy).

Restraint.—Cast the animal upon the same side as the limb upon which you wish to operate; leave the limb in the hobble; fasten its congener upon the corresponding fore limb.

TECHNIQUE.—The great sciatic passes along the internal side of the tendon of the hough. As one passes the hand above the point of the calcaneum it is detected superficially situated a little in front of the cord surrounded by fatty

connective tissue (fig. 52). It is there that the operation is performed.

At two or three centimeters in front of the anterior border of the tendon of the hough divide the skin and aponeurosis of the leg for a length of four centimeters; dissect the cellulo-adipose tissue which envelopes the nerve; isolate it, seize it with the forceps, cut it above first, excise a portion about two centimeters long from the inferior portion and unite the edges of the wound by two stitches. (Rousseau.)

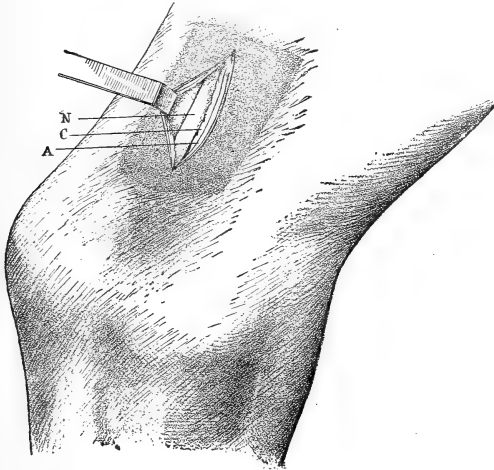


Fig. 52.—Neurectomy of the great sciatic (posterior tibial).
A, aponeurosis; C, cellulo-adipose layer; N, sciatic nerve.

IV.—AUTO-PLASTY OF THE KNEE.

Cast the animal on the side opposite to that on which you wish to operate; hold the limb in extension.

Instruments.—Bistouries, forceps, needle with holder, and Florence hair.

TECHNIQUE.—Shave the skin on the anterior face of the knee; make two curvilinear incisions, limiting a narrow elliptical strip parallel to the long axis of the limb (fig. 53). Raise that strip, and do not go below the subcutaneous connective tissue. Dissect the lips of the wound of the skin; move them to a sufficient degree to permit their union. If the loss of substance is very large, make an incision on each side at a sufficient distance from the wound and parallel with its long axis to favor the slipping of the skin. Unite the lips of the amputation by interrupted sutures with Florence thread.

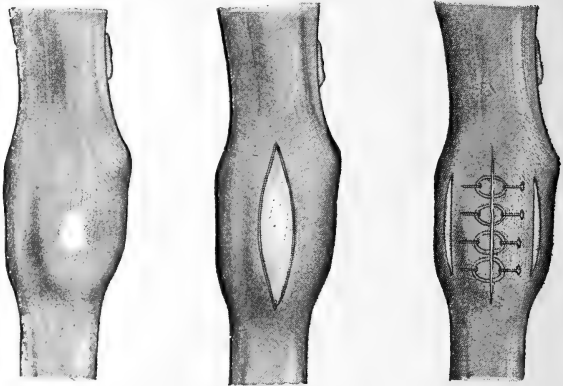


Fig. 53.—Anto-plasty of the knee cap (after Cherry; figures reproduced by W. Hunting).^{*} Replacing the twisted suture by discontinuous stitches of Florence hair.

In practice the operation only succeeds under the most vigorous antiseptic precautions and the insurance of complete immobility of the knee until the moment the cicatrix is solid. (Delcambre and Vinsot.)

^{*} CHERRY, "On Broken Knees," *The Farrier and Naturalist*, 1829, Vol. II., p. 377. HUNTING, "An Operation on Blemished Knees," *The Veterinary Record*, 1889, p. 474.

FOOT.

I.—SAND-CRACKS.

1.—Grooving.

Make a transverse groove five to six centimeters long and one centimeter wide at the superior third of the wall. Use the paring knife or rasp. Groove to the pellicle.

2.—Thinning in a V-shape.

Trace two oblique grooves on the wall, converging downward. They should be at equal distance from the sand-crack at the superior part and unite on a level with its inferior extremity at a variable height upon the wall. Thin the narrow triangular strip of horn comprised between these grooves to the bottom.

3.—Operation for Sand-crack.

Restraint.—For sand-crack at the toe, cast the animal on the side opposite to that on which you wish to operate. Secure the posterior limb to the corresponding anterior above the knee, or the anterior to the posterior above the hough. For quarter-crack, the accident often occurs upon the inner or outer quarter, cast the subject upon the same side as the limb to be operated upon, or upon the opposite side and secure as has already been indicated.

Instruments.—Drawing-knife, sage-knife, forceps, paring-knife and farrier pincers; for dressing, shoe, wadding and roller bandage.

TECHNIQUE.—A.—METHOD BY EXTIRPATION.—*First step: Furrowing.*—The foot is to be pared deeply in its anterior region; take a drawing-knife with a large hollow, and make two furrows in the horn five or six centimeters from the sand-crack; they should be parallel or gradually converge towards the plantar border; limit in this way a strip of wall in which the fissure real or fictitious occupies the central part. Give the grooves a breadth of a centimeter and a half; without making arches, hollow them into the wall towards the plantar border until the horn gives way to the pressure of the finger

nail. Unite these two furrows at their inferior part by a third groove, equally deepened at the bottom, between the wall and sole.

Second step: Incision of the horn.—With the sage-knife in the full hand, the thumb pressing upon the wall as a point of support, incise the horn at the bottom of the furrows, along the edges of the strip that is to be extirpated in order to save the thinned portion; make the incision with the point of the sage-knife, and avoid a deep incision of the sub-horny integument.

Third step: Extirpation.—Hold the hoof-knife in the full hand by its dull extremity, in a transverse direction to the axis of the foot; carry the other extremity to the inferior part of one of the grooves, and engage it under the strip of horn to be forced out; give the instrument a point of support against the wall on the opposite side of the groove; detach the strip at its inferior part by pressure upon the free extremity of the instrument, which gives a lever of the first-class. As soon as the narrow strip is partially loosened an assistant seizes it with the pincers, and by giving it a see-sawing movement from below upward, succeeds in detaching it from the podophyllous tissue; a second movement in a lateral direction releases it from the cutidura from one groove to the other. During the execution of this last manoeuver, press upon the podophyllous layer with the thumbs to avoid tearing that organ.

Fourth step: Excision.—With the forceps and sage knife lift the band of podophyllous tissue from the entire surface of the third phalanx and scrape it.

Dressing without a shoe.—Cover the wound with wadding of turf, bind the foot, the digital region and adjust the layers of wadding with the band. Make circles around the phalanges and reverse upon the plantar region. Assure sufficient pressure to prevent hemorrhage. Envelope the dressing in a sheet of linen and furnish the whole with a double plait of straw. (Fig. 56).

Dressing with a shoe.—Cover the wound with phlegdets superposed to overflowing over the sides and above the gap. Secure them with a roller bandage; passing the first, turn to

the middle, the second above the third, and the balance successively above and below, making as many reverses as may be necessary, being careful that each turn of the bandage covers the inferior two-thirds of that which preceded, and being covered in its inferior two-thirds by the turn that follows. Hold the ends upon the median line between the two branches of the shoe perpendicular to the plantar region. All turns of the bandage should be passed behind between the end and the branches of the shoe.

B.—METHOD OF THINNING.—*First step: Thinning a strip of wall.*—Trace two grooves upon the wall, converging downward, the same as if practicing the extirpation method. Thin the strip of wall with the drawing-knife until the horn responds at all points to the pressure of the nail. At the coronet, the blood oozes upon the cut where it rests upon the cuticula a half centimeter from the horn; also continue the thinning of the pellicle by scraping with the sage or drawing knife.

Second step: Excision.—With the sage-knife excise the middle part of the thinned region, removing the horn and podophyllous structure for the width of a centimeter the whole length of the thinned portion. Scrape the phalanx.

Dress the same as for extirpation.

II.—REMOVAL OF THE SOLE.

Restraint.—Cast the animal; hobble the member in a simple position if the operation is made on a fore foot.

Instruments and bandage material.—Hoof-knife, farrier's pincers, shoeing hammer, drawing-knife, sage-knife, thin shoe with four holes, splints, wadding and roller bandage.

TECHNIQUE.—*First step: Furrowing.*—Pare the foot, leaving the sole and frog a half centimeter thick in order to avoid their tearing with the pincers when employing traction. Immediately inside of the white line at the periphery of the sole, cut a large circular groove from a centimeter to a centimeter and a half wide, dividing the bars in the rear and to the depth that the horn should be thinned.

Second step: Incision of the horn at the bottom of the groove.—Hold the sage-knife in the right hand, supporting the

thumb against a point on the sole; with the point incise the thin layer at the bottom of the furrow, by beginning at the inferior heel, and avoid cutting into the thick velvety tissue.

Third step: Removal.—Detach the sole in the anterior region with the hoof-knife or elevator by taking a point of support upon the inferior part of the wall, and avoid tearing the velvety tissue. An assistant seizes the anterior part of the sole with the pincers and tears it, and also the frog from before backward by a see-sawing movement, while you continue to separate the parts as it continues to approach the heels.

Dressing.—Attach the shoe, dispose layers of wadding over the plantar region; begin by heaping the gap. Afterwards put on the splints longitudinally and transversely. Cover the heels with small phlegdets. Fasten the dressing by several turns of the roller bandage, which in the rear passes over the splints that are supported by the heels of the shoe.

The foot may also be bandaged as after the operation for punctured wound of the foot.

III—OPERATION FOR PUNCTURED WOUND OF THE FOOT.

Restraint.—Secure the foot as for removal of the sole. Place a bundle of straw under the member or hobble the limb in the crossed position for the execution of the essential steps.

Instruments.—Drawing-knife, sage-knife, forceps, tenaculum, scraper or curette. If the sole is removed, use the instruments necessary for that operation.

TECHNIQUE.—A.—PARTIAL OPERATION.—*First step:* Unsole or thin the horn deeply in the plantar region—sole bars and frog.

Second step: Excision.—Hollow an infundibuliform cavity in the middle zone of the plantar region; excise a part of the cushion and aponeurosis. Make the removal with the forceps and sage-knife.

B.—COMPLETE OPERATION.—Effect the first step as for partial operation.

Second step: Removal of the Plantar Cushion.—The foot is held in extension by an assistant; section the cushion transversely near its base with the double sage-knife; make the section obliquely from back forward, from the surface of the cushion towards the aponeurosis, to a point such that the prolonging of the incision in the aponeurosis would lead to the posterior border of the os navicular. Seize the anterior part

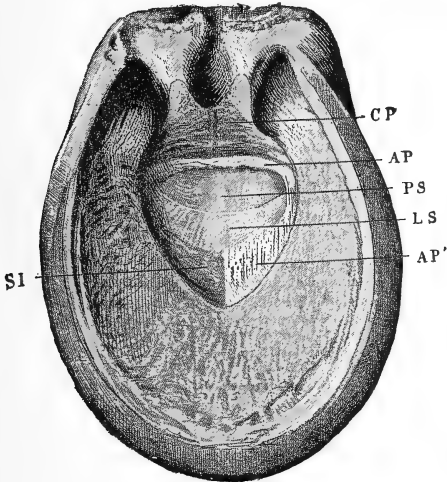


Fig. 54.—Complete operation for punctured foot.

CP, plantar cushion; AP, transverse section of the plantar aponeurosis; PS, small sesamoid; LS, sessamoido-phalangeal ligament; AP', oblique layer of the plantar aponeurosis, near to its insertion; SI, surface for insertion of that aponeurosis.

of the cushion with the forceps or tenaculum and detach it by giving two cuts flatwise with the sage-knife in the hollow of the foot. Ordinarily the deep layers of the cushion rest upon the aponeurosis; excise it with the sage-knife and forceps.

Third step: Removal of the Plantar Aponeurosis.—With the sage-knife, resting upon a solid point of support, section the plantar aponeurosis transversely from one lateral lacunæ to the other. At the deepest point the instrument should come upon the os navicular near its posterior border. Follow with a division upon the median line and behind the strip of aponeurosis to a level with the sessamoidean; excise each portion successively and separate it with the tenaculum or forceps, and cut it with the sage-knife. Be careful of the hand at the point of support; achieve first a transverse section of the aponeurosis on one side; then make a curvilinear incision toward the semi-lunar crest; afterwards detach it from the phalanx by tearing it from the semi-lunar crest. The same manipulation for the other portion. (Nocard.)

Fourth step: Scraping the Osseous Faces.—With a scalpel blade, a drawing-knife or straight gouge, maneuvered flatwise, lift the cartilaginous layer which covers the inferior face of the navicular. Lift the terminal fibers of the plantar aponeurosis uniformly and scrape the semi-lunar crest, and avoid wounding the inter-osseous ligament. When the operation is made for its therapeutic action, do not scrape the semi-lunar crest, lest the fibers which are attached are struck with necrosis. In that case limit the large incision to the necrosis and scrape the osseous face corresponding. (Fig. 54).

Dressing.—Cover the plantar region with layers of wadding and bandage the foot or apply a dressing with a shoe as for removal of the sole.

IV.—OPERATION FOR CARTILAGINOUS QUITTOR.—COMPLETE REMOVAL OF THE FIBRO-CARTILAGE OF THE OS PEDIS.

Restraint.—The animal is cast; fix the limb in a simple position, or crossed above or below the knee if it occurs in a posterior limb, and above or below the hough if it occurs in an anterior member.

Instruments.—Rasp, drawing-knife, sage-knife, forceps, retractor, pieces necessary for dressing. If the operation is

made by extirpation also provide the instruments necessary to detach a part of the wall.

TECHNIQUE.—A.—METHOD BY THINNING.—*First step: Thinning of the quarter.*—Pare the foot thin to the bottom over the quarter where you wish to operate, the bar and the corresponding portion of the sole. Afterward trace a groove upon the wall obliquely from above downward, from before backward, starting from the coronet on a line with the anterior extremity of the cartilage, and limit the strip by walls twice as far apart at the superior extremity as at the other. Thin the horny pellicle over the entire extent of the narrow strip, especially at the surface and neighborhood of the coronet. If the superficial horny layer is very hard and difficult to cut, use a rasp upon it or a cautery heated to a dull red.

Second step: Incision of the Keratogenous Membrane.—Separate the wall from the podophyllous tissue by incising the integument between the two portions of the keratogenous membrane along the inferior coronary zone. Make the incision with the sage-knife held in the full hand, the thumb taking a point of support over the thinned quarter; begin at the anterior limit of the thinned portion, to prolong backward just within the lateral lacunæ, turning round the heel between the cuticular circle and podophyllous leaves. The blade of the sage-knife held perpendicularly divides only the horny pellicle and subjacent tegument. Avoid cutting the cartilage.

Third step: Laying bare of the Coronet and Skin.—Seize the inferior border of the coronet with the forceps; by means of a sage-knife detach that organ partially from the cartilage for the full length of the incision; lay it bare for about a centimeter in width. Towards the middle of the incision follow by introducing a double sage-knife, convex face outward, between the coronet and the cartilage just above its superior border. Lay bare the cutidura and skin in the rear first; hold the instrument in the full hand; make it gradually pivot on its axis backward and inward to bring the cutting edge upon the surface of the cartilage, and by a series of slow movements executed from in front backward, separate the cartilaginous tegument; arriving on a level with its posterior border, turn it

and gradually withdraw the sage-knife in such a manner that the coronet will not be found strongly held upon the cutting edge of the instrument. Then follow by manipulating the sage-knife from back forward to accomplish the separation on a line with the anterior part of the body. During the execution of these acts, which are directed toward the complete isolation of the whole external face and edges of the cartilage, take a point of support over the thinned quarter. Avoid equally the cutting of the coronet and the cartilage.

Fourth step: Extirpation of the Cartilage.—Engage a simple sage-knife (right or left, according to the quarter operated upon) under the coronet; introduce it flatwise, the edge turned upward and backward, turning the posterior border of the body; execute a half turn of the instrument upon its axis, then with a single cut excise the posterior part of the cartilage from within to without, and make the exit of the knife above the podophyllous leaves. To remove the remaining portion of the scutiform plaque, the foot should be held in extension and the coronet separated by the tenaculum. By successive attempts excise first the inferior part, raising the cartilaginous laminæ, the thinner as you approach the fibrous layer, which should be respected. Shortly the light color and the consistence of the cartilaginous tissue give place to a yellowish gray hue, and to the suppleness of the fibrous substance.

To extirpate the superior part, take the other sage-knife and work it from bottom to top; completely separate the antero-supero angle of the body, where often the cartilaginous layer is thickened. To excise the antero-inferior angle, which fills the depression situated in front of the basilar apophysis, use the curette or small paring-knife.

If the cartilage has undergone ossification in the region of the basilar process, remove that osseous neoformation with the paring-knife used as a little gouge. When the ossification of the plaque is extensive, remove all. Detach it first from the phalanx by making a furrow at its base with the paring-knife, and achieving the operation with the hoof-knife and the hammer. Afterwards separate it with the hoof-knife and with a sage-knife detach it from adjoining tissues. All these manipu-

lations should be effected, taking the necessary care not to wound the synovial membrane, nor the lateral ligaments at their juncture with the foot. Nearly always in front of the body there rests a *cartilaginous portion* of the scutiform plaque. Remove it by thin layers as in the classic operation.

B.—METHOD BY EXTIRPATION.—*First step: Furrowing.*—Pare the foot and the inferior face of the heel thin; groove the wall from the edge of the coronet to the plantar border, mak-

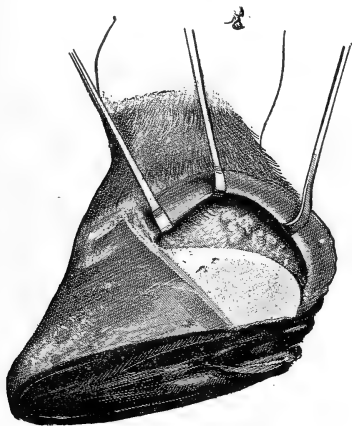


Fig. 55.—Complete operation for the removal of cartilaginous quittor. (Method by thinning) The cartilaginous layer of the scutiform plaque is removed.

ing the furrow a centimeter and a half wide obliquely downward and backward, beginning at the anterior part of the cartilage, the limits of the superior extremity of the strip should be double the width of the inferior. Make another groove in the plantar region from the inferior extremity of the first to the heel.

Second step: Forcibly Removing the Strip of Wall.—Incise the horny pellicle at the bottom of the groove, along the

border of the part to be removed in a manner to conserve a thin band of a centimeter in front of the podophyllous tissue. Follow by detaching that portion of the wall, proceeding in the same manner as has been indicated for sand-crack.



Fig. 56.—Bandage of the Foot.

At the *third step* prolong the incision of the keratogenous membrane upon this band.

After that effect the uncovering and extirpation as in the first procedure.

Dressing with a Shoe.—Attach the shoe; place a tampon of wadding in the depression under the podophyl and coronet,

in order to conserve the disposition of the cuticular region; heap up the parietal breach, dispose large layers of wadding and secure it with the bandage. Pass the first circular turn at the middle of the dressing, reverse the bandage on a level with the shoe heel on opposite sides and hold the end to the point perpendicular to the plantar region; pass it from behind forward, the second turn above, and the third below. Fix the dressing solidly by associating the reverse circular turns between the heel and the end and cover the part as in the dressing of a sand crack. Secure the ends with a straight knot.

Bandage without a Shoe.—After having placed a wadding tampon under the coronet and heaped the gap at the quarter, envelop the foot and digital region by layers of super-imposed wadding. Secure these by turns of bandage upon the phalangeal ray and by the reverses passed under the plantar region.

Cover the dressing with a linen sheet two or four-ply and complete by a double braid of straw. (Fig. 56).

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