Acrostical,

Heart sick'ning the cuttings, the horrible torture,
Attempted by some Quacks, to tinker man up.
Relieve our sore ailings,
Restore Nature's failings,
Your surgeon skilled hands then, will change sorrows cup.

With regards of
Your's Truly
C. G. Spalding

Hyde Park, Mass.
March 21, 1867.

OPERATIVE SURGERY ILLUSTRATED:

CONTAINING MORE THAN

NINETEEN HUNDRED ENGRAVINGS;

INCLUDING

TWO HUNDRED ORIGINAL, AND FIFTY COLORED DRAWINGS:

WITH

EXPLANATORY TEXT,

BY

R. U. PIPER, M. D.

ALSO A CHAPTER UPON

THE USE OF ETHER IN SURGERY,

FROM THE TRANSACTIONS OF THE AMERICAN MEDICAL ASSOCIATION, WRITTEN AT THE REQUEST OF A SURGICAL COMMITTEE OF THAT BODY, BY HENRY J. BIGELOW, M. D., PROFESSOR OF SURGERY IN THE MEDICAL SCHOOL OF HARVARD UNIVERSITY.

BOSTON:
TICKNOR, REED, AND FIELDS.
M DCCC LII.

STEREOTYPED AT THE

BOSTON STEREOTYPE FOUNDRY.

TO

PROF. HENRY J. BIGELOW,

SURGEON TO THE MASS. GEN. HOSPITAL,

DISTINGUISHED BY HIS PROFESSIONAL ATTAINMENTS,

AND

ENDEARED TO THE AUTHOR BY HIS UNIFORM KINDNESS,

THIS BOOK

IS GRATEFULLY INSCRIBED.

PREFACE.

A PICTURE often presents to the eye, at a glance, more satisfactory and precise information than a protracted description. With this belief, and with a desire to make existing knowledge available and cheap, rather than to enlarge its boundaries, the present work was undertaken. The author has aimed to make it useful, both to practitioners and to students. It is not designed to be a methodical treatise, but rather a general storehouse of matters connected with practical surgery; and although it really contains ample illustrations of all the regular operations, both of the theatre and of the dissecting room, the surgeon will also find here a large amount of useful and practical information, upon a wide range of collateral subjects connected with surgical manipulation. Among the former are the ligature of the arteries, large and small, and amputations, in all their details: among the latter are dislocations and fractures; illustrations of a great number of irregular and special operations, here for the first time brought together; and illustrations of surgical anatomy; while an especial feature of the work is the delineation of surgical disease, and of remarkable cases of surgical injury, both before and after dissection.

Most modern illustrated surgical works have been laid under contribution to furnish the nineteen hundred drawings here presented; and as the result, the author offers to the medical profession, in a single volume, a series of illustrations and abridged descriptions of almost every subject connected with practical surgery. The descriptions have been generally abridged from the sources which furnished the drawings, and both have been selected from works of high authority.

While the author ventures to believe that all surgeons will find his book convenient for reference at short notice, and one which may suggest details and expedients in instruments, operations, and dressings that are apt to escape from the memory, and which are to be found illustrated only in weighty and expensive folios, he feels confident that it is adapted to the convenience and wants of the general practitioner.

A considerable amount of original matter and many illustrations will be found in the work, selected from the practice of surgeons, to whom the author is indebted for this opportunity of presenting these cases to the public.

The author would here express his gratitude for the kindness which he has uniformly received from every member of the profession, whose attention has been called to his work. So numerous are his obligations in this respect, extending as they do over more than three years, during which time he has been engaged upon it, that he finds it impossible to mention all by name. To Drs. Hayward, Holmes, Storer, Reynolds, Bowditch, Parkman, and Williams, he would express his gratitude for the loan of costly books, and for uniform aid and encouragement. He is also under many obligations to Mr. Horatio R. Storer. He has to thank Drs. Plympton and Cutter, of Woburn, and Dr. Davis, of Avon Springs, N. Y., for the loan of books. To Dr. Joseph Dalton, of Brentwood, N. H., and Dr. Chadbourne, of Concord, N. H., the author would express his gratitude for many favors in connection with the preparation of his book, as well as for constant kindness from the commencement of his professional life. To Dr. S. L. Abbott, of Boston, and Dr. T. Rickard, of Woburn, he would return his acknowledgments for their kindness, extending over the whole time he has been engaged upon the work, and especially during the preparation of the text, the whole of which they have assisted the author in correcting, as it has passed through the press. He has also to express his thanks to the accomplished artist, Monsieur A. Sonrel, for his kindness and counsel in regard to the engravings. To Dr. H. J. Bigelow, whose library has ever been open to him, and who has been ready at all times to aid and advise, he has endeavored to show his sense of obligation by the dedication.

Woburn, Mass., *May* 1, 1852.

OPERATIVE SURGERY ILLUSTRATED.

PLATE I.

Incisions, Position of the Bistoury, etc. Incisions are of various forms, in accordance with the purposes for which they are designed. Some are intended to reach superficial, others deep-seated parts. Another class have for their object, in connection with the above, the surrounding of parts either diseased or healthy, and various other purposes. In most cases, the skin should be made tense, previous to commencing an incision. This may be done either by the operator or by assistants.

Fig. 1. Crucial incision.

Fig. 2. T incision.

Figs. 3, 5. Simple curved and straight incisions.

Fig. 4. H incision.

Fig. 6. L incision.

Fig. 7. Crescentic incision.

Fig. 8. T incision inverted.

Fig. 9. Elliptical incision.

Fig. 10. V incision.

Figs. 16, 17, 21–26. Irregular incisions, from Liston, intended for various purposes.

Figs. 11, 13, 27, 28, from Fergusson.

Fig. 13. The scalpel held with the hand, supported by two fingers resting upon the part.

Fig. 27. The same with the cutting edge of the knife upwards.

Fig. 28. Position for holding the bistoury.

The remaining figures on this plate are after Bourgery.

Fig. 11. The scalpel held with the hand unsupported.

Fig. 12. First position. Instrument held as a pen.

Fig. 14. Fourth position. The edge turned towards the palm of the hand.

Fig. 18. Making an incision with the knife in the third position.

Fig. 19. Scissors employed in making horizontal cuts.

Fig. 20. Incision from without, inwards.

PLATE II.

Fig. 1. Position of the scissors, which enables the operator to act with the most power.

Figs. 2, 3. Fifth position of the instrument.

Fig. 4. First position of the right hand in the act of making an incision, while the parts are made tense by the left.

Fig. 5 is a V incision, showing the elasticity of the skin and subjacent tissues.

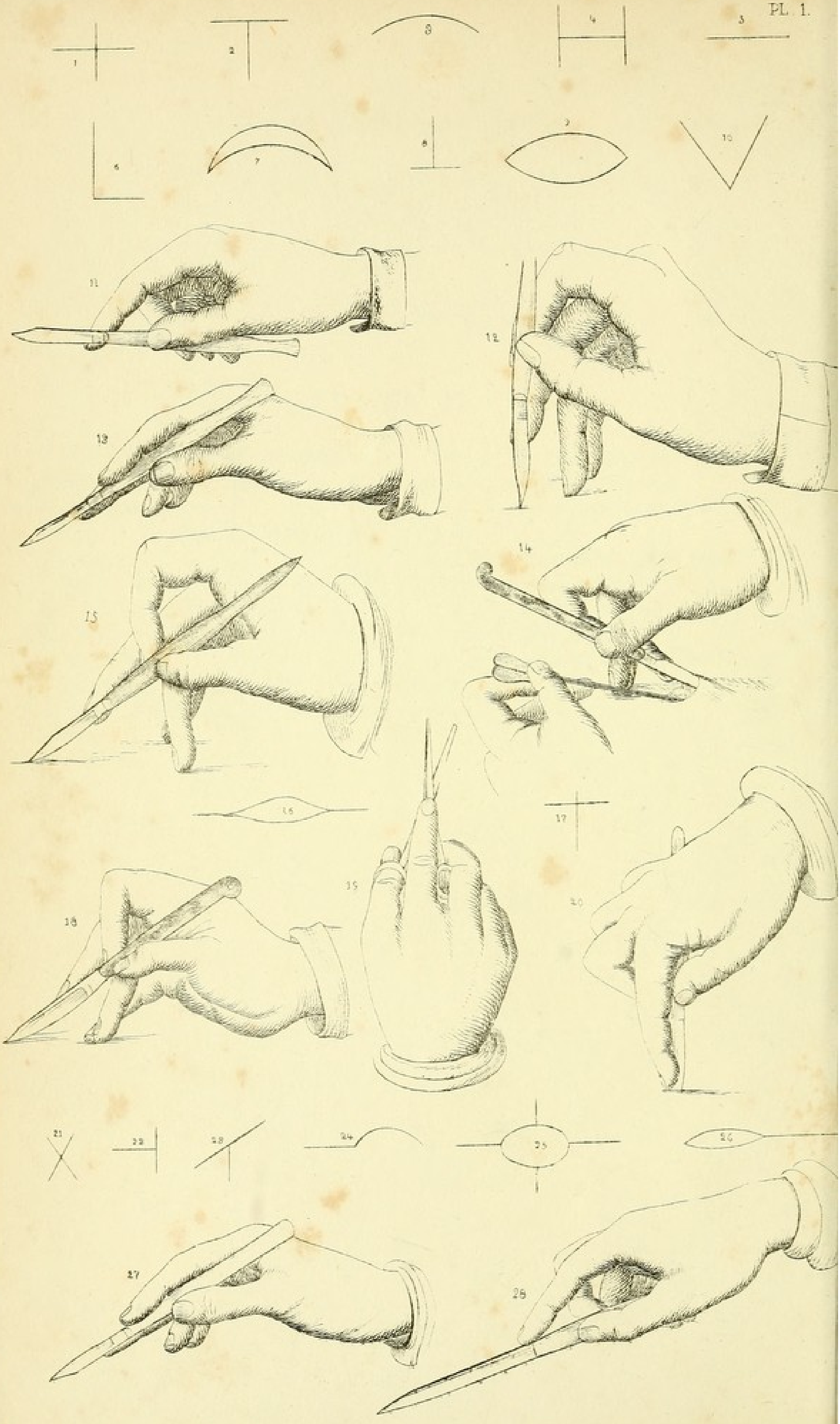
Fig. 6. Incision from without, inwards, upon a fold of the skin.

Figs. 7, 9, show the same effect as Fig. 5.

Fig. 8. T incision. Instrument held in the sixth position.

Fig. 10. Crucial incision. Instrument in the fifth position.

Fig. 11. Fifth position of the bistoury.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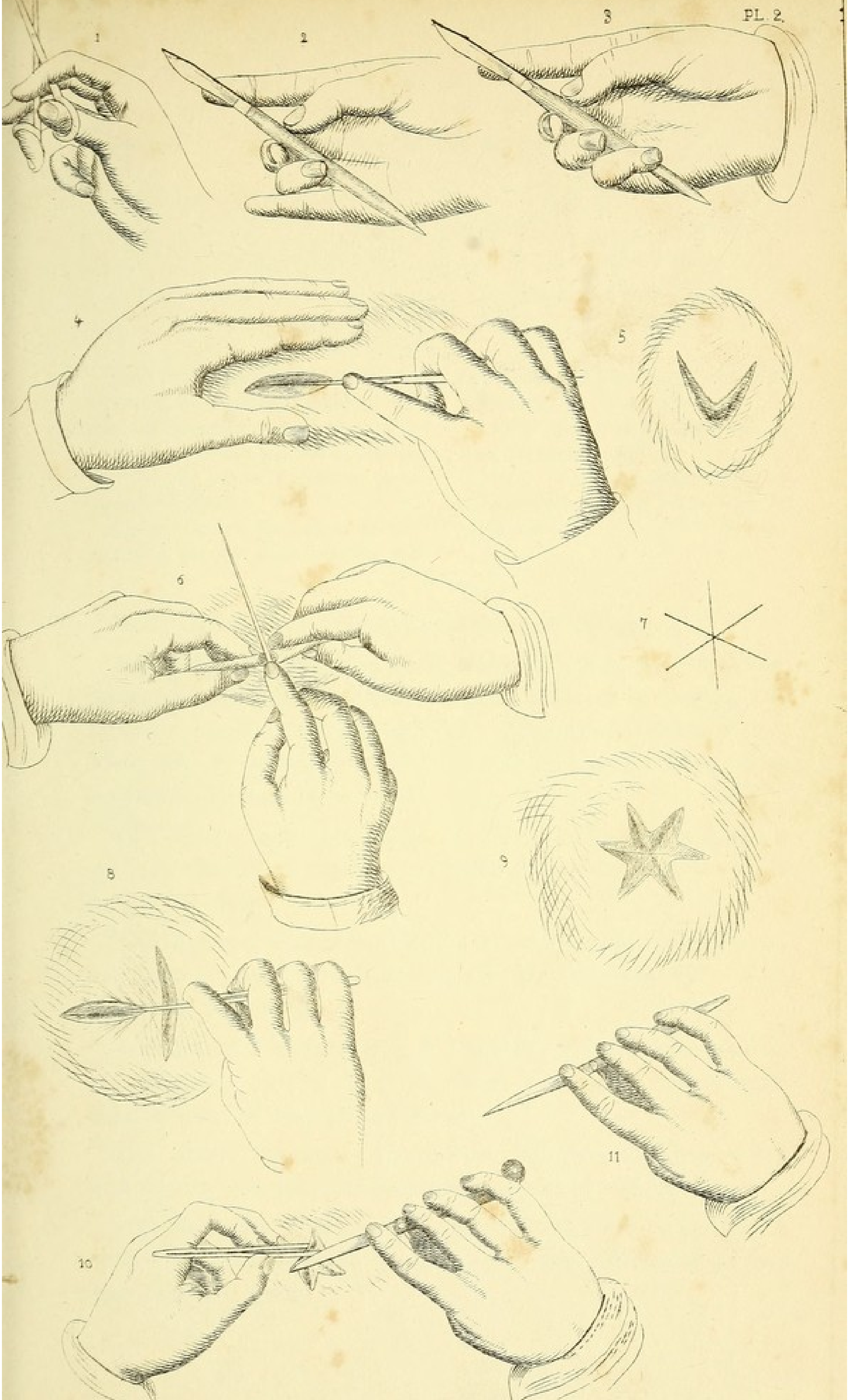
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PLATE III.

Figs. 1, 3. Incision with the instrument held perpendicular to the part, as in puncturing an abscess.

Fig. 2. Seventh position of the bistoury, in the act of dissecting up a portion of tissue.

Fig. 4. Second position of the instrument, the left hand making the skin tense, and also giving a point of support to the instrument.

Fig. 5. Same as Fig. 20, Plate I., with the hand brought down.

Fig. 6. Eighth position of the instrument, making a puncture with the blade flat.

In numbering the positions, I have followed Bourgery.

The First Position (Fig. 3, Plate II.) puts the instrument completely under the control of the hand, and is to be preferred in making extensive superficial incisions. The second position (Fig. 4, Plate III.) is especially adapted to making incisions from within outwards, and from right to left.

The Third Position (Figs. 12, 18, Plate I.) is best suited to cases in which it is necessary to make short, deep incisions, as in cutting for stone.

The Fourth Position (Fig. 14, Plate I.) is convenient for cutting from within, outwards, and to the left; or from within, outwards and backwards.

The Fifth Position (Fig. 2, Plate II.) is well adapted to delicate dissections, as in opening the sheath of an artery, and in operations in cases of strangulated hernia.

The Sixth Position (Fig. 8, Plate II.) gives facility of acting with rapidity and precision over a large extent of surface.

The Seventh Position (Fig. 2, Plate III.) will be found convenient in cases where it is necessary to make horizontal sections over important parts.

THE EIGHTH POSITION (Fig. 6, Plate III.) represents the process of puncturing as with a trochar.

Fig. 7. Compression of the brachial artery with the tourniquet.

Fig. 8. Compression of the brachial artery by what is sometimes called the field tourniquet. This is useful in case of sudden accidents, when no other instrument is at hand. It is constructed of a small, compact, or hard compress, and any convenient ligature — a bandage, or handkerchief, to surround the limb, twisted tight by means of a stick.

Fig. 9 shows the course of the artery on which compression is made, as represented in the preceding figures.

PLATE IV.

Fig. 1. The popliteal, posterior tibial, and peroneal arteries.

Fig. 2. Compression of the brachial artery with the hand.

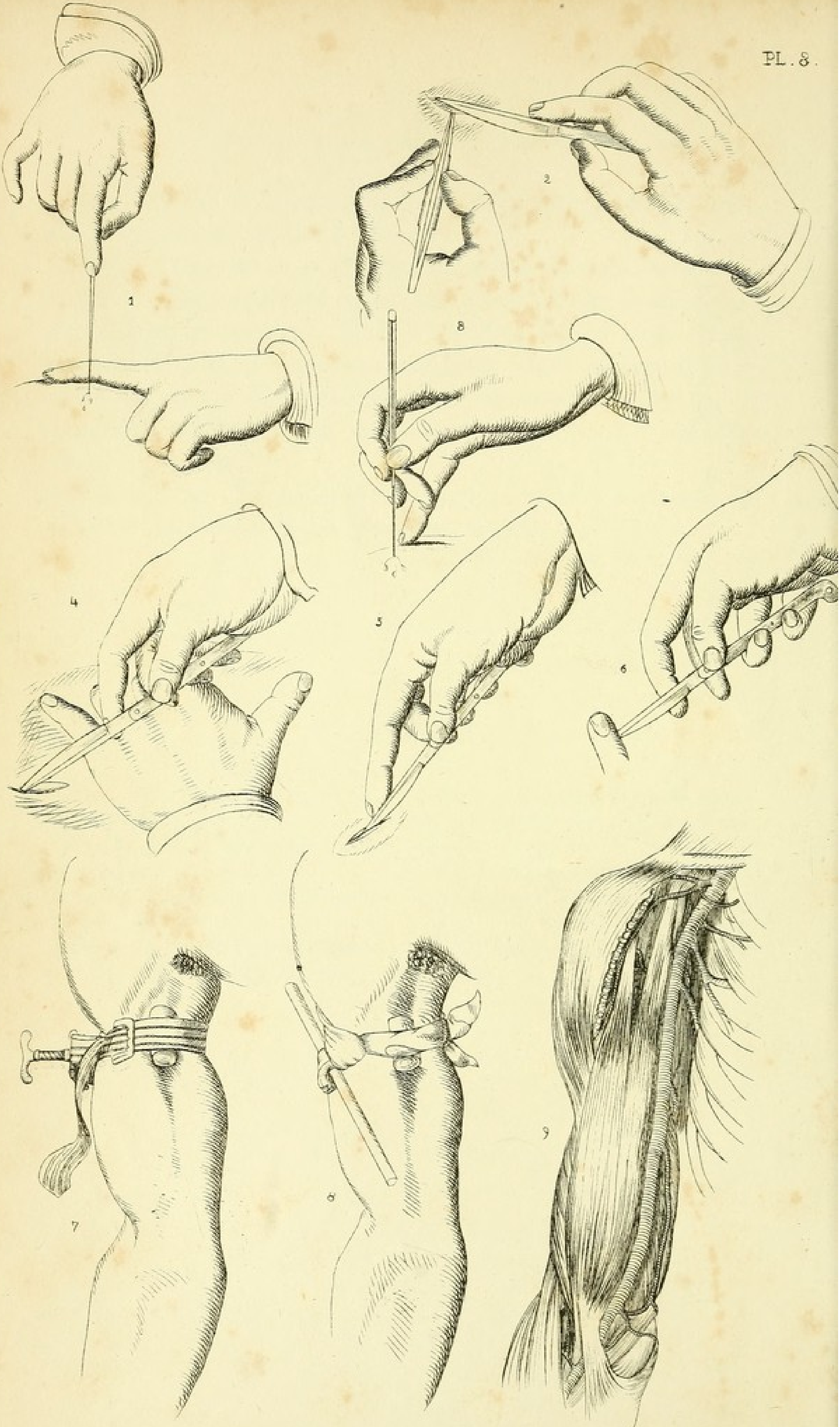
Fig. 3. Compression of the femoral artery with the hand.

Fig. 4. Compression of the femoral artery with the field tourniquet.

Fig. 5. Compression of the femoral artery with the thumbs, at the brim of the pelvis.

Fig. 6. Compression of the popliteal artery with the tourniquet.

Fig. 7 shows the course of the femoral artery, the sartorius being divided.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PL. 4.

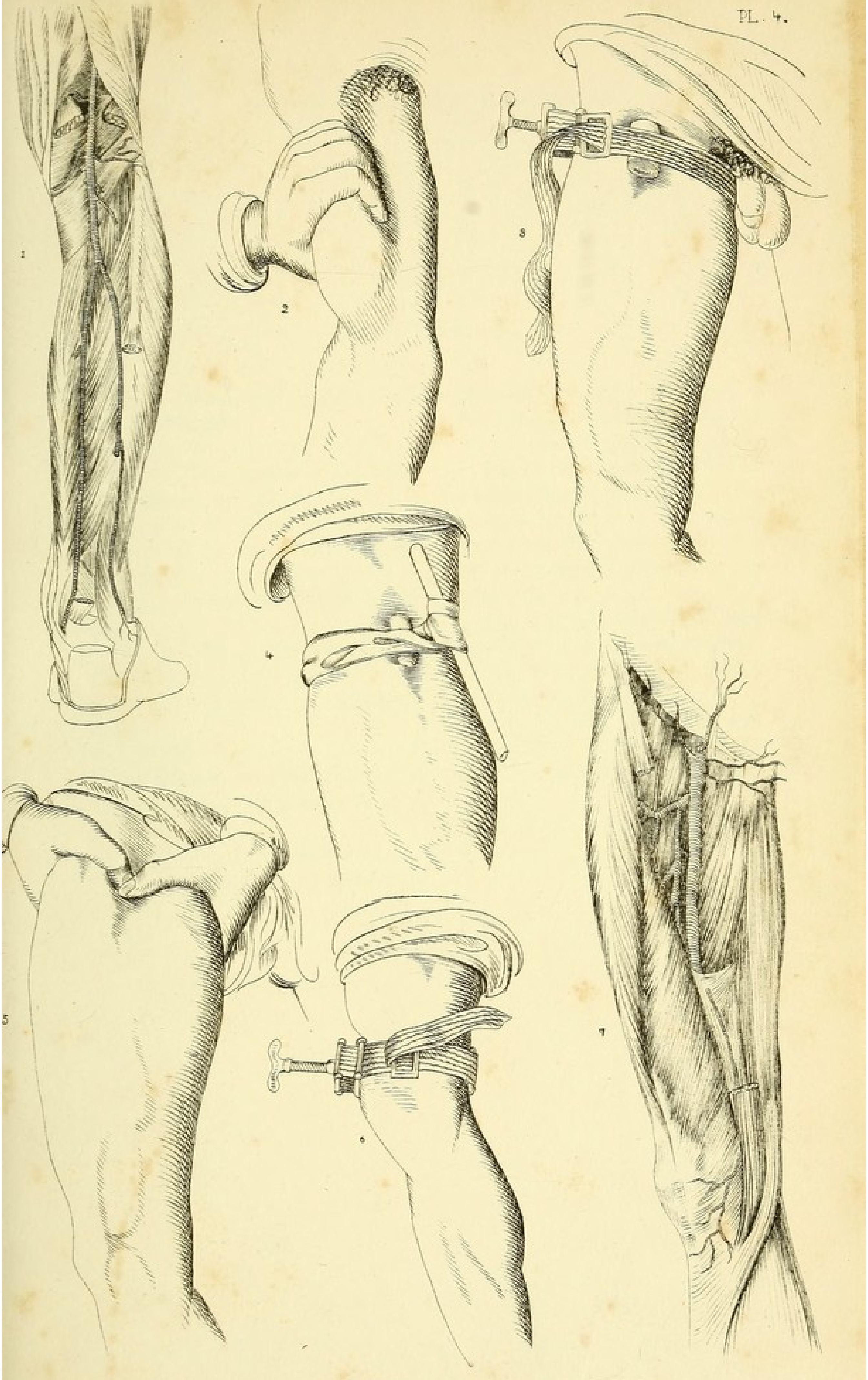


PLATE V.

Fig. 1. Tourniquet of Petit modified by Charrière.

Fig. 2. Tourniquet of Dupuytren.

Fig. 3. Compression of the femoral artery at two points; the first at the brim of the pelvis, by an instrument of Petit; lower down by the instrument of Dupuytren, Fig. 2.

Fig. 4. Common English tourniquet.

Fig. 5. Compressor invented by Charrière, for small arteries.

Fig. 6. Tourniquet of Petit, modified.

Fig. 10. Application of Charrière's instrument to the anterior tibial on the foot, and the posterior tibial on the ankle.

Fig. 11. An instrument with two pads, so arranged as to modify the pressure from one to the other. This instrument is designed to be applied for the cure of aneurism, by pressure.

Fig. 13 may be used instead of the common tourniquet, or for the same purpose as the last. The remaining figures on this plate represent parts of the instrument applied, Fig. 2, plate VI.

Fig. 7 is the pad which is attached to the screw in the above figure.

Fig. 8 shows the pads in their relation to each other.

Fig. 9. The lower pad, and the framework, which is also padded, and corresponds to the upper pad, Fig. 8.

Fig. 12 is a side view of the lower pad.

PLATE VI.

Fig. 1. Compression of the Arteries of the Face, and the Carotid Artery. The bandage that passes beneath the chin compresses the facial artery at its passage under the edge of the lower jaw.

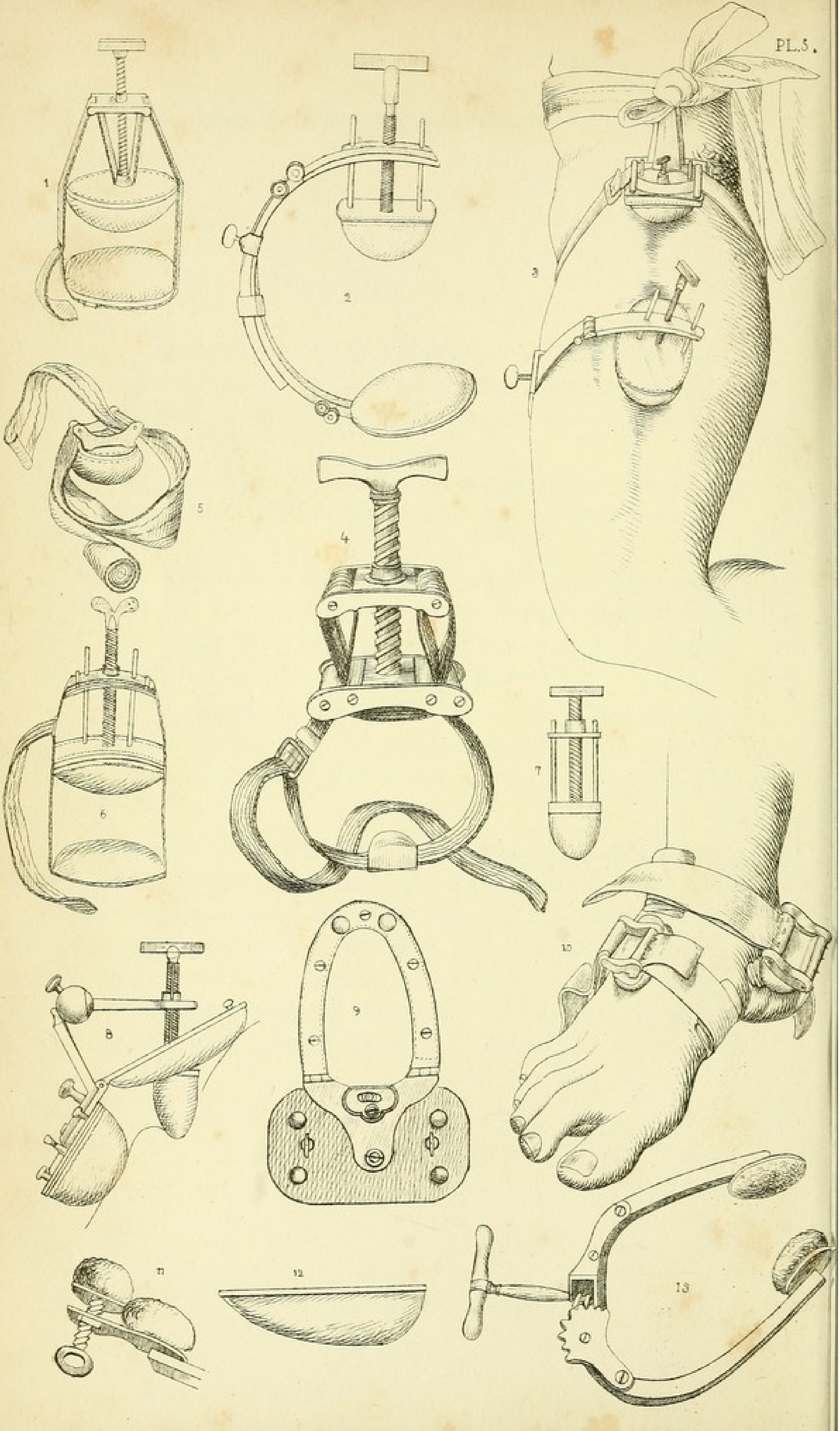
The upper compress on the face rests upon the frontal artery, the lower upon the infra-orbital artery, as it emerges from the infra-orbital canal.

The instrument represented as compressing the carotid, in this figure, is similar to the one in Fig. 2, Plate V.; it is so constructed that it may be lengthened or shortened at pleasure. The pad that rests upon the artery is the same as Fig. 7, Plate V.

Fig. 2. Compression of the Temporal and Subclavian Arteries. In the first case, the pad is placed directly in front of the ear; it may be made of a small roller, or like those in Fig. 13, Plate V.

Compression of the Subclavian, represented in this figure, will be better understood by referring to Fig. 8, Plate V.; the small pointed pad rests over the subclavian, while the others are so placed as to make counter-pressure, and thus keep the artery in place. Bourgery, from whom this drawing is taken, says, "This instrument is capable of compressing the subclavian in all subjects, so as to arrest completely the flow of blood in the vessel."

PL. 5.



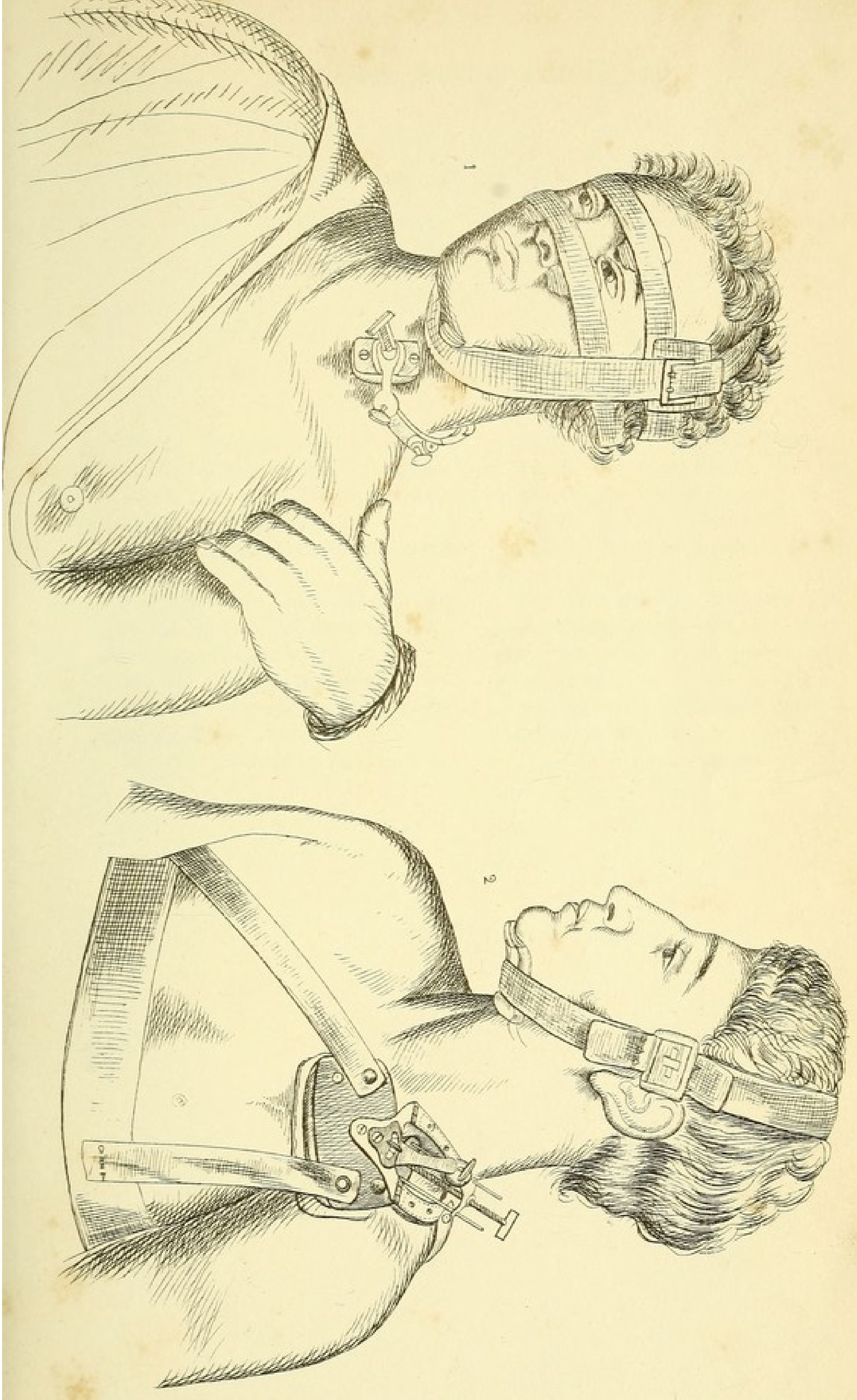


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PLATE VII.

Fig. 1. Straight scissors.

Fig. 3. Common dressing forceps.

Fig. 7. Common French bistoury.

Fig. 10. Curved scissors.

Fig. 11. Straight, blunt-pointed bistoury.

Fig. 13. The same as Fig. 11, with the edge of the instrument carried to the point.

Fig. 14. English bistoury.

Fig. 16. Bistoury of Larrey, the blade fixed by a slide.

Fig. 17. Bistoury of Recamier.

Figs. 2, 4, 6, 12. French lancets.

Fig. 5. Same as Fig. 3, with the handles of the forceps curved.

Fig. 8. Convex bistoury.

Fig. 9. View of the edge of Fig. 10.

Fig. 15. Bistoury, with the back ground thin, in order that the instrument may slide in the groove of a small stylet.

Fig. 18 shows the manner of fixing the blade of Fig. 13.

Fig. 19. Common scalpel.

PLATE VIII.

Fig. 1. Fergusson's "surgical scissors."

Figs. 3, 4, 8, 9. French forceps.

Fig. 5. Dissecting hooks.

Fig. 6. Cap to Fig. 11.

Fig. 12. Sharp-pointed scissors for dissections.

Fig. 13. Small probe-pointed director.

Fig. 14. French director.

Fig. 16. Sharp-pointed hook.

Fig. 18. Two-pronged, blunt-pointed hook.

Fig. 2. Porte-mèche.

Fig. 7. Meeting of the points of Fig. 4.

Fig. 10. Common English director.

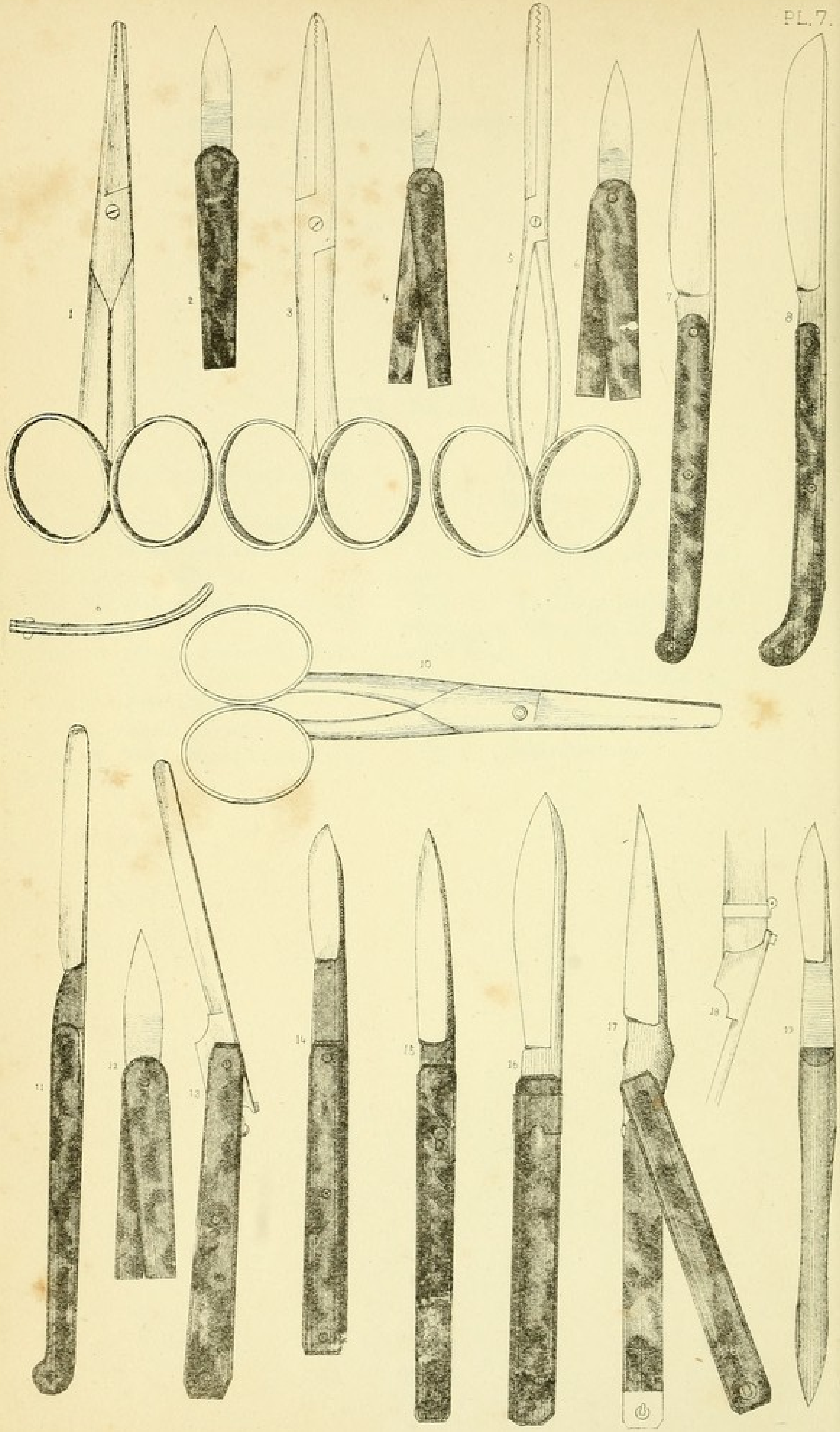
Fig. 11. Exploring needle. The small figures below this are sections of the same.

Fig. 15. English dissecting forceps.

Fig. 17. Blunt-pointed hook.

Fig. 19. Common probe.

PL. 7.



PL. 8

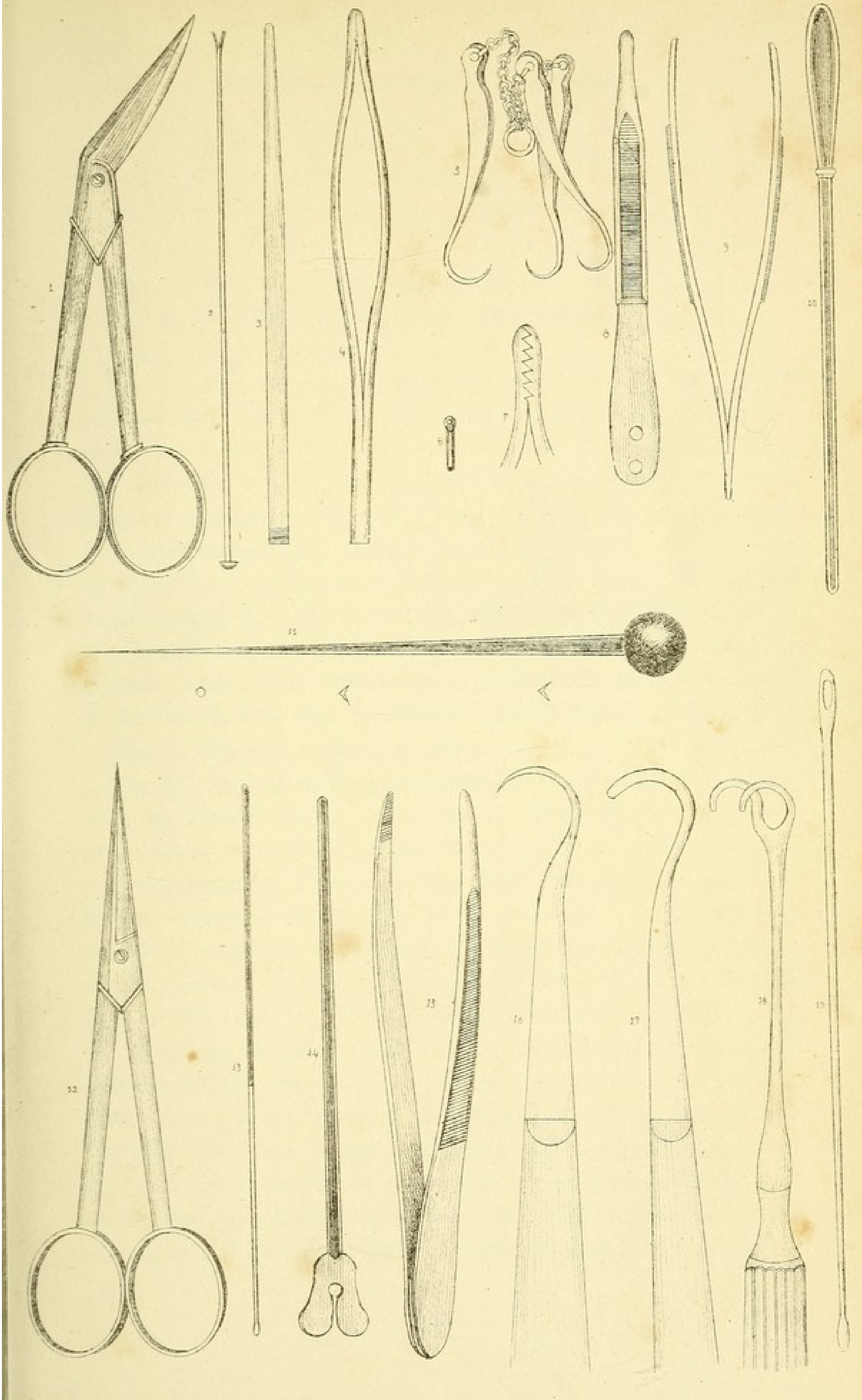


PLATE IX.

Fig. 1. Glover's, or continuous suture.

Fig. 2. Interrupted suture, with adhesive strips.

Fig. 3. Interrupted suture.

Fig. 4. Mr. Fergusson's knot, for strangulating tumors with broad bases. "A needle, armed with a thread, is thrust transversely under the centre of the tumor. The centre of the thread, which has the needle in it, is then divided. Next, one end of the thread is passed through the eye of a needle, which eye should be near its point, and having been brought one fourth round the circumference of the tumor, is thrust transversely through its base. Then it is to be disengaged from the eye of the needle, and the other thread to be put into the eye, and to be carried back with it. Lastly, the adjoining ends of the two threads are to be tied tightly, so that each of the two threads shall include an 8-shaped portion of the tumor."

Fig. 5. Twisted, or hare-lip suture.

Fig. 6. Method of dressing wounds with strips, made to adhere with the ethereal solution of gun cotton. The author's method is, to use strips of thin silk, or ribbon, that which is unsized and of open texture is requisite. One end of the strip is laid upon the part, and the liquid applied to the strip, which it strikes through and fixes almost at once. Then another strip is applied in the same manner, on the opposite side of the wound, a little above or below the first, as the case may be, and so on, until the requisite number of pieces are in place; then the lips of the wound are drawn together by the free ends, which are fixed in a similar manner. This dressing possesses many advantages. It may be used out of doors, in cold or hot weather; may be applied to any part that is free from moisture at the time of application; is not subsequently affected by moisture, if a sufficient quantity of the liquid is applied; adheres with great tenacity, and when it is removed, does not, like the old

adhesive plaster, leave any thing upon the skin. It may, perhaps, be well to state, that when the liquid is too thick, it cannot be easily applied, but that it may be reduced to the requisite density by the addition of sulphuric ether.

Fig. 7. Quilled suture.

Fig. 9. Interrupted suture tied upon one side.

Figs. 10, 11, 12, 15, 16. Different kinds of surgical needles.

Figs. 13, 17. Different views of Figs. 12, 16.

Fig. 8. Continuous suture, not much used.

Fig. 14. The reef-knot, most used by surgeons.

Fig. 18. The surgeon's knot, as it is called, but little used.

PLATE X.

Fig. 1. Manner of grasping the lancet previous to performing the operation of venesection.

Fig. 2. Manner of holding the lancet in making the puncture, the little finger supporting the hand.

Fig. 3. VENESECTION. The ligature applied, the lancet in the median cephalic vein, which, according to Druitt, should be preferred for the operation. The median basilic is the vein usually chosen for this purpose. This is probably on the account of its size, it being the larger of the two. The danger to be apprehended if the latter vessel be chosen, is the transfixing of the vein, and the piercing of the brachial artery. The result of such an accident is shown in Figs. 7 and 8.

In performing the operation of venesection, a ligature should be placed a little above the elbow, sufficiently tight to prevent the return of the blood in the veins, but not to stop the pulse at the wrist; the operator, standing back of the arm, takes the forearm in his hand, places his thumb upon the vein below the intended puncture, and then (using the right hand for the right arm, and *vice versa*) pushes the lancet obliquely into the vein, and makes it cut its way directly outwards. After sufficient blood is taken, the ligature should be removed, and the thumb of the surgeon applied to the bleeding aperture. The wound should be dressed by applying a little lint; over this a strip of plaster; and upon this, a small compress, secured by a bandage, applied as in Fig. 5, Plate 162.

Fig. 3. References.

1. The cephalic vein.
2. The median cephalic vein.
3. The external cutaneous nerve.
4. The radial vein.
5. The internal cutaneous nerve.
6. The basilic vein.
7. The brachial artery.
8. The fascia, which separates the brachial artery from the median basilic vein; the upper part of the fascia being divided and turned aside to show the course of the artery.
9. The posterior ulnar vein.
10. The anterior radial, or common median.
11. The anterior ulnar vein.

Fig. 5.

1. The cephalic vein.
2. The external cutaneous nerve, piercing the deep fascia, and dividing into two branches, which pass behind the median cephalic vein.
4. The median cephalic vein.
5. The spiral cutaneous nerve, a branch of the musculo-spiral.
6. The radial vein.
7. The process of fascia derived from the tendon of the biceps, which separates the median basilic vein from the brachial artery.
8. The intercosto-humeral cutaneous nerve.
9. The internal cutaneous nerve, dividing into branches, which pass in front of the median basilic vein.
10. The basilic vein.
11. A slight convexity of the deep fascia formed by the brachial artery.
12. The trunk, formed by the union of the anterior and posterior ulnar veins.
13. The median basilic.
14. The posterior ulnar vein.
15. A communicating branch between the deep veins of the forearm and the upper part of the median vein.
16. The anterior ulnar vein.

Fig. 4. From Maclise's Surgical Anatomy.

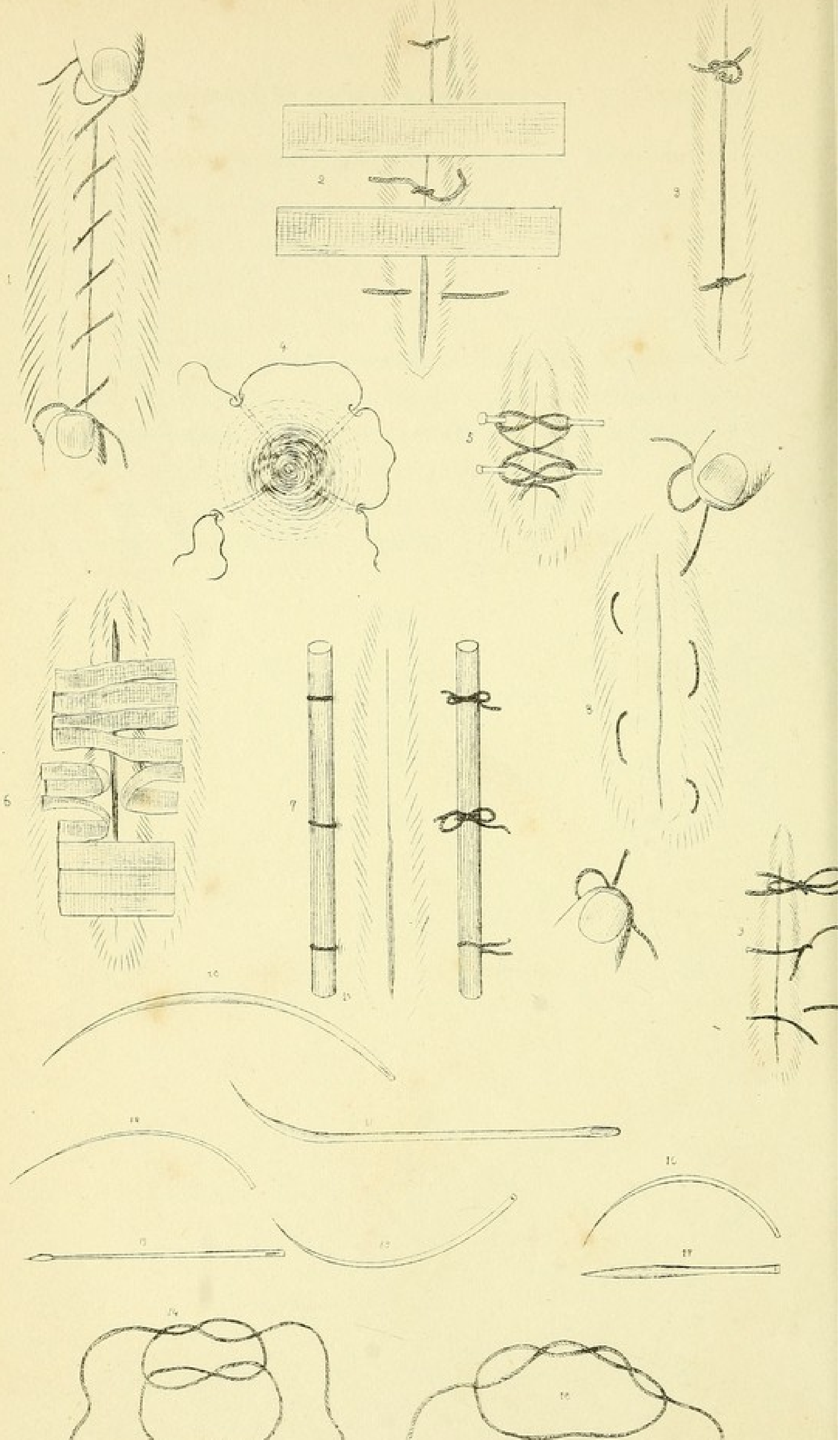
1. Fascia covering the biceps muscle.
2. Cephalic vein, with the external cutaneous nerve.
3. A communicating vein, joining the venæ comites.
4. Radial artery at its middle.
5. Radial artery of the pulse.
6. Basilic vein, with the internal cutaneous nerve.
7. Lymphatic gland.
8. Brachial artery, with the venæ comites, the median nerve lying at the inside of the vein.
9. Median basilic vein.
10. Ulnar artery, with ulnar nerve.

Fig. 6. Bleeding in the Internal Saphena Vein.

Fig. 7. External Appearance of the Arm in case of aneurismal varix, caused by puncture of the artery in performing the operation of venesection.

Fig. 8. Dissection of the above. In this case, (Figs. 7, 8,) the surgeon may either attempt the cure by compression, bandaging the whole limb, and keeping the patient in bed, on a low diet; or he may enlarge the wound upwards and downwards, to the extent of three inches, and tie the vessel above and below the wound, avoiding the median nerve, which lies at the inner side.

There are authorities for both practices.



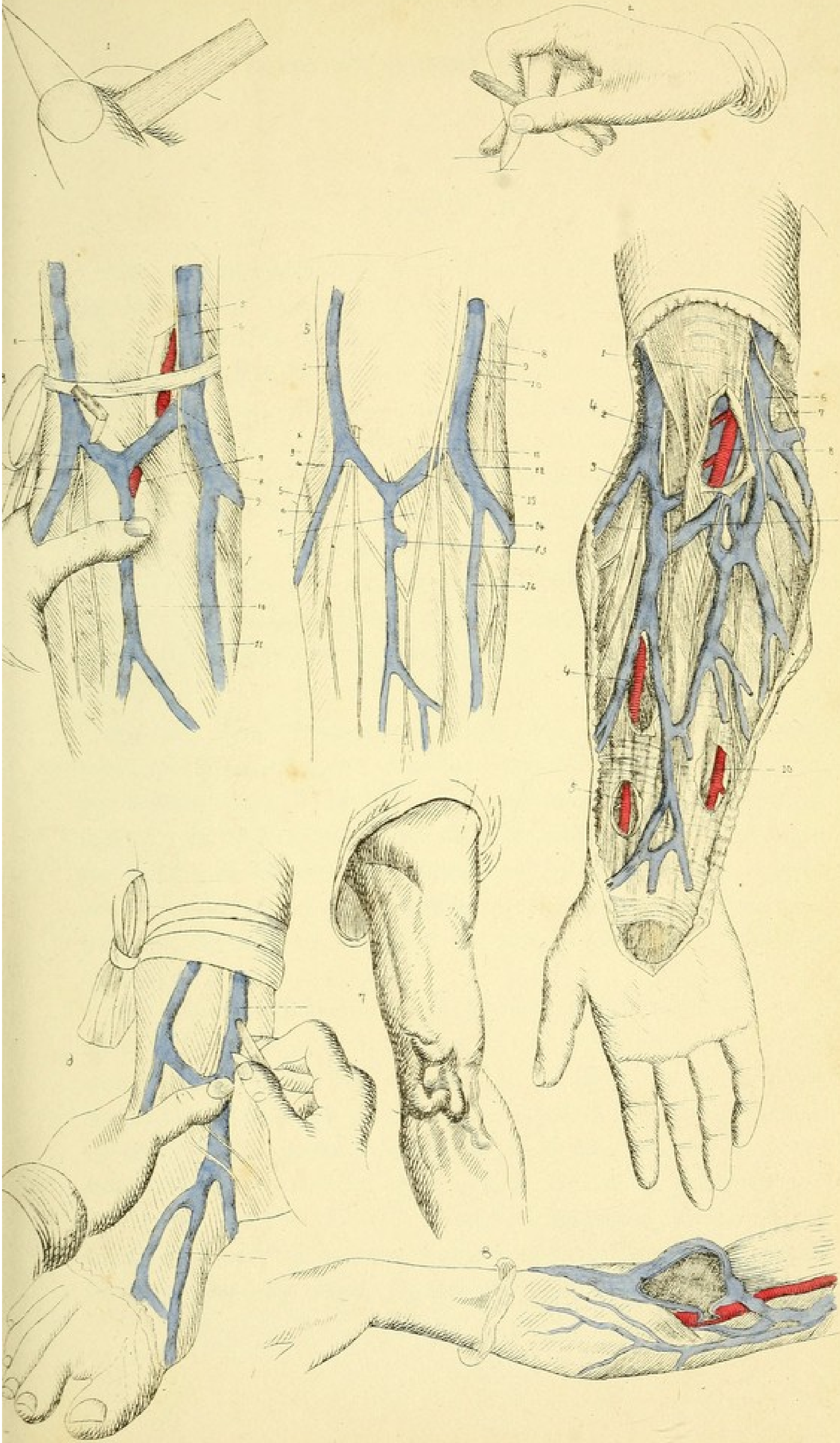


PLATE XI.

Fig. 2. BLEEDING IN THE JUGULAR VEIN. The external jugular vein is sometimes opened in cases of apoplexy in adults, and in children if the veins at the elbow are hidden by fat. The patient, if a child, being laid in the nurse's lap, with its head towards the surgeon, the latter puts his left thumb on the vein a little above the clavicle, and then opens it with a lancet at a point marked in the figure, cutting towards the thumb, and in a direction downwards and inwards, so that the incision may cross the fibres of the platysma. The wound should be closed by lint and plaster. Instead of the thumb, a compress may be placed on the vein, and be secured by a bandage carried under the axilla of the opposite side. If an adult, the patient may be placed in the sitting posture, if preferred.

Fig. 3. THE SUPERFICIAL TEMPORAL ARTERY. The main trunk of this vessel passes over the zygomatic process of the temporal bone, about a quarter of an inch in front of the auditory meatus. It divides, usually, at about an inch and a quarter above the middle of the zygomatic arch, into two branches, the anterior and posterior. Arteriotomy may be practised either upon the main trunk or the anterior branch of the artery. The latter is usually chosen for the operation.

Fig. 4 shows the points where the operation is commonly practised. The operation is performed in the following manner: The surgeon feels for the largest branch of the artery, (if the branch is chosen,) steadies it with two fingers, one placed above, the other below the intended puncture, then pushes in the lancet in the same manner as in venesection. The incision should be directed across the vessel, and should cut it about half through; when sufficient blood has flowed, the instrument should be again introduced, and the vessel cut entirely across, so that its ends may retract. A firm graduated compress should then be applied, and be confined with a bandage passing round the head; this should be allowed to remain for a week or ten days. Should subsequent bleeding or false aneurism follow, they must be treated by pressure; but if the wound is much inflamed or ulcerated, a transverse incision should be made each side of it, and the artery be tied in both places.

Figs. 5, 6. SETONS are introduced by pinching up a fold of skin, and first passing a bistoury through, and afterwards a probe, armed with a skein of silk, or cotton, or a long, flat piece of India rubber, or strip of cloth; or perhaps the better process is, to arm a seton needle with the required substance, and pass it through at one operation.

Fig. 1. SURGICAL ANATOMY OF THE FACE AND NECK.

1. Zygoma.
2. Temporal artery, with its accompanying vein.
3. Parotid gland.
4. Mastoid half of the sterno-mastoid muscle.
5. Auricularis magnus nerve of the superficial cervical plexus.
6. External jugular vein.
7. Lymphatic bodies of the post triangle.
8. Locality of the subclavian artery in the third part of its course.
9. Clavicular attachment of the trapezius muscle.
10. Masseter muscle, crossed by the parotid duct, and some fibres of the platysma.
11. Buccinator muscle.
12. Facial vein.
13. Facial artery, seen through the fibres of the platysma.
14. Locality of the common carotid artery at its division into internal and external carotids.
15. Subcutaneous platysma myoides muscle, lying on the face, neck, and upper part of the chest, and covering the structures contained in the two surgical triangles of the neck.
16. Lip of the thyroid cartilage.
17. Locality beneath which the commencements of the subclavian and carotid arteries lie.

PLATE XII.

Fig. 1. The same as the preceding, with the platysma myoides removed.

1. Levator auris muscle.
2. Temporal vein and artery.
3. Occipital half of the occipito-frontalis muscle.
4. Portio dura, or motor division of the seventh pair of cerebral nerves.
5. Tempero-maxillary branch of the external carotid artery.
6. Occipital artery, accompanied by its nerve, and also by some branches of the occipitalis minor nerve, a branch of the cervical plexus.
7. External jugular vein, descending from the angle of the jaw, where it is formed by the union of the temporal and maxillary veins.
8. Auricularis magnus nerve, ascending to join the portio dura.
9. External carotid artery, branching into lingual, facial, temporal, and occipital arteries.
10. Internal carotid artery.
11. Splenius capitis and colli muscles.
12. Lymphatic bodies of the posterior triangle of the neck.
13. Superficial descending branches of the cervical plexus of nerves.
14. Scalenus anticus muscle.
15. Same as 12.
16. Posterior scapular artery.
17. Sternal attachment of the sterno-mastoid muscle, marking the situation of the root of the common carotid.
18. Posterior half of the omo-hyoid muscle.
19. Brachial plexus of nerves, in connection with 21, the subclavian artery.
20. Transversalis colli artery.
21. Subclavian artery.
22. Orbicularis oculi muscle.
23. Zygomaticus major muscle.
24. Parotid duct.
25. Masseter muscle.
26. Buccinator muscle.
27. Facial artery.
28. Inferior maxillary bone.
29. Depressor anguli oris muscle.
30. Facial vein.
31. Digastric muscle.*
32. The upper line touches the submaxillary gland ; the lower, the lymphatic body.
33. Hyoid bone.
34. Common carotid at its point of division, uncovered by the sterno-mastoid.
35. Thyroid cartilage.
36. Hyoid half of omo-hyoid muscle.
37. Sterno-hyoid muscle.
38. Superior thyroid artery.
39. Anterior jugular vein.
40. Sternal attachment of the sterno-mastoid muscle.
42. Sterno-cleido-mastoid muscle.

* The anterior portion of the posterior belly of the digastricus, in this figure, is brought too far forward, as if it passed over the posterior part of the anterior belly. The two portions of this muscle have a common origin at this point.

Fig. 2.

1. Layer of the cervical fascia which invests the sterno-mastoid and trapezius muscles.

2. Descending superficial branches of the cervical plexus of nerves.

3. Lymphatic bodies lying between two layers of the cervical fascia.

4. Layer of the cervical fascia continued from 1, over the subclavian artery and brachial plexus of nerves.

5. External jugular vein, seen under the fascia which invests the sterno-mastoid muscle.

6. Platysma muscle cut on the body of the sterno-mastoid muscle.

7. Layer of the cervical fascia, lying beneath the clavicular portion of the sterno-mastoid muscle.

8. Scalenus anticus muscle, stretching over the artery, and separating it from the internal jugular vein.

9. Clavicular attachment of the sterno-mastoid muscle, lying over the internal jugular vein, &c.

10. Vein formed by the union of the external jugular, scapular, and other veins.

11. Subclavian artery, in the third part of its course.

12. Inner branches of the brachial plexus of nerves.

13. Post half of the omo-hyoid muscle.

14. Clavicular portion of the trapezius muscle.

Fig. 3.

1. Internal maxillary artery, passing behind the neck of the lower jaw bone.

2. Temporo-maxillary artery.

3. Occipital artery, crossing the internal carotid artery and jugular vein.

4. Mastoid insertion of sterno-mastoid muscle.

5. Spinal accessory nerve, which pierces the sterno-mastoid muscle, to be distributed to it and the trapezius.

6. Internal carotid artery, with the descendens noni nerve lying on it.

7. Cervical plexus of nerves, giving off the phrenic nerve, to descend the neck on the outer side of the internal jugular vein, and over the scalenus muscle.

8. Splenius muscle.

9. Scalenus posticus muscle.

10. Branches of the brachial plexus of nerves.

11. Transversalis colli artery.

12. Post scapular artery, passing through the brachial plexus.

13. Trapezius muscle.

14. Transversalis humeri artery.

15. Union of the post scapular and external jugular veins, which enter the subclavian vein by a common trunk.

16. Post half of the omo-hyoid muscle.

17. Subclavian artery, in connection with the brachial plexus of nerves.

18. Part of the subclavian vein, seen above the clavicle.

19. Scalenus muscle, separating the subclavian artery from the vein.

20. Clavicular origin of the sterno-mastoid muscle of the right side, turned down.

21. Parotid duct.

22. Tortuous facial artery.

23. Hyo-glossus muscle.

24. Mylo-hyoid muscle, cut and turned aside.

25. Genio-hyoid muscle.

26. Ninth, or hypoglossal nerve, distributed to the muscles of the tongue.

27. Lingual artery, passing under the fibres of the hyo-glossus muscle.

28. External carotid artery.

29. Superior thyroid artery.

30. Anterior half of the omo-hyoid muscle.

31. Vagus nerve, between the carotid artery and internal jugular vein.

32. Common carotid artery, with the vagus nerve at its outer side, and the descendens noni nerve lying on it.

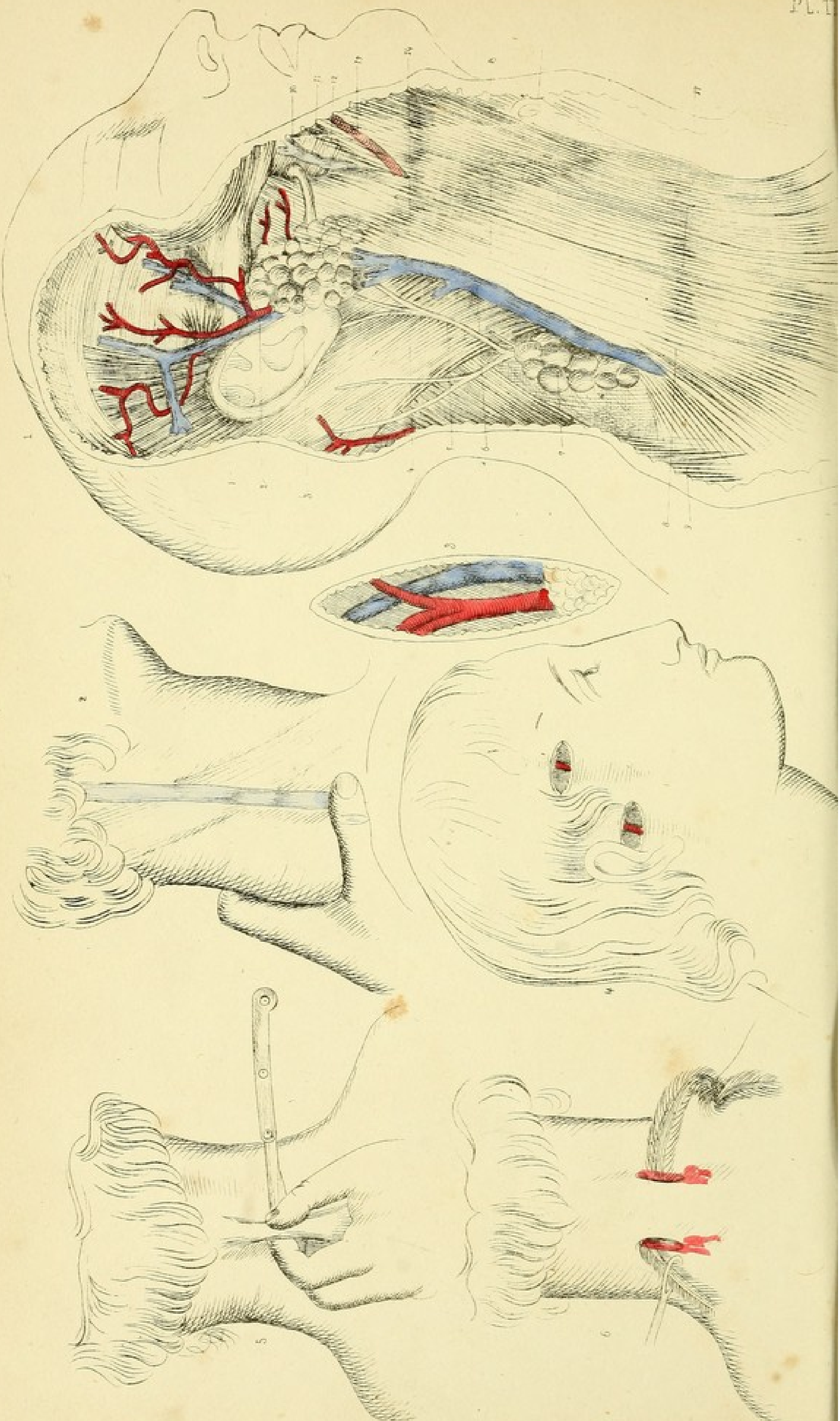
33. Sterno-hyoid muscle cut, the sterno-thyroid on the inside of it.

34. Sternal origin of the sterno-mastoid muscle of the left side.

35. Internal jugular vein, crossed by some branches of the cervical plexus, which join the descendens noni nerve.

36. Subclavian artery crossed by the vagus nerve.

37. Innominata artery at its point of bifurcation.



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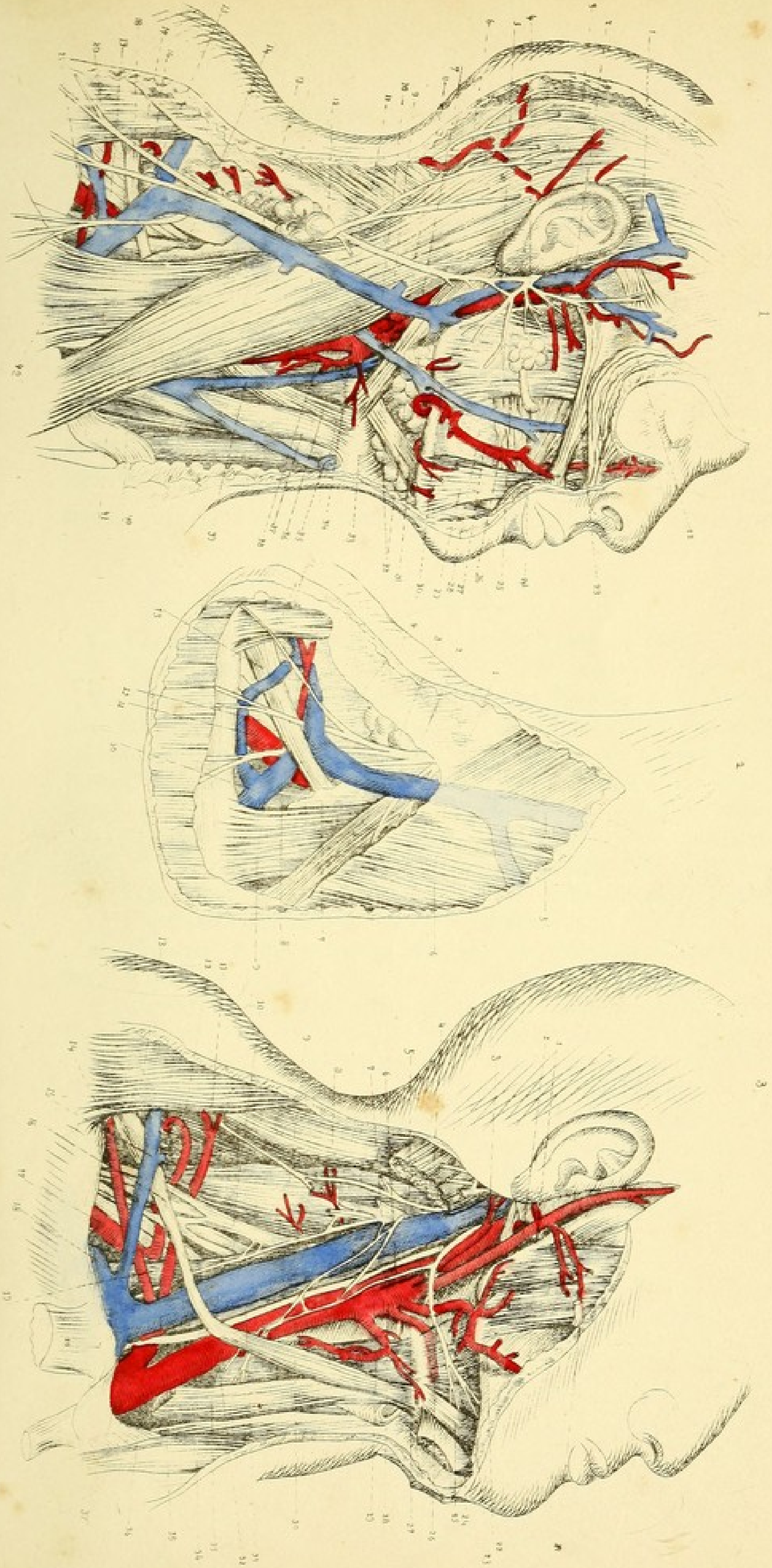

PLATE XIII.

LIGATURE OF ARTERIES. In case of hemorrhage from wounds in arteries, the wounded part should, if possible, be exposed, and a ligature be placed above and below it. If this cannot be done, a ligature must be placed on the main trunk above, at the nearest practicable point, and perhaps it may be necessary to place a ligature below, to prevent regurgitation. This operation is most commonly practised for the cure of the various kinds of aneurism.

Fig. 1.

1. Ligature of the temporal artery.
2. Ligature of the facial artery.
3. Ligature of the lingual artery.
4. Ligature of the carotid artery. Above and back of this, (not numbered,) ligature of the occipital artery.
5. Ligature of the subclavian artery.
6. Ligature of the axillary artery.
7. Ligature of the brachial artery.
8. Ligature of the artery at the bend of the arm.
9. Ligature of the radial artery at its upper part.
10. Ligature of the ulnar artery at its upper part.
11. Ligature of the radial artery at its lower part.
12. Ligature of the ulnar artery at its lower part.
13. Ligature of the arteries in the palm of the hand.
14. Ligature of the external iliac.
15. Ligature of the radial artery, between the thumb and index finger.
16. Ligature of the femoral artery at the upper part of its course.
17. Ligature of the femoral artery in the middle third of its course.
18. Ligature of the posterior tibial artery.
19. Ligature of the posterior tibial at its lower third.
20. Ligature of the posterior tibial artery, near the malleolus internus.
21. Ligature of the anterior tibial artery at its upper third.
22. Ligature of the anterior tibial artery, at the lower third of the leg.
23. Ligature of the anterior tibial on the top of the foot.

PLATE XIV. Fig. 1.

1. Parotid gland, covered by the cervical fascia.
2. Posterior belly of the digastricus.
3. Cervical fascia.
4. Sublingual nerve.
5. Sterno-mastoid muscle.
6. External jugular vein.
7. Facial vein, entering the internal jugular.
8. Internal carotid, with the descending branch of the ninth nerve lying on it.
9. External carotid artery.
10. Common carotid.
11. Part of the platysma muscle.
12. Fascia propria of the vessels.
13. Cervical fascia, beneath the sterno-mastoid muscle.
14, 15. Facial vein and artery seen beneath the fibres of the platysma.
16. Sublingual artery.
17. External carotid.
18. Hyoid bone.
19. Sterno-thyroid muscle.
20. Cervical fascia, cut.
21. Omo-hyoid muscle.
22. Sterno-hyoid muscle.
23. Sterno-thyroid muscle.

Fig. 2. LIGATURE OF THE FACIAL ARTERY. This artery may easily be tied by cutting through the skin and cellular tissue that cover it, where it turns over the jaw, (Fig. 5, Ref. 2) at the anterior border of the masseter muscle.

1. Facial artery.
2. Fascia, covering the temporal muscle.
3. Facial vein.
4, 5. Masseter muscle.
6. Some fillets of the facial nerve.

Fig. 3. LIGATURE OF THE TEMPORAL ARTERY.

1. Fascia, covering the temporal muscle.
2. Zygomatic arch.
3. Temporal artery.
4. Temporal vein.
5. Parotid gland.

Fig. 4. LIGATURE OF THE COMMON CAROTID ARTERY. The common carotid is generally tied below the point where it is crossed by the omo-hyoid muscle. The patient being placed as in Plate XIII., an incision, three inches in length, is made along the margin

of the sterno-mastoid muscle. This incision should be carried through the skin, platysma, and superficial fascia, and should terminate about an inch above the sternum.

The head should now be brought a little forward, so as to relax the sterno-mastoid muscle, and the cellular tissue beneath is to be raised with forceps and divided; any veins that are found should be turned aside with the handle of the scalpel, and are not to be wounded if it can be avoided. Next come the thin, strong, deep fascia, and the omo-hyoid muscle, to the margin of which it adheres. It should be pinched up slightly with the forceps, just below that muscle, and be divided by cautious touches with the knife, which should be placed with its flat surface towards the artery; the division of the fascia should be made immediately over the artery, the situation of which is to be carefully ascertained by the finger. About half an inch of the sheath of the artery is to be opened in the same manner, avoiding the descendens noni nerve, which ramifies upon it. It should be opened rather to the inner side of the artery, so that the jugular vein may not be interfered with. An aneurism needle, armed with a single ligature, is next to be carried round the vessel from the outer side, care being taken to keep it close to the vessel within the sheath. When its point appears on the inner side, the surgeon seizes the ligature with forceps, and withdraws the needle; ascertains that the nervus vagus is not included in the ligature, and then ties it tightly in the double knot represented in Fig. 14, Plate IX. One end of the ligature may then be cut off close to the knot, and the other be left hanging out of the wound, which is to be closed with plaster when bleeding has ceased. The patient must be kept perfectly quiet in bed till the ligature separates.

This artery may also be tied above the omo-hyoid muscle by making an incision through the skin and platysma, three inches in length, and terminating at the level of the cricoid cartilage. The fascia should next be divided on a director, as in Fig. 14, Plate I. The surgeon then separates the cellular tissue and veins from the sheath, opens the sheath, and passes the ligature in the manner described above.

THE EXTERNAL CAROTID ARTERY (Plate XII., Fig. 3, Ref. 28) may be tied in the following manner: An incision, of the same length and direction as in the preceding operation, should be made through the skin, platysma, and sheath, so as to tie the vessel near its origin; that is, at a level with the os hyoides, below where it is crossed by the digastric muscle, (Plate XIII., Fig. 1, Ref. 31,) and ninth nerve, (Plate XII., Fig. 3, Ref. 26.)

1. Descending branch of the ninth pair of nerves.
2. Omo-hyoid muscle.
3. Pneumo-gastric nerve.
4. Platysma muscle, cut and drawn apart, with the skin and cellular tissue.
5. Sterno-mastoid muscle.
6. Common carotid, with the instrument passed beneath it.
7. Sheath of the vessels.
8. Sterno-thyroid muscle.
9. Same as 4.
10. Sterno-hyoid muscle.

Fig. 5.

1. Line of incision for ligature of the temporal artery.
2. Line of incision for ligature of the facial artery.
3. Line of incision for ligature of the subclavian artery. The line in this figure should be carried farther back.

Fig. 6. LIGATURE OF THE LEFT SUBCLAVIAN ARTERY. The subclavian artery of either side may be readily tied external to the scalenus muscle.

The patient should be laid upon the table, with the shoulder of the affected side drawn down as far as possible, and the head slightly turned to the other side. An incision must then be made above, and parallel with, the clavicle, three or four inches in length. It should be carried through the skin and platysma, and extend from the margin of the sterno-mastoid to that of the trapezius. This preliminary incision may be conveniently made by drawing down the skin and cutting through it while it is steadied on the clavicle. The superficial fascia must next be divided to the same extent, taking care not to wound the external jugular vein. If the sterno-mastoid has rather a wide attachment to the clavicle, some of its fibres may be divided to give more room. The succeeding steps of the operation consist in cutting cautiously through the cellular tissue and fascia, down to the outer edge of the scalenus muscle. Many surgeons tear through these with a director, or blunt silver knife. The point of the finger must next be passed along the scalenus, down to the rib, and in the angle between that muscle and the rib the artery will be found. The needle must be passed round, from below upwards.

1. Fascia covering the artery, &c., divided.
2. Subclavian artery.
3. Scalenus anticus muscle.
4. Sterno-mastoid muscle.
5. Subclavian vein.
6. Posterior cervical artery.
7. Nerves which go to form the axillary plexus.
8. Cervical border of the trapezius muscle.
9. Superficial branches of the cervical plexus of nerves.
10. External jugular vein, very large in this subject.
11. Omo-hyoid muscle.

Fig. 7. Ligature of the Innominata Artery. The arteria innominata has been tied in cases of aneurism of the right subclavian, extending inwards as far as the scalenus. The patient being placed upon his back, with the shoulders raised, and the head thrown back, an incision, three or four inches in length, may be made, as in the figure, commencing over the middle of the upper part of the sternum, and running back nearly parallel with the clavicle; or an incision may be made as in Fig. 7, Plate XV., between the sternal and clavicular tendons of the sterno-mastoid. In the first case, this muscle will be cut across; in the second, it will be separated, and the two sides drawn back, as in the figure. Other methods are recommended by different authors. Druitt describes the operation in the following manner: "One incision, two inches in length, is to be made along the inner margin of the sterno-mastoid muscle, terminating at the clavicle; and another across the origin of that muscle, meeting the former at a right angle. The flap of integ-

ument thus formed is to be turned up, and the sternal and part of the clavicular origin of the sterno-mastoid are to be divided on a director, which is to be passed behind the muscle, and kept as close to it as possible. In either case, after dividing this muscle, the cellular tissue, which now appears, should be divided by a few slight touches of the knife, and with the fat be turned aside, when the fibres of the sterno-hyoid will be exposed. This latter muscle, with the sterno-thyroid, must be separately divided on a director. A strong fascia, which next appears, must be cautiously scratched through, and the carotid be traced with the finger down to its origin. Then, the vena innominata being depressed, a ligature may be carried from without inwards, round the artery, close to its bifurcation, taking care to avoid the vagus, recurrent, and cardiac nerves."

Fig. 7.

1. Common origin of the ascending and transverse cervical, and superior scapular arteries.
2. Subclavian artery.
3. Scalenus anticus muscle.
4. Nerve going to the diaphragm.
5. Thyroid vein.
6. Vertebral vein.
7. Internal jugular vein.
8. Pneumo-gastric nerve.
9. Sterno-mastoid muscle, cut.
10. Primitive carotid artery.
11. Subclavian artery.
12. Sterno-thyroid muscle.
13. Sterno-hyoid muscle.
14. The trachea.
15. Arteria innominata.

Fig. 8. Ligature of the Left Subclavian Artery. From Manec.

1. The sterno-mastoid muscle, divided.
2. Transverse cervical artery.
3. Omo-hyoid muscle.
4. External jugular vein.
5. Brachial plexus of nerves.
6. Middle portion of the clavicle.
7. Subclavian artery.
8. Scalenus anticus muscle.

Fig. 9. Ligature of the Lingual Artery of the Left Side. The lingual artery may be tied by making a transverse incision along the os hyoides from a little below the symphysis of the jaw, to near the border of the sterno-mastoid muscle. The skin, platys-

ma, and fascia being divided, the artery must be looked for where it lies upon the greater cornu of the os hyoides, below the digastric muscle and ninth nerve. This artery has been tied in cases of tumors and wounds of the tongue; but considering the depth at which it lies from the surface, the irregularity of its origin, and the important parts in its vicinity, it is much better, as a general rule, to tie the external or common carotid.

Fig. 9.

1. Submaxillary gland.
2. Great hypoglossal nerve.
3. Stylo-hyoid muscle.
4. Tendon of the digastricus muscle.
5. Hypoglossus muscle, cut.
6. Upper part of thyro-hyoid muscle.
7. Middle constrictor muscle.
8. Lingual artery.
9. Greater cornu of the os hyoides.
10. Facial vein.

Fig. 10. Ligature of the Occipital Artery of the Right Side. The scalp having been shaved behind the ear, an incision is made through the skin from an inch and a half to two inches in length, beginning at the posterior border of the sterno-mastoid, about half an inch behind, and a little below the point of the mastoid process, running obliquely backwards and upwards, in the direction of the superior curved line of the occipital bone. The aponeurosis of the above muscle is then divided, and the splenius exposed just below the line of its insertion. The splenius is next to be divided the whole length of the wound, either by incision from above downwards with the knife, or in the groove of the director. The artery, which may now be felt pulsating, is to be isolated and tied. Particular care should be taken not to wound either of the accompanying veins, as they would bleed freely.

Fig. 10.

1. Superior oblique muscle.
2. The two occipital veins.
3. Tendinous expansion of the sterno-mastoid muscle.
4. Occipital artery.
5. Posterior border of the trachelo-mastoid muscle.
6. Splenius capitis muscle divided.

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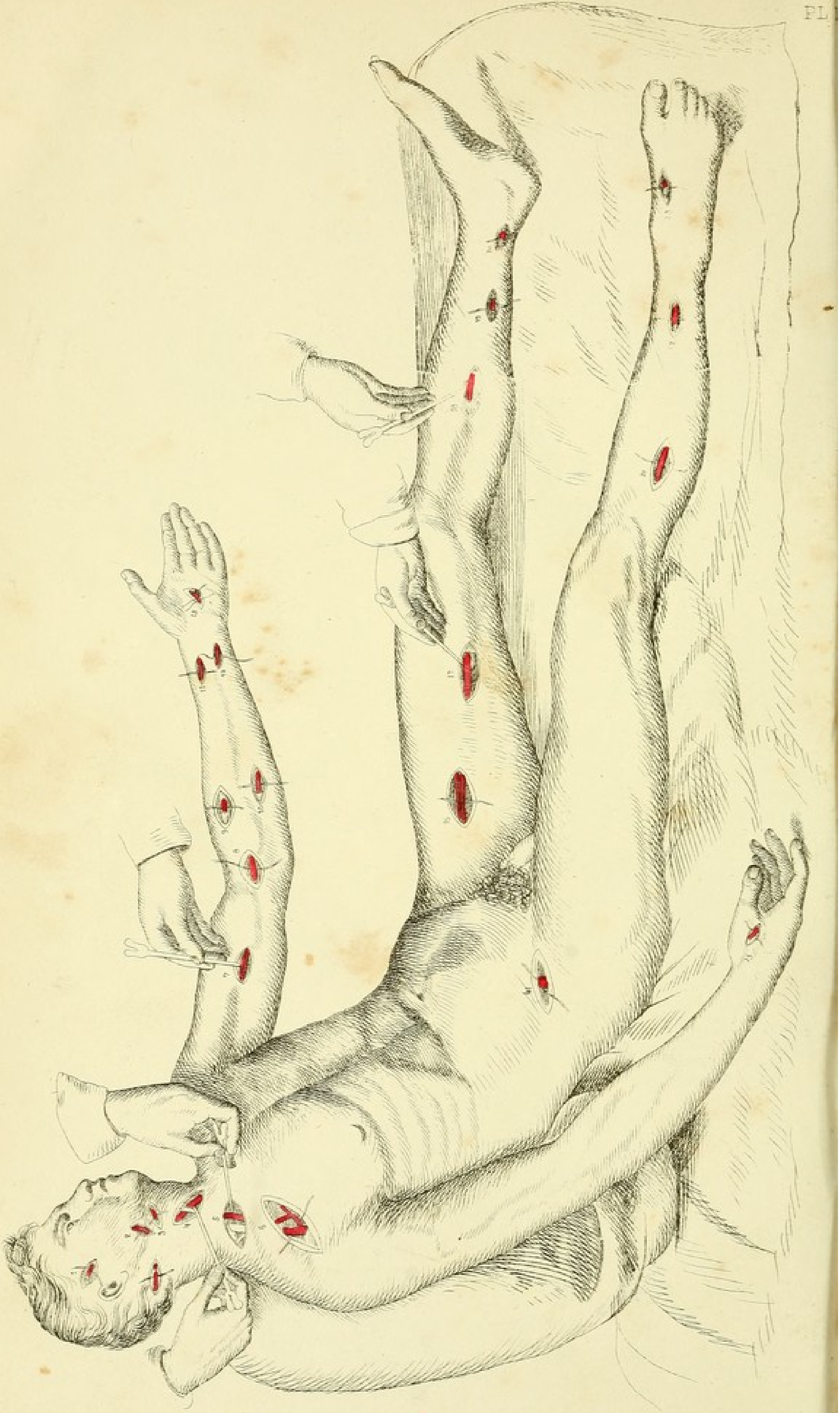


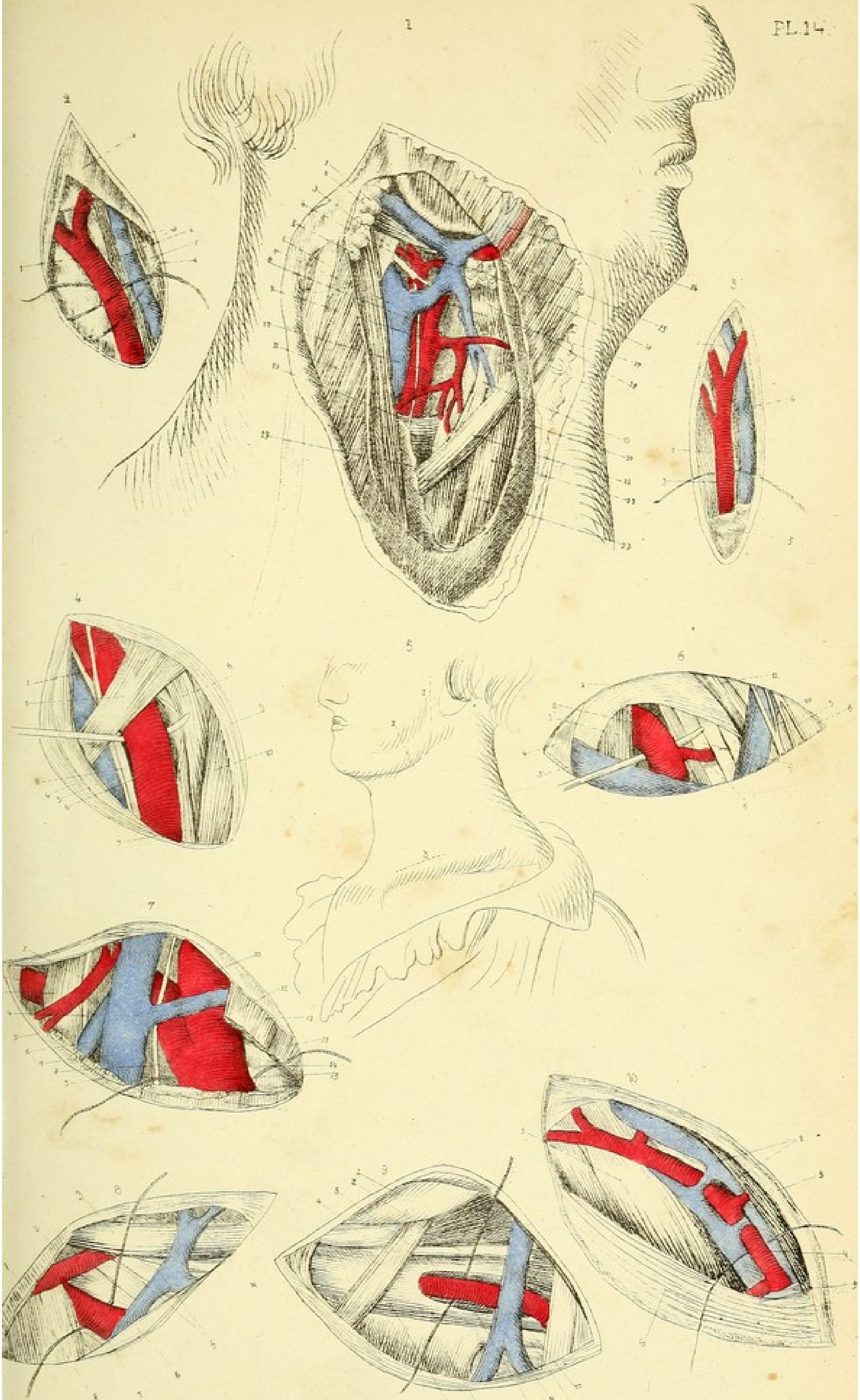


PLATE XV. Fig. 1.

1. Cervical fascia.
2. Right sterno-mastoid muscle.
3. Left sterno-hyoid muscle, cut.
4. Left sterno-thyroid muscle, cut.
5. Right sterno-hyoid muscle.
6. Deep cervical fascia.
7. Trachea.
8. Left sterno-mastoid muscle.

9, 10. Deep cervical fascia.

11. Anterior jugular vein.
12. Scalenus anticus muscle.
13. Lower end of the left internal jugular vein.
14. Left subclavian vein.
15. Left subclavian artery.
16. Pneumo-gastric nerve.
17. Common carotid artery.

Fig. 2.

1. Sterno-mastoid muscle, cut.
2. Right pneumo-gastric nerve, crossing the subclavian artery.
3. Internal jugular vein.
4. External jugular vein.
5. Right subclavian vein.
6. Clavicle.
7. Fascia of the neck.
8. Right sterno-hyoid muscle, cut.
9. Right sterno-thyroid muscle, cut.
10. Left sterno-mastoid muscle.
11. Left sterno-hyoid muscle.
12. Deep fascia of the neck.
13. Trachea.
14. Left sterno-thyroid muscle.

Ligature of the Brachial Artery. The course of this artery may be seen by referring to Plate XX., Fig. 2. It is superficial throughout its course. It may be tied at the upper part of its course, by making an incision two inches in length on the inner border of the coraco-brachialis muscle, and at the lower part, by making a similar incision on the inner border of the biceps. The incision must be made in the direction of the artery towards the centre of the limb; and in dividing the cellular tissue, great care must be taken not to wound the internal cutaneous nerve which lies superficial to the vessel in the upper part of its course. At the lower part of the limb, the basilic vein must be avoided. The median nerve lies over the vessel in the middle of its course, and it has two venæ comites, which must be excluded from the ligature.

Before tying the ligature, it should be ascertained whether the trunk exposed commands the circulation at the part desired.

Fig. 3. Ligature of the Radial Artery at its Upper Third. The radial artery, in the upper third of the forearm, may be tied by making an incision three inches in length, in a line from the bend of the elbow to the thumb, through the skin and superficial fascia, avoiding the veins. The supinator longus and pronator teres being drawn asunder, and the deep fascia being divided to the same extent, the artery will be exposed, with its accompanying veins, which are to be carefully separated before the ligature is passed. The aneurism needle should be introduced from without, in order to avoid the radial nerve, which lies on the radial side.

This vessel can be tied in its middle third by making a similar incision through the same parts, on the ulnar border of the supinator longus; and in the lower third, by making an incision on the radial side of the flexor carpi radialis. It may also be tied at the back of the carpus, just before it dips into the palm, between the first and second metacarpal bones, by making an incision between the tendons of the extensor secundi and primi internodii pollicis. But it is easier to tie it at the lower part of the forearm.

Fig. 3.

1. Superficial nerve.
2. Collateral veins.
3. Superficial vein.
4. Aponeurosis, cut and turned back.
5. Tendon of the pronator teres muscle.
6. Artery lying between the veins.
7. Internal border of the supinator longus muscle.
8. Second layer of aponeurosis.
9. Flexor sublimis.
10. Same as 4.

Fig. 4. Ligature of the Axillary Artery. This artery may be tied below the clavicle by making a semilunar incision, with its convexity upwards, from near the sternal end of the clavicle to

the anterior margin of the deltoid muscle. The skin, superficial fascia, and clavicular fibres of the pectoralis major muscle, are to be divided in succession, avoiding the cephalic vein and thoracica acromialis artery, where they pass between the pectoralis and deltoid; the flap being turned down, a strong fascia, which intervenes between the pectoralis minor and subclavius muscles, is next to be divided on a director; the cellular tissue, and veins covering the vessel, are to be turned aside; then the axillary vein being pressed downwards, a ligature is carried round the artery, from below upwards. This operation is exceedingly difficult, and only to be performed in case of wounds.

It is much more easy to tie this artery in the axilla. The arm being widely separated from the trunk, and the forearm supinated, an incision three inches in length is made over the head of the humerus, between the margins of the pectoralis major and latissimus dorsi muscles, but rather nearer the latter. The cellular tissue having been dissected through so as to expose the vessel, and the vein and nerves having been drawn aside, the aneurism needle should be passed from the inside.

Fig. 4.

1. First branch of the brachial plexus of nerves.
2. Axillary artery.
3. Axillary vein.
4. Fat and cellular tissue beneath the skin.
5. Pectoralis major divided in the direction of its fibres.
6. Cephalic vein.
7. Thoracic and acromial arteries which unite in one common trunk with the main vessel.
8. Same as 4.
9. Same as 5.

Fig. 5. Brachial Artery at the Bend of the Arm. From Velpeau.

1. Cutaneous nerve.

2, 7. Skin and cellular tissue divided.

3, 9. Aponeurosis cut and turned back.

4. Sheath of the artery.

5. Part of the brachialis anticus muscle.

6. Median nerve.

8. The artery, with an instrument passed beneath it.

Fig. 6. LIGATURE OF THE SUBCLAVIAN ARTERY. AFTER CHAMBERLAYNE.

1. Brachial plexus of nerves.
2. Cephalic vein.
3. Superior border of the pectoralis minor.
4. Section of the clavicular attachment of the pectoralis major.
5. Internal humeral vein.
6. Subclavian artery, with the needle passed beneath it.

Fig. 7. LIGATURE OF THE INNOMINATA ARTERY.

1. Part of the omo-hyoid muscle.
2. Inferior thyroid artery.
3. Common origin of the ascending and transverse cervical arteries, in this subject coming off from the inferior thyroid.
4. Phrenic nerve.
5. Scalenus anticus muscle.
6. Vertebral vein.
7. Internal jugular vein.
8. Clavicular portion of the sterno-mastoid muscle.
9. Subclavian artery.
10. Internal mammary artery.
11. Sterno-thyroid muscle.
12. Arteria innominata.
13. Sterno-hyoid muscle.
14. Rectus anticus major.
15. Thyroid body.
16. Pneumo-gastric nerve.
17. Primitive carotid artery.
18. Trachea.

Fig. 8. LIGATURE OF THE RADIAL ARTERY AT ITS LOWER PORTION.

1. Veins accompanying the artery.
2. Radial artery.
3, 5. Aponeurosis divided in order to expose the artery.
4. Tendon of the anterior radial muscle.

Fig. 9. LIGATURE OF THE ULNAR ARTERY AT ITS UPPER THIRD. When this vessel is wounded at its upper third, where it is covered deeply with muscles, it is an undecided point whether the wound should be dilated, cutting through or across the muscles to reach the bleeding point, or whether the lower end of the brachial should be tied.

1. Ulnar artery, with an instrument passed beneath it.
2. Ulnar nerve.
3, 6. Aponeurosis sheathing the vessels and nerve.
4. Flexor carpi radialis muscle.
5, 8. First layer of aponeurosis.
7. Flexor carpi ulnaris.

PLATE XVI. Fig. 4. 1st.

Ligature of the Ulnar Artery at its Lower Third. The ulnar artery at its middle and lower thirds may be readily exposed by making an incision three inches in length along the outer margin of the flexor carpi ulnaris. This muscle is then to be drawn inwards, the deep fascia to be divided, the veins to be separated from the artery, and the needle to be passed from within, so as to avoid the ulnar nerve, which lies on the ulnar side.

1. Deep fascia.
2. Venæ comites.
3. Branch of the ulnar nerve.
4. Tendon of the flexor carpi ulnaris muscle.
5. Superficial fascia.
6. Ulnar artery.

Fig. 4. 2d. Ligature of the Aorta, the Common Iliac, and the Internal Iliac Arteries. The dotted line on the left of this figure shows the direction of the incision; the incision is shown completed on the right, the wound being held open by a copper spatula. The dotted line around the umbilicus shows the course of the incision made by Sir Astley Cooper, when he placed a ligature on the abdominal aorta. After opening the peritoneum, dividing the linea alba an inch and a half above the umbilicus, and as much below, Sir Astley, by scratching with his nail at the root of the mesentery, was enabled to insulate the artery, and carry a thread round it.

The aorta, the common iliac, and the internal iliac arteries, may be tied by a similar operation. An incision from four to six inches in length must be made on the anterior surface of the abdomen. It may either be made parallel to the outer border of the rectus, or to the epigastric artery, and should terminate an inch above Poupart's ligament. The three layers of abdominal muscles are to be cautiously divided to the same extent, and the fascia transversalis likewise, it being first scratched through, so that the finger may be introduced between it and the peritoneum to divide it upon. The peritoneum must now be detached by the fingers from the iliac fossa, as far as the brim of the pelvis, where the external iliac will be found beating, and by following this vessel upwards, the operator will come upon the internal, or common iliac, or the aorta.

The edges of the wound being now held asunder by a copper spatula, the artery to be tied must be separated from its vein with the nail of the forefinger or the flat end of a probe, and the aneurism needle be passed round between it and the vein. The common iliac veins lie behind their respective arteries; the left iliac vein is behind its artery, and the right is a little external as well as posterior.

Fig. 1. LIGATURE OF THE RADIAL ARTERY on the back of the hand, between the metacarpal bones of the thumb and forefinger.

Fig. 3. LIGATURE OF THE PALMAR ARCH, formed by the nlnar artery, and also of a branch which anastomoses with the radial.

THE EXTERNAL ILIAC ARTERY may be tied, according to Sir Astley Cooper's method, by making a semilunar incision (with the convexity looking downwards and outwards) from near the anterior superior spinous process of the ilium to the superior angle of the external abdominal ring. This incision will be nearly parallel with Poupart's ligament, and about an inch above it. The skin, superficial fascia, and tendon of the external oblique having been divided, the lower margin of the internal oblique and transversalis muscles must be raised on the finger, and be detached from Poupart's ligament; the fascia transversalis must be carefully scratched through, and then, if the finger is passed back under the spermatic cord, it will come in contact with the artery. The dense cellular tissue, connecting the artery with the vein, (which lies on its internal and posterior aspect,) must be scratched through, and the needle be passed between them.

Fig. 5. Ligature of the External Iliac and Femoral Arteries. From Manec. The upper drawing, ligature of the external iliac; the lower drawing, ligature of the femoral artery,

1. A portion of the intestines.
2. Iliac vein.
3. External iliac artery.
4. Portion of intestine.
5. Lumbar plexus of nerves.
6. Tendon of the external oblique.
7. Transversalis muscle.
8. Internal oblique muscle.
9. Fascia transversalis.
10. Iliac fossa.

Fig. 5. Ligature of the Femoral Artery.

1. Branch of the femoral artery going to the superficial parts.
2. Femoral artery.
3. Femoral vein.
4. Termination of the great saphena vein.
5. Deep fascia.

Fig. 6. Ligature of the Primitive, External, and Internal Iliac Arteries. From Bourgery.

1. Section of the superficial abdominal fascia.
2. Second layer of abdominal fascia.
3. Section of the external oblique muscle.
4. Section of the internal oblique muscle.
5. Section of the transversalis muscle.
6. Peritoneum of the internal iliac fossa.
7. Surface of the iliac fascia upon which are seen branches of the lumbar nerves.
8. Common iliac artery.
9. Nervous filament which must be excluded from the ligature.
10. External iliac artery.
11. Primitive iliac vein.
12. Internal iliac artery.
13. Peritoneum pressed back by an assistant.

Fig. 8. Ligature of the External Iliac. From Manec.

1. Internal oblique muscle.
2. Tendon of the external oblique.
3. Glands over the artery.
4. Nerve; (in some of the plates this is colored by mistake.)

5, 9. Fibrous sheath which separates the vein and nerve from the artery.

6, 7. Superficial vein and artery.

8. Circumflex artery on the left—epigastric artery on the right.

LIGATURE OF THE FEMORAL ARTERY. The femoral artery may be tied in any part of its course. When the operation is required for popliteal aneurism, it should be performed just above the part where the vessel is overlapped by the sartorius, a little below the origin of the profunda. The patient being placed on his back, with the limb slightly bent and turned outward, the incision should be made in the course of the vessel, which corresponds with a line drawn from the middle of Poupart's ligament to the inner edge of the patella. The incision may be commenced two inches below the groin; its length must depend upon the thickness of the parts to be divided. It is better to make it too long than too short. The cellular tissue must next be divided down to the fascia lata, avoiding the saphena vein. If any glands are met with, they should be turned aside. The fascia lata is now to be divided for about two inches, and the sartorius to be drawn gently outwards. The artery may now be felt pulsating. The sheath and cellular tissue over it should be raised with the forceps, and divided by cautious touches, the knife being held with its flat surface towards the artery. The aneurism needle should be passed from within outward, avoiding the vein which lies behind the artery. Before finally tightening the ligature, the artery should be compressed, to see whether the flow of blood ceases, as there may be some irregularity in the distribution of the artery. The femoral artery may also be tied in the middle third of the thigh, where it is covered by the sartorius, by cutting down upon that muscle and turning it aside, and slitting up the strong fibrous sheath which envelops the artery at that part. This is a much more difficult operation than the former, and, according to most authorities, has no commensurate advantages.

Fig. 7. LIGATURE OF THE FEMORAL ARTERY AT ITS UPPER THIRD.

1. Crural nerve.
2. Deep fascia.
3. Superficial fascia.
4. Sartorius muscle.
5. Internal saphena vein.
6. Femoral artery.
7. Saphenus nerve.
8. Crural vein.

Fig. 12. Ligature of the Femoral Artery at its Middle Third.

1. Femoral artery.
2. Sartorius muscle.
3, 3. Superficial fascia.
4. Deep fascia.
5. Femoral vein.
6. Crural nerve.
7. Anastomotica magna.

Ligature of the Gluteal Artery. The gluteal artery may be tied by placing the patient on his face, with the toes turned inwards, and making an incision from an inch below the posterior spinous process of the ilium, and an inch from the sacrum towards the great trochanter ; this incision should be about four inches long. The fibres of the gluteus maximus having been cut through or separated to the like extent, and a strong fascia beneath having been cut through, the vessel will be found emerging from the upper part of the sciatic notch. The sciatic artery may be found by making an incision through the same parts, and for the same extent, but an inch and a half lower down. Both these operations are extremely difficult, from the great depth to which the dissection must be carried, the unyielding nature of the surrounding parts, and the hemorrhage from the numerous blood-vessels that must necessarily be wounded. They should be attempted, however, in case of wounds.

Ligature of the Popliteal Artery. The popliteal artery may be tied by cutting through the skin and fascia lata, to the extent of three inches on the outer border of the tendon of the semimembranosus muscle, the patient being placed on his face with the limbs straight. On pressing that tendon inward, the artery may be felt. Its vein, which lies superficial and rather external to it, must be cautiously separated and drawn outward, and the needle be passed between them. This operation is very seldom performed.

Ligature of the Posterior Tibial Artery. The operation usually recommended for tying this artery in the upper part of the leg is performed thus. The limb being placed on its outer side, with the knee bent and the foot extended, an incision four inches in length must be made through the skin and fascia, over the inner margin of the tibia, avoiding the saphena vein. The edge of the gastrocnemius thus exposed is to be turned back; a director must then be insinuated beneath the inner head of the soleus, and this muscle must be divided from its attachment to the tibia. The strong and tense fascia beneath it must next be divided in the same manner. Then, the muscles being relaxed as much as possible by bending the knee and extending the foot, the artery may be felt about an inch from the edge of the tibia. The veins are to be separated from it, and an aneurism needle passed round it from without inward so as to avoid the nerve.

Ligature of the Posterior Tibial Artery in the Lower Third of the Leg. The posterior tibial artery may be easily exposed in the lower third of the leg, by cutting parallel to the tendo Achillis, and on its inner side, to the extent of two or three inches through the skin and two layers of fascia. The cellular tissue and sheath of the vessel must next be cautiously divided, and the venæ comites having been separated from it, the needle must be passed round the vessel from the outer side.

Ligature of the Posterior Tibial behind the Inner Ankle. This artery may be tied behind the inner ankle by making a semilunar incision two or three inches long, in the hollow between the heel and the ankle, but rather nearer to the latter. The integuments, the superficial fascia, and a very strong tendinous aponeurosis, continuous with the deep fascia of the leg, must be successively divided to the same extent. The sheath of the vessels which will be thus exposed must be opened, the venæ comites separated, and the needle passed from the heel towards the ankle, in order to avoid the nerve which lies a little nearer to the heel.

Fig. 9. Ligature of the Posterior Tibial Artery at its Upper Third.

1. Deep fascia.
2, 11. Soleus muscle.
3. Internal saphena vein.
4. Skin and cellular tissue.
5. Superficial fascia.
6. Gastrocnemius muscle.
7. Dense fascia covering the soleus muscle.
8. Posterior tibial vein.
9. Posterior tibial muscle.
10. Posterior tibial artery.

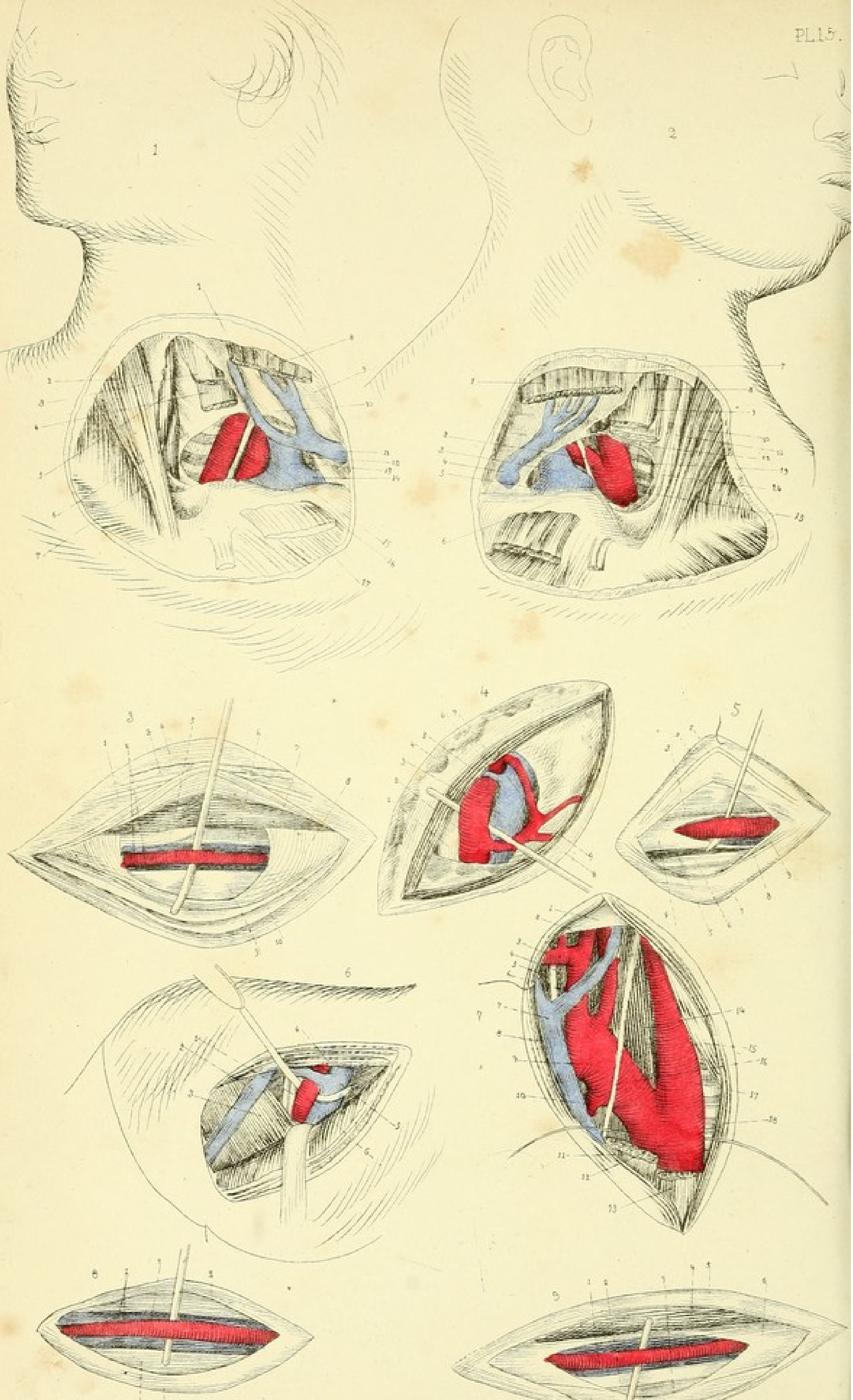
Fig. 11. Ligature of the Posterior Tibial Artery at its Middle Third.

1, 1. Skin and cellular tissue.
2, 8. Collateral veins.
3. Deep fascia.
4. Branch of the saphena vein.
5. Tendo Achillis.
6. Posterior tibial nerve.
7. Posterior tibial artery.

Fig. 10. Ligature of the Posterior Tibial behind the Malleolus.

1. Deep fascia.
2. Superficial fascia.
3, 8. Skin and cellular tissue.
4. Deep fascia.
5. Venæ comites.
6. Posterior tibial artery.
7. Tibial nerves.
8. Subcutaneous veins.

PL. 15.



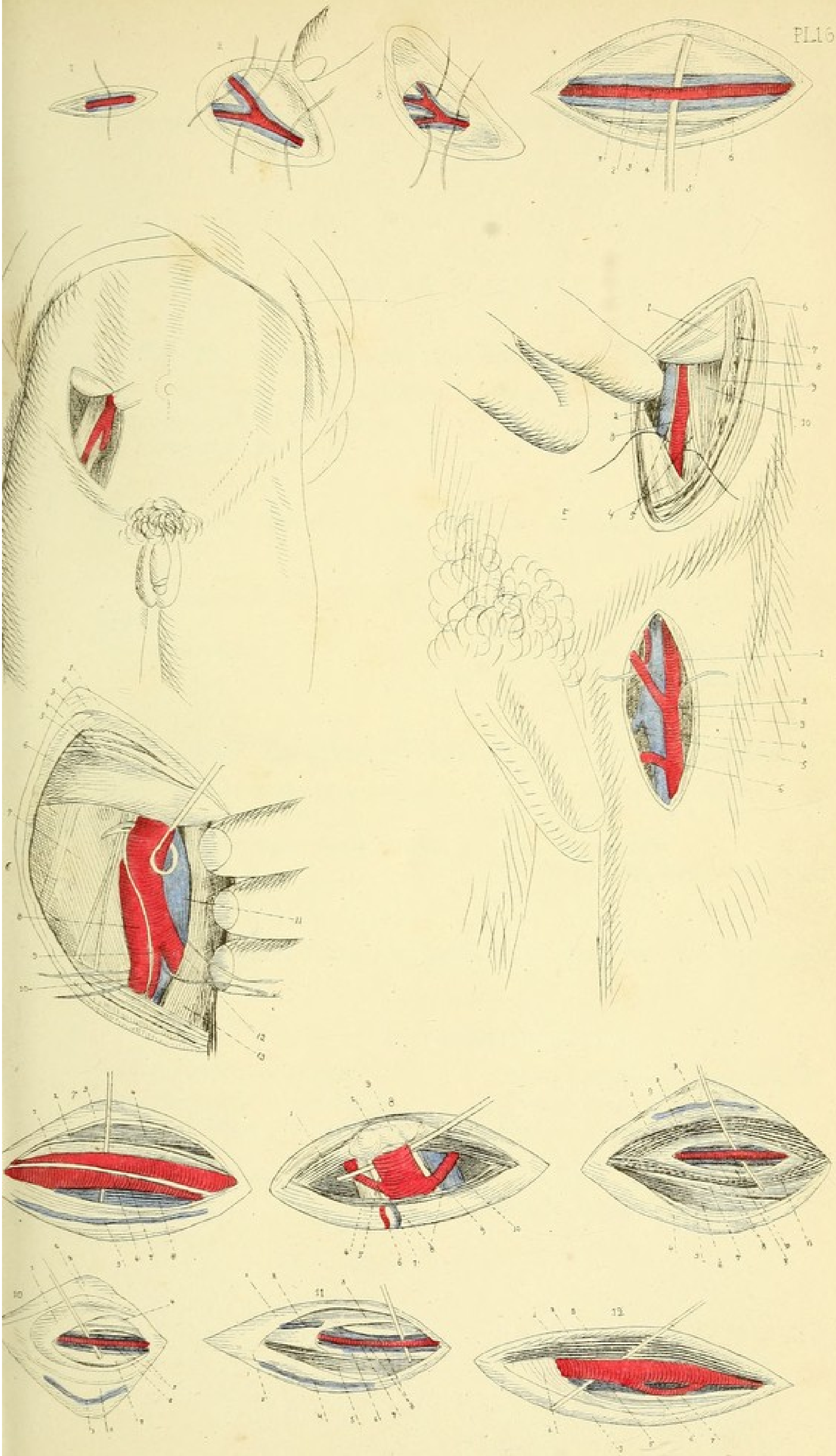


PLATE XVII.

Fig. 10. Ligature of the Anterior Tibial Artery.

1. Tibial artery, under which is passed the needle of Deschamps.
2. Superficial fascia.

3, 4. Tibialis anticus muscle.

5, 7. Venæ comites.

6. Tibial nerve.

Fig. 11. Ligature of the Tibialis Anticus Artery at its Lower Third.

1. Section of the skin and cellular tissue.
2. Tibial veins.
3. Tendon of the extensor of the toes.
4. Anterior tibial nerve.
5. Anterior tibial artery.

Fig. 12. Ligature of the Dorsalis Pedis Artery.

1, 2. Section of the skin and cellular tissue.

3, 4. Section of the fascia on the top of the foot.

5. Tendon of the extensor proprius pollicis.
6. Venæ comites.
7. Artery, with the ligature passed beneath it.

Fig. 13 shows the places of incision for tying the last mentioned arteries.

Instruments.

Fig. 1. Needle of Desault.

Fig. 2. Needle of Deschamps.

Fig. 3. Director, armed with a thread.

Figs. 4, 5. Bent needles, for passing ligatures.

Fig. 6. *Serre-nœud*, instrument for tightening knots.

Fig. 7. Stylet needle.

Fig. 8. *Pince à coulisse;* forceps with a clasp.

Fig. 9. Needle of J. L. Petit.

PLATE XVIII.

Fig. 1. Posterior Ligaments of the Lower Extremity of the Forearm, of the Carpus and Metacarpus.

1. Posterior ligament of the wrist joint.
2. External lateral ligament.
3. Internal lateral ligament.
4. Posterior carpal ligaments.
5. Posterior ligament of the carpus and metacarpus.
6. Ligament passing from the trapezium to the second metacarpal bone.
7. One of the dorsal ligaments which unite the last four metacarpal bones.

Fig. 2. Dorsal Surface of the Right Foot.

1. The astragalus.
2. Anterior extremity of the astragalus which articulates with 4, the scaphoid bone.
3. The os calcis.
4. The scaphoid bone.
5. The internal cuneiform bone.
6. The middle cuneiform bone.
7. The external cuneiform bone.
8. The cuboid bone.
9. The metatarsal bones of the first and second toes.
10. The first phalanx of the great toe.

Fig. 3. Bones of the Thumb and Forefinger.

Fig. 4. Dorsal Surface of the Bones of the Carpus of the Right Hand.

1. The lower extremity of the ulna.
2. The lower extremity of the radius.
3. The pisiform bone.
4. The cuneiform bone.
5. The semilunar bone.
6. The scaphoid bone.
7. The unciform bone.
8. The os magnum.
9. The trapezoides.
10. The trapezium.

11, 12, 13, 14, 15. Metacarpal bones.

Fig. 5. Posterior View of the Ankle Joint.

1. Interosseous ligament.
2. The posterior inferior ligament.
3. The transverse ligament.
4. The internal lateral ligament.
5. The posterior fasciculus of the external lateral ligament.
6. The middle fasciculus of the external lateral ligament.
7. The synovial membrane of the ankle joint.
8. The os calcis.

Fig. 6. Ligaments of the Sole of the Foot.

1. The os calcis.
2. The astragalus.
3. The tuberosity of the scaphoid bone.
4. The long calcaneo-cuboid ligament.
5. Part of the short calcaneo-cuboid ligament.
6. The calcaneo-scaphoid ligament.
7. The plantar tarsal ligament.
8. The tendon of the peroneus longus muscle.
9. Plantar tarso-metatarsal ligaments.
10. Plantar ligament of the metatarso-phalangeal articulation of the great toe; the corresponding ligament is seen upon the other toes.
11. Lateral ligaments of the metatarso-phalangeal articulation.
12. Transverse ligament.
13. Lateral ligaments of the phalanges of the great toe; the corresponding ligaments as seen upon the other toes.

Fig. 7. Anterior Ligaments of the Lower Extremity of the Forearm, of the Carpus and Metacarpus.

1. Anterior and inferior radio-ulnar ligament.
2. Anterior ligament of the wrist joint.
3. External lateral ligament.
4. Internal lateral ligament.
5. Pisiform bone.
6. Os magnum.
7. Capsular ligament of the trapezium and first metacarpal bone.
8. One of the palmar ligaments.
9. Common transverse palmar ligament.
10. Anterior ligaments of the metacarpo-phalangeal articulations.
11. Lateral ligament of the metacarpo-phalangeal articulation of the thumb.

Fig. 8. Lateral ligaments of the articulations of one finger.

Fig. 9. Refs. 1, 2. The anterior ligaments of the phalangeal articulations of the finger.

Fig. 10. Same as Fig. 8.

Fig. 11. Internal View of the Ligaments of the Elbow Joint.

1. The anterior ligament.
2. The internal lateral ligament.
3. The orbicular ligament.
4. Oblique ligament.
5. Interosseous ligament.

Fig. 12. External View of the Elbow Joint.

1. The humerus.
2. The ulna.
3. The radius.
4. The external lateral ligament.
5. The orbicular ligament.
6. Posterior extremity of the orbicular ligament.
7. The anterior ligament.
8. The posterior ligament.

Fig. 13. Internal View of the Ankle Joint.

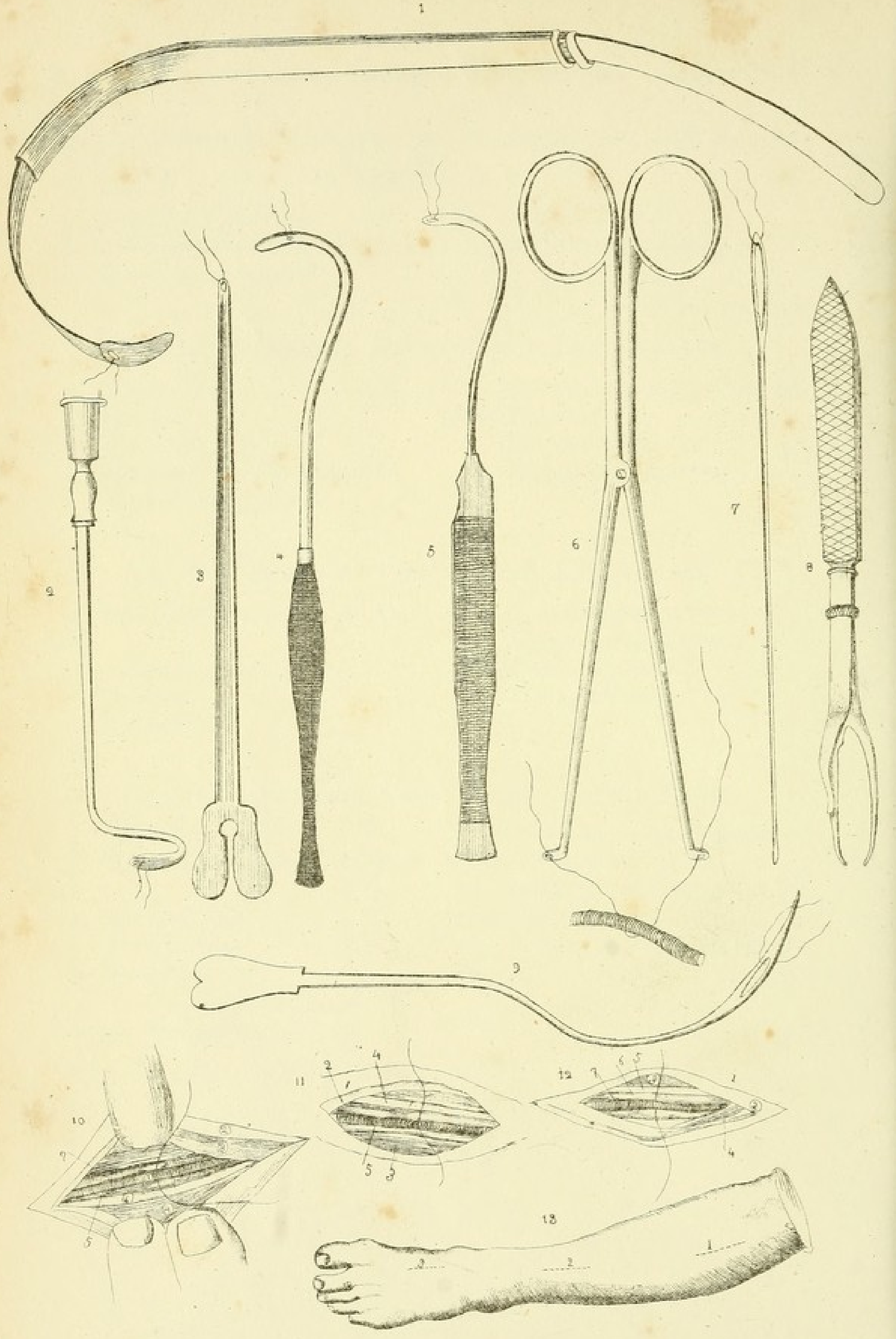
1. The internal malleolus of the tibia.

2, 2. Part of the astragalus.

3. Os calcis.
4. Scaphoid bone.
5. Internal cuneiform bone.
6. Internal lateral ligament.
7. Anterior ligament.
8. Tendo Achillis.

Fig. 14. External View of the Ankle Joint.

1. The tibia.
2. External malleolus of the fibula.
3. The astragalus.
4. The os calcis.
5. The cuboid bone.
6. The anterior fasciculus of the external lateral ligament.
7. Middle fasciculus of the external lateral ligament.
8. Posterior fasciculus of the external lateral ligament.
9. Anterior ligament of the ankle.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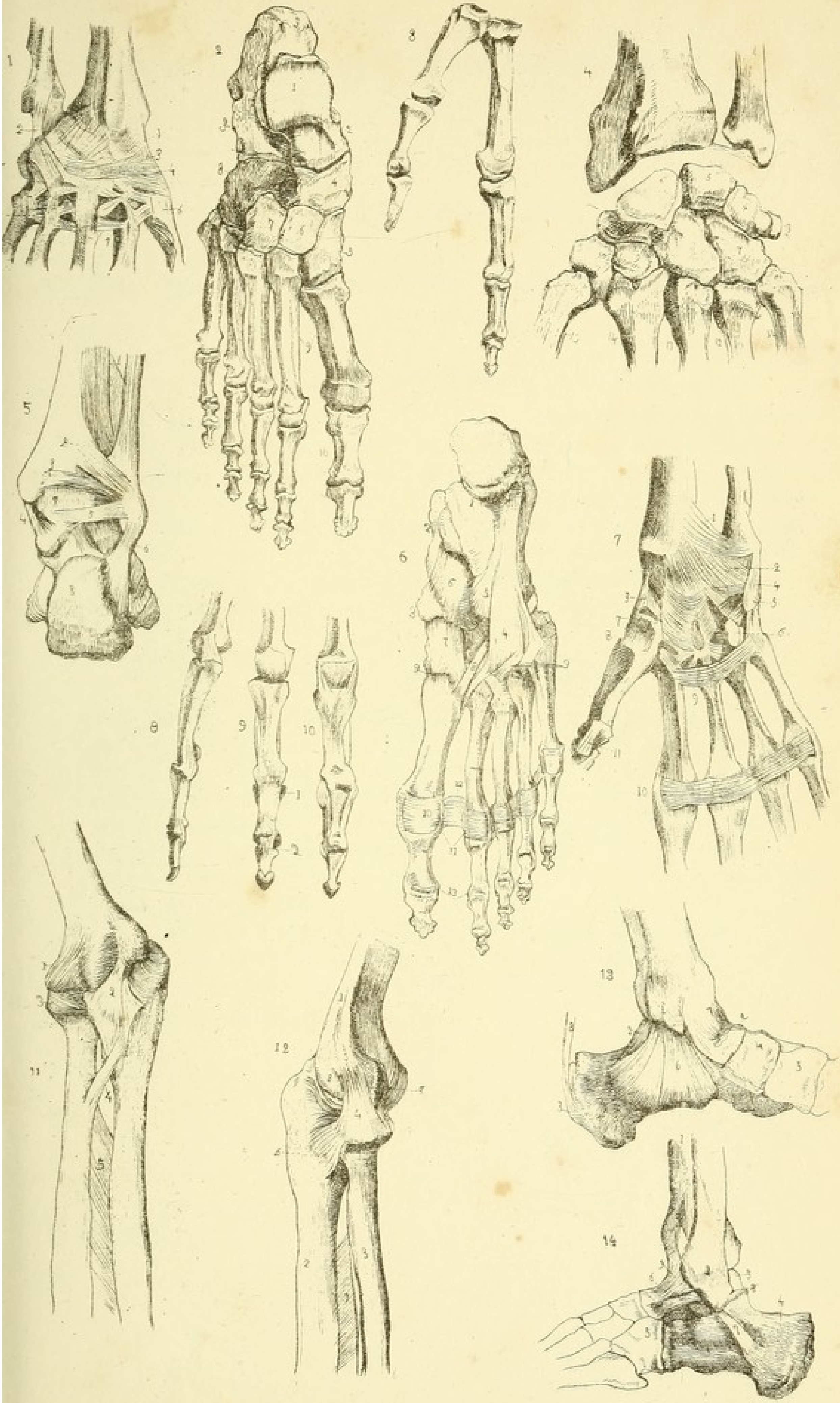

PLATE XIX.

The Surgical Form of the Male and Female Axillæ compared.

Fig. 1. The Female Axilla.

1, 2. Axillary vein.

3. Coraco-brachialis muscle.

4. Short head of the biceps muscle.

5. Pectoralis major muscle.

6. Mammary gland, seen in section.

7. Serratus magnus muscle.

8, 10. Lymphatic glands.

9. Subscapular artery, crossed by the intercosto-humeral nerves, and descending parallel to the external respiratory nerve. Beneath the artery is seen a subscapular branch of the brachial plexus, given to the latissimus dorsi muscle.

Fig. 2. The Male Axilla.

1. Axillary vein, drawn apart from the artery, to show the nerves lying between both vessels. On the bicipital border of the vein is seen the internal cutaneous nerve; on the tricipital border is the nerve of Wrisberg, communicating with some of the intercosto-humeral nerves.

2. The common trunk of the venæ comites, entering the axillary vein.

3. Axillary artery, crossed by one root of the median nerve.

4. The basilic vein.

5. Coracoid head of the biceps muscle.

6. Coraco-brachialis muscle.

7. Pectoralis major muscle.

8. Pectoralis minor muscle.

9. Tendon of the latissimus dorsi muscle.

10. Teres major muscle.

11. Subscapular artery.

12. Conglobate gland.

PLATE XX.

Fig. 1. Surgical Dissection of the Axillary and Brachial Regions.

1. Subclavian vein, crossed by a branch of the brachial plexus, given to the subclavius muscle.

2. Subclavian artery lying on the first rib, 6, 6.

4. Anterior scalenus muscle.

5. Subclavius muscle.

6. The first rib.

7, 17. Scapular and sternal ends of the clavicle.

8. Humeral attachment of the great pectoral muscle.

9. A layer of fascia encasing the lesser pectoral muscle.

10. Thoraic half of the great pectoral muscle.

11. Coracoid attachment of the lesser pectoral muscle.

11.* Coracoid process of the scapula.

12. Coraco-brachialis muscle.

13. Biceps muscle.

14. Tendon of the latissimus dorsi muscle, crossed by the intercosto-humeral nerves.

15. Teres major muscle, on which, and 14, is seen lying Wrisberg's nerve.

16. Brachial fascia, investing the triceps muscle.

17. Sternal end of clavicle.

18. Cephalic vein.

19. Axillary artery.

20. Axillary vein.

21. Basilic vein with internal cutaneous vein lying upon it.

22. Brachial artery with the median nerve and venæ comites.

23. Median nerve.

Fig. 2. Surgical Dissection of the Bend of the Arm, and the Forearm.

1. Biceps muscle.

2. Basilic vein, cut.

3. Brachial artery.

4. Median nerve.

5. Brachialis anticus muscle.

6. Origin of radial artery.

7. Supinator radii longus muscle.

8. Aponeurosis of the tendon of the biceps muscle.

9. Pronator teres muscle.

10. Flexor carpi ulnaris muscle.

11. Flexor carpi radialis muscle.

12. Palmaris longus muscle.

13. Radial artery; radial nerve on the outside.

14. Flexor digitorum sublimis.

15. Flexor pollicis longus.

16. Median nerve.

17. Lower end of radial artery.

18. Ulnar artery and ulnar nerve.

19. Pisiform bone.

20. Extensor metacarpi pollicis.

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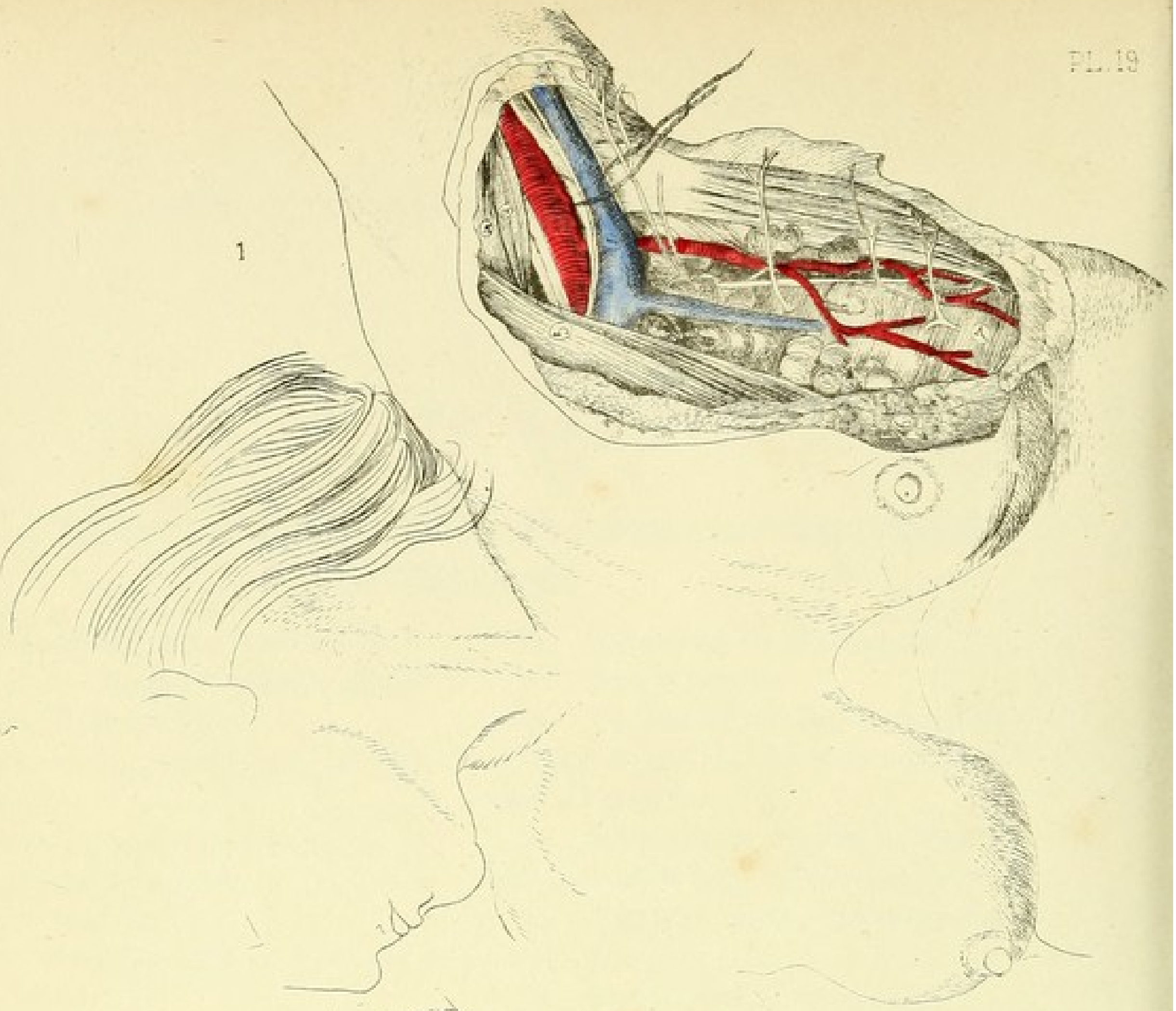

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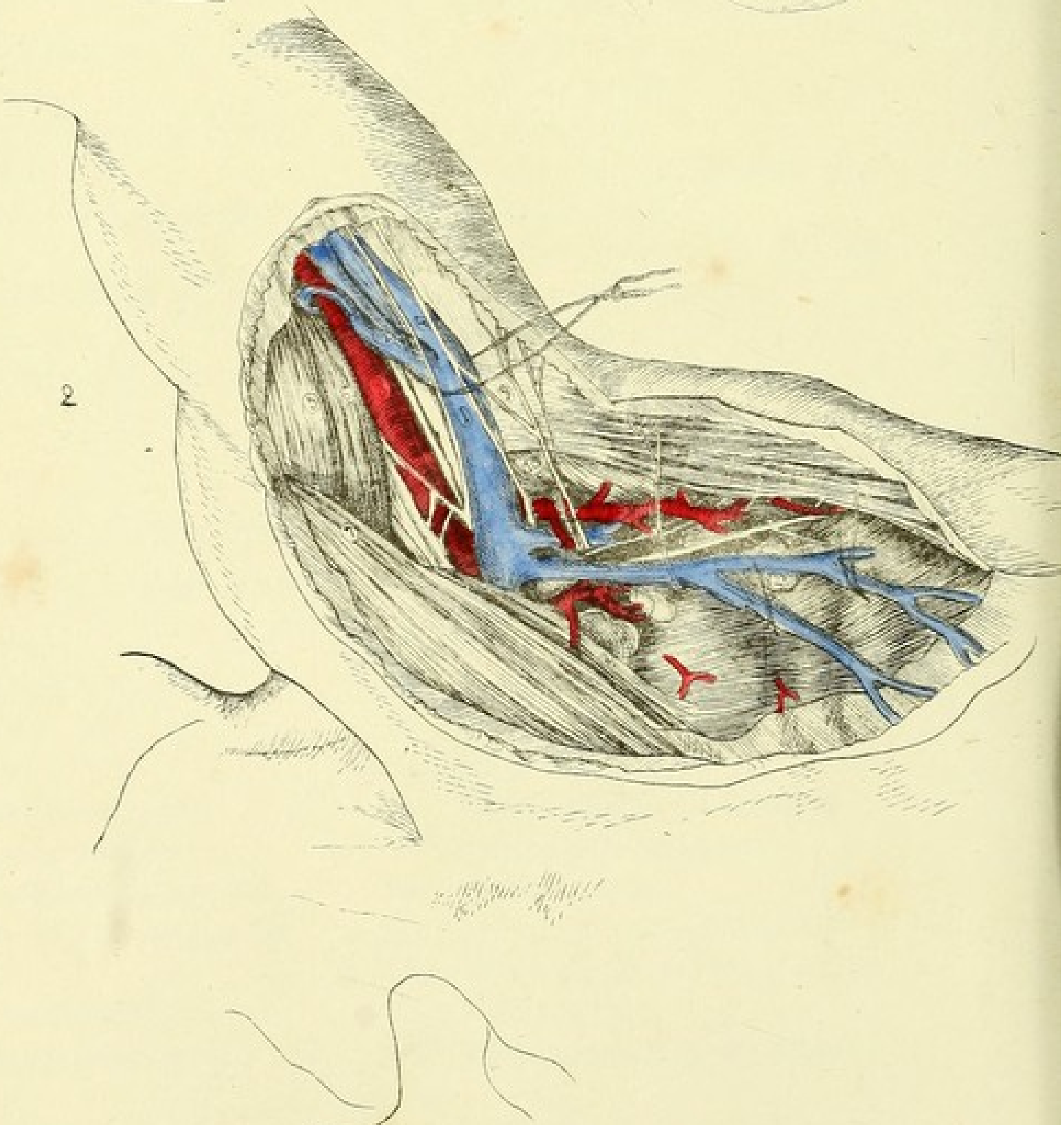

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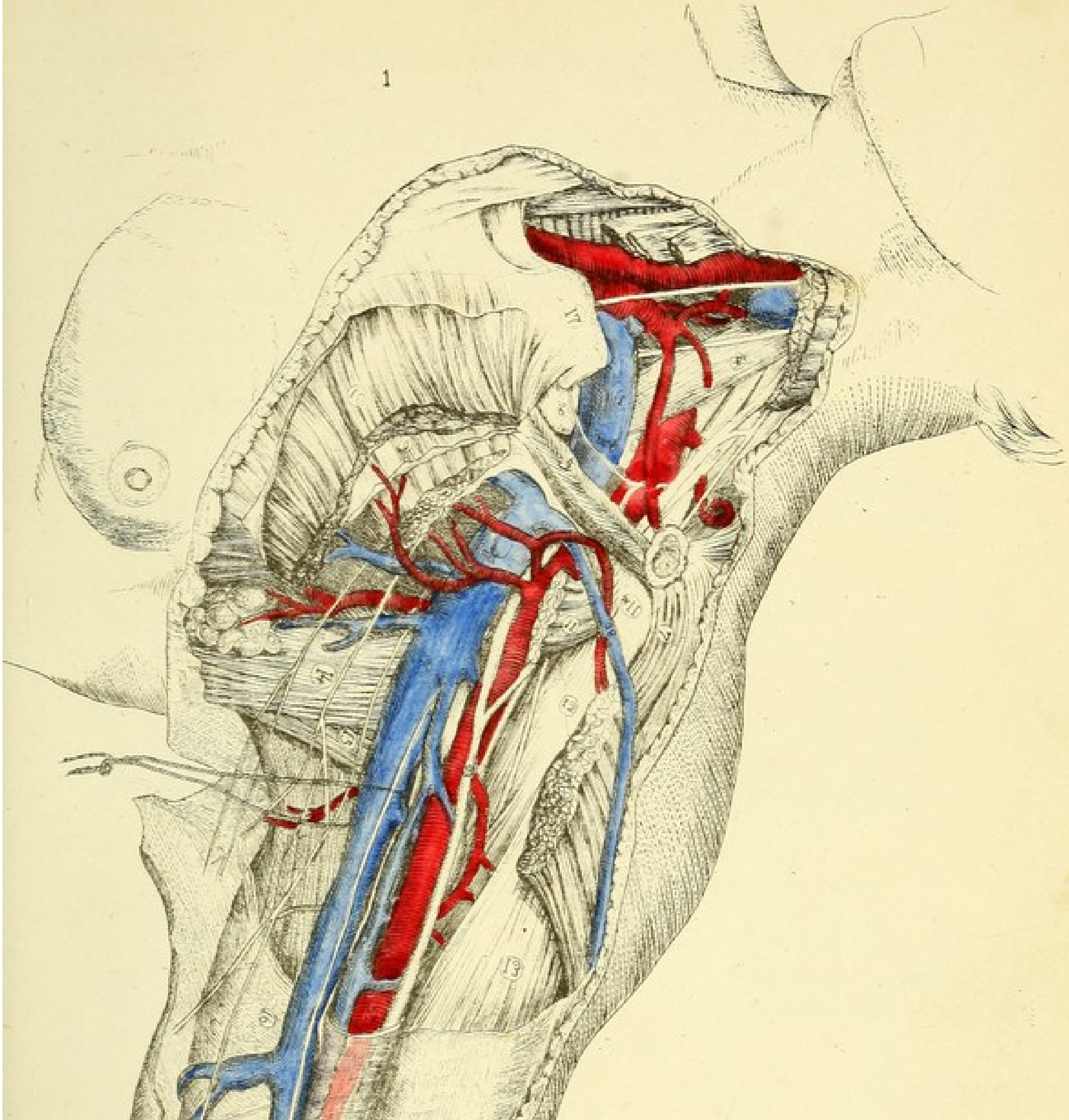

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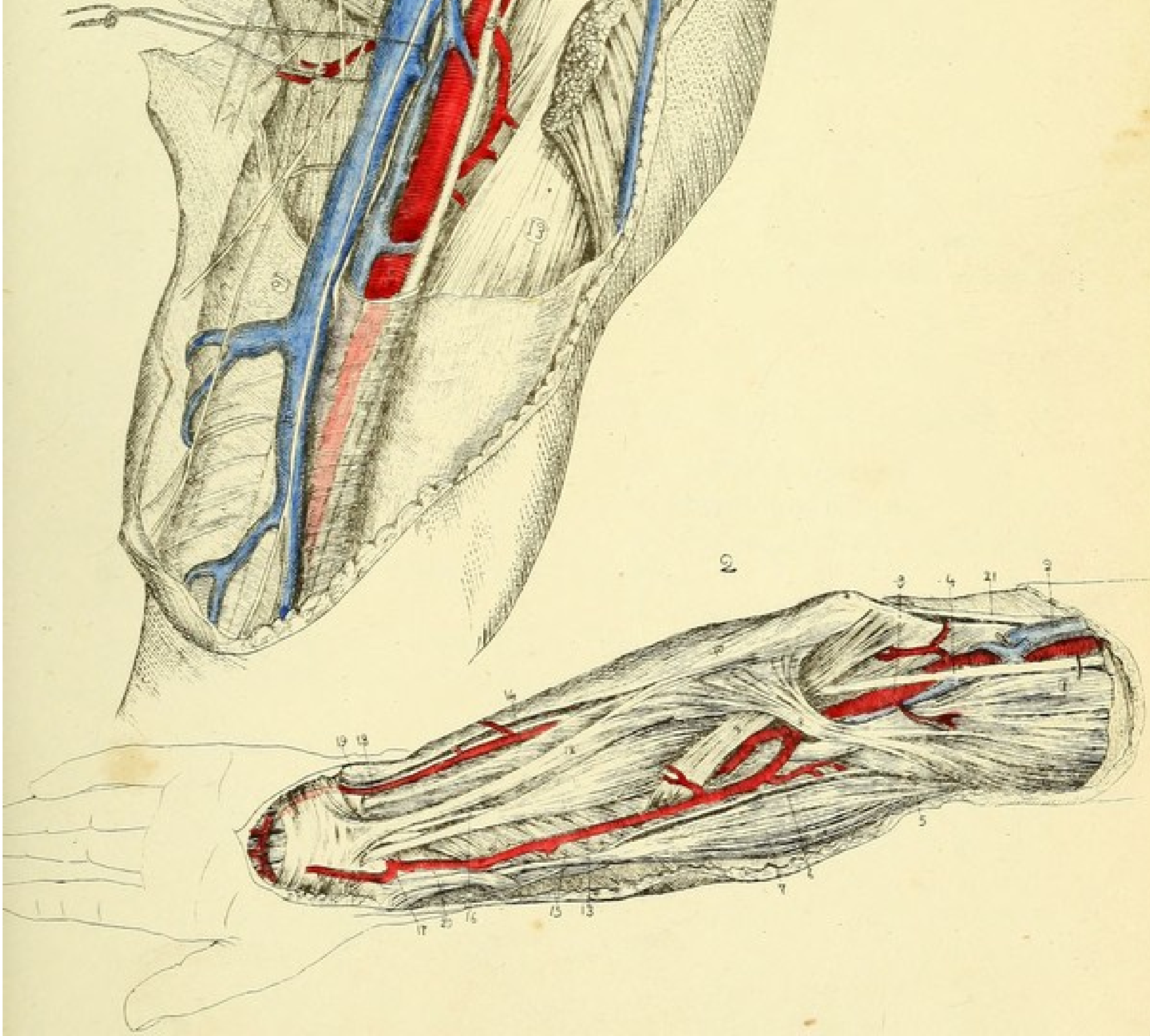

PLATE XXI.

Fig. 1. Ligaments of the Scapula.

1. Superior acromio-clavicular ligament.
2. Coraco-clavicular ligament.
3. Coraco-acromial ligament.
4. Transverse ligament.
5. Capsular ligament.
6. Coraco-humeral ligament.
7. Long tendon of the biceps.

Fig. 2. Ligaments of the Pelvis.

1. Anterior ligament of the vertebræ.
2. Lumbo-sacral ligament.
3. Lumbo-iliac ligament.
4. Anterior sacro-iliac ligament.
5. Obturator membrane.
6. Poupart's ligament.
7. Gimbernat's ligament.
8. Capsular ligament.
9. Ilio-femoral ligament.

Fig. 3. Ligaments of the Knee Joint.

1. Tendon of the quadriceps.
2. Patella.
3. Ligamentum patellæ.
4. Synovial membrane.
5. Internal lateral ligament.
6. External lateral ligament.
7. Antero-superior tibio-fibular ligament.

Fig. 4. Ligaments of the Pelvis and Hip Joint.

1. Oblique sacro-iliac ligament.
2. Posterior sacro-ischiatic ligament.
3. Anterior sacro-ischiatic ligament.
4. Great sacro-ischiatic foramen.
5. Lesser sacro-ischiatic foramen.
6. Cotyloid ligament.
7. Ligamentum teres.
8. Cut edge of the capsular ligament.
9. Part of the obturator membrane.

Fig. 5. Posterior View of the Ligaments of the Knee Joint.

1. Ligamentum posticum Winslowii.
2. Tendon of the semi-membranosus muscle.
3. Process of fascia.
4. Process which is sent inwards.
5. Posterior part of internal lateral ligament.
6. Long external ligament.
7. Short external lateral ligament.
8. Tendon of the popliteus muscle.
9. Postero-superior tibio-fibular ligament.

Fig. 6. Right Knee Joint laid open from the Front.

1. Lower extremity of the femur, with its two condyles.
2. Anterior crucial ligament.
3. Posterior crucial ligament.
4. Transverse ligament.
5. Ligamentum mucosum.
6. Semilunar cartilage.
7. External fibro-cartilage.
8. Ligamentum patellæ, turned down.
9. Bursa, laid open.
10. Antero-superior tibio-fibular ligament.
11. Interosseous membrane.

PLATE XXII.

Fig. 1. Amputation of the Finger at the Metacarpal Joint. From Liston. An incision is made on the radial or ulnar side of the joint, over the prominence of the knuckle, in a semilunar form, the convexity being forwards. The finger is next inclined to the opposite side, and the ligaments and tendon are divided by the point of the knife, and the head of the bone turned out; the knife is then placed behind it, and a similar flap formed on the opposite side.

Fig. 2. Amputation of the Fingers or Thumb at the last Joint. From Druitt. The phalanx being firmly held, and slightly bent, an incision is made in the direction of the upper dotted line, through the joint. The bistoury is then made to cut a flap from the palmar surface in the direction of the lower dotted line.

Fig. 3. Amputation between the Articulations. From Fergusson. The finger is transfixed, and a flap made on the palmar surface in the direction of the line on the figure; a lunated incision is next made, and the bone divided with the bone forceps, or with a saw, as seen in Fig. 4. The wound may be closed in all these cases by a stitch, or by adhesive strips, as seen in Fig. 7.

Fig. 4. Division of the second Phalanx with the Saw. The appearance of the stump after the operation is shown in this figure, on the third finger.

Fig. 5. Operation the same as in Fig. 2, the incision being commenced on the back of the finger. Upon the third finger, in this figure, is shown the manner of dressing the wound with an adhesive strip. In this figure is also seen the stump after the amputation of the thumb.

Fig. 6. Method of Mons. J. L. Petit. The index finger is the one on which the operation is here represented. The incision is commenced on the back of the hand, and carried round till it meets at the point where it was commenced; the ligaments are then divided as seen in the figure.

The other method represented in this figure is that of M. Lisfranc. The incision is commenced on the inside of the finger, the instrument is carried round the head of the bone, and the operation is finished as represented in the figure.

Fig. 7. Dressing of the thumb; operation shown finished in Fig. 5.

Figs. 8, 9. Method of M. Lisfranc. Palmar and dorsal flap operation.

Figs. 10, 11. Oval operation. Method of M. Scoutetten.

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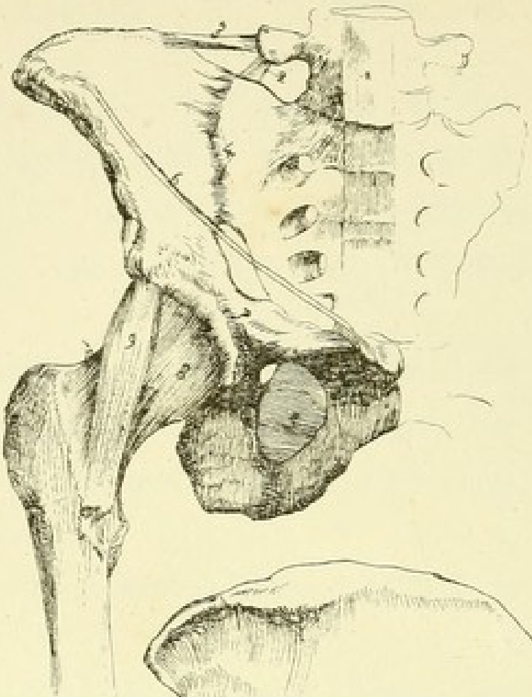

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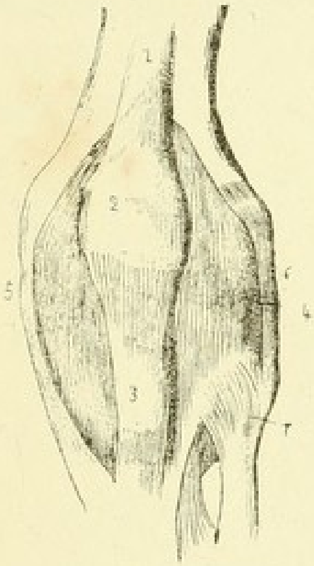

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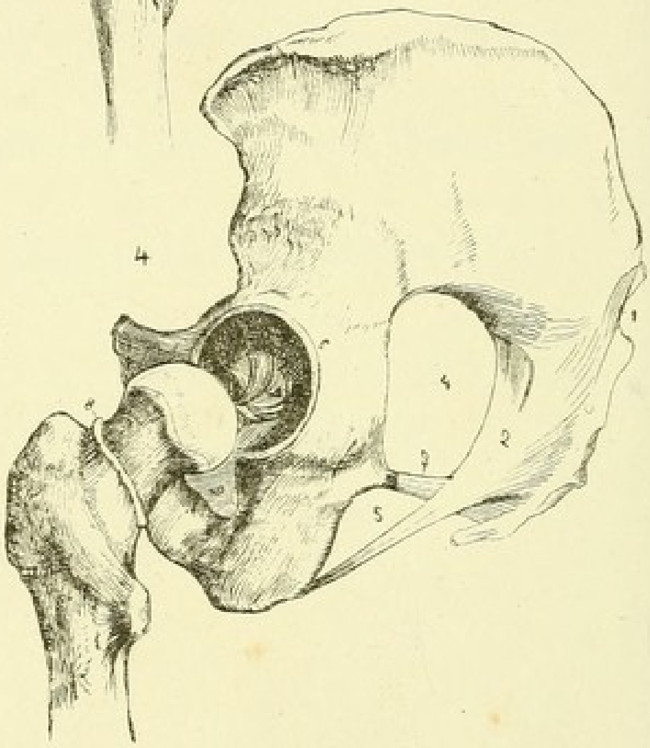

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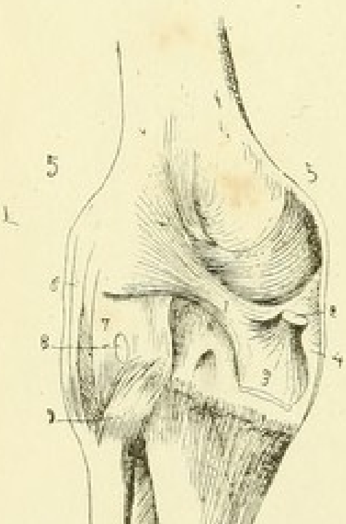

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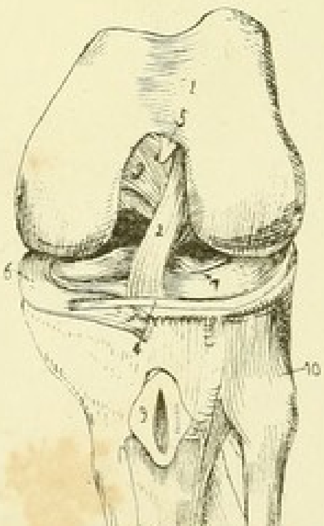

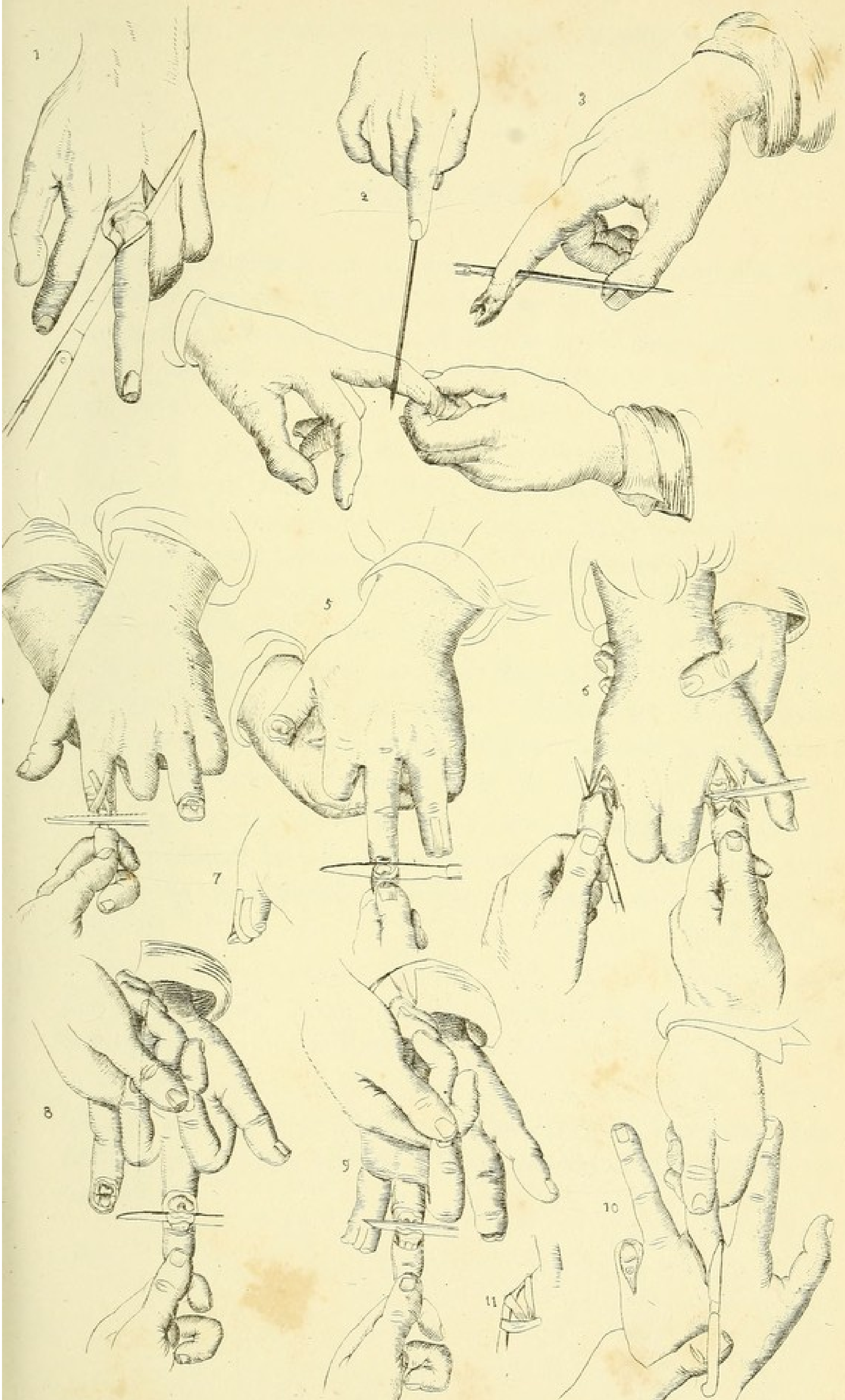
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PLATE XXIII.

Fig. 1. Amputation of the four Fingers at their Metacarpal Joints. The hand is held by an assistant. The operation is commenced on the back of the hand; the knife, having been carried through the articulations, is represented as cutting a flap on the palmar surface.

Fig. 2. Amputation in the Course of the Metacarpal Bone of the second Finger. The incision may be made commencing near the point where the bone is to be divided, carrying it downward and forward round the bone, terminating where it began. The operation may be finished as shown in the figure, or as shown in Plate XXIV. Fig. 1.

Fig. 3. Amputation of the Metacarpal Bone of the Thumb, by an outward Flap. The surgeon having passed the knife round the head of the bone, the operation is represented at the point where he is about to finish the flap.

Fig. 4. Amputation of the third Metacarpal Bone by two Incisions in the Form of a V. The bone having been isolated by the incisions, the knife is represented as opening the joint.

Fig. 5. Amputation of the Metacarpal Bone of the Little Finger. After the Method of M. Lisfranc. The instrument is represented as about to enter the joint.

Fig. 6. Amputation of the Metacarpal Bone of the Thumb by the Oval Method. The operation is represented as on the point of being finished by the separation of the ligaments on one side.

PLATE XXIV.

Figs. 1, 2. Amputation of the Middle Finger, with the Head of the Metacarpal Bone. From Liston. The line of the incision is seen in Fig. 2, and is the same as for amputation at the joint. The head of the bone is separated by the forceps. The palm of the hand is left entire by this method, while the hand is much less deformed, and the hemorrhage less, than in cases where the incision is carried deeper.

Fig. 3. Amputation of the Thumb. From Liston. Here the incision is commenced over the dorsum of the metacarpal bone, about three fourths of an inch above the articulation; it is carried along the line of the bone, inclining slightly to its radial aspect, down to the fold of integument between the thumb and forefinger; here the point of the bistoury is entered, and passing under the adductor muscle, is made to emerge through the incision where it commenced.

Fig. 4. Amputation of the first Joint of the Thumb, commencing on the Back. From Liston. The knife is pushed across the joint from point to heel, the integuments are divided, the joint opened by the point of the knife, and the instrument carried round the head of the bone, and made to cut its way out, forming a flap on the palmar aspect. This operation, and the one described in Plate XXII. Fig. 3, is applicable to all the fingers.

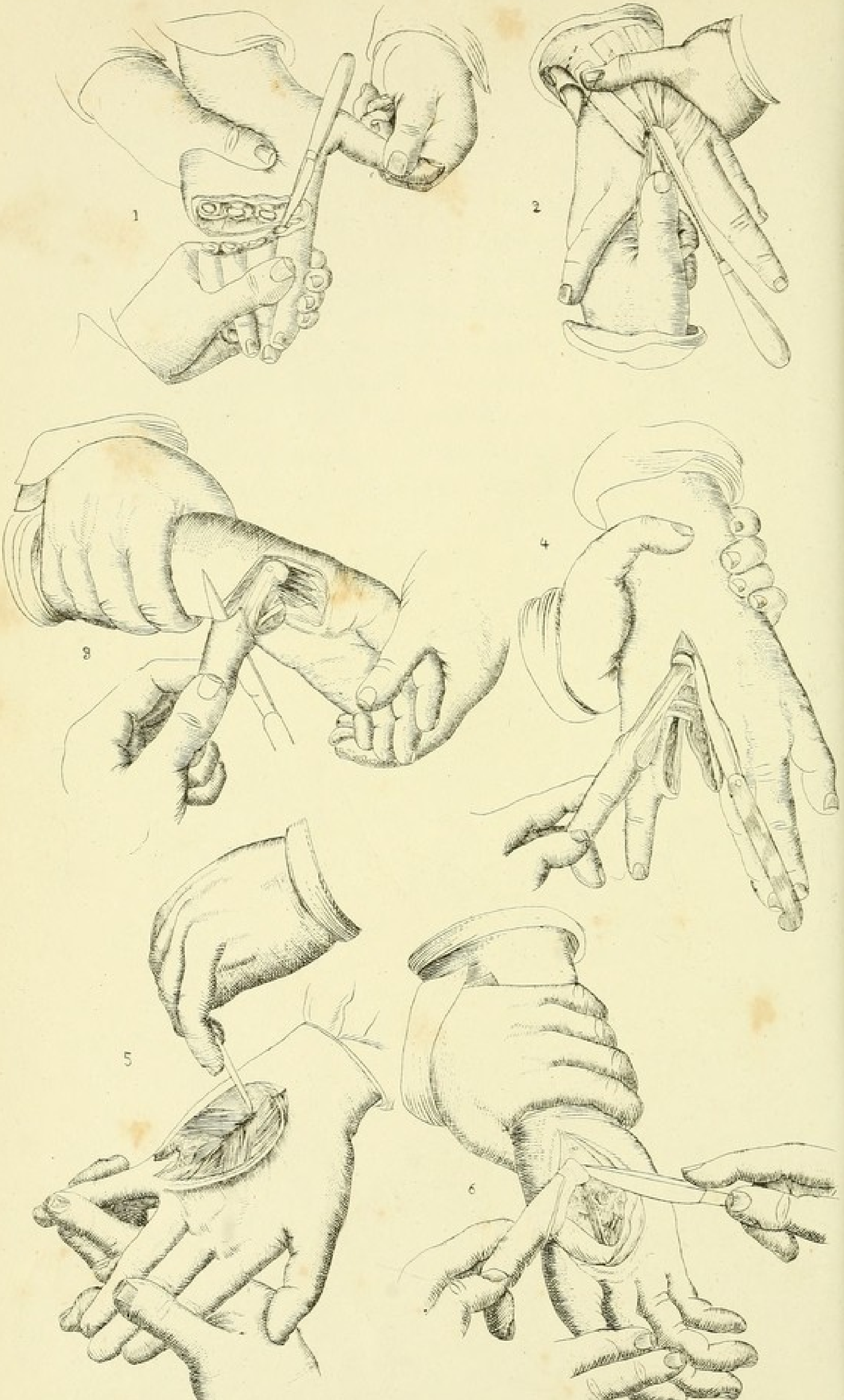
Fig. 5. Amputation of the Metacarpal Bone of the Thumb. From Fergusson. In this case, the knife is carried upward till arrested by the trapezium, then through the joint, then cutting downwards so as to form a flap from the ball of the thumb.

In cases of amputation of the metacarpal bones between the phalanges, the surgeon should take care so to place the remaining parts during the process of cure as to produce as little deformity as possible. Sometimes, from want of attention to this, the fingers have been allowed to cross each other, and thus the hand has been rendered almost or quite useless.

Fig. 8. From Fergusson. Showing deformity caused by too small a portion of the metacarpal bone being removed, and also from bad position of the fingers during the process of cure.

Fig. 7. From Fergusson. Showing the line of incision in amputation above the joint of the index finger. The bone should be cut obliquely, so that there shall be no angular projection next the skin.

Figs. 9, 10, contrast amputation at the joint and above it, the bone being cut obliquely.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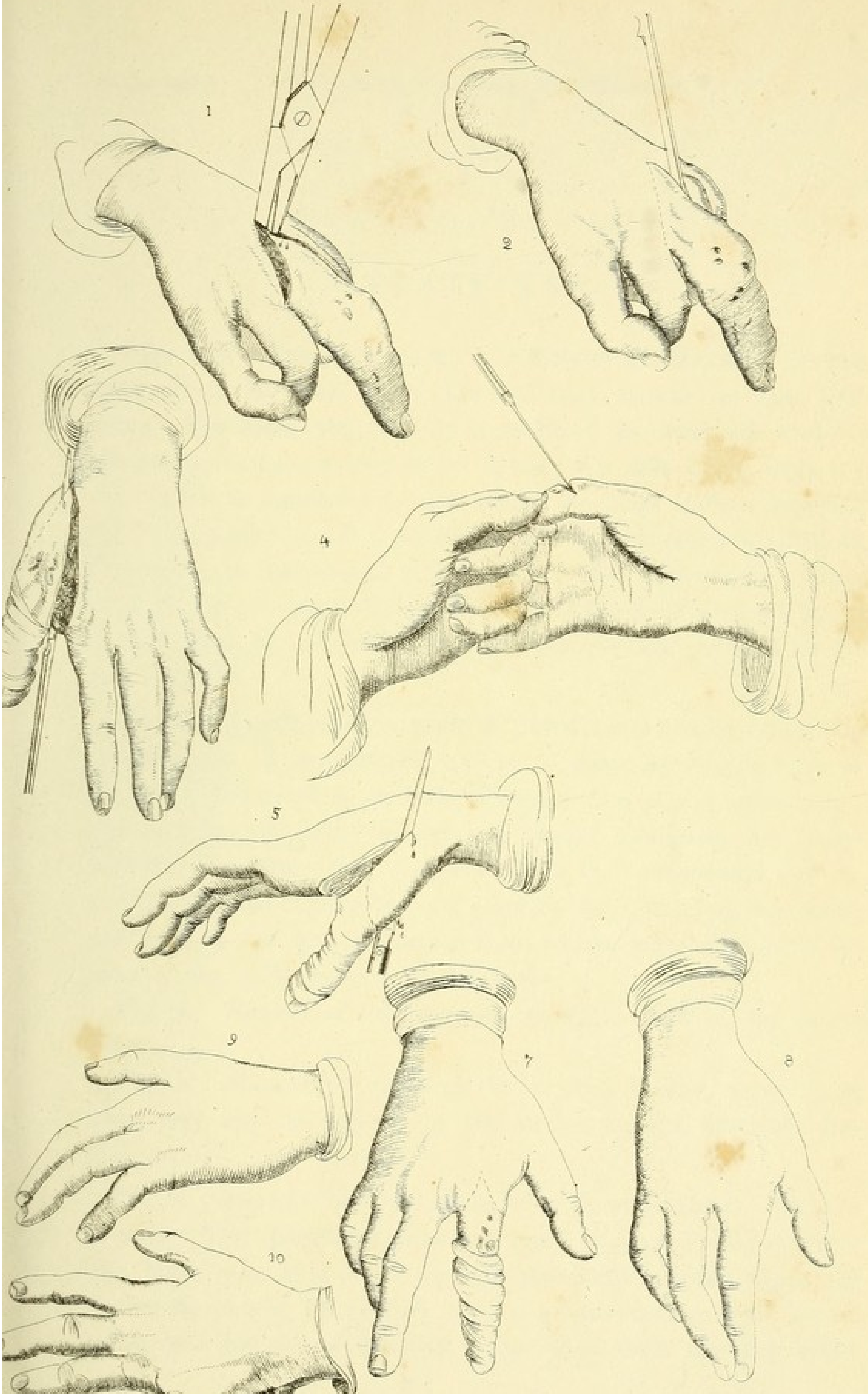
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PLATE XXV.

Figs. 1, 3. AMPUTATION BY THE CIRCULAR METHOD, IN THE CONTINUITY OF THE FOUR METACARPAL BONES OF THE FINGERS. The hand being held by an assistant, an incision is made on the palmar surface, as seen in the figure; the skin being retracted, the incision is completed to the bones; the hand is then reversed, the knife carried round upon the back, and the incision finished by separating the interosseous tissue with the point of the knife. Strips of cloth are next applied, as seen in Fig. 3, the flesh retracted by the assistant, and the operation finished with the saw, as seen in the same figure.

Fig. 2. AMPUTATION THROUGH THE CARPO-METACARPAL ARTICULATION. A semicircular incision is made across the back of the hand, two thirds of an inch below the line of the articulations, and carrying the knife through the tissues connecting the thumb with the index finger; an assistant draws the integuments upward, and the surgeon finishes the operation by disarticulating the bones, and forming the flap by cutting from within outward, towards the palm of the hand, as seen in the figure.

Fig. 4. Manner of dressing the stump in both of the above cases.

Fig. 5. Manner of securing the arteries in the above cases. They may also be secured by the torsion forceps, described farther on.

Fig. 6. AMPUTATION THROUGH THE RADIO-CARPAL ARTICULATION. The operation may be performed in the following manner: The hand being held in the position represented in the figure, the instrument should be carried in a semilunar course down to the bones, from one side of the wrist to the other, about one inch below

the articulation; the flap should then be dissected up, and the posterior part of the joint opened; the textures on each side of the wrist should next be cut through; and lastly, a flap in the direction of the dotted line should be preserved from the front.

PLATE XXVI.

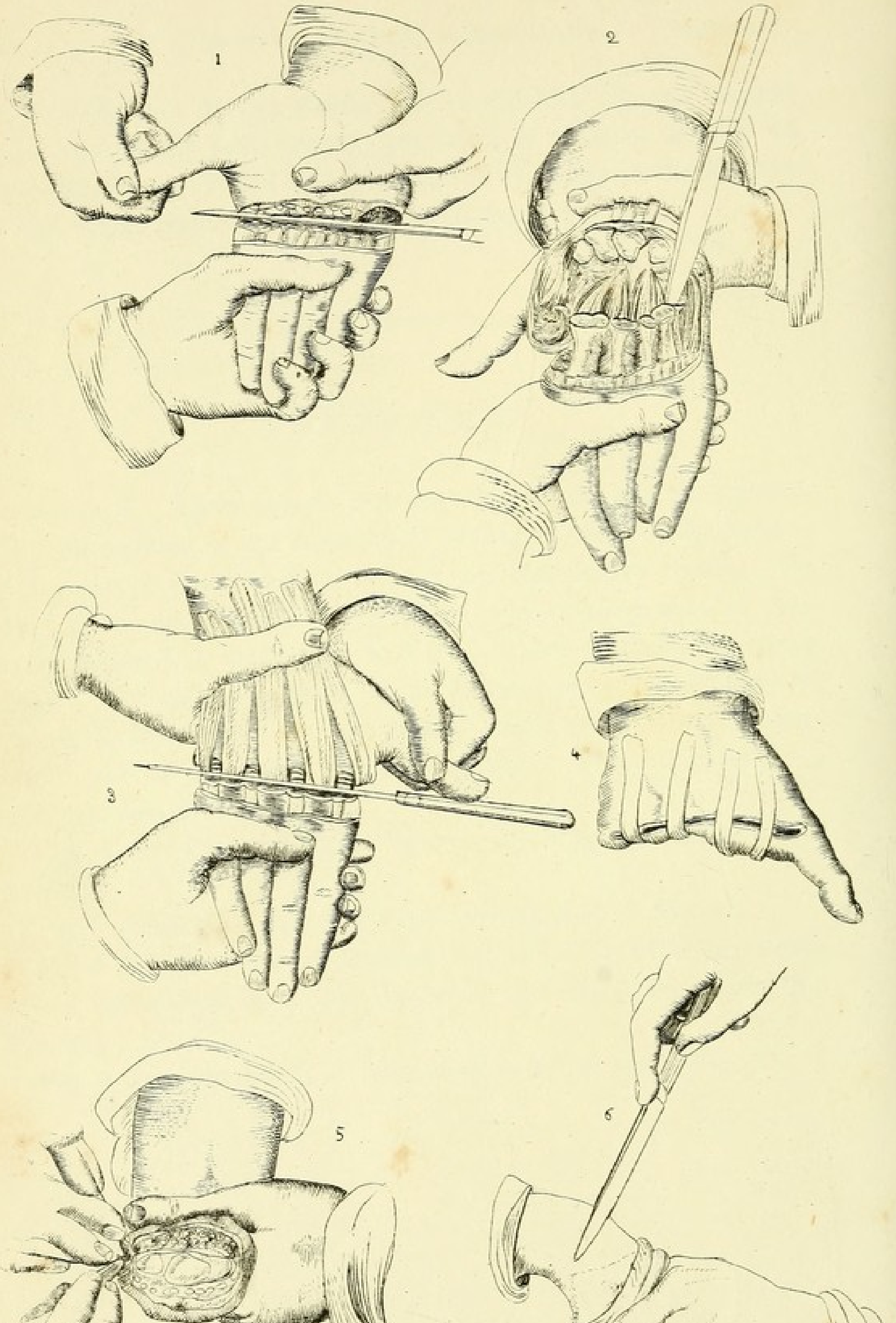
Figs. 1, 5. These figures are from Fergusson, and are given to show his opinion of the necessity of saving as much of the hand as is possible, or that promises to be in the least degree useful. "In proof of my anxiety," he says, "not to remove more than is positively required, I must refer to Fig. 5, which exhibits the stump which I was enabled to make in an instance of gun shot injury of the hand, where even the two fingers which were ultimately preserved were in an almost hopeless condition. Fig. 6 is given for a similar reason as those above.

Figs. 4, 8. Cases of fibrous tumors, involving the bones of the hand.

Fig. 7 shows the result of the operation in case of Fig. 8.

Fig. 3 shows a case of diseased ring finger, in which a portion of the metacarpal bone was removed; the dotted lines show the incisions.

Fig. 2 shows the result of the operation in this case, (Fig. 3.)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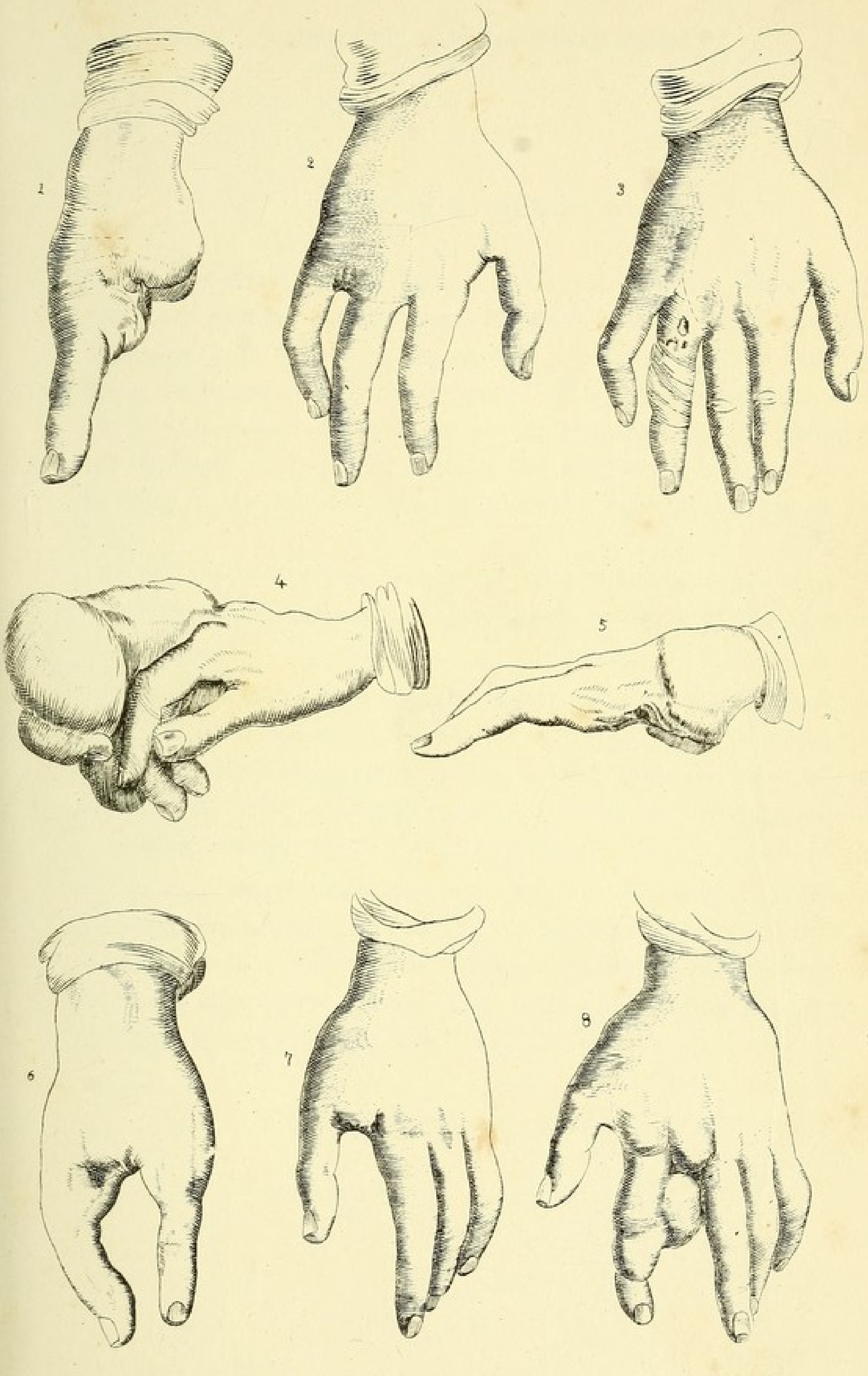
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PLATE XXVII.

Fig. 1. Amputation of the Wrist. From Druitt. A semilunar incision is made across the back of the wrist, its extremities being at the styloid processes, and its centre reaching down as far as the second row of carpal bones. The flap being dissected up, the joint is opened behind; the lateral ligaments are cut through, and the knife being placed between the carpus and the bones of the forearm, is made to cut out a flap from the anterior surface of the palm.

Fig. 2 shows the operation on the point of being completed.

Fig. 3 shows the manner of dressing the stump in all the cases on this page.

Fig. 4. Amputation of the Wrist. Circular Operation. The skin being drawn up by an assistant, an incision is made just below the line which separates the forearm from the palm of the hand. The external lateral ligament is then cut through, and the remaining attachments of the joint divided.

Fig. 5. Amputation of the Wrist. From M. Lisfranc. The first flap is made in front, and the bones separated; the hand is then placed in a state of demi-pronation, and the operation finished, as represented in the figure. The method of securing the arteries in these cases is shown in Plate XXXII. Fig. 5.

PLATE XXVIII.

Fig. 2. Amputation of the Forearm. This operation should always be performed as near the wrist as possible.

Flap Operation. The limb being placed in a state of pronation, the flap should be made from the extensor side; next, another flap is made from the opposite side; care should be taken not to pass the knife between the bones in making either transfixion. The interosseous tissues should next be divided, the flesh retracted, and the bones sawed through. The arteries should next be secured, and the stump dressed, as seen in Fig. 3.

Fig. 4. Appearance of the stump after amputation.

Fig. 1. Appearance of the stump after the wound has healed.

Circular Operation. The limb should be held in a position with the thumb uppermost; the skin being drawn up by an assistant, a circular incision is made through it down to the fascia. The skin should again be retracted, and the incision carried to the bone; the interosseous parts are next to be divided; the flesh is to be drawn up with a three-tailed retractor, and the bones are then to be sawed through together, the saw being worked perpendicularly. The radial, ulnar, and two interosseous arteries require ligatures.

Figs. 5, 6. Circular Amputation at the Elbow Joint. A circular incision is made through the skin; the instrument being held as represented in Plate XXIX. Fig. 2; the skin is then dissected up, as in Fig. 5, the flesh retracted, and the operation finished, as in Fig. 6.

Fig. 7 shows the stump after amputation, three arteries being tied.

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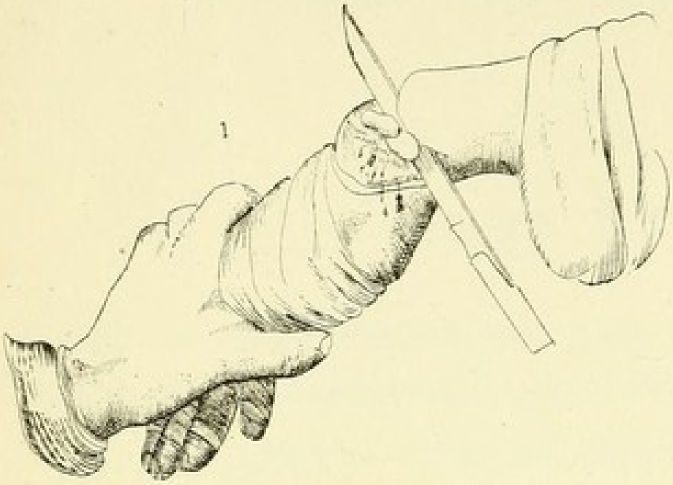

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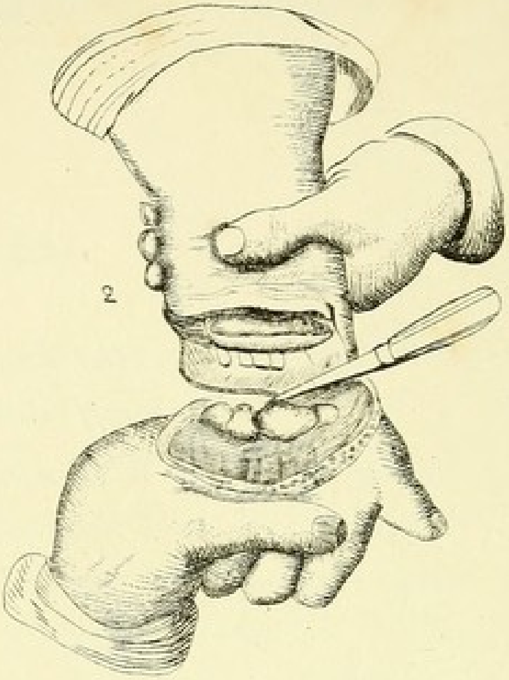

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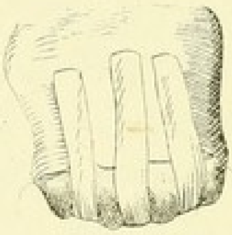

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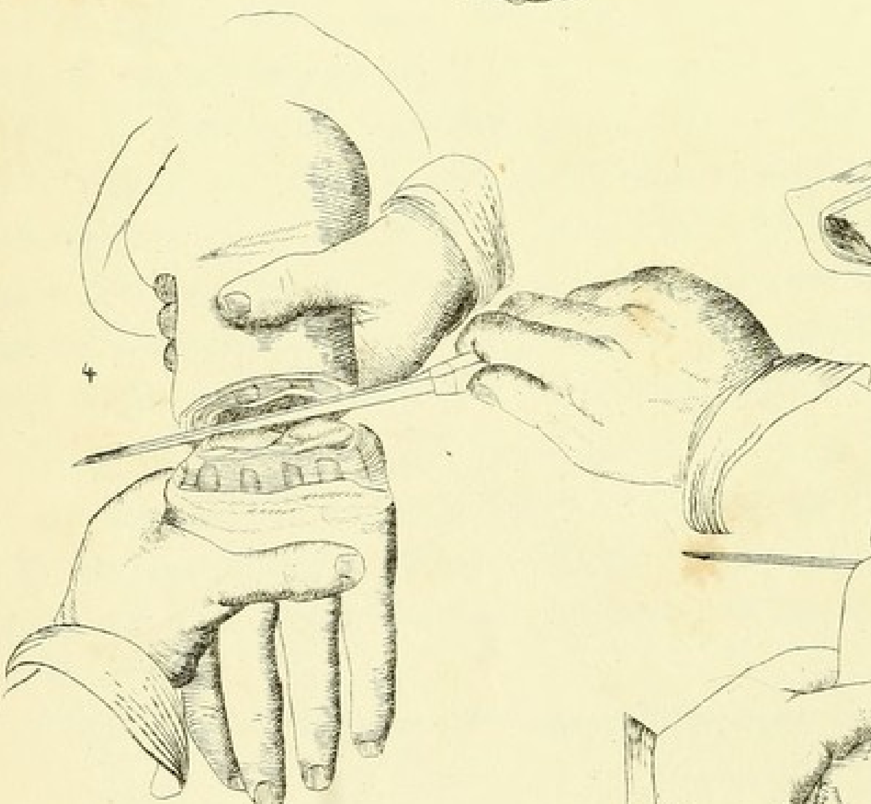

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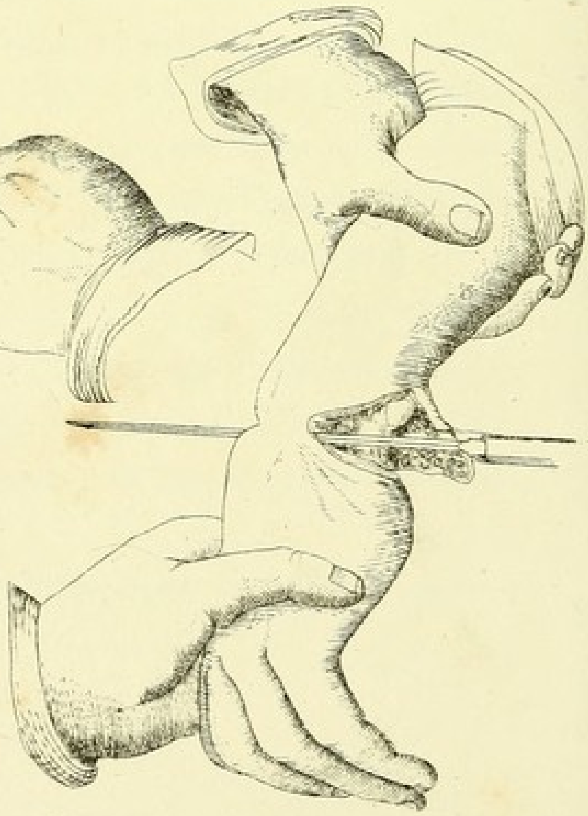

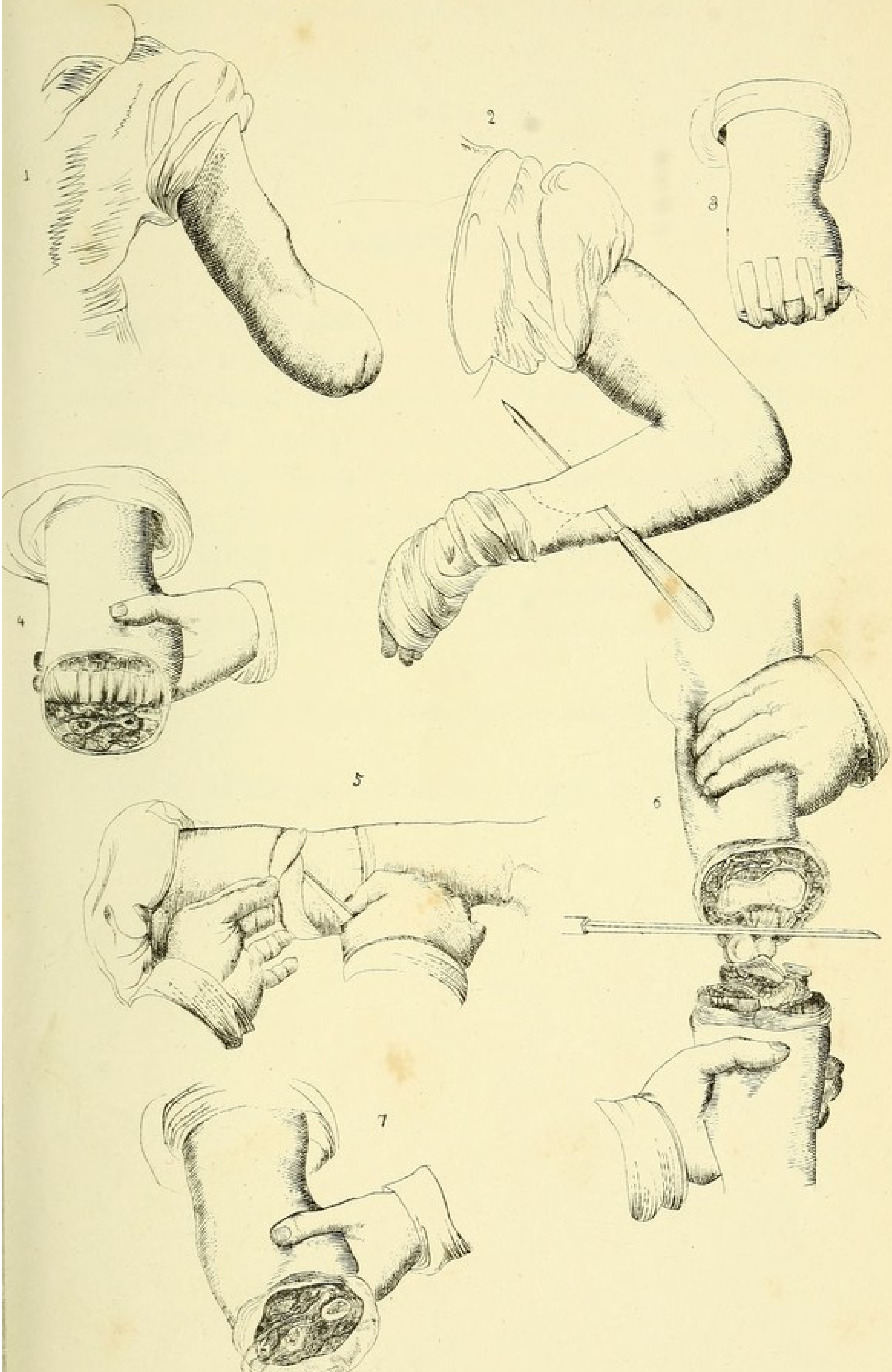
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PLATE XXIX.

Fig. 1. Amputation at the Elbow Joint. After Dupuytren. In this case a single flap is made, and the operation finished by dividing the olecranon with a saw, as seen in the figure.

Figs. 2, 4. Amputation of the Arm by the Circular Method. The manner of holding the instrument at the commencement of the operation is shown in both figures. An incision should be made through the skin, which being forcibly retracted, another is made to the bone, (Fig. 3.) These incisions should be so made as to cut the skin and muscles rather longer in front and behind than at the sides.

Fig. 5. The stump after circular amputation, with the arteries secured.

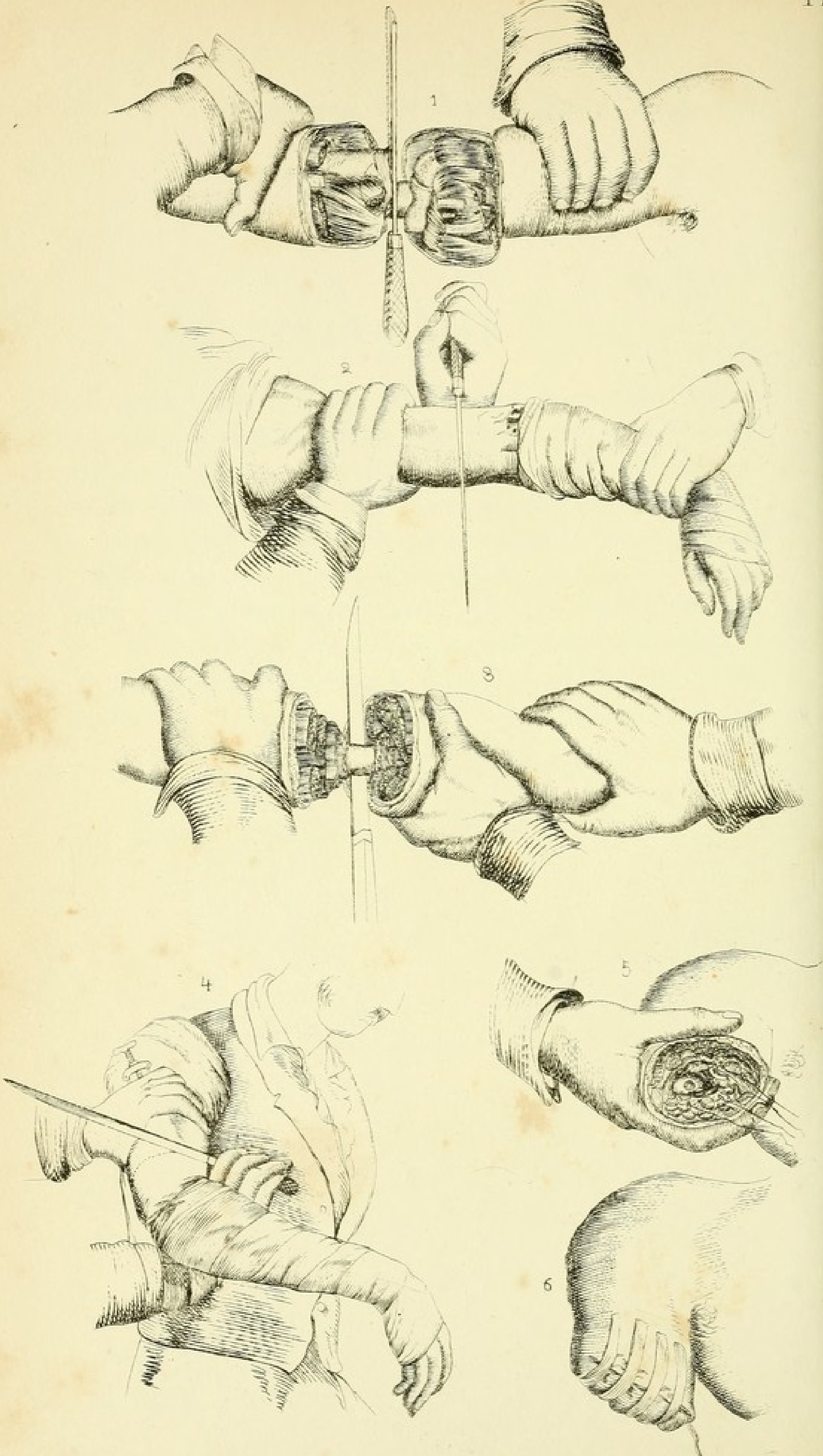
Fig. 6. Manner of dressing the stump in the above operation.

PLATE XXX.

Amputation of the Arm. Flap Operation. The knife is entered at one side, carried to the bone, turned over it, and brought out at a point opposite. The vessels should be left for the anterior flap, which should be formed in a manner similar to the other.

The various positions in which the arm may be held, and consequent different methods of transfixion, are seen in Figs. 1, 3, 5; the formation of the second flap is shown in Fig. 8; the separation of the bone by the saw, in Fig. 9; the appearance of the stump, in Fig. 7; the manner of dressing, in Figs. 2, 4, and the appearance of the arm after the healing of the wound, in Fig. 6.

Pl. 2



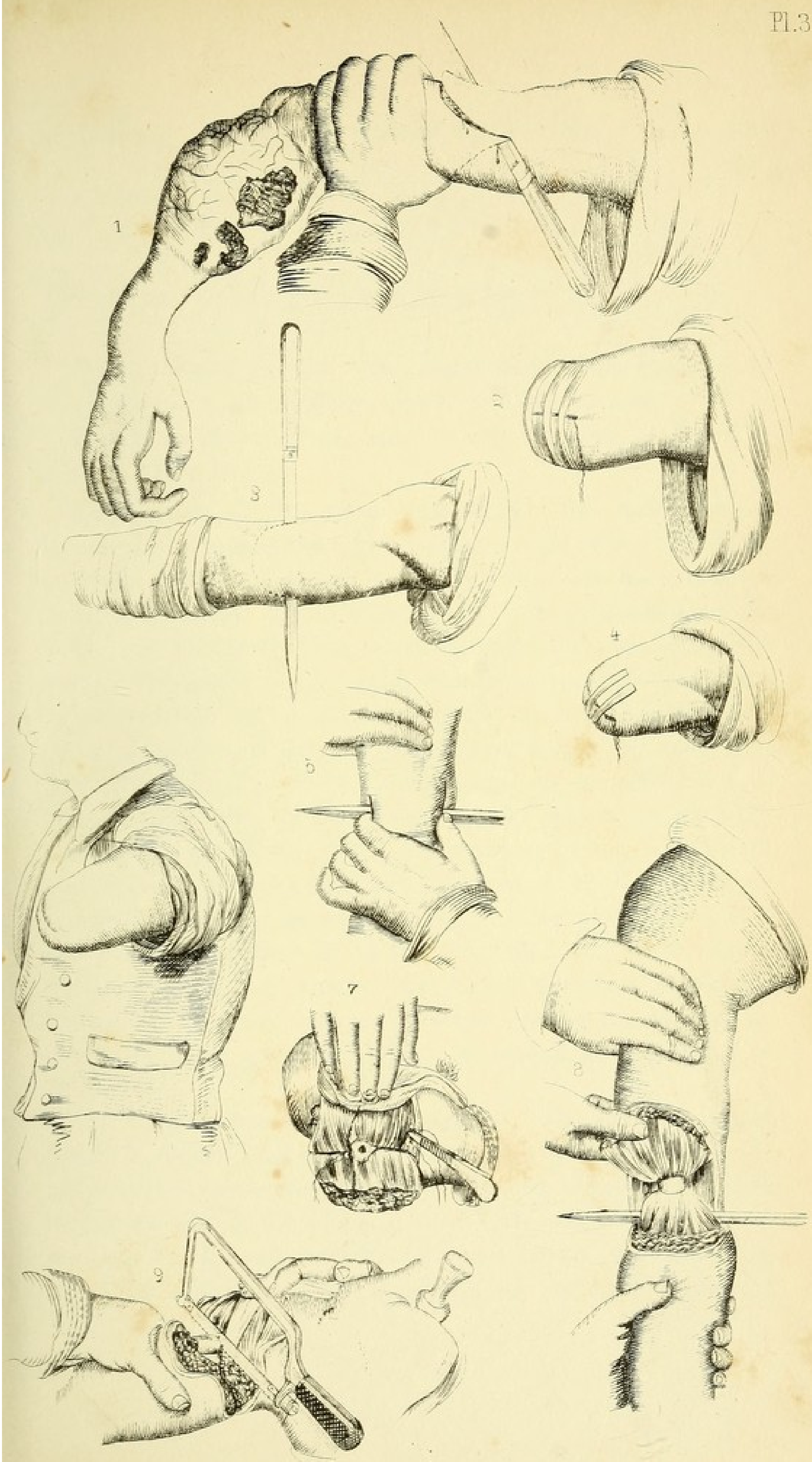

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PLATE XXXI.

Fig. 1. From Liston. The dotted line in this figure shows the incision in a case of fibrous tumor, involving the bone.

The tumor dissected out, together with the bone, is shown in Plate XXXII. Fig. 1.

Amputation at the Shoulder Joint. The patient should be seated in a chair, (Fig. 5,) or be placed on a table, (Figs. 3, 4,) with the shoulder projecting beyond its edge, and the subclavian artery compressed. If the right arm is to be operated upon, the knife must be entered (Fig. 4) at the anterior margin of the deltoid, an inch below the acromion, and thrust through the muscle, across the outside of the joint, and brought out at the posterior margin of the axilla. If the left side is operated upon, the knife must be entered (Fig. 3) at the posterior margin of the axilla, and be brought out at the anterior margin of the deltoid muscle. The external flap is made by cutting downward and outward. The origins of the biceps and triceps, and insertions of the infra and supra spinatus, are next cut through, and the joint laid open. The inner flap is made by placing the knife as in Fig. 5, and cutting downward and inward. An assistant should grasp the flap which contains the axillary artery, as soon as it is formed, as the pressure on the subclavian is not generally sufficient to control the circulation in the arm.

Fig. 2. This figure is from Fergusson. The operation is performed in the following manner: The patient being laid on a table, the surgeon stands in front of him; the incision is made from a little behind the root of the acromion toward the coracoid process, and thus the flap is made from the skin and deltoid; this flap being raised, the joint is opened from above, and the other flap formed

from the remaining parts below the bone. In this case, before dividing the axillary artery, an assistant is directed to seize the vessel above the point of division.

Fig 6. Appearance of the stump after amputation at the shoulder joint.

PLATE XXXII.

Fig. 1. Case of fibrous tumor, referred to in the description of Plate XXXI. Fig. 1.

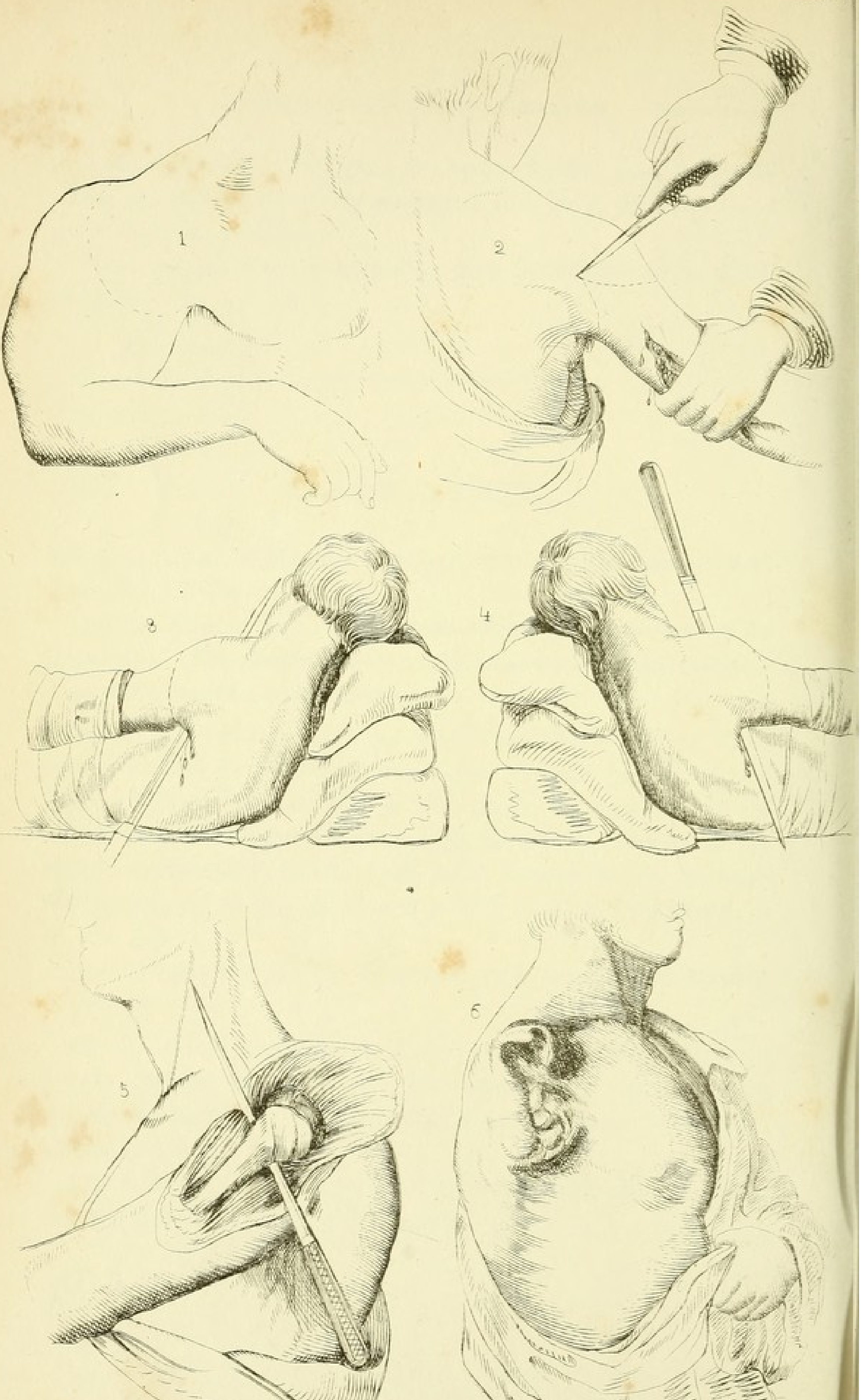
Fig. 2. Case of a lad of fourteen, whose arm was torn off by machinery. The preparation is in the museum of King's College. This patient made a good recovery.

Fig. 4. Amputation at the Shoulder Joint. From Larrey. A vertical incision is first made over the joint; an oval incision, commencing at this, is next made on each side of the joint; the hand of an assistant secures the artery; the head of the bone is disarticulated, and the knife thrust through behind the bone, and made to cut its way downward, so as to form an oval wound, as seen in Fig. 5.

Fig. 6 shows the manner of securing the arteries, and dressing the wound.

Fig. 3. Oval Method of Amputation at the Shoulder Joint. After M. Guthrie. The first steps of this operation are seen in the figure; the succeeding ones are similar to those described in Fig 4.

Fig. 5 shows the appearance of the wound after the operation, and the manner of securing the vessels.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Pl. 32.

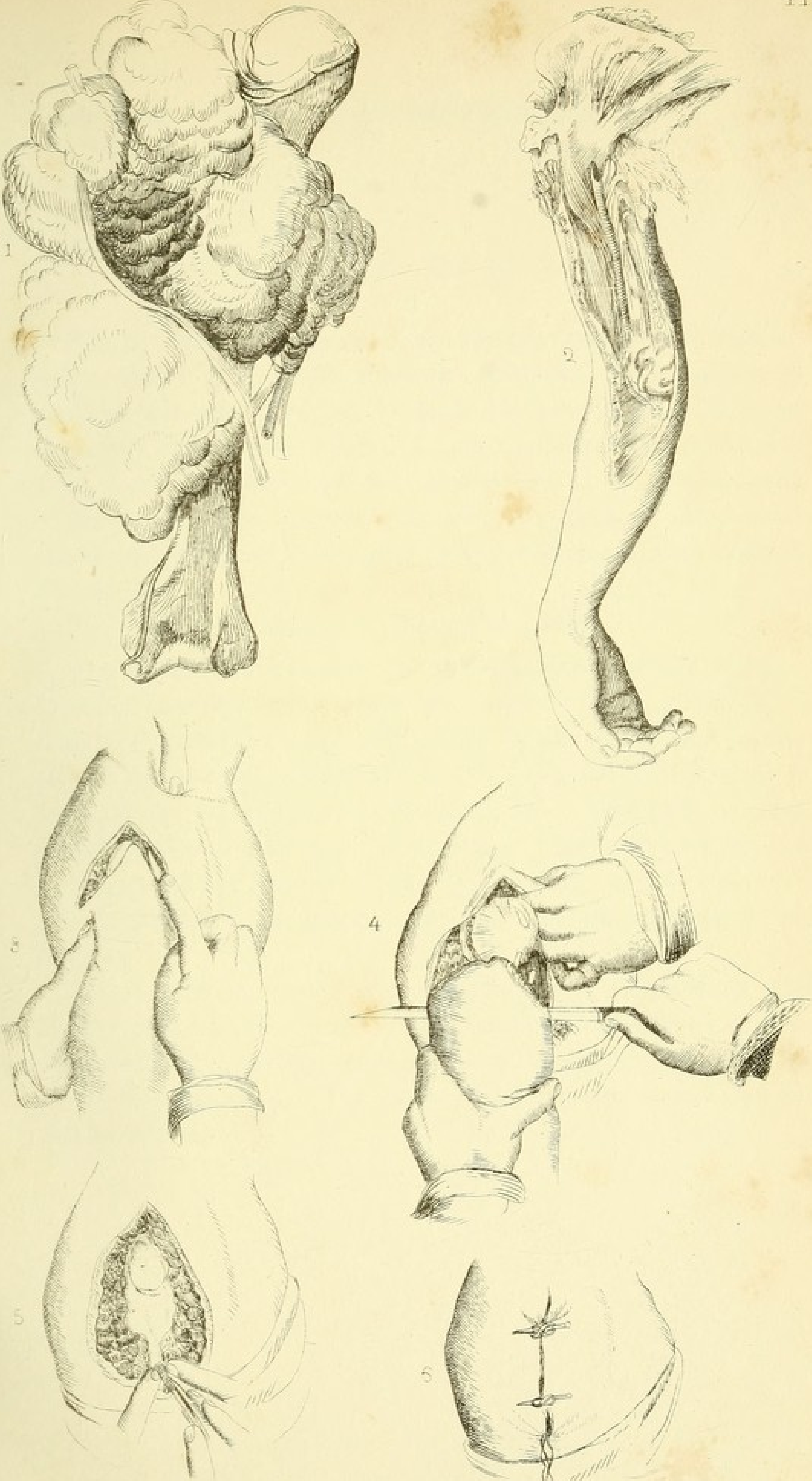


PLATE XXXIII.

Fig. 1. Circular Method of Amputation at the Shoulder Joint. Alanson's Method modified. The incision is made by a circular sweep of the knife through the skin, while an assistant compresses the artery. Another assistant retracts the skin after the first incision, and the surgeon cuts to the joint, as seen in the figure. The assistant now grasps the flesh, so as to control the hemorrhage, and the surgeon finishes the operation, as seen in Fig. 2.

Fig. 6 shows the manner of dressing the wound.

Figs. 3, 4. Amputation at the Shoulder Joint with a Double-edged Knife. From Bourgery. The knife is thrust through the arm, as shown in Fig. 3; as it passes over the joint, the point is depressed, and made to enter and open the joint; it is then made to cut its way out, and form a flap. The knife is next placed in the opening made in the joint by the first incision, and carried round the head of the bone, and made to form the anterior flap, while an assistant grasps the flesh and compresses the arteries.

Fig. 5 shows the wound after the operation. The arteries that are tied are, first, the upper one, the posterior circumflex; second, the middle, the inferior scapular; third, the lower, the brachial at its commencement. The brachial vein is also represented as tied in this figure.

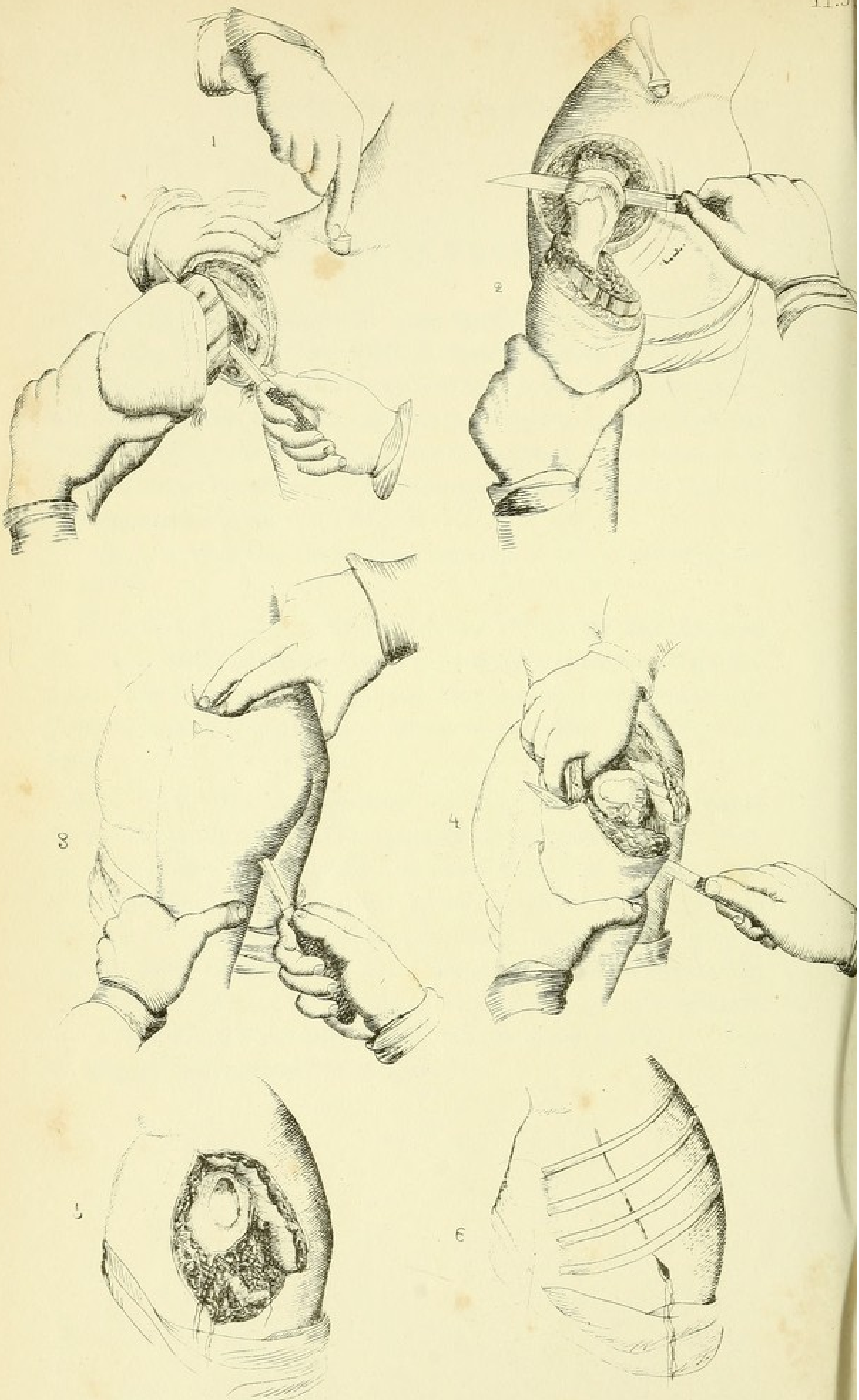
PLATE XXXIV.

Figs. 1, 2. Amputation at the Shoulder Joint. Method of M. Dupuytren. The knife is thrust through the arm, and made to cut its way downward and outward, so as to form the posterior flap; this flap is turned up and held by an assistant, and the joint pierced by the knife, when the other hand of the assistant is made to secure the arteries. The operation is then finished by cutting downward, as shown in Fig. 2.

Figs. 3, 4, show the closure and dressing of the wound after the operation.

Figs. 5, 6, 7. Amputation of the Toes at any of the Joints, is performed in the same manner as amputation of the fingers. The head of the metatarsal bone should not be removed in these cases, as it is important to preserve the whole breadth of the foot.

Figs. 8, 9. 10. Amputation of all the Toes at their Metatarsal Joints. This operation is performed by first making a transverse incision along the dorsal aspect of the metatarsal bones, dividing the tendons and lateral ligaments of each joint in succession; and then the phalanges should be dislocated upward, and the knife carried round their heads, and made to form a flap on the plantar surface. The various steps of the operation are seen in the figures; the dressing of the stump is shown in Fig. 9. The arteries, of course, should be secured.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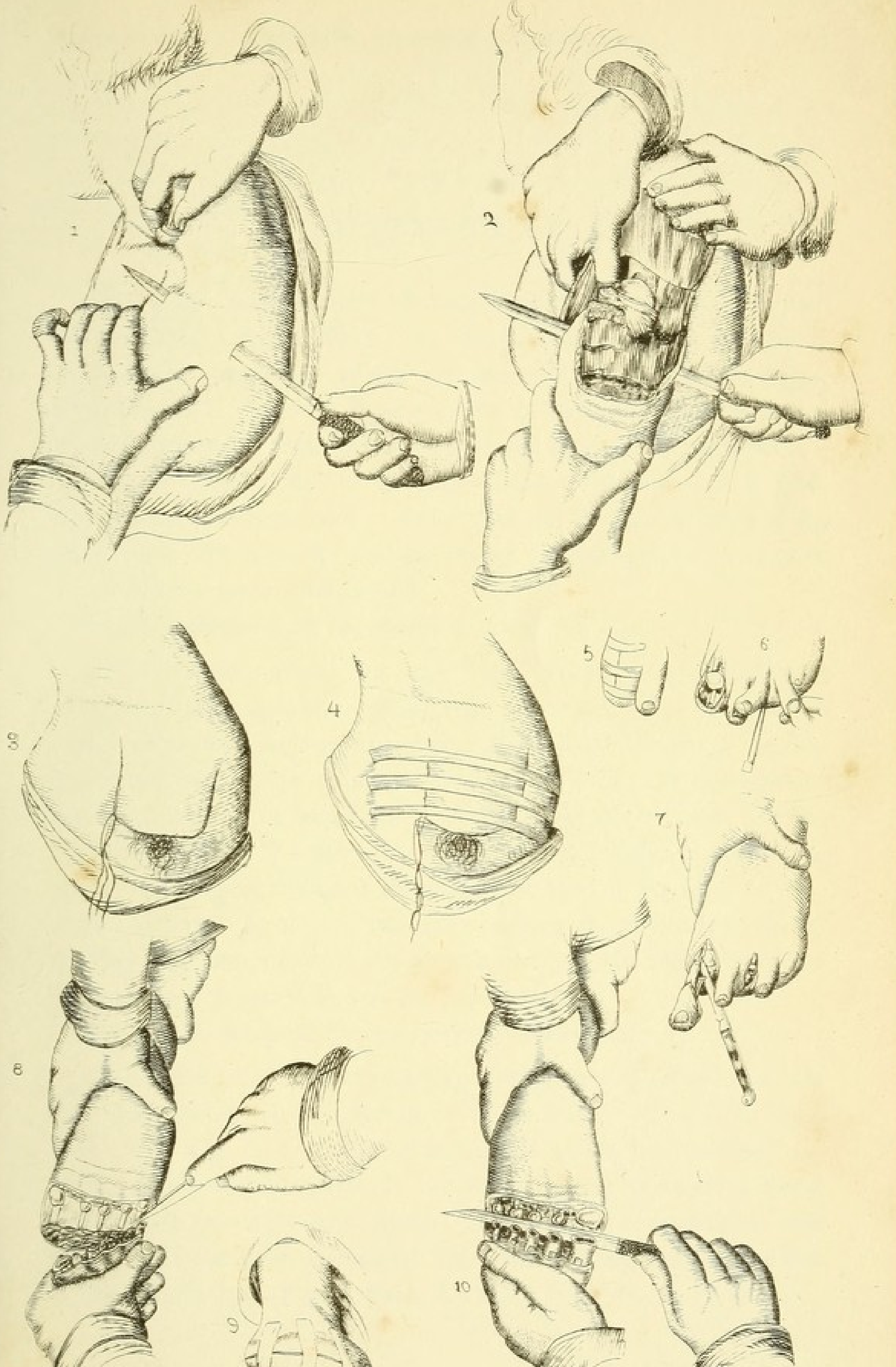
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PLATE XXXV.

Figs. 1, 2. Amputation of the Metatarsal Bones of the Great and Little Toes. In these cases, an oval incision is made, as in amputation of the metacarpal bone of the little finger, (Plate XXIII. Fig. 5.) In amputation of the great toe, it is better, if circumstances permit, to cut through the bone, as in the figure, — or, what is better, with the forceps, — than to disarticulate it from the internal cuneiform bone. In dividing the metatarsal bones of the great and little toes, the forceps should be held obliquely, so as to avoid leaving prominent angles.

Fig. 3. Dressing of the stump in the above cases.

Fig. 4. Amputation of all the Toes. 1st. Lisfranc's Method. The operator, holding the toes as in Fig. 4, makes a semicircular incision, extending from the internal border of the first metatarsal bone to the external border of the fifth ; the articulations are next opened in succession with the point of the knife, and the operation finished by carrying the knife behind the heads of the bones, and forming a flap on the plantar surface of the foot.

2d. As in the figure : a semilunar incision is made on the top of the foot, and afterwards on the plantar surface ; the integuments are drawn up by an assistant, and the joints opened.

Fig. 5. Dressing of the stump in this operation.

Figs. 6, 7, 8, 10. Amputation through the Tarso-metatarsal Articulation. Lisfranc's Operation. The foot being held as in Fig. 6, a semilunar incision is made from without, inwards, across the foot, with its convexity looking downward, about half an inch below the articulation. The surgeon next divides, with the point of the knife, the dorsal ligament, carrying it along the line of the articulation, (Fig. 2, Plate XVIII.)

The joint of the second metatarsal is next to be opened. This is done by introducing the point of the knife between the internal cuneiform and the head of the first metatarsal bone. The knife should make an angle of forty-five degrees with the axis of the foot; its edge should be turned upward. The knife is next carried to a right angle, its point dividing the whole of the interosseous ligament in its course; the external surface of the joint is next divided.

The foot is now bent towards its plantar aspect, and the remaining attachments divided, when the knife is carried round the heads of the bones, and the operation finished by forming a flap on the plantar surface, (Fig. 10.)

Hey's operation consists in sawing the ends of the bones, instead of disarticulation.

Mr. Liston strongly recommends the making of both flaps previous to disarticulation, as in Fig. 5.

PLATE XXXVI.

Figs. 1, 2, 3. Amputation through the Tarsus. Chopart's Method. In the first place, the articulation of the cuboid with the os calcis, and that of the naviculare with the astragalus, must be sought for, and a semilunar incision be made from one to the other. The internal and dorsal ligaments that connect the naviculare to the astragalus are to be divided with the point of the bistoury. The ligaments connecting the os calcis and cuboid are next to be divided, and the operation finished by forming a flap from the plantar surface of the foot.

The figures, together with Plate XXXV. Fig. 9, show the successive steps of the operation.

AMPUTATION AT THE ANKLE JOINT. SYME'S OPERATION. In this operation, the whole of the bones of the foot are taken away, and the articular surface of the tibia, with both malleoli, is cut off smoothly, but the skin of the heel is preserved as a cushion for the stump to rest upon. Mr. Syme makes one curved incision across the instep, from one malleolus to the other, and carries a second across the sole of the foot. The flaps are dissected from the subjacent parts; the astragalus and os calcis, with the rest of the foot, are removed, and the projections of the malleolar processes cut off with the forceps. If the ankle itself is diseased, a thin slice of the lower extremity of the tibia and fibula may be removed with a saw. A puncture is sometimes made through the integuments of the heel to let the discharge escape freely.

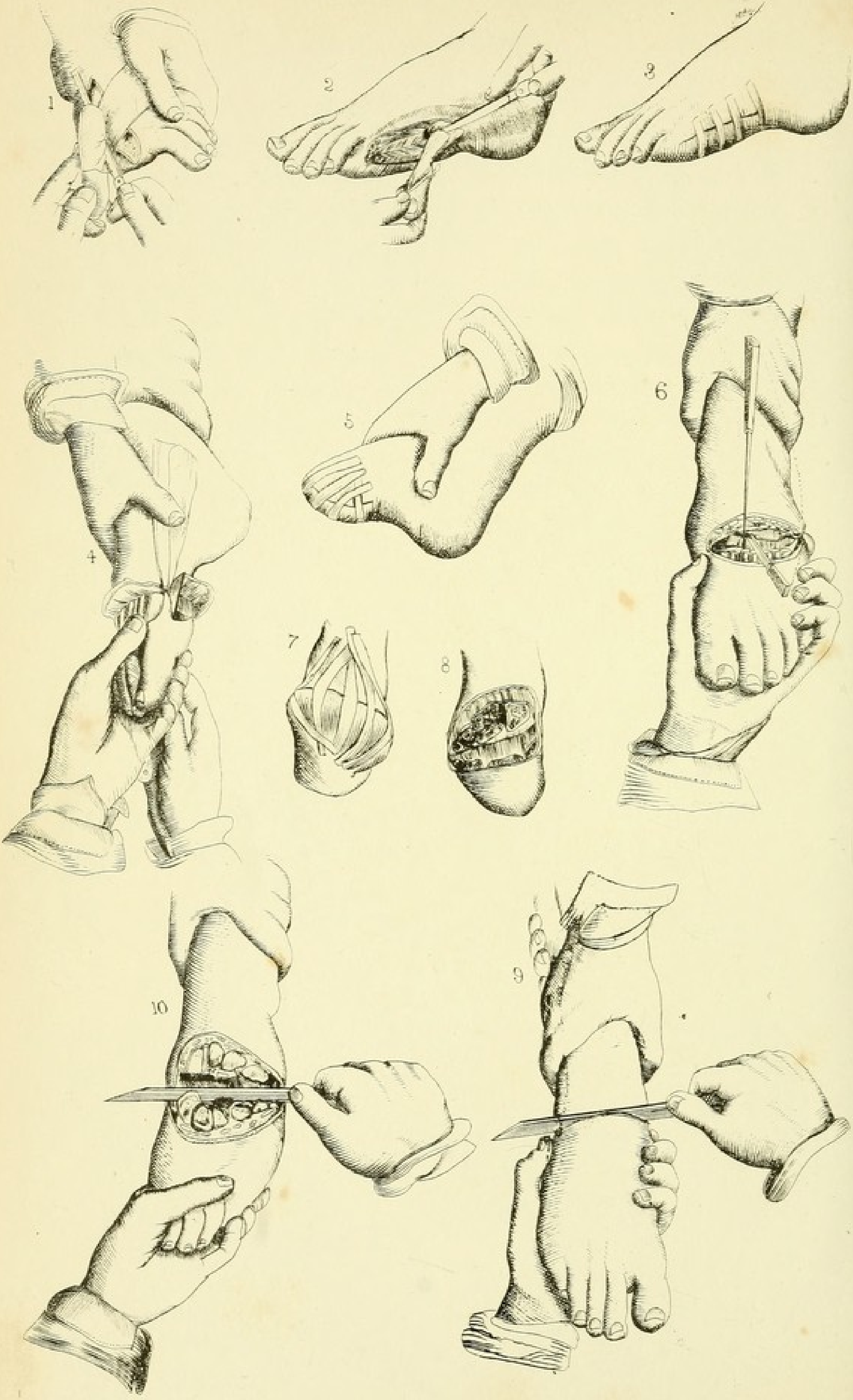
Figs. 4, 9, 8. AMPUTATION OF THE LEG BY TWO FLAPS. METHOD OF VERMALE MODIFIED. Operation on the left leg. The knife is first thrust through on the outside of the leg, and carried downward so as to form the outer flap. The point of the knife is then entered on the opposite side of the bone at a point corresponding with the lower end of the first flap, the skin is dissected up by carrying the knife upward along the bone; the knife is then plunged through, as seen in the figure, and the opposite flap formed; the flaps are then retracted, and the operation finished by sawing the bones.

The stump, with the position of the bones, is shown in Fig. 9; the dressing in Fig. 8.

Fig. 6. AMPUTATION OF THE LEG BY ONE FLAP. FROM BOURGERY. Operation on the right leg. The double-edged knife is thrust through the leg, back of the bones, and the flap formed by cutting downward and outward; the knife is then carried round the fore part of the leg, and the bone divided with the saw.

Fig. 5 shows the stump, after the operation.

Fig. 7, the dressing of the same.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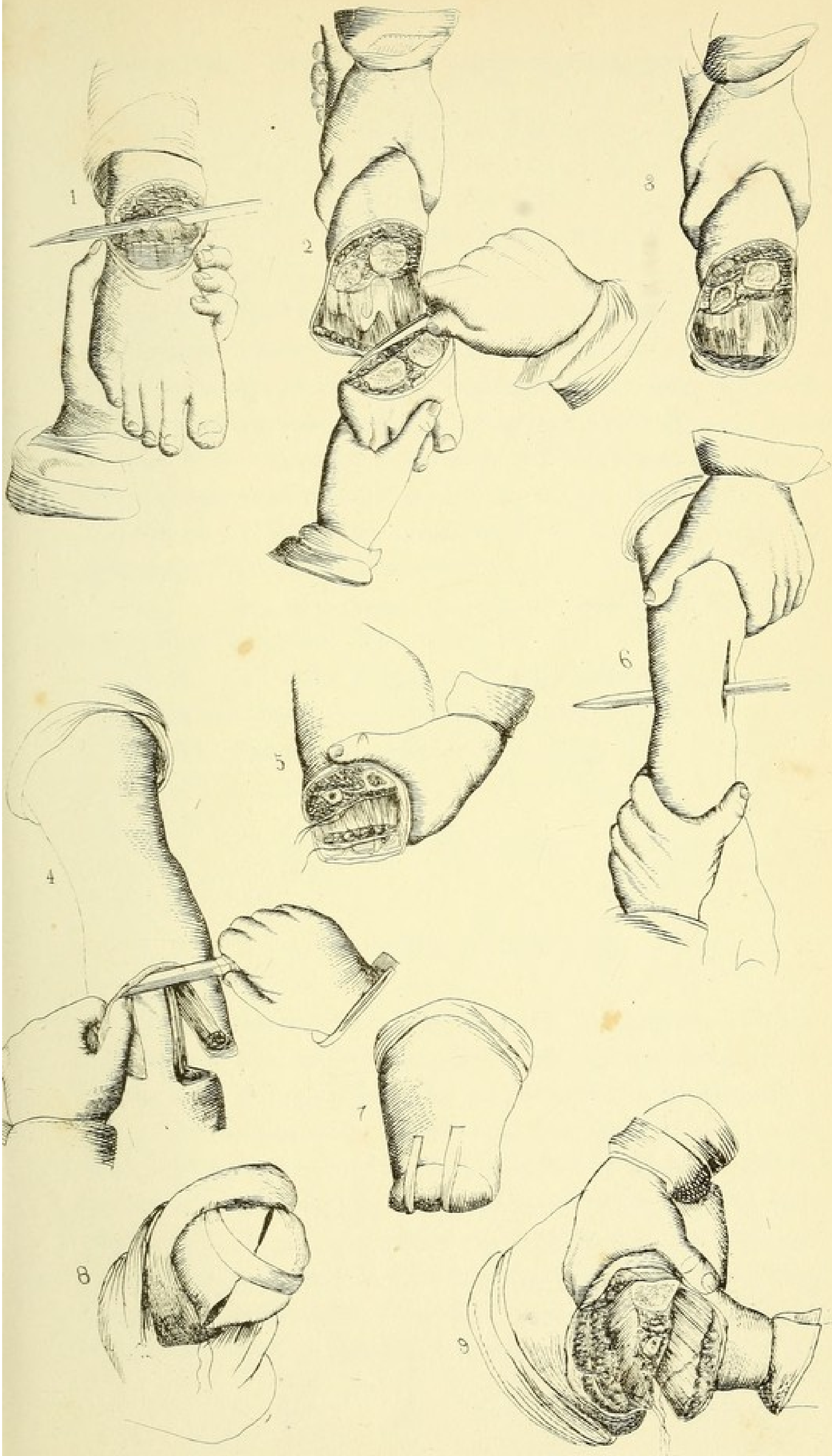
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PLATE XXXVII.

Fig. 1. Case from Mr. Fergusson, in which the metatarsal bone of the great toe, the internal cuneiform, a part of the middle cuneiform, and a part of the second metatarsal bones, were removed.

Fig. 2. Appearance of the stump two years after the operation.

Figs. 3, 4. Amputation through the foot, from Fergusson, with the appearance of the stump after the wound was healed.

Figs. 6, 5. Chopart's operation, from Fergusson, with the appearance of the stump after the cure.

Fig. 7. Line of incision, in case of removal of the metatarsal bone of the great toe; from Fergusson.

Fig. 9. Case from Fergusson, in which the incisions in Syme's operation are represented by the dotted lines.

Fig. 8. Stump from one of Syme's cases.

PLATE XXXVIII.

Amputation of the Leg. After Fergusson. Where the surgeon has the choice of site, he should operate about the middle of the leg. The operation may be performed in the following manner: The patient being placed on a firm table, properly supported and held by assistants, the tourniquet being applied at the knee or groin, or the circulation being commanded by the fingers of an assistant, the surgeon transfixes the limb back of the bone with the amputating knife, and forms a flap three or four inches in length, in proportion to the bulk of the leg; next he should draw the knife across the front of the leg, forming a semilunar incision with the convexity downward; the flaps being drawn up, the knife should be carried between and round the bones, so as to separate the remaining integuments; the operation is finished by dividing the bones with the saw.

Figs. 1, 3. Operation which Mr. Fergusson recommends in preference to the preceding.

In this method, the heel of the knife is laid on the side of the leg opposite to that on which the surgeon stands; the blade should then be drawn across the limb in the direction of the dotted line, (Fig. 1,) until its point comes opposite the place of commencing the incision; without raising the instrument, the limb should be transfixed behind the bones, (Fig. 3,) and the operation finished as described above.

Fig. 4. Appearance of the stump after amputation of the leg.

Fig. 2. Artificial leg applied.

Fig. 5 shows the socket, and manner of securing the instrument.

Fig. 6 shows the appearance of the stump after the cure, in amputation by the above process.

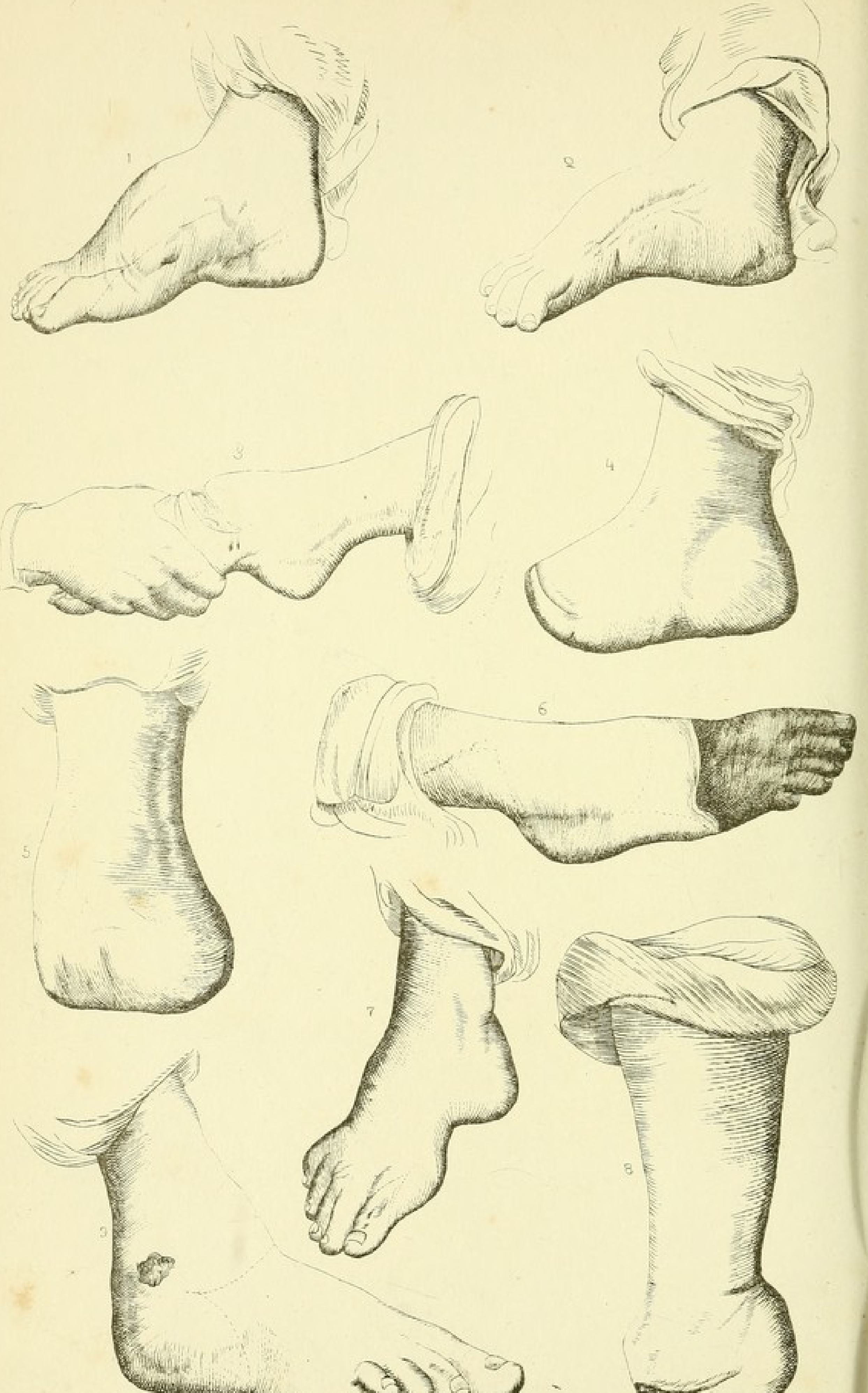
It may be as well, perhaps, to remark here, that, in amputations of the leg, both bones should be divided on a level. If the surgeon stand on the inside of the limb, it may be as well to divide the fibula first; if, on the contrary, he stand on the outside, it will be found more convenient to divide both bones at the same time.

Fig. 7. Amputation at the Knee above the Joint. (Amputation at the joint is shown on Plate XLI.) This operation may be performed in the following manner: The circulation being controlled as before described, the surgeon stands on either side of the leg he chooses; he then draws the blade of the knife across the joint, from one condyle to the other, in a lunated course, on a level with the middle of the patella, and divides the tissues to the bone; the flap should then be retracted, and the quadriceps extensor divided above the patella; the point of the knife should then be entered at one end of the wound, and pushed behind the femur, as in the drawing, and a flap formed in the direction of the dotted line, about six or eight inches long, in proportion to the thickness of the limb; this

flap should be slightly retracted, when the knife should be carried round the bones a little above the condyles, and the operation finished by dividing the bone with the saw.

Fig. 8. Dressing of the Stump. The arteries are tied, and the flap usually secured by stitches and adhesive strips.

Fig. 9 shows a stump which was made after the manner described above.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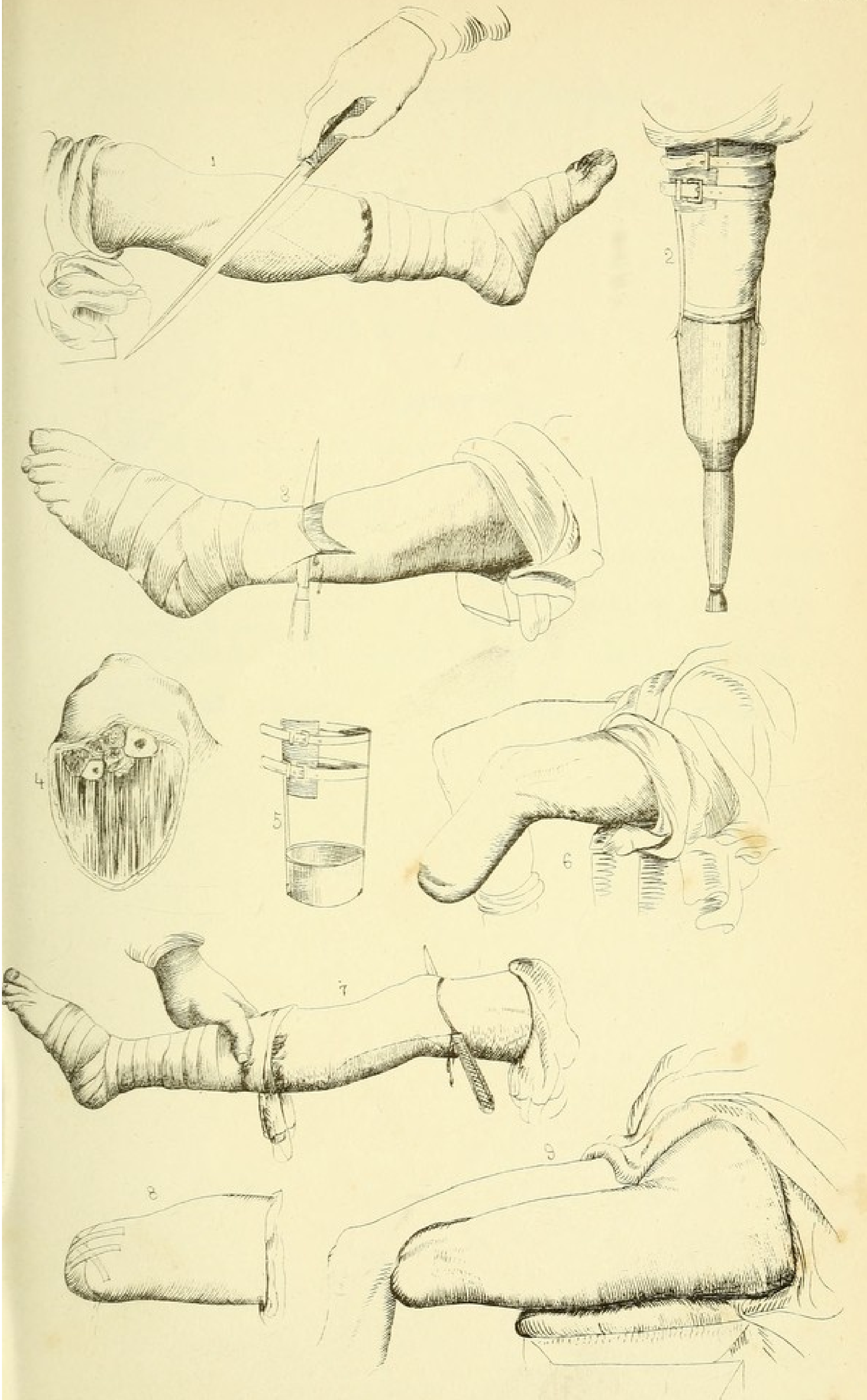
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PLATE XXXIX.

INSTRUMENTS.

Fig. 1. Amputating knife, for circular operations. From Liston.

Fig. 2. Large amputating saw.

Figs. 3, 4. Aneurism needles.

Fig. 5. Small amputating saw.

Figs. 6, 7. Surgeon's needle.

Figs. 8, 9. Ancient needle.

Fig. 10. Bone forceps.

Figs. 11, 12, 13, 14, 15. Amputating knives.

Fig. 16 Clasp bistoury.

Figs. 17, 18, 19. Different kinds of forceps.

Fig. 20. Curved bistoury.

Fig. 21. Torsion forceps.

Fig. 22. Tourniquet of J. L. Petit, modified.

Figs. 23, 24, 25, 26. Various kinds of forceps.

Fig. 27. Common English amputating saw.

Fig. 28. Chain saw of Jeffrey.

PLATE XL.

INSTRUMENTS.

Fig. 1. Mallet, to be used in connection with chisels and gouges, in cases of resection of bone.

Figs. 2, 8, 9. Various saws for resection of bones.

Figs. 3, 5, 6, 11, 12. Bone chisels and gouges.

Figs. 4, 7, 10. Small saws, to be used in cases of amputation, and for other purposes.

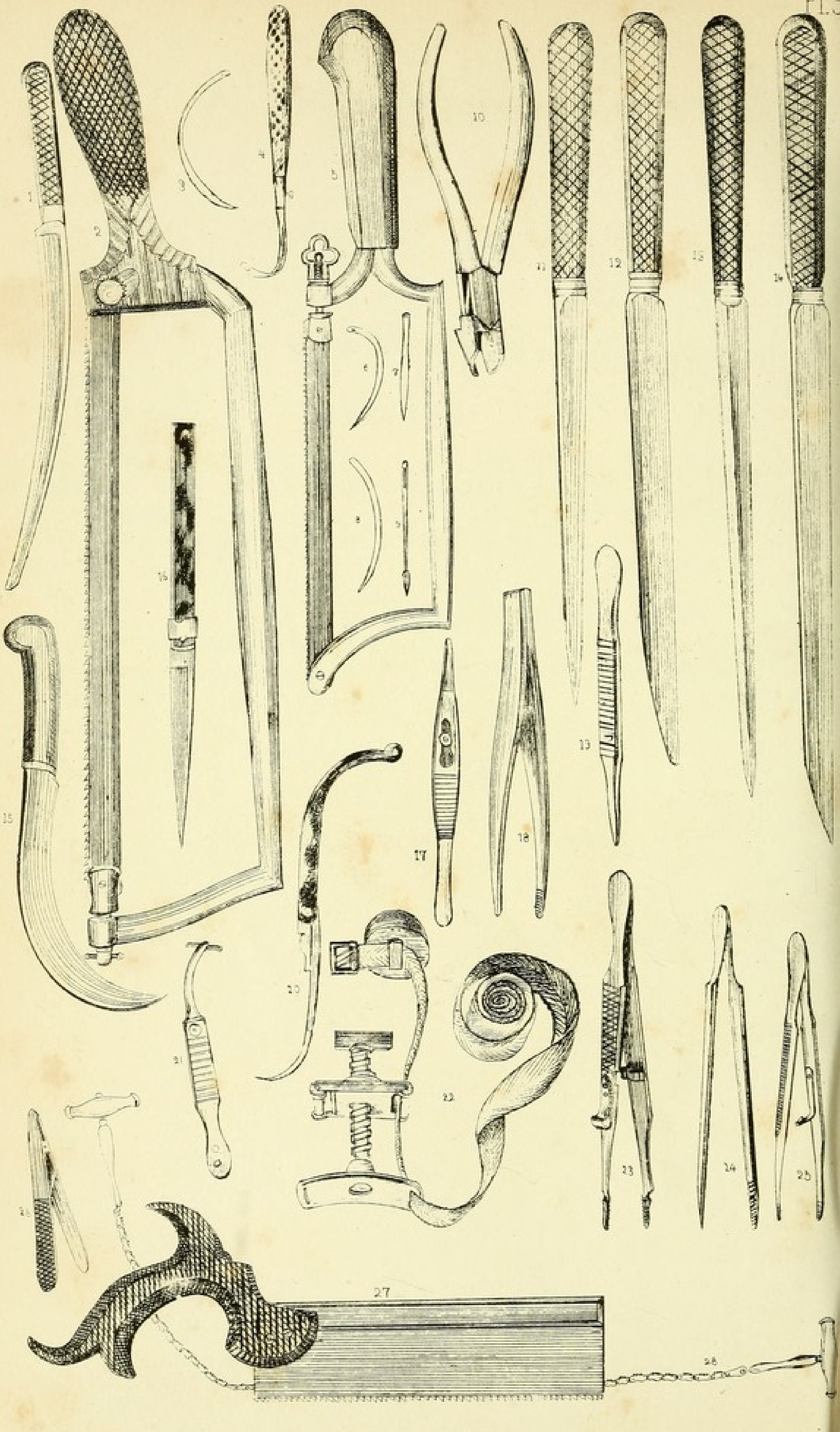
Fig. 13. Bistoury, to be used in operations of the skull.

Fig. 14. Forceps for preventing hemorrhage.

Figs. 15, 18, 20. Instruments for passing ligatures.

Fig. 16. Forceps for securing arteries.

Figs. 17, 19, 21. Bone forceps.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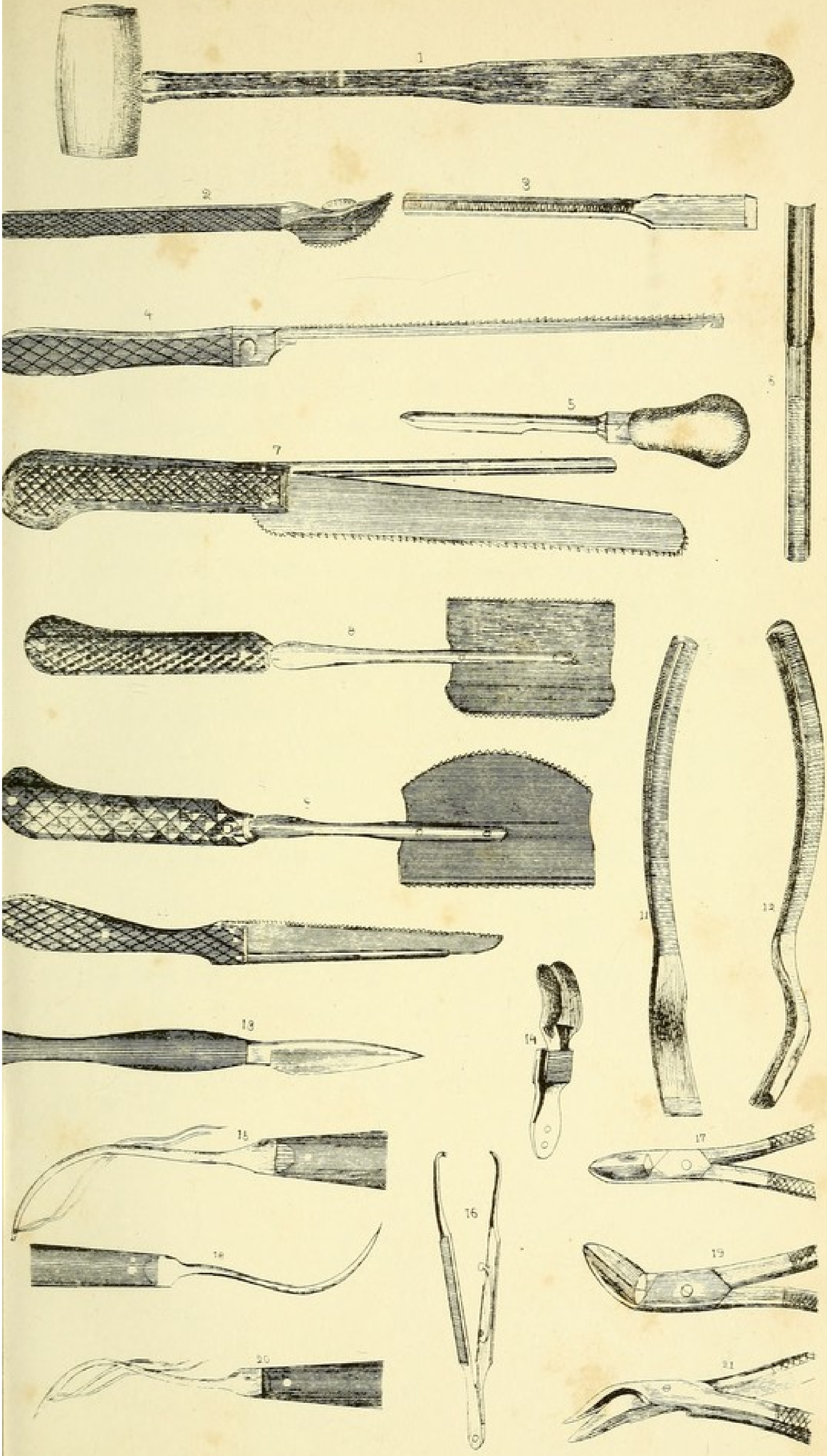
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PLATE XLI.

Figs. 1, 2. AMPUTATION THROUGH THE KNEE JOINT. A semilunar incision is made over the joint, as seen in Fig. 1; the anterior, lateral, and crucial ligaments are next divided; the knife is then carried behind the joint, and made to cut its way downward and outward, as seen in Fig. 2. The patella may be left, or removed, according to circumstances.

This operation may be performed in various ways: 1. As recommended by Beclard, by taking a longer flap from the anterior surface; 2. By making lateral flaps, as was done by Rossi; 3. After the method of Velpeau, by circular incisions, three or four inches below the patella; 4. By making three flaps from the circumference of the upper part of the leg, as was successfully done by Pancoast.

Fig. 7 shows the stump with the anterior tibial artery held by forceps, with the posterior tibial and peroneal arteries secured by ligatures.

Fig. 3 shows the manner of dressing the stump.

Fig. 4. AMPUTATION OF THE THIGH BY TWO FLAPS. FROM BOURGERY. The anterior flap being made, the surgeon is about forming the posterior flap by cutting downward and backward.

Fig. 6. Appearance of the stump before closure of the wound. In this case four arteries are to be tied.

Fig. 5. Manner of dressing the stump.

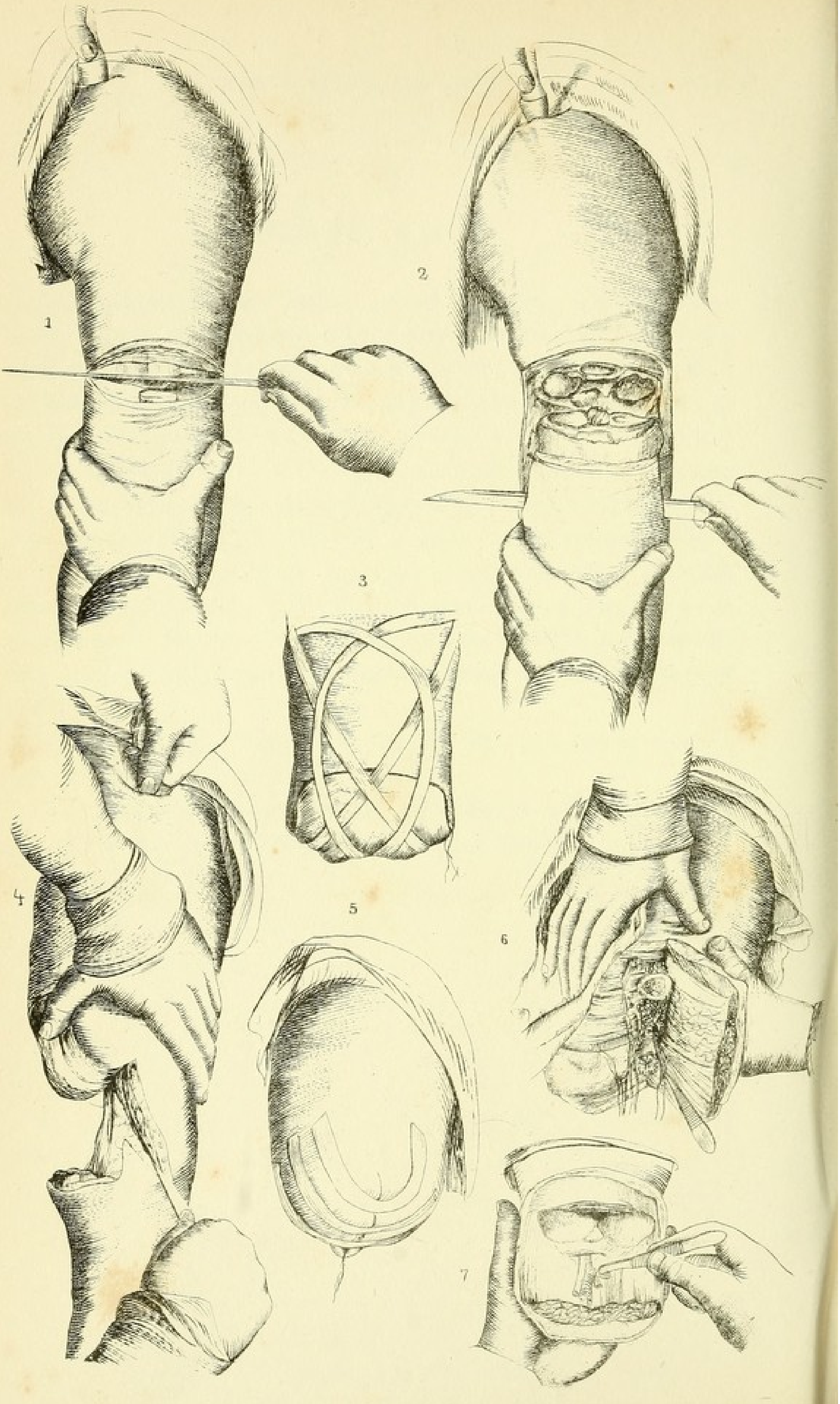
PLATE XLII.

Amputation of the Thigh at its Middle. Flap Operation. In this operation, the surgeon stands on the tibial side of the right limb, and on the fibular side of the left; he raises the flesh in the left hand, and plunges the knife in behind the saphena vein on the right side, passes it horizontally through to the bone, carries it over it, and brings it out on the opposite side as low down as possible; the anterior flap is then formed by cutting in the direction of the dotted lines in Figs. 1, 2; the knife is again passed through, as seen in Fig. 3, and the posterior flap made somewhat longer than the former; the flaps are now forcibly retracted, (Fig. 4,) and the knife carried round the bone, to divide the muscles by which it is immediately invested, and the operation finished by sawing the bone, as seen in Fig. 4.

The operation is performed on the left limb in a similar manner, only the knife is entered on the outside.

Of course, in all these cases the circulation is to be commanded, and the arteries to be secured in the usual manner.

Pl. 41



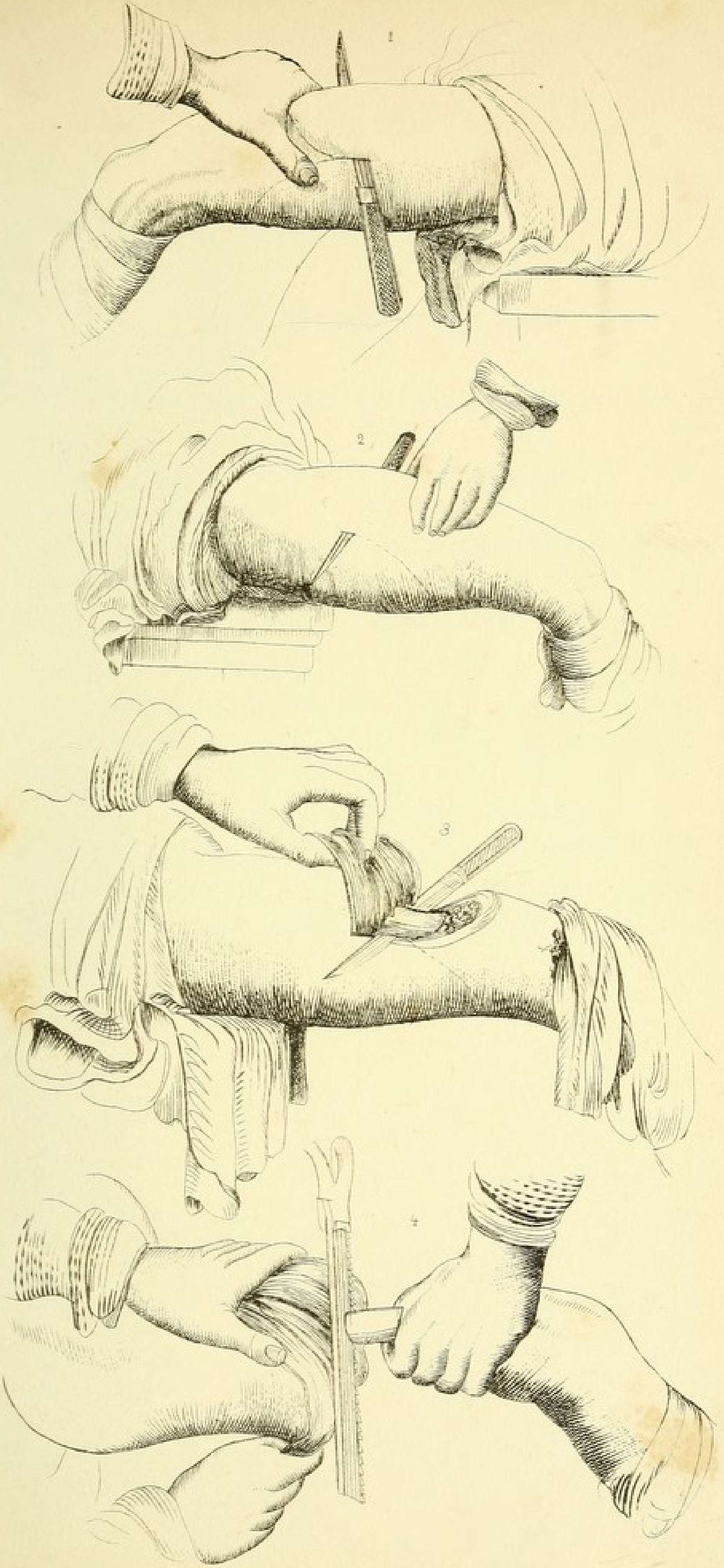

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PLATE XLIII.

Fig. 1 shows the manner of seizing an artery previous to applying a ligature.

Fig. 2 shows the manner of dressing the stump, in the operation shown on Plate XLII.

Fig. 3. This drawing is from Fergusson, and exhibits one of his cases some time after amputation was performed.

Fig. 4. Railway accident, from Liston.

Fig. 5. Amputation of the Thigh by Lateral Flaps. When this method is determined upon, the operator should remember to make the posterior part of the flaps the longest, as in the figure.

Fig. 8. Dressing of the stump in the above case.

Fig. 7. Appearance of the stump some time after the operation.

Fig. 6. Operation recommended by Mr. Liston in cases of severe accidents in fleshy subjects, where immediate amputation is demanded.

PLATE XLIV.

Circular Operation. From Mr. Liston. The knife is first applied as in Fig. 1, and carried round the limb, through the skin and cellular tissue, at one sweep; the integuments are then forcibly retracted, or dissected up in some cases, as in Fig. 3, when another cut is made through the superficial muscles; these again are drawn up, and the incisions finished by a circular sweep of the knife to the bone; the bone is then divided by the saw, as in Plate XLII.

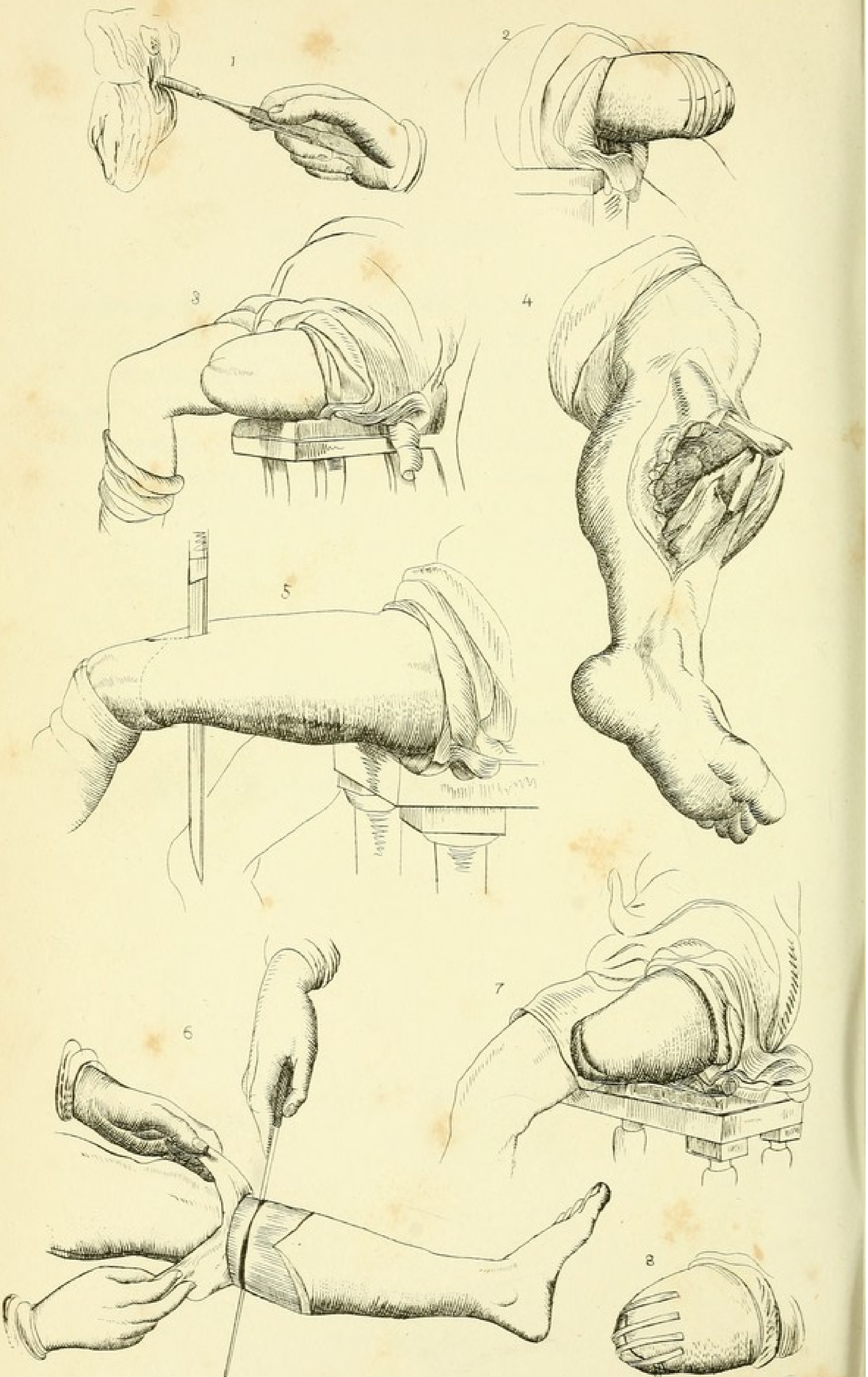
It may be necessary in some of these cases, where the muscles are thick, to use a cloth retractor.

Fig. 2. Appearance of the part cut off in the circular operation.

Fig. 4. Diagram showing the sort of hollow cone it is the object of the surgeon to form by this method.

Fig. 6 shows the appearance of the stump, with the arteries being secured.

Fig. 5. Manner of dressing the stump.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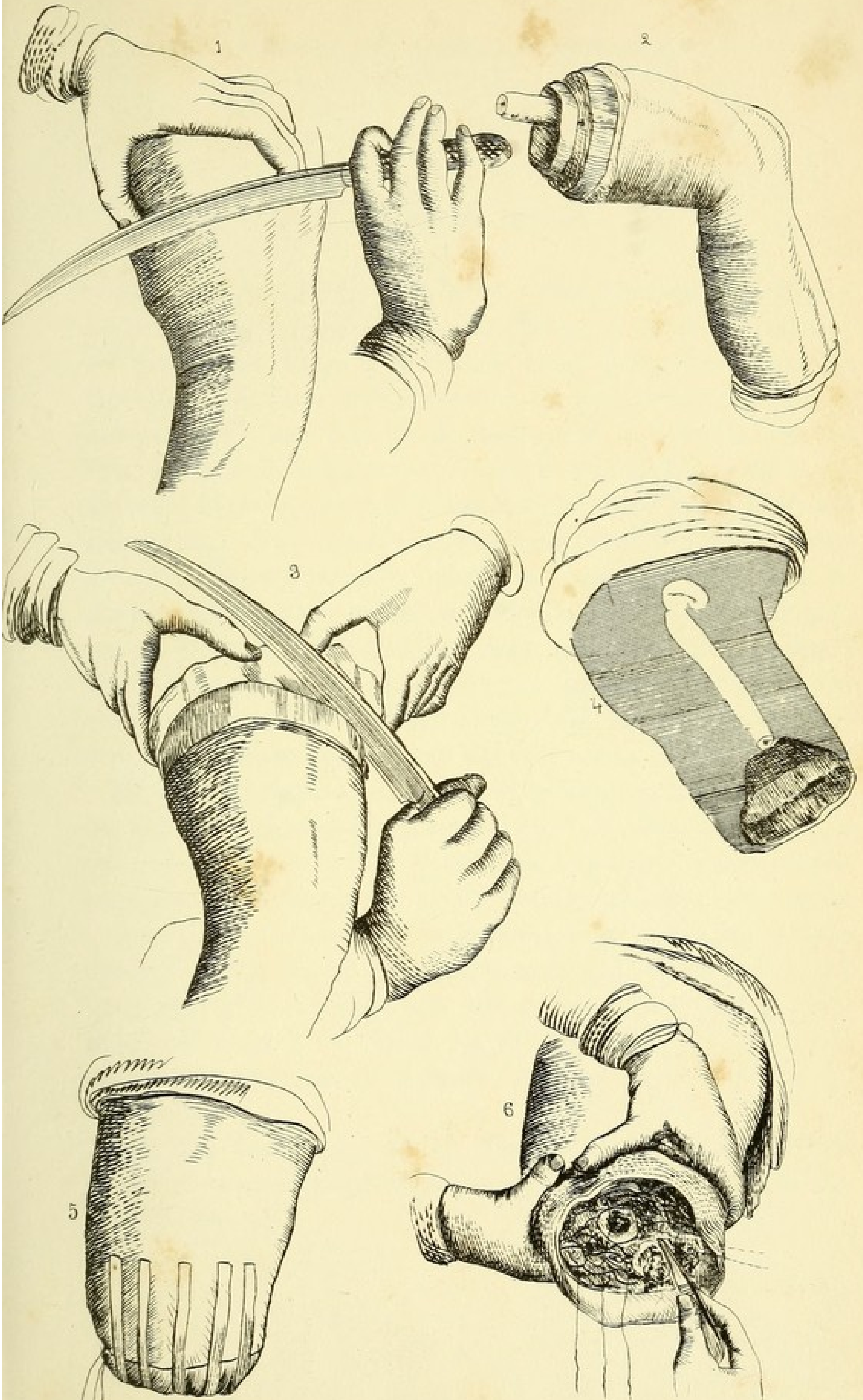
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PLATE XLV.

Amputation at the Hip Joint. This operation is performed by Mr. Liston in precisely the same manner in which he amputates the thigh lower down. The femoral artery being compressed, the knife is entered about midway between the anterior superior spinous process of the ilium and the trochanter, and is carried across the front of the articulation, so as to form the anterior flap. An assistant must follow the knife with his hand, so as to grasp firmly the anterior flap. The capsular ligament must next be cut by drawing the knife forcibly across it; then the ligamentum teres must be divided, and the knife carried through the joint, as seen in Fig. 4, and the posterior flap formed by cutting downward and backward; this flap should also be grasped by an assistant. The bleeding vessels should now be secured, beginning with those in the posterior flap, and the stump dressed as in Fig. 3.

Mr. Mayo performed this operation in less than thirty seconds in the following manner: First, passing the knife completely through the limb on the inner side of the joint, he carried it forward and inward, so as to form a flap of the adductor muscles; then he cut into the joint, and severed the ligamentum teres, and the muscles attached to the digital fossæ, with a strong, curved knife; and lastly, putting in the knife over the trochanter, and cutting downward and outward, he formed his external flap. Mr. Mayo tied the femoral artery below Poupart's ligament previous to the operation.

Fig. 5 is from a case of Dr. Handyside, of Edinburgh. This operation was performed after the method of Mr. Liston, as described above.

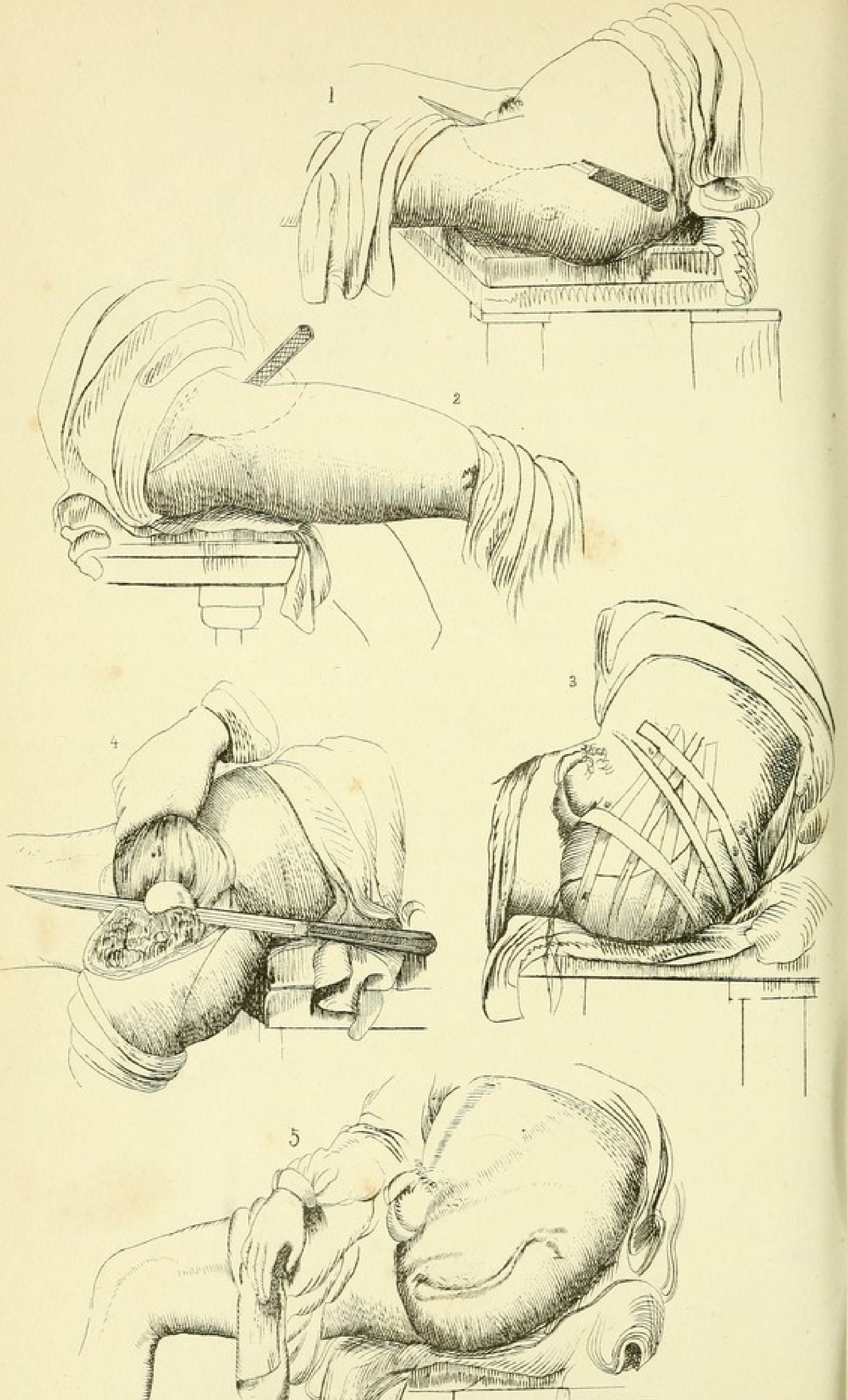
PLATE XLVI.

Figs. 1, 3, 4. Amputation at the Hip Joint. Method of M. Cornuau. A vertical incision being made over the trochanter, two oval incisions are carried from this to the bone — the one anterior, the other posterior, as seen in Figs. 1, 3; the articulation is then divided, and the knife carried round the head of the bone, down to the point, where it is seen in Fig. 1; it is then made to cut its way out, when such a wound is formed as is seen in Fig. 3. The dressing of the stump, in this case, is shown in Fig. 4.

Figs. 2, 6. Amputation at the Hip Joint. Method of Lalouette. A semicircular incision being made to the joint, in the line shown in the figure, the surgeon proceeds to open the joint, and to disarticulate the head of the bone; he then carries the knife round the head of the bone, and forms a flap from the inside by cutting downward and inward.

Fig. 4 shows the manner of dressing the wound.

Fig. 5. Amputation at the Hip Joint. Method of Larrey. A longitudinal incision over the artery is first made, when the artery and vein are secured, as seen in the figure; next the knife is entered at the bottom of this incision, and carried round the limb in the direction of the lower dotted line; it is then brought back to the point of departure; the incisions being completed, the bone is disarticulated as in the preceding cases.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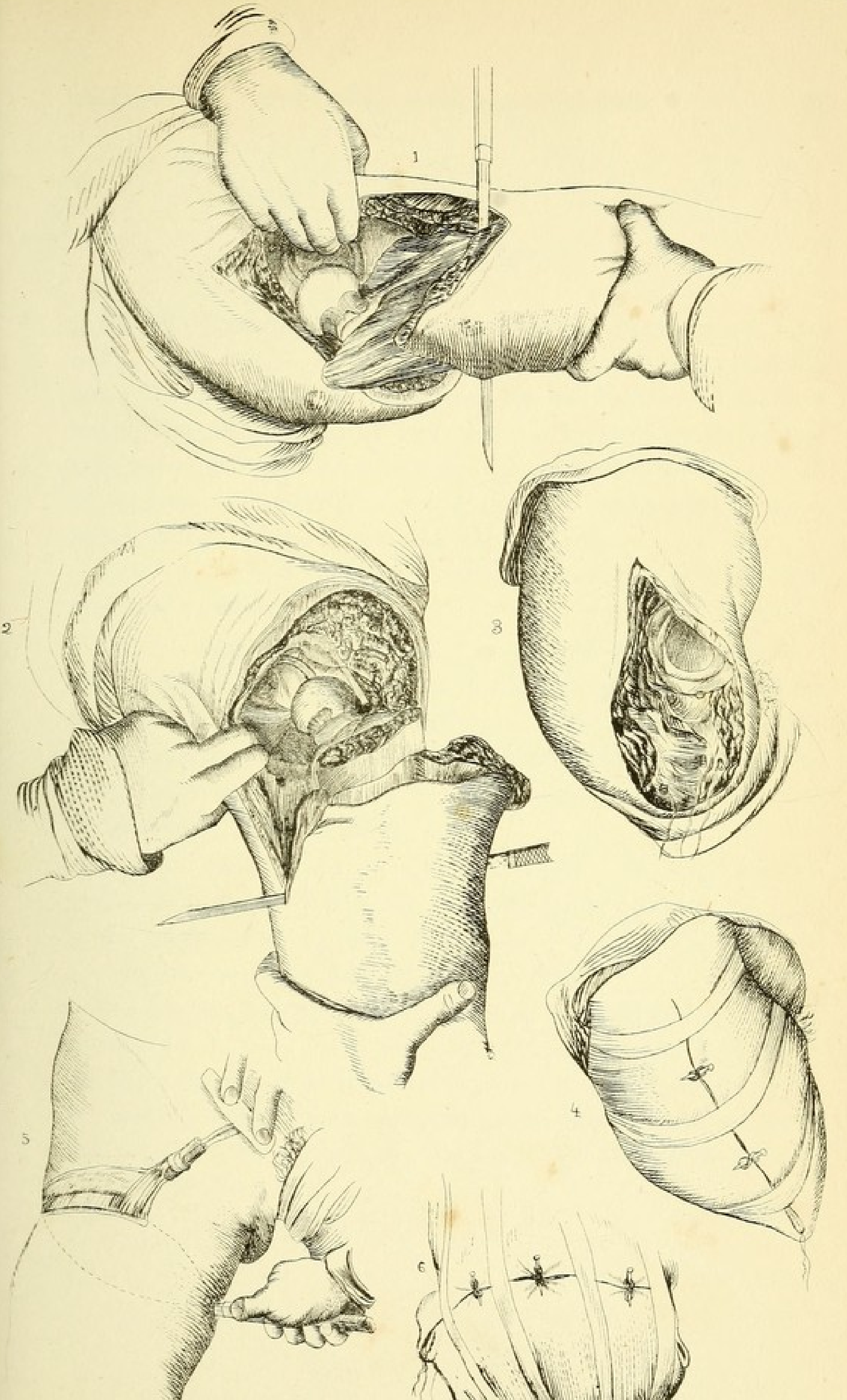
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PLATE XLVII.

Fig. 1. Amputation at the Hip Joint. Method of Delpech. The femoral artery being tied, the surgeon makes his incision, as in the circular operation, carrying the knife round the limb, but varying its direction on each side; or two semilunar incisions may be made from without, inward and upward, towards the head of the bone. In this figure, the operation is represented as about being finished by the division of the ligaments.

Refs. 1. Femoral artery. 2. Obturator artery. 3. Deep femoral and circumflex arteries.

Fig. 2. Amputation at the Hip Joint. Method of Delpech. Right limb. The knife is thrust through the limb, and the anterior flap made, and the arteries tied before proceeding further in the operation; the surgeon next disarticulates the head of the bone, carries the knife back of its head, and forms the posterior flap, in the manner shown in the figure.

Fig. 3. Amputation at the Hip Joint. Method of Lisfranc modified. To obviate the difficulty of carrying the point of the knife around the head of the bone, a V incision is made, and a triangular portion of flesh left upon the limb.

The surgeon, having made the external flap, and tied the divided arteries, enters the knife for the internal flap, the hands of an assistant following the knife so as to command the femoral artery; the internal flap being formed, and turned aside, and the vessels secured, the surgeon next proceeds to disarticulate the head of the bone, as seen in the figure.

PLATE XLVIII.

Fig. 2. Amputation at the Hip Joint, by the Circular Method. After Abernethy. Left leg. The femoral artery having been tied, as in Plate XLVII. Fig. 1, the surgeon proceeds to make a circular incision through the skin and cellular tissue, about three inches and a half below the groin; the skin and muscles are retracted, as the dissection is continued to the head of the bone; the joint is opened, and the bone disarticulated by dividing the remaining ligaments. The wound is dressed in the usual manner.

It may not be improper to remark, in this place, that what Mr. Fergusson deems necessary preparation to the performance of the formidable operation of amputation at the hip joint, may be considered of equal importance in every operation of any consequence. "Previous to the operation, every arrangement should be made regarding assistants, instruments, and other appurtenances; and nothing should be left to chance on such a momentous occasion." The surgeon should be able to depend upon his assistants, as regards intelligence and firmness; indeed, he should not undertake any of the more important operations, unless he is fully competent to the task himself, and can obtain assistants upon whom he can depend in any emergency. The instruments necessary in amputations are, first, some one of the various amputating knives suited to the case; suitable bone forceps, in some cases to take the place of the saw, in others, to follow the saw when there is splintering of the bone; dissecting forceps; several pairs of forceps with catches, or slides, to seize and hold the ends of bleeding vessels, or, in some cases, forceps to apply to a part where there is oozing of blood; the tenaculum is also used by some, instead of forceps, for seizing arteries. A tourniquet should always be at hand. Sponges, water, cloths, and ligatures should also be prepared. For the dressing, needles armed with thread, and some kind of adhesive strips, will be necessary. The dressing in all cases, says Mr. Liston, should be light, and no bandages be applied until some days after the operation, when, in some cases, it may be desirable to change the form of the stump by compression.

Figs. 1, 4. Appearance of bones some time after amputation.

Fig. 5. Dissection of the stump some time after amputation of the thigh.

Fig. 3. Gangrene, arising from starvation and exposure to cold. From a cast in King's College Museum.

Fig. 6. Gangrene in an old person. In this case, the patient seemed predisposed to the disease, and of course amputation was deemed inadmissible.

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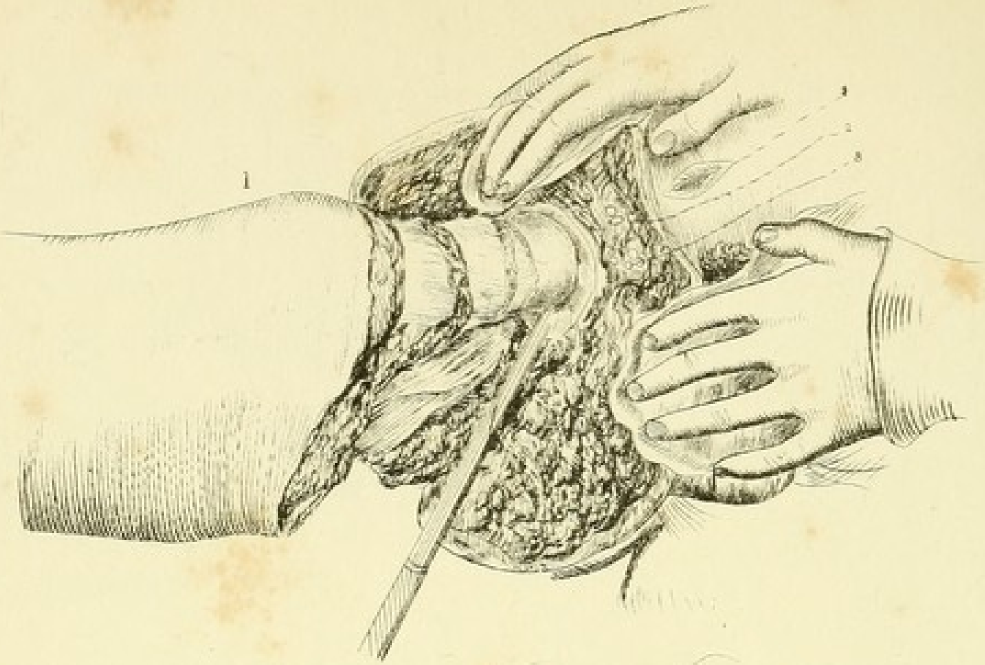

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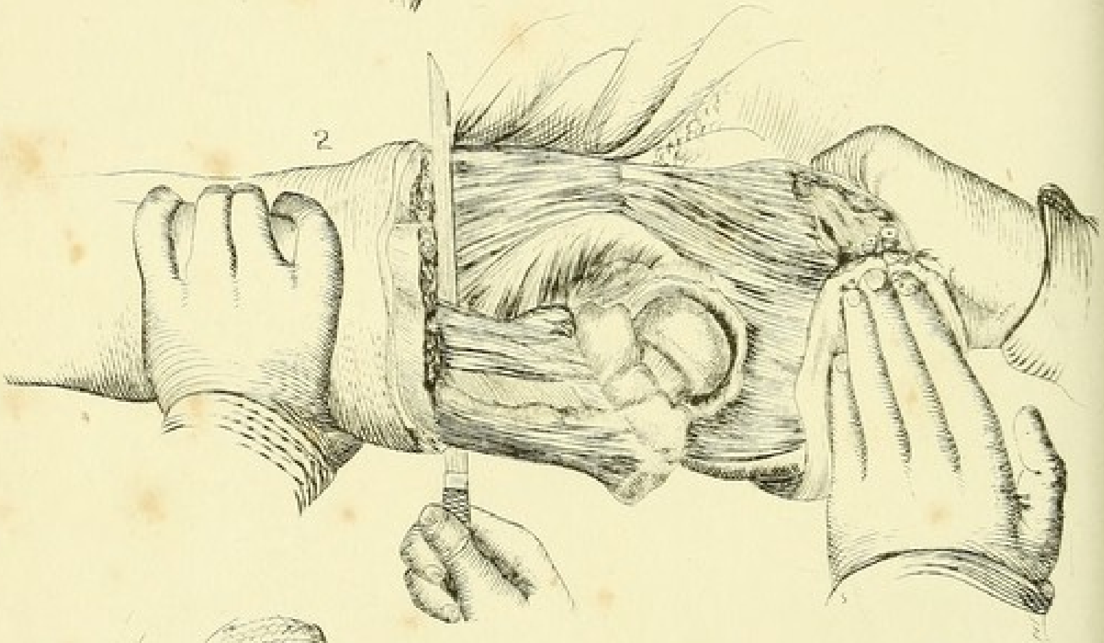

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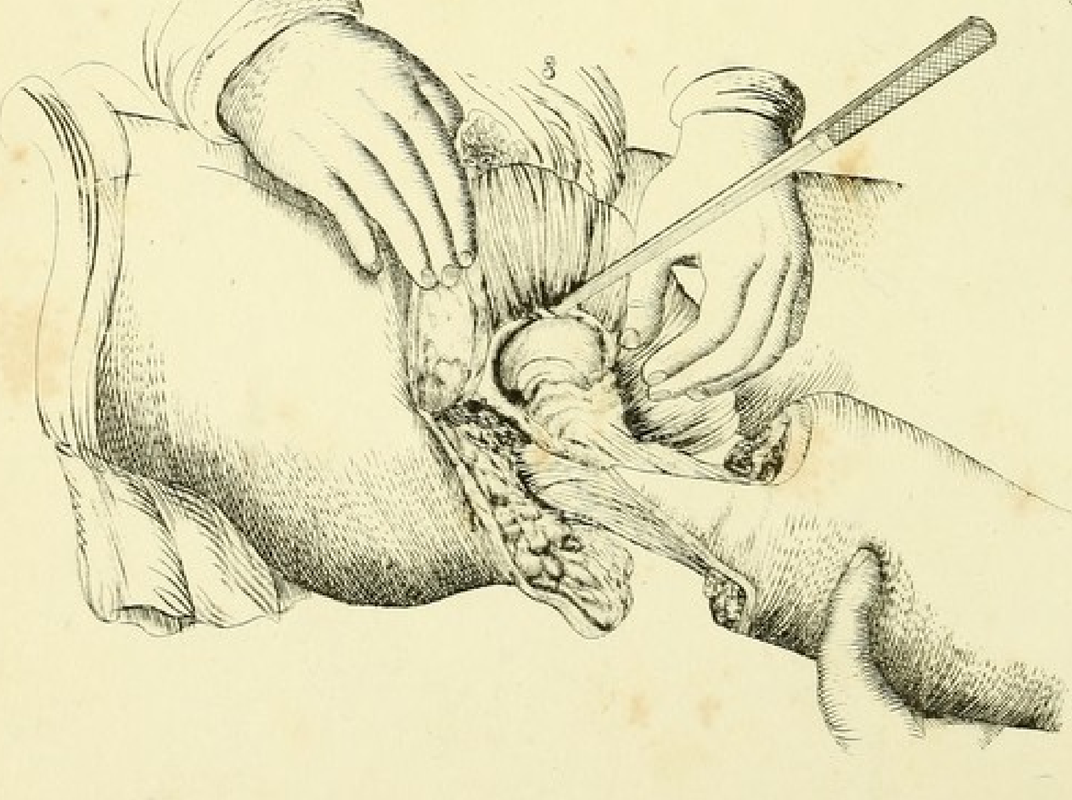


Pl. 48

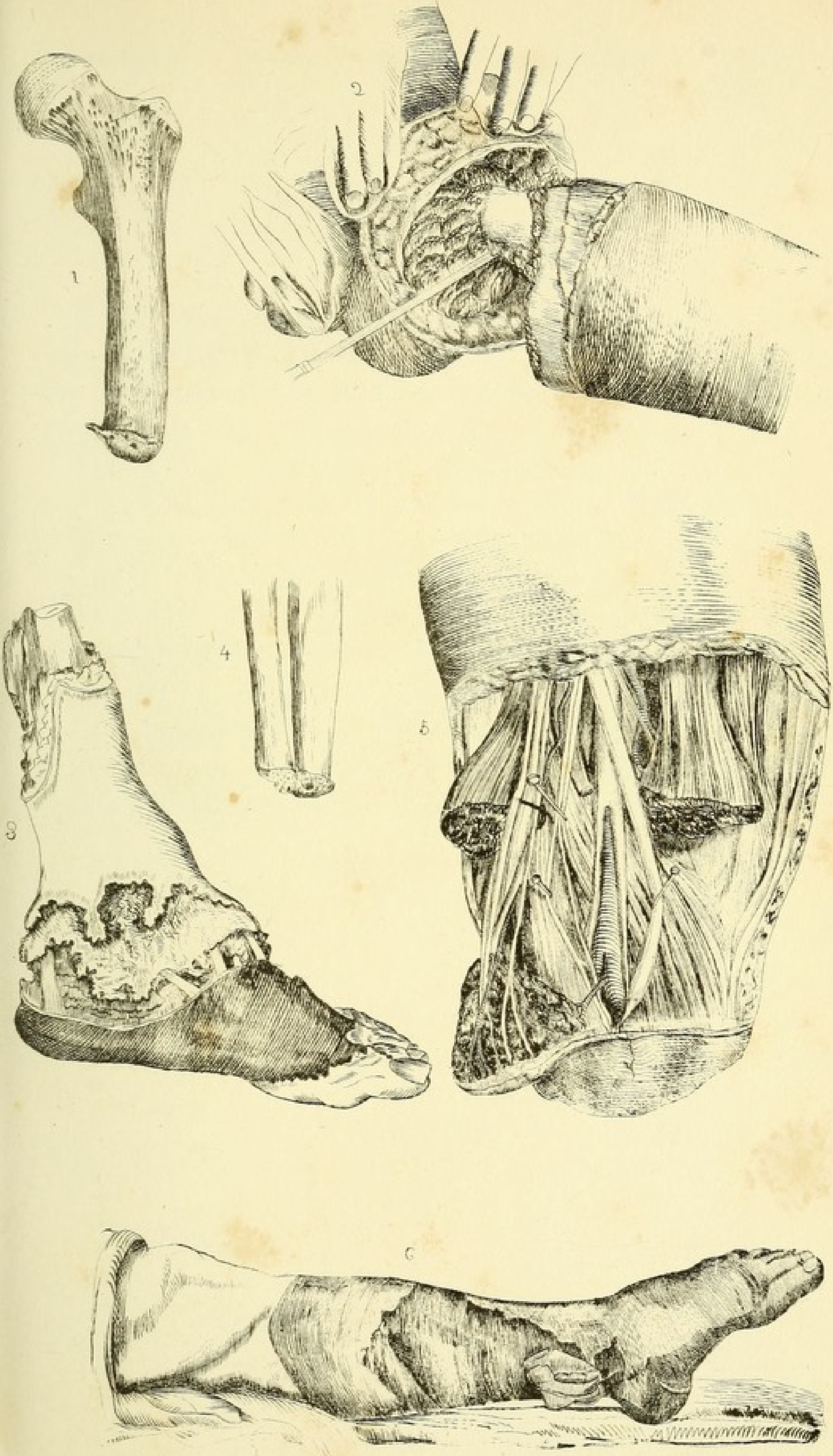


PLATE XLIX.

Fig. 1. Dry gangrene in a patient aged seventy-five. In this case, which came under the care of Mr. Liston, the patient's health was so far restored by treatment, that amputation of the limb was performed, and the patient made a good recovery.

Fig. 2. Case of wet gangrene from freezing.

Figs. 3, 6. Effects of inflammation of joints. From Liston.

Figs. 7, 9. Caries of the bones forming the elbow joint.

Fig. 8. Gouty, or rheumatic disease of the ankle joint.

Figs. 4, 5. Caries of bone; part of the olecranon, and one of the condyles of the humerus; described farther on.

Fig. 10. Abscess of Bone. This disease is characterized by a cavity lined with a vascular membrane, and filled with pus, formed in the substance of the bone. There may be a small piece of necrosed bone confined in the cavity.

PLATE L.

Figs. 1, 7. Caries of Bone. Caries is an unhealthy inflammation of bone, which produces softening, and then leads to ulceration and suppuration.

The bone, when macerated and dried, looks soft and spongy, eaten into hollows, and thrown into irregular elevations, as seen in the figures.

Fig. 2. Exfoliation signifies the mortification and separation of a superficial layer of bone, or of the extremity of a bone. When bone is about to exfoliate, it becomes white and dry.

Figs. 3, 5. Healthy and Diseased Bone. Healthy bone, (Fig. 3,) when examined under a microscope, is seen to consist of an obscurely granular substance, arranged in concentric laminæ, around longitudinal canals. The laminæ are separated by circular rows of minute cavities, or cells, having fine canaliculi running from them, as shown in the succeeding figure. In diseased bone, (Fig. 5,) the only changes that have been observed, are variations of plus and minus.

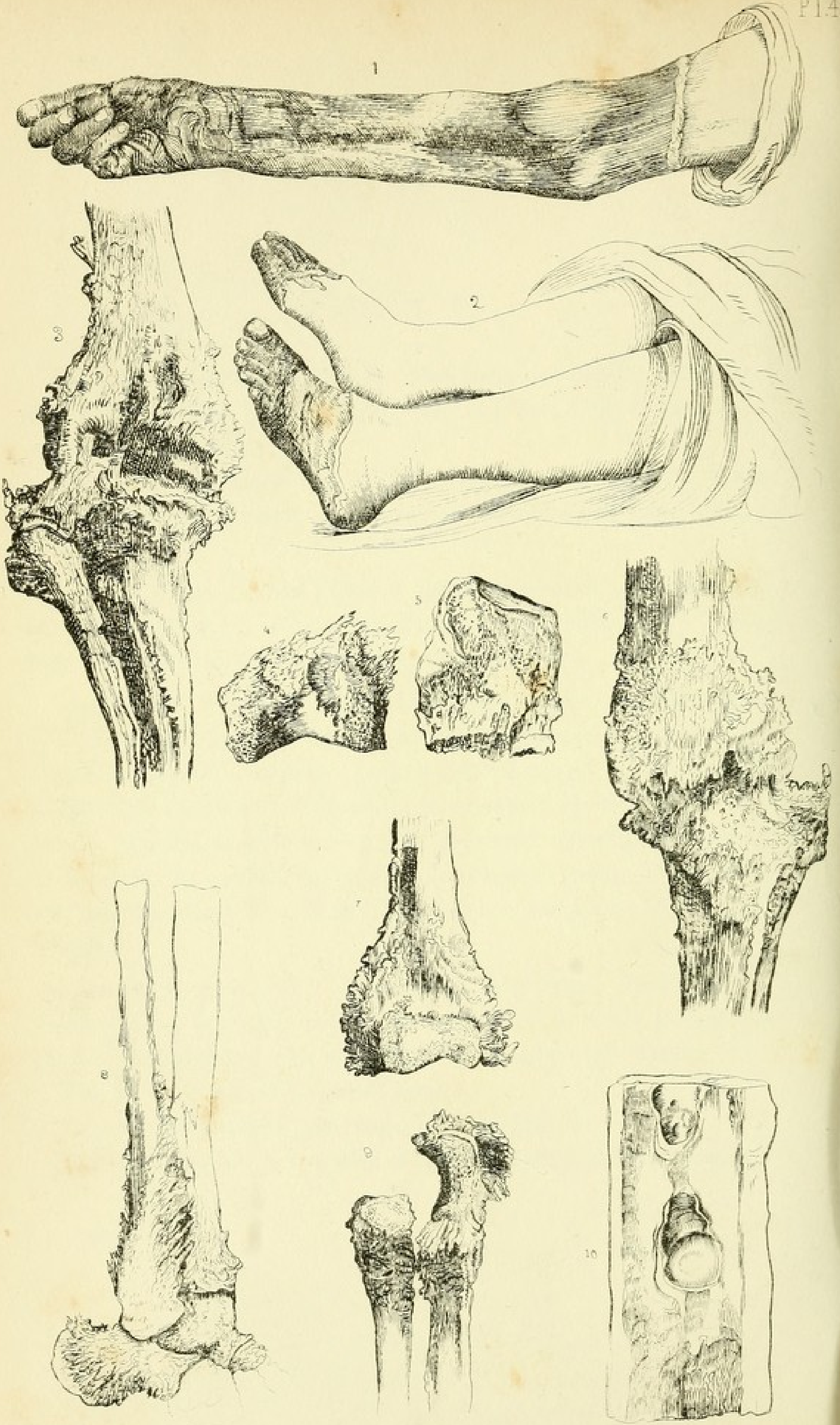
Figs. 4, 8, 9, 10, 12. Necrosis. This term, signifying the death of bone, is usually restricted to that form in which part of the shaft of a cylindrical bone dies, and is enclosed by new bone.

Fig. 11. Section of necrosed bone.

Fig. 6. Anchylosed joint, caused by scrofula.

Fig. 13. Section of the tibia of a patient affected with rachitis.

Pl. 49



Pl. 50.

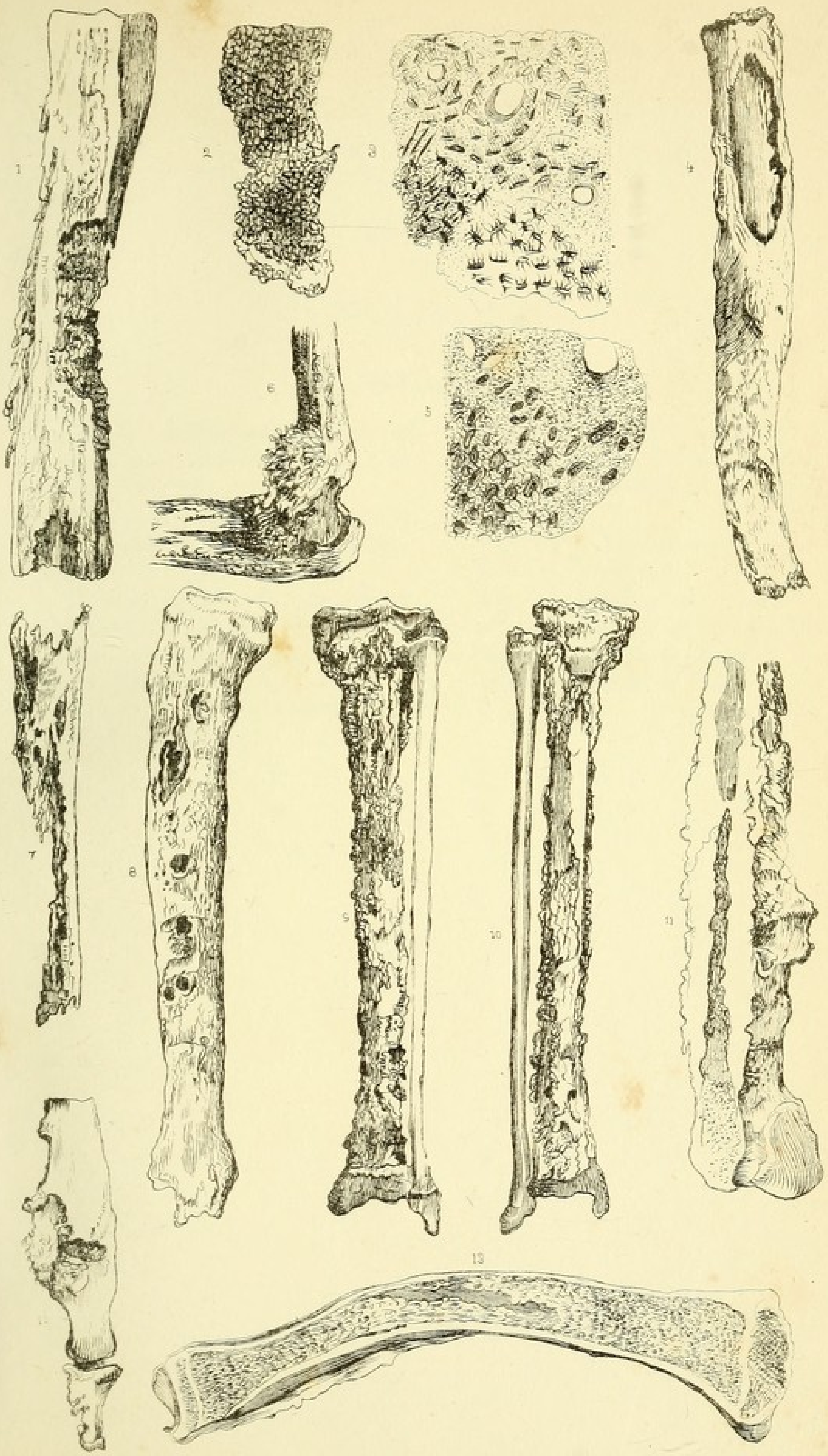


PLATE LI.

INSTRUMENTS.

Fig. 1. Manner of attaching the various saws to the instrument of M. Martin, (Fig. 6.)

Figs. 2, 7, 11, 27, 28, 29. Various saws connected with the above instrument.

Fig. 23. Handle, to turn the instrument of M. Martin, (Fig 6.)

Figs. 3, 4, 5, 15, 18, 24. Various kinds of trephines.

Figs. 16, 17. Handles for trephines, perforators, screw elevators, &c.

Figs. 8, 13. Screw elevators.

Fig. 9. Brush, for clearing away the particles of bone produced by the trephine.

Figs. 10, 22, 25. Elevators.

Fig. 12. Perforator.

Fig. 14. Bone forceps.

Fig. 19. End view of Fig. 15.

Fig. 20. Saw of M. Charrière.

Fig. 21. Saw of M. Heine.

PLATE LII.

Instruments.

Fig. 1. Tenatome of Bouvier.

Figs. 2, 3, 4, 11. The points of lancets and other instruments, magnified.

Fig. 5. Elevator.

Figs. 6, 7. Bone forceps.

Figs. 8, 9, 10. Portions of bistouries, magnified.

Figs. 12, 13. Small saw of Larrey.

Figs. 14, 15. Saw of M. Raimbaud.

Fig. 16. Small saw, with a firm back.

Figs. 17, 18. Instrument for perforating bone, and also for seizing portions of bone which the surgeon wishes to remove.

Fig. 19. Tenatome of M. Duval.

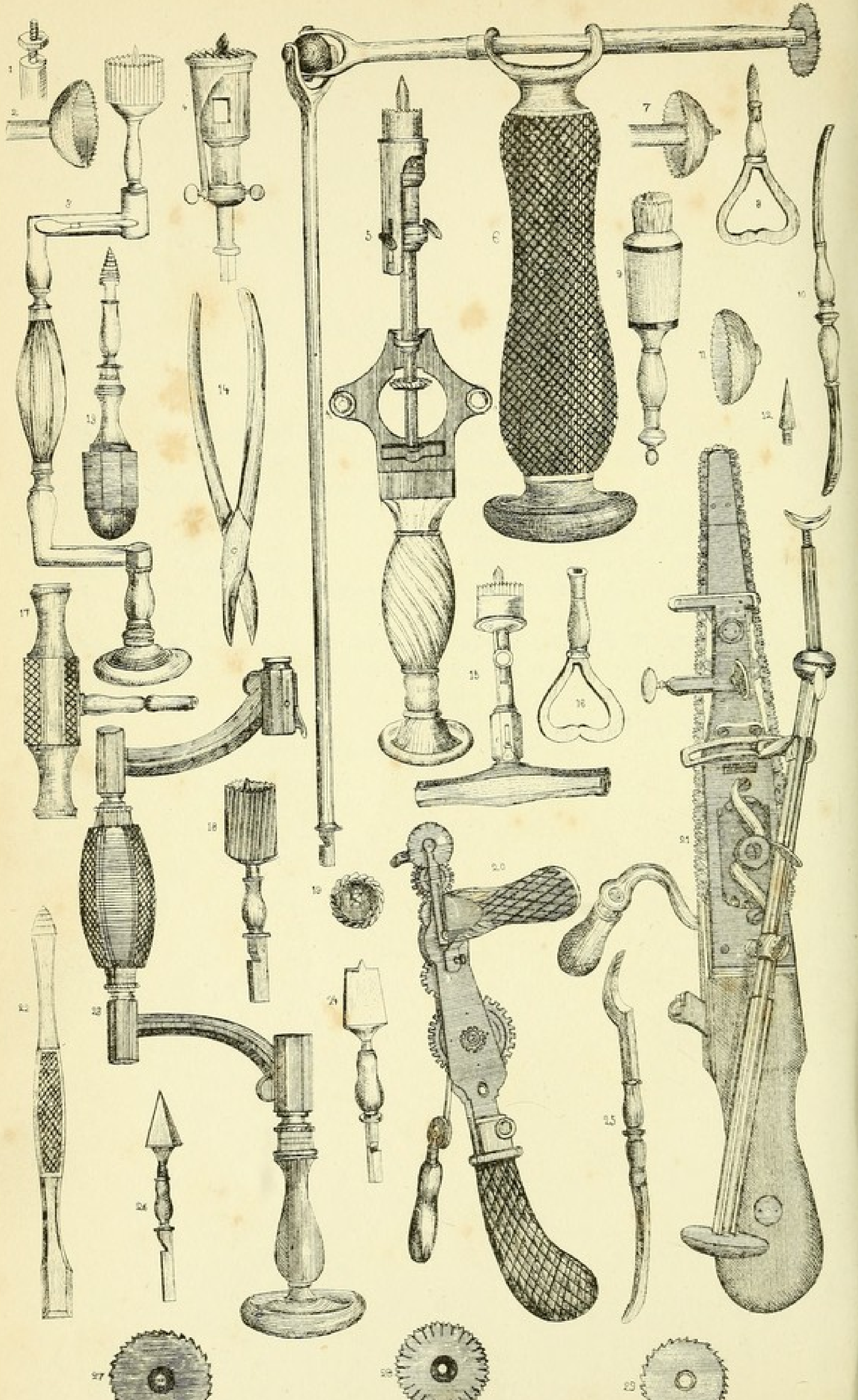
Fig. 20. Tenatome of M. Guerin.

Fig. 21. Tenatome of M. Staess.

Figs. 22, 23. End view of Figs. 26, 27.

Figs. 24, 25, 26, 27, 28. Various forms of scrapers for removing portions of diseased bone.

Fig. 29. Amputating knife of M. V. Onsenoort.



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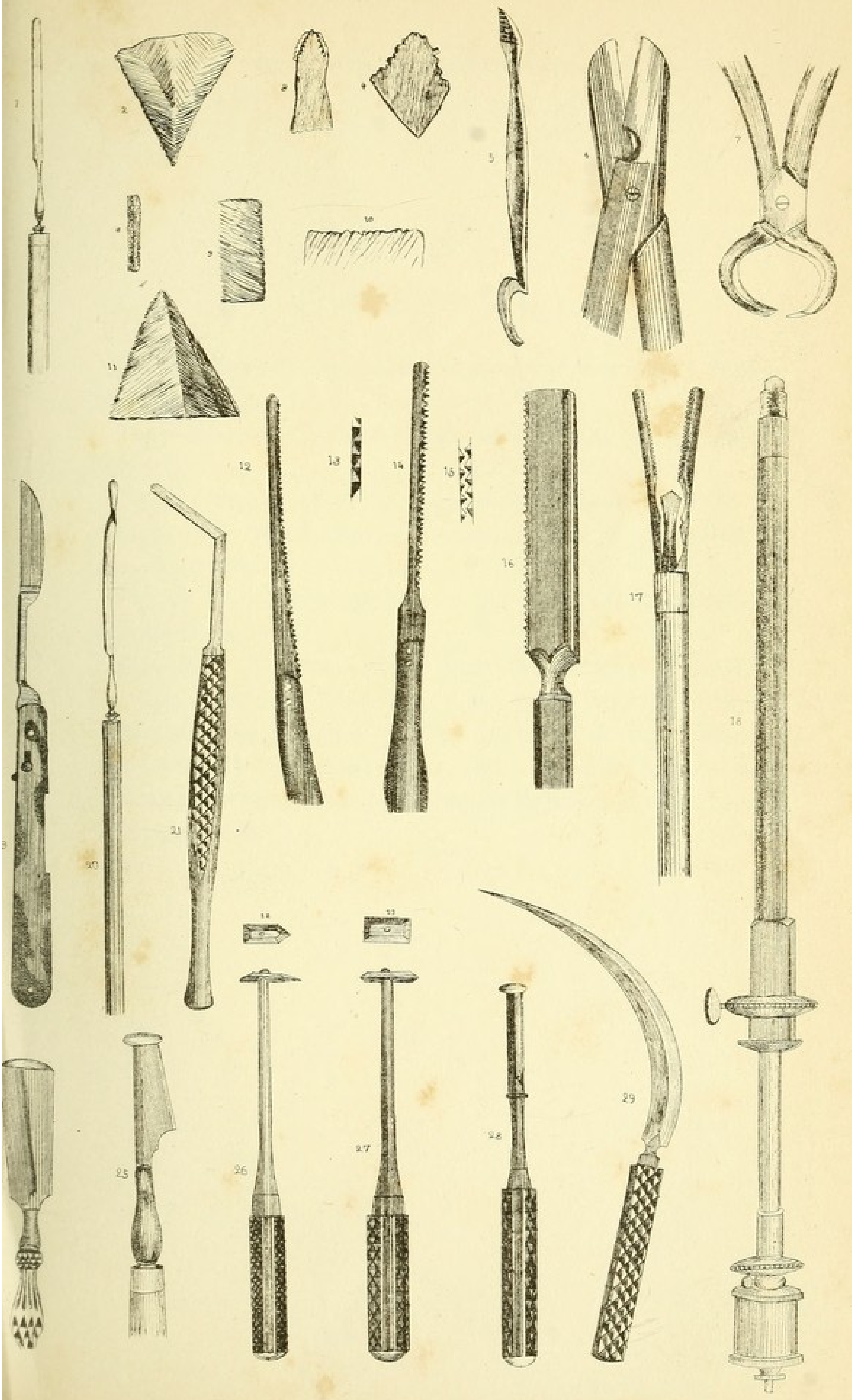


PLATE LIII.

Fig. 1. From Bourgery, case where a ball was lodged in one of the pelvic bones.

Fig. 2 shows the manner of extracting a ball, in a case similar to Fig. 1.

Fig. 3. Case in which the tibia was struck by a spent ball.

Figs. 4, 8. Introduction of a seton in a case of non-united fracture of the tibia.

Fig. 5. Compound fracture of the femur, with extraction of portions of the bone.

Figs. 6, 7. Case of a young man of seventeen. From Liston. The first sketch was taken a year before the second. At the first examination, the existence and detachment of the sequestrum was ascertained. It might have been easily removed, had the patient consented to the operation, and thus much time and suffering would have been saved.

PLATE LIV.

Fig. 1. Removal of a portion of the skull bone in case of exostosis. A crucial incision (Fig. 7) is made, and the flaps dissected back, and the saw applied as seen in the figure.

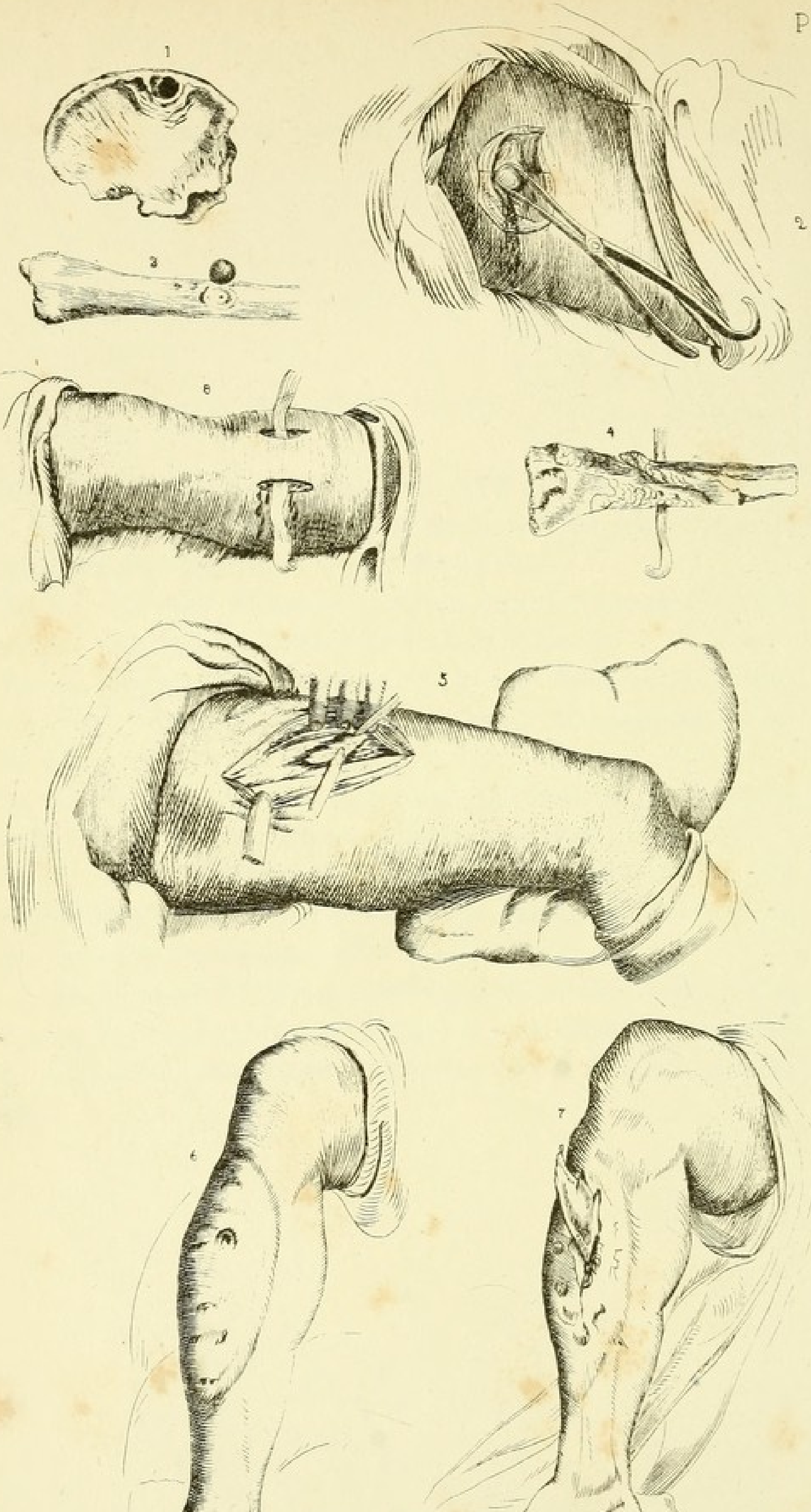
Fig. 2. Operation in case of exostosis on the upper third of the humerus. A V incision (Fig. 8) is made in this case.

Fig. 3. Copied from Bourgery, (from the Muséum de la Faculté.) Case in which the above operation is supposed to be performed.

Fig. 4. From Bourgery, representing Dr. Barton's operation for artificial joint in case of complete anchylosis of the hip joint.

Fig. 6. Removal of a portion of sequestrum of the humerus. In this case a longitudinal incision (Fig. 5) is made, and the trephine of M. Charrière applied to uncover the dead bone.

Fig. 9. Sequestrum of the middle portion of the radius. The dead bone, in this case, was not enclosed in a sheath of new bone, as in the last, and the surgeon was enabled at once to divide it with the forceps.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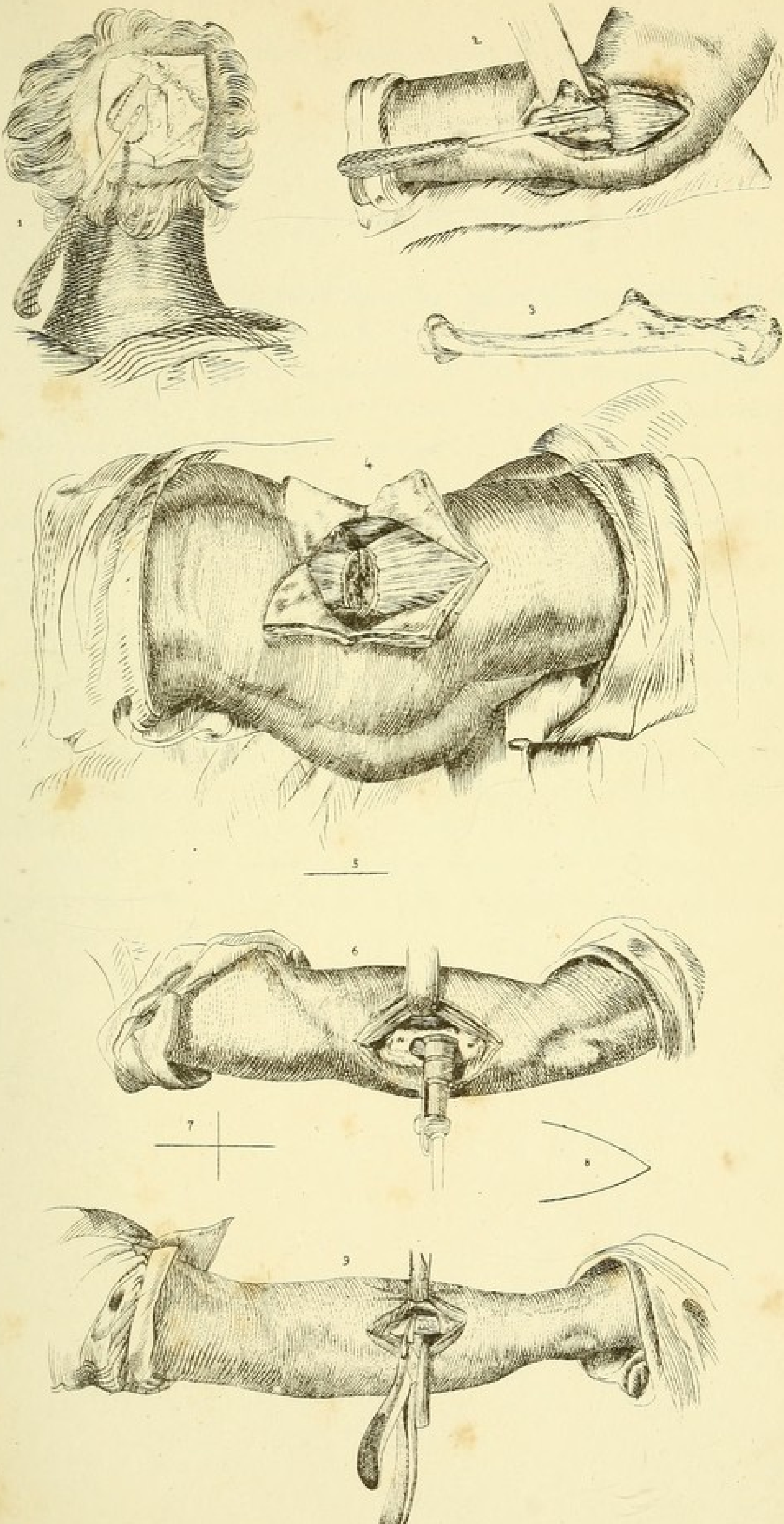
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PLATE LV.

Fig. 1. Sequestrums of the tibia, and of the first metatarsal bone. In the first case, a T incision (Fig. 5) is made, and the dead bone operated upon by the perforator of M. Dupuytren, (Plate LII. Figs. 17, 18.) In the second case, a similar incision is made, and the bone extracted with the forceps.

Fig. 2. Extraction of a dead portion of the femur. A longitudinal incision (Fig. 4) is made, and the new bone perforated with the trephine; the sequestrum is being removed with the forceps and chisel.

Fig. 3. Case from Liston, in which, for long-continued and severe pain in the tibia, the bone was perforated, and matter was found. The patient made a good recovery.

Fig. 7. Extraction of a sequestrum of the clavicle. The bone is uncovered by a T incision; the sheath of new bone is divided by forceps, and the sequestrum extracted as in Fig. 1.

Fig. 8. Extraction of a portion of necrosed os frontis. A T incision was made to the bone, and the diseased portion removed with the forceps and elevator.

Fig. 6. Necrosed bone, removed in the above operation.

PLATE LVI.

Fig. 1. Effects of syphilitic caries. From King's College Museum.

Figs. 2, 3. From Liston. He says, with regard to them, "A few accidental blows on the head, and a perseverance in the use of mercurial alteratives for a series of years, gave rise to the state of matters represented in the figures. The large, dead portion represented was removed some months before the death of the patient."

Trephining. This operation may be performed in the following manner: A crucial or T incision being made, and the flaps dissected back, the pericranium being shaved off from the part which is to be perforated, the surgeon applies the instrument, and works it, if it be like the one used in Fig. 5, with an alternate pronation and supination of the wrist; and when it has cut a circular groove deep enough to work in firmly, he withdraws the centre-pin. The surgeon should be careful not to press heavily on the instrument, and he should frequently pause during the operation, and examine the depth of the groove he has made. When he reaches the dura mater, he introduces the elevator to remove the circular piece of bone.

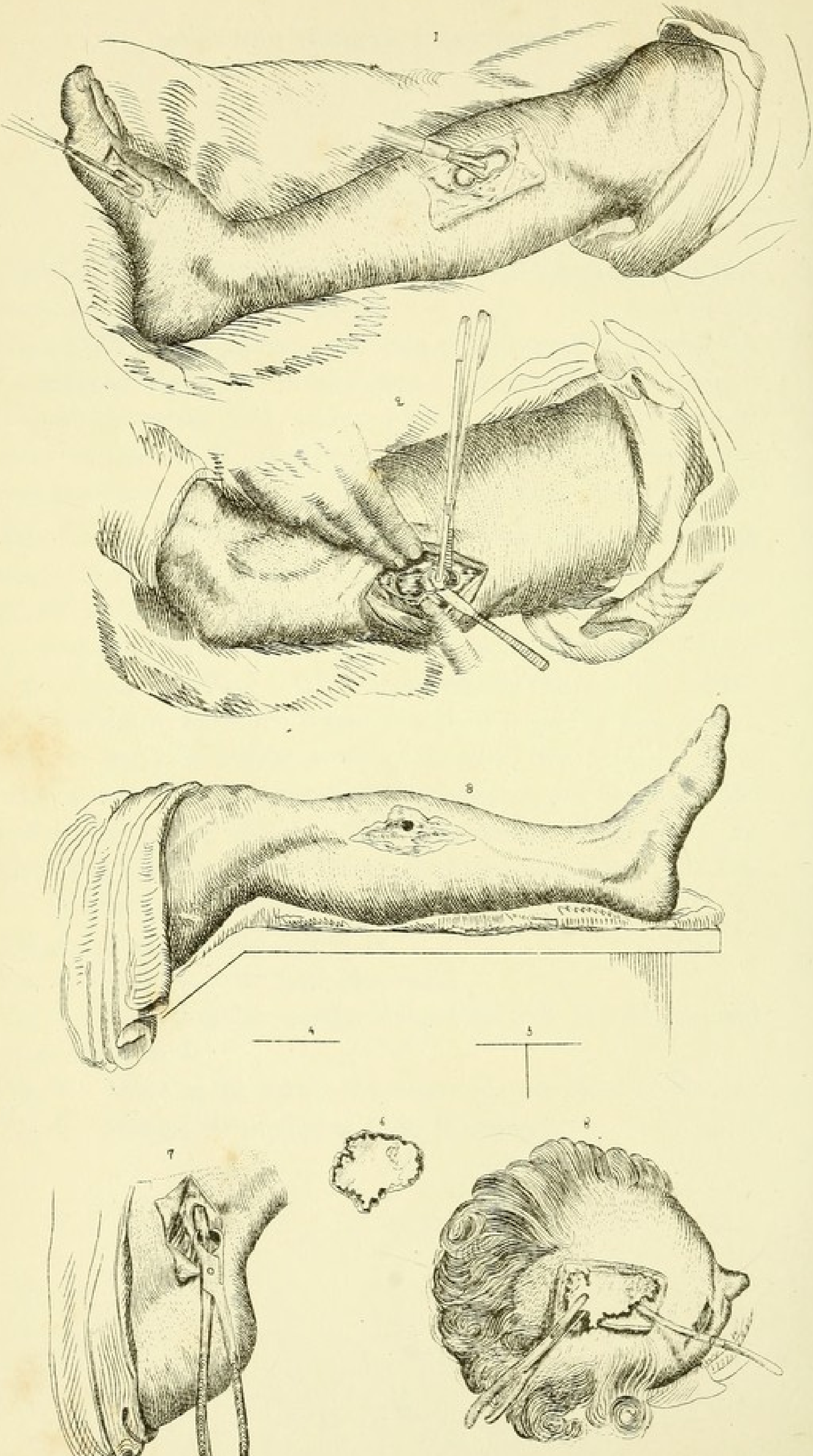
Fig. 4. Trephine used at Fig. 5.

Fig. 6. Incision in the following cases.

Fig. 7. Enlarging the opening in the bone with the forceps, and couteau lenticulaire.

Fig. 8. Dividing the dura mater to give exit to blood or pus.

Fig. 9. Method of trephining, from Bourgery.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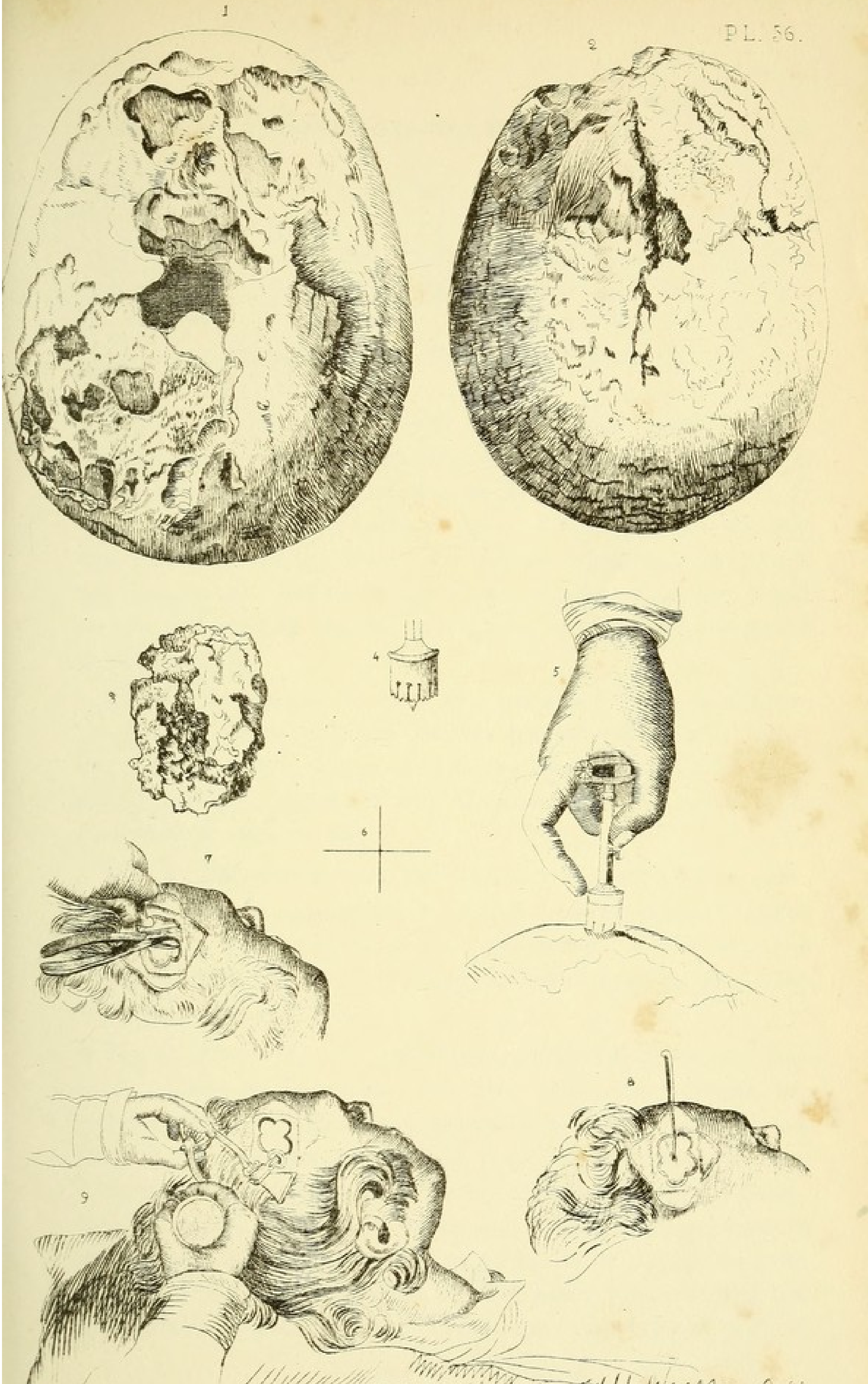
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PLATE LVII.

Resection, and Removal of Bones.

Fig. 1. Extraction of the Metacarpal Bone of the Thumb. A double L incision (Fig. 4) is made; the distal end of the bone is first detached, and then its articulation with the wrist, as seen in the figure. The extensor tendons of the thumb are the only ones divided in this operation. The muscles belonging to the thumb are seen at the palmar margin of the wound, and at the dorsal margin the extensor tendons, which have been carefully separated from the bone.

Fig. 2. Resection of the End of the Ulna. A T incision (Fig. 8) being made, the surgeon proceeds carefully to isolate the end of the bone; a strip of cloth is next drawn under the bone, and it is divided upon this with the chain saw; the operation is completed as seen in Fig. 7.

Fig. 3. Extirpation of the third Phalanx of the Middle Finger. A longitudinal incision is made of sufficient length to allow the operator to get at the articulations. The bone is first separated from the second phalanx, and then from its connection with the metacarpal bone.

Fig. 7. Resection of the Carpal Extremity of the Radius. A sort of L incision (Fig. 8) is made, the flaps are dissected up, the bone isolated so as to admit of a compress being placed below it, and over this a chain saw is passed, with which the bone is divided. The surgeon, after having opened the radial articulation, raises the fragment of bone, and finishes the operation by dividing the ligamentous connection on the inner side of the bone with the knife. A bent spatula, or blunt hook, draws outward the aponeurosis, the radial nerves and vessels, and the extensor tendons

of the thumb, as well as those of the two carpo-radial extensors. On the inner side of the wound are seen the extensor tendons of the fingers. At the bottom of the wound the fibres of the pronator quadratus muscle are brought into view. The first steps of this operation, as will at once be seen, are precisely the same as in Fig. 2.

Fig. 9. Resection or Extirpation of the Radius Entire. A longitudinal incision over the whole length of the radius is made through the skin and aponeurosis, and from the lower end of this, an incision at right angles is made over the back of the wrist. The supinator radii longus and the two radial extensors, (1,) are separated from the inner side of the bone, the radius is isolated and divided in the middle. The lower half of the radius is removed, after being divided a second time, to avoid injuring the two extensor muscles of the thumb, (2.)

The posterior lip of the wound (3) is formed by the margin of the extensor muscles. To effect the isolation of the upper fragment, the supinator brevis, (4,) which enclosed the bone, has been divided longitudinally. The point of the operation shown, is when the surgeon, having isolated and raised the upper fragment, is about to sever its connection with the condyle of the humerus.

Ref. 5. Articular surface of the first range of carpal bones.

Fig. 12. Resection of the Distal End of the Metacarpal Bone of the Forefinger. The bone is divided by the forceps, without wounding the palm of the hand.

Fig. 11. Excision of the Elbow Joint. From Fergusson. A crucial or H incision should be made, as the case requires a more or less extensive wound in proportion to the extent of disease in the bone. In this case, the disease being extensive, the H incision (Fig. 13) is required. The ulnar nerve should be carefully preserved, and held aside; the insertion of the triceps should be divided, and the ends of the bones, but slightly retained by their ligaments, are turned out of the wound by slightly flexing the forearm; the soft parts are detached as much as necessary, by cutting upon, and close to, the bones; the extent of ulceration or injury is then

ascertained, and, by the application of the saw, the unsound parts may be removed.

A copper spatula may be used to protect the nerve and soft parts, while the bones are sawed. The cutting bone-forceps may be substituted for the saw with young patients, and the gouge may be used for the purpose of scooping away small portions of carious bone which cannot be removed by either forceps or saw. Any arteries that require it having been tied, the wound is closed by two or three sutures and slips of plaster, and the limb placed, half bent, on a pillow. The ends of the bones will unite by ligament.

PLATE LVIII.

Fig. 1. Resection of the lower End of the Humerus. Process of Moreau. The patient is laid upon the abdomen, and the left arm, carried a little outward from the trunk by an assistant, presents its posterior surface upward. With his other hand the assistant may compress the trunk of the brachial artery. The drawing represents the operation as nearly finished.

The flap is formed of the integuments, and of the inferior end of the triceps muscle.

The inner border of the wound is formed by the divided triceps.

The outer border of the wound is formed by the supinator radii longus and the radial extensor.

The bottom of the wound is formed by the posterior surface of the brachialis anticus.

The olecranon and the end of the radius are also seen.

The ulnar nerve is seen on the ulnar side of the wound.

Fig. 3. Resection of the entire Joint. From Bour-

GERY. The patient is placed in the same position as described in connection with Fig. 1. The operation is shown on Plate LVII. Fig. 11.

Fig. 2. Method of dressing the wound in either case described above.

Figs. 4, 5. Incisions practised in Figs. 1, 3.

Figs. 6, 12. RESECTION OF THE HEAD OF THE HUMERUS. PROCESS OF BOURGERY. The patient is placed in the sitting posture, and the arm raised by the left hand of the surgeon.

An assistant with one hand draws the head of the patient away from the affected side, while with the other he compresses the artery above the clavicle. The surgeon enters the knife at the back part of the articulation, an inch and a half above the posterior fold of the armpit. The knife is pushed onward round the bone, through the arm, and brought out below the acromion. The knife is carried down the bone, so as to make two incisions, each three inches long. The knife is to be withdrawn, and a compress passed through the wound, as in the figure, to raise the upper bridge of muscles. The arm is now to be taken by an assistant, and the surgeon, with a common scalpel, separates the attachment of the biceps round the neck of the humerus, and passes a compress below it, the two ends of which are to be drawn downward and backward, in order to carry out of the way the muscles, nerves, and vessels that occupy the armpit. The capsule and the tendons of the articular muscles are next to be cut, and the bone to be divided by the chain saw, as seen in the figure. The capsule is next divided on its posterior face, and the fragment luxated through the anterior opening.

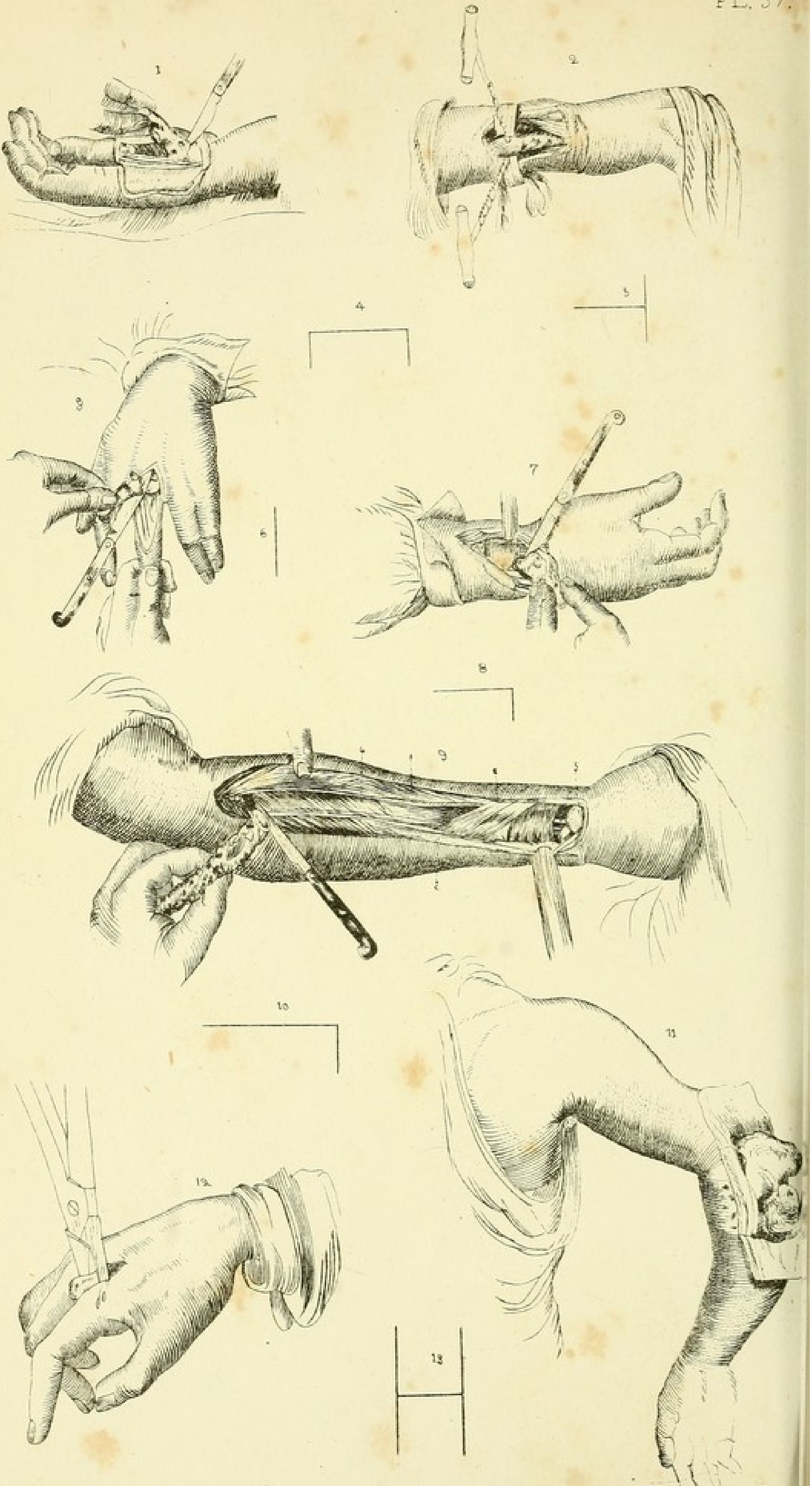
Fig. 7. Appearance of the wound after resection by the process of Bourgery.

Fig. 11. Closure of the wound after the operation described above.

Figs. 9, 10. RESECTION OF THE HEAD OF THE HUMERUS. PROCESS OF SYME. A V incision (Fig. 9) is made, and the flap dissected up so as to expose the joint. The capsule is to be divided across, the finger introduced into the joint to serve as a guide to the knife in the section of the articular tendons. The bone is now dislocated forward, and the knife carried behind the head, so as to separate the soft parts; a compress, or piece of card or wood, is to be passed between the humerus and soft parts, and the diseased portion cut off with the saw.

Fig. 8 shows the mode of closing the wound in this case.

PL. 57.



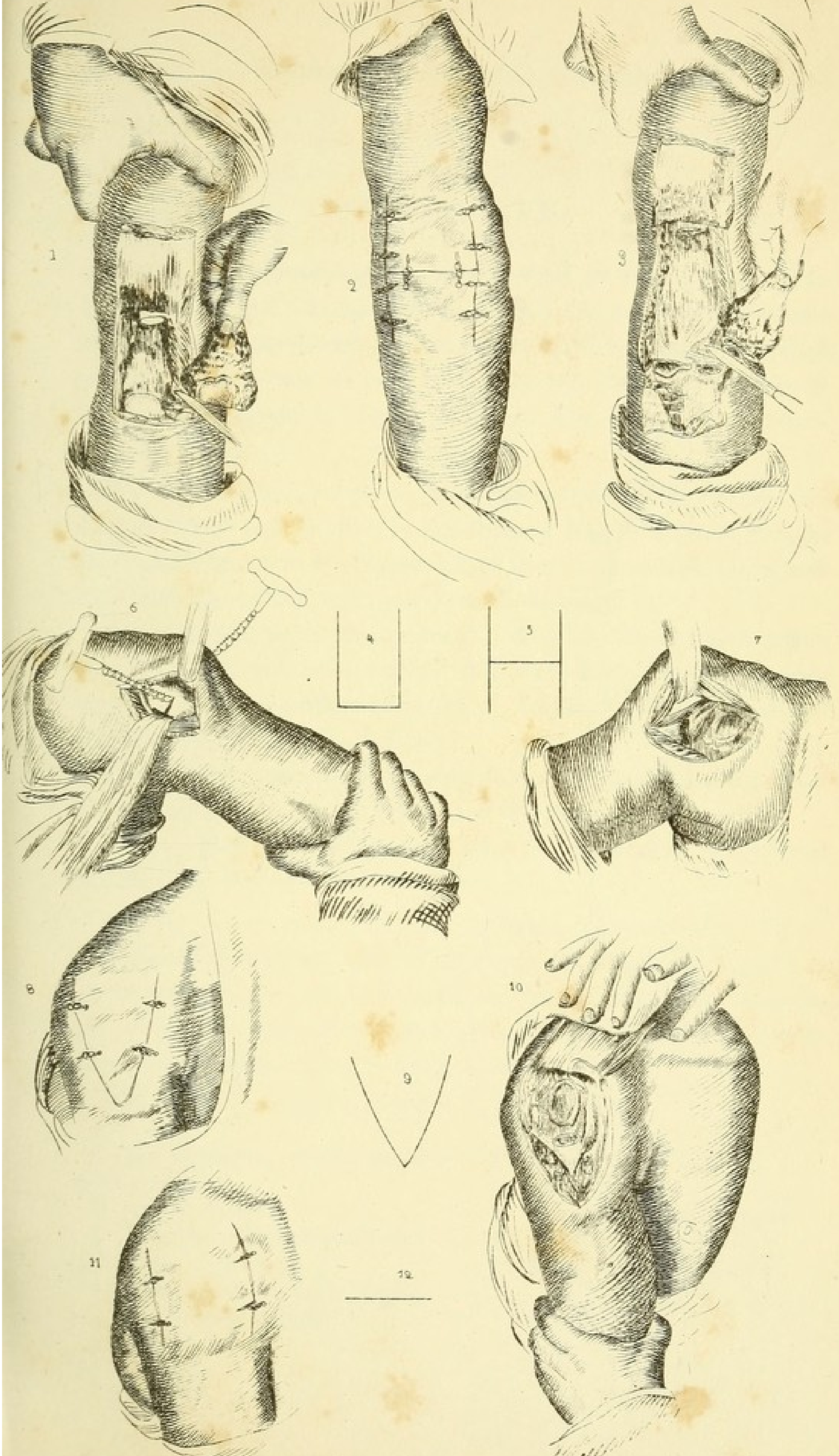

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PLATE LIX.

Fig. 1. Resection of the lower End of the Fibula. An L incision (Fig. 7) is made, and the flap dissected up and turned back; the bone is isolated so as to pass a band beneath it on which to work a chain saw, as seen in the figure. After the bone is divided, the fragment is turned out, as in Fig. 5, and disarticulated with the knife.

Fig. 2. Extirpation of the Metatarsal Bone of the Great Toe. An incision in the form of Fig. 3 is made, and the flap turned up, as in the figure. The bone is disarticulated at both ends with the scalpel, and turned out of its place.

Fig. 4 shows the parts exposed. Refs. 1. The internal cuneiform bone. 2. Extensor tendon of the great toe. 3. Interosseous muscle. 4. First phalanx of the toe. At the bottom of the wound are seen the interosseous vessels.

Fig. 5 shows the operation nearly finished. At the lower part of the wound are seen the tendons of the two long peronei muscles.

Fig. 9. Refs. 1, 1. Flaps reverted. 2. Tendons of the peronei muscles. 3. Bed of the bone.

Fig. 6. Resection of the lower End of the Tibia. This operation, together with resection of the fibula and upper end of the astragalus at the same time, may be practised; but amputation of the limb is preferred by most surgeons. The figure shows the operation on the point of being finished.

Fig. 11 shows the parts involved in the operation.

1. Rectangular flap of skin turned up on the leg.
2. End of the tibia.
3. Tendons of the anterior tibial, and extensor muscles.
4. Tendons of the flexor longus, and posterior tibial muscles.
5. Inferior end of the fibula.
6. Peroneus tertius.
7. Long flexor of the great toe.
8. Internal saphena vein.
9. Surface of the astragalus.

Figs. 8, 10. Resection of the Ankle Joint entire. Process of Moreau. The operation is shown at the moment of termination. An incision of the form of Fig. 10 has been made over each bone of the leg, and the two cutaneous flaps reverted. On the side of the wound are seen the tendons and flexor muscles of the toes, as well as the posterior tibial vessels and nerve, and the peroneal vessels. The internal saphena vein is seen, passing down on the inner face of the flap.

Fig. 12. Resection of the Ankle Joint entire. Process of Bourgery. A longitudinal incision is made on each side of the joint, and the soft parts carefully dissected up so as to pass a band on each side of the bone, as seen in the figure. The bones are divided with the chain saw, and the fragments disarticulated, as in Fig. 5, with the knife.

Fig. 15. Removal of the articular end of the astragalus with the chain saw.

Fig. 14. Closure of the wounds in the above operations.

PLATE LX.

Fig. 1. Resection of the Shaft of the Fibula. Process of Seutin. An incision is made along the external border of the fibula, dividing the skin and peronei muscles down to the bone. The lips of the incision are held asunder by an assistant, while the surgeon separates them on each side from the bone. A compress is passed beneath the middle of the bone, and at this part it is first divided with the chain saw; the lower and upper parts are separated in the same manner.

Fig. 6 shows the parts exposed in the above operation.

1, 1. Peroneus longus.
2, 2. Peroneus secundus.
3, 4. Portions of the fibula.
5. Peroneal vessels.

Figs. 2, 3, 4. Resection of the Radio-carpal Articulation entire. Process of Bourgery. The soft parts are separated entire in two masses, so that the various nerves, vessels, tendons, &c., are undisturbed in their relation to each other.

A longitudinal incision is made on each side of the joint; the soft parts are carefully dissected so as to admit of the passage of two bands, as seen in the figure. First, the radius is divided with the chain saw, as seen in Fig. 4; next, the first range of carpal bones.

Fig. 5. View of the resected joint, (Figs. 2, 4.)

Fig. 7. Closure of the wound after the operation described above.

Figs. 8, 10. Resection of the posterior Part of the Os Calcis. A T incision is made, and the flaps are dissected up, and turned back. Two converging sections of the os calcis are made with the saw between the insertion of the tendo Achillis and the place of origin of the plantar muscles from this bone. A third perpendicular cut is made with the saw, uniting the first two in a truncated angle. If the caries be superficial, it may be removed by a strong knife, gouge, or a Hey's saw; if it extend into the body of the bone, it may be scooped out with the gouge.

Figs. 11, 12. Extirpation of the Cuboid, and Resection of the Apophysis of the Os Calcis. In this case, the incision (Fig. 11) is made, and the cuboid bone first dissected out. In the figure, the articular extremity of the apophysis of the os calcis is seen being divided by a Hey's saw.

Fig. 9 shows the parts exposed by the operation.

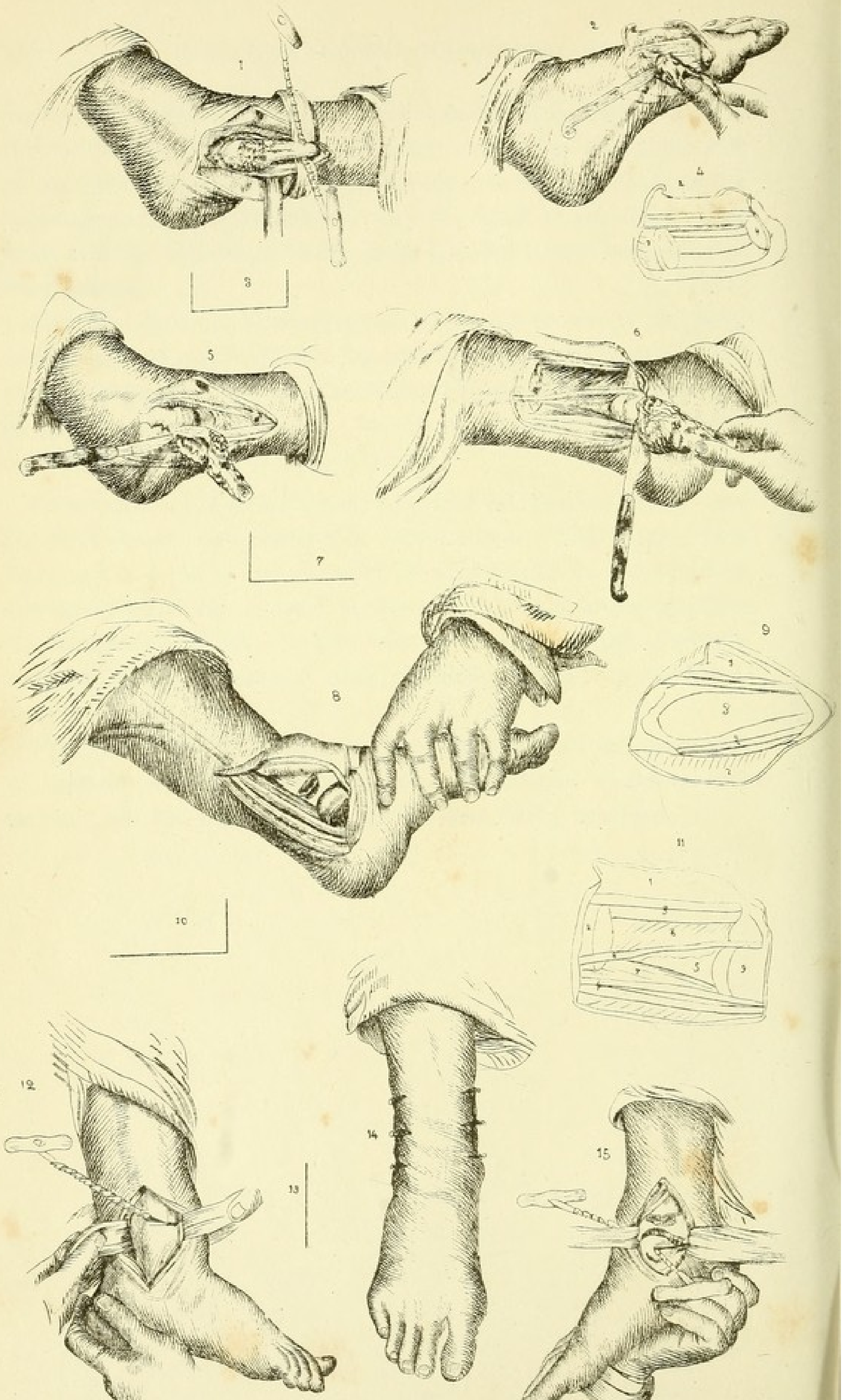
1. Flap of skin turned up.
2. Extensor muscle of the toes.
3. Tendon of the peroneus secundus.
4. Tendon of the peroneus longus.
5. Articular extremity of the last two metatarsal bones.
6. Middle cuneiform bone.

Figs. 13, 14. Resection of the Head of the Fibula. Process of Bourgery. An incision of the form of Fig. 13 is made, and the flap turned back. The fibres of the peroneus longus are now to be detached, and the bone denuded at the point where it is to be divided. This division is made as in Fig. 1, and the end of the fragment raised and moved from side to side, to favor its detachment from its articulation with the head of the tibia. The knife must be kept close to the bone, in order to avoid the anterior tibial nerves.

Fig. 18. Refs. 1. Vertical section of the upper part of the peroneus longus muscle, in order to lay bare the bone. 2. Anterior tibial vessels uninjured. 3. Articular surface of the tibia, which may also be resected if found diseased. 4. Lower fragment of the fibula. 5. Part of the peroneus longus muscle.

Figs. 15, 16. Extirpation of the Scaphoid Bone, and Resection of the internal Cuneiform. This figure from Bourgery is given as an example of what might be attempted in case of caries of the internal border of the tarsus, involving either the articulation of the scaphoid with the astragalus and cuneiform bones, or the latter bones at their place of junction with the metatarsal.

Fig. 17. Refs. 1. Tendon of the long flexor of the great toe. 2. Adductor muscle of the great toe. 3. Vertical section of the scaphoid, all the internal mass of the bone being removed.



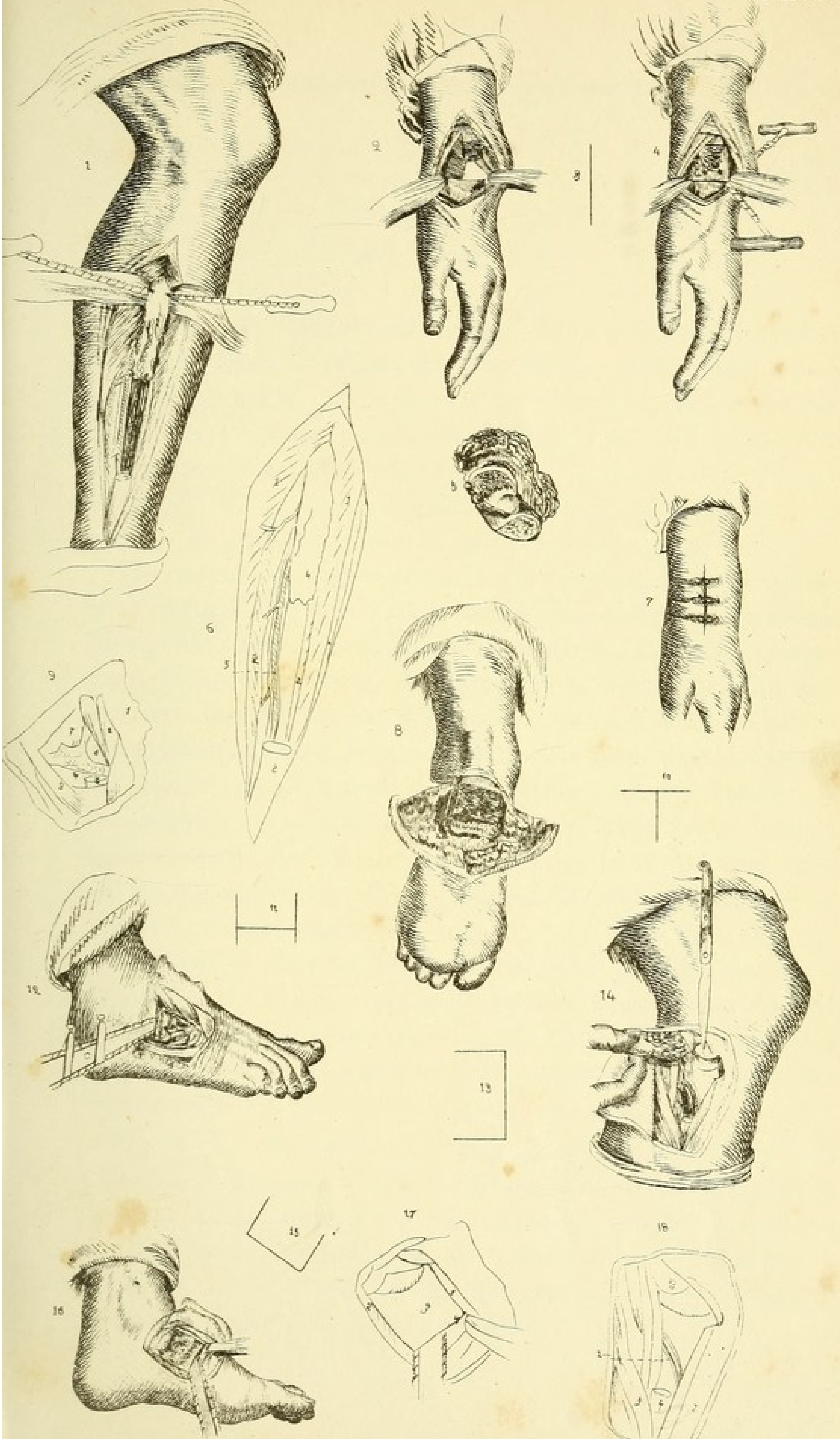


PLATE LXI.

Figs. 1, 3, 6. Resection of the Knee Joint. Process of Moreau. Refs. 1. Upper flap. 2. Hollow space which is occupied by the patella. 3. Surface of the fibrous capsules of the condyles. 4. Popliteus muscle. 5. Section of the end of the tibia. 6. Section of the end of the femur.

Fig. 2. In this figure, the end of the femur being removed, the surgeon is employed in sawing the head of the tibia.

The operation is performed in the following manner: An incision of the form of Fig. 6 is made; the incision uniting the longitudinal ones is made across the limb below the patella; the knife is carried through the skin, fascia, and ligaments to the joint. The flaps are next dissected up, the upper one carrying with it the patella. A scalpel should then be carried along close to the posterior face of the joint, to detach it from the soft parts without injuring the popliteal vessels. A wooden splint, or a piece of thick leather, is to be passed between the soft parts and posterior face of the thigh bone, and the diseased surface of the condyles divided from above downward with the amputating saw.

The head of the tibia should be divided in a similar manner, as seen in Fig. 2. If the patella is not diseased, it should be preserved. The wound may be closed as in Fig. 3. After the operation, it is important to keep the parts as quiet as possible; for this purpose the apparatus for fractured thigh may be applied.

Figs. 9, 4. Resection of the external Half of the Clavicle. A crucial incision is made, and the flaps dissected back, by which the acromial half of the clavicle is exposed. A compress is passed below the middle of the bone, and it is divided with a chain saw. In this stage of the operation the surgeon is about to divide the acromio-clavicular articulation.

1, 1, 1, 1. The four flaps of the skin, formed by the crucial incision.

2. Insertion of the trapezius muscle, separated from the upper margin of the bone.

3. Separation of the deltoid from the lower margin of the bone.

4. Subclavius muscle.

Figs. 5, 8. Resection of the Upper Half of the Scapula. Process of Janson.

1. Section of the integuments on the back of the shoulder.

2. Section of the upper part of the trapezius muscle.

3. Section of the levator scapulæ.

4. Section of the deltoid.

5. Section of the rhomboideus.

6. Section of the infra-spinatus muscle.

7. Section of the subscapularis.

8. Perpendicular cut through the acromion process.

9. Angular division of the body of the scapula below the spine, the glenoid cavity and the articulation of the shoulder joint being preserved.

10. Bottom of the wound occupied by the subscapularis muscle.

11. The tendon of the supra-spinatus muscle divided, the muscle itself being removed with the portion of bone excised.

12. Ligature of the superior and posterior scapular arteries.

Figs. 11, 12. Resection of the Anterior Portion of the Third and Fourth Ribs. In the stage of the operation shown in the drawing, the surgeon, after having made the outer section of the ribs, raises the fragments with his left hand, and, having divided the intercostal muscles, detaches the portions of the two ribs by another cut near the junction with their cartilages. To protect the pleura from the action of the saw, an oiled compress has been introduced below the ribs, where it is sustained by the fingers of an assistant.

2, 3. Section through the pectoralis major and minor muscles, the diseased portions of which have been removed.

4. Perpendicular cut of the great pectoral muscle on the side next the axilla.

5. Fifth rib.

6. Place of the section of the two diseased ribs.

7. Fragment of the ribs united by the interosseous muscle and fascia.

8. Surface of the costal pleura below the portion of ribs to be resected.

9, 10. Ligature of the thoracic and intercostal arteries.

Excision of the Knee Joint. Mr. Fergusson directs the operation to be performed in the following manner: An incision three or four inches long should be made on each side of the joint, opposite the lateral ligaments, and a third should be carried across the fore part, so as to unite the whole like the letter H.

The ends of the lateral incisions should be at nearly equal distances above and below the articulation, and that in front should extend over the patella. This bone should now be detached by dividing the textures around it, close to its margins, and the soft parts should then be dissected upward and downward to a sufficient extent to permit of a thorough examination of the diseased bones. And, to facilitate this, as well as the future stages of the operation, the lateral and crucial ligaments should be divided; the saw, forceps, and gouge must be used according to circumstances. It will, in most instances, be requisite to apply the saw, and the forceps will not be so useful here as at the elbow. The diseased portion of the femur may be first removed, and then the head of the tibia, as also of the fibula, should they be involved in the affection. In using the knife in the posterior part of the joint, more care is required than in cutting deep into the elbow; for, in dividing the crucial ligaments, there is nothing between the instrument and the popliteal vessels but the posterior ligament, and some cellular tissue; in applying the saw, too, more care is required; yet, in either proceeding, I cannot recommend the introduction of a spatula of wood to protect these and other parts, as greater isolation of the bones is thereby produced than the circumstances warrant; for it appears to me, that the supposed danger can, by due caution, be avoided. If the patella be sound, the surgeon may use his discretion in leaving it. The wound should be carefully dressed, the margins brought together with stitches, the ends of the bones allowed to be in contact, and the limb should be steadily supported in the extended position by any convenient apparatus.

It may be remarked, that Mr. Fergusson prefers amputation above the knee in all cases to this operation.

RESECTION OF THE CLAVICLE. Dr. Mott removed nearly the whole of this bone in 1827. Dr. Warren removed the entire bone in 1832.

Mr. Fergusson says of this operation, "No set rules, further than those of the common principles of surgery, can be given for such operations." All those alluded to were evidently by the operators themselves deemed of the most formidable kind. This operation, as performed by Mr. Liston, is described in another part of the book.

RESECTION OF THE SCAPULA. PROCESS OF JANSON. Nearly the whole body of this bone was removed by Janson. The tumor, in the case operated on by this surgeon, occupied the subscapular fossa, and weighed nearly eight pounds when removed. He circumscribed it by two semi-elliptical incisions, nine inches in length, saving the integuments as much as possible, by dissecting them off from the lips of the incisions, so as to lay bare the base of the tumor. He next divided the attachments of the trapezius, supra and infra-spinatus muscles, and, discovering that the scapula above the spine was healthy, he divided the bone below the spine with the saw, thus leaving uninjured the articulation of the arm; the tumor was then loosened and removed. The wound left was six inches broad and nine inches long.

Cuming, in a case of gun shot wound, removed, after disarticulation of the arm, not only the clavicle, but the whole scapula with it, and the patient recovered.

RESECTION OF THE RIBS. Dr. Pancoast removed a portion of the ninth rib, in 1842. The pleura should not be injured, in these cases, if it can be avoided; yet M. Jacquet, in removing a portion of two ribs, opened the pleura without injury to his patient.

Portions of the sternum may also be removed. Of course, the incisions in these cases must be made according to the situation and extent of the disease. A thorough knowledge of anatomy, and of the resources of his art, are necessary to the surgeon who undertakes any of the formidable operations under consideration.

Partial Resection of the Vertebræ. An incision, from three to six inches long, is to be made over the tops of the spinous processes of the vertebræ. This is to be crossed at each end by a transverse incision, two or three inches long, which should divide the soft parts down to the bone. The flaps are then to be dissected up, and held apart with blunt hooks. The vertebral arch is next to be divided with a Hey's saw between the roots of the spinous and transverse processes, but nearer the latter, and the ligaments connected with the isolated piece are to be cautiously severed with the knife.

Partial Resection of the Pelvic Bones. Sir Astley Cooper removed successfully a part of the descending ramus of the pubis with a Machell's and a Hey's saw.

Van Onsevoort resected the whole of this bone. Of course, the surgeon must be governed in these operations by general principles, as the diseases for which they are required vary so much in their situation and extent, that no fixed rules can be given. In removing a carious portion of the ilium, an incision should be made along the edge of the crista, and a flap dissected off from the outer surface of the bone. The abdominal muscles are to be detached along its top, and drawn inward by an assistant, carrying with them the peritoneum and the edge of the iliacus internus. The bone may be detached with the Hey's saw and cutting forceps.

Resection of the Head of the Os Femoris. Method of Velpeau. A semilunar incision having been carried behind the articulation, from the anterior and superior spine of the ilium to near the tuberosity of the ischium, a large flap is to be cut, with its base downward, through the thickness of the muscles at the head of the limb. The flap is then to be raised, and the capsule opened on its posterior part; the thigh is next to be flexed, and carried inward, the round ligament divided, and a knife passed between the head of the femur and cotyloid cavity, — carried down along the neck of the femur, so as to divide the remains of the capsular ligament, and allow the head of the bone to be pressed outward through the wound; the diseased portion is next to be removed with the saw; the limb is then to be placed in its natural position, and the flap fastened down with the twisted or interrupted suture.

Professor Pancoast prefers the process of Jaeger, which is as follows: A longitudinal incision on the external part of the thigh is to be commenced two inches above, and extend (cutting down to the bone) three inches below, the trochanter. From the top of this incision, another, four inches long, is to be carried backward and downward. The triangular flap thus formed is to be dissected off from the trochanter, and the bone turned out and excised as in the process of Velpeau.

PLATE LXII.

Fig. 1. Resection of the Chin. The lip is divided in the middle line, and the section continued down to the os hyoides. The flaps are dissected up and turned back, and the two canine teeth extracted to give passage to the saw, with which the jaw is divided vertically on either side of the chin. Previous to detaching the bone, a fine silver wire is passed through the genio-hyoglossus muscle, to prevent the convulsive retraction of the tongue backward. An assistant holds the wire, while the surgeon, with the left hand, draws downward the fragment of the jaw, and with the bistoury divides the insertion of the genio-hyoglossus, and genio-hyoid, and mylo-hyoid muscles.

Fig. 6. Incision in the case above described.

Figs. 2, 4, 11. Resection of the Upper Jaw. Method of Warren, modified by Velpeau. A semilunar incision is made from the commissure of the lips to the middle of the space between the external canthus of the eye and the point of the ear, as shown in Fig. 11, and the flap dissected off, and turned up, or held as in Fig. 2. The zygomatic arch, the external angle of the orbit, the nasal process of the upper maxilla, and the palatine arch between the second incisor and canine teeth, are all necessarily divided, and the fat of the orbit carefully detached from the floor of the orbit without injury to the ball. The stage of the operation shown in the figure is that in which the surgeon loosens the bone with his left hand, while with a knife in his right he detaches from above downward the soft parts from the bone on the side of the zygomatic fossa.

Fig. 3.

1. Section of the upper maxillary bone.
2. Palatine arch.
3. Section of the zygomatic arch.
4. Section of the external orbital process.
5. Section of the nasal process of the upper maxillary bone.
6. Eyeball, surrounded with its mass of fat.
7. Posterior opening of the nasal fossa.
8. Border of the temporal muscle. Below it is seen the zygomatic attachment of the masseter muscle.
9. The tongue.

Fig. 12. Closure of the wound after the removal of the bone by incisions made according to the process of Gensoul.

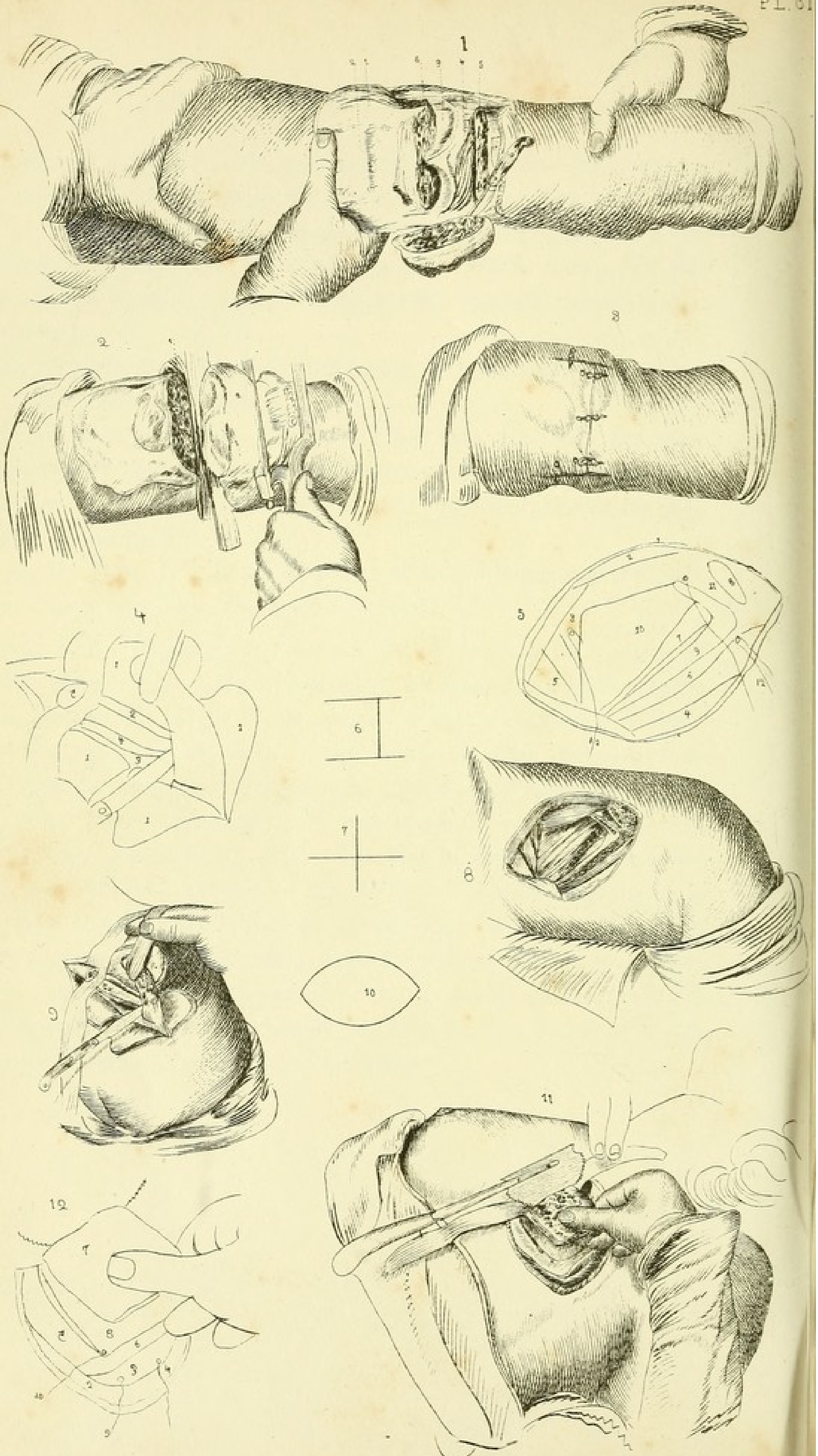
Figs. 5, 10. Resection of the Lower Jaw. An incision is made, commencing (Fig. 10) at a point below the lobule of the ear, and carried round, in the line indicated on the figure, to a corresponding point on the opposite side. The facial artery is divided in this incision, and must be secured with a ligature. The flap thus circumscribed is dissected up from the bone, commencing at its middle portion. The flap is next turned up, and the jaw isolated by dividing the platysma, and the mylo-hyoid muscles. Next a silver wire is passed through the genio-hyoglossus muscle, and brought out between the lips, and given in charge to an assistant; after which, the attachments of the tongue may be divided with impunity. The jaw is thus isolated, and its inner side is sawed through at the symphysis to facilitate the disarticulation of each ramus. In the drawing, the right half has been removed, and the surgeon is about disarticulating the remaining half. The trunk of the internal maxillary artery has been tied so as to prevent hemorrhage from its various branches,— the inferior dental, the masseter, and pterygoid, — which have been cut in the operation. The assistant, who holds the flap, is to make pressure previously on the trunk of the carotid artery, till the stage of the operation arrives in which the internal maxillary can be secured.

Mr. Fergusson's method of performing this operation is described in another part of the book.

Pancoast says of this operation, " But one case only has been reported, and that but imperfectly authenticated, of this frightful operation, which has been well described by Vidal as the ne plus ultra of the surgeon."

Fig. 7. Refs. 1, 2, 3, 4. Contour of the wound, and the part from whence the bone has been removed.

Figs. 9, 8. RESECTION OF THE BODY OF THE JAW ON THE RIGHT SIDE. The points for dividing the bone being at the canine tooth, and at the origin of the ramus, a vertical incision is made through the lip to the base of the chin. Another incision, starting from the middle of the posterior part of the ramus of the jaw, is carried down to the angle, and then along the base of the jaw to the vertical incision at the chin. The flap is dissected off from the bone, and reflected upward on the cheek. The first molar tooth is removed to give room to the saw in dividing the bone. The bone is next separated by dissection from the soft parts on its inner face, and a guttered instrument passed below it, on the groove of which the chain saw of Jeffrey is passed, as seen in the drawing, for the purpose of making the section of the bone.



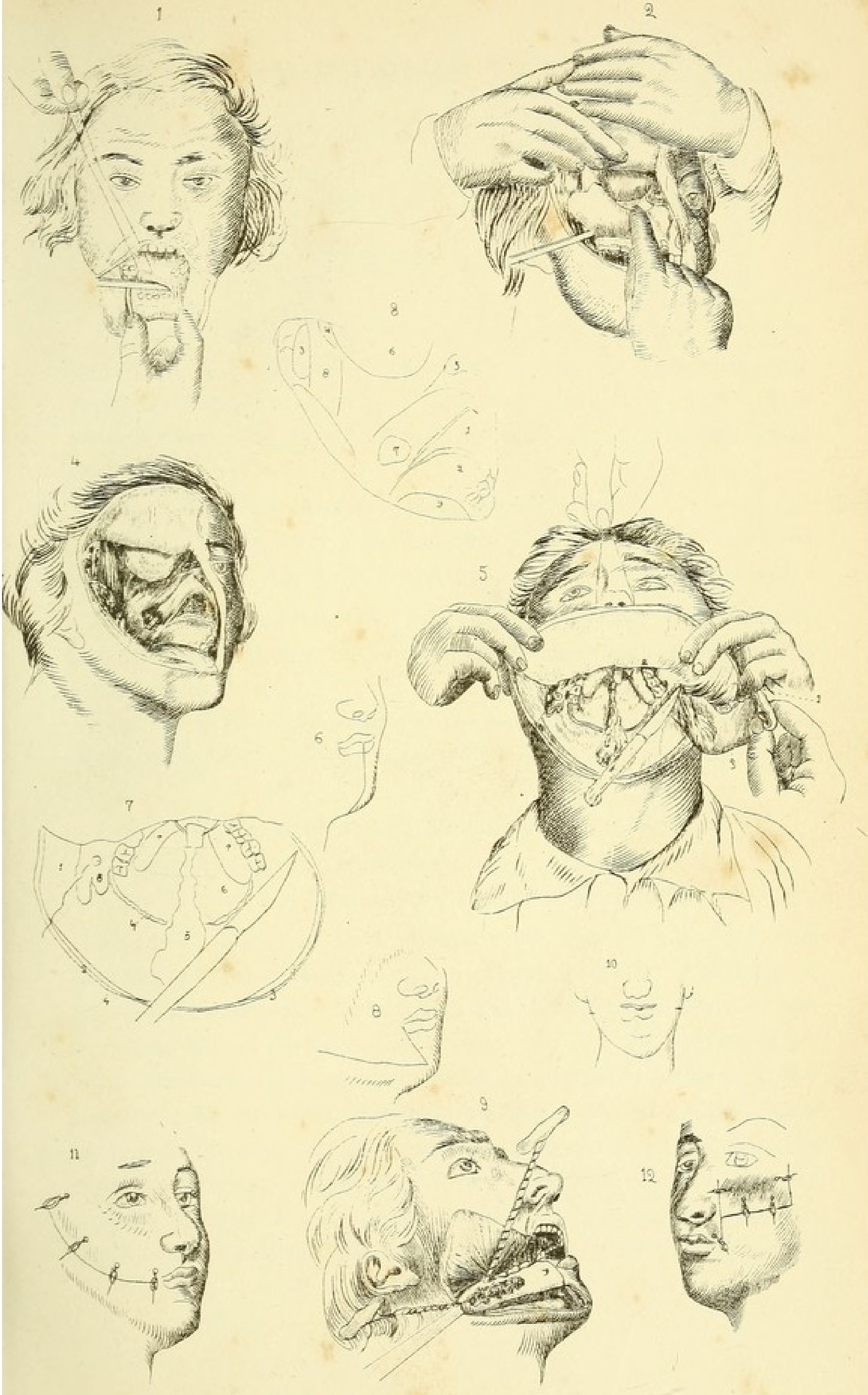


PLATE LXIII.

Fig 1. Bunion. This disease is caused by pressure. Narrow-toed shoes or boots, which crowd the ends of the toes upon each other, causing the extremity of the metatarsal bone of the great toe to become more prominent than natural, are the principal causes of this disease.

Figs. 2, 3. Scrofulous disease of the ankle joint.

Fig. 4. Taken from a patient who died from disease about the face and throat, occasioned by bad position of the wisdom tooth.

Fig. 5. Exostosis of the Little Toe. This disease, though frequently met with in the great toe, is rare in the smaller ones.

Fig. 6. Case of dislocation of the astragalus, in which the limb might have been saved by cutting down upon the bone and removing it.

Fig. 7. Cyst formed around the root of a decayed tooth.

Fig. 8. Paronychia, or whitlow.

Figs. 9, 10. Appearance of bones in cases of this disease.

Fig. 11. Removal of a Portion of the Lower Jaw for Malignant Affection of the Gums. From Fergusson. An incision was made directly downward from each angle of the mouth, as low as the base of the bone; the lip and soft parts between these wounds were then dissected towards the neck; next the anterior molar tooth was extracted on each side, and a slight notch made with the saw, similar to the one in Plate LII. Fig. 16; the same instrument was then applied in a horizontal direction, midway between the alveolus and the base, and a notch being made, the cutting forceps completed the separation. This patient made a good

recovery, and the jaw was left in a situation to have artificial teeth applied to it.

Fig. 12. ONYCHIA. ULCERATION ABOUT THE NAIL. In these cases, it is sometimes necessary to remove a portion of the nail. The operation is performed in the following manner: One blade of a pair of sharp-pointed scissors is passed along beneath the nail as far as its root; the blades are then brought together, dividing the part; the isolated portion is torn away by forceps.

Fig. 13. The sheath, and (Fig. 14) the enclosed bone, in a case of necrosed metatarsal bone of the great toe.

Figs. 15, 16, 17. Scrofulous caries, occurring in the phalanges and metacarpal and metatarsal bones of unhealthy children.

PLATE LXIV.

Fig. 1. Osteo-sarcoma of the lower jaw.

Exostosis of the Great Toe. Fig. 2. Macerated specimen. Fig. 3. Recent specimen.

Fig. 4. Onychia Maligna. From a cast in the King's College Museum.

Fig. 5. Spina Ventosa. From a specimen in the collection of Mr. Nasmyth, of Edinburgh.

Fig. 6. Operation for Disease of the Antrum. If either of the molar teeth be loose or carious, it should be extracted, and a trochar be pushed through the socket into the antrum. But if all the teeth are sound, or if they have all been extracted before, an incision should be made through the membrane of the mouth, above the alveoli of the molar teeth, and the bone be pierced by a strong pair of scissors, or trochar, as represented in the figure. The cavity should be frequently syringed with warm water. If the discharge continue profuse and fetid, search should be made for loose bone, which should be removed immediately, the aperture in the jaw being enlarged if necessary.

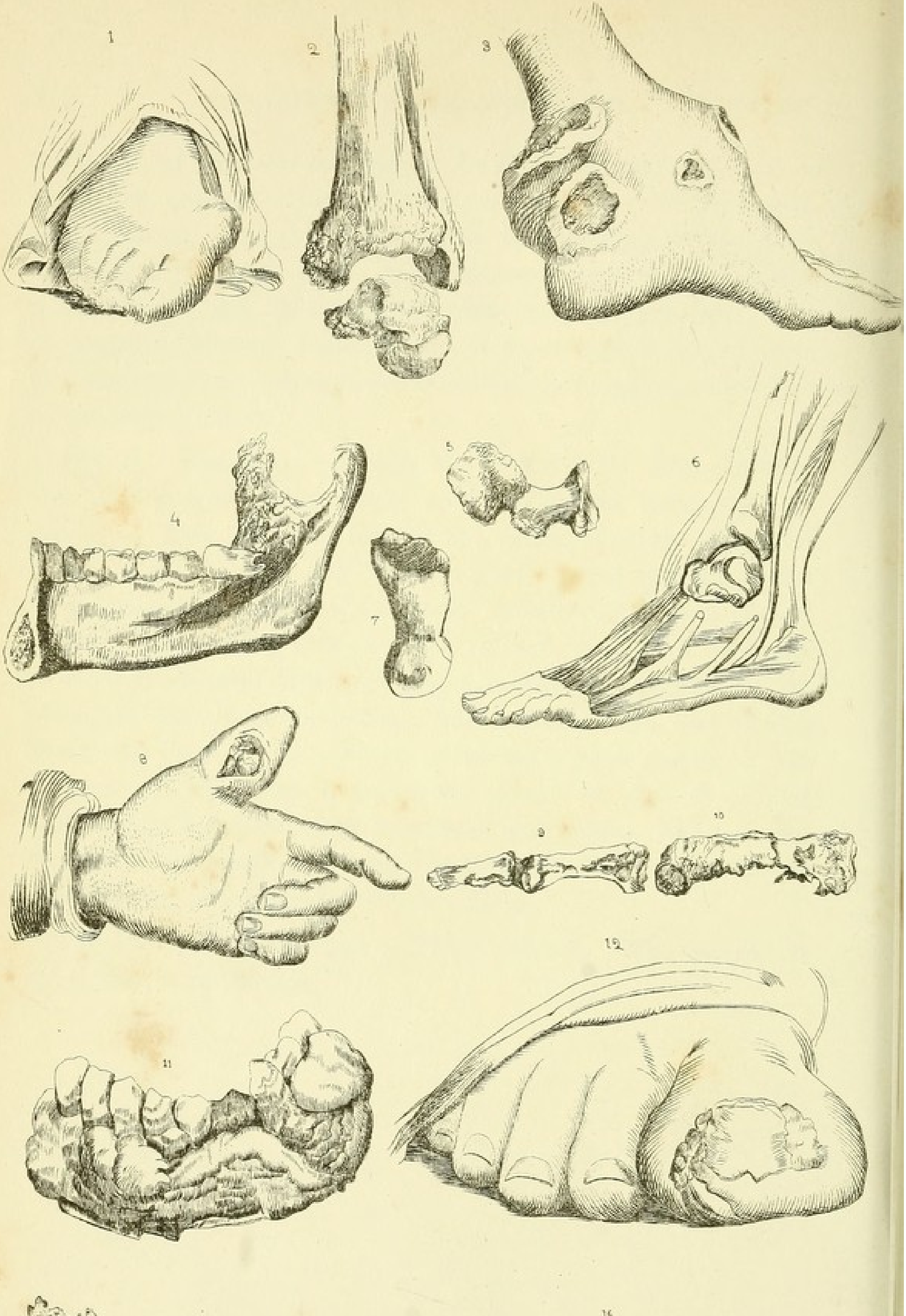
Fig. 8. Epulis signifies a tumor formed by hypertrophy of the gum, without apparent alteration of structure. It should be removed without delay. The tooth on either side must be extracted, and the tumor cut out entirely, a portion of the bone being also removed if necessary.

Fig. 7. Carious Teeth. From the presence of carious teeth, or decayed portions of teeth, (says Mr. Liston,) many evils, both local and general, ensue, besides inflammation and abscess. They are frequently the cause, and the sole cause, of violent and continued

headache ; of glandular swellings in the neck, terminating in, or combined with, abscess ; of inflammation and enlargement of the tonsils, either chronic or acute ; of ulcerations of the tongue or lips, often assuming a malignant action from continued irritation; of painful feelings in the face, tic douloureux, pains in the tongue, jaws, &c. ; of disordered stomach, from affection of the nerves, or from imperfect mastication, and of continued constitutional irritation, which give rise to serious disease.

Fig. 9. Removal of the Clavicle. By Mr. Liston. The clavicle was first cut down upon, the incision being made to diverge a little on each side of the tumor, towards its mesial aspect, as in Fig. 10. The bone was partly sawed through, within three quarters of an inch of its sternal extremity, and then clipped across by the cutting forceps. The cut end was raised by means of a screw elevator, (Plate LI. Fig. 8,) which was fixed, as in the figure, in the medullary cavity. The incisions were then carried round the base of the swelling, including a large portion of the integument. The deep dissection was carried as close as possible to the tumor and bone, which it invested completely. The muscular fibres, and the conoid and trapezoid ligaments having been cut, no difficulty was experienced in disarticulation.

Fig. 11. Spina Ventosa. From Liston. The remedy in these cases is amputation.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PL 64.

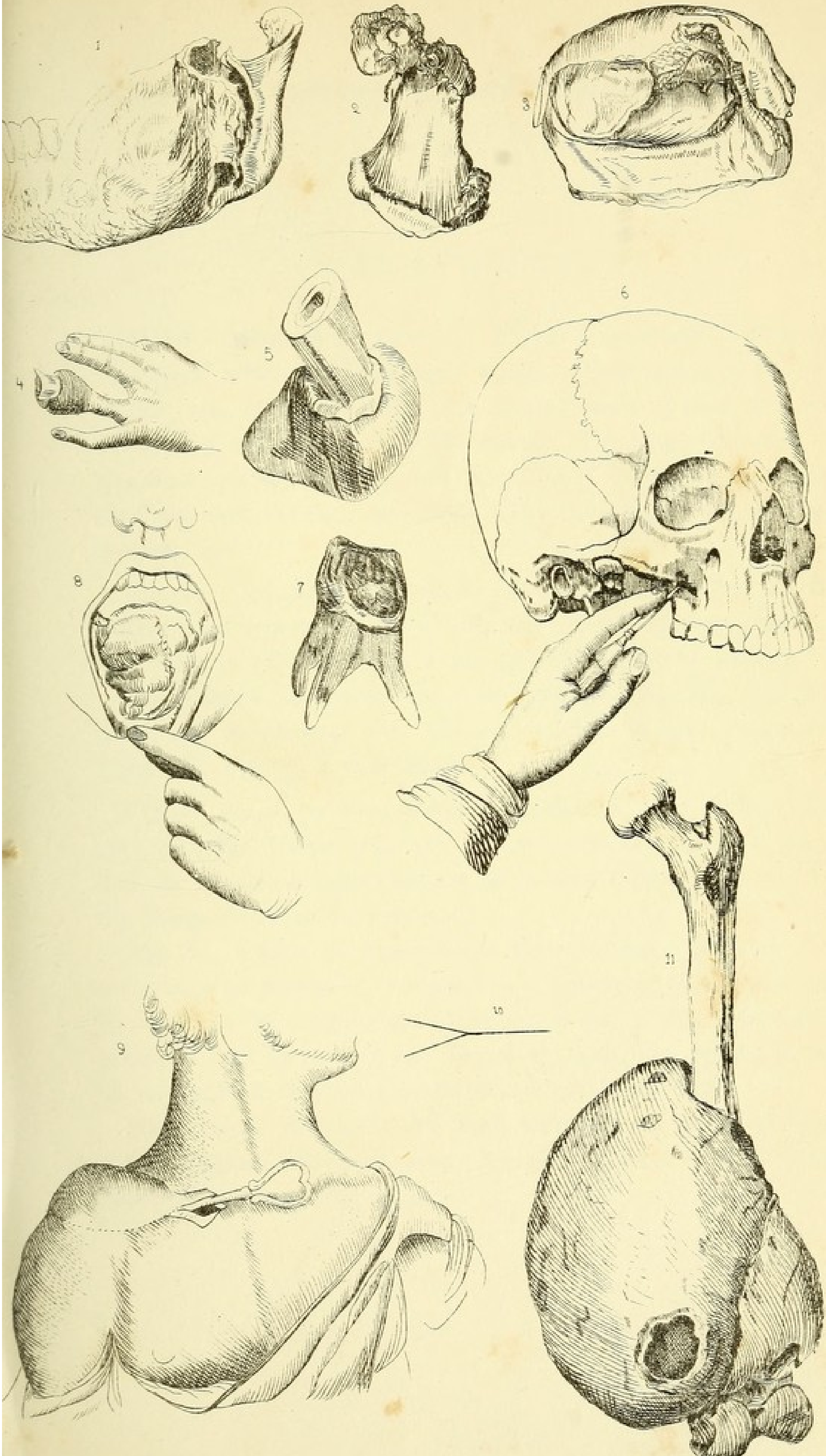


PLATE LXV.

Fig. 1. Morbus Coxarius. From Fergusson. This was the case of a boy of fifteen years of age. Four inches of the head of the bone were removed. The patient made a good recovery. The line of incision is seen in the figure. The head, neck, and trochanter major were isolated, and turned out of the wound, by twisting the limb over the opposite thigh. The bone was separated by a common saw.

Fig. 3. Congenital Malformation of the Hand. The fingers were separated by the knife, and the skin of the palmar surface made to unite with that on the dorsal by means of stitches.

Fig. 2 shows the appearance of the hand after the cure. To these cases, the dressing of thin silk and solution of gun cotton (see Plate IX. Fig. 6) is well adapted.

Fig. 4. Case of Deformity occasioned by a Burn. This case, says Mr. Liston, "is from a very horrid and atrocious scoundrel, the companion and assistant of Messrs. Burke, Hare, and Co., the Thugs of the modern Athens."

Fig. 5. Cases of permanent Contraction of the Fingers may be treated in various ways. Many of these cases may be cured by the application of splints alone, if the treatment is persevered in for a sufficient length of time. In others, it may be necessary to divide the whole of the contracted tissues.

Subcutaneous division of the rigid textures, together with extension, will succeed in many cases. These operations are still further described on succeeding pages.

PLATE LXVI.

Fig. 1. Section of the infra-orbital nerve.

Fig. 2. Section of the palmar aponeurosis for permanent contraction of the fingers. Process of Dupuytren. A splint, to which the fingers are to be bandaged, is represented behind the hand.

Fig. 3. Section of the frontal nerve.

Fig. 4. Section of the palmar aponeurosis. Process of M. Goyrand.

Fig. 5. Section of the sterno-mastoid muscle. The operation is performed with the straight bistoury, passed under the muscle on a grooved director.

Fig. 6. Section of the palmar aponeurosis. Process of Sir Astley Cooper.

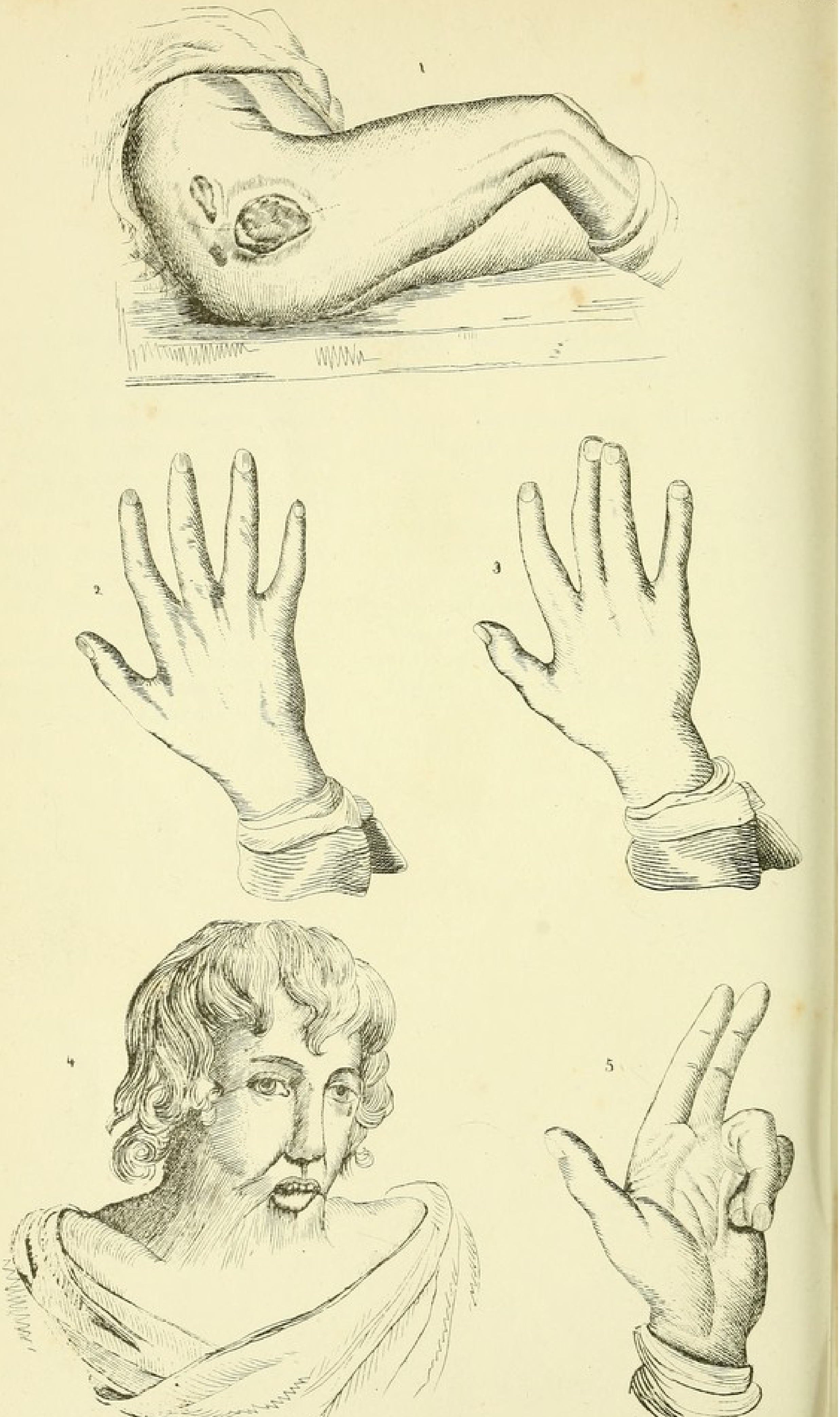
Fig. 7. Ulceration round the toe nail; removal of the diseased flesh. Process of Dupuytren.

Fig. 8. Section of the tendo Achillis. Process of M. Stromeyer.

Fig. 9. Removal of the nail, with the diseased mass of flesh round it. Process of Lisfranc.

Fig. 10 shows the above case after division of the tendon.

Fig. 11. Case of club foot.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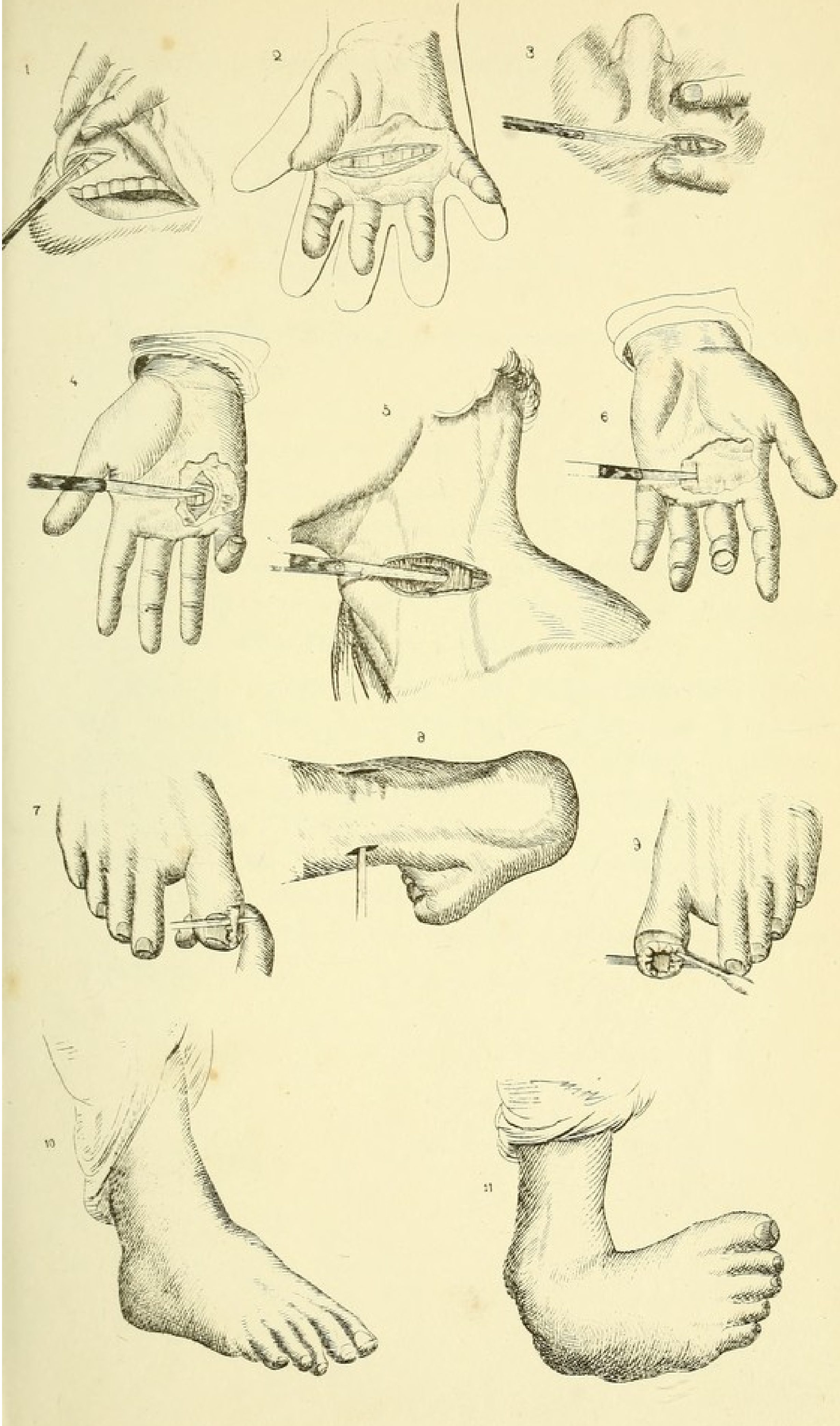
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PLATE LXVII.

TALIPES. The treatment of this and kindred cases is described in succeeding pages.

Fig. 1. TALIPES VALGUS. In this case, the outer edge of the foot is raised up, and the patient walks on the inner ankle.

Fig. 2. TALIPES CALCANEUS. In this case, the tendon of the tibialis anticus and the common extensor tendons were divided, and by this means the foot brought into a more natural position.

Fig. 3. TALIPES EQUINUS. In this form, the heel is raised, and the patient walks on the ball of the foot.

Figs. 4, 5. TALIPES VARUS. This is the most common distortion. In these cases, the heel is raised, the inner edge of the foot drawn upward, and the whole foot is twisted inward; so that the patient walks on the outer edge — in some cases on the dorsum of the foot, (Plate CLXXV. Fig. 1.)

Figs. 6, 7. Mr. Liston's apparatus for the treatment of cases in which the tendo Achillis has been divided.

Fig. 8. Apparatus for the treatment of rûpture of the extensor tendons of the foot.

PLATE LXVIII.

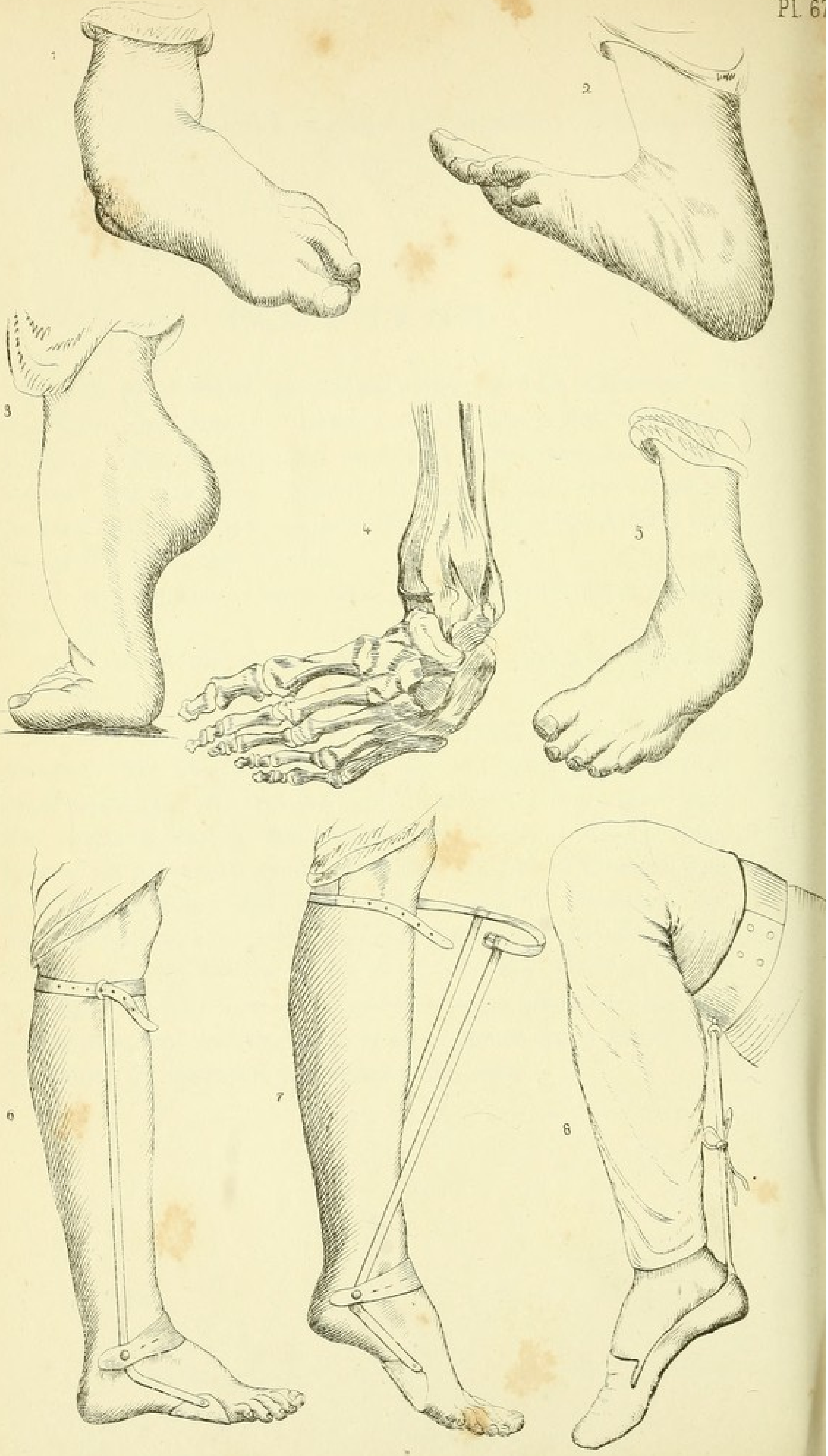
Figs. 1, 2, 3. Case of Contraction of the Tendons of the Knee and Ankle. From Liston. The patient was a girl of fifteen. The operation was performed in the following manner: A needle was introduced under the tendons in the ham—those of the semi-tendinosus and semi-membranosus; the tendo Achillis was also at the same time divided.

The usual apparatus was applied to the foot, and the apparatus, Fig. 3, to the knee.

Fig. 2 shows the appearance of the limb one year after the treatment.

Fig. 4. Treatment of Varicose Veins by the Twisted Suture. The surgeon pinches up the vein between his left fore-finger and thumb, and passes a needle behind it; it is a good plan, also, to pass another at right angles, which should be made to transfix the vein twice, and should go behind the first; a thread is then to be twisted round them tight enough to stop the circulation; and this may be done at as many places as the surgeon thinks requisite. The points of the needles should be cut off; they should be allowed to remain till they have begun to create slight ulceration; and it is better, unless the irritation is too great, to permit one or two of them to separate by ulceration quite through the vein.

Pl. 67



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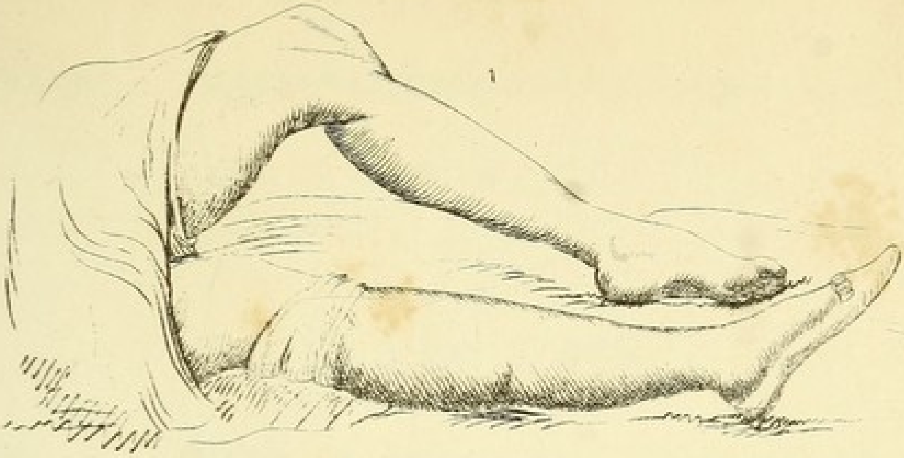

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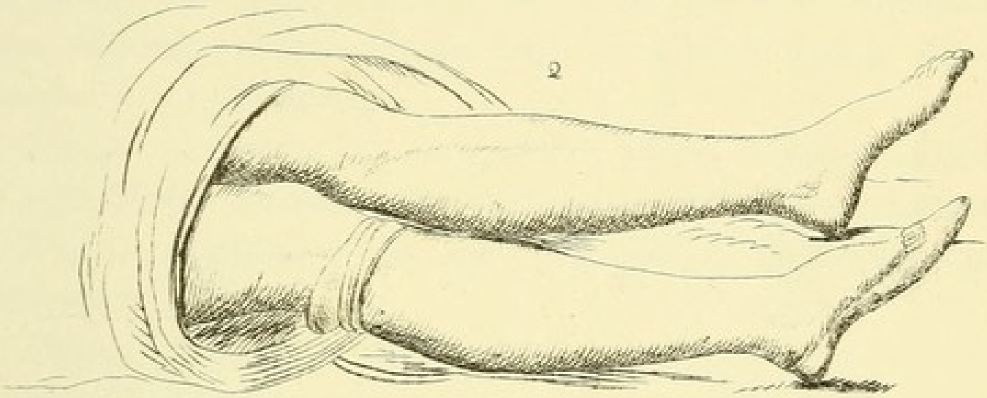

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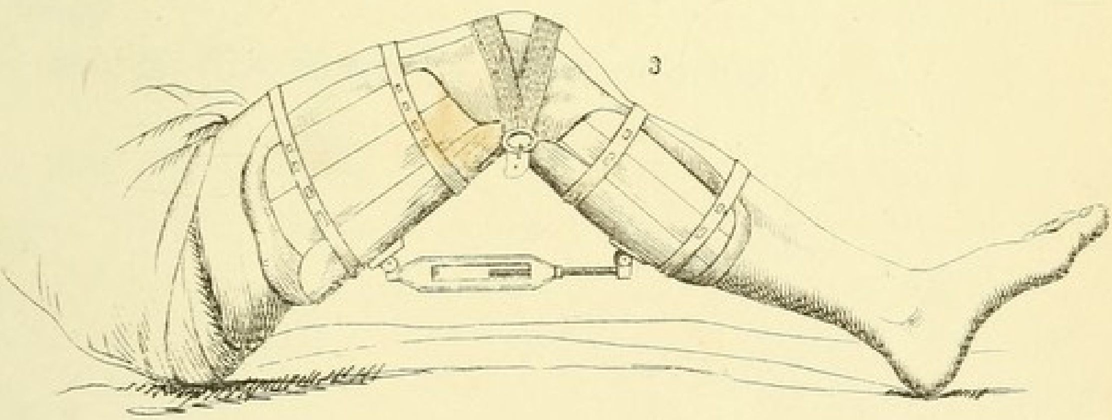

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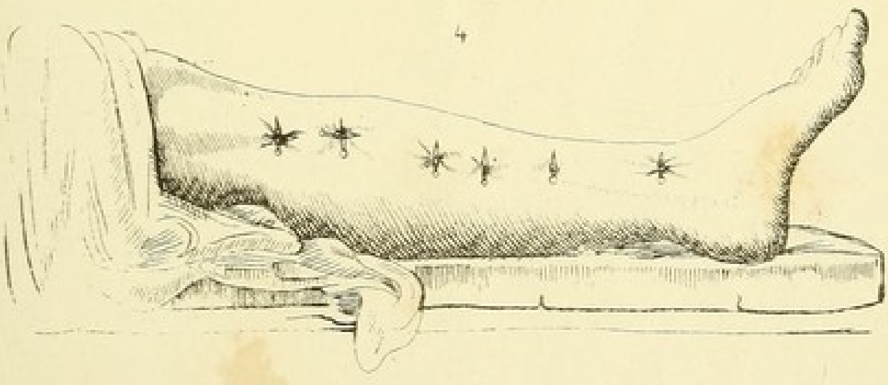

PLATE LXIX.

Fig. 1. Aneurism by Anastomosis. This case was treated by Dr. Maclachlan, of Chelsea hospital. Needles were introduced as in the case Plate LXVIII. Fig. 4, and in seven months a cure was effected. Eight needles only were used during the whole course of the treatment.

Fig. 2. Aneurism by anastomosis. From a preparation in the King's College Museum, showing an enlarged and tortuous artery.

Fig. 3. Instrument for the treatment of enlarged veins by pressure.

Fig. 4. Application of Fig. 3.

Fig. 5. Treatment of varicose veins by torsion.

Fig. 7. Treatment by ligature and division of the enlarged vessel.

Fig. 6. Case of varicose veins, from Liston.

PLATE LXX.

Fig. 1. Amputation of the Breast. From Bourgery. Pressure being made, as in the figure, the surgeon makes a semi-elliptical incision below the nipple, along the lower border of the pectoralis major, and another on the upper and inner side of the nipple, so as to include the diseased part between them. He next dissects out the lower and outer part of the gland quite down to the pectoralis, (taking care not to get behind that muscle,) and then, cutting from below upward, he separates the remainder. The wound should be carefully examined to see that no portion of the diseased gland, or diseased tissue, is left behind. Arteries are next to be tied, and the patient to be put to bed, and after all oozing has ceased, strips of adhesive plaster may be applied, as in Fig. 3.

Fig. 2 shows the course of the first incisions.

Fig. 4. Gelatiniform cancer, from a preparation in the King's College Museum.

Fig. 12 exhibits the circular loculi as they appear on a section.

Fig. 11 shows the spherical character of the morbid growth itself.

Anatomical Characters of Malignant Growths. These growths are composed of two parts: first, of granules, — of cells rounded, or caudate, (Figs. 5, 6, 7,) containing nuclei, — younger cells, and granules, with a few fat cells and globules; and, secondly, of a fibrous tissue, or stroma, in which the former parts are embedded, which fibrous tissue sometimes appears to be the natural filamentous tissue; sometimes is formed of elongated cells (Figs. 8, 9, 10) that adhere by their extremities; sometimes of the distended parietes of old cells which have become filled by the growth of new ones in their cavity, and sometimes of a substance resembling the buffy coat of the blood.

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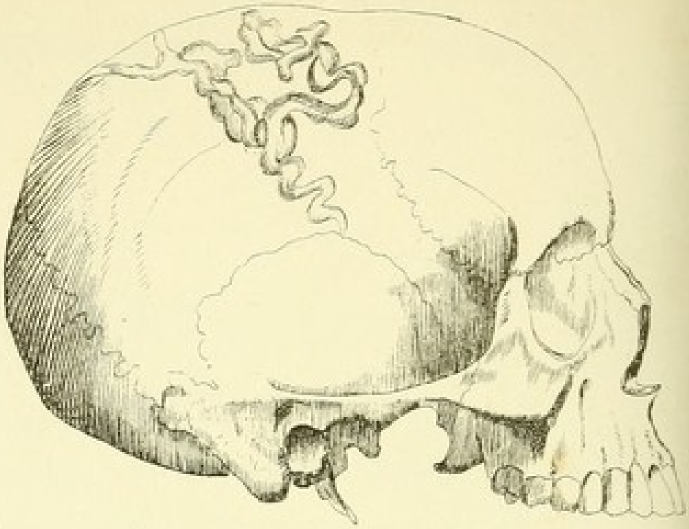

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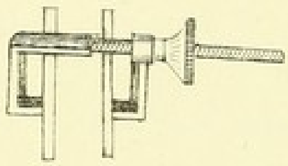

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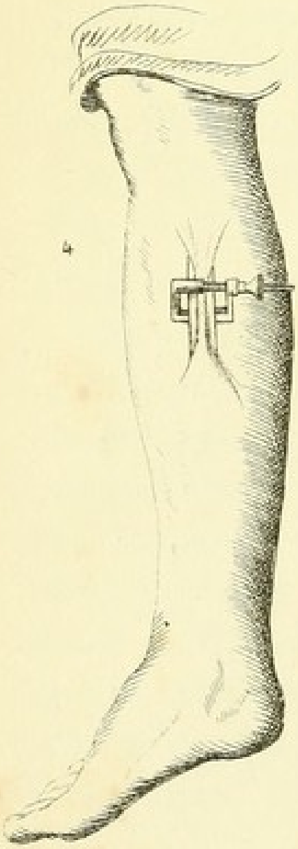

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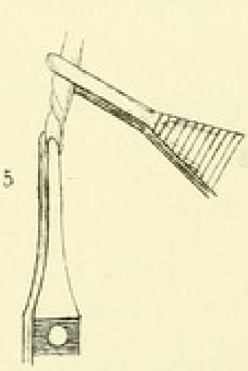

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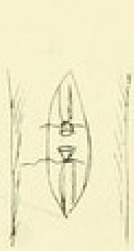

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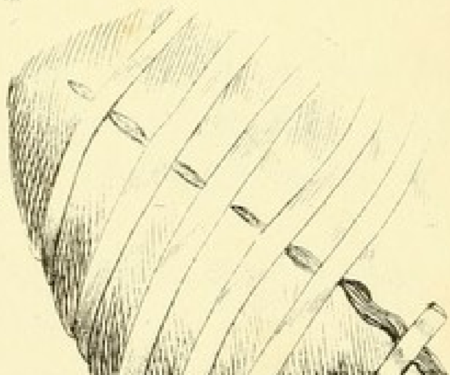

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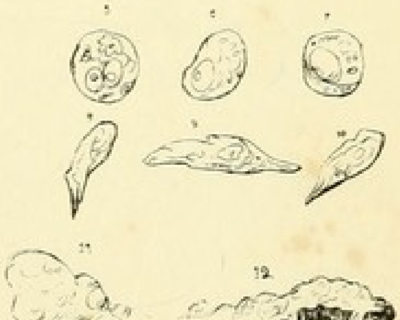


PLATE LXXI.

Fig. 1. Amputation of the breast. From Fergusson.

Fig. 5. Form of incision.

Fig. 2. Medullary sarcoma; fungus hæmatodes. From Druitt.

Fig. 3. Cancer. From Druitt.

Fig. 4. Melanosis. From Druitt. In this case, the tumor is not represented quite so dark as it should be.

Figs. 6, 7. Enlargement of the mesenteric glands, from scrofulous patients.

PLATE LXXII.

Figs. 1, 2, 5. Cancer of the Lip. The disease must be extirpated by a V incision, and the parts brought together as in the operation for harelip, either with the interrupted suture, or the harelip suture.

Fig. 3. Carcinoma of the mammary gland. From Liston.

Fig. 4. Fibrous tumor of the antrum.

Fig. 6. Loose cartilages form as pendulous growths on the synovial membrane, and become accidentally detached.

The common method of operating is, first to push the cartilage to the upper part of the joint on one side of the patella, and hold it there against the condyle of the femur; then, the skin having been drawn slightly upward, an incision is made down to the cartilage of sufficient length to let it escape.

Dr. Goyrand, and also Mr. Syme, proposes the following method, as the above operation is considered very hazardous: The cartilage being fixed as above described, a narrow knife is passed under the skin, and a wound is made in the capsule of sufficient size to allow it to be squeezed out of the joint into the subcutaneous cellular texture; time is then given for the wound in the synovial membrane to heal, and the cartilage may be allowed to remain in its new position, or be removed, according to circumstances.

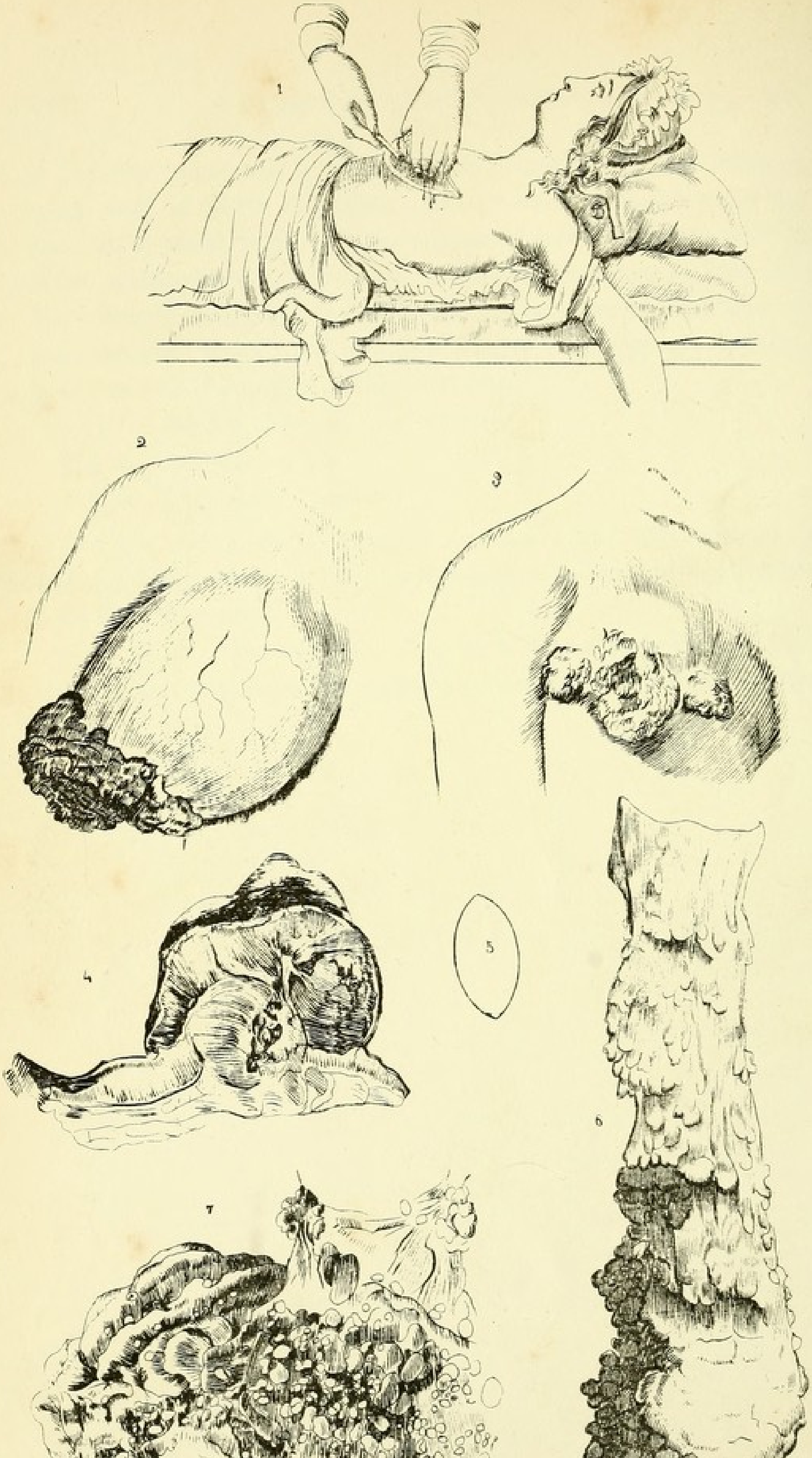
Fig. 7. Section of an encysted tumor.

Fig. 8. Adipose tumor.

Fig. 9. Encephaloid tumor.

Fig. 10. CHIMNEY SWEEPER'S CANCER. The only remedy is excision of the diseased parts, and this must be done early, or there is no hope of success.

Figs. 11, 12. Bronchocele. Fig. 12 is from King's College Collection; the œsophagus is seen to be pushed to the right side by the tumor.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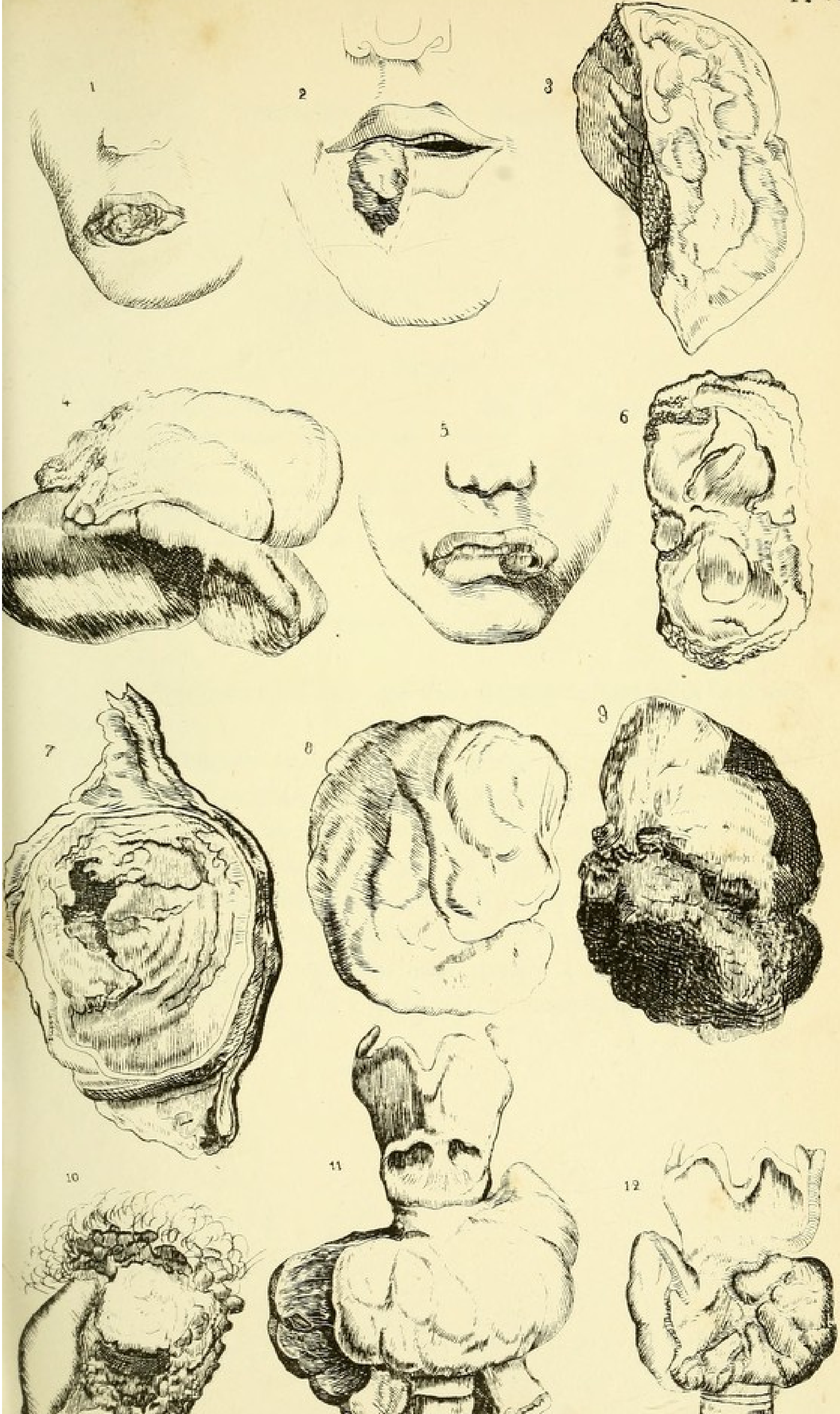
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PLATE LXXIII.

Tumors.

Fig. 1. Fibrous tumor.

Fig. 2. Anatomical structure of bronchocele.

Fig. 3. Fibrous tumor of the upper jaw, following a blow. This tumor was successfully removed by Mr. Liston.

Fig. 4. Fibrous tumor, occupying the place of the submaxillary gland.

Fig. 5. Enlarged bursa of the knee.

Fig. 6. Ganglion, formed in the synovial sheath of the flexor tendon of the finger.

Fig. 7. Tumor dissected out in the case represented by Fig. 4.

The description of this operation may serve for others in a similar situation.

An incision was made under and parallel to the jaw; another was made vertical to this, and by dissecting back the flaps, room was given for the succeeding steps of the operation, which consisted in dissecting down to the tumor, and turning it out, occasionally dividing its connection with the surrounding tissue. The edge of the knife must be uniformly directed towards the morbid growth. The facial vein may be cut across and require a ligature. The facial artery lies so deep that it need not be wounded.

PLATE LXXIV.

Fig. 1. Tumor over the parotid gland, with an attachment behind the ramus and angle of the jaw.

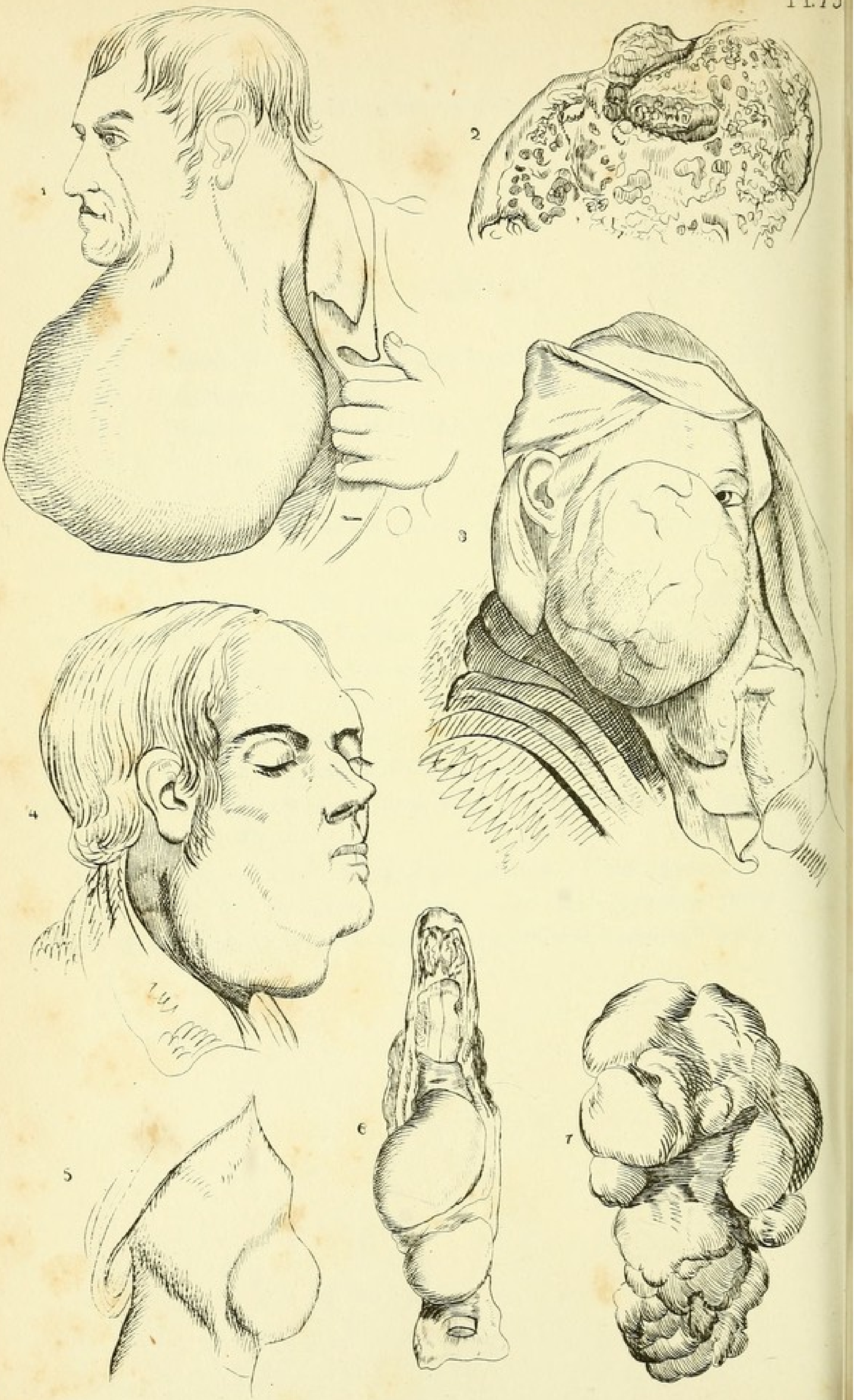
Fig. 2. Malignant tumor involving the under jaw, following excision of cancerous lip.

Fig. 3. From Liston. Tumor of the thyroid body, the rapid distention of which with blood caused the patient's death within two days.

Fig. 5. REMOVAL OF ERECTILE TUMORS BY LIGATURE. FROM LISTON. A crucial incision (Fig 4) was made, and the coverings turned back as in the figure; the needle across the tumor was first introduced without a ligature; the tumor was raised by this, and the second needle passed underneath the first, carrying a strong thread; this needle was then withdrawn, and the other armed with a thread and withdrawn also. These were then secured in the manner delineated in Fig. 6.

Fig. 7. Case of a patient aged sixty-seven. From Liston.

Upon tying the ligatures, incisions were made between their points of insertion, so as more closely to embrace the enclosed mass.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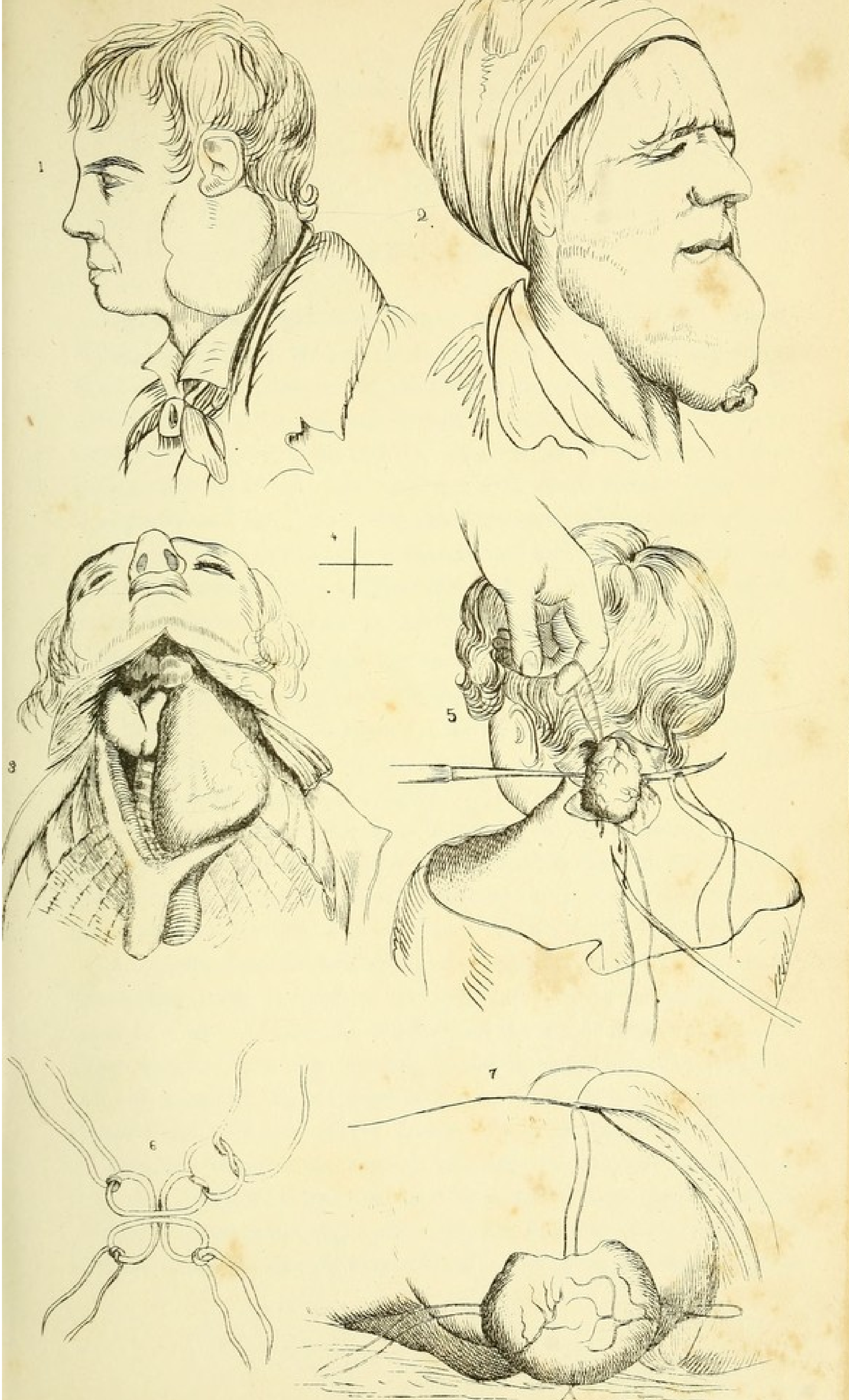


PLATE LXXV.

Fig. 1. Operation for Tumor of the Under Jaw. From Fergusson. The incision is made in the direction of the dotted line; the facial artery being secured by ligature, the bone must be divided in front by saw and forceps, when the mass must be drawn outward to one side; the anterior attachments of the tongue, (supposing division of the bone to have been made farther back than the symphysis,) the mylo-hyoid, the mucous membrane, the internal pterygoid, the masseter, the temporal, the external pterygoid, and, lastly, the lateral ligaments and synovial capsule, should all be divided successively, and so the operation will be accomplished.

Figs. 2, 3. Operations on the Upper Jaw. From Liston. Should it be necessary to divide the bone in the mesial line, one of the incisors must be extracted; if the incision is carried farther round on the side, one of the molars must be removed in order to admit of division of the bones.

The point of the bistoury is entered over the external angular process of the frontal bone, and is carried down through the cheek to the corner of the mouth, being guided by the fore and middle finger of either hand, which may be placed in the cavity. A second incision, made down to and along the zygoma, falls into the other. Then the knife is pushed through the integument to the nasal process of the maxilla, the cartilage of the ala is detached from the bone, and the lip is cut through in the mesial line. The flap thus formed is quickly dissected up, and held by an assistant; the attachment of the soft parts to the floor of the orbit, the inferior oblique muscle, the infra orbital nerve, &c., are cut, and the contents of the cavity supported and protected by a narrow bent copper spatula. With the forceps the zygomatic arch, the junction of the malar and frontal bones by the transverse facial suture, and the nasal process of the superior maxilla, are cut in succession; then, a notch having been made in the alveolar process, the palatine arch is clipped through by strong scissors, placed along it, one blade in the nostril of the affected side, the other in the mouth. An assistant must be prepared to place his fingers on one or both of the carotids; but pressure on both at the same time must be made with caution. The tumor is now shaken from its bed, and, as it is turned down, the remaining attachments are divided by the knife, the velum palati is carefully preserved, and also, if possible, the palatine plate of the palate bone.

The dotted lines on the figures show the course of the incisions.

Fig. 3 shows the appearance before, Fig. 2 after, the operation.

Fig. 4. Excision of the upper jaw, where the incisions were less extensive than in the preceding case. From Liston.

Fig. 5. Lipoma of the nose, removed by Mr. Liston.

Figs. 6, 7. Cases of nasal polypi.

Fig. 8. Internal appearance in these cases.

PLATE LXXVI.

Fig. 1. Hernia humoralis.

Fig. 2. Case of Tumor removed by Mr. Liston. The testicles, and about two inches of the penis, were removed with it. The tumor weighed nearly fifty pounds.

Fig. 3. Hydrocele. From King's College Museum.

Fig. 4. External appearance in case of hydrocele.

Fig. 5. Hæmatocele.

Fig. 6. Warty excrescences of the prepuce combined with phymosis. In this case, half an inch of the end of the foreskin was removed by a single stroke of the bistoury, and then an incision made on the director in the direction of the dotted line; the skin

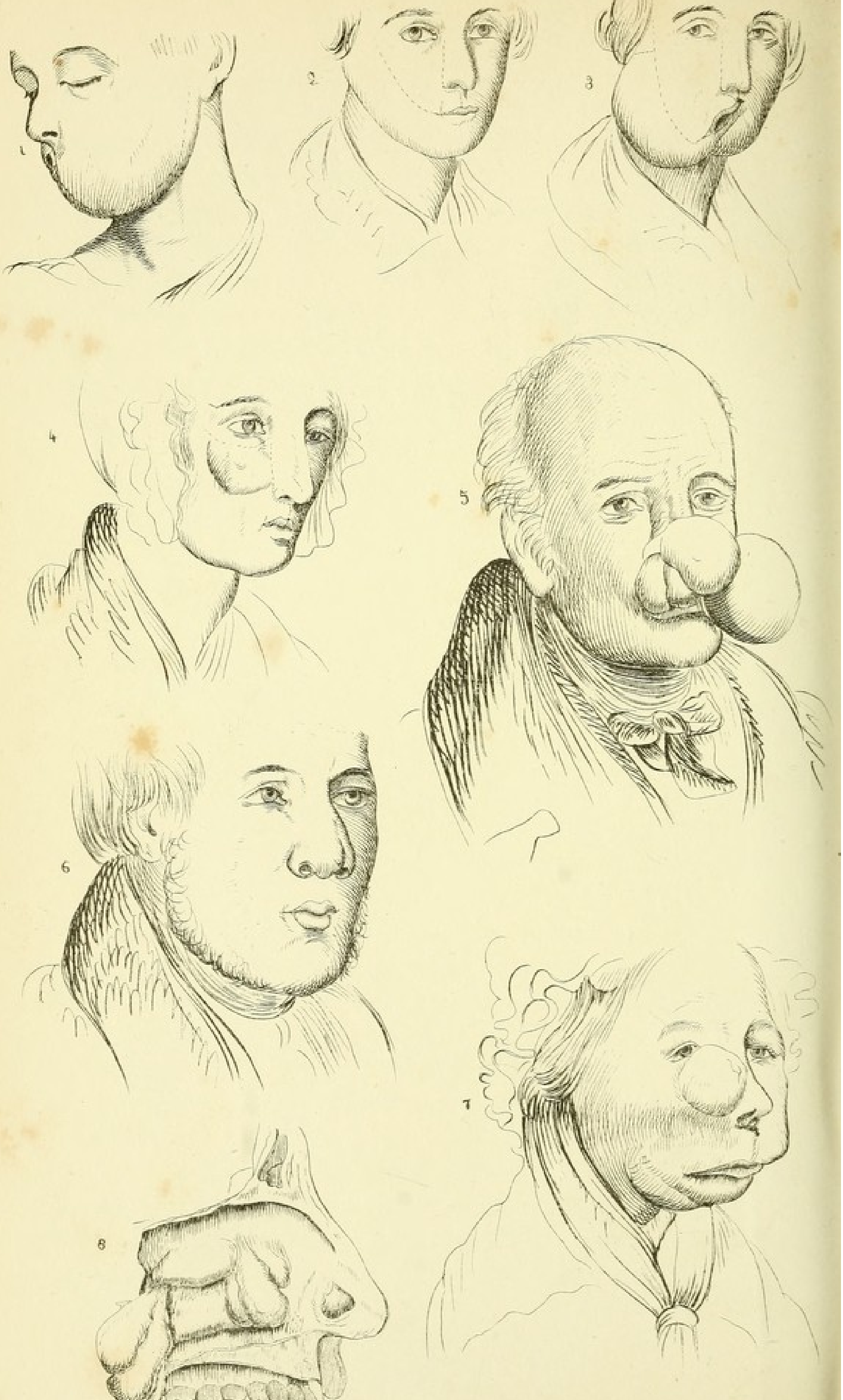
and mucous membrane were then united with a few points of suture.

Fig. 7. SPINA BIFIDA. If the surgeon decides to puncture, in these cases, the puncture should be made at one side of the sac, and with a needle, or trochar.

Fig. 8. Encysted hydrocele.

Figs. 9, 10. Piles after excision, showing the dilated veins of which they are, in a great measure, composed. Operations on these tumors are shown in succeeding plates.

Pl. 75



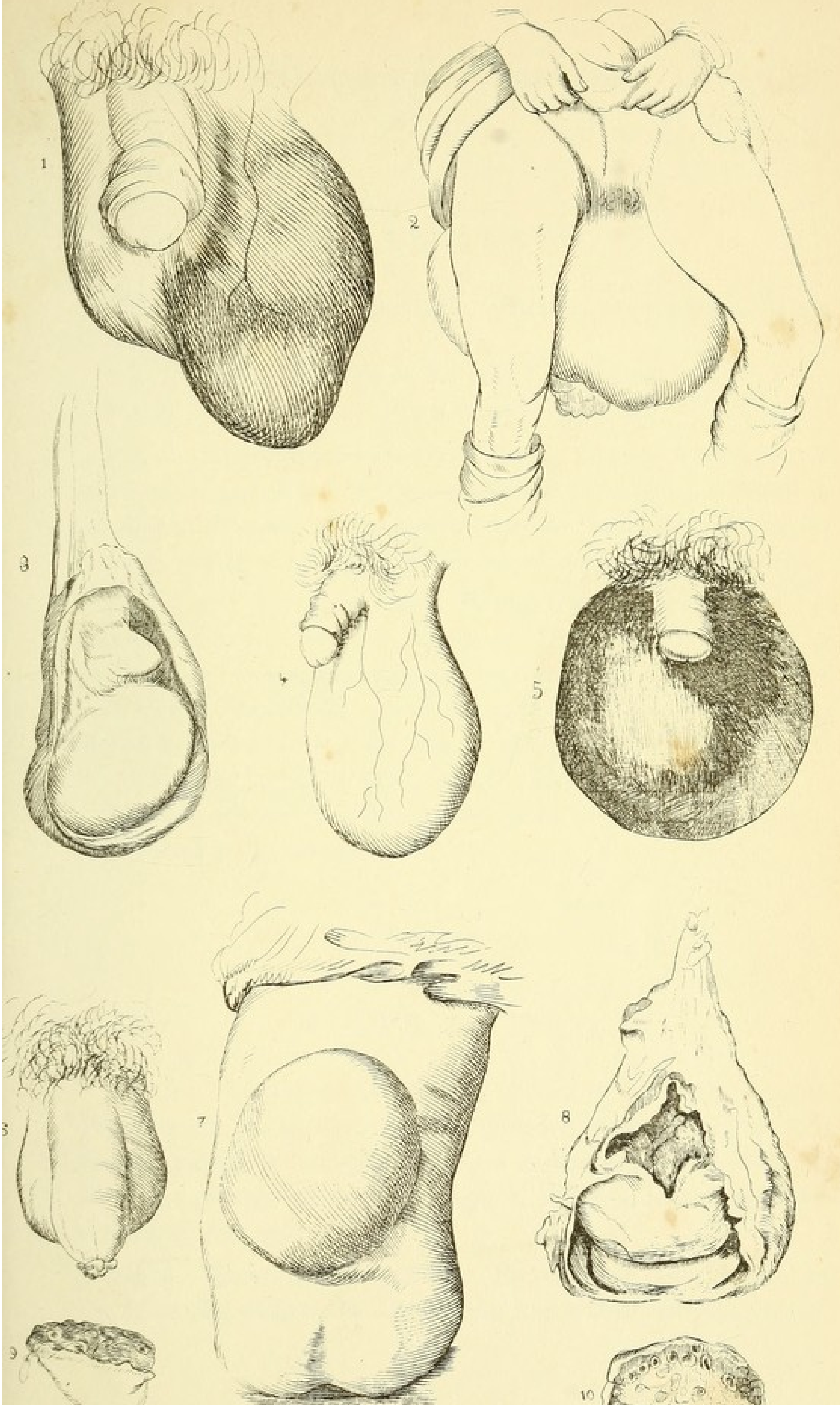

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PLATE LXXVII.

Fig. 1. Cartilaginous exostosis. From a preparation in King's College Museum.

Fig. 2. Simple exostosis of the end of the femur.

Fig. 3. Osteo-sarcoma, with fracture of the bone.

Fig. 4. Ligature of Nasal Polypi. A loop of wire, or catgut, must be passed into the fauces, and over the tumor, as shown in the figure; the ends of the ligature may be drawn through a silver catheter, and tightened from day to day, as the case may require.

Figs. 5, 6. Plugging the Nostril in Case of Hemorrhage. A loop of wire, or catgut, as above, may be passed into the pharynx; a thread ligature may be attached to this, and brought back with it through the nostril; some lint must be attached to the thread, as shown in the figure, and be guided by the finger back of the velum, and be pulled firmly into the cavity.

Fig. 4 shows both the anterior and posterior openings of the nostril, stopped in this manner.

PLATE LXXVIII.

Fig. 1. Removal of Nasal Polypus by the Mouth. Process of M. Manne. The surgeon seizes the tumor with bent forceps, guided by his finger, as seen in the figure. In order to allow the passage of a large polypus, the soft palate has been divided in this case.

Fig. 2. Removal of a Nasal Polypus by the Nose. In the figure, the surgeon has seized the tumor with the forceps, and,

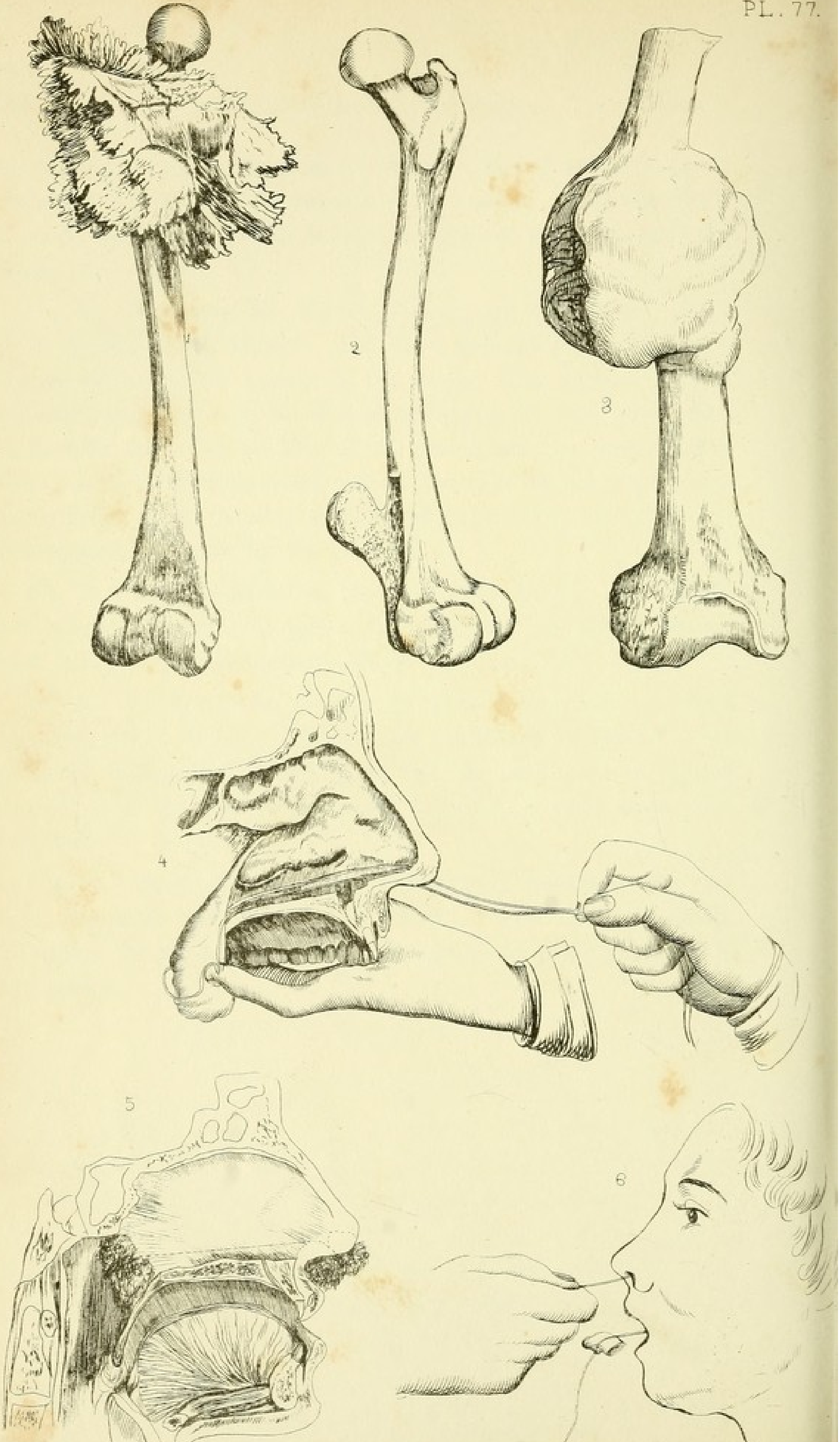
by twisting it upon its root, and at the same time drawing it downward, has brought it to the opening of the nostril. When the tumor is large, an incision is made between the ala and upper lip, as in the figure.

Fig. 3. Removal of Nasal Polypi by Ligature. Process of M. Felix Hatin. The nasal fossa of the right side is shown by a vertical section of the head. The septum naris is removed, with the exception of a small strip at the back part. The ligature is carried on the floor of the nostril into the throat, and is there seized by the instrument, and carried over the polypus, as seen in the figure. The ligature is tied and tightened by one of the various instruments used for the purpose.

Fig. 4. Perforation of the Frontal Sinus. A T incision is made through the skin to the bone, and the flaps dissected back, and the sinus perforated with the trephine.

Fig. 5. Perforation of the Antrum Maxillare through the external Wall. The mucous membrane is divided at its place of reflection from the gum, and the soft parts separated upward from the bone, so as to give room for the small crown of a trephine.

Fig. 6. Perforation of the Antrum through one of the Sockets of the Molar Teeth. The first molar tooth being lost, the point of a perforator is applied to drill a passage into the antrum.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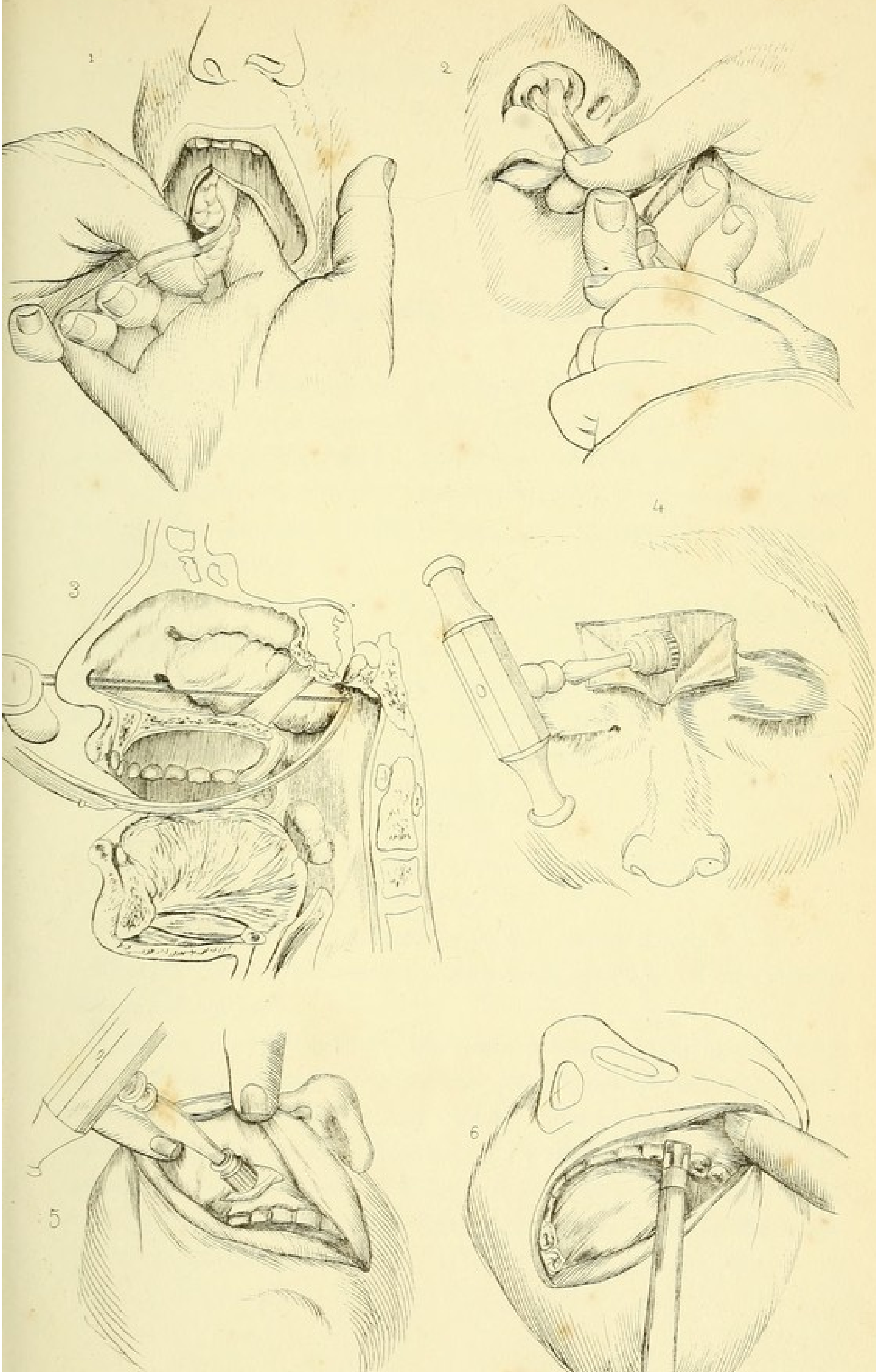
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PLATE LXXIX.

Figs. 1, 4. Operation for the Removal of Cancer of the Under Lip. Process of Chopart. The incisions are made in the direction of the dotted lines seen in the figure. The diseased parts are removed, and the lower flap dissected up, and brought into its place, as seen in Fig. 4. The wound is to be closed by the harelip suture.

Figs. 2, 5. Cancer of the Under Lip. Two incisions are made, and the parts removed, as seen in Fig. 2. An incision is made at each angle of the mouth, as seen in Fig. 5; the flaps dissected up to some extent over the bone, and the wound brought together and secured, as shown in the figure.

Fig. 8. Operation of M. Bourgery.

Fig. 3. Operation of M. Lisfranc.

Fig. 6. Reunion of the parts in the last two operations.

Fig. 7. Operation of M. Serres.

Fig. 9. Reunion of the parts with the harelip suture.

Fig. 10. Removal of a cancer occupying the angle of the mouth. Process of Celse.

Figs. 11, 12. Process of Lallemand for closing the gap left by the excision of cancer, involving the commissure of the mouth, and a portion of the lower lip and cheek. The remnant of the lower lip has been drawn up and attached by suture, so as to form the commissure of the mouth. A flap of integument has been raised from the side of the cheek, and fastened by suture to fill up the space left by the portion removed.

PLATE LXXX.

Fig. 1. Removal of Polypus by Ligature. Process of Dubois. The external surface of the nasal fossa of the right side is shown by a vertical section through the head, the septum narium being removed, with the exception of two small strips. At the period of the operation shown, the three ends of the threads, those of the ligature, and that of a colored thread which controls the movement of the segment of a gum catheter, have been drawn out through the anterior orifice of the nostril. The third thread, designed to draw back at will the loop of the ligature, is pendent from the mouth. The left forefinger of the surgeon is passed through the mouth, and curved upward behind the velum palati, for the purpose of carrying the loop of the ligature behind and round the polypus, so as to embrace its root. When this application of the ligature has been effected, the segment of the catheter is to be withdrawn by pulling the colored thread. The ligature is then to be tightened by the introduction of a *serre-nœud* over its extremities.

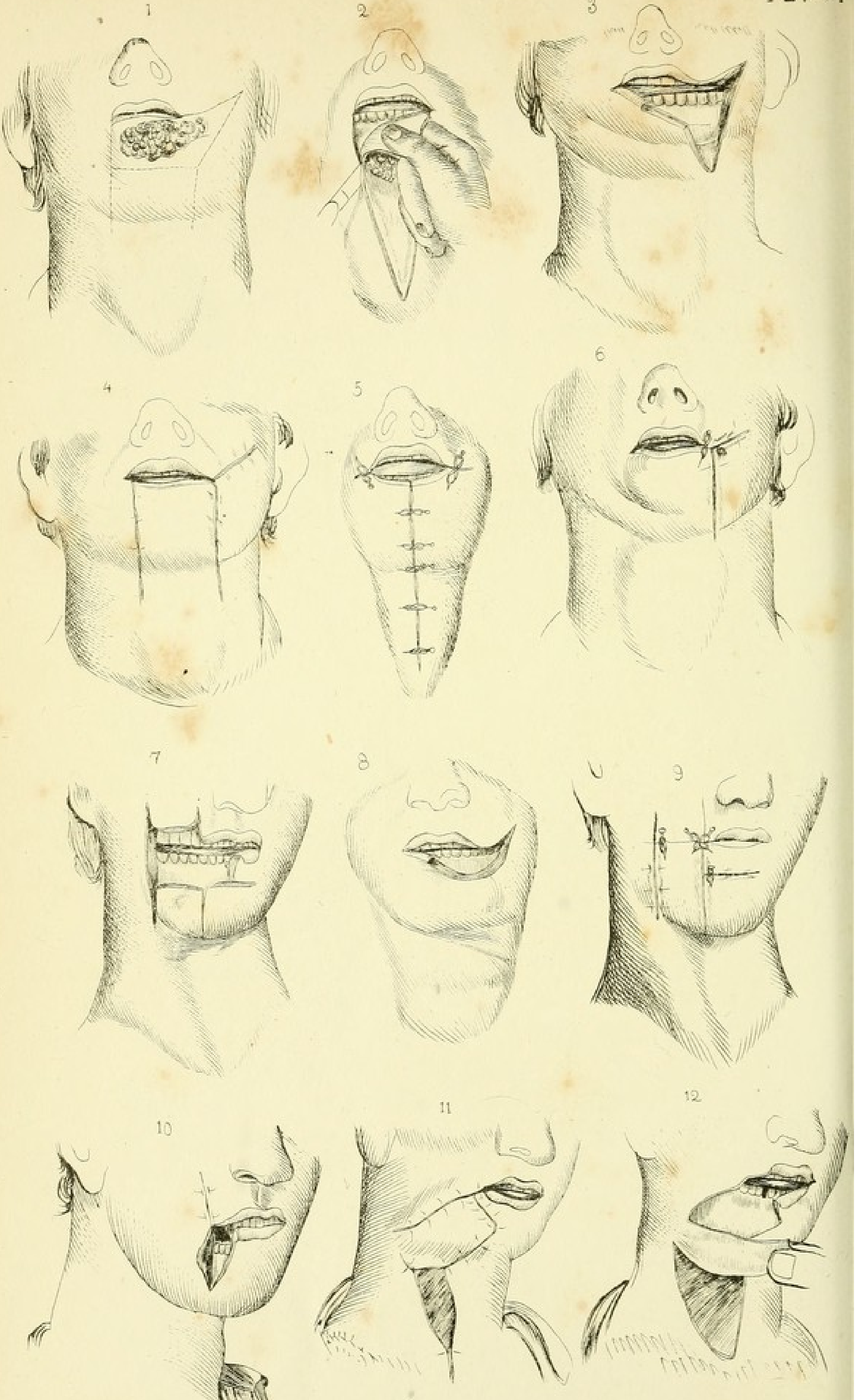
Figs. 2, 4. Interior of the Nasal Fossæ, Mouth, and Pharynx. In both figures, the sound of Laforest is seen, passed into the nasal duct. In Fig. 4, the duct is laid open. The lower curved instrument in the nose is the one referred to.

The middle instrument in Fig. 4, and the upper instrument in Fig. 2, are passed into the Eustachian tube. The upper instrument in Fig. 4 is the sound of Bellocq, employed in the figure to plug the posterior nares. The remaining instrument in Fig. 4 is introduced into the duct of Steno.

The remaining instrument in the nose in Fig. 2 is introduced into the antrum maxillare. An instrument thrust into the œsophagus is also seen in this figure.

Fig. 5. Œdema glottidis compared with Fig. 6, a healthy state of the glottis. From Liston.

Fig. 3. Catheterism of the larynx with the sound of Charrière, in case of asphyxia, in which we wish to produce artificial respiration.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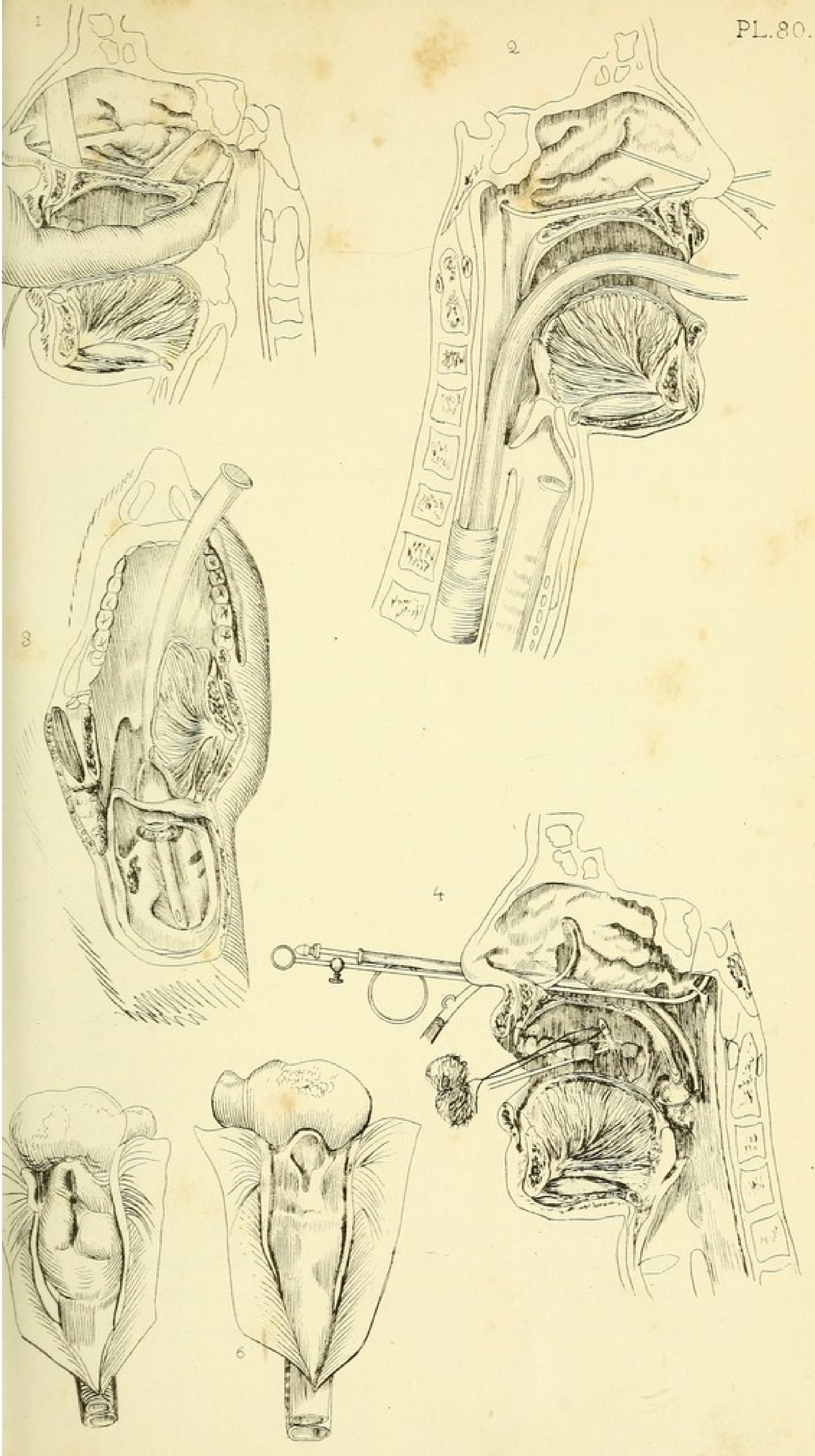
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PLATE LXXXI.

Fig. 1. "Sonde préhensive" of Dupuytren, introduced into the œsophagus.

Fig. 2. Introduction of a flexible tube into the œsophagus, for the purpose of conveying food to the stomach, in case of contraction of the œsophagus.

Figs. 4, 5. TRACHEOTOMY. PROCESS OF LISTON. The patient, if an adult, had better be placed in a chair, and his head supported on the breast of an assistant. The opening in the neck is made as seen in Fig. 4; a small scalpel is best suited to the purpose. In the adult, an incision of an inch and a half or two inches is made, the extent varying according to the thickness and length of the neck — the depth, in fact, at which the windpipe is placed from the surface. The opening is made to extend from immediately below the cricoid cartilage to near the top of the sternum, and exactly in the mesial line. The skin and superficial fascia are first divided, the fatty matter underneath is cut through, and the deep fascia is exposed and slit up over the junction of the sterno-hyoid muscles; their cellular connections are then separated with the point of the knife: with its handle, and with the finger, by which it is ascertained that no stray arterial trunk lies in the way, the fore part of the trachea is cleared of the loose cellular tissue and congeries of veins; these are pushed downward, and the isthmus of the thyroid body, if it exists, pushed upward.

The patient is desired to swallow his saliva; the moment is then seized, when, by this action, the larynx is elevated and the tube elongated; the point of the knife is entered into the rings, with its back towards the sternum, and, by a slight sawing motion, three or four of them are divided upward, and in the middle line. By proceeding thus, there is seldom bleeding to any troublesome extent, nor

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is there any occasion for tying vessels, or for pausing before completing the opening. In children, difficulty is sometimes experienced in consequence of the shortness of the neck, and the flow of venous blood, increased by the struggling and screaming of the patient. Occasionally, in them, cessation of bleeding need not be waited for, as, upon the completion of the operation and expulsion of the foreign body, the child generally becomes calm, the breath is unembarrassed, and the oozing ceases instantly. Great assistance is here derived from the use of a small, sharp hook, (Fig. 5,) by which the tube is pulled upward and fixed before any attempt is made to open it. The alarm consequent upon the admission of air thus unnaturally into the ramifications of the trachea having subsided, a search is instituted for the foreign body by the introduction of the probe. The forceps follow this, and, by their gentle and cautious use, the object may be attained. If the operation be performed for the relief of dyspnœa, a conical, curved tube (Fig. 3) should be introduced for the patient to breathe through; it may be fixed as in Fig. 6. When the patient wishes to cough or speak, he must be taught to close its orifice with his finger. It should be frequently freed of any mucus that may lodge in it.

Fig. 6. Laryngotomy is performed by cutting through the crico-thyroid membrane, which may be felt as a soft depression an inch below the pomum Adami. In this operation, the only casualty at all to be feared is the division of a branch of the superior thyroid artery, which runs across the membrane, and is occasionally of such size as to cause trouble when cut.

Fig. 7. Tracheotomy. From Bourgery.

PLATE LXXXII.

Figs. 2, 3 show the canule of M. Bretonneau introduced into the trachea after the operation of tracheotomy. The tube may be fixed as in Plate LXXXI. Fig. 6.

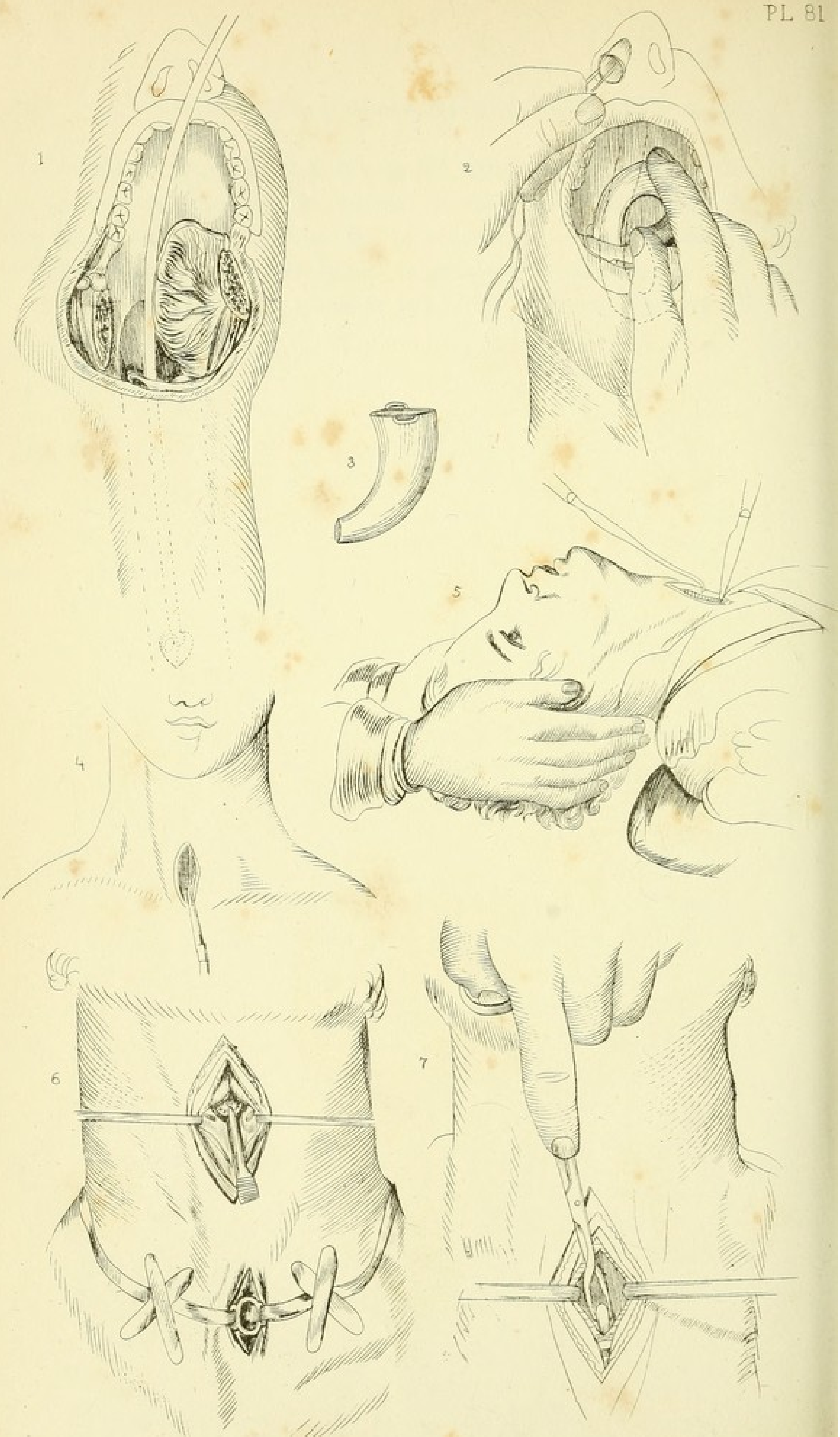
Figs. 1, 4, 5. Operation for fistula in the hyo-thyroid membrane. Process of M. Lallemand. Fig. 1 shows the manner of closing the wound.

Figs. 6, 7. Œsophagotomy. This operation should be performed on the side towards which the foreign substance projects. Its situation having been ascertained, an incision of sufficient length must be made through the skin and platysma, between the sterno-mastoid muscle and trachea. The cervical fascia must next be divided on a director. The surgeon must then divide the cellular membrane with a blunt knife, or lacerate it with his finger, avoiding the carotid and thyroid arteries, and the recurrent nerve. A common silver catheter may then be passed down the throat, and be made to project in the wound, so that the œsophagus may be opened by cutting upon it. This small wound in the œsophagus should be dilated with forceps, in order to avoid hemorrhage, and the foreign body should then be extracted. This operation has occasionally been performed for the purpose of conveying food into the stomach in cases of stricture of the œsophagus, but with no very satisfactory results.

Fig. 8. Dilatation of the Œsophagus in Case of Stricture. The method of introducing the bougie is as follows: The patient sits upright, with the head thrown as far back as possible, and the mouth wide open. The bougie, which should be previously warmed in the hand, and oiled and gently curved, is passed down into the pharynx, in such a manner that its point may slide along

the vetebræ. In order that it may not excite coughing by interfering with the epiglottis, the patient should be directed to protrude the tongue from the mouth as far as possible, or to perform the act of deglutition just when the bougie is entering the pharynx.

Fig. 9. Removal of cancerous goitre by ligature. Process of M. Mayer.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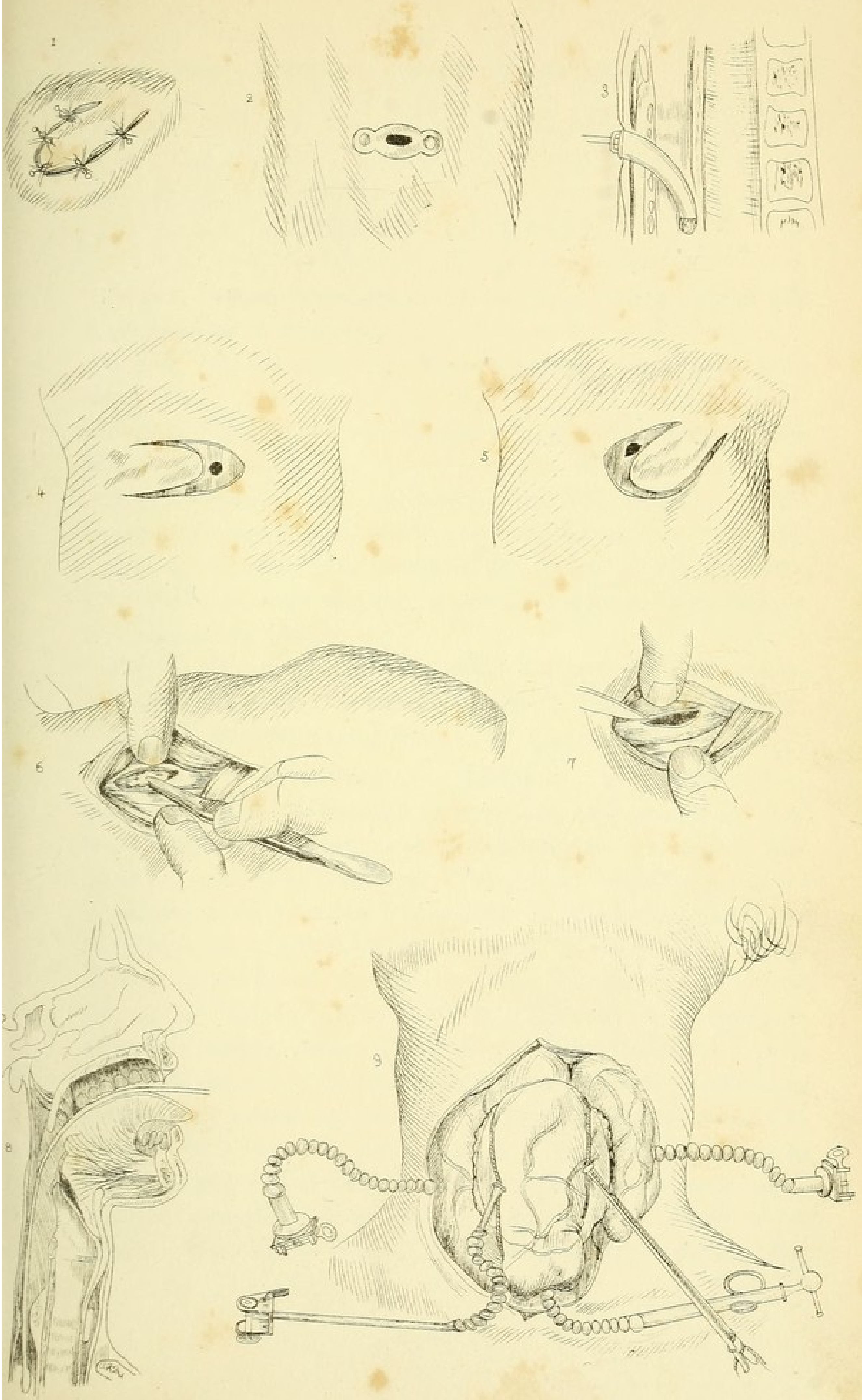
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PLATE LXXXIII.

Fig. 1. Warty excrescences of the vocal chords. From Liston's Elements of Surgery.

Fig. 2. Œdema glottidis. From a patient in the Royal Infirmary.

Fig. 3. The larnyx and trachea of a lady of seventy. From Mr. Liston's collection.

Very extensive false membranes are seen blocking up the bronchi; a large portion besides was coughed up.

Fig. 4. A view from behind of the larynx of a patient who, some weeks previous to death, attempted suicide by wounding the fore part of the neck.

Fig. 5. Warty excrescences within the larynx. Laryngotomy had been performed. From the Middlesex Hospital Museum.

Fig. 6. Contraction and dilatation of the trachea.

Wounds of the Throat. Treatment. In the first place, any arteries that are wounded must be tied, and hemorrhage from large veins must be restrained by pressure with the fingers, kept up as long as may be necessary. The patient should be put to bed in rather a warm room; and as soon as all oozing has ceased, but not before, his shoulders should be raised by pillows, and the head be bent forward, and confined by a bandage passing from each side of the nightcap to the shoulders. Plasters are inadmissible, and so are sutures, except in the cases that will be alluded to presently. If the wound penetrates the trachea or larynx, it should be covered with a loose woollen comforter, or, after the first week, with a respirator, if it can be nicely adapted. The patient should not be kept too low, and if the pharynx or œsophagus is wounded, a common, large-sized, elastic catheter may be passed, through which nutritive fluids can be injected, by means of an elastic bottle. But if, during the inflammatory stage, the attempt causes great irritation, it may be necessary to employ nutrient enemata merely; at all events, no tubes should be passed through the wound for that purpose. The great thirst and dryness of the fauces, experienced in these cases, may in some measure be mitigated by sucking a wet rag. If the patient finds great difficulty in expectorating through the wound, he must be taught to close it partially, by leaning his head forward, and placing his fingers on it, whilst he makes an expiratory effort, so that he may expel the air with a sudden gust.

If the aperture of the lower portion of the trachea be closed by the overlapping of the upper portion, it may be requisite to employ sutures; but they should be passed merely through the cellular tissue, around the cartilage, and neither through the cartilage nor the skin. In every stage of the case, difficulty of breathing should be viewed with suspicion. It may arise from the overlapping of the trachea alluded to above, or from the passage of blood into the trachea by the premature closing of the wound, or, if the trachea be not opened, it may be caused by the pressure of coagulated blood, confined by the same cause. The cause of dyspnœa must be ascertained in all cases, if possible, and met by appropriate treatment. A longitudinal division of the trachea may be necessary to relieve the dyspnœa.

Fig. 7. Excision of the ear for a cancerous tumor.

Figs. 8, 9. Ligature of a polypus of the auditory canal. As only a part of the tumor could be detached by the first operation, the ligature was again applied, as in Fig. 9, to the root of the tumor.

Fig. 10. Erectile tumor of the pavilion of the ear, for which Dupuytren tied the carotid successfully.

PLATE LXXXIV.

Fig. 1. Perforation of the tympanum with the perforator of M. Deleau.

Fig. 2. Ligature of polypus of the ear; same operation as Plate LXXXIII. Fig. 8.

Fig. 3. Vertical section of the temporal bone, showing the soft parts of the auditory canals untouched.

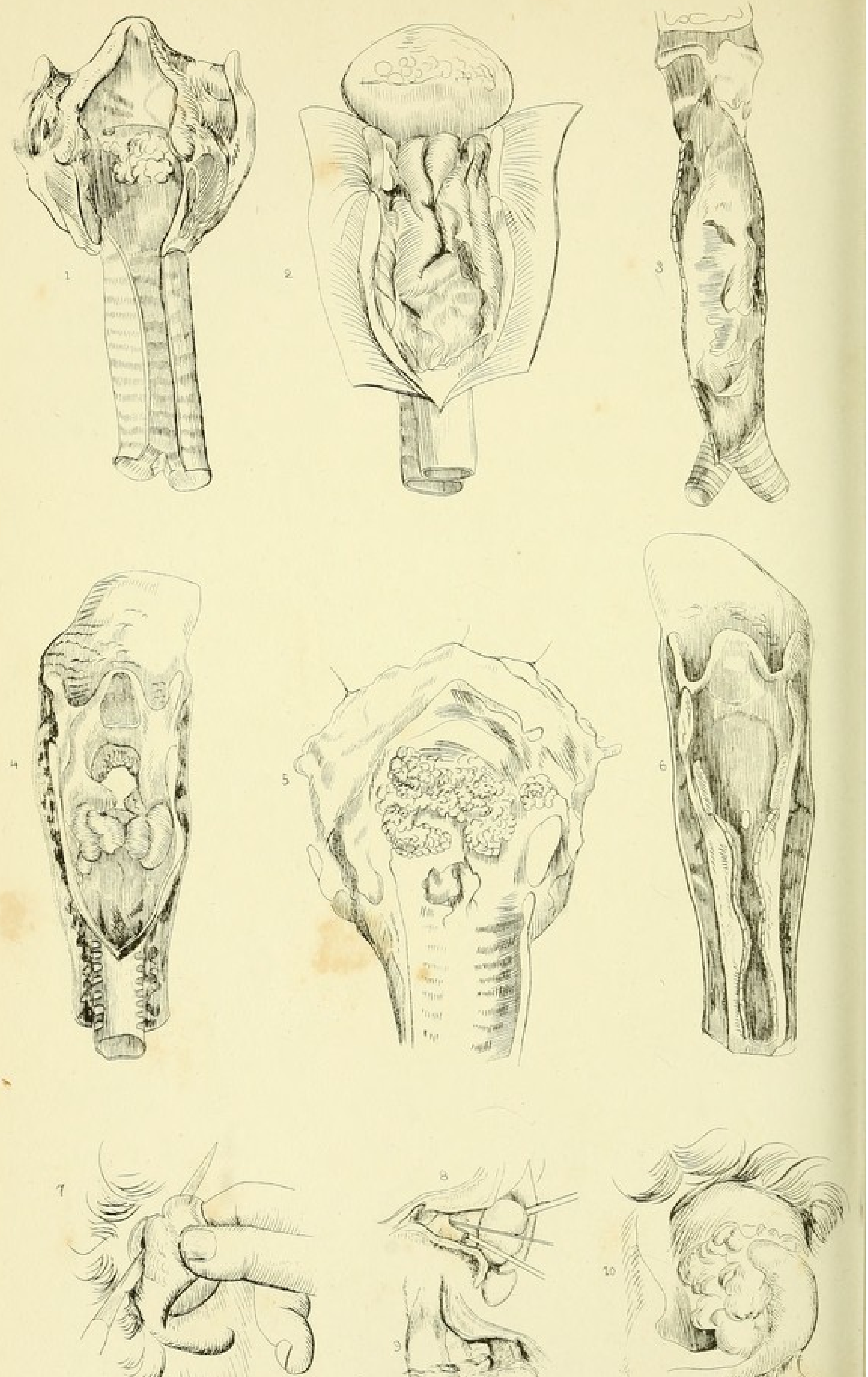
Fig. 4. Vertical section of the temporal bone, showing the auditory canals and their vertical diameter.

Fig. 5. Same section as Fig. 4, the soft parts preserved.

Fig. 6. Horizontal section of the auditory canals, showing their antero-posterior diameter.

Fig. 7. Extraction of a polypus from the ear with the polypus forceps.

Fig. 8. Extraction of a foreign substance from the ear, with the curette.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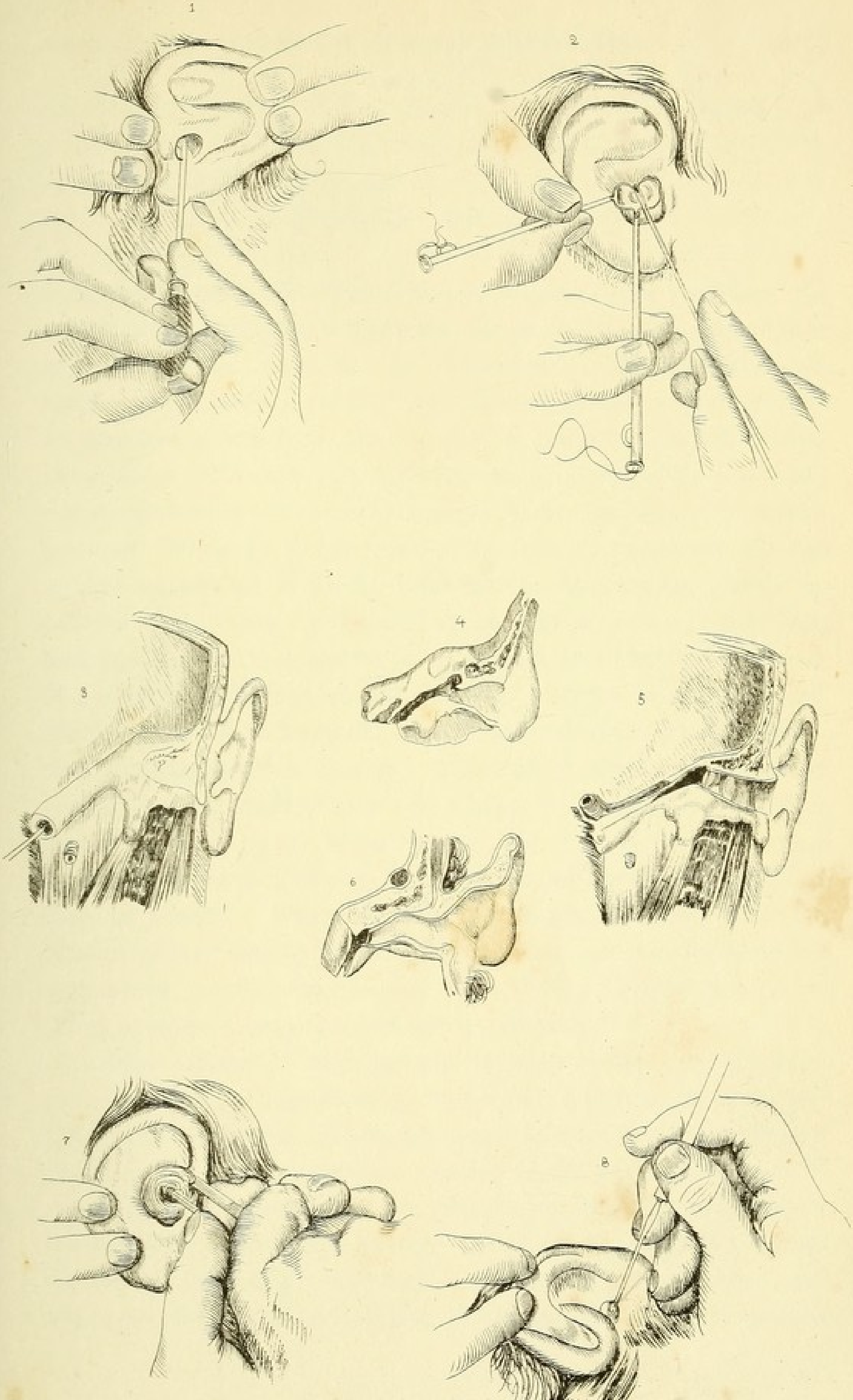


PLATE LXXXV.

Rhinoplastic or Taliacotian Operations. When the whole or greater part of the nose has perished, a triangular piece of leather should be cut into the shape which it formerly presented, and be spread out flat on the forehead with its base uppermost, and its boundaries should be marked out on the skin with ink. Then the remains of the old nose (if there are any) are to be pared, and the margins of the nasal aperture are to be cut into deep, narrow grooves. When the bleeding from these wounds has ceased, the flap of skin marked out on the forehead is to be dissected up, and all the cellular tissue down to the periosteum with it, so that it may hang attached merely by a narrow strip of skin between the eyebrows. When all bleeding has ceased, the flap is to be twisted on itself, and its edges are to be fitted into the grooves made for their reception, and fastened with sutures. The nose thus made is to be supported, but not stuffed, with oiled lint; it should be wrapped in flannel, to keep up its temperature; and if it become black and turgid, owing to a deficiency in the return of blood from it, a leech may be applied. When adhesion has thoroughly taken place, the twisted strip of skin by which its connection with the forehead was maintained may be cut through, or a little strip may be cut out of it, so that it may be laid down smoothly.

2. The septum or columna nasi is often restored by the same operation with the nose itself, by means of a flap from the forehead; but it is better, as Mr. Liston proposes, to form it out of the upper lip at a subsequent operation. A strip is cut out of the centre of the upper lip, a quarter of an inch in breadth, and of its whole thickness. The frænulum having been divided, this strip is turned up, but not twisted, and its labial surface having been pared off, and the inside of the apex having been made raw, the two latter surfaces

are united by the twisted suture, and the wound of the lip is also united by the same. During the cure, the nostrils must be kept of their proper size, by introducing silver tubes occasionally.

3. When *one ala nasi alone* is destroyed, a portion of integument may be measured out on the cheek, and be raised to supply the deficiency. But if both alæ are lost, or if the cheek be spare and thin, it is better to supply their place with skin brought from the forehead. The slip which connects the ingrafted portion with the forehead will, of course, be long and thin; in order to maintain its vitality, a groove may be made to receive it on the dorsum of the nose. But when union has occurred, this connecting slip may be raised and cut off, and the groove which contained it be united by sutures.

4. Depression of the apex of the nose is to be remedied by raising the parts, dividing any adhesions that may have formed, making, if necessary, a new columna in the manner described above, and supporting the parts carefully with plugs of lint till they have acquired firmness. But it may be done still more completely by a method which was proposed by Dieffenbach, and a modification of which has been practised with great success by Mr. W. Fergusson.

"The point of a small scalpel," says Mr. Fergusson, "was introduced under the apex, and the ala was separated from the parts underneath; next the knife was carried on each side, between the skin and the bones, as far as the infra-orbital foramen, taking care not to interfere with the nerves, when, by passing the point of my finger below the nose, I caused the latter organ to be as prominent as could be wished. I now passed a couple of long silver needles, which had been prepared for the purpose, with round heads and steel points, across from one cheek to the other, having previously applied on each side a small piece of sole leather, perforated with holes at a proper distance; then I cut off the steel points, and with tweezers so twisted the end of each needle as to cause the cheeks to come close to each other, and thus render the nose prominent. Thus by bringing the cheeks more into the mesial line, a new foundation, as it were, was given to the organ. Adhesion occurred in some places, granulations in others. In the lapse of ten days, the needles were withdrawn, and in the course of a few weeks, when cicatrization was complete, the nose presented as favorable an appearance as could reasonably have been desired."

5. Depression of the ridge, owing to the loss of the ossa nasi, may be remedied by paring the surface, and covering it with a flap of skin from the forehead, or by making a longitudinal incision, and ingrafting a small portion of skin from the forehead into it; or, if the case is slight, by cutting out one or two transverse slips, and bringing the cut edges together by sutures, so that the surface may be stretched to its proper level.

Figs. 1, 2, 3, 4, 6. Cases of restoration of the nose. From Bourgery.

Figs. 5, 8. Restoration of the nose by the Italian method.

Figs. 9, 7. Case from Mr. Fergusson. Fig. 9 shows the case previous to the operation; Fig. 7, after the parts have been healed.

PLATE LXXXVI.

Fig. 2. Removal of One Half of the Tongue with Scissors. Process of Boyer. The tongue is held by the fingers of the surgeon, and with the hook in the hands of an assistant, as seen in the figure. A longitudinal incision has been made down the middle of the tongue, and the scissors are seen applied for the purpose of making a second incision.

Fig. 4. Removal of a Portion of the Tongue with a Bistoury. The tongue is drawn out with a hooked forceps and the hand of an assistant, and the operation is performed as seen in the figure.

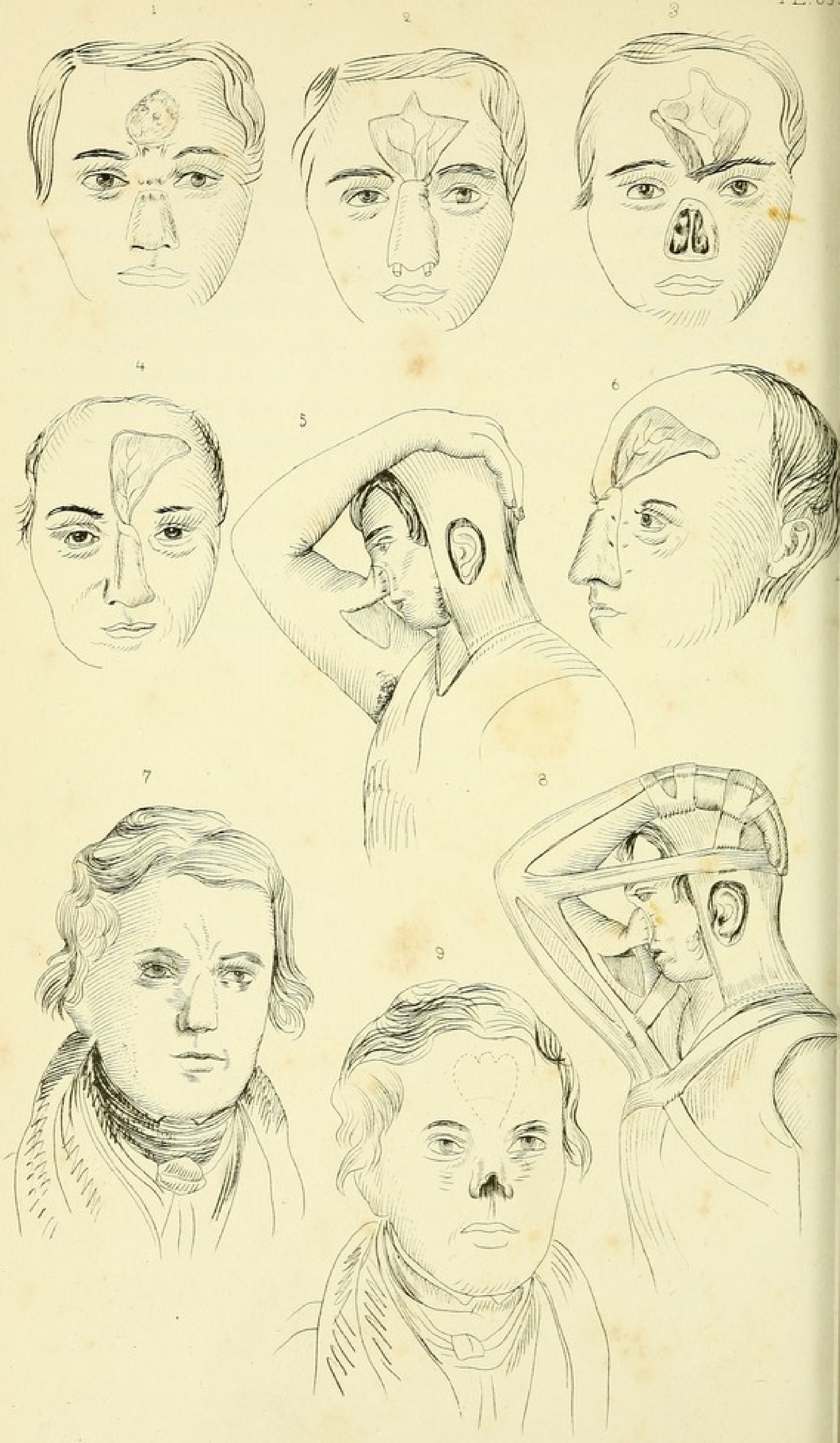
Fig. 1. Manner of closing the wound in the above operations by means of an interrupted suture behind, and a twisted or harelip suture in front.

Fig. 3. REMOVAL OF A PORTION OF THE TONGUE BY LIGATURE. PROCESS OF M. MAINGAULT. Two ligatures are introduced by means of a curved needle, as seen in the figure, and fastened in the same position as in Fig. 5.

Fig. 5. In this figure, both the longitudinal and lateral ligatures are seen tightened with the serre-nœud of Roderic, as modified by M. Mayer.

Fig. 6. LIGATURE OF A SMALL CANCEROUS TUMOR OF THE TONGUE. The ligature is carried sufficiently deep to involve the tumor and a small portion of the healthy tongue.

Fig. 7. Inflammation of the tongue.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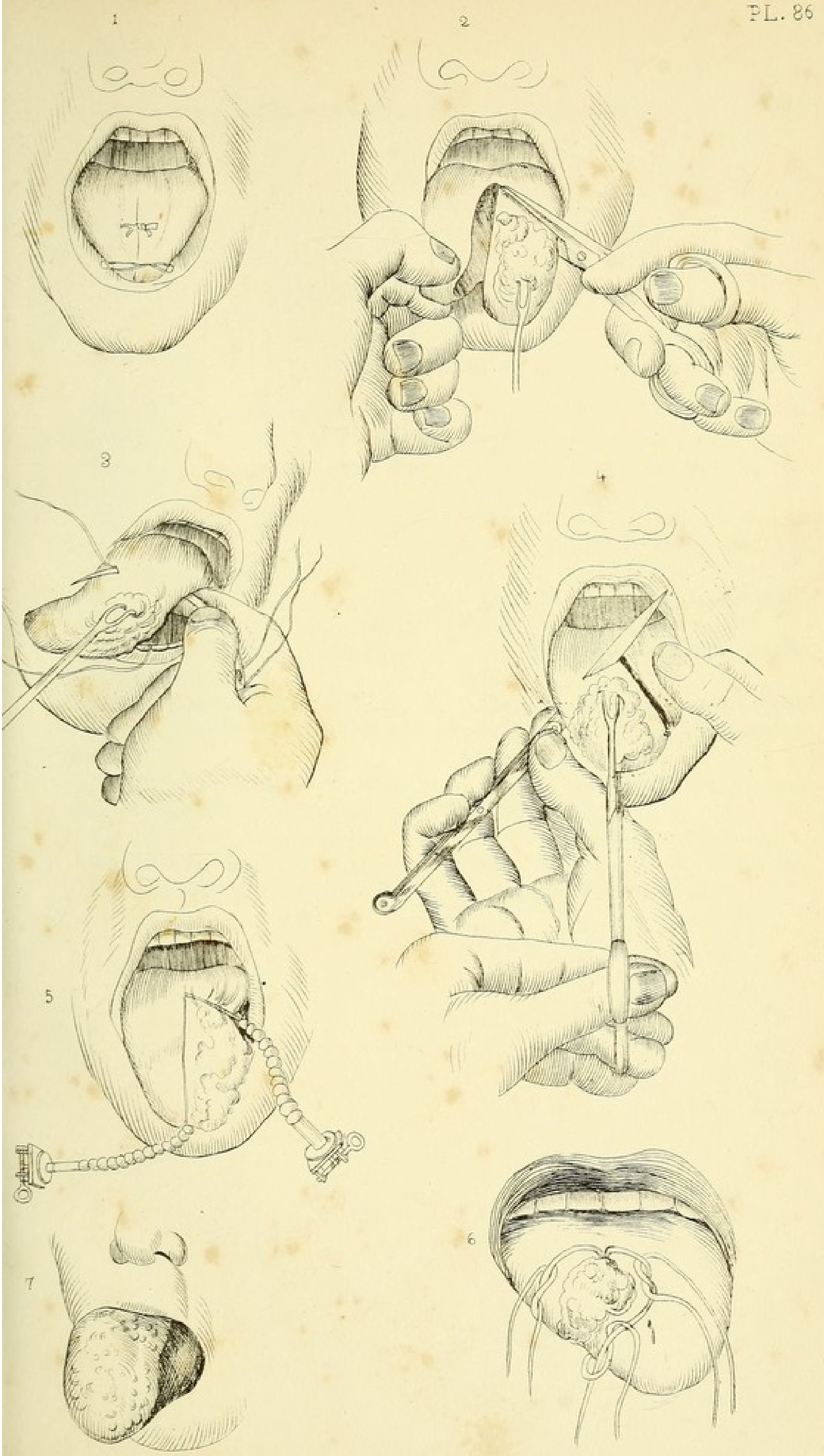


PLATE LXXXVII.

INSTRUMENTS.

Fig. 1. Sonde-préhensive of Dupuytren.

Figs. 2, 3. Large and small extremity of Fig. 12.

Fig. 4. Polypus forceps of Dupuytren.

Figs. 5, 7. Canula of M. Bretonneau.

Fig. 6. Trocar of M. Bretonneau.

Fig. 8. Double hook for tracheotomy and laryngotomy.

Fig. 9. Sound of Chaussier.

Fig. 10. Sonde-préhensive of M. Gama.

Fig. 11. Instrument of M. Gama, closed upon a foreign substance.

Fig. 12. Tracheotomy tube.

Fig. 13. Forceps of M. Trousseau.

Fig. 14. Hook of M. Bretonneau.

Figs. 16, 17, 21. Forceps of M. Charrière, for polypus of the ear.

Fig. 18. Brush for cleansing the tracheotomy tube.

Figs. 19, 20. Curette for the extraction of foreign bodies from the ear.

Figs. 22, 24, 27. Trephine of M. Fabrizj, for the tympanum.

Fig. 23. Speculum auris of M. Itard.

Figs. 24, 25. Instrument of M. Deleau, for the same purpose as Fig. 26.

Fig. 28. Instrument for the same purpose as Fig. 6.

Fig. 29. Small curved scissors.

Fig. 30. Forceps of Dupuytren, for polypus of the ear.

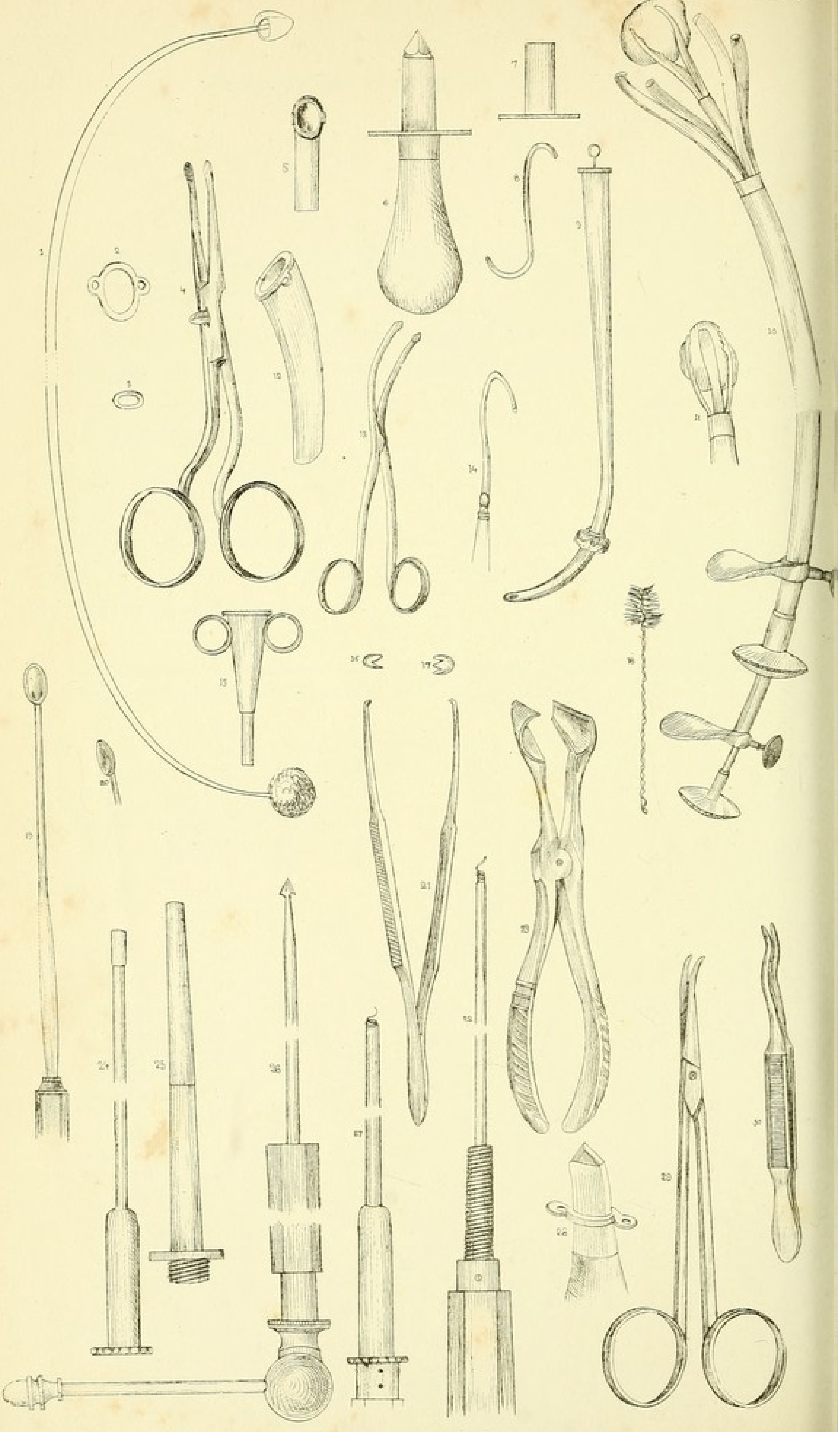
PLATE LXXXVIII.*

Instruments contained in a pocket case of M. Charrière. As will be seen, the bistouries are arranged with two blades in one handle. They are so contrived as to be fixed, either open or shut, by means of the slide and notched end of the blade, (Figs. 20, 21.) The porte caustique, (Figs. 9, 11, 14, 15, 16,) as will be seen, is very compactly arranged.

Figs. 13, 22, 23, 24, show M. Charrière's exploring needle.

Fig. 23. Scissors curved laterally. The remaining instruments will be known at a glance.

* The very beautiful and compact case of instruments delineated in Plate LXXXVIII. were kindly loaned me by the importer, Mr. Joseph Burnett, of Boston.



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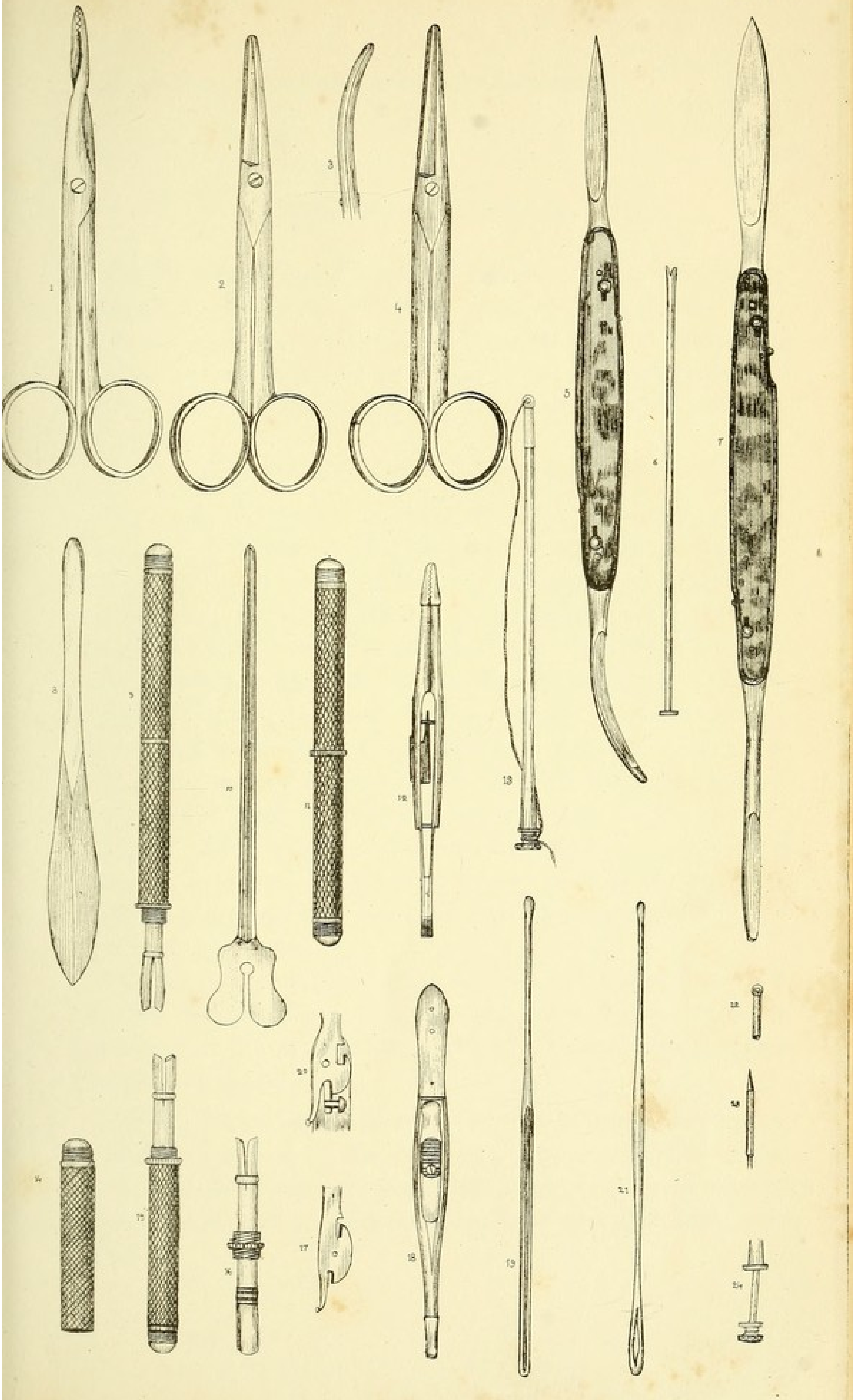

PLATE LXXXIX.

Fig. 2. Salivary Fistula. Dilatation by the Seton. Process of Morand. With the probe of Anel, a suture composed of several silk threads has been passed from the fistulous orifice, and brought to the buccal orifice of the duct and through the mouth. The two extremities of the seton have been knotted upon the cheek.

Fig. 3. Surgical anatomy of the parotid gland.

Figs. 5, 1. Puncture for the Purpose of making a new Passage. Process of M. Deguise. A first puncture has been made from before backward, bringing out one end of a cord upon the cheek, and leaving the other end in the mouth. In the figure, a second puncture is about to be made in the direction of the duct, from behind forward, with the canulated trocar of M. Graneria. A piece of cork in the mouth receives the point of the trocar, and protects the tongue from injury. The outer end of the cord is then to be passed through the canula after the stilet is removed, and the canula with the cord, brought out through the orifice of the mouth.

Fig. 1. The two ends of the cord are then to be knotted in the cavity of the mouth. The loop or ligature rests at the bottom of the fistulous orifice of the canal, the outer opening of which is now to be made to cicatrize.

Fig. 4. The same process executed with two needles introduced from the fistulous orifice, each of which has a separate direction, and is carried through into the cavity of the mouth, bringing with it one end of the cord.

Fig. 6. Horizontal Section of the Cheek, showing the circular loop formed by the cord in the inner substance of the cheek, and the fistulous passage for the duct opening externally, through which the needles and the ends of the cord have been introduced.

PLATE XC.

Harelip Operation. Harelip signifies a congenital fissure of the upper lip. Various cases of single and double harelip are seen in the plate.

Treatment. The edges of the fissure, which are red, like the lip, are to be pared, and then made to unite by adhesion. If the patient is a child, his body should be entirely wrapped in a cloth, to prevent its struggles; and the surgeon sits behind, taking the head of the child between his knees. Then seizing the lip by the corner of the fissure, with his left forefinger and thumb, he pierces it with a bistoury at the top of the fissure, just under the nose, and carries the instrument downward so as to shave off the edge of the fissure and the rounded corner at the bottom; and it is better to remove too much than too little. This process is repeated on the other side, and the two strips are detached from the upper angle. When bleeding is checked, the edges are to be brought into exact union, and transfixed by two or more harelip pins, or long, slender needles, on which a twisted suture is to be made. The first pin should be inserted near the angles of the fissure, and if the labial artery bleed, another pin should be placed so as to transfix and compress it. The pins should penetrate full two thirds of the thickness of the lip. They may be removed on the fourth or fifth day, and a strip of adhesive plaster may be drawn from one cheek to the other instead. If the harelip is double, both sides should be operated on at the same time, the middle flap being transfixed by the pins. But care should be taken to push up the middle flap towards the nose, so as to render the latter organ more prominent, as it is in general very flat in cases of harelip.

If one or more teeth project into the fissure, so as to offer any impediment to its union, they should be extracted; and if the bone project much, it may be necessary to remove a small portion of it with the cutting forceps, the soft parts on it having been first divided with the knife; but sometimes (as in a case related in Cooper's Dictionary) the projecting bones may be pushed so far backward by means of a kind of spring truss worn daily for several hours, that the soft parts may be brought over them without difficulty; and when this can be done, it is far better not to sacrifice any of the teeth. Some surgeons push the projecting part back at once with forceps, causing slight fracture. Some operators prefer scissors for the purpose of making the incisions. In some cases, the simple interrupted suture is used. Of course, the process will vary according to the nature of the case, and the skill and fancy of the surgeon.

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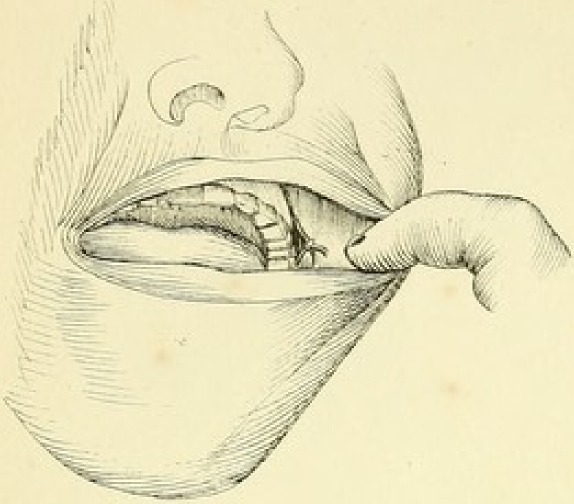

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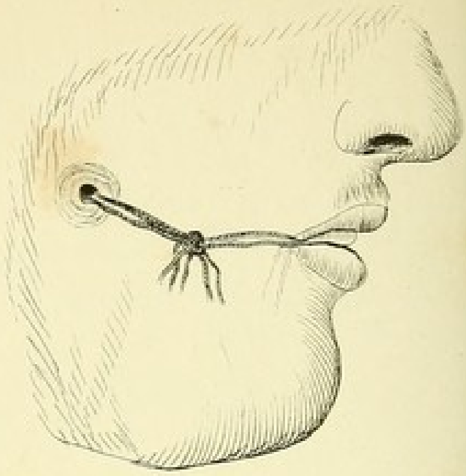

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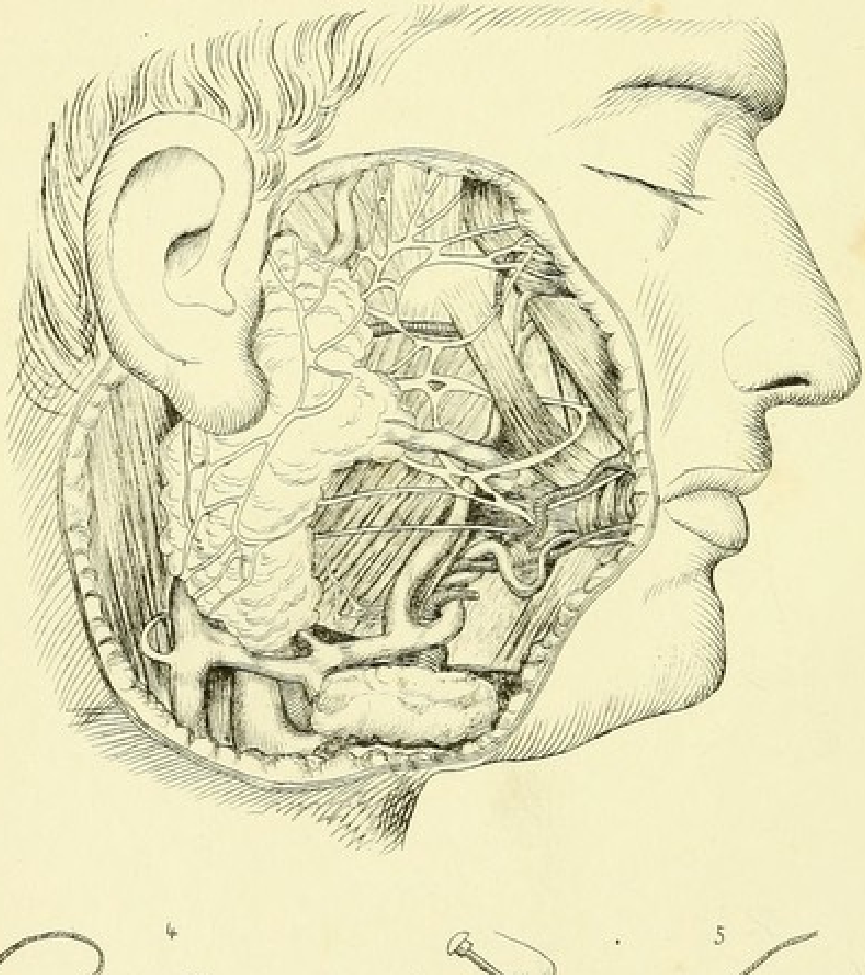

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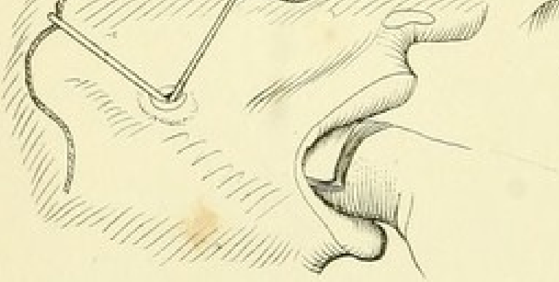

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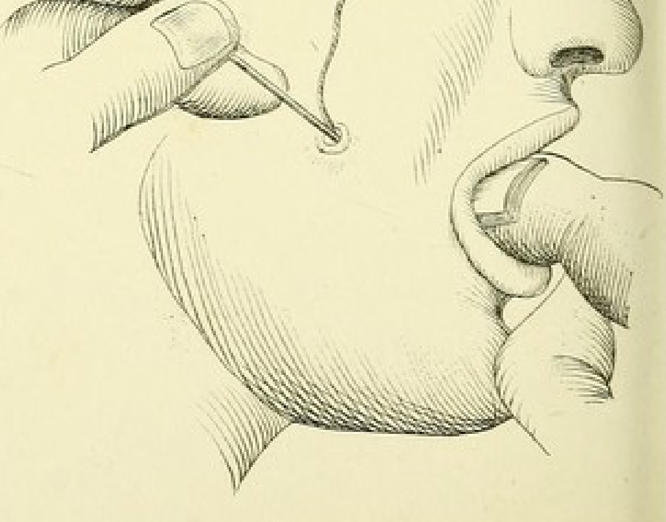

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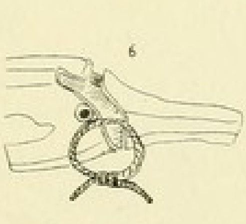


Pl. 90.

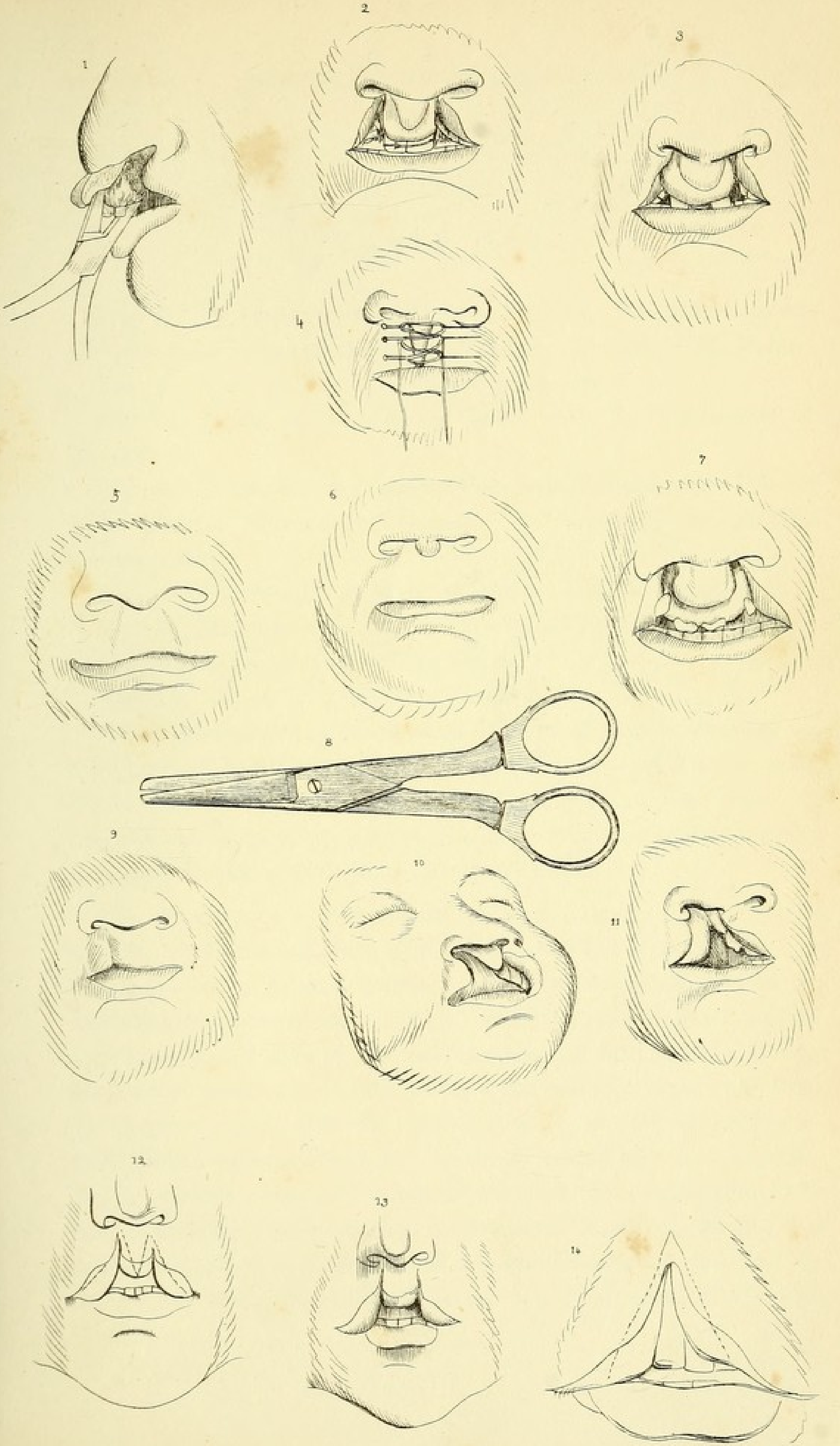


PLATE XCI.

Fig. 1. OPERATIONS FOR CLEFT PALATE. STAPHYLORAPHY. Section of the edges of the divided palate. Process of M. Berard.

Fig. 8. Same as Fig. 1. Process of M. Roux.

Fig. 2. Union of the divided palate with the instrument of M. Guyot.

Fig. 3. Passage of the needle from before backward. Process of M. Berard. The crooked forceps (Fig. 4) may also be used for this purpose.

Fig. 5. Passing the ligature. Process of M. de Pierris.

Fig. 7. Passing the ligature. Process of M. Roux.

Fig. 9. Ligature with the fingers.

Fig. 10. Knot. Copied from Druitt.

When the fissure extends from back to front, entirely through the hard and soft palate and lip, the lip should be operated upon early, in the manner described when speaking of harelip. The fissure in the soft palate may, at puberty, be united by a somewhat similar operation to the one about to be described.

MR. FERGUSSON'S OPERATION. The description is his. "With a knife, whose blade is somewhat like the point of a lancet, the cutting edge being about a quarter of an inch in extent, and the flat surface being bent semicircularly, I make an incision about half an inch long on each side of the posterior nares, a little above and parallel to the palatine flaps, and across a line straight downward from the lower opening of the Eustachian tube by which I divide the levator palati on both sides, just above its attachment to the palate. Next, I pare the edges of the fissure with a straight, blunt-pointed bistoury, removing little more than the mucous membrane ; then, with a pair of long, blunt-pointed, curved scissors, I divide the posterior pillar of the fauces immediately behind the tonsil, and, if it seems necessary, cut across the anterior pillar, too, the wound, in each part, being about a quarter of an inch in extent. Lastly, stitches are introduced by means of a curved needle, set in a handle."

PLATE XCII.

Fig. 1 shows the parts referred to in Mr. Fergusson's operation last described.

Refs. 1. The levator palati. The dark line shows where it should be cut across.

2. The inner bundle of fibres of the palato-pharyngeus facing the posterior pillar of the fauces. The black line indicates the place of division.

3. The palato-glossus, with the mark for incision, if one should be deemed necessary. The tonsil lies between these two muscles.

4. The tensor palati. The cartilaginous extremity of the Eustachian tube is in front of this.

5, 5. The posterior extremity of the inferior turbinated bone.

6. The septum.

7. The uvula on each side stretched apart.

Fissures in the Anterior Part of the Bony Palate may be diminished by lateral compression during growth, and after puberty may either be palliated by means of an obturator of gold or caoutchouc, or relief may be attempted by means of an operation first proposed by Dr. J. M. Warren. This consists in paring off the tissues from the bones on each side of the fissure in two lateral flaps, and stitching these together in the mesial line.

Dr. Pancoast performed an operation for fissure of the hard palate by forming two flaps from the mucous covering of the sides and roof of the mouth. These were reversed upon the opening witl their mucous surface upward, and attached to each other by two points of interrupted suture, and forced firmly up against the margin of the bony orifice — which had previously been made raw with a knife — by a curved harelip pin, the convexity of which presented upward. The wrapping of the ligature round the pin carried the flaps firmly up against the orifice, so as to facilitate the adhesion to the raw margin of the latter. The mucous membrane of the sides of the flaps was partially shaved with the knife before they were reflected upward.

Fig. 3. Guillotine tonsil instrument.

Fig. 4. Excision of the tonsils, with the bistoury.

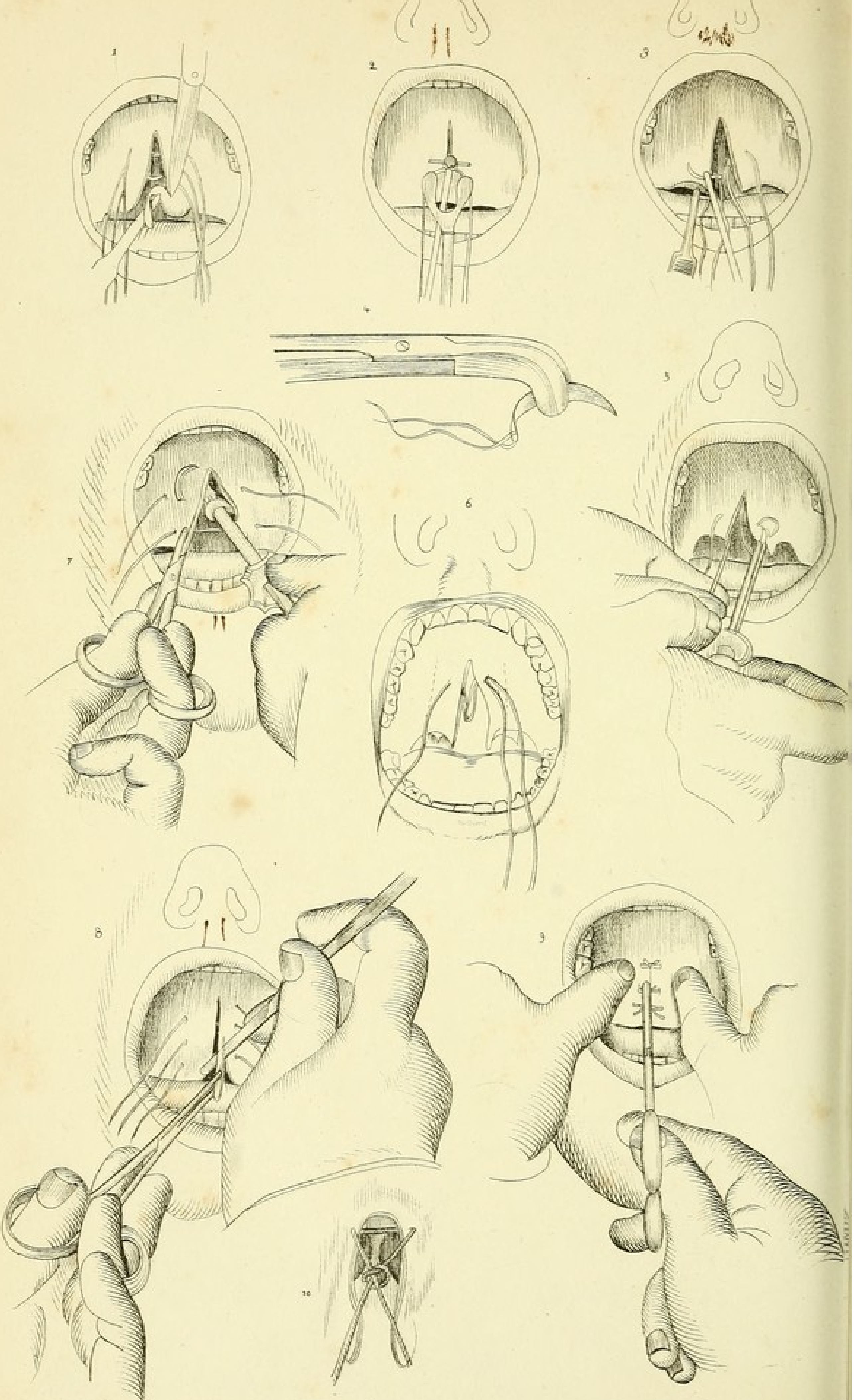
Fig. 4. (On the right of the page.) Ligature of the tonsil, with the *serre-nœud* of M. Itard.

Fig. 5. Staphyloraphy. Process of Dieffenbach.

Fig. 5. (Near the bottom of the plate.) Closure of an orifice in the hard palate by two lateral flaps, dissected from the sides.

Fig. 6. Excision of the tonsils with the instrument of M. Fahnestock.

Fig. 7. Excision of the tonsils, with the hooked forceps and bistoury.



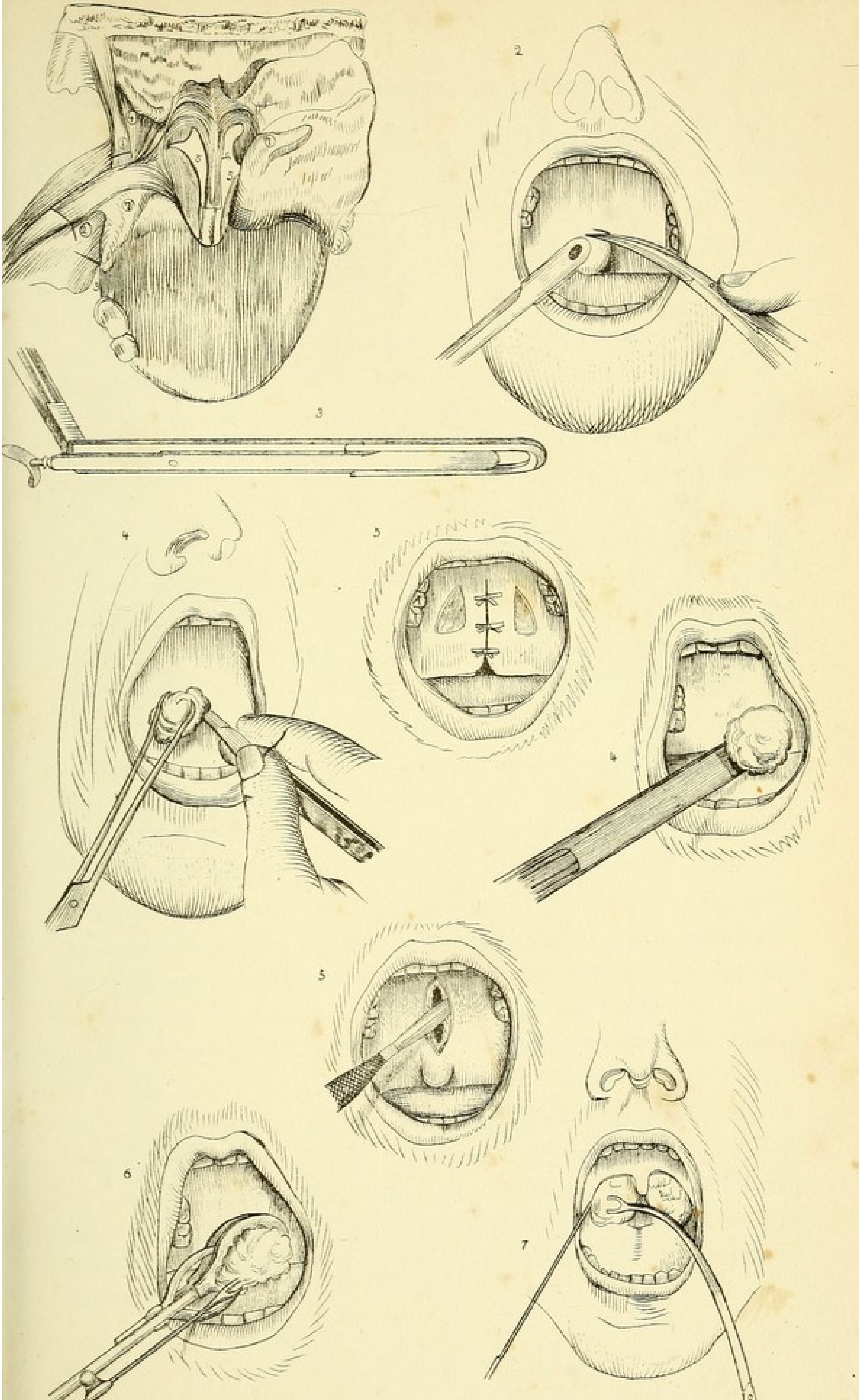


PLATE XCIII.

Fig. 3. Paracentesis Thoracis may be performed by making an incision an inch and a half long between the fourth and fifth, or fifth and sixth, ribs, at, or a little behind, their middle. The intercostal muscles are then to be cautiously divided, and the point of the bistoury to be passed through the pleura. If fluid escapes from this puncture, it may be slightly enlarged. The patient should be placed on the diseased side, immediately after the puncture, so that the matter may flow out without the ingress of air. The wound should be closed with lint and plaster before too much matter has escaped. The abdominal viscera should be pressed upward while the fluid is escaping. The chest should be bandaged afterward, and the operation repeated in a few days, if necessary.

Fig. 2. Paracentesis Thoracis. Process of M. Beclard. The skin and cellular tissue is drawn strongly to one side, before the introduction of the instrument; then, upon its withdrawal, the wound may be covered.

Fig. 1. Process of M. Reybard. An incision is made so as to uncover a rib; a portion of the middle of the bone is taken out by a small trephine, and a tube introduced, to which is attached a portion of the intestine of some animal; this, by being kept constantly moist by the matter which escapes, prevents the ingress of air.

Fig. 4. Opening of the Pericardium in Case of Hydrops Pericardii. Process of M. Skielderup. A crucial incision is made at the lower end of the sternum, opposite the articulation of the fifth rib. A small trephine is applied, and after the piece is removed, the pericardium is opened with the forceps and bistoury, as seen in the figure.

The second incision in this figure shows the point of incision of Desault, for the same operation.

"This operation," says Druitt, "may, if thought advisable, be performed either by making an incision opposite the heart's apex, and dividing the muscles and pericardium with the same precautions as in paracentesis thoracis, or by first making an opening into the pleura opposite the junction of the fifth or sixth rib with its cartilage, and then introducing the finger, feeling for the distended pericardium, and cutting into it with curved scissors.

Fig. 5. Abscess of the Liver. Previous to opening into the abscess, an incision should be made through the skin and muscular tissue over the liver, in order to produce adhesion between the serous surfaces; after this has taken place, the incision is extended into the tumor.

PLATE XCIV.

Fig. 1. Paracentesis abdominis. From Bourgery.

Fig. 2. Same operation as Fig. 1. Profile view.

Figs. 3, 4, 5. Trocar for performing the above operation.

Operation. The patient must be seated in a chair. A broad towel must then be passed round the lower part of the abdomen, and its ends be crossed behind, and intrusted to two assistants, who are to be instructed to draw it tight, and support the belly as the fluid escapes; otherwise, the removal of the compression, to which the abdominal veins have been habituated, would cause the blood to gravitate into them from the heart, and induce syncope; or perhaps they might burst, and occasion fatal hemorrhage. A piece of flannel, broad enough to cover the whole abdomen, and having a notch cut out of it, above and below, and the edges sewed together afterwards, is a good substitute for the towel. The surgeon, then, holding a trocar in a canula, in his right hand, with the end of his forefinger about two inches from the point of the instrument, plunges it through the linea alba, two inches below the umbilicus; then, steadying the canula with his left hand, he pulls out the trocar with his right; the assistants are to draw the towel tight as the fluid escapes. If the trocar is a large one, it will be as well to puncture the skin with a lancet, before introducing it. The aperture is to be closed with lint and plaster, and the patient to be put to bed with the towel fastened round the loins. A broad flannel roller should be substituted for it before he rises. If a patient with ascites happens to have an old irreducible hernia, and the sac is much distended, and preserves a free communication with the abdomen, it is a good plan to puncture the sac instead of the linea alba.

OVARIOTOMY. There are two methods of performing this operation. The first is by means of a long incision from sternum to pubes, which was practised some years ago by McDowell, of Kentucky, and by Mr. Lizars, and of late by Dr. Clay, of Manchester. The manner of operating which Dr. Clay adopted was as follows: The patient being placed comfortably on a table, he severed the integuments from sternum to pubes with one stroke — an incision twenty-four inches long. Then, having carefully cut through the peritoneum at the upper part, sufficiently to introduce two fingers of his left hand, he passed in a probe-pointed bistoury, and, under the protection of his fingers, divided the peritoneum to the extent of the first incision. The pedicle of the tumor, one of the broad ligaments, was then firmly tied and cut through; but as it was excessively thick, some of the vessels in it continued to bleed, and required separate ligatures; some adhesions that were soft and recent gave way readily to the slightest touch; but an extensive omental adhesion required to be divided by the scalpel, and a vessel that bled freely was secured. The tumor was then lifted up and removed. When all bleeding had ceased, the integuments were brought together with nine stitches, and strips of adhesive plaster were passed round the body. The incision should be made to diverge a little, so as not to cut

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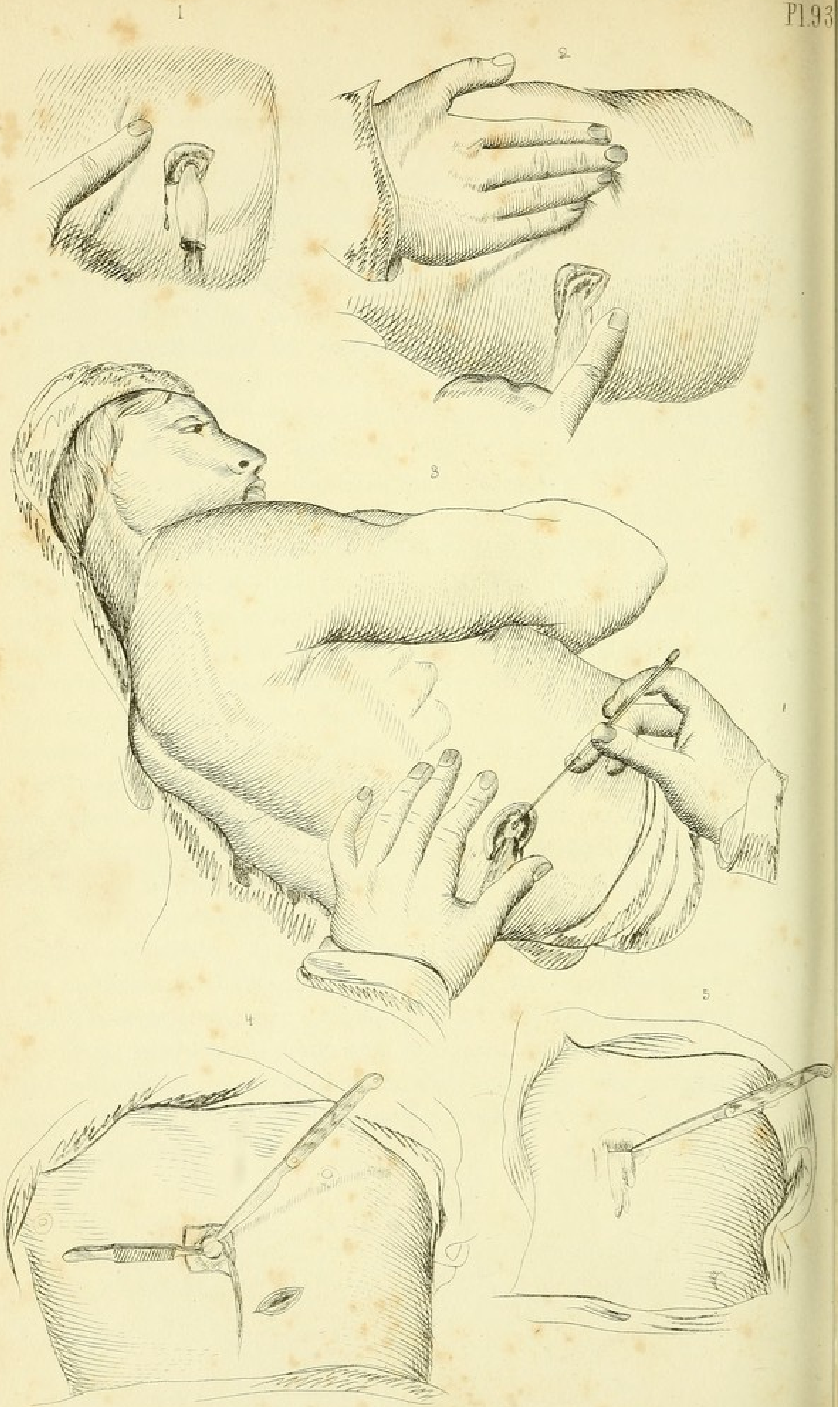
through the umbilicus. If, on examining the tumor, it is found either to be of a different nature from what was anticipated, or to have contracted numerous and wide adhesions, it is better to close the wound quietly, without attempting to extirpate it. In order to bring the sides of the abdomen evenly together, a number of lines may be marked across the linea alba, with nitrate of silver, before the operation.

The second mode of operating is by means of an incision through the linea alba, below the umbilicus, of from two to four inches in length. As soon as the ovarian cyst is exposed, it is to be punctured, and the edges of the puncture being seized with a hook, or forceps, the whole of the cyst is to be dragged out of the wound, as it gradually collapses on the fluid escaping; then the pedicle of the cyst, having been transfixed with a needle armed with a strong ligature, is to be tied tightly and cut off. Whilst the cyst is protruding, an assistant should keep his hands on the margins of the wound, to prevent any escape of the bowels. An estimate may be formed whether the tumor consists of one cyst or many, by the quantity of fluid which escapes when the puncture is made; and if a second cyst is discovered, it may be punctured and dragged out also. This operation was suggested many years ago, although never performed, by Dr. W. Hunter. It was revived in 1838 by Mr. Jeaffreson, and has since been adopted by Mr. B. Phillips, Dr. F. Bird, Mr. Lane, and other operators. It may be remarked, that the temperature of the apartment in which any such operation is performed, ought to be raised to seventy degrees. Dr. E. R. Peaslee recommends that all operations in which the peritoneum is opened, should be performed in a room where the air is moist, as well as warm. He considers the liability to peritoneal inflammation much less, when this precaution is observed.

Pl. 93



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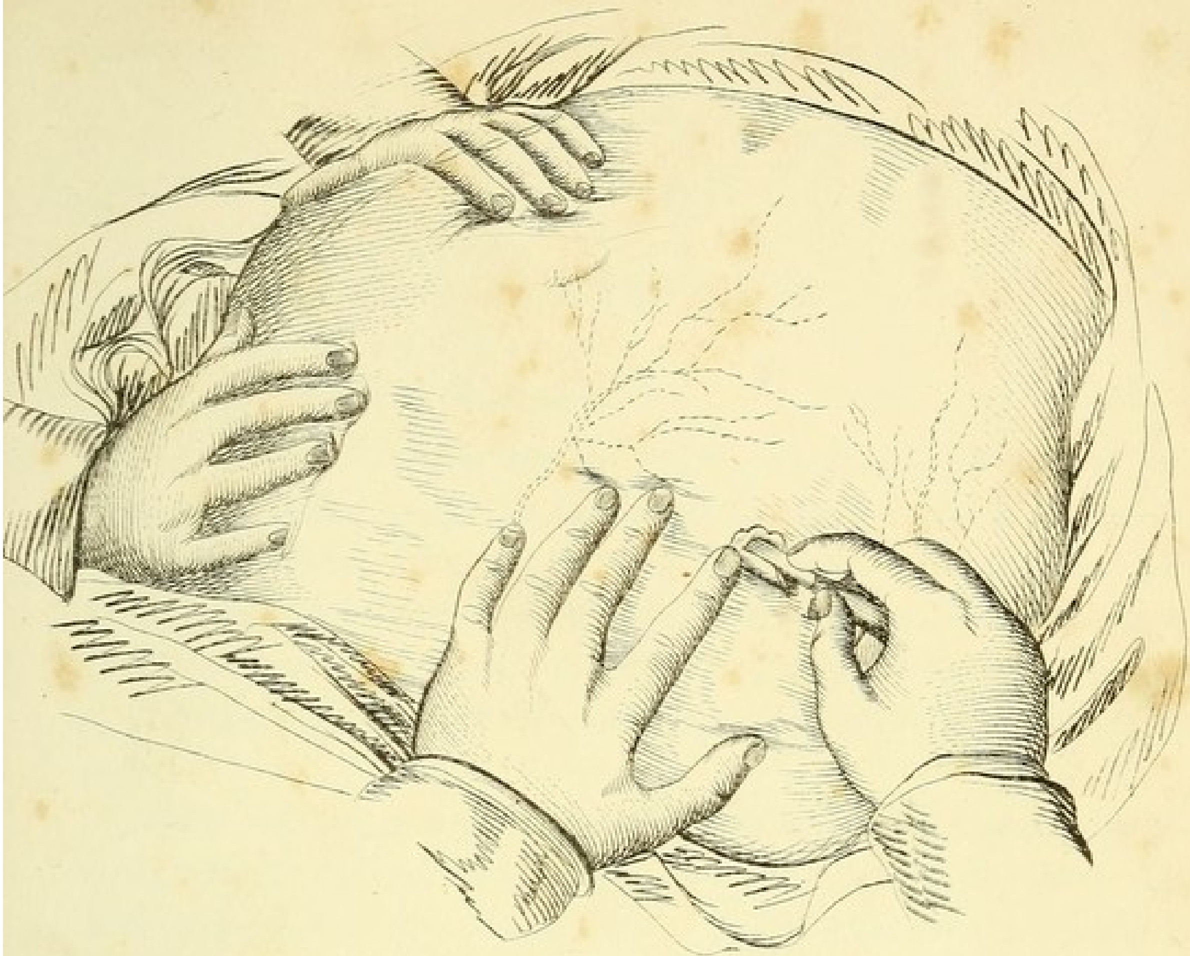

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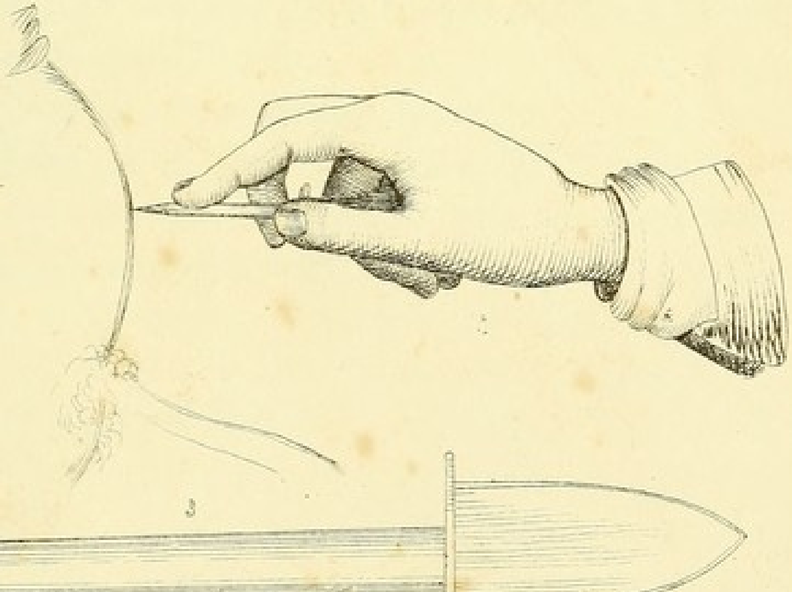

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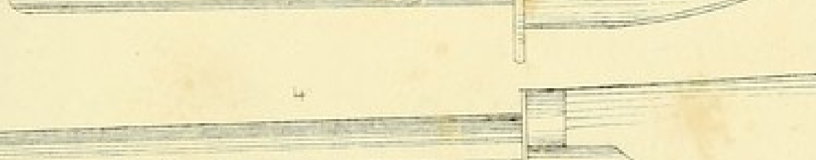

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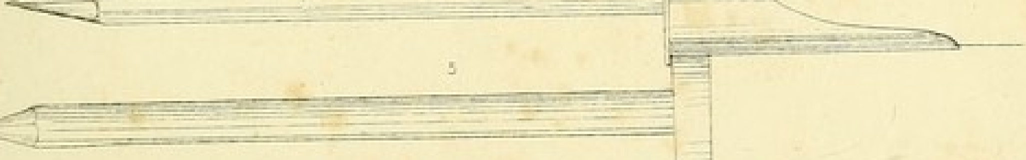

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PLATE XCV.

Fig. 1. Suture of Ledran.

Fig. 2. Dilatation of an Abdominal Wound for the purpose of reducing a mass of the small intestines which have escaped externally. The folds of intestine are gently drawn down with the surgeon's left hand, so as to admit the insertion of the forefinger into the top of the wound. Over the nail of this finger the back of a probe-pointed bistoury is passed, for the purpose of dilating the orifice.

Fig. 3. Dilatation on the grooved director of an opening in the omentum, through which a hernial protrusion has taken place. The suture of the wound in the small intestine is made by the process of Beclard.

Figs. 4, 5. Suture by one of the processes of Reynard.

Fig. 6. Small wooden plate, seen applied in Fig. 4, for the wound in the intestine shown in Fig. 5.

Fig. 7. Suture by the process of Jobert.

Fig. 8. Wound in the intestine closed by the glover's suture. The surgeon is returning the intestine with his right hand.

Figs. 9, 10. Process of Jobert for invagination.

PLATE XCVI.

Fig. 1. Invagination of the intestine by the process of Beclard.

Fig. 2. Invagination by the process of Ledran.

Figs. 4, 3, 6, 5. Invagination by the Process of M. Denans. Two rings are placed in the cut ends of the intestine, over which the edges are folded so as to present serous surfaces internally. The large ring is then introduced, (Fig. 3,) and the ends brought together and secured, as seen in Fig. 6.

Fig. 5 exhibits a section of this operation.

Figs. 7, 8. Cases of accidental artificial anus; from the collection of Dupuytren.

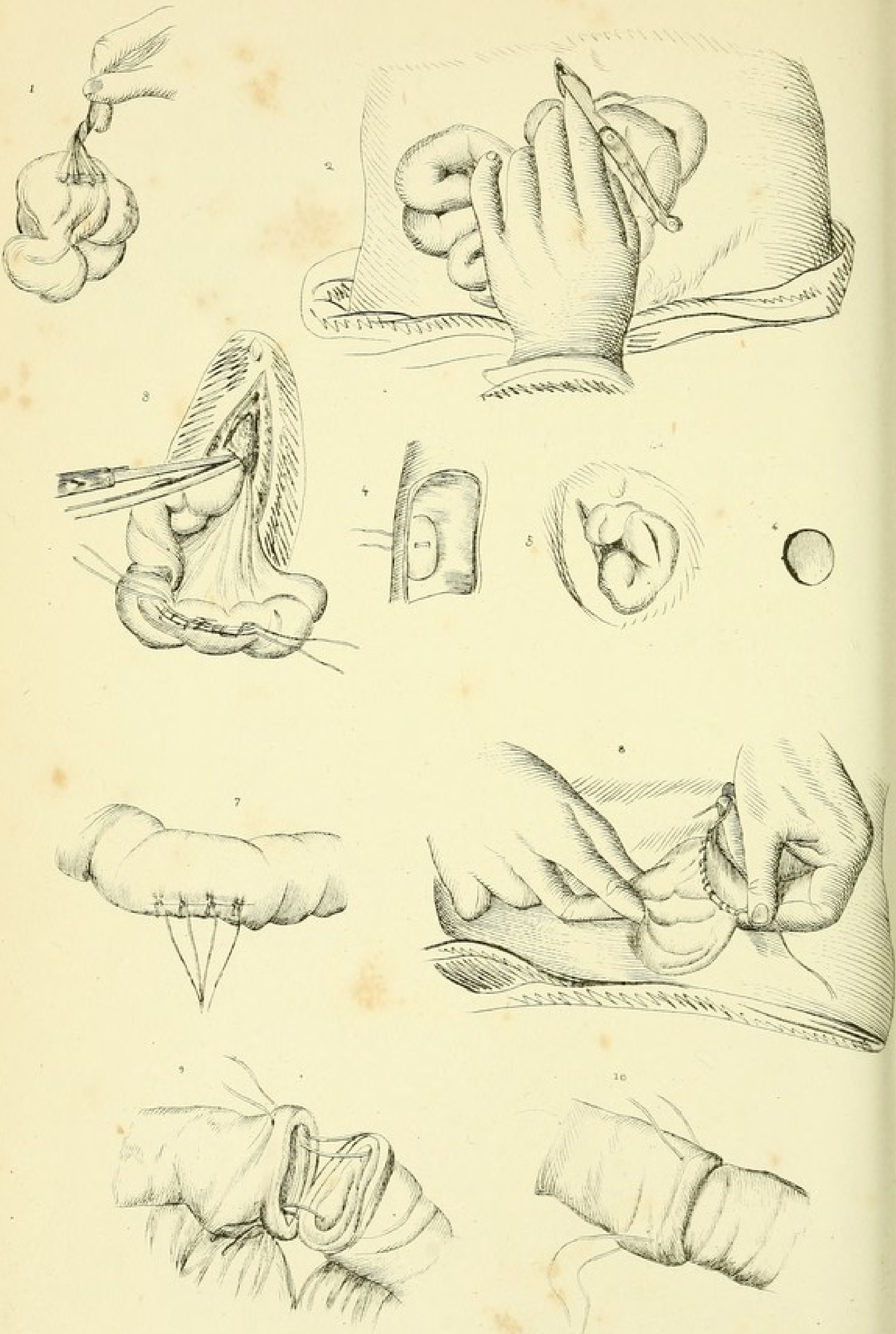
Figs. 9, 10. Cases of strangulated hernia, with a portion of the intestine mortified.

Wounds of the Abdomen. In case of a simple wound of the parietes, the surgeon must first (if it be large enough) gently introduce his finger to ascertain that no part of the intestine protrudes. The wound must be closed by adhesive plaster, or by suture, if it is extensive. If the epigastric artery is wounded, it must be cut down upon, and tied.

If the intestines protrude, and are neither wounded nor gangrenous, they should first be freed from any foreign particles that adhere to them, and then be returned as soon as possible. The patient should be placed on his back, with his shoulders raised and his knees drawn up. If absolutely necessary, the wound may be a little dilated with a probe-pointed bistoury. Then the surgeon should return the bowel, portion by portion, passing it back with his right forefinger and thumb, and keeping his left forefinger on that which is already replaced, to prevent it from protruding again. He should be careful to replace intestine before omentum, and the part that protruded last should be returned first.

If the stomach and intestines, when protruded, are found to be wounded, the wound should be carefully closed with a fine needle and silk, by the continuous or glover's suture, in such a manner as to bring the edges into apposition, and prevent all extravasation between them; then the part should be replaced, and the external wound be closed. If, however, any part of the bowel that is protruded be bruised or lacerated, or gangrenous, it should not be returned, but be left hanging out of the wound, that an artificial anus may be formed.

Artificial Anus. The treatment of these cases will be described in connection with the description of Plate CIV.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Pl. 96.

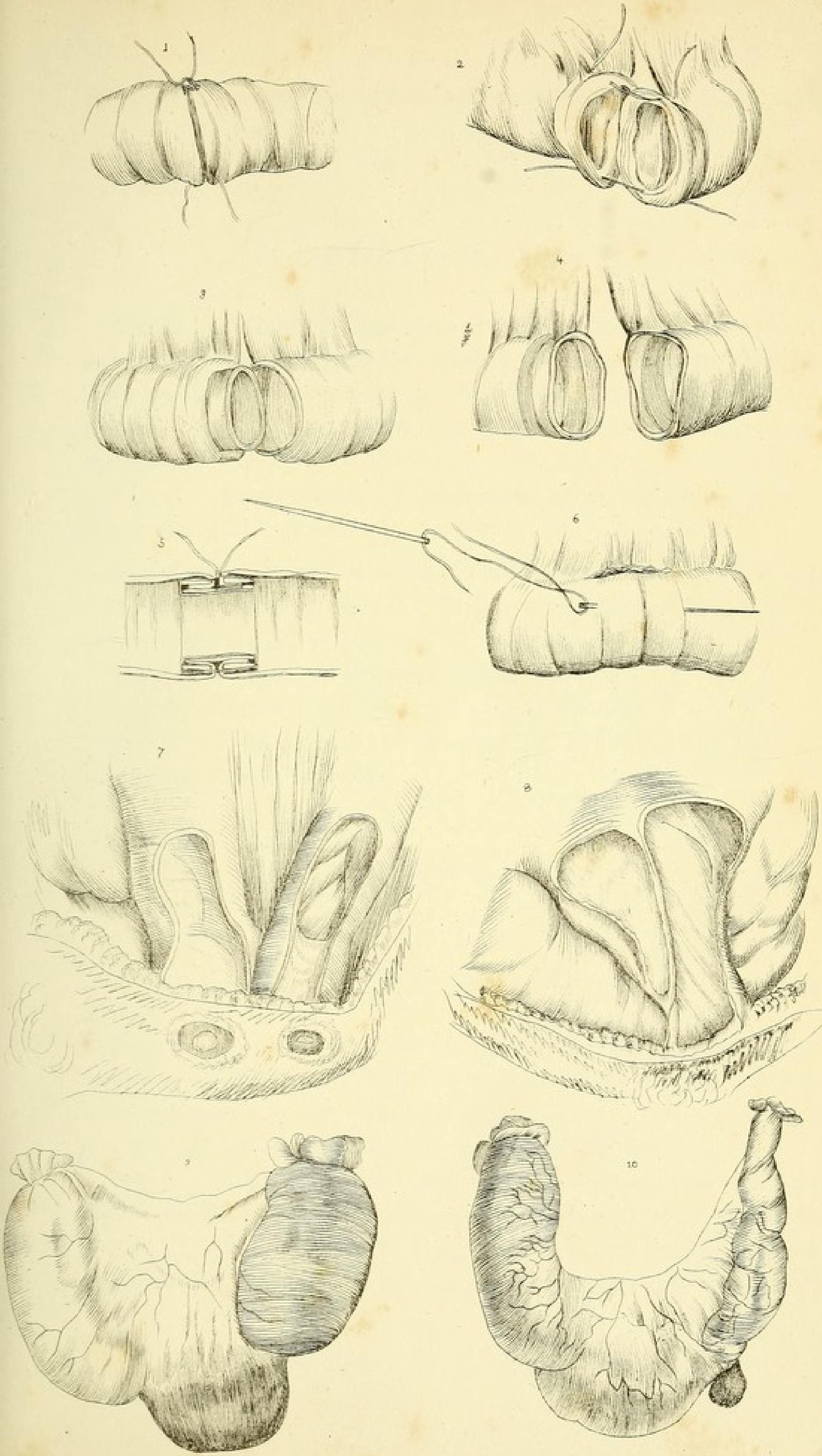

PLATE XCVII.

Fig. 1. Internal Strangulation of the Intestines in a case of Crural Hernia. From the Musée de la Faculté. The hernia had been reduced, but the symptoms still continued. After the death of the patient, the parts were found as shown in the figure.

Fig. 2. Strangulation of the cœcal extremity of the ilium. From the same collection.

Fig. 3. Umbilical Hernia. The coverings of this hernia are skin, superficial fascia, and sac. They are always very thin, and not unfrequently the sac is adherent to its contents.

Figs. 4, 5. Cases of congenital inguinal hernia.

Fig. 6. Case of large femoral hernia in a female.

Fig. 7. Femoral hernia. The dotted line shows the line of incision in case of operation.

PLATE XCVIII.

Fig. 1. Hernia Infantilis. From Liston. The tunica vaginalis, distended with fluid, lay in front of the hernial sac, and extended nearly to the abdominal ring.

Fig. 2. Inguinal hernia, with the line of incision.

Fig. 3. From Tiedemann, showing the difference between oblique and direct inguinal hernia, and their relations to the epigastric artery. In the oblique, the neck of the tumor inclines upward and outward, and causes a fulness extending up to the middle of

Poupart's ligament. In the direct, it inclines, if at all, rather inward; and when the hernia is reduced, the finger, carrying the integument before it, can be passed directly into the abdominal cavity. But, in old cases of oblique hernia, the neck of the sac is dragged down towards the mesial line, so that all distinction is lost.

Fig. 4, from Tiedemann, gives an internal view of the parts concerned in the formation of hernia, and, on the left side, shows the usual place at which direct inguinal hernia protrudes.

Fig. 5, from a preparation of Mr. Fergusson's, in King's College Museum, shows a femoral hernia, with its relation to the other parts which pass under Poupart's ligament. Externally are seen sections of the iliacus and psoas muscles, with the crural nerve between them; then, the femoral artery and vein; next, the hernia, which passes through a small aperture, occupied by an absorbent gland in the normal state, and is bounded by Gimbernat's ligament on its inner side. The hernia passes downward in the sheath of the femoral vessels, separated, however, from the vein, as that is from the artery, by a process of cellular tissue. The sheath of the vessels is continuous above with the fascia transversalis.

Fig. 7. Same as Fig. 5. Refs. 12. Hernial sac. 13. Femoral vein. 14. Femoral artery.

Fig. 6. Case of obturator hernia, of which the patient died.

Pl. 97.

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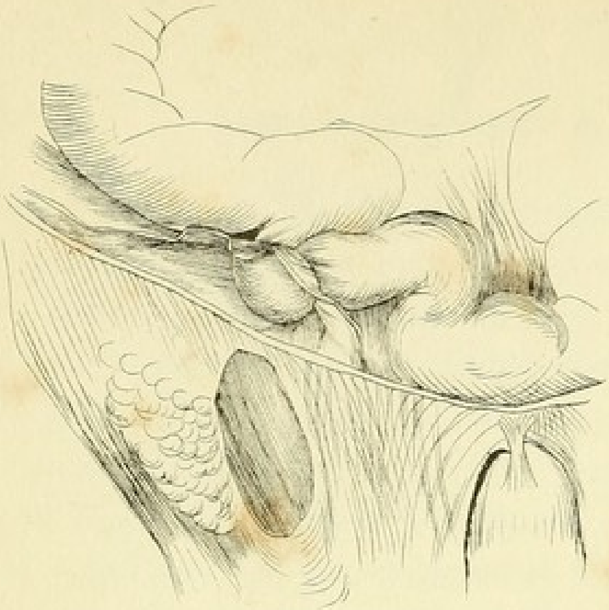

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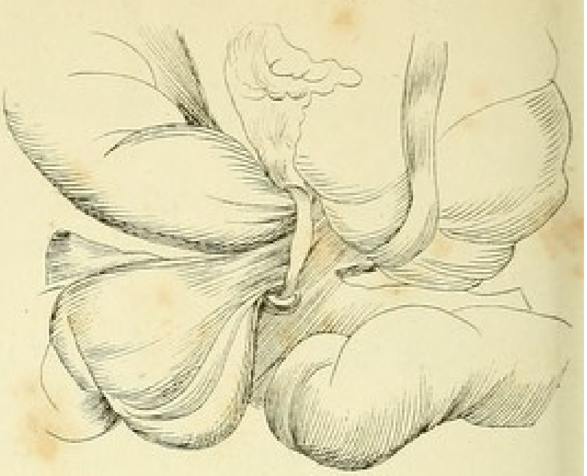

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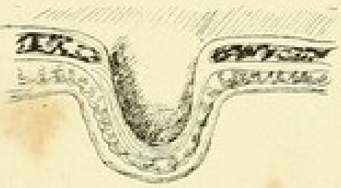

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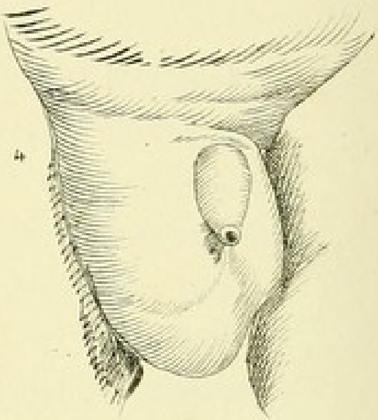

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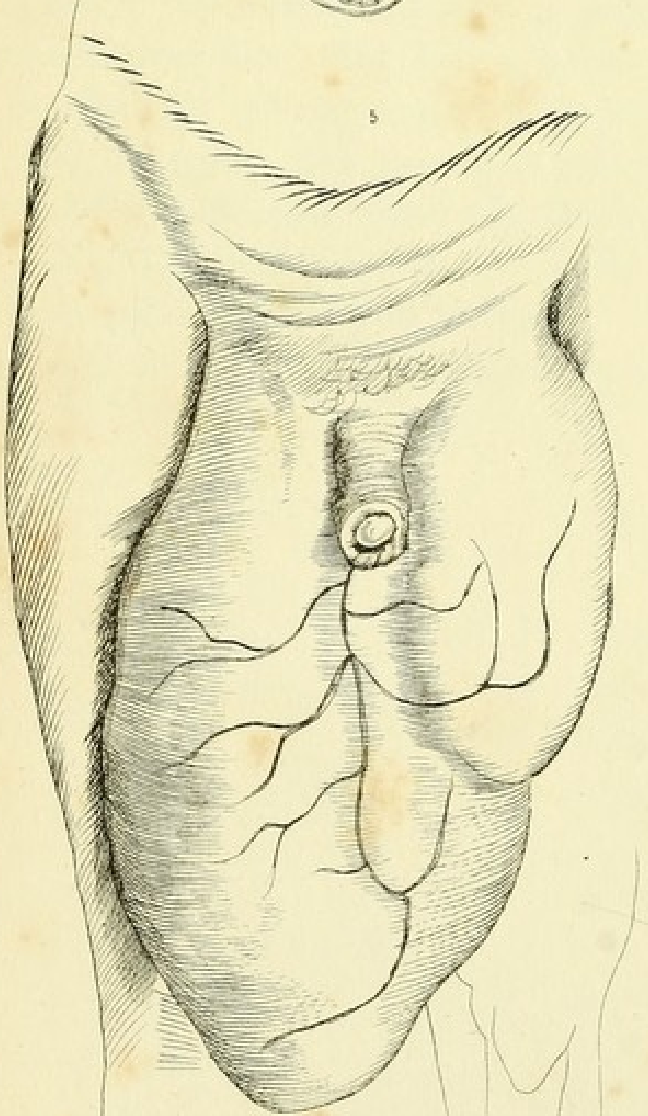

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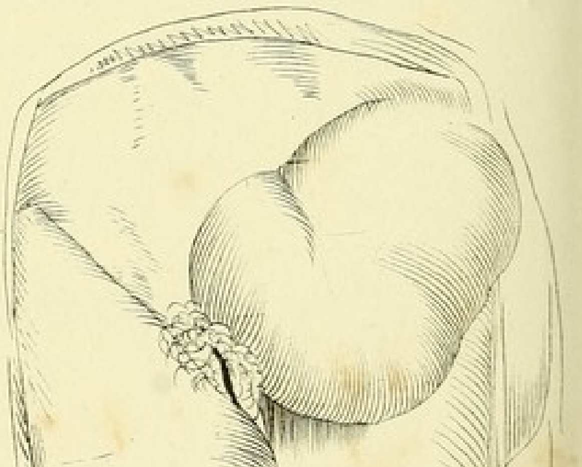

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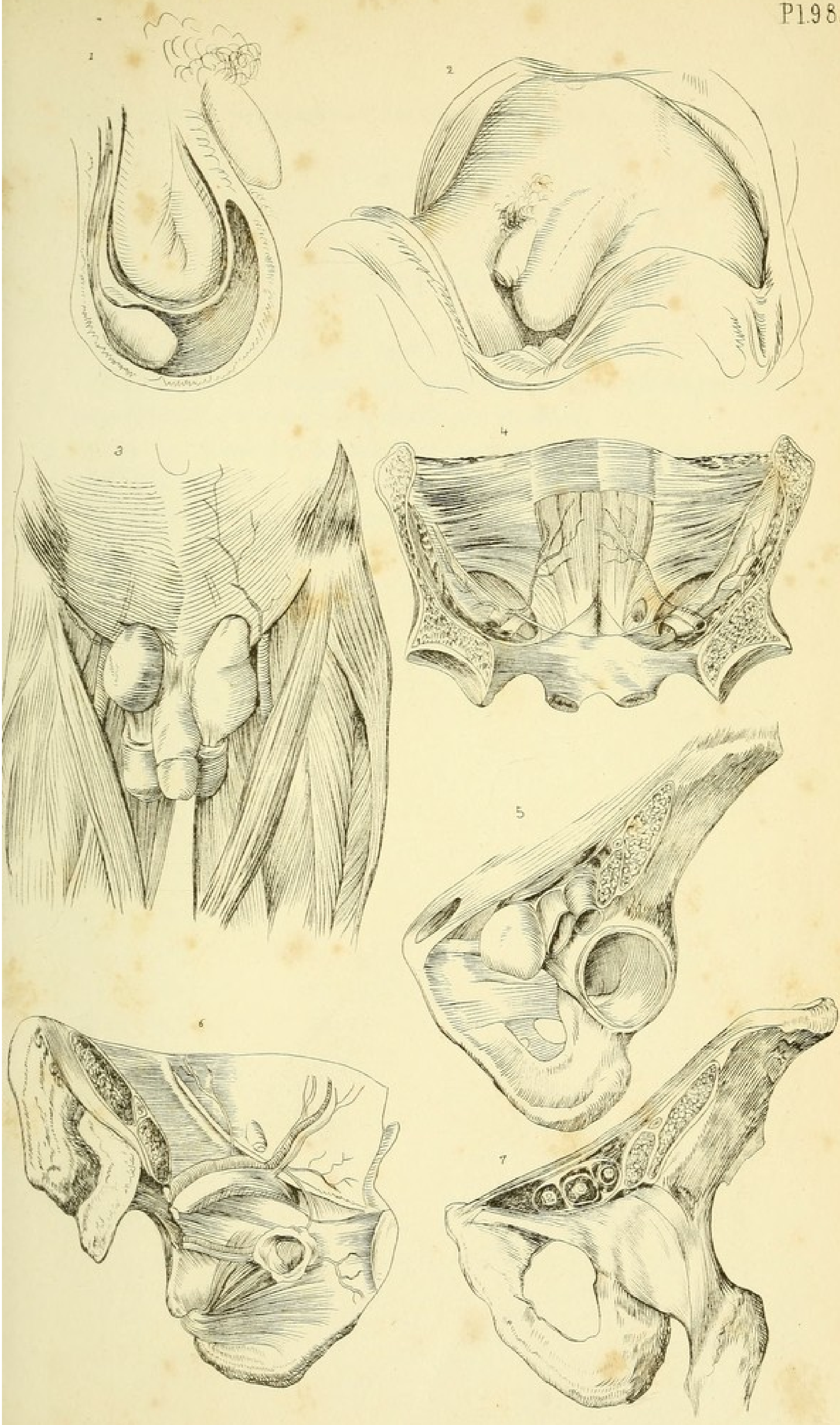

PLATE XCIX.

Figs. 1, 2. Reduction of hernia by the taxis.

Fig. 3 shows the manner the knife is held upon the finger, when passed into the hernial sac to divide the stricture.

Fig. 4. Dissection of the parts concerned in inguinal hernia.

Fig. 5. Dividing the stricture in a case of inguinal hernia. The knife is directed upward and inward.

Fig. 6. Introduction of the finger after the sac has been opened, in order to ascertain the seat of the stricture.

PLATE C.

Fig. 1. Similar to Fig. 8, Plate XCIX. In this figure the surgeon is represented as cutting directly upward, holding the bistoury in his left hand.

Fig. 2. Division of the stricture with the probe-pointed bistoury. Instrument more curved than in the preceding cases.

Fig. 3. Opening the Sac. The surgeon lifts a fold of the peritoneal sac from off the surface of the intestine, and punctures it with the knife held flatwise.

Fig. 5. Strangulated Crural Hernia. Division of Hey's ligament. The finger is represented as being passed under the stricture; on this the knife is slid flatwise, and the edge is then turned upward.

The left-hand upper bistoury is placed in a position to show the process of Pott for dividing with his curved bistoury the inner end of the crural arch directly upward.

The other bistoury is placed in a position to show the process of Sharp for the division of the crural arch obliquely upward and outward. This is attended with the risk of wounding the femoral vein.

Fig. 4. The lower end of the peritoneal pouch is shown on the point of being laid open with the bistoury over the finger, so as to leave no cul-de-sac for the retention of the secretions during the cure.

Fig. 6. The lower bistoury is placed in a position to show the process of Sabatier for the division of the stricture upward and inward.

The other bistoury is placed in a position to show the process of Dupuytren for dividing the ligament of Gimbernat obliquely upward and outward by an incision from the exterior.

On the edge of the ligament, several small incisions are shown, as in the process of Scarpa for enlarging the orifice of the crural ring.

INGUINAL HERNIA. Oblique inguinal hernia is the most common. It takes the same route as the testicle in its passage from the abdomen into the scrotum. It commences as a fulness, or swelling, at the situation of the internal abdominal ring, (that is to say, a little above the centre of Poupart's ligament,) next passes into the inguinal canal, (and in this stage is called bubonocele;) and if the protrusion increases, it projects through the external ring, and descends into the scrotum of the male, or labium of the female. The coverings of the hernia are, 1. Skin; 2. A strong layer of condensed cellular tissue, divided from the superficial fascia of the abdomen, in which the external epigastric artery ramifies. With this is mostly incorporated, 3. The fascia spermatica, a tendinous layer, derived from the intercolumnar bands, a set of semicircular fibres which connect the two margins of the external ring. Under this lies, 4. The cremaster muscle, sometimes called tunica communis. Next comes, 5. The fascia propria, a cellular layer continuous with the fascia transversalis of the abdomen; and, lastly, 6. The sac. The internal epigastric artery is always internal to the neck of the sac. The spermatic cord is generally behind the sac; but in old cases, the parts which compose the spermatic cord are separated by the tumor, so that the vas deferens and spermatic artery lie sometimes in front, and sometimes on either side.

THE DIRECT INGUINAL HERNIA bursts through the conjoined tendon of the internal oblique and transversalis muscles, just behind the external ring. Its coverings are the same as those of the oblique variety, except the cremaster muscle, for it has no connection with the cord. The epigastric artery lies external to the neck of the sac. This hernia may, however, push the conjoined tendon before it, instead of bursting through it. The spermatic cord generally lies on its outer side.

DIAGNOSIS. Hydrocele may be distinguished from hernia by its beginning at the bottom of the scrotum, by its being semi-transparent and fluctuating, and preventing the testicle from being clearly felt,—whilst the cord can be distinctly felt above it,—and by not dilating on coughing; whereas hernia begins at the top of the scrotum, is not transparent, does not fluctuate, does not prevent the testicle from being felt, although it obscures it, and dilates on coughing. But hernia often coëxists with hydrocele, the former beginning from above, the latter from below; moreover, a hernia consisting of intestine greatly distended with flatus has been known to be as transparent as hydrocele.

Hydrocele of the cord, if low down, may be distinguished by its transparency and fluctuation; but if high up, it may extend into the abdominal ring, and receive an impulse on coughing, and the diagnosis be very difficult. But, as hernia may be concealed behind this kind of tumor, the rule, "When in doubt, operate," should be acted upon in case of symptoms of strangulation.

Varicocele resembles hernia, inasmuch as it increases in the erect posture, and perhaps dilates on coughing; but it may be distinguished from hernia by its feeling like a bag of worms; and although, like hernia, it disappears when the patient lies down, and the scrotum is raised, still it quickly reappears, though the pressure would effectually prevent a hernia from coming down again.

A testicle that has stopped at the external abdominal ring, without descending into the scrotum, has been frequently confounded with a bubonocele, and has been compressed with a truss, to the great pain and detriment of the patient. Care and attention will prevent this mistake.

Strangulated Hernia. The seat of the stricture is generally at the neck of the sac; but in some rare cases, the bowel has been constricted by membranous bands, or by fissures in the omentum, or in the sac itself.

The Symptoms of Strangulated Hernia are, first, those of obstruction of the bowels; secondly, those of inflammation. The patient first complains of flatulence, colicy pains, a sense of tightness across the belly, desire to go to stool, and inability to evacuate the bowels. (It is true that stools may be passed, if there be any fecal matter in the bowel below the hernia, or if the hernia be entirely omental, but with very transient relief.) To these symptoms succeeds the vomiting of the contents of the stomach, then of mucus and bile, and lastly, of matters which have acquired a stercoraceous appearance by being delayed in the small intestines. Meanwhile the tumor is uneasy, tense, and incompressible. If this state of things continue, the inflammatory stage comes on. The neck of the sac becomes tender, and tenderness diffuses itself over the tumor and over the abdomen, both of which become very painful, and much more swollen. The countenance is anxious; the vomiting constant; the patient restless and despondent; and the pulse small, hard, and wiry. After a variable time, the constricted parts begin to mortify. The skin becomes cold, the pulse very rapid and tremulous, and the tumor dusky red and emphysematous; but the pain ceases, and the patient, having, perhaps, expressed himself altogether relieved, soon afterwards dies.

DIAGNOSIS. If a patient with irreducible hernia be attacked by colic, or enteritis, or peritonitis, the case will present many of the features of strangulation. Yet it may, perhaps, be distinguished, by noticing that the pain and tenderness did not begin at the neck of the sac, and are not more intense there than elsewhere. The diagnosis will be very obscure if the inflammation commences on the omentum or intestine in the sac; but the general rule is, — When in doubt, operate. In every case of sudden and violent colic, the surgeon should not fail to make a thorough examination of his patient for hernia, because he may have been laboring under it for years, and yet, from ignorance or *mauvaise honte*, may not mention it.

TREATMENT OF STRANGULATED HERNIA. In the first place, an attempt should be made to return the protrusion by a manual operation called Taxis, (Plate XCIX. Figs. 1, 2.) The bladder having been emptied, the patient should lie down with his shoulders raised; both his thighs bent towards the belly, and placed close to each other. He should be engaged in conversation, to prevent him from straining with his respiratory muscles. Then the surgeon, if the tumor be large, grasps it between the palms of both hands, gently compresses it, in order, if possible, to squeeze a little of the flatus into the abdomen, pushes it in the axis of the neck of the sac, and, at the same time, with the fingers, gently kneads and sways the parts at the neck of the tumor, or, perhaps, tries to pull them very gently downward, in order, if possible, to dislodge them. This operation may be continued for a quarter or half an hour, or longer, if the tumor is indolent, but not so long if it is tender. Too much force must not be used, as from this may arise fatal consequences. It sometimes happens that the taxis succeeds better when the abdominal parietes are not so much relaxed; at all events, this plan may be tried if the ordinary one fails.

If the taxis does not succeed, the following auxiliary measures may be resorted to:—

Bleeding to the approach of syncope should be tried if the patient is robust, the hernia small and of recent date, and if there is much tenderness of the sac or the abdomen; in which latter case it should be employed before trying the taxis.

The hot bath, (96° to 100° Fahrenheit,) continued long enough to produce great relaxation, is useful in similar cases; but it must be recollected, that a delicate person will not be very likely to bear the shock of an operation, if bled or boiled to death's door first of all.

A large dose of opium or morphia is a remedy that is much in vogue in cases of acute strangulation, after bleeding; especially if the pain and vomiting are violent.

The tobacco enema is sometimes used with advantage, but it is a dangerous remedy.

Cold applied to the tumor by means of pounded ice or a freezing mixture, (12° Fahrenheit,) in a bladder, is useful, by reducing inflammation, condensing flatus, and constringing the skin. It is most applicable to large scrotal herniæ. This, too, is not without its hazards, for it may cause gangrene of the skin, if applied too long, or if hot applications are incautiously used after it.

Operation for Strangulated Inguinal Hernia. The parts being shaved, and the skin made tense, an incision (Plate XCVIII. Fig. 2) three or four inches long must be made through the skin along the axis of the tumor, beginning above its neck. This will be quite long enough, even for the largest hernia, because the object is to bring the seat of the stricture fully into view, without exposing too much of the sac. Then the successive coverings before enumerated are to be divided in the following manner: A small portion of each is to be pinched up with the forceps, and cut into, with the knife held horizontally; a director is to be passed into this little aperture, and the layer is then to be divided on it to the extent of the incision in the skin. Cautious operators will find (or make) many more layers than those usually enumerated, which are, in fact, easily subdivisible, especially in old herniæ. When at last the sac is reached, which will be known by its bluish transparency, it is to be opened to the like extent, a little bit of it being first pinched up and cut through, (Plate C. Fig. 3,) so as to admit the director. If possible, it should be done at a part where there is some serum or omentum between it and the bowel. Then the left forefinger (Plate XCIX. Fig. 6) should be passed up into the neck of the sac to seek for the stricture, which will generally be at the internal ring. It must be dilated so as to allow the finger to pass into the abdomen. A curved, blunt-pointed bistoury should be passed flat on the finger (Plate C. Fig. 2) through the stricture, and its edge then turned so as to divide it. The division should be made directly upward, parallel to the linea alba, and then, whether the hernia be direct or oblique, the epigastric artery will not be wounded. If no stricture be discovered in the neck, it must be sought for in the body of the sac.

The subsequent proceedings are detailed after the description of crural hernia.

Crural Hernia escapes behind Poupart's ligament. It passes first through the crural ring, an aperture bounded internally by Gimbernat's ligament, externally by the femoral vein, before by Poupart's ligament, and behind by the bone. It next descends behind the falciform process of the fascia lata; thirdly, it comes forward through the saphenic opening of that fascia; and, lastly, as its size increases, it does not descend on the thigh, but turns up over the falciform process, and lies on the anterior surface of Poupart's ligament. The coverings of this hernia are, 1. Skin; 2. The superficial fascia of the thigh, loaded with fat, and divisible into an uncertain number of layers; 3. Fascia propria; 4. The sac. Between the last two there is often found a considerable layer of fat, which might be mistaken for omentum.

Diagnosis. 1. Femoral hernia may be distinguished from the inguinal by observing that Poupart's ligament can be traced over the neck of the sac, and that the spinous process of the pubes lies internal to it; whereas, it is the reverse in inguinal hernia. Besides, the femoral is generally much smaller, and is more frequent in women than in men.

2. Psoas abscess resembles this hernia in its situation—in dilating on coughing, and diminishing when the patient lies down. The points of distinction are, that it is generally more external, that it fluctuates, but does not feel tympanitic, and that it is attended with symptoms of disease of the spine.

3. Varix of the femoral vein also resembles this hernia, inasmuch as it dilates on coughing, and diminishes when the patient lies down; but then, if pressure be made below Poupart's ligament, the swelling quickly reappears, although it must be evident that under such circumstances a hernia could not come down.

Bubo, and other tumors of the groin, may, in most cases, be recognized by their being unattended with abdominal disorder. But, if there be any such swelling, and also symptoms of strangulation, an incision should certainly be made to examine it.

Treatment. Reducible femoral hernia should, like the other varieties, be kept back with an instrument. If irreducible, the same rule applies to every variety; they should be supported by some instrument that will prevent their enlargement.

Femoral hernia, when strangulated, gives rise to much severer symptoms than the inguinal does. In performing the taxis, the patient should be placed in the usual position, with the thigh of the affected side strongly rotated inward, and crossed over towards the other side. The tumor should first be drawn downward from the anterior part of Poupart's ligament, and then be pressed with the point of the fingers backward and upward. If, however, the taxis (with bleeding and the warm bath, if the tumor is tender) does not soon succeed, the operation should be resorted to.

Operation. In the first place, the skin must be divided. Some surgeons make one simple perpendicular incision. Sir A. Cooper directs one like an inverted ⊥. Mr. Liston prefers making an incision along Poupart's ligament, and falling perpendicularly from its centre over the tumor.

The skin may be very safely and expeditiously divided by pinching it up into a fold, and running the knife through it with its back towards the sac. Mr. Fergusson sometimes makes one like an inverted ⅄, so that the skin can be turned back in three flaps, after which the succeeding layers may be divided by a simple longitudinal incision. Then the different cellular layers down to the sac must be divided by the bistoury and director, as in the inguinal hernia, and the sac must be opened with very great care, because it is generally very small, and embraces the bowel tightly, and seldom contains any serum or omentum. Then the finger should be passed up to seek for the stricture, which, according to Sir A. Cooper and Mr. Liston, will be generally found to be the inner edge of the falciform process. This must be gently divided for a line or two, the incision being directed upward, and a little inward, towards the spinous process of the pubes. It must be recollected, that if this incision be carried too far, the spermatic cord in the male, or round ligament in the female, will be injured. If, however, the stricture is not released by this incision, a few fibres of Gimbernat's ligament must be divided, although it must be recollected that the obturator artery not unfrequently runs round behind that ligament, and would be infallibly wounded.

In operating for hernia, when the sac is opened, the intestine should be well examined, especially that part of it which has been actually compressed by the stricture, being gently drawn down for that purpose. If it be merely dark claret-colored, from congestion, or slightly roughened with lymph, or if it exhibit a few patches of ecchymosis, it should be returned, the operator being careful to replace it, bit by bit, intestine before omentum, and those parts first which protruded last. The wound may then be closed with one or two sutures, and a firm compress be placed upon it.

If the intestine is mortified, which will be known by the softened green or ashy spots, the mortified part should be slit open, the stricture be divided, and the patient left to recover with an artificial anus.

If the omentum is gangrenous, or if it is thickened and indurated, it would, if returned, excite dangerous irritation of the peritoneum. In this case, some surgeons advise it to be left to granulate in the sac, or to cut it off close to the neck of the sac, and leave it there as a plug to prevent further protrusion. Macfarlane and others, on the contrary, recommend it to be cut cleanly off, and all the vessels to be tied with fine silk ligatures, and the end to be then passed quite into the abdomen, breaking up any adhesions about the neck of the sac, if necessary; thus avoiding the dragging pains and colic which are liable to occur if a portion of the omentum or intestine is fixed. The surgeon should carefully examine every portion of omentum which is in a hernial sac, so as to ascertain that no knuckle of intestine is contained within its folds, before it is returned into the abdomen, left in the sac, or removed altogether.

Umbilical Hernia. If it becomes strangulated, and the patient is aged, and the strangulation was preceded by constipation, purgatives and copious enemata should have a fair trial. If the operation is necessary, an incision three inches in length should be made at the upper part of the tumor through the skin, fascia, and sac, in succession. The stricture should then be dilated directly upward in the linea alba, with the knife recommended in other cases. But perhaps it is better to make the incision so as to divide the under side of the neck of the sac, as advised by Mr. Liston.

VENTRAL HERNIA is that which protrudes through the linea alba, or through the lineæ semilunares or transversæ, &c., or, in fact, through any other parts of the abdominal parietes, save those which are the ordinary seats of hernia. It may be a consequence of wounds or bruises. Its treatment requires no distinct observations; but if it should ever be necessary to operate for the relief of strangulation, care must be taken to avoid the epigastric artery.

Perineal hernia descends between the bladder and rectum, forcing its way through the pelvic fascia and levator ani muscle, and forming a tumor in the perineum.

VAGINAL HERNIA is a variety of the preceding, in which the tumor projects into and blocks up the vagina, instead of descending to the perineum. Labial or pudendal hernia descends between the vagina and ramus of the ischium, and forms a tumor in one of the labia. It is to be distinguished from inguinal hernia by the absence of swelling at the abdominal rings. These three herniæ must be replaced by pressure with the fingers, and be kept up by pads made to bear against the perineum, and by hollow caoutchouc pessaries worn in the vagina.

ISCHIATIC HERNIA protrudes through the sciatic notch. This and the preceding are exceedingly rare; and the tumors are, of necessity, small. If discovered to exist during life, they must be returned and supported by proper apparatus; and if strangulated, the stricture must be divided by operation.

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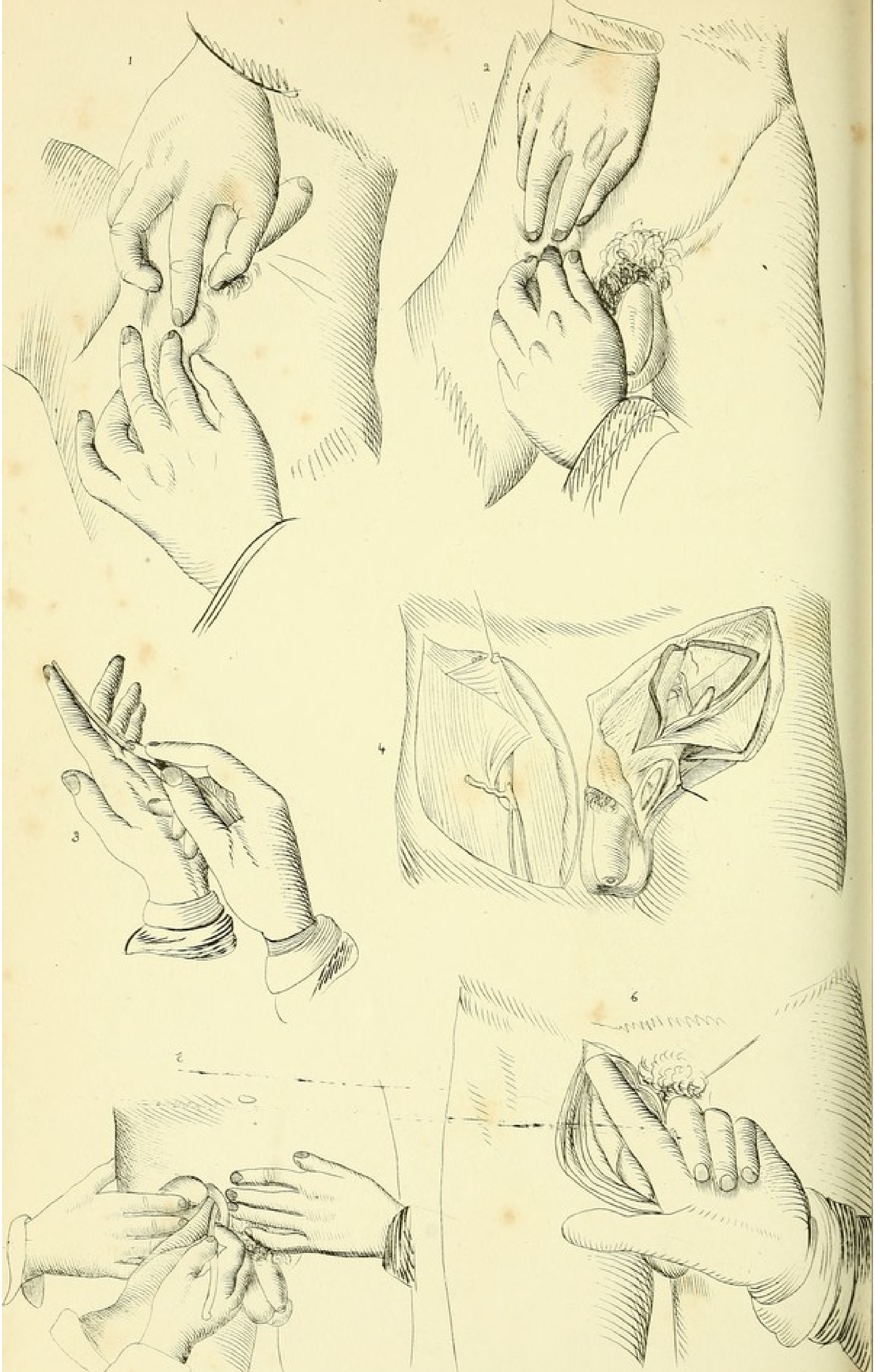
Pl.99



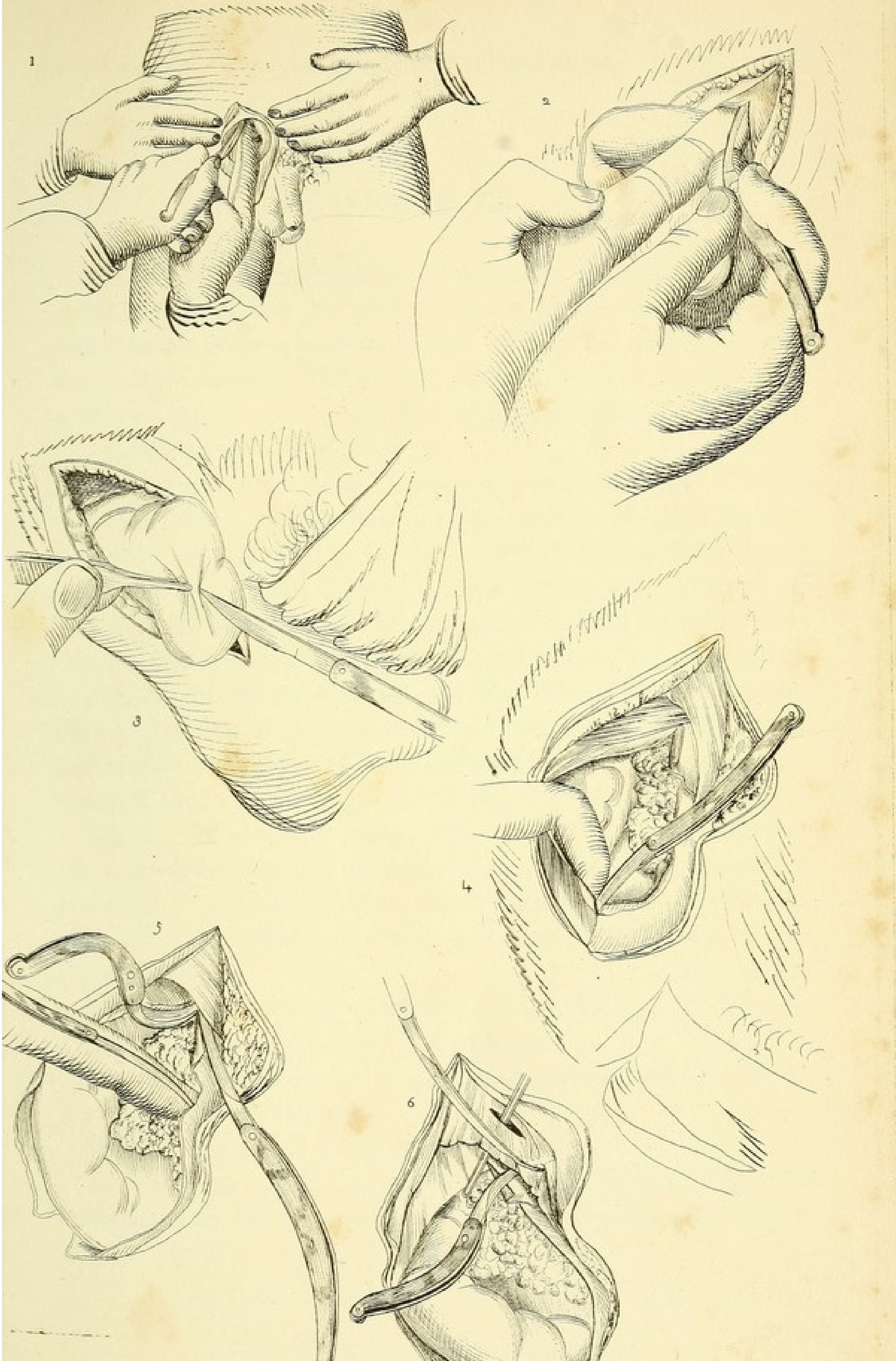

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PLATE CI.

Fig. 2. Radical Cure of Hernia by causing an Adhesive Inflammation of the Walls of the Sac, the Viscera being previously reduced. On the left of this figure is shown the process of M. Bonnet. This consists in enclosing the cord between two pins — the ends of the pins being fastened upon two hemispherical rolls of linen.

On the right of the figure is seen the process of Gerdy. A fold of skin is pushed with the forefinger through the external inguinal ring into the inguinal canal. A curved needle is then passed along the finger, and carried through the double thickness of skin and the anterior wall of the canal which is found between them. This is the first step of the operation.

Fig. 1. In this drawing, the operation of Gerdy is shown completed; the skin at the border of the opening made by tucking the fold of skin into the canal being united, as in a plastic operation, to a flap of skin which has been raised from below it.

Fig. 6. Process of Velpeau. The integuments are pushed into the canal with a flat strip of wood. Upon this, a cutting instrument is carried upward, as shown in the figure, and the neck of the sac scarified. The transverse dotted lines show the situation of the abdominal rings.

Figs. 3, 7, 8. Process of Belmas. The needle of this surgeon (Figs. 4, 5, 9) is complicated in its structure.

Fig. 7. In this figure is seen the first stage of the operation — the introduction of the needle.

Fig. 3. Separation of the needle.

In Fig. 8, the sac is laid open to show the threads of gelatine introduced by the instrument, so as to produce adhesive inflammation.

PLATE CII.

APPLICATION OF TRUSSES. The instruments here represented are those of Dr. Chase, of Philadelphia. The block of the instrument is made of wood or ivory, and of the form shown in the figures. The neck of the truss is of malleable iron, so that it may be adjusted to any angle by bending it. In the experience of the author, hard block trusses are more easily worn than others, and better adapted to prevent the descent of the hernia, and to produce the permanent cure of the disease. For two years, the author paid considerable attention to the treatment of hernia with reference to a radical cure. In nearly half of the cases submitted to treatment, this desirable object was attained. In a case of double crural hernia, the patient was seen two years after the truss had been laid aside, and there had been no descent of the bowel. In all his cases, the instruments shown in this plate were used.

Fig. 1 shows the application of a ventro-inguinal truss. The position of the block in regard to the pelvis is shown, (Plate CIII. Fig. 2.)

Fig. 2. Inguinal truss applied.

Fig. 5. Umbilical and femoral trusses applied. As will be seen, (Figs. 3, 4,) the block of the femoral truss is so formed as to bear up under the ligament.

Fig. 3. Femoral block, Ref. 4. Longitudinal section of Fig. 3.

Fig. 6. Inguinal block. Refs. 7, 8. Sections of Fig. 6.

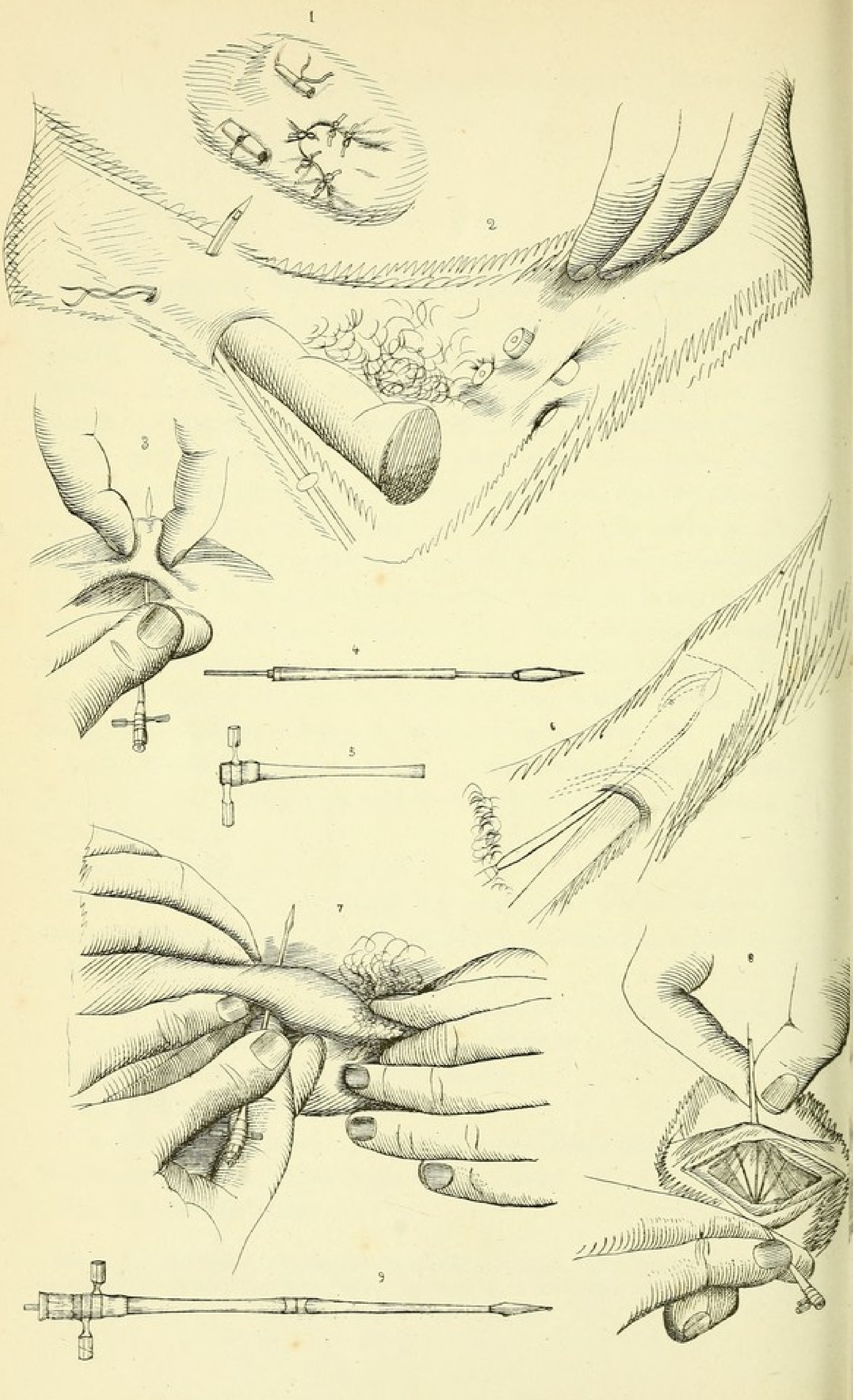
Figs. 10, 11, 12. Ventro-inguinal block.

Figs. 9, 13. Umbilical block.

Fig. 14. Double truss. A soft pad is applied where the dotted line is seen, to rest on the back of the patient.

Fig. 15. Single truss.

NOTE. Mr. J. W. Phelps, of Boston, has made these instruments, slightly modified, for me, for several years. I have found them in every case as efficient as the original truss of Dr. Chase.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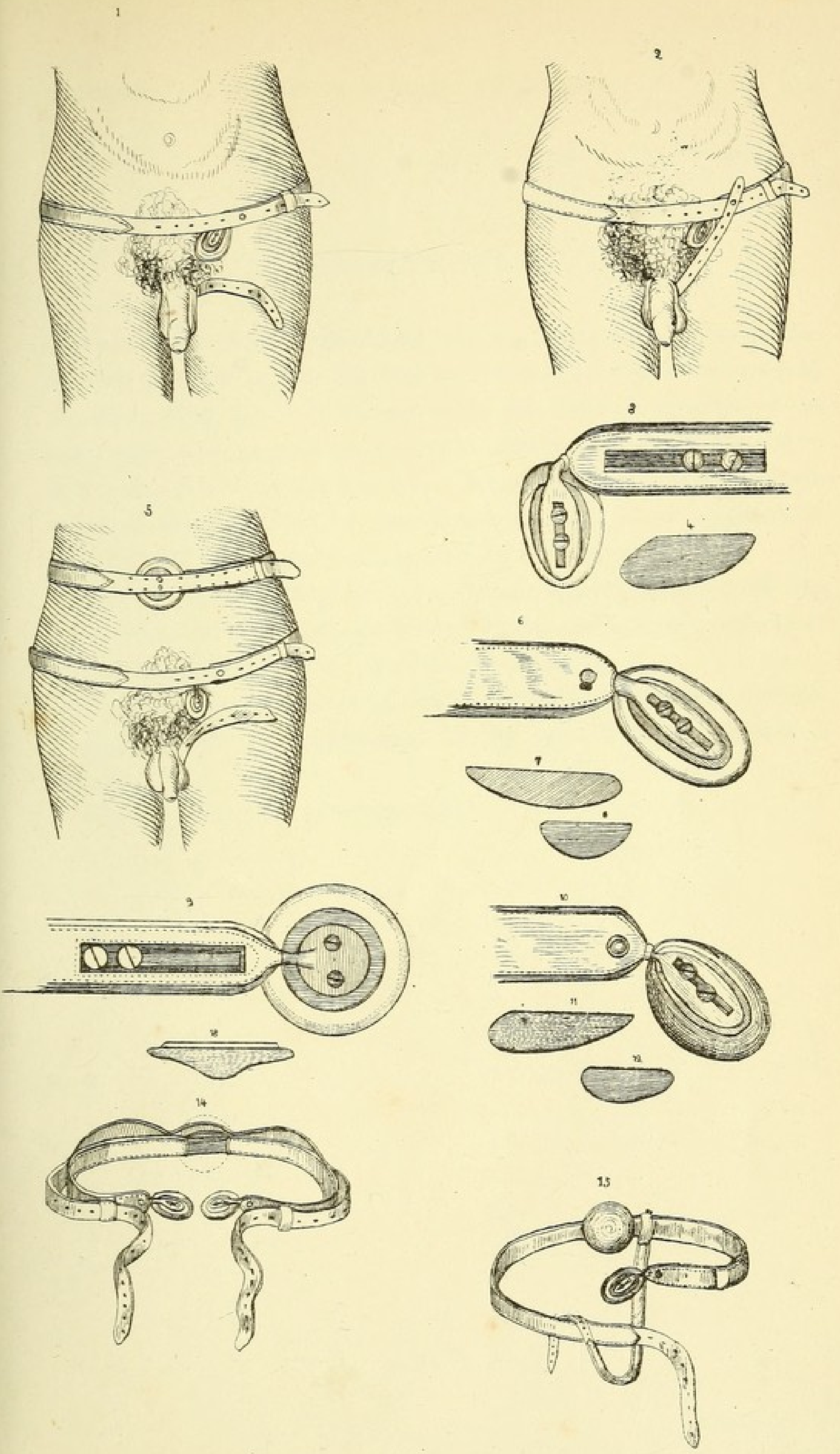
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PLATE CIII.

ARTIFICIAL ANUS. METHOD OF M. AMUSSAT. A transverse incision is made in the left lumbar region, just above the crest of the ilium, (Fig. 1,) so as to come upon the descending colon, at the outer edge of the sacro-lumbalis and longissimus dorsi muscles, where it is not covered by peritoneum. As soon as the gut is reached, a loop of thread should be passed through it to fix it, (as shown in Fig. 1,) and then it may be opened by a bistoury.

Fig. 4. The constant prolapsus, which is such a source of distress when artificial anus is situated in the groin, is not so likely to occur when an operation is made in this situation.

Fig. 3 shows the manner of uniting the various parts with sutures.

Fig. 8 shows the appearance of the part after the wound is healed.

Fig. 2. Described on page 178.

PLATE CIV.

Figs. 1, 2, 3. Formation of artificial anus in the groin.

Fig. 2. Process of Littre.

Fig. 4. Enterotome of Dupuytren.

Figs. 8, 9, 10, 11. Forceps-enterotome.

Description of Artificial Anus. In artificial anus, that portion of intestine which is immediately above the aperture, and the portion which is immediately below it, meet at the artificial anus at a more or less acute angle, and present two orifices — one by which matters descend from the stomach, and another which leads down to the rectum. These two orifices are separated by a crescent-shaped septum, formed by a projection of the mesenteric side of the bowel opposite to the aperture. Now, it may readily be understood, that the greater the aperture in the bowel, the more acute will be the angle at which the upper and lower portions meet, and the greater will the septum also be; and if the septum is large, it will act as a valve, and close up the orifice of the lower portion of the bowel, causing any matter that comes down through the upper portion to escape externally, instead of passing through the lower.

Figs. 5, 6. Operations for the Cure of Artificial Anus. The object of this operation is to destroy the septum described above, and, at the same time, to produce adhesion between the serous coats of the intestine, and afterwards to heal the external wound.

Fig. 7. Closure of the external wound.

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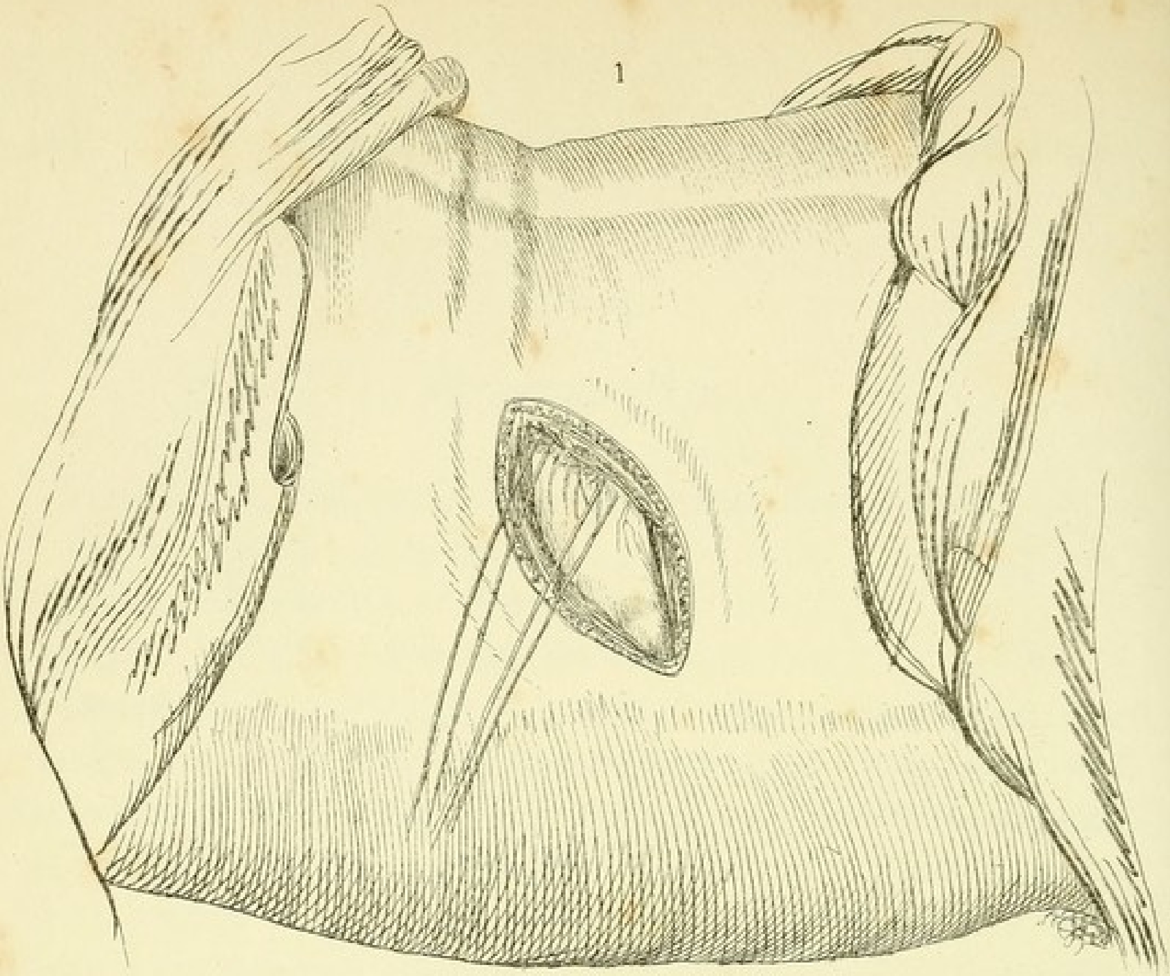

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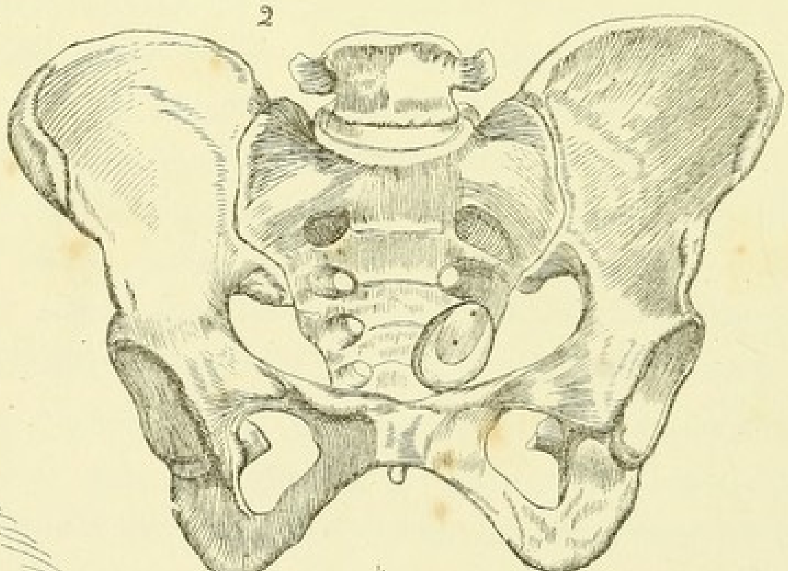

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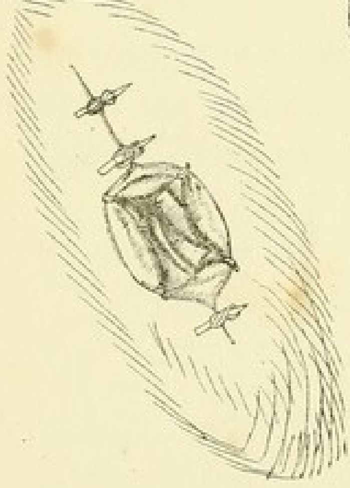

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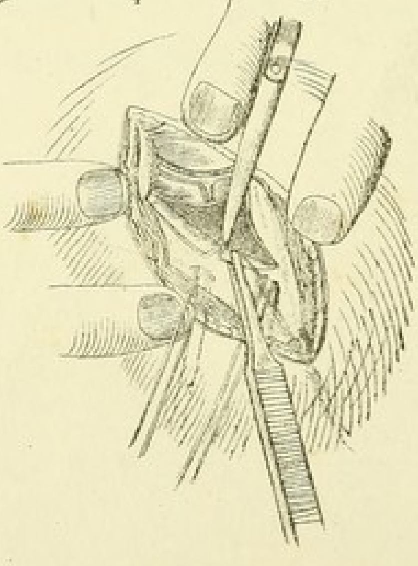

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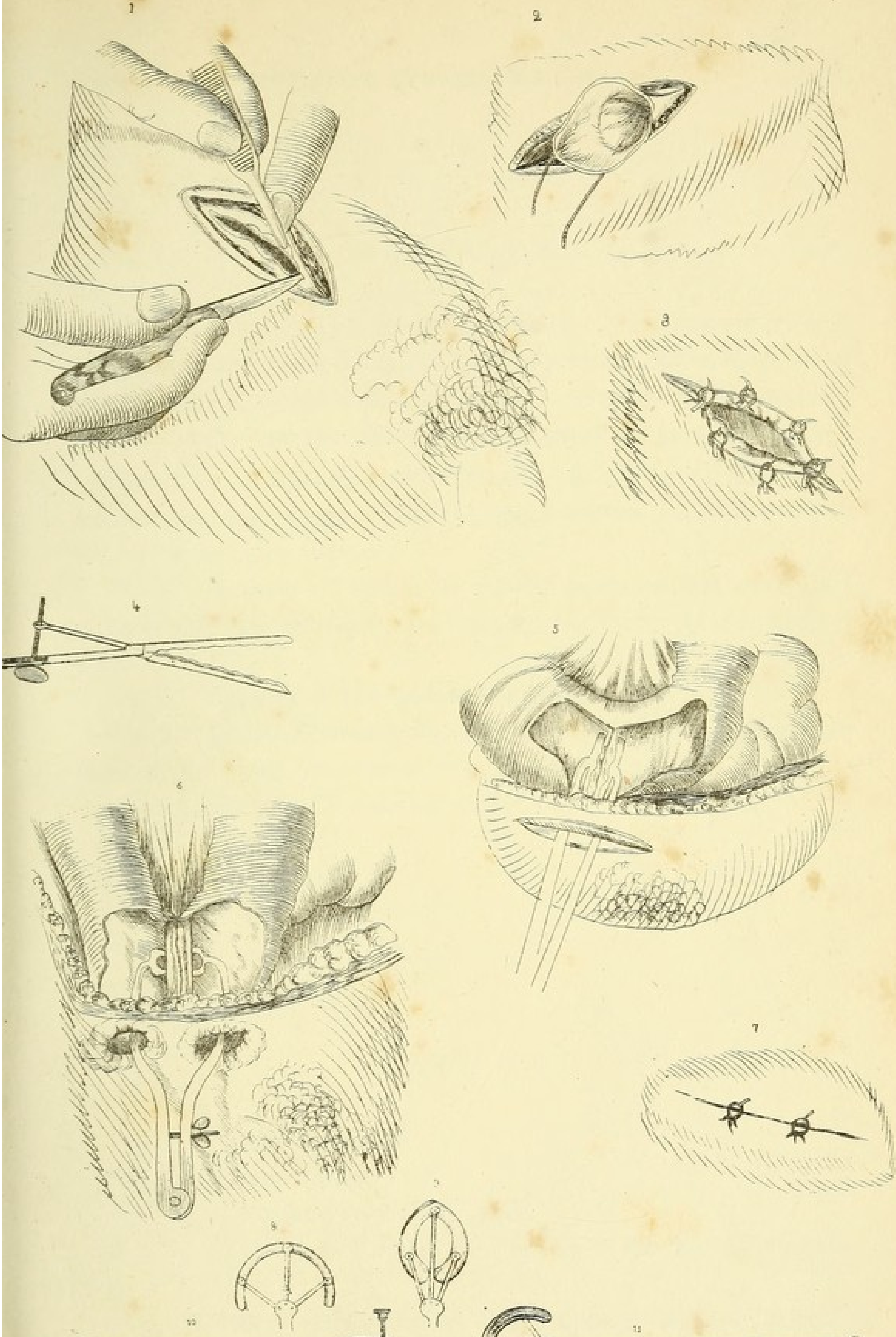
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PLATE CV.

Fig. 1. Excision of Internal Piles. Process of Boyer. The tumors are drawn down and held by threads, and excised below the point of attachment of the ligatures, in order, if hemorrhage follow, that the operator may be able to get at the parts to check it.

Figs. 2, 7. Operation for Fistula in Ano. In Fig. 2, the internal opening is but a slight distance within the sphincter; in Fig. 7, it is much deeper.

Fig. 8. A skein of thread is shown introduced into the wound to keep the external parts open during the healing of the internal portion.

Fig. 5. Division of the sphincter muscle.

Fig. 6. Introduction of a ligature for fistula. The ligature has been carried by the bent probe from within outward.

Fig. 9. Excision of external piles.

Fig. 3. Gorgeret.

Fig. 4. Syringotome.

PLATE CVI.

Fig. 1. Speculum ani.

Fig. 2. Prolapsus ani.

Fig. 3. Operation for fistula in ano.

Fig. 4. Manner of holding the instrument in the above operation.

Fig. 5 (from a preparation in King's College Museum) shows a section of a prolapsed rectum, the whole circumference of the lower part of the bowel being everted and extruded. The mucous membrane is excessively thickened from irritation and exposure.

Operation for Piles. If the piles are external, they may be removed by excision with the knife or scissors; if internal, they should be removed by ligature.

The operation is performed as follows: The bowel having been previously well cleared, the patient must be told to protrude the piles; and if he cannot do it easily, he should sit over a vessel of warm water, or have an enema of warm water. Then the piles should be drawn out with a tenaculum, and a ligature (not too fine) be tied as tightly as possible round the base of each. If the tumors are large, a double ligature may be passed through their base with a needle, and either half be tied separately. Before finally tightening the ligatures, the piles should be slightly punctured. After the operation, the ends of the thread should be cut short, and returned into the rectum. The patient should remain in bed, and the bowels should not be disturbed for forty-eight hours after the operation.

The operation by excision, if the surgeon chooses to perform it, should be done as described in connection with Plate CV. Fig. 1.

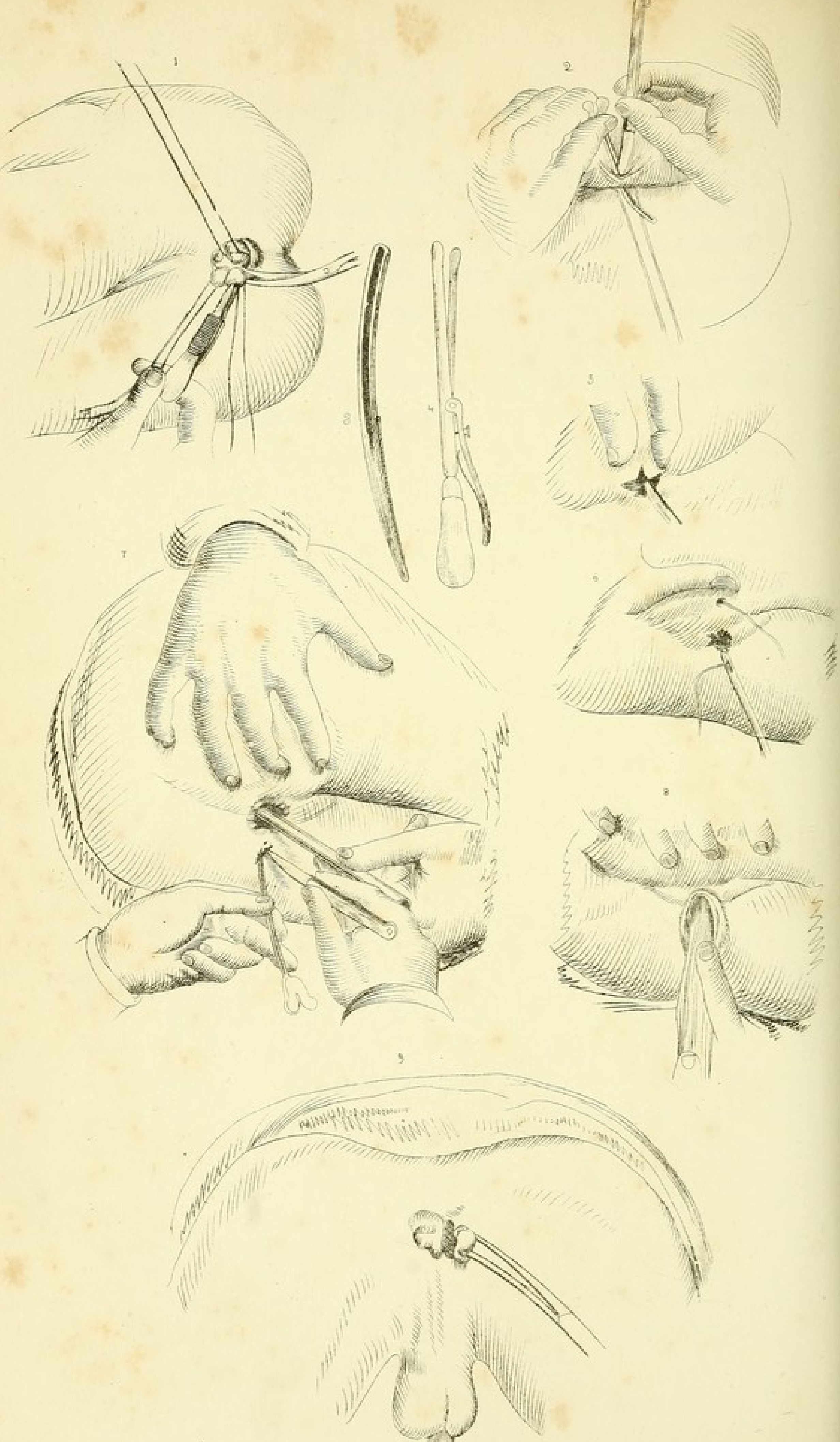
Dr. Houston's treatment of piles is as follows: The pile having been protruded, its surface is moistened with concentrated nitric acid, applied by means of a smooth wooden stick, and then olive oil is to be applied, in order to prevent the caustic from being too widely diffused. The subsequent treatment is the same as after extirpation by ligature.

Fistula in Ano. There are three kinds described in the books. 1. Complete fistula, which has an internal and external opening; 2. The blind external fistula, which has no opening into the bowel, although it generally reaches its outer coat; 3. The blind internal fistula, which opens into the bowel, but not externally, although its situation is indicated by a redness and hardness near the anus.

Operation. The patient being placed on his knees, and his elbows on a bed, or being made to kneel on a chair and lean over the back of it, and the nates being kept asunder by an assistant, the surgeon introduces his left forefinger into the anus, and at the same time explores with a probe the whole extent and all the ramifications of the fistula. If it is of the blind internal kind, its situation must be ascertained, and a puncture be made into it by the side of the anus. Perhaps a probe, bent at an acute angle, may be passed into it from the bowel, and serve as a guide for the puncture. Then, one forefinger being still in the anus, the surgeon passes a strong, curved, probe-pointed bistoury up to the farther end of the fistula. Next, (if the internal opening cannot be found,) he pushes it through the internal coats of the bowel, so that its point may come in contact with his forefinger. Then he puts the end of his forefinger on the point of the bistoury, (Plate CVI. Figs. 3, 4,) and draws it down out of the anus; and as soon as it is fairly out, he pushes the handle toward the orifice of the fistula, so as to divide skin and bowel at one sweep. Sir B. Brodie recommends that the bistoury should always be passed through the internal opening of the fistula, and says that the affection will be very liable to return if this is not divided; he condemns the practice of cutting through the bowel higher up than this opening. A few threads of oiled lint are then to be placed in the wound, and the patient to be kept in bed for three days. The subsequent treatment consists in the observance of perfect cleanliness, and the daily introduction of a very small slip of lint (which may be dipped in some stimulating lotion if necessary) between the edges of the wound, for the first four days, so as to prevent them from uniting, and to cause it to granulate from the bottom. If violent hemorrhage follows the operation, and does not yield to the application of cold, the anus must be well dilated with a speculum, so as to expose the bleeding surface to the air, and any artery discernible may be tied; or else it may be firmly plugged with lint, which is to be secured by a T bandage.

Operation for Prolapsus Ani. 1. The mildest consists in pinching up two or three folds of mucous membrane on the protruded bowel, with forceps, and tying them tightly with ligatures. 2. Or ligatures may be passed by needles through several folds of skin, just at the margin of the anus, which are then to be tied up tightly, or a small patch of mucous membrane may be destroyed by acid.

Excision of a portion of the sphincter ani is sometimes practised. Plate CVII. Fig. 4 shows this operation.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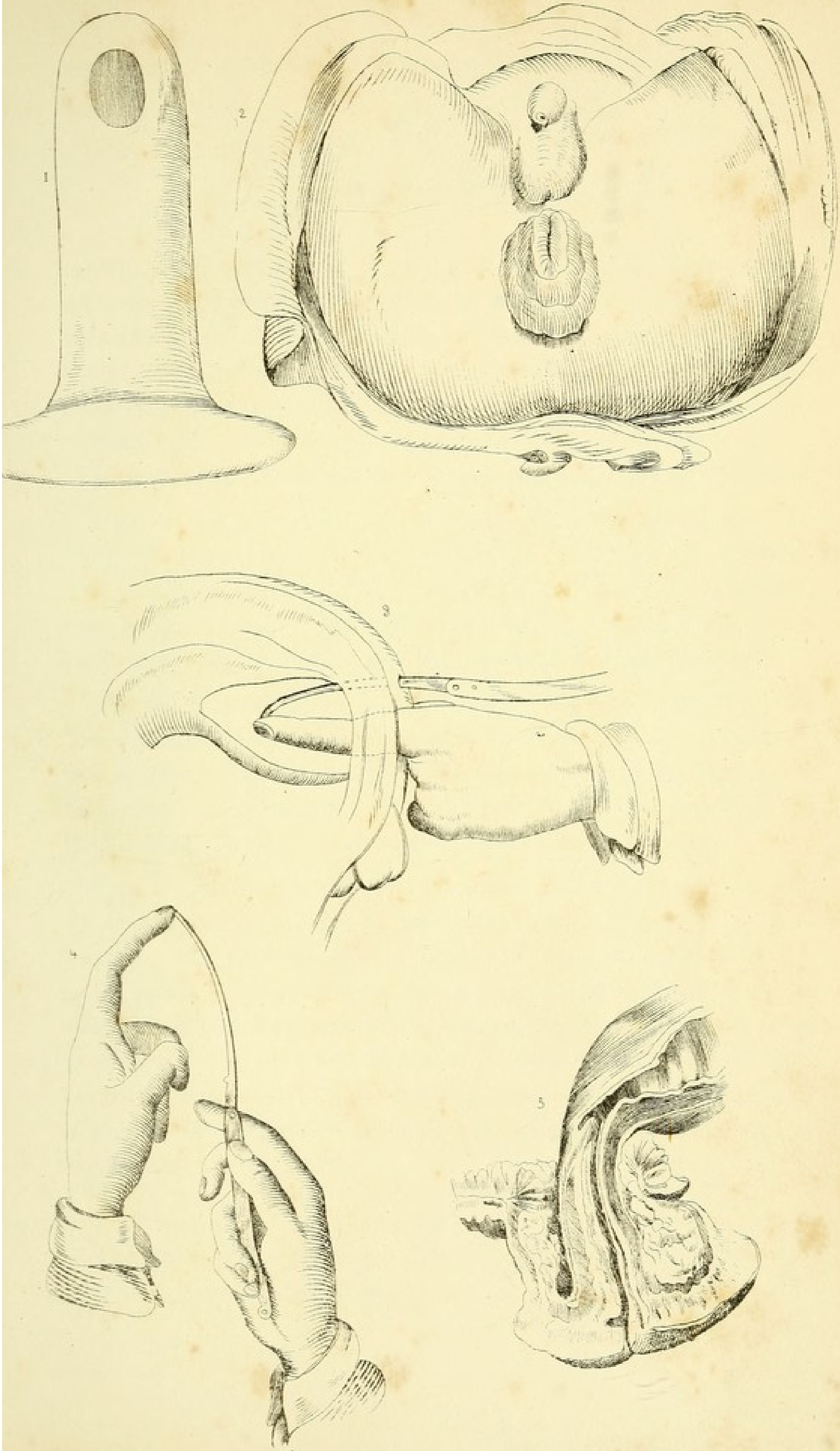


PLATE CVII.

Fig. 1. Excision of several Folds of the Integument at the Circumference of the Anus, for Prolapsus of the Rectum. Process of Dupuytren. A fold of the skin is shown raised with a pair of forceps, so as to be readily snipped away with a pair of curved scissors.

Figs. 2, 3. Two-branched speculum.

Figs. 5, 6, 7. Two-branched fenestrated speculum of Charrière.

Fig. 4. Excision of a Circular Protuberance of the Mucous Membrane of the Rectum. Process of Ricord. The projecting portion of the membrane is sustained by two threads, held by an assistant. The excision is made by grasping the prominent part with the forceps, and shaving it off with the bistoury.

Fig. 8. Ligature of a Polypous Tumor of the Rectum. The dilatation is made by the speculum, (Figs. 5, 6, 7.) The polypus is drawn down with a blunt hook, so as to allow the ligature to be thrown around its neck. The ligature is to be tightened with the double canula, or with a *serre-nœud*, as seen in the drawing.

Fig. 9. Excision of the Inferior Part of the Rectum, in Cases of Cancerous Degeneration. Process of Lisfranc. The anal end of the rectum has been detached from the parts on its outer surface by two semi-elliptical incisions upon its sides. The left forefinger of the surgeon is then introduced, so as to draw the rectum down, in which position a couple of assistants secure it with hooks. The surgeon, then, with a pair of scissors curved on the flat, incises circularly the intestine above the seat of the cancerous degeneration.

PLATE CVIII.

Figs. 5, 7. OPERATION FOR IMPERFORATE ANUS. PROCESS OF M. AMUSSAT. A longitudinal incision is made across the usual place for the orifice of the anus, and this is crossed at its anterior end by a horizontal cut, to allow of the formation of two flaps, which are to be turned outward by the fingers of an assistant. A sound is then introduced into the vagina, to serve as a guide in the extension of the incision towards the cul-de-sac, by which the rectum is terminated at some distance above the skin of the perineum. The loop of a ligature, passed with a needle, serves to draw downward the pouch of the rectum, while the surgeon opens it by a crucial incision with the bistoury.

Fig. 7. Conclusion of the operation. The horizontal wound is closed by sutures. The margins of the longitudinal wound are united to the divided portions of mucous membrane, and converted into an anal orifice.

Fig. 6. Same operation as Fig. 7; the obstruction is just within the verge of the anus. A small speculum is used in this case.

Fig. 4. TAMPONNEMENT OF THE RECTUM. The instrument consists of a metallic tube, to one end of which is attached a bag. It is passed into the rectum empty, and the charpie pushed up into the bag by the side of the tube.

Figs. 1, 2, 3. DILATATION OF STRICTURE OF THE RECTUM. PROCESS OF M. BOURGERY. An elastic tube, one end of which is armed with a metallic ring, is passed into the rectum, threaded with two ligatures, which are kept in their places by the stilet, (shown in Fig. 3.) One end of each ligature hangs out of the tube; the other ends hang out of the rectum on each side of the tube. The charpie, or lint, is passed up by the side of the tube, by attaching it near the anus to the portion of ligature on the outside of the tube, and by pulling the ligature on the inside.

Figs. 8, 9, exhibit cases of permanent stricture of the rectum.

Permanent Stricture of the Rectum. The remedies are aperients and injections, and the bougie, or the operation described above. A soft bougie, capable of being passed with moderate facility through the stricture, should be introduced once in three or four days, and be allowed to remain fifteen or twenty minutes; and the size should be gradually increased as a larger one can be passed. Instruments of every sort, when introduced into the rectum, should be handled with the utmost gentleness.

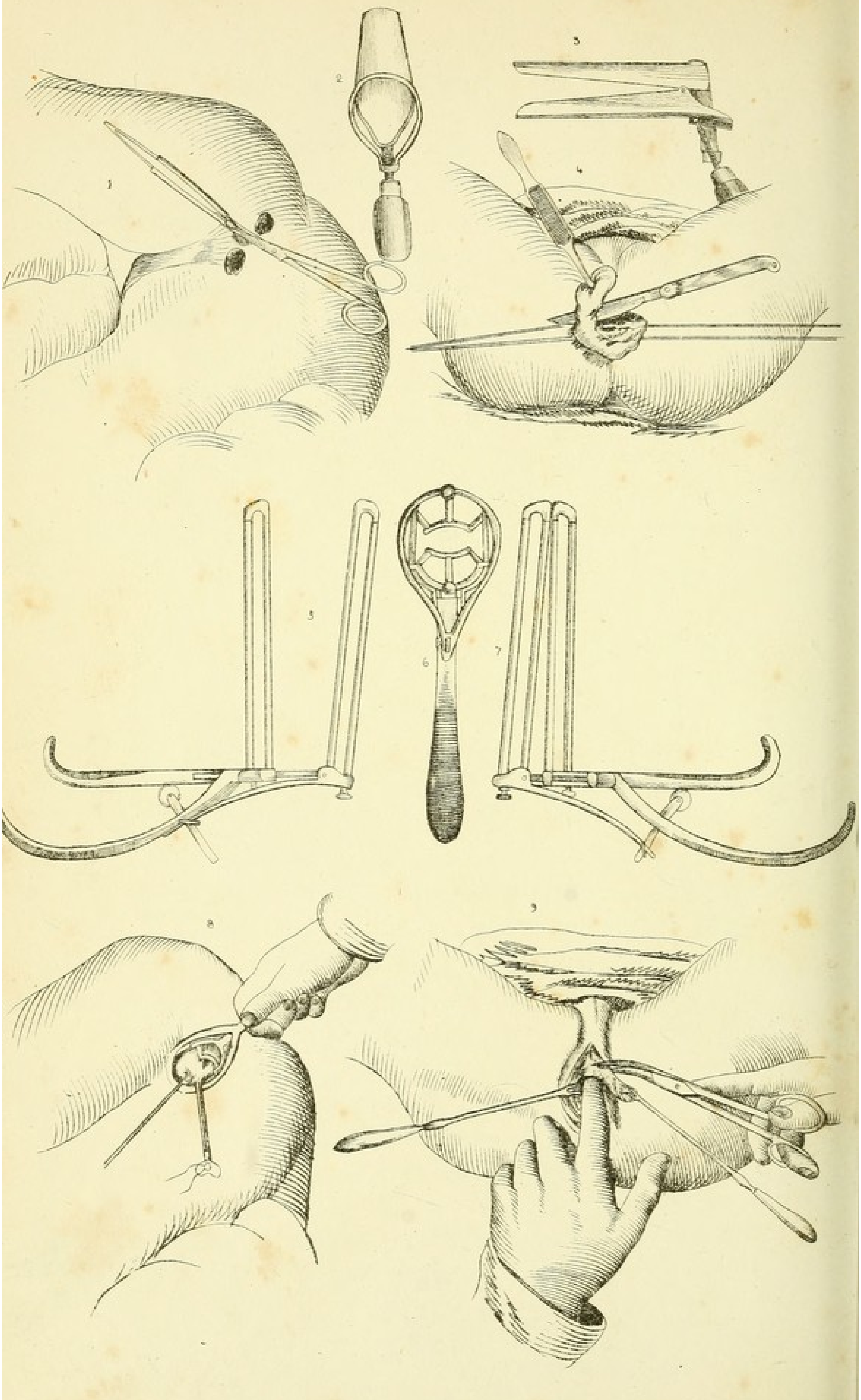
Ulcer of the Rectum. If the usual treatment fail, the sphincter must be divided, and made to heal by granulation.

A Vascular Excrescence is liable to grow from the female urethra, varying in size from that of a large pin's head to that of a horse-bean. It causes great distress, through its exquisite sensibility. It should be cut off, and the potassa fusa be applied to the surface to prevent its reproduction. But immediately after the caustic, a sponge dipped in diluted vinegar should be applied, in order to prevent injury to the surrounding sound parts; and if it is necessary to introduce the caustic within the urethra, it must be done by means of a tube with an aperture in it corresponding to the diseased surface.

Uterine Polypus. Treatment. A ligature should be twisted tightly round its neck, but not too near the womb, by means of the double canula.

Imperforate Hymen. Sometimes this membrane completely obstructs the vagina, and causes the menstrual fluid to accumulate and distend the uterus. The impediment is easily removed by a crucial incision.

The Labia may be the seat of acute inflammation, and of encysted tumors, and sarcomatous or fatty enlargements. The treatment of these cases requires no distinct description. The clitoris and nymphæ, if they grow to an inconvenient size, should be curtailed by the knife. If they are affected with scirrhus, they should be entirely extirpated at an early period.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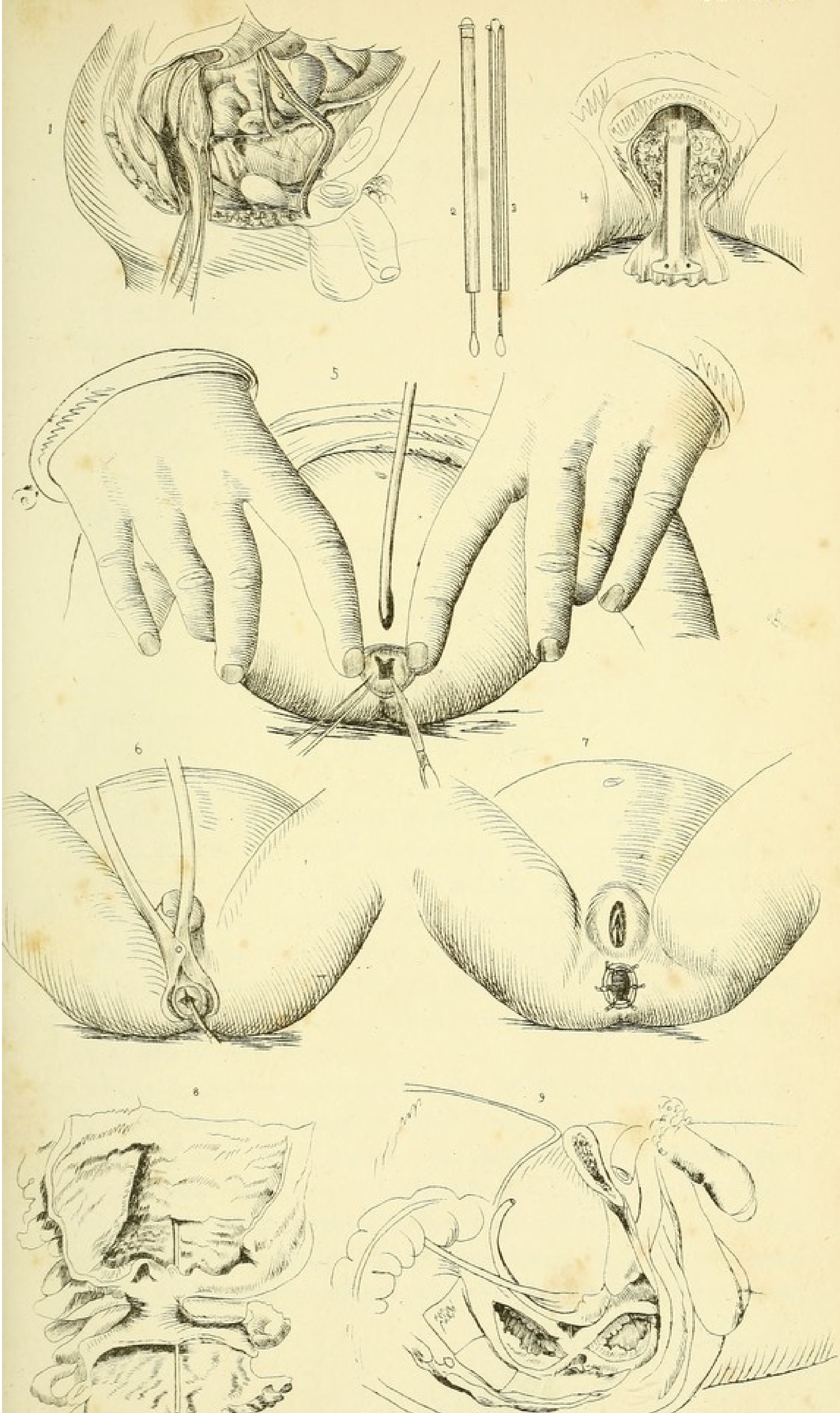
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PLATE CIX.

Fig. 1. From Liston. The bladder, kidneys, and ureters of a boy under three years of age, who was supposed to be laboring under stone in the bladder.

Fig. 2. Rupture of the urethra.

Figs. 3, 4, 7. Strictures of the urethra.

Fig. 5. Cyst of the prostate gland; from King's College Collection.

Fig. 6. A calculus lodged in a cyst, close to the apex of the prostate gland.

PLATE CX.

Figs. 1, 2. Stricture from enlarged prostate gland.

Fig. 3. One of the tubuli uriniferi, from a kidney affected with Bright's disease; oil globules are seen through its walls.

Figs. 5, 6, 7. Epithelium cells from the tubuli uriniferi, loaded with oil globules magnified four hundred diameters.

Fig. 8. Fibrinous shreds from the interior of the tubuli uriniferi, having blood corpuscles and oil globules entangled in them. Magnified two hundred diameters.

Fig. 4. From a preparation in the Middlesex Hospital Museum. It represents the beginning, middle, and end of a fatal case of disease of the urinary organs. It shows a tight stricture about three inches from the extremity of the penis; the urethra dilated behind it; another stricture in the membranous portion; false passages and abscess around; the bladder, contracted in size, but enormously thickened; the urethra, dilated and tortuous, looking like an

intestine; and the kidney, extended and atrophied, with scarce any of the secreting substance remaining.

Fig. 9. Fistulas occasioned by stricture of the urethra.

Permanent stricture of the urethra can only be cured by mechanical means. These are five. 1. The bougie; 2. The catheter kept in the urethra; 3. The caustic bougie; 4. Puncturation with the stilet; and, 5. Division from the perineum.

First, a wax bougie should be passed, in order to ascertain the size and seat of the stricture; after this, a metallic instrument, gradually increasing the size as the stricture yields.

A metallic sound, of moderate size, may be introduced once in three or four days, and firmly pressed against the stricture from five to fifteen minutes, taking care to keep its point against the upper part of the urethra. If this process is repeated often enough, it will at last clear the way to the bladder.

In cases of stricture that will not suffer an instrument to pass, Mr. Guthrie recommends a bougie to be kept in the urethra, and to be made to press constantly against the anterior surface of the stricture. He says that this plan has never failed, in his hands, to clear the urethra, and to effect a passage into the bladder.

Puncturation or division of the stricture, by means of lanceted stilets, may be resorted to with advantage in some cases of old stricture, especially if at the anterior part of the urethra.

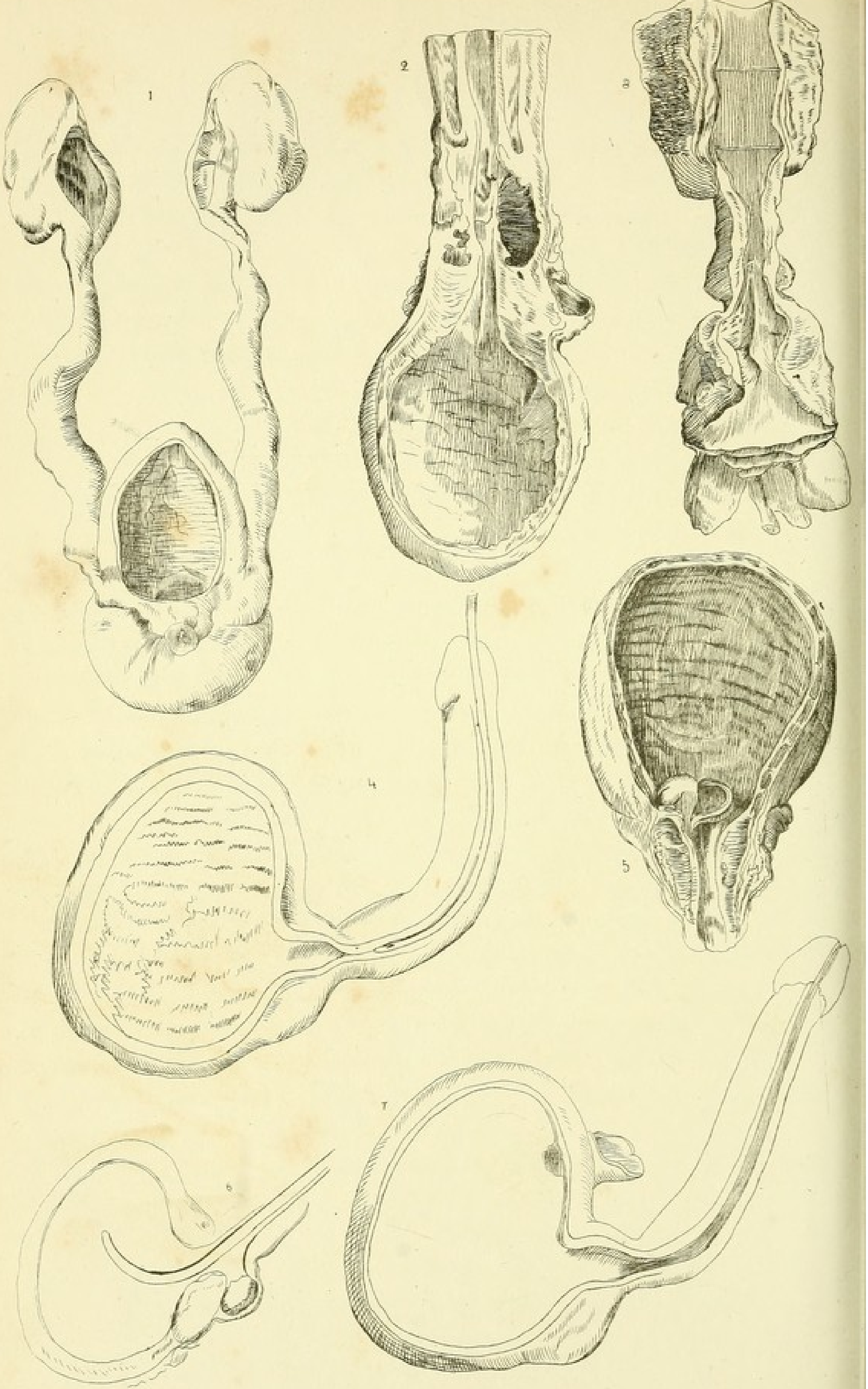
Opening of the urethra from the perineum is performed thus: The patient is placed in the lithotomy position; a grooved staff is passed down to the stricture, and the left forefinger, introduced into the rectum, is to feel for the urethra, and serve as a guide to the incisions. Then a straight bistoury is to be plunged just above the anus, to the depth of an inch, and made to cut its way out upward in the middle line of the perineum. The end of the sound should next be felt for, and cut upon, and the knife is then to be carried backward through the stricture into the urethra beyond it, which is always more or less dilated and prominent, especially if the patient is told to strain and try to pass urine. A gum catheter should then be passed into the bladder, and be retained there, so that the wound may heal over it, forming a new passage. It should, however, be changed once in three or four days. A modification of this operation consists in cutting down through the perineum into the dilated part of the urethra. Then, having introduced the finger, the surgeon presses with it against the back part of the stricture, and having passed down an instrument similar in principle to the lance stilet, makes the lancet cut through the stricture. A catheter is next passed into the bladder, and retained there. In the case operated upon in this way by Sir B. Brodie, the patient recovered the power of making water in a tolerable stream.

Urinary abscess should be opened at once.

Rupture of the Urethra, and Extravasation of Urine. Treatment. A staff or catheter must be passed as far as possible, and it may sometimes be passed quite into the bladder, because the stricture generally relaxes after the bladder is unloaded, be it how it may. Then the urethra must be opened, and the stricture be divided in the manner described in the last section, and a catheter be passed through the wound into the bladder, and be allowed to remain several days. At the same time, free incisions must be made into parts that are swollen, or emphysematous, showing that they have been pervaded by the urine.

Sometimes there is a blind fistula in the perineum, that is, a small, narrow fistula opening into the urethra, but not externally. It is occasionally inflamed and tender, and may be felt as a small tumor in the perineum, perhaps the size of a horse-bean. It is attended with more or less discharge from the urethra. The treatment consists in laying open the tumor, and dilating any stricture that exists.

Sometimes a fistulous communication forms between the urethra and rectum. This may be known by air passing through the urethra. It is to be treated by dilating the urethra, and then, perhaps, a heated wire may be introduced into the fistula from the rectum, in order to close it by adhesive inflammation.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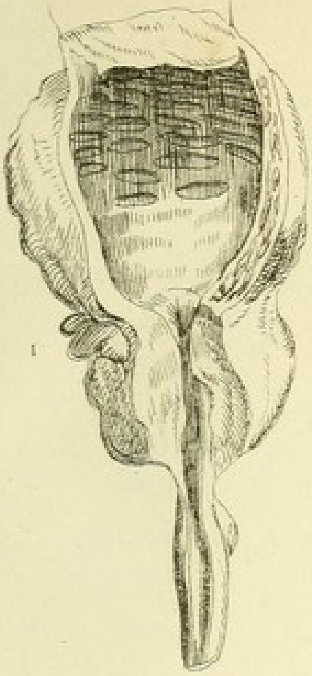

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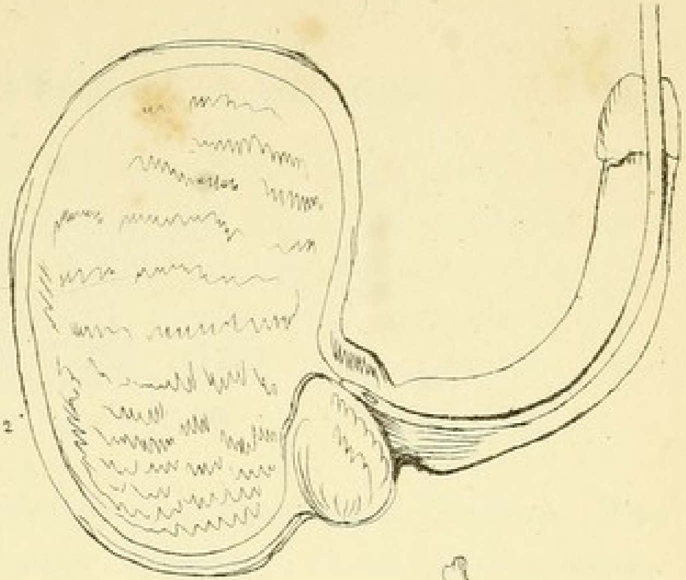

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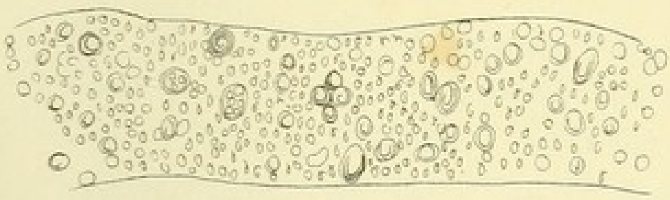

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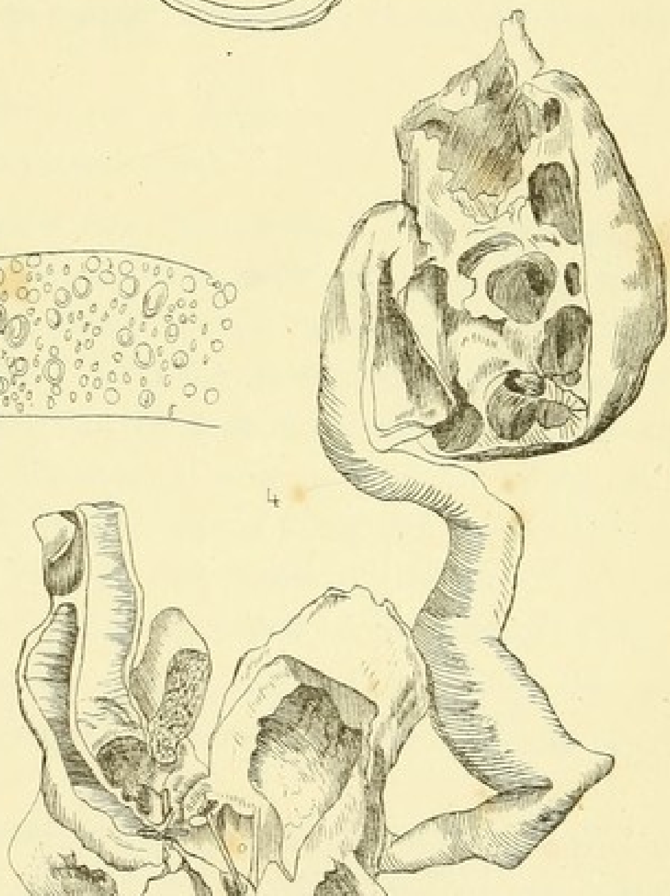

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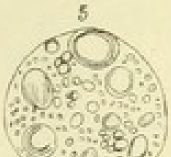

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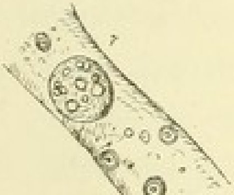

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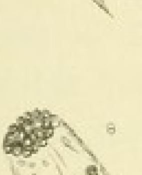

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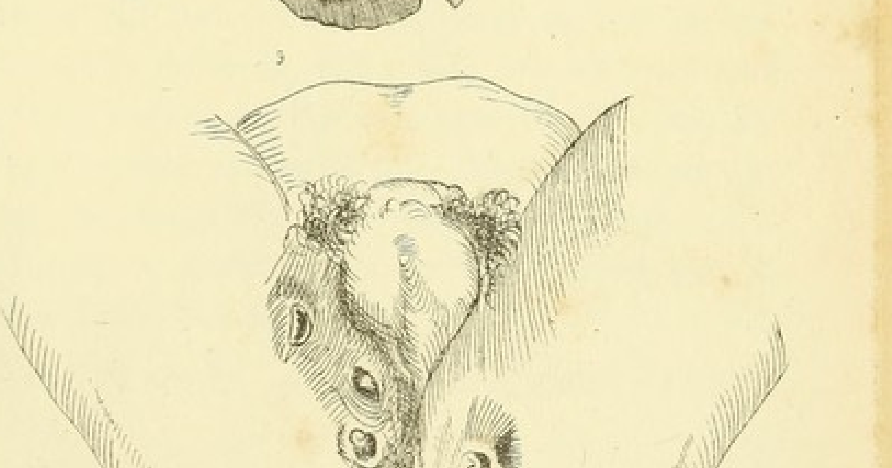


PLATE CXI.

Fig. 1. Hydrocele.

Fig. 2. Puncture of hydrocele by the process of Baudens. The instrument is allowed to remain, in order to excite adhesive inflammation.

Figs. 6, 7, 8, 9. Instrument of Baudens.

Figs. 11, 12, 13. Common trocar.

Figs. 3, 5. Operation for Hydrocele. The surgeon grasps the tumor behind, and introduces a trocar and canula into the sac, pointing the instrument upward, so that it may not wound the testicle. He next withdraws the trocar, at the same time pushing the canula well into the sac. The direction of the instrument is changed somewhat after its introduction, as seen in Fig. 3. When all the serum has escaped, the surgeon injects from two to four ounces of some stimulating fluid through the canula by means of an elastic bottle, fitted with a stop-cock, or by means of the syringe, (Fig. 4.)

Fig. 10. Puncture of the Bladder through the Rectum is performed when urine is extravasated, and in most cases of impassable stricture.

The operation is performed by placing the patient on his hands and knees, or on his back, with his knees drawn up, and bringing him close to the edge of the bed. The right forefinger of the surgeon is next introduced into the anus, with a long, curved trocar and canula by its side; then, feeling for the distended bladder just behind the prostate, and exactly in the middle line, he plunges the trocar into it, leaving the canula for four and twenty hours. The point of the trocar should be withdrawn slightly within the canula, as it is being introduced into the anus.

Puncture of the Bladder above the Pubes. This is easily performed by making a small incision through the linea alba, just above the pubes, and then thrusting a long trocar and canula downward and backward into the bladder where it is not covered with peritoneum. The canula must be retained, and the patient be kept on his back, to prevent extravasation, and no time should be lost in restoring the natural passage.

PLATE CXII.

Fig. 1. Excision of a Portion of Skin and Tunica Vaginalis Testis. The fluid is first to be evacuated by puncture, and the puncture itself extended upward by an incision. A portion of the skin and serous sac is then to be removed, as shown in the drawing.

Fig. 2. Ligature of the arteries of the cord, proposed as a means of arresting the growth of a commencing sarcocele, by causing atrophy of the organ. Process of Maunoir.

Fig. 3. Castration.

Fig. 4. Ligature of the cord, en masse, after castration.

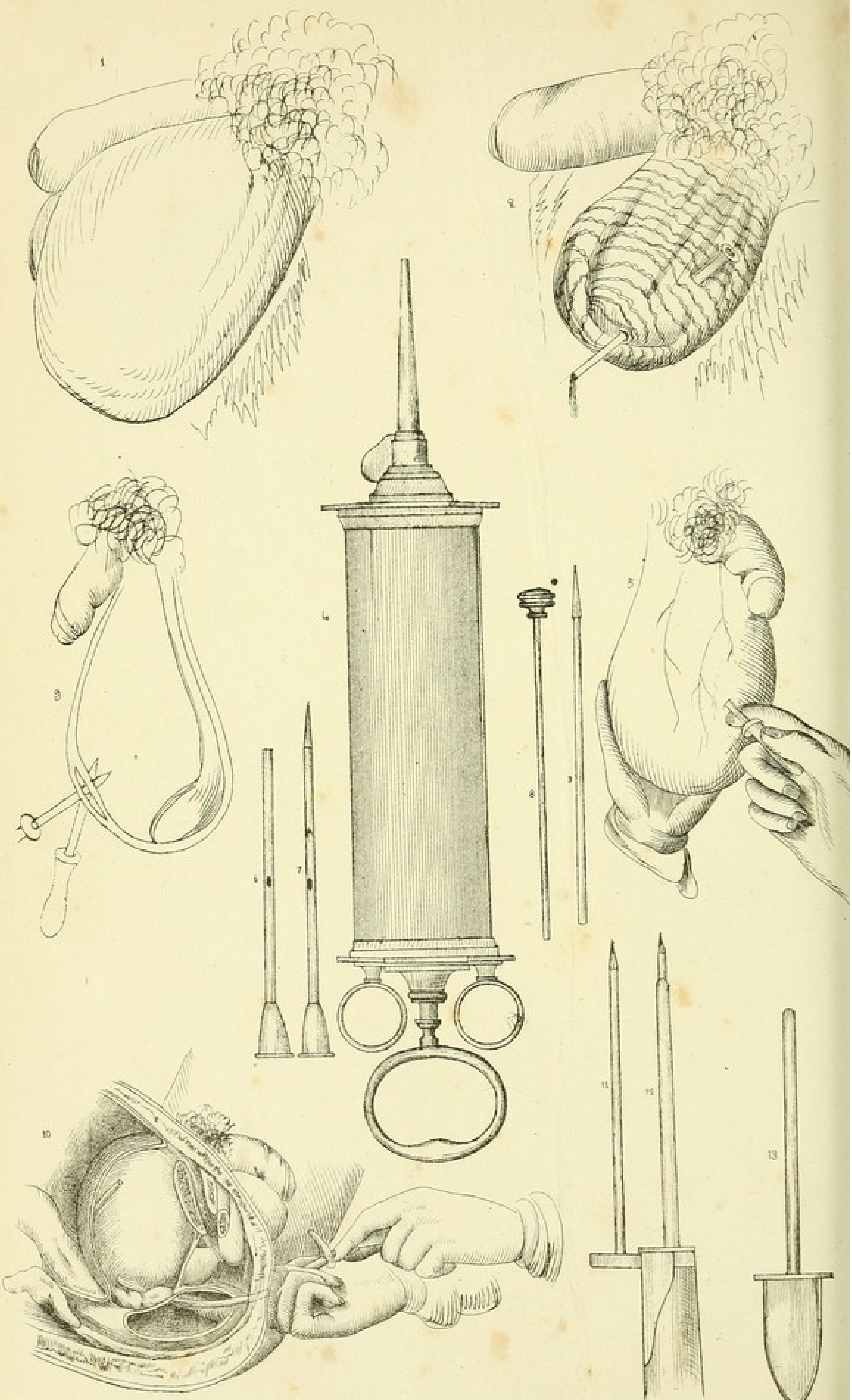
Fig. 5. Sarcocele. From M. Baudens. The opening of a fistula is seen on the side.

Fig. 6. Sarcocele. From M. Velpeau.

Castration is performed thus: The scrotum being shaved, the surgeon grasps it behind to stretch the skin, and then makes an incision from the external abdominal ring to the bottom of the scrotum. If the skin is adherent, or diseased, or if the tumor is very large, two elliptical incisions may be made, so as to remove a portion of skin between them. If there is any doubt as to the nature of the disease, he may next open the tunica vaginalis, to examine the testis. Then he separates the cord from its attachments, and an assistant holds it between the finger and thumb, to prevent it from retracting when divided. The operator now passes his bistoury behind the cord and divides it, and seizing the lower portion, draws it forward and dissects out the testicle. The arteries of the cord, and any others requiring it, are then to be tied; but the wound must not be closed till all the bleeding has ceased, as this operation is often followed by secondary hemorrhage.

Amputation of the Penis may be performed in the following manner: The part to be removed should be grasped in the left hand, when the surgeon, with a stout bistoury or small catlin, should effect the separation with one stroke of the blade. An assistant may have hold of the root of the organ, and can restrain the hemorrhage by pressure, until ligatures are placed upon the dorsal arteries, those in the corpus cavernosum, and such others as may require it.

PL. III.



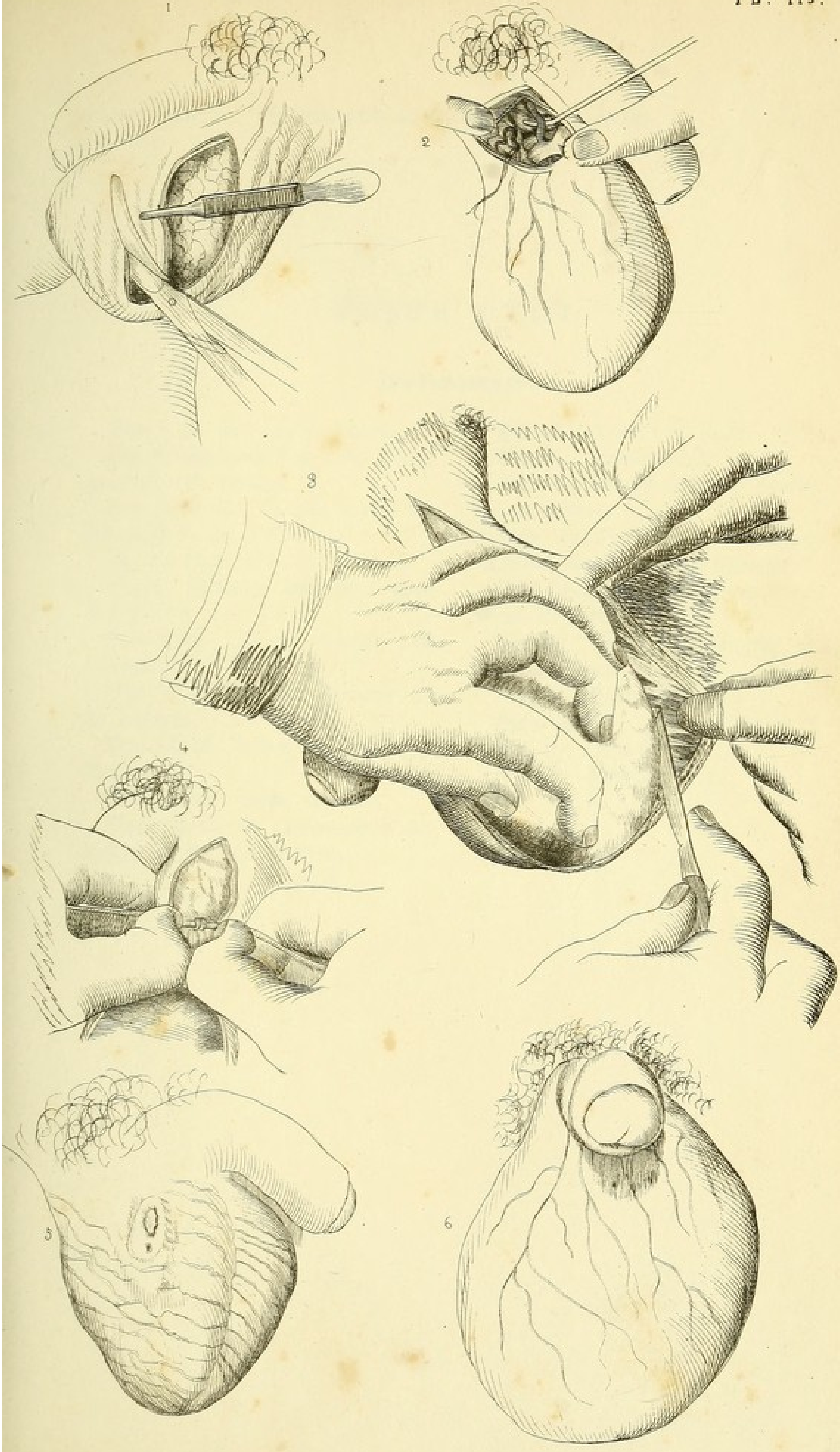

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PLATE CXIII.

INSTRUMENTS.

Figs. 1, 2. Maunoir's scissors.

Fig. 3. Scissors with both blades guarded with buttons.

Figs. 4, 5, 6. Various knives for operating on the eyelids.

Fig. 7. Catheter of M. Gensoul.

Fig. 8. Catheter less bent than Fig. 7.

Figs. 9, 23. Lance forceps of Onsenart.

Figs. 10, 24. Needle elevator of M. Luzarde.

Figs. 11, 25. Lance elevator of Emden.

Figs. 12, 26. Lance elevator.

Figs. 13, 14, 22. Instruments for incision of the lacrymal sac.

Fig. 15. Adam's iris knife.

Fig. 16. Metallic style.

Fig. 17. Catgut style, for dilating the nasal duct.

Figs. 18, 27. Needle, lance, and crotchet combined of M. Clement.

Figs. 19, 28. Elevator, or extractor of M. Pamard.

Fig. 20. Knife for enlarging the corneal section.

Fig. 21. Tube of Wathen.

Figs. 29, 30. Needle of Beer.

Fig. 31. Daviel's curette.

Fig. 32. Tyrrell's hook.

PLATE CXIV.

INSTRUMENTS.

Fig. 1. Small curved forceps.

Fig. 2. Cataract knife.

Figs. 3, 4–5, 7–6, 8. Points of different forceps.

Fig. 9. Forceps for plucking out the eyelashes.

Fig. 10. Instrument of M. Furnari for the extraction of cataract. The figure at the left of this is a side view of Fig. 10.

Fig. 11. Instrument for the same purpose as Fig. 10.

Fig. 12. Keratome of M. Furnari.

Fig. 13. Cataract needle.

Fig. 14. Method of fastening the forceps, Fig. 20.

Figs. 15, 16, 17. Instruments for operating in case of strabismus.

Figs. 18, 23. Curved scissors.

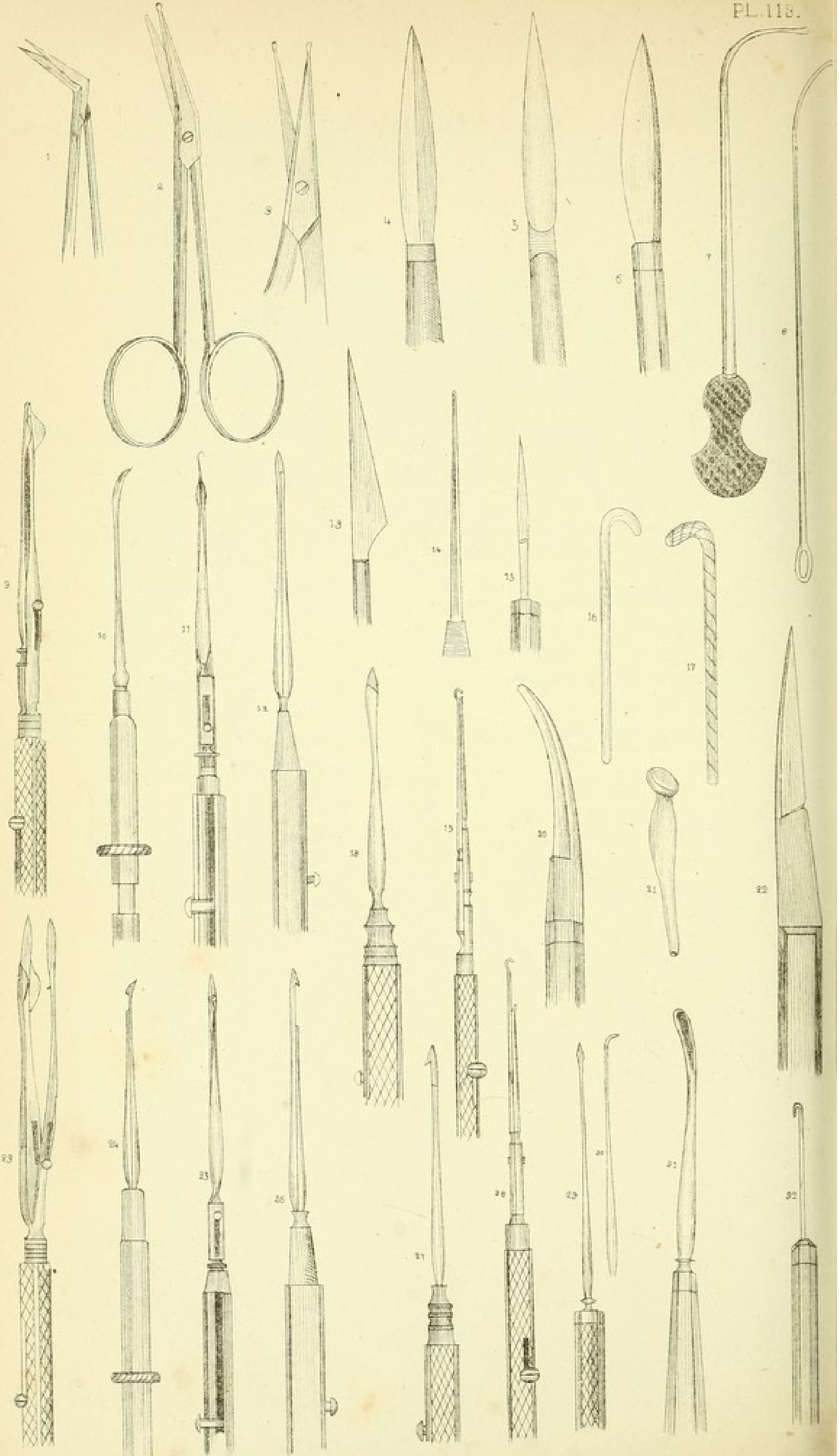
Fig. 19. Elevator of M. Pellier.

Fig. 20. Extracting forceps of M. Reisenger.

Fig. 21. Curette.

Fig. 22. Speculum for the ear or nose.

Fig. 24. Ear speculum.



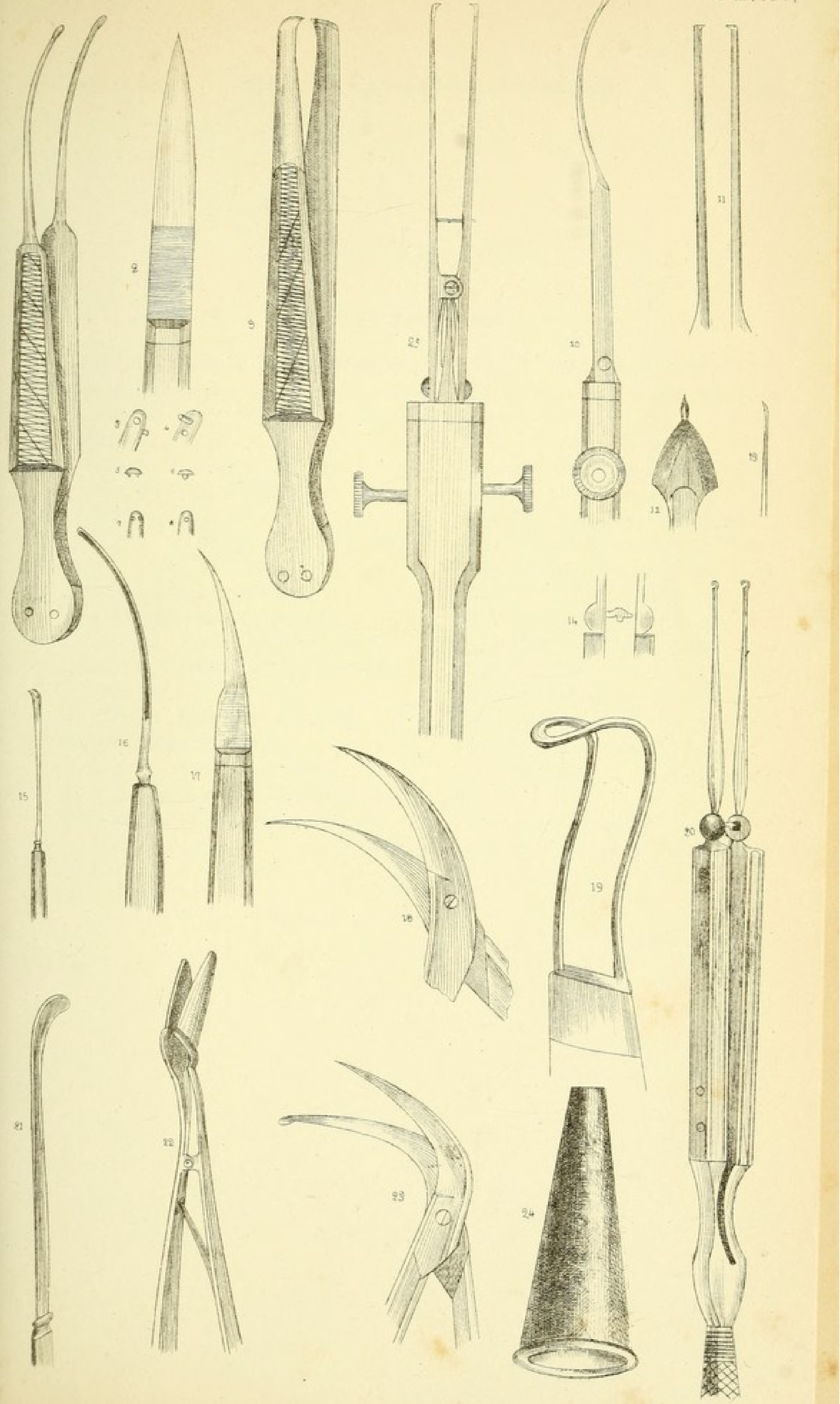

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PLATE CXV.

Instruments.

Fig. 1. Tube of Pellier, modified by M. Malgaigne.

Fig. 2. Tube, full size. From Velpeau.

Fig. 3. Canule of Laforest.

Fig. 4. Tube of Foubert.

Fig. 5. Straight tube.

Fig. 6. Tube, modified by Velpeau.

Fig. 6. Long canule.

Figs. 8, 9, 10. Metal stylets.

Fig. 11. Canule of Pamard.

Fig. 12. Copper stylet, belonging to Fig. 14.

Fig. 14. Syringe; to this may be attached Figs. 13 and 6.

Fig. 15. Catheter of M. Serre.

Figs. 16, 17. Lance of M. Furnari, for incisions of the cornea.

Fig. 18. Tube or canule of Dupuytren.

Fig. 19. Tube of M. Gerdy.

Figs. 20, 21, 22. Lead stylets of Scarpa.

Fig. 23. Stylet of Anel.

Fig. 24. Mandrin of Dupuytren.

Fig. 25. Catheter of Lecat.

Fig. 26. Catheter of M. Pirondi.

Fig. 27. Ophthalmostat of Velpeau.

Figs. 28, 29. Needle of Dupuytren.

Fig. 31. Keratome of Wenzel.

Fig. 32. Keratome of Beer.

Fig. 33. Stylet of Desault.

Fig. 35. Crotchet of Desgranges.

Fig. 36. Mandrin of Velpeau.

Figs. 37, 38. Needle of M. Gerdy.

Fig. 39. Instrument of Jurine.

Fig. 40. Forceps of Physic, modified.

Fig. 41. Forceps of Maunoir.

Fig. 42. Forceps of Velpeau.

PLATE CXVI.

Instruments.

Figs. 1, 2. Stylets for removing obstructions from the nasal canal.

Figs. 3, 8, 15, 25. Forceps of Velpeau.

Fig. 3. Forceps of M. Furnari, for the extraction of the crystalline lens.

Fig. 4. Straight needle of Beer.

Fig. 5. Double Keratome of M. Carrou.

Fig. 6. Elevator of M. Luzardi.

Fig. 7. Perforator of M. Montain.

Fig. 9. Instrument of M. Manec.

Fig. 10. Crotchet of M. Cloquet.

Fig. 11. Elevator of Pellier.

Figs. 12, 13. Keratome of Velpeau.

Fig. 14. Sonde cannelée.

Figs. 16, 17. Mandrin of Dupuytren.

Fig. 18. Kystitome of La Faye.

Fig. 19. Canule of M. Gensoul, for cauterizing the nasal canal.

Figs. 20, 21. Ring of M. Sanson, for cauterizing the conjunctiva around the cornea.

Fig. 22. Canule for the cauterization of the nasal canal.

Fig. 23. Perforator of Pellier.

Fig. 24. Canule for cauterization of the os unguis.

Fig. 26. Hook of Walther.

Figs. 27, 28. Crotchet of Beer.

Fig. 29. Instrument to destroy the crystalline lens.

Fig. 31. Knife of Siegerist.

Fig. 32. Keratome of M. Furnari.

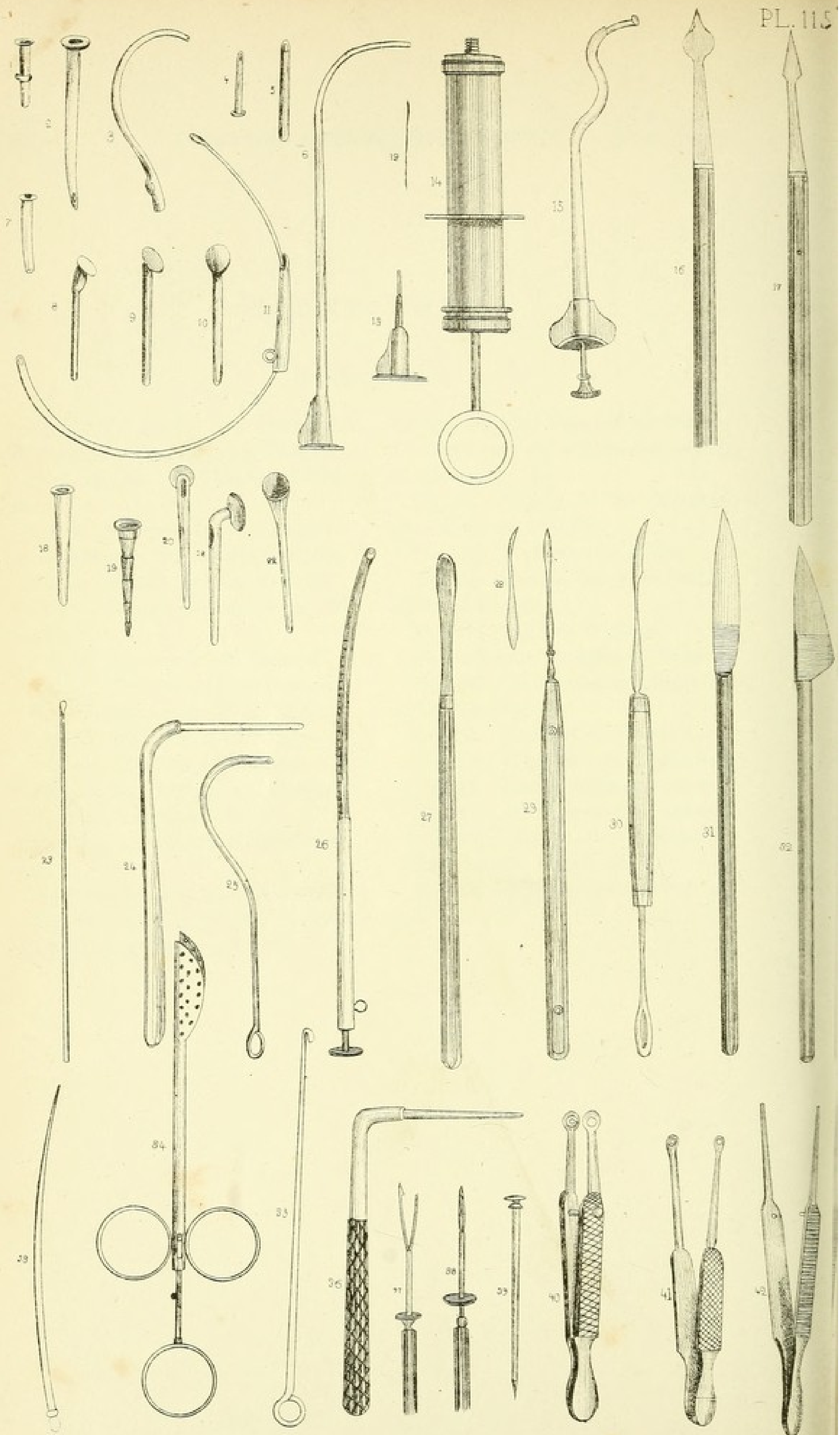
Fig. 33. Double knife of Jaeger.

Fig. 34. Elevator of M. Fardeau.

Fig. 35. Keratome of Richter.

Figs. 36, 37. Hey's needle.

Fig. 38. Scissors for artificial pupil.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PL. 116.

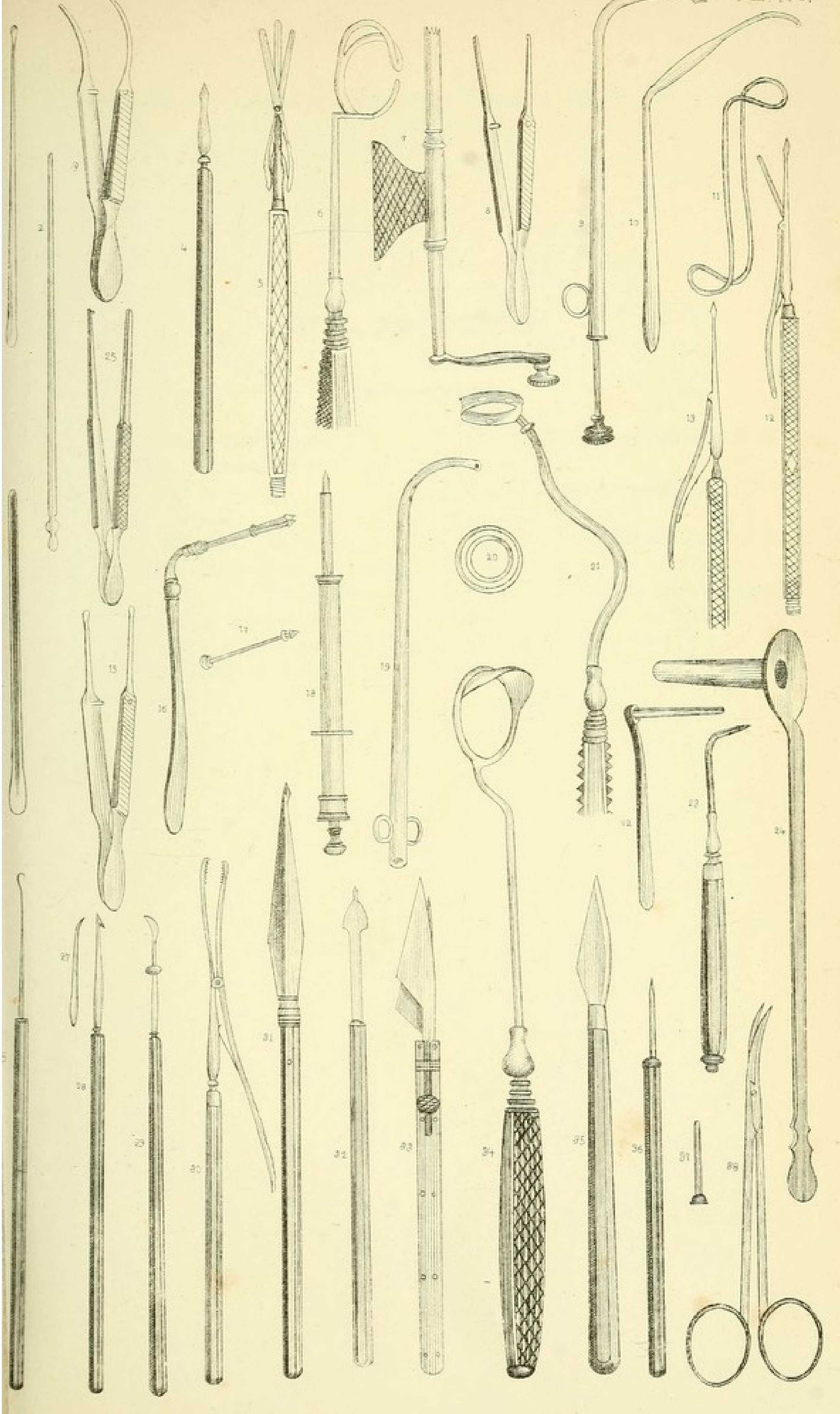


PLATE CXVII.

INSTRUMENTS.

Fig. 1. Porte-fil of Levret.

Figs. 2, 9. Serre-nœud of Dupuytren.

Fig. 3. Porte-fil.

Fig. 4. Mandrin, or tampon, on which to place the instruments, (Plate CXVIII. Figs. 1, 2, 3,) previous to introducing them into the vagina.

Fig. 5. Leroy's blunt hook for supporting the bladder in the high operation.

Fig. 6. Bistoury cystitome of M. Belmas.

Fig. 8. Sound cystitome of M. Leroy.

Fig. 10. Sound, with a lance of F. Come.

Figs. 11, 13. Leroy's sheathed cystitome.

Fig. 12. Staff of Dupuytren.

PLATE CXVIII.

Instruments.

Fig. 1. Speculum with four valves.

Fig. 2. Speculum of Duges.

Fig. 3. Speculum with three valves.

Fig. 4. Canula for the rectum, in case of obstructions.

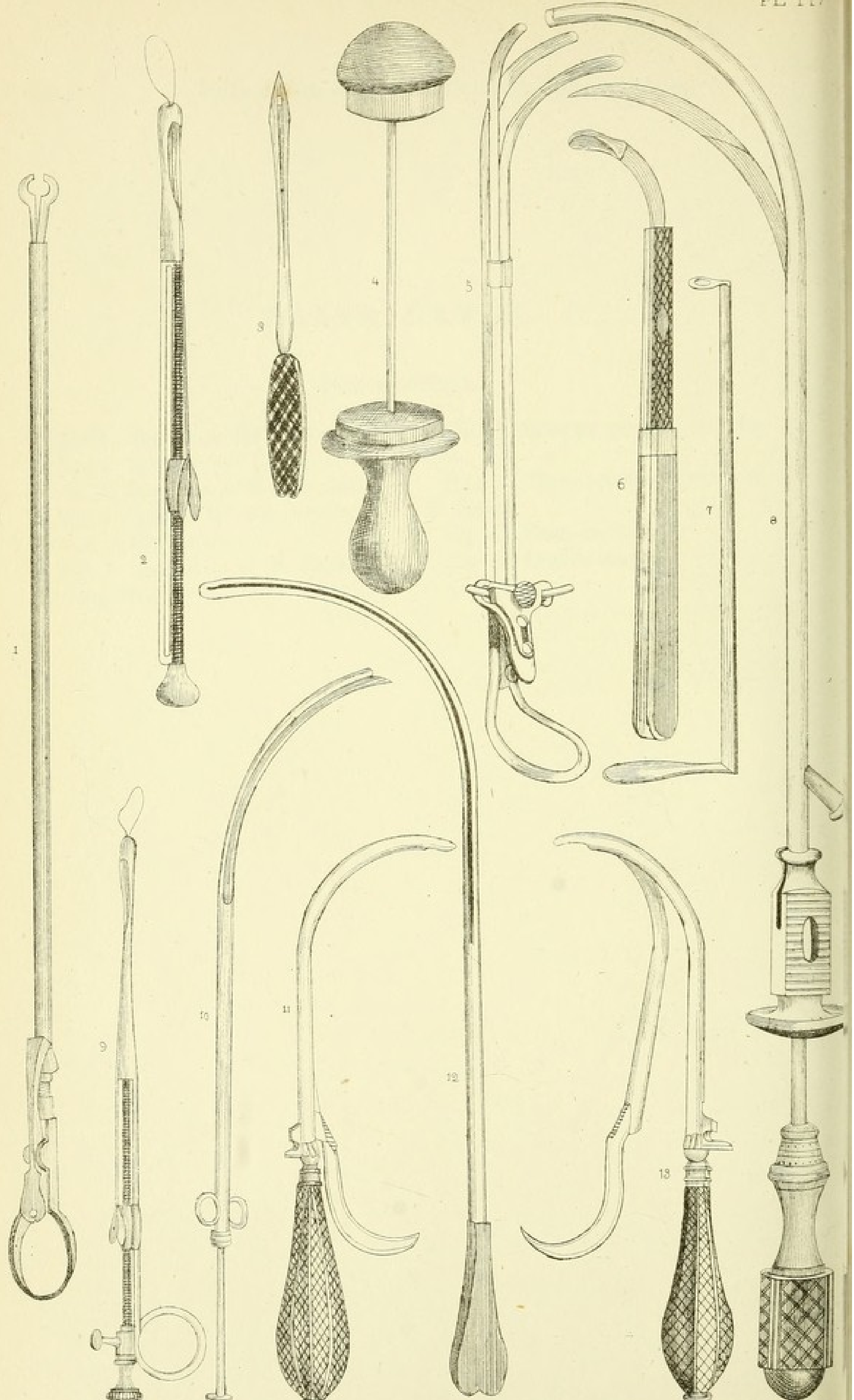
Fig. 5. Instrument of M. Raybard, for empyema.

Fig. 6. Forceps porte-fil of Levret.

Fig. 7. Three-branched forceps of M. Ricord.

Fig. 8. Porte-caustique.

Fig. 9. Double canula.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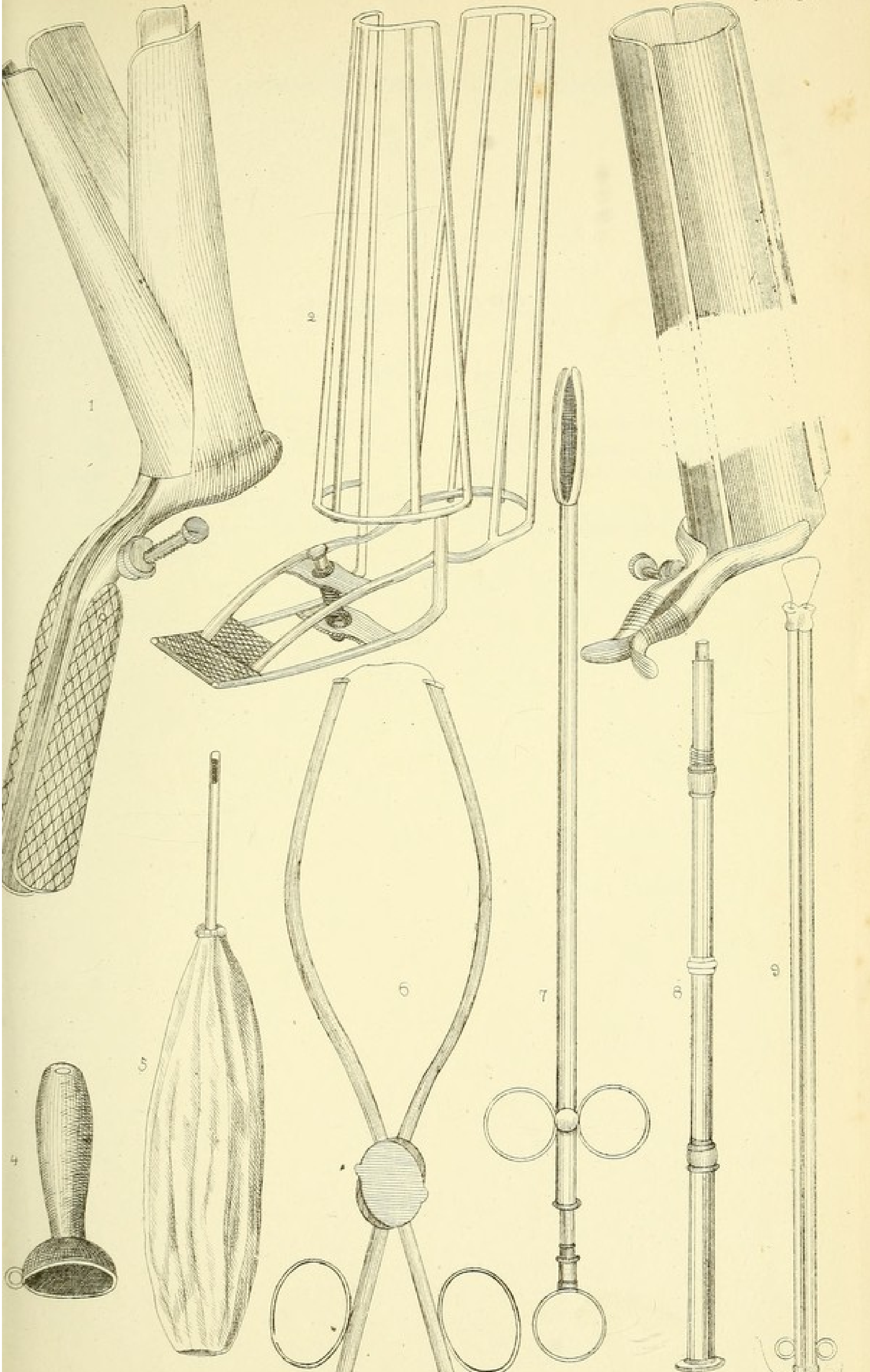
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PLATE CXIX.

INSTRUMENTS.

Fig. 1. Lithotome of Dupuytren.

Fig. 2. Scarificator of M. Tanchou.

Fig. 3. Porte-caustique of M. Leroy.

Figs. 4, 5, 6, 7. Porte-caustiques of M. Lallemand.

Fig. 9. Mallet of Velpeau.

Fig. 10. Forceps of M. Civiale.

Figs. 11, 13, 14. Various kinds of knives.

Fig. 12. Double canula.

PLATE CXX.

Instruments.

Figs. 1, 6, 10. Various lithotomy knives.

Fig. 2. Gorget of M. Roux.

Fig. 3. Catheter of Guerin.

Fig. 4. Lithotome of Come.

Fig. 5. Forceps of M. Charrière.

Fig. 7. Instrument for crushing the stone in the bladder.

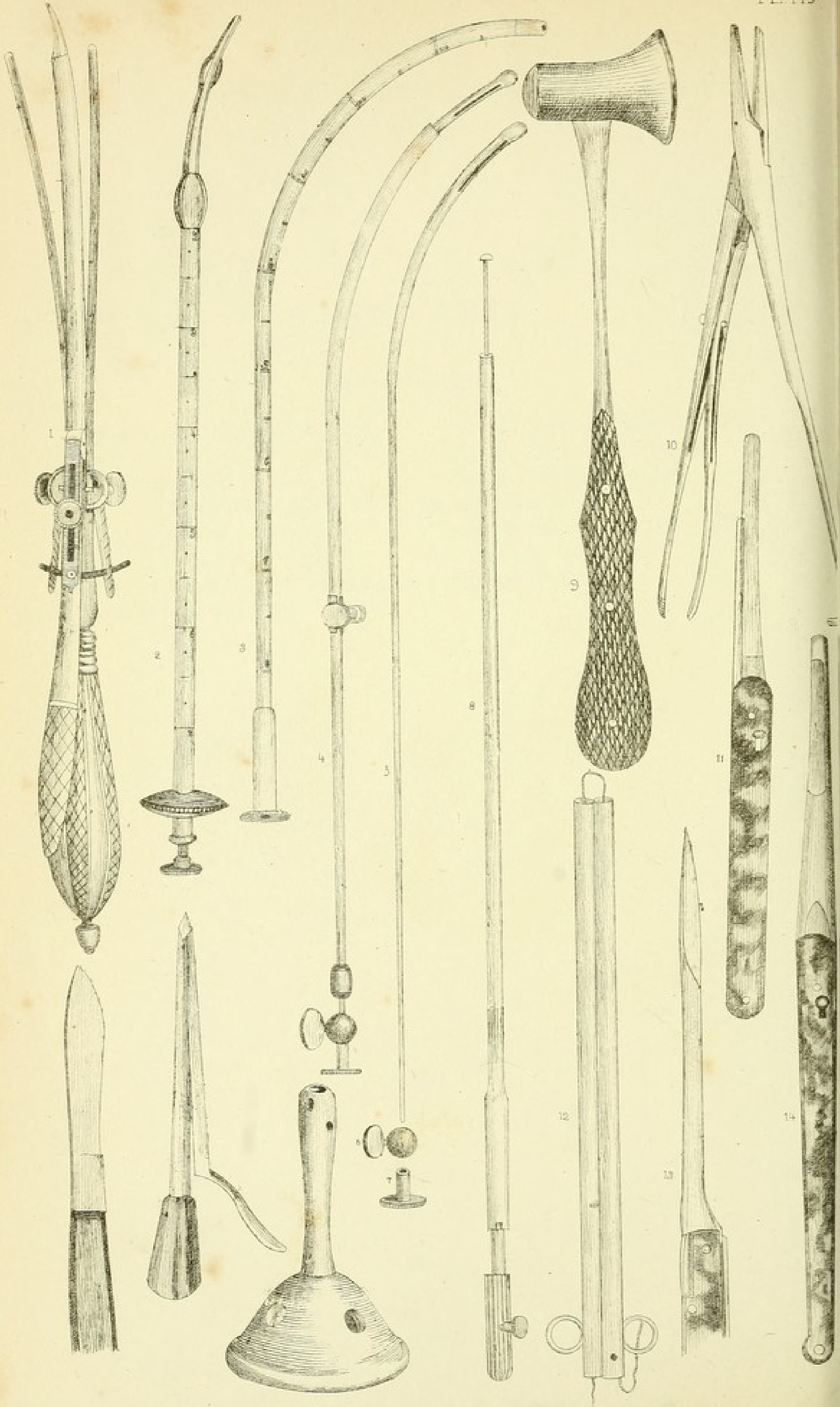
Fig. 8. Staff of Dupuytren.

Fig. 9. Metallic sound.

Fig. 11. Straight catheter, with threads attached.

Fig. 12. Instrument for drilling and crushing the stone.

Fig. 13. Speculum.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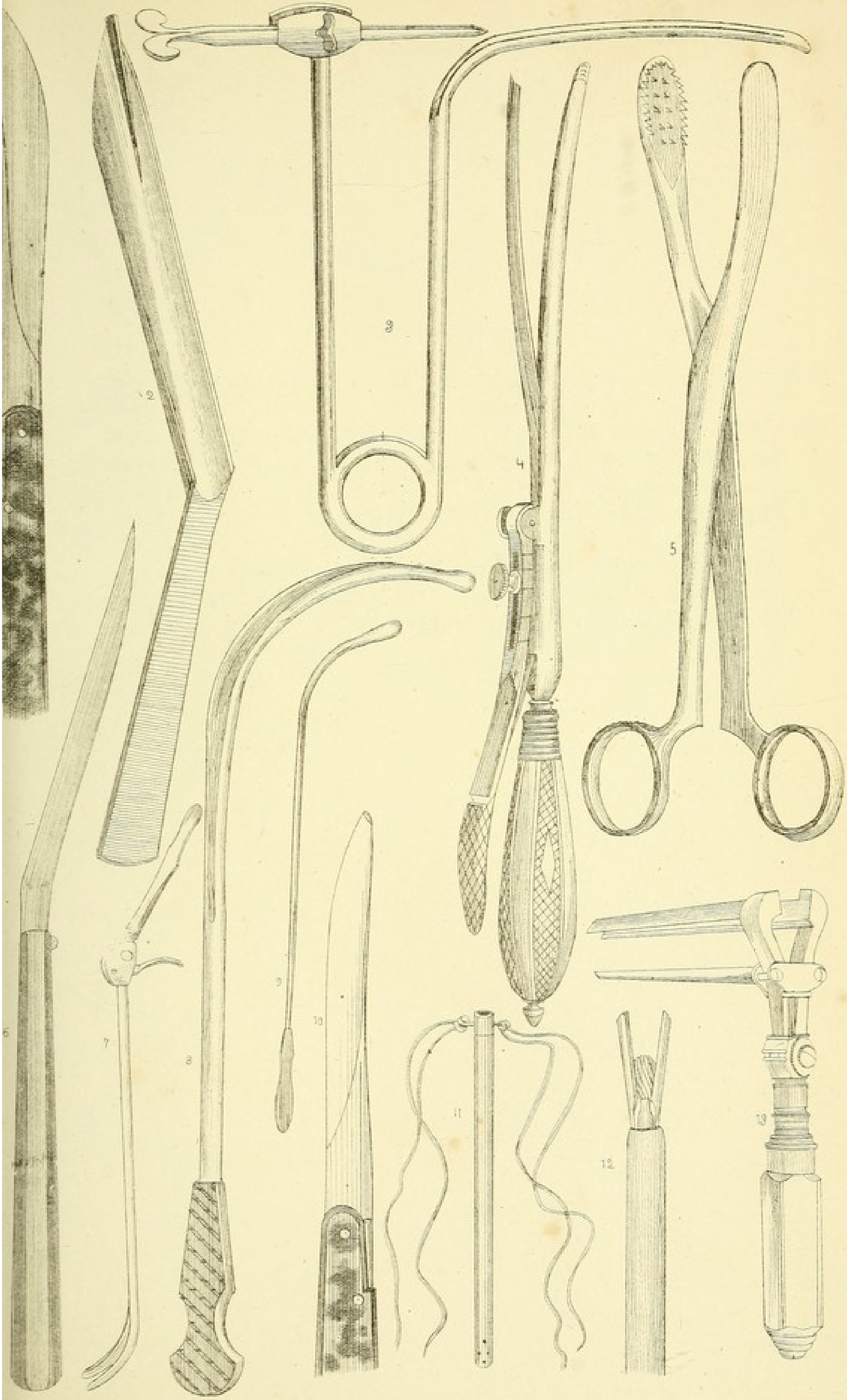
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PLATE CXXI.

Instruments.

Figs. 1, 3. Lithotrite of Mr. Fergusson.

Fig. 2. Lithotrite, with a vice and apparatus for breaking the stone by percussion.

Figs. 4, 5. Vice to be applied to Fig. 2.

Figs. 6, 15. Lithotrite of M. Jacobson, modified by Velpeau.

Fig. 7. Instrument to hold the drilling apparatus, described hereafter.

Figs. 8, 9. Lithotrite of Charrière.

Fig. 11. Curette of M. Leroy.

Figs. 12, 13. The same as Fig. 14, with the ends of the tubes armed with drills.

Fig. 14. Sound of Gruithuisen ; a portion of the end of this instrument should be represented as separable.

PLATE CXXII.

Instruments.

Figs. 1, 4. Porte-caustique.

Figs. 2, 5. Forceps for extracting substances lodged in the urethra.

Figs. 3, 6, 7. Various kinds of bougies.

Figs. 8, 9. Mandrin of M. Tanchou.

Fig. 10. Scarificator of M. Ricord.

Fig. 11. Instrument of M. Leroy.

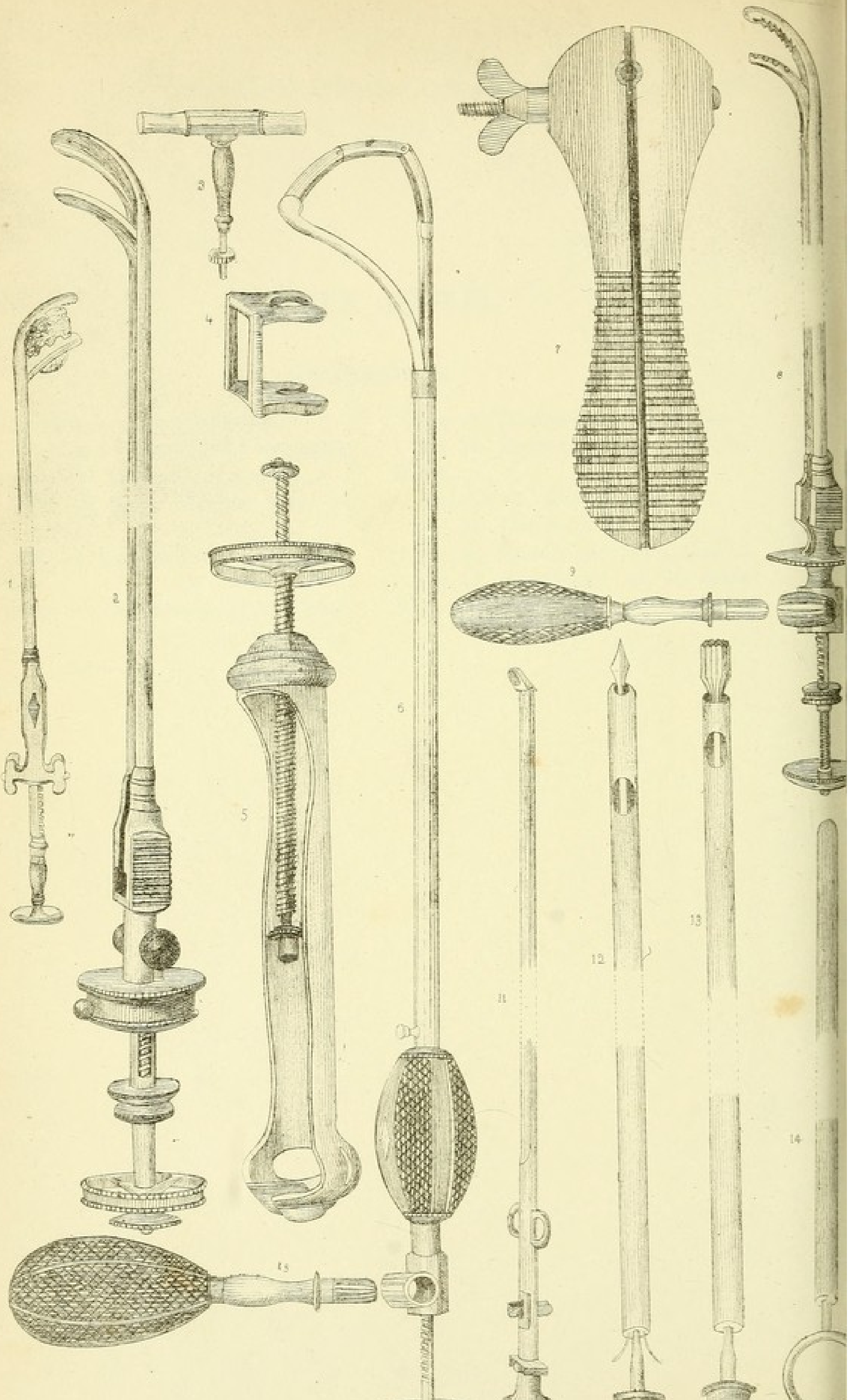
Fig. 12. Porte-caustique of M. Barre.

Figs. 13, 14. Porte-caustique.

Fig. 15. Curette of M. Bonnet.

Fig. 16. Head of instrument, Fig. 1.

Fig. 17. Scarificator of M. Stafford.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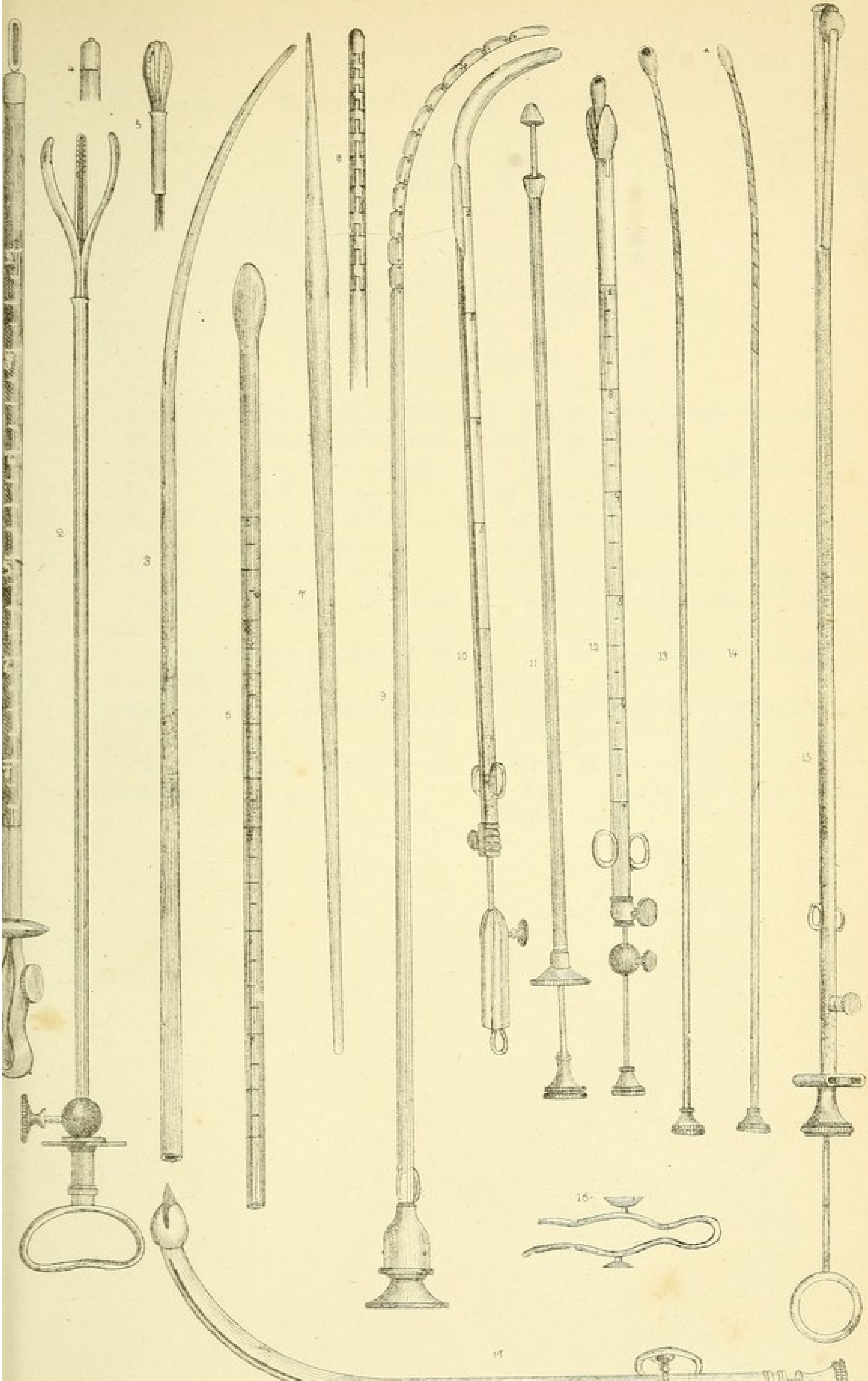
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PLATE CXXIII.

Instruments.

Fig. 1. Porte-aiguille of M. Roux.

Figs. 2, 3, 7. Needles of M. Graefe.

Fig. 4. Needle in the handle, Fig. 1.

Fig. 5. Needle of M. Alcock.

Fig. 6. Needle of M. Ebel.

Fig. 8. Forceps of Graefe.

Fig. 9. Serre-nœud of Graefe.

Fig. 11. Tonsil forceps of Chaumet.

Fig. 12. Tonsil instrument of M. Fahnestock.

Fig. 13. Forceps (porte-aiguille) of M. Sotteau.

Fig. 14. Polypus forceps of M. Charrière.

Fig. 15. Serre-nœud. Instrument for tying ligatures.

Figs. 16, 17. Ligature instruments of Desault.

Figs. 18, 19. Needle of Bourgougnon.

Fig. 20. Needle of M. Schwerdt.

Fig. 21. Porte-aiguille of Fauraytier.

Fig. 22. Extremity of Schwerdt's needle.

Fig. 23. Serre-nœud of M. Mayor.

Fig. 24. Dieffenbach's lancet-shaped bistoury.

Figs. 25, 26. Double and single hooks.

PLATE CXXIV.

INSTRUMENTS.

Fig. 1. Enterotome of M. Raybard.

Fig. 2. Hernia bistoury of Le Dran.

Figs. 3, 5. Œsophagotomy instrument of Vacca.

Figs. 4, 10. Triple and double hooks.

Fig. 7. Enterotome of Delpech.

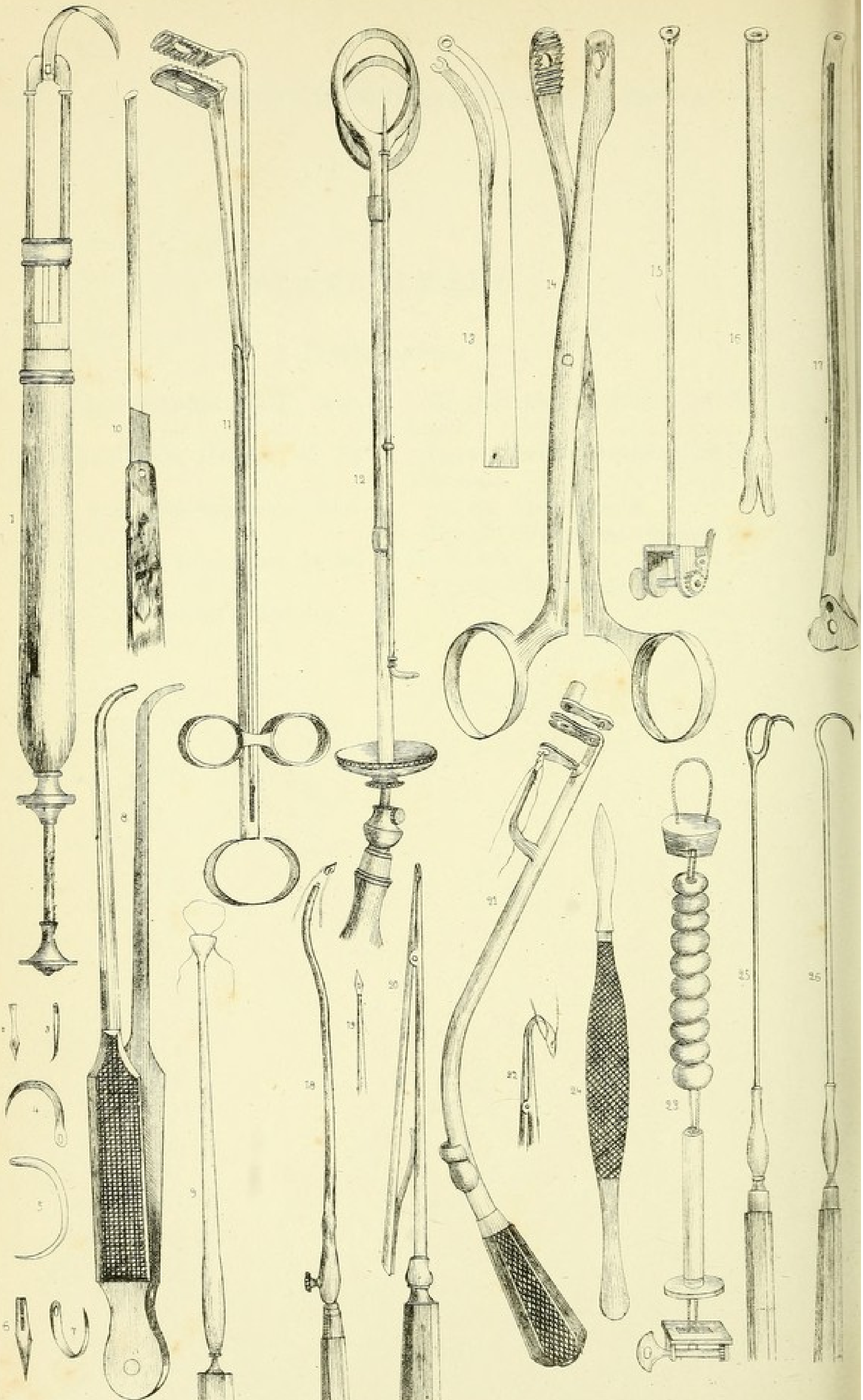
Fig. 8. Gorget dilator of Le Blanc.

Fig. 9. Tonsil instrument of M. Velpeau.

Fig. 10. Bent scissors.

Fig. 12. Œsophagus forceps of Mr. Liston.

Fig. 13. Double-hook forceps.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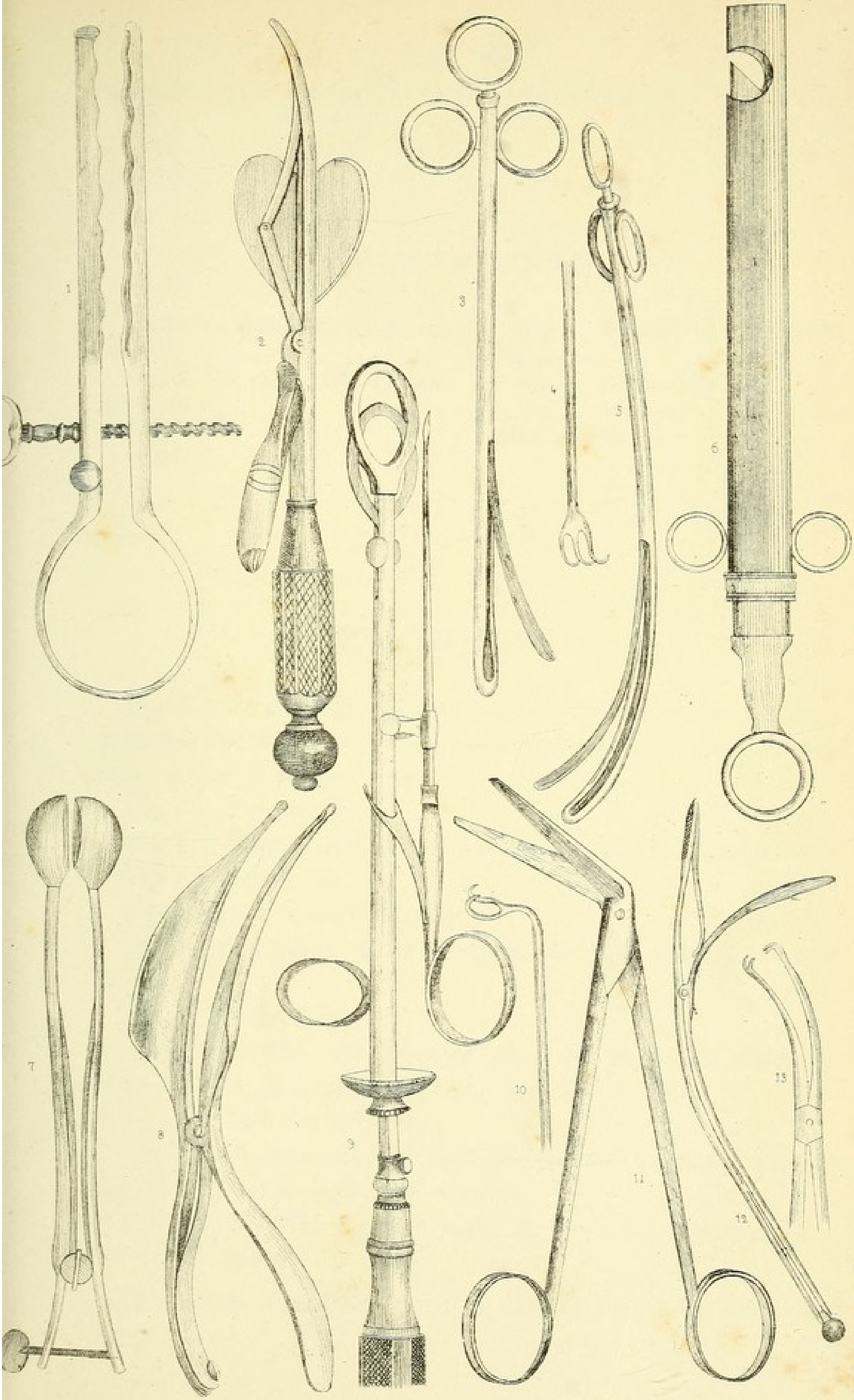
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PLATE CXXV.

Figs. 1, 4. Operations for phymosis.

Figs. 2, 5, 8. Operations for paraphymosis.

Fig. 3. Excision of a portion of the prepuce.

Fig. 6. Circumcision.

Fig. 9. Dressing of the wound after circumcision.

PLATE CXXVI.

Fig. 6. Epispadias. From Liston. The operation consisted in paring the edges, and putting them together over a catheter, with many points of twisted suture.

Fig. 7. Paraphymosis.

Fig. 9. Sutures introduced after the operation for paraphymosis.

Fig. 8. Phymosis.

Figs. 1, 2, 3. Oxalic deposits.

Fig. 5. Crystals of triple phosphate of lime, under the microscope.

Fig. 4. Lithic deposits.

Figs. 10, 12, 13. Specimens of phosphate and triple phosphate of lime, found in a nucleus of uric acid.

Fig. 11. Salivary calculus.

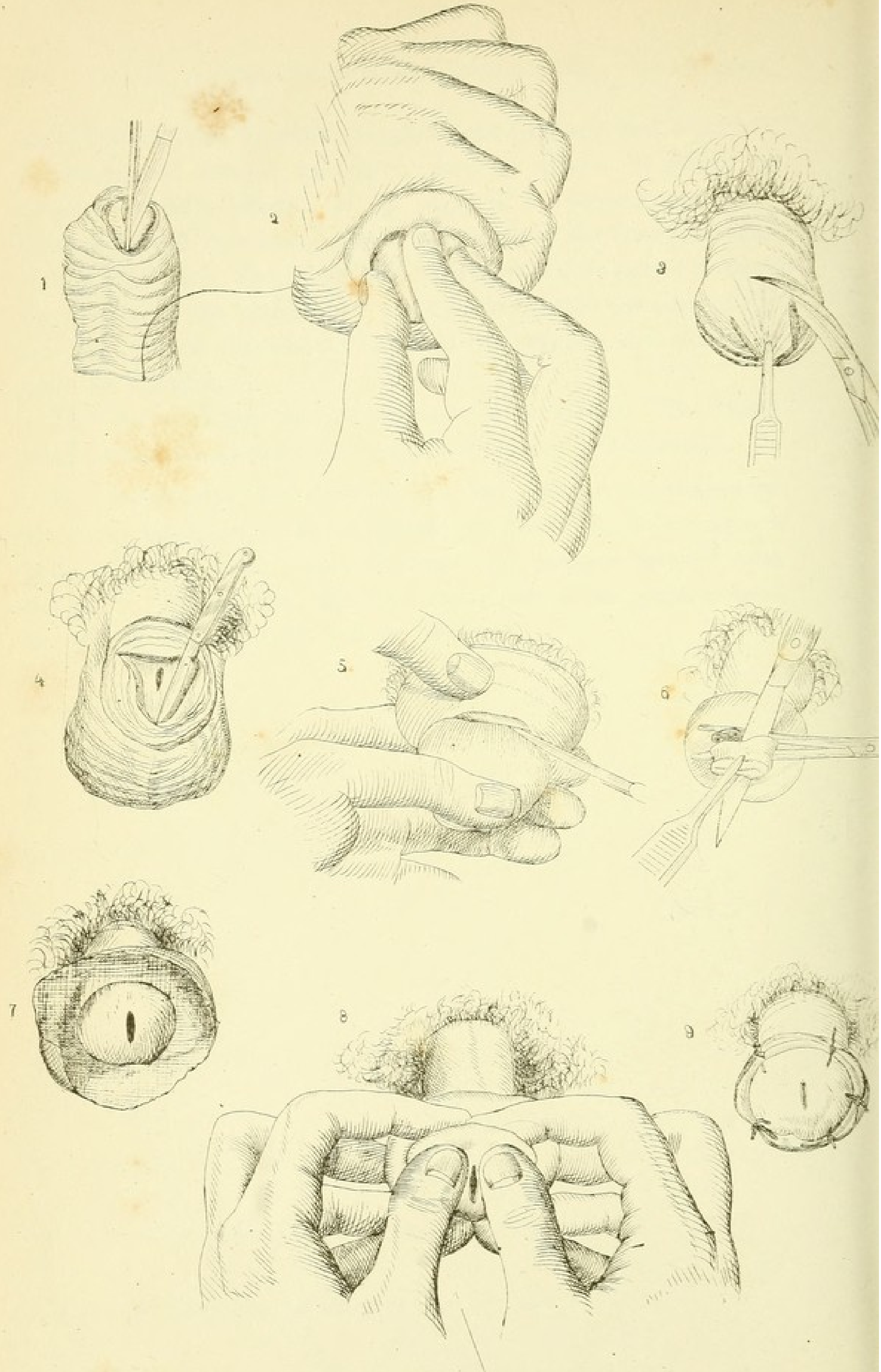
Fig. 14. A brass ring, cut from the penis of a patient who had slipped it upon the organ when a child.

Fig. 15. Calculus operated upon by the drill; afterwards cut out by Mr. Liston.

Operation for Phymosis. A director should be introduced about half an inch between the glans and prepuce, and a curved, narrow-pointed bistoury be passed along its groove, by which the prepuce should be slit up. If the edges of the prepuce are thickened, it should be seized between the blades of the forceps, and be shaved off. Then four or five fine sutures should be passed through the margin of the incision, so as to draw together the edge of the skin and that of the mucous lining of the prepuce, that they may unite by adhesion.

This operation may also be performed with scissors. The blade, which is introduced under the prepuce, should be probe-pointed.

Paraphymosis. Treatment. The surgeon first compresses the glans with one hand, so as to squeeze out the blood; then pushes it back with this hand, whilst he draws the prepuce forward with the other. If this fails, the constricting part of the prepuce must be divided with a curved, pointed bistoury.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Pl. 126.

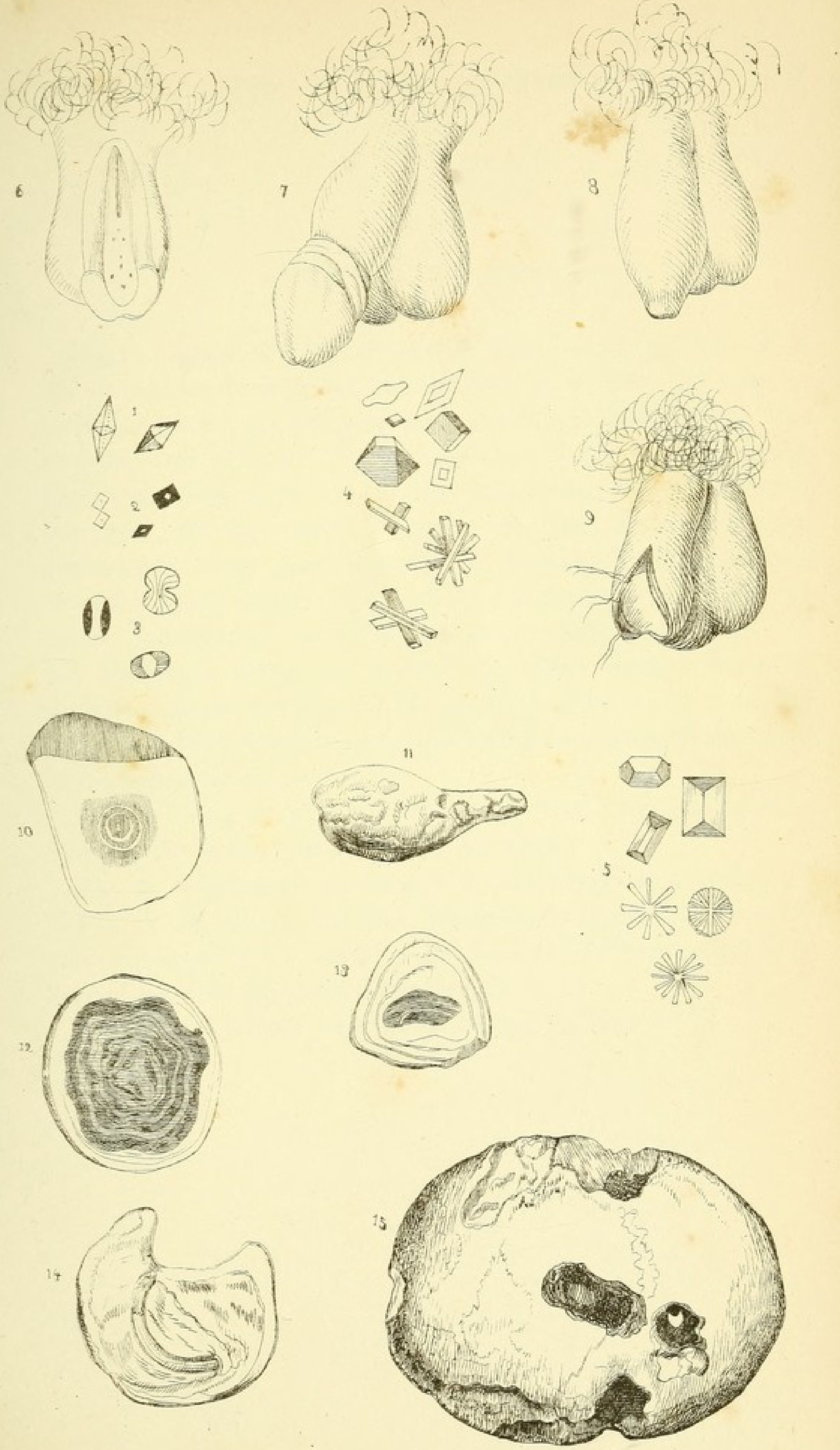

PLATE CXXVII.

Fig. 1. Sounding for Stone in the Bladder. The bladder should contain from five to eight ounces of fluid. The patient should be placed on his back, with the hips slightly raised. The surgeon, standing on the right side of the patient, enters the sound, having first oiled it, into the urethra, with its convexity towards the left groin. Having passed it down to the sinus of the urethra, he gradually turns the point towards the triangular ligament, bearing along the upper surface of the canal, and then, by depressing the handle and pushing the instrument gently upward in the axis of the bladder, it enters the cavity. If, after searching carefully, the stone cannot be detected, the patient may be placed in another position, and the different expedients resorted to which are described in the various works on surgery.

Fig. 2. Case of a patient who died from fragments of stone blocking the urethra, as shown in the figure.

Fig. 3. Method of operating with Mr. Fergusson's instrument.

Fig. 4. A stone as large as, according to Liston, may be safely operated upon by the crushing instrument. (Of course, this must depend upon the character of the stone.)

Fig. 5. M. Civiale's method of drilling the stone.

PLATE CXXVIII.

Figs. 1, 2. From Liston. Fig. 1 shows the stone caught in the instrument.

Fig. 2. The instrument brought into a position for crushing the stone.

Fig. 3. Loop for confining the hands and feet of the patient in the operation of lithotomy.

Fig. 4. Described in connection with Plate CXXIX.

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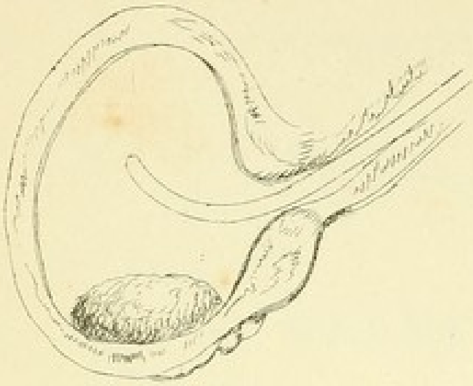

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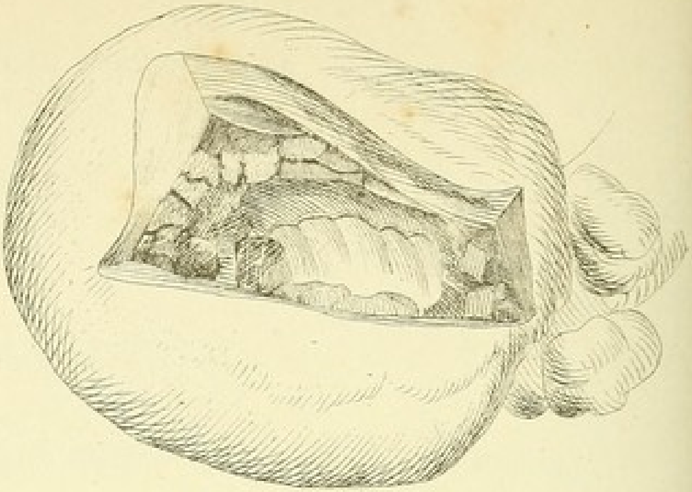

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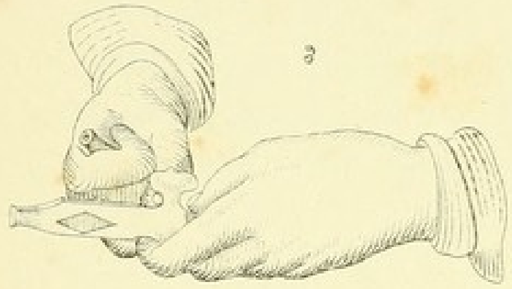

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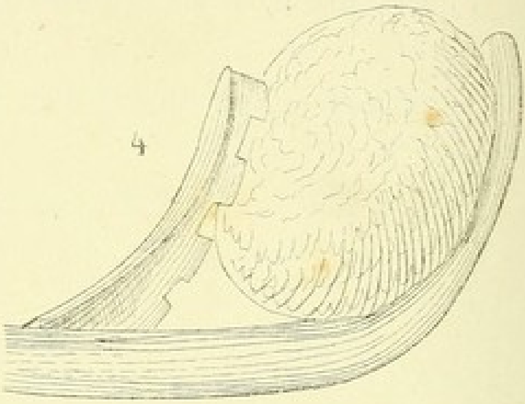

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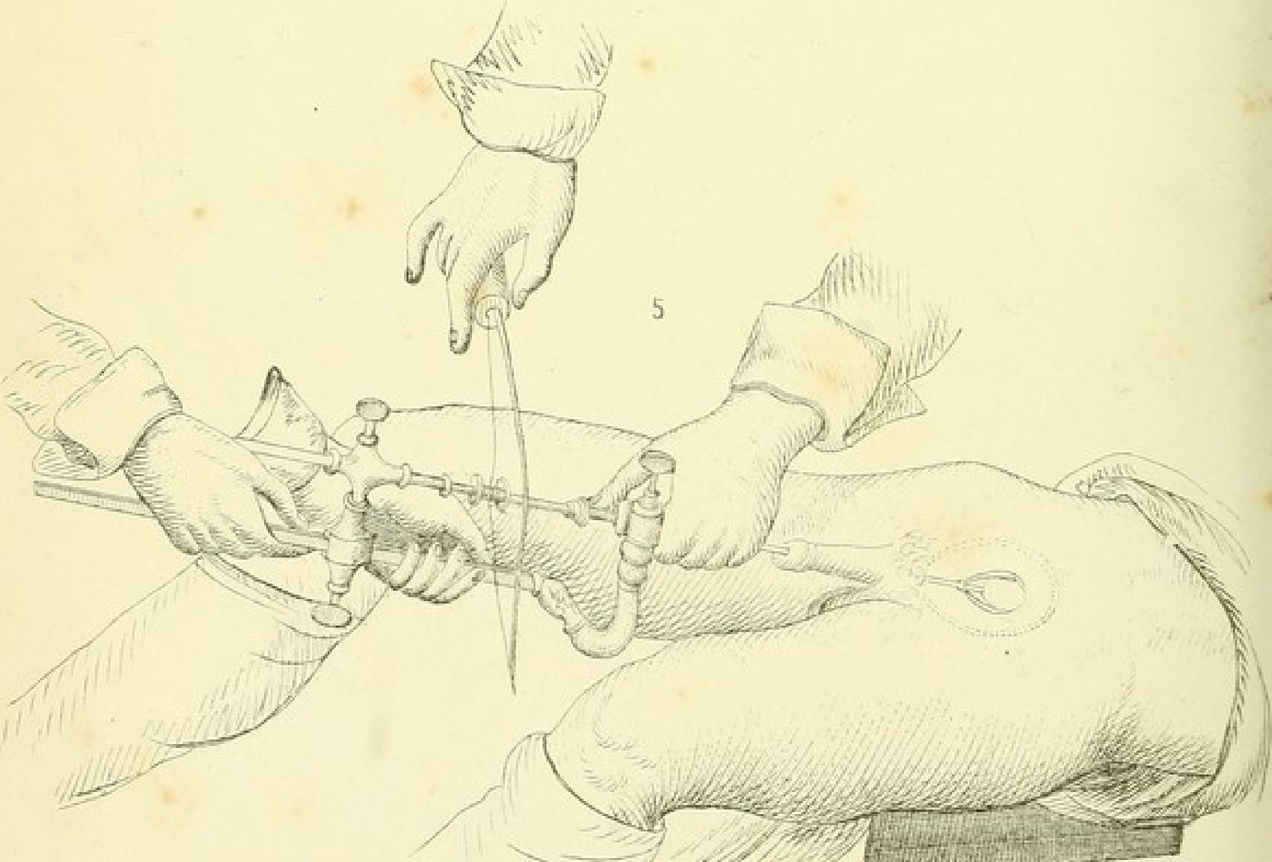

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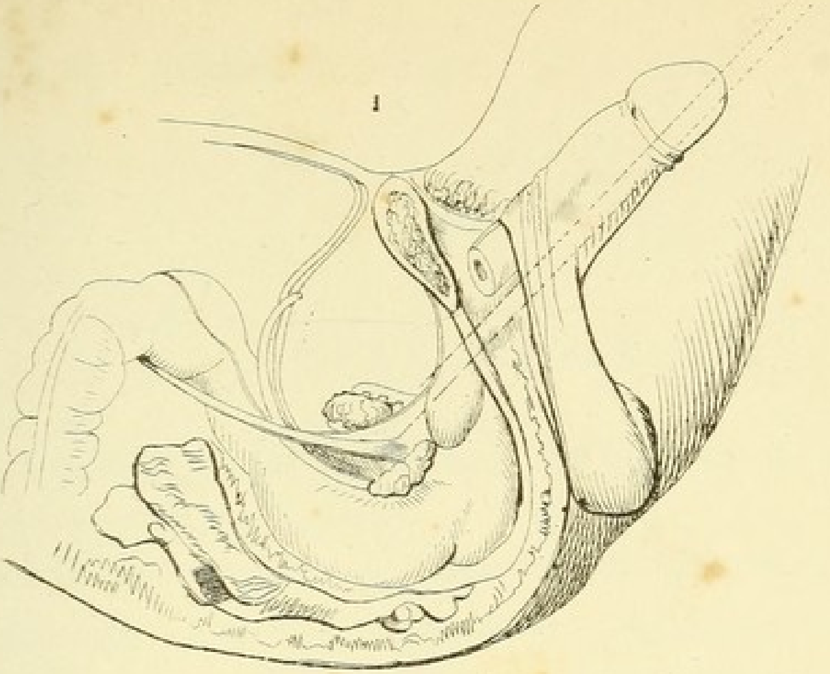

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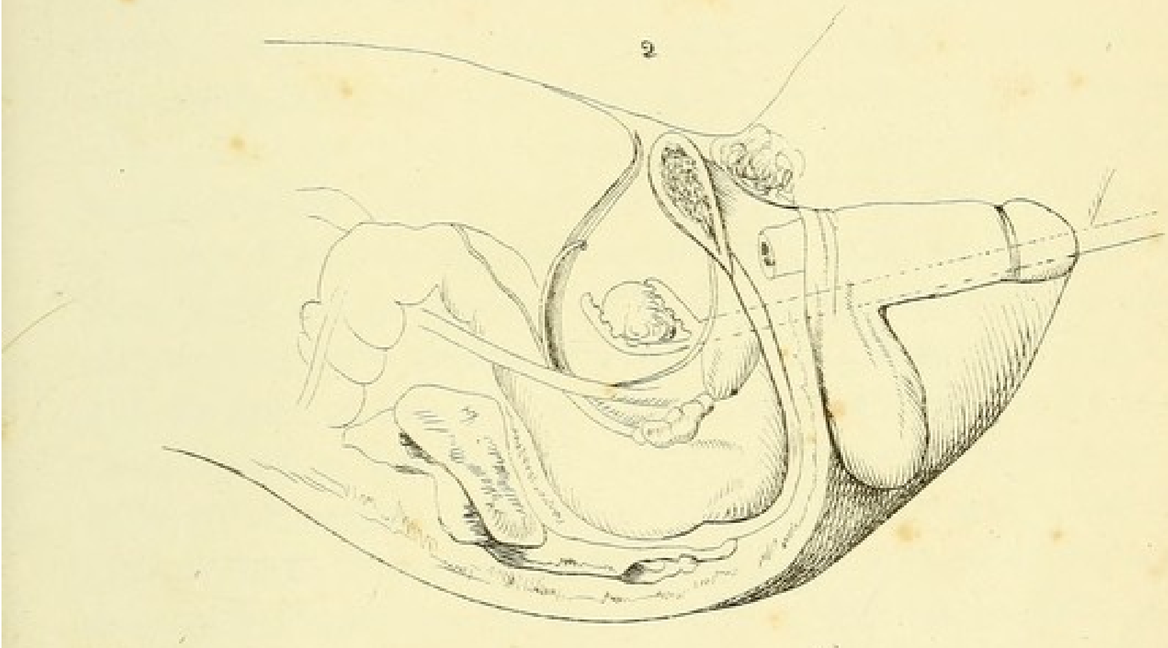

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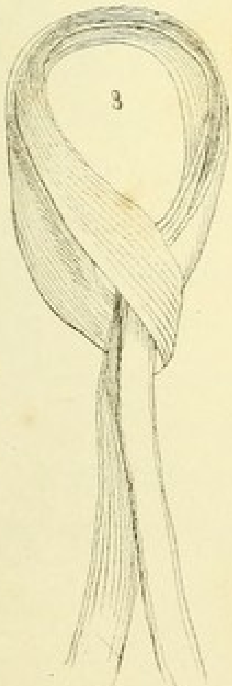

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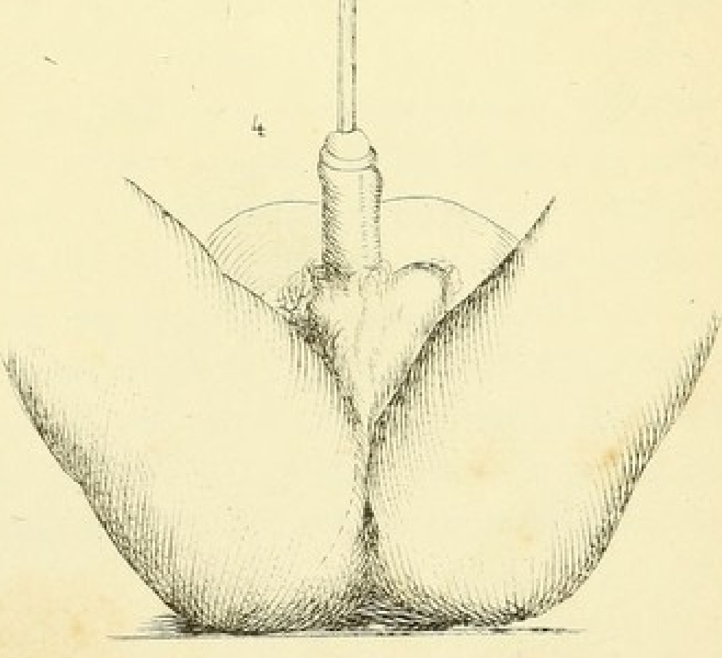

PLATE CXXIX.

Fig. 1 exhibits an internal view of the parts at the neck of the bladder concerned in lithotomy.

Fig. 2 exhibits the parts cut through in this operation.

Lithotomy. Lateral Operation. An enema of warm water should be administered about an hour before the operation. The bladder should be moderately full. The staff should be introduced, and made to strike the stone previous to placing the patient on the table. The table should be about two and a half feet high. The patient should be placed upon his back, with his shoulders resting in the lap of an assistant, who sits astride behind him. A piece of broad worsted tape, doubled as in Fig. 3, should be placed upon each wrist, and the patient made to grasp the outside of each foot with the hand of the same side; and the hand and foot are to be firmly secured in this position, with the tape already applied to the wrist. The surgeon may now introduce the forefinger of the left hand, well oiled, into the rectum, to ascertain the size of the prostate, and its depth from the surface. He should also examine with his fingers the surface of the perineum, and the position of the rami and the tuberosities of the ischia.

Every thing being now prepared, — an assistant on each side holding the thighs firmly asunder, another being at hand to give the surgeon his instruments, and a third stationed on the left side, to hold the staff perpendicularly and well hooked against the symphysis pubis, in which position he is to keep it from first to last, — the surgeon commences the operation by passing in his knife to the depth of an inch on the left side of the raphé, about an inch before the anus, (see dotted line, Plate CXXVIII. Fig. 4, which is placed by mistake on the wrong side,) and cuts downward and outward to the bottom of the perineum, midway between the anus and tuberosity of the ischium. The forefinger of the left hand is then placed in the bottom of the wound, near its middle, and directed upward and forward. Any fibres of the transverse muscle, or of the levator anui, that offer resistance, are divided by the knife, its edge being turned downward. The finger passes readily through the loose cellular tissue, but is resisted by the deep fascia, immediately anterior to which the groove of the staff can be felt, not thickly covered. The point of the instrument is slipped along the nail of the finger, and guided by it, is entered, the back still directed upward, into the groove at this point. The finger all the while is placed so as to depress and protect, as much as possible, the coats of the rectum, and the same knife, pushed forward, is made to divide the deep fascia, the muscular fibres within its layers, and to perforate the urethra about two lines in front of the prostate. Figs. 3, 4, illustrate this point. (Fig. 3 is from Druitt; Fig. 4 from Liston. A difference between the two will be seen in the manner of holding the knife.) The knife must then be pushed gently into the bladder, slitting up the urethra, and notching the prostate in its course. The knife being withdrawn, the left forefinger is gently insinuated into the bladder, dilating the parts as it enters; then, the assistant having removed the staff, the forceps are cautiously introduced over the finger into the bladder, the finger being gradually withdrawn as the instrument enters. At this moment, the instrument is opened, and the stone caught, if possible, as it is brought into the jaws of the instrument by the gush of water from the bladder. After the stone is seized, it is extracted by slow, cautious, undulating movements. The forceps should be held with the convexity of the blades upward.

The general maxims to be borne in mind during the performance of this operation are, 1. To make a free, external incision, and to carry it low enough down, that the urine may subsequently escape freely, without infiltrating the cellular tissue; 2. Not to cut too high up, or to open the urethra too much in front, for fear of wounding the bulb or its artery; 3. Not to wound the rectum, or pudic artery, by carrying the incisions too much inward or outward; 4. And above all, not to cut completely through the prostate, beyond its fibrous envelope, for death will almost surely follow from infiltration of urine.

VARIETIES IN THE LATERAL OPERATION. Most surgeons direct the assistant to hold the staff so that it may project in the perineum, and incline a little to the left side of it; and when they have opened the urethra, and are about to incise the neck of the bladder, they take its handle in their own left hand, and bring it down horizontally. Some prefer a straight staff.

DIVERSITIES IN THE MANNER OF CUTTING INTO THE BLADDER. Some use a bistouri caché, (Plate CXIX. Fig. 1, and Plate CXX. Fig. 4.) Sir B. Brodie prefers a beaked knife, or, if the stone is very large, a double-edged knife with a beak in the centre, so as to divide both sides of the prostate. When the bladder is opened, he directs the wound to be dilated by means of the blunt gorget, which distends the neck of the bladder, and splits clean through the prostate. Many surgeons open the bladder by means of the cutting gorget. If it should be necessary to divide both sides of the prostate, it may be done as described above, or with a probe-pointed bistoury, the edge of which should be directed towards the right tuber ischii. Mr. Mayo, after making the usual external incisions, cuts into the side of the prostate, as far back as he can reach, and brings the knife out along the groove of the staff into the membranous part of the urethra.

The recto-vesical operation consists in cutting into the bladder from the rectum, in the middle line, behind the prostate.

The bilateral operation is performed by making a curved incision, with the convexity upward from one side of the perineum to the other, carrying it between the anus and the bulb of the urethra, opening the membranous portion of the urethra, and then pushing a double bistouri caché into the bladder, by which both sides of the prostate may be divided.

The high operation is performed by making an incision through the linea alba, and opening the bladder, which is projected upward on the point of a catheter, at its fore and upper part, where it is not covered by peritoneum.

Lithectasy, or Cystectasy, was performed by Mr. Fergusson in the following manner: The patient having been placed in the usual lithotomy position, an incision was made in the raphé about an inch and a half long, terminating half an inch in front of the anus, from which point two incisions, each about three fourths of an inch in length, were carried downward and outward. The superficial cellular tissue having been similarly divided, the point of the knife was thrust into the groove of the staff, a little in front of the triangular ligament. This ligament having been slightly divided on both sides, in the direction downward and outward, the metal point of an Arnott's dilator was carefully guided along the groove of the staff into the bladder. The dilator, which is composed of a cylindrical bag of oiled silk, was then injected with a little warm mucilage of gum arabic, till the patient complained of some pain from the distention. The object now is to increase the dilatation at short intervals, till, at the end of from thirty to forty hours, forceps can be introduced, and the stone extracted.

PLATE CXXX.

Fig. 1. Operation for lithotomy, with the lithotome of Frere-Come.

1. Bladder.
2. Prostate gland.
3. Incision in the prostate.
4. Urethra.
5. Bulb of the urethra.
6. Cavernous portion of the urethra.
7. Section of the corpus cavernosum.
8. Symphysis pubis.
10. Summit of external incision.

10′, 10′. Line of superficial incision.

11. Rectum.
12. Sacrum.
13. Posterior portion of peritoneum.
14. Ureter.
15. Vas deferens.
16. Viscera.
17. Cut edge of peritoneum.
18. Abdominal muscles.
19. Tendon of the rectus muscle.
20. Anterior wall of the bladder.

Fig. 2. Extraction of the stone.

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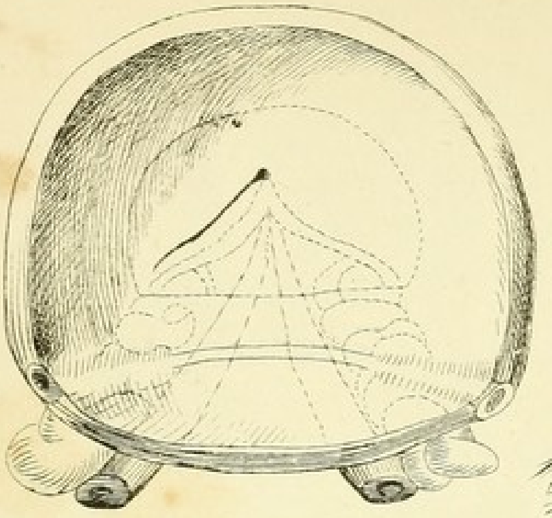

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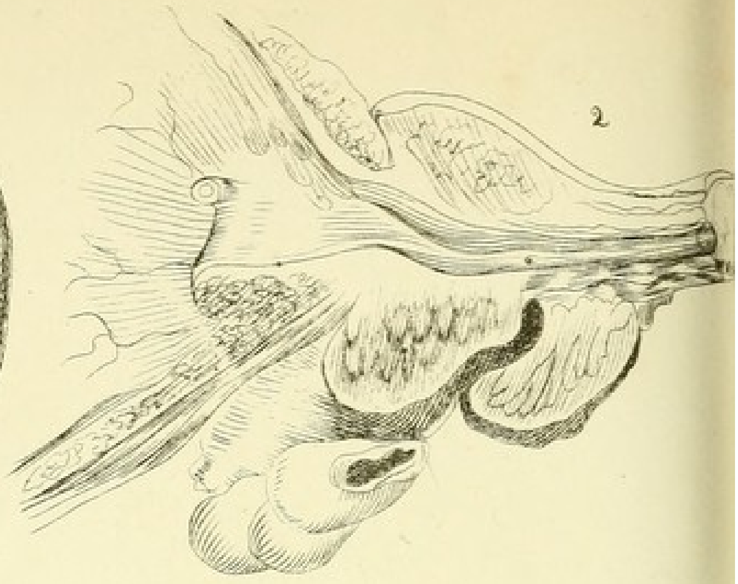

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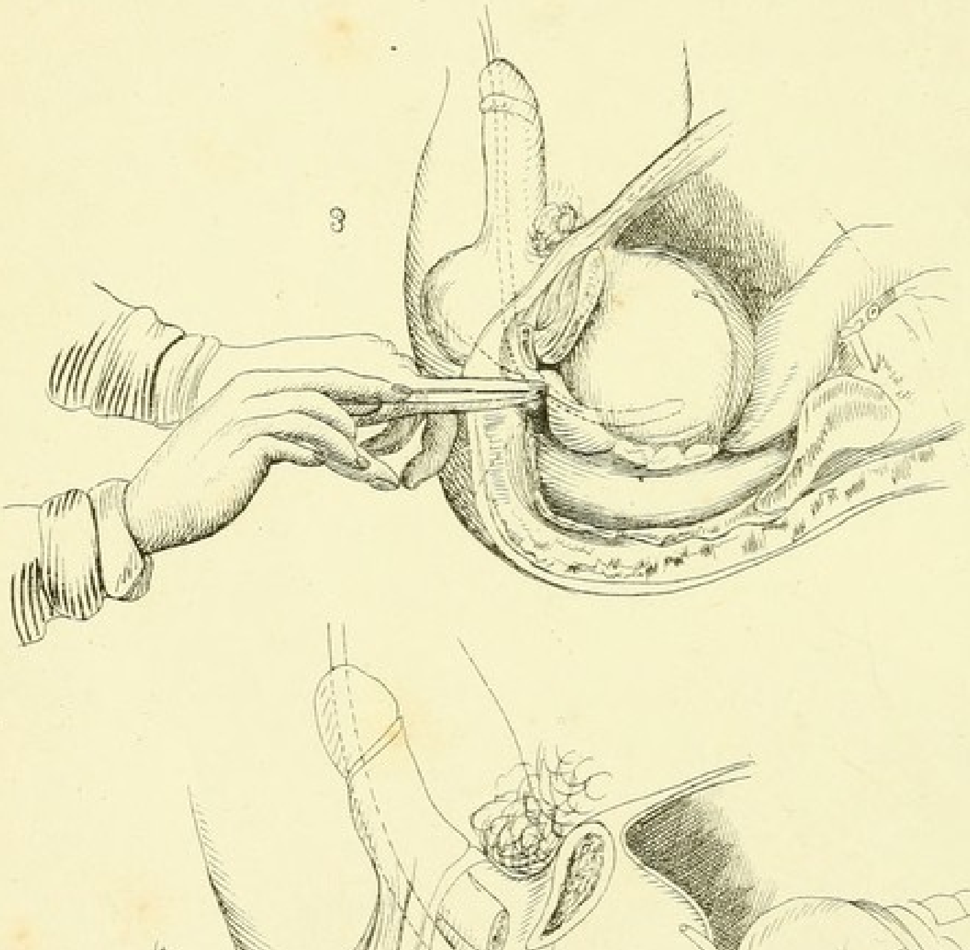

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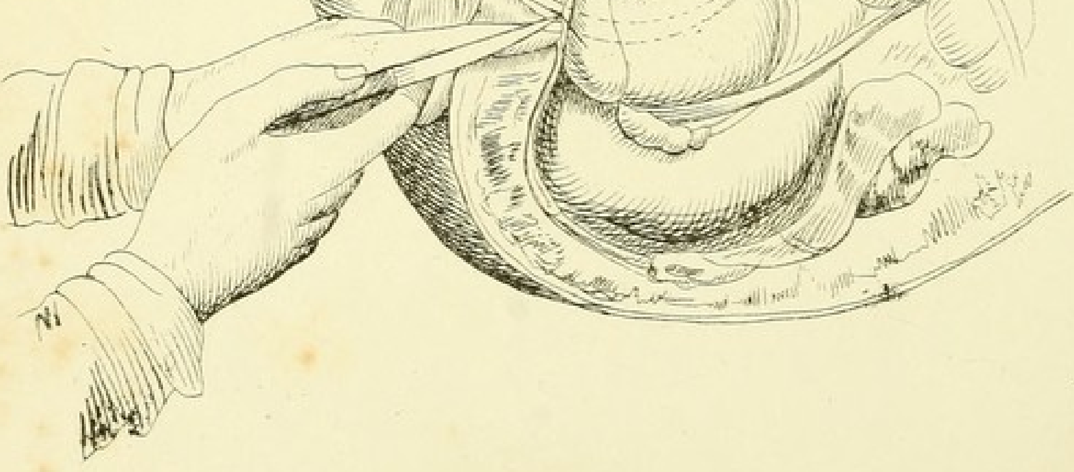

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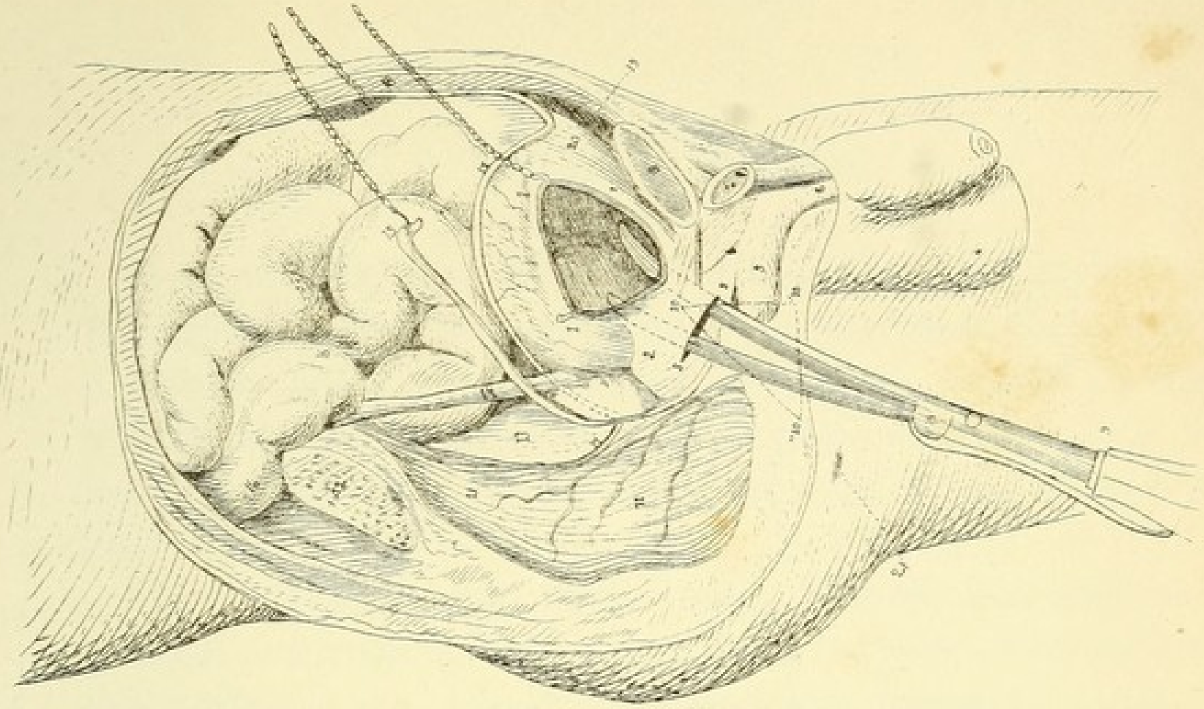

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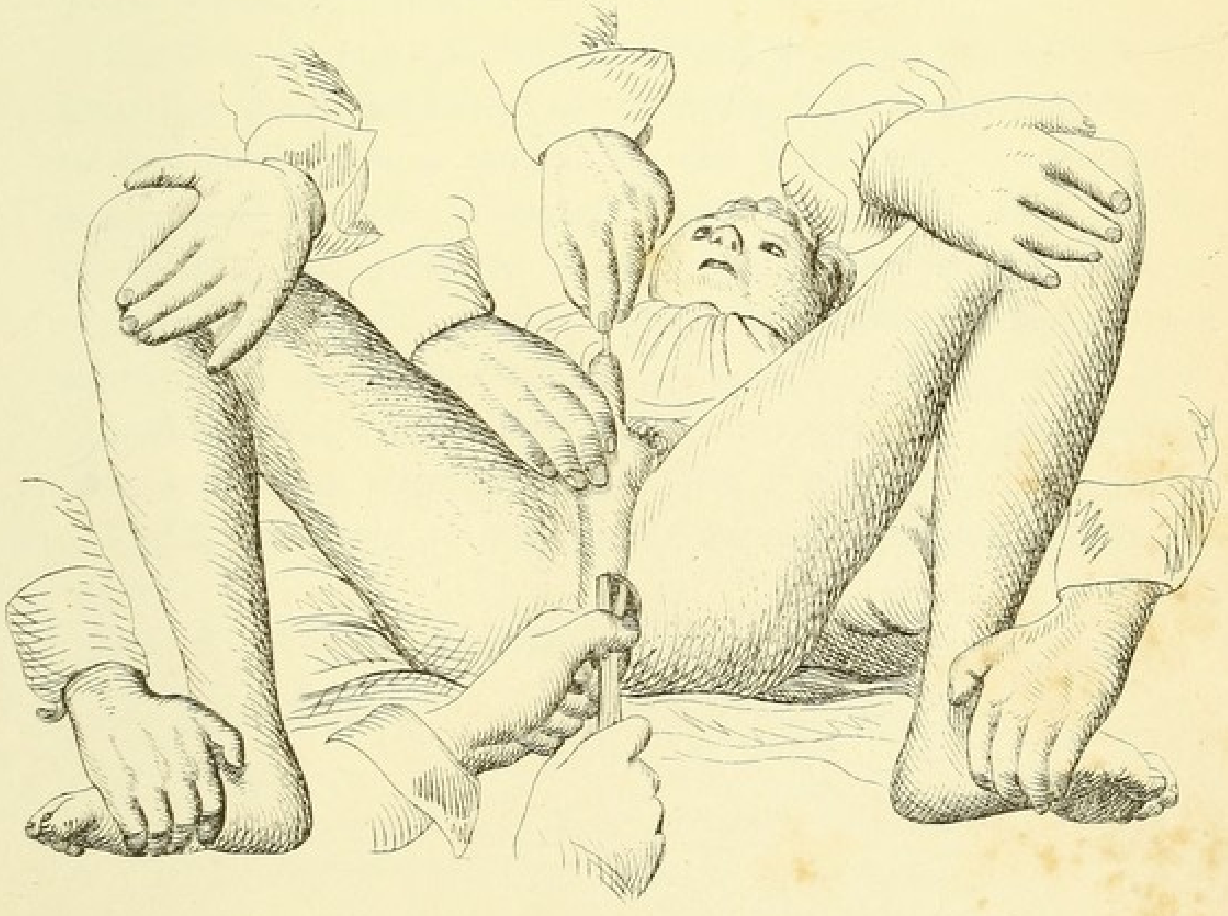


PLATE CXXXI.

FRACTURE OF THE SKULL. Fractures of the skull are divided, 1. Into those which consist of mere fracture, without displacement; 2. Into fractures, with extravasation of blood; 3. Into fractures with depression. Fracture of the base of the skull (Fig. 5) is the most dangerous kind; it is occasioned by a fall on the vertex of the head.

Fig. 1. Fracture, with displacement. Several small portions of bone are seen upon the dura mater. Such fractures are almost invariably followed, in a short time, with intense inflammatory action.

Figs. 2, 4. In some cases the external opening in the bone may be small, and the internal table may be extensively detached in splinters, as shown in the anterior fracture in these cases.

The posterior fracture in these figures Mr. Liston calls "camerated fracture."

Fig. 3 is from a case of Mr. Liston, in which the patient was insensible for a week after the accident, from which state he recovered by degrees, so that, at the end of a month, he was able to walk about; but a few weeks afterwards, he, for three days, lost the power of speech, which he recovered, on a profuse discharge of matter taking place from the wound. He afterwards had several attacks of insensibility, varying in duration. The piece of bone figured, together with several others, were removed. This patient, after some time, entirely recovered his health.

Fig. 5. Fracture of the base of the skull, from a fall on the vertex.

Fig. 6. Fracture, with displacement.

PLATE CXXXII.

Figs. 1, 2. Unreduced Dislocation. From Sir Astley Cooper. When a dislocated bone has been unreduced for some time, it forms for itself a new socket, and some degree of motion is gradually restored.

Fig. 4. Ununited fracture.

Fig. 5. Partial dislocation of the ankle joint. From a preparation at St. Thomas's Hospital.

Fig. 3. Dislocation of the knee. From a preparation in St. Thomas's Hospital. This dislocation was caused by ulceration; the tibia is turned directly forward, and anchylosed at a right angle with the femur.

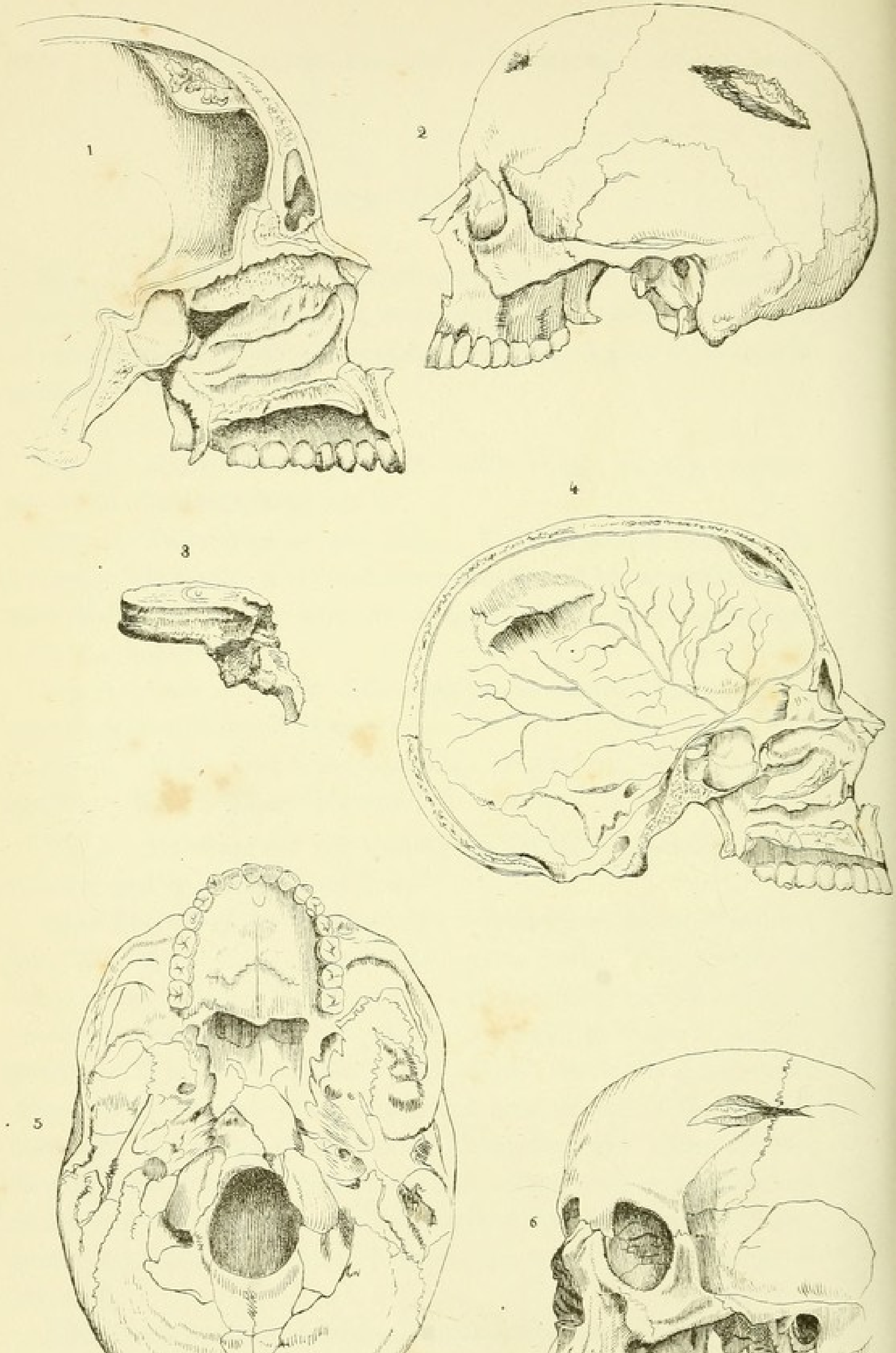
Fig. 6. Case of an old dislocation at the elbow. From a preparation at St. Thomas's Hospital.

Fig. 7. False joint, from non-union of fracture. From a preparation in King's College Museum.

Fig. 8. Reparation of Fracture. This is produced by the effusion and organization of lymph.

After fracture of most of the bones, a quantity of lymph is effused into the cellular tissue, around the broken part. This, in two or three weeks, becomes converted into a cartilaginous capsule, called a provisional callus, which completely surrounds the fracture, and adheres firmly to the bone above and below. In two or three weeks more, the provisional callus ossifies, and then the use of the bone is restored. But at this time, the ends of the fractured bones are not directly united, and if the provisional callus were removed, they would still be separable. In the course of five or six months, however, bony union takes place between the bones, and the callus is absorbed.

After fracture of the cranium, acromion, olecranon, patella, cervix femoris, or of any bone invested with synovial membrane, no provisional callus is formed.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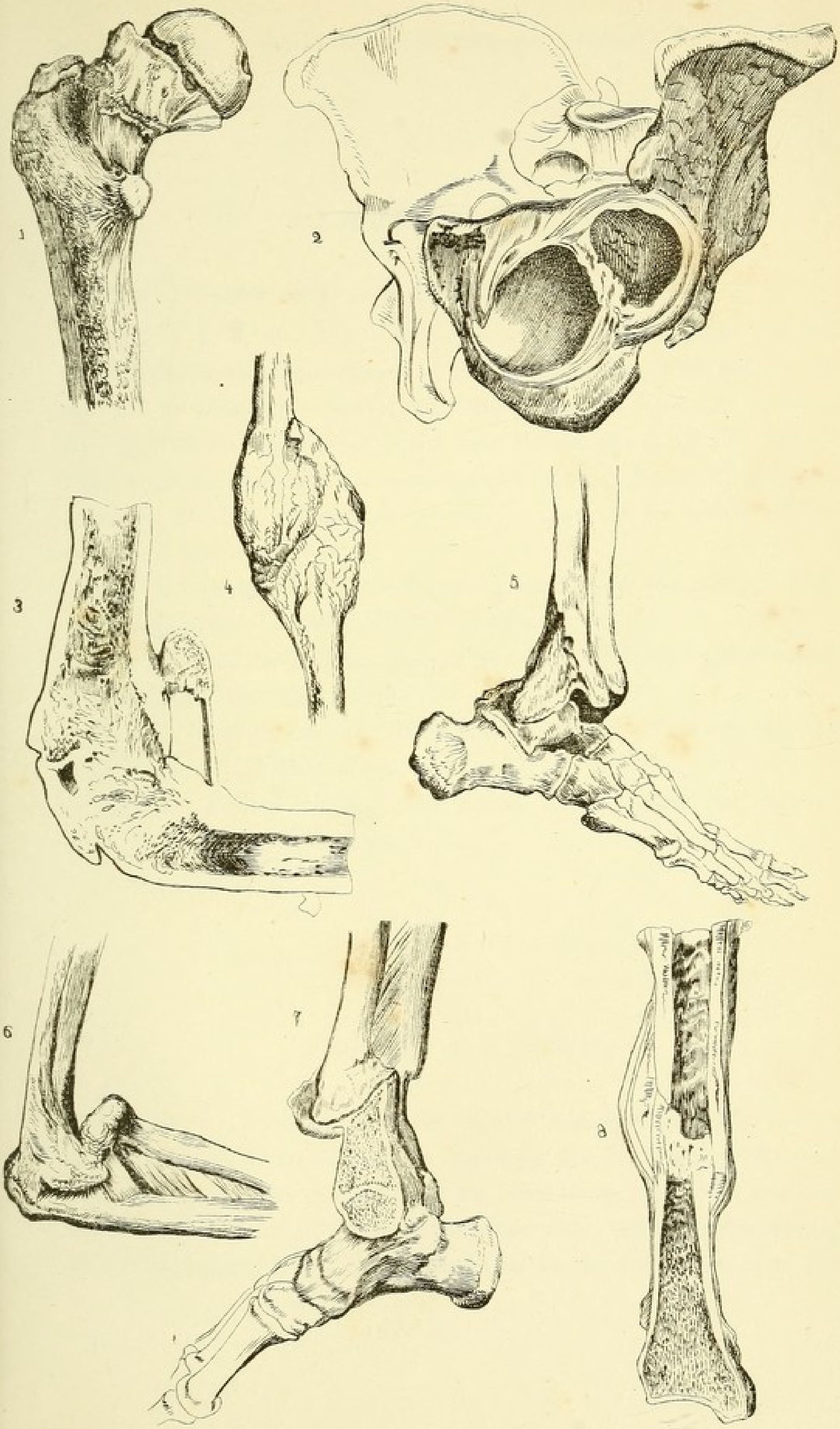
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PLATE CXXXIII.

Figs. 1, 2, show the form and ligaments of the hip joint.

Figs. 3, 4, 5, 6. Dislocations of the Hip Joint. There are four principal dislocations of the hip joint: 1. The dislocation upward, in which the head of the bone is thrown upon the dorsum ilii; 2. The dislocation backward into the sciatic notch; 3. Downward upon the obturator externus muscle; and, 4. Forward upon the os pubis; Besides these, there are two or three others which will be described hereafter.

Fig. 3. Dislocation upward and forward upon the pubes. This corresponds with Plate CXXXIV. Figs. 7, 8.

Fig. 4. Dislocation upon the dorsum ilii. This corresponds with Plate CXXXIV. Figs. 3, 4.

Fig. 5. Dislocation into the thyroid foramen. This corresponds with Plate CXXXIV. Figs. 5, 6.

Fig. 6. Dislocation into the sciatic notch. This corresponds with Plate CXXXIV. Figs. 1, 2.

PLATE CXXXIV.

Figs. 1, 2. Dislocation of the femur backward into the sciatic notch, or upon the pyriformis, is known by the following symptoms: The limb is shortened from half an inch to an inch; the toes rest upon the ball of the great toe of the other foot; the knee is advanced and turned inward, but not so much as in the dislocation upon the dorsum ilii; the trochanter is rather behind its natural position, and the head of the bone can scarcely be felt.

Figs. 3, 4. Dislocation of the femur upward upon the dorsum ilii is the most frequent form of dislocation of the hip.

SYMPTOMS. The limb is from an inch and a half to two inches and a half shorter than the other; the toes rest upon the opposite instep; the knee is turned inward, and is a little advanced upon the other; the limb can be slightly bent across the other, but cannot be moved outward; the trochanter is less prominent than the other, and nearer the spine of the ilium, and if the patient is thin, and there is no swelling, the head of the bone can be felt in its new situation.

DIAGNOSIS. Fracture of the cervix femoris may be distinguished from this dislocation by the circumstance that the limb can be freely moved in any direction, although with some pain; that it is turned outward instead of inward; and that it can be drawn to its proper length by moderate extension, but becomes shortened again as soon as the extension is discontinued; whereas in dislocation it requires a forcible extension to restore the limb to its proper length and shape; but when once the head of the bone is in its socket, it remains there.*

Figs. 5, 6. Dislocation downward into the thyroid foramen, or upon the obturator externus.

In this form of dislocation, the limb is lengthened one or two inches; it is drawn away from the other; the toes point downward and directly forward; and the body is bent forward, because the psoas muscle is on the stretch.

Figs. 7, 8. Dislocation upward and forward upon the pubes. In this dislocation, the limb is shortened about an inch; it is drawn away from the other, and the foot points directly outward; the head

* There are a few cases on record of fracture of the great trochanter, which was drawn upon the dorsum ilii into the position occupied by the head of the bone when dislocated. It is sufficient to notice the possibility of such cases, in order to put surgeons upon their guard.

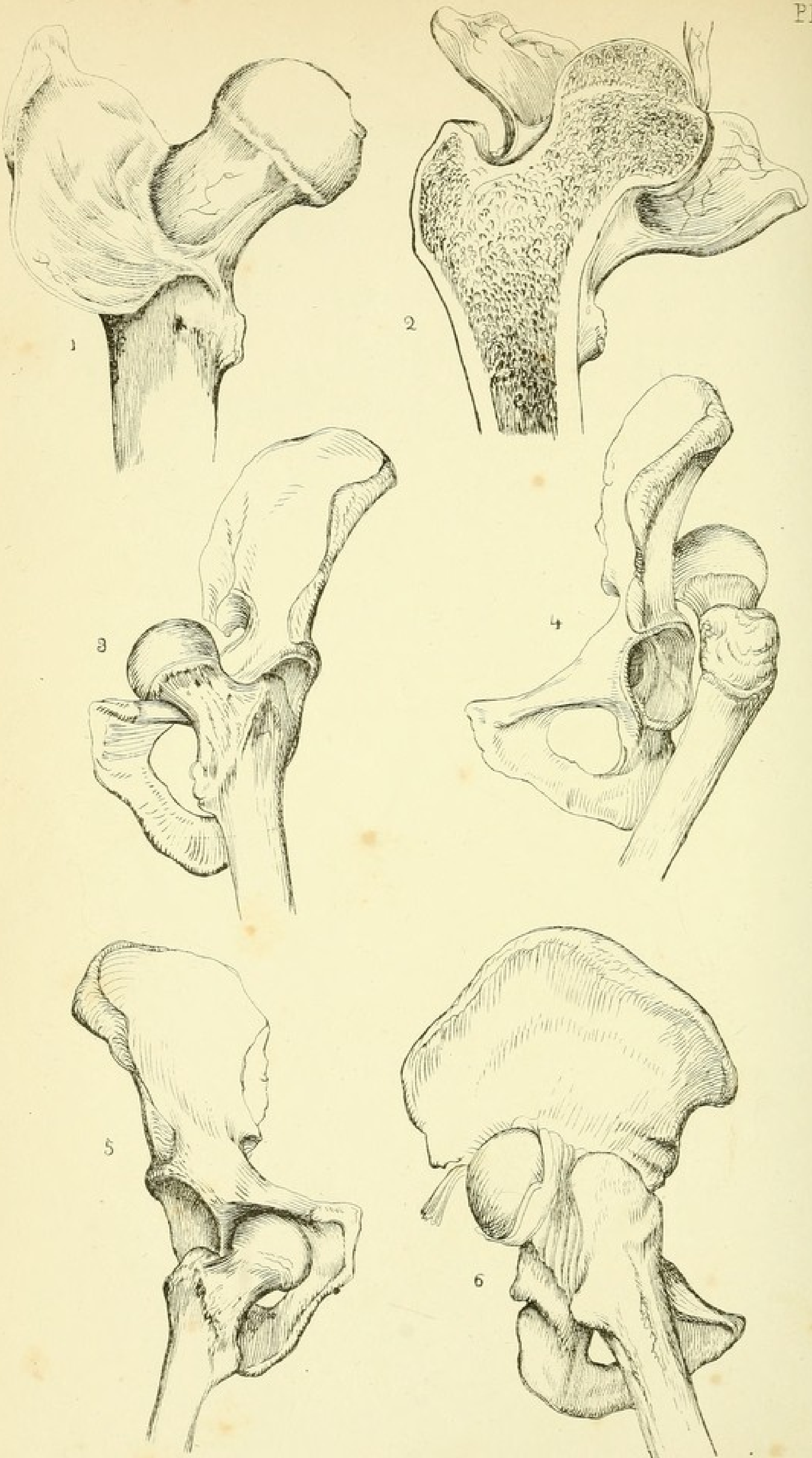
of the bone may be plainly felt below Poupart's ligament; and by this circumstance, this dislocation may be distinguished from fracture of the cervix femoris.

In Fig. 8, the foot of the figure is not turned sufficiently outward.

With respect to the relative frequency of the dislocations, Sir A. Cooper believed, that, out of twenty cases, twelve would be on the dorsum ilii, five into the ischiatic notch, two into the foramen ovale, one upon the pubes.

UNUSUAL DISLOCATIONS. Besides the above four varieties, a dislocation directly downward upon the tuberosity of the ischium, one directly backward upon the spine of the ischium, and one directly upward into the space between the anterior spinous processes of the ilium, have been known to occur, although very rarely.

Pl. 133.



Pl. 134.

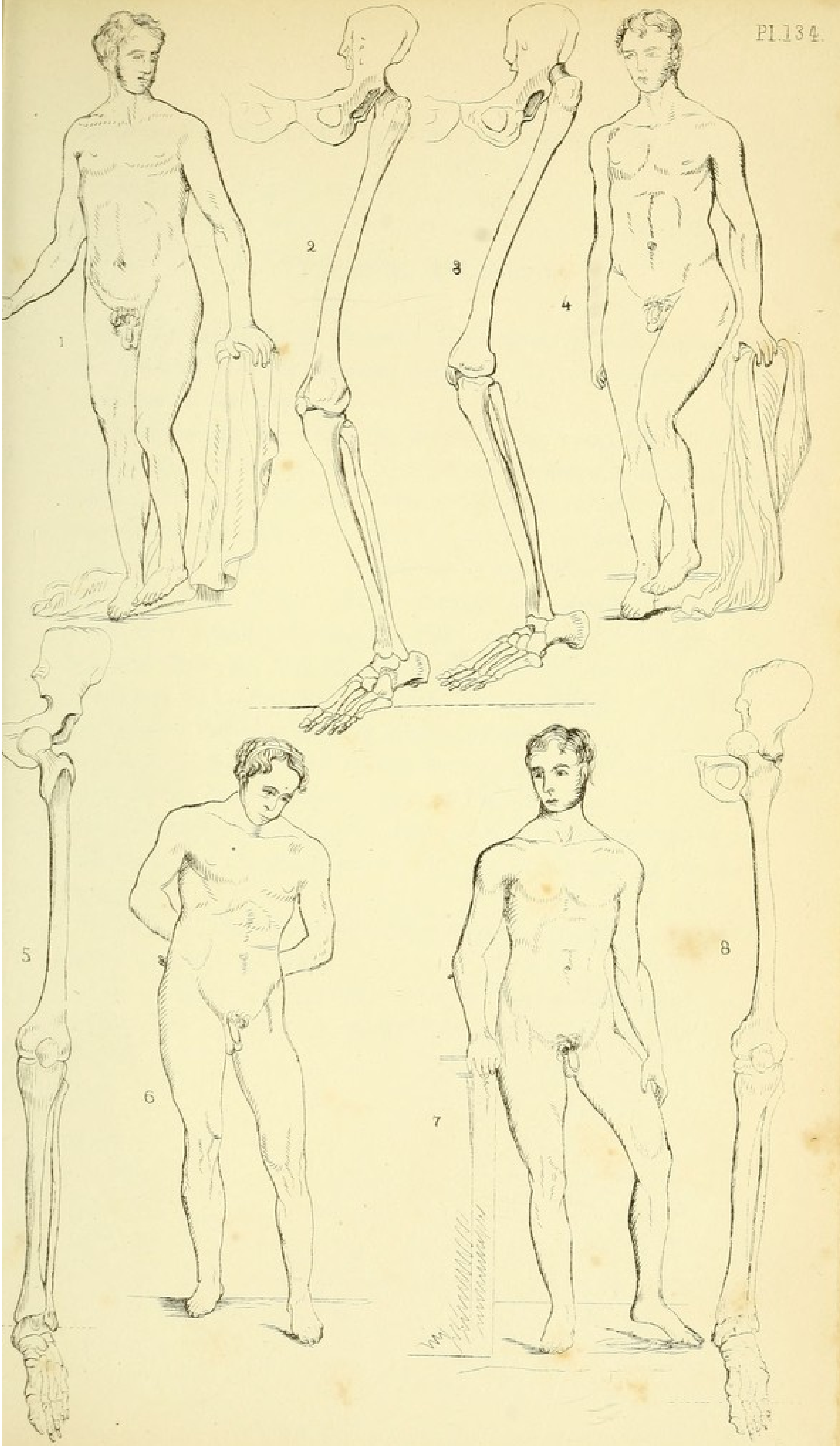


PLATE CXXXV.

Fig. 1. From Sir A. Cooper. Dislocation upward and forward, the head of the bone resting between the two anterior spinous processes of the ilium.

The following were the symptoms in this case: The limb was shortened three inches, and it could not be lengthened in any degree. The knee and toes were very much turned out, and the attempt to rotate the thigh inward produced severe pain, without effecting any change in the position of the limb. Abduction and adduction were almost equally difficult and painful, but flexion could, to a certain extent, be performed with less difficulty. The hip was flattened, and the trochanter major could not be felt. There was no hard or distinct tumor upon the pubes; but just below the anterior superior spinous process of the ilium, a very distinct, hard, round tumor could be felt, moving in unison with the thigh when flexion and extension were made. In this case, reduction was effected by extending the limb in a direction downward and backward, raising the head of the bone, and rotating the knee inward.

Figs. 2, 4. An old case of dislocation upon the pubes. From Sir Astley Cooper's collection.

Fig. 3. From a preparation in Guy's Hospital Museum.

Figs. 5, 6. Dislocation upward and forward. From Sir Astley Cooper.

PLATE CXXXVI.

Fig. 2. Fracture of the Neck of the Femur may occur either within the capsular ligament, or external to it. The fracture within the capsule is the more common, and is generally caused by indirect violence, that is, by a slight force acting on the lower extremity of the limb, as happens in slipping from the curb-stone; sometimes, however, it is produced by falls or blows upon the hip. It is very rare in persons under fifty, but very common in aged people, especially in aged women.

Symptoms. After a blow or fall, the patient finds himself unable to stand. He complains of great pain, which is increased by motion, and is principally seated at the upper and inner part of the thigh. The leg is from half an inch to two inches shorter than the other; the foot is turned outward; the heel rests in the space between the ankle and tendo Achillis of the other leg; crepitus may be detected, if the hand, or the stethoscope, be placed on the trochanter whilst the limb is drawn to its proper length and rotated; the trochanter generally projects less than on the other side, and the limb may usually be moved freely, although with great pain, especially if it is abducted. In some cases, shortening does not take place until some days after the accident; in some instances the limb is turned inward. This fracture does not unite by bone.

Treatment. The patient should be kept in bed a fortnight, or until pain and tenderness abate, with one pillow under the whole length of the limb, and another rolled up, and placed under the knee. He may then be allowed to sit in a high chair, and shortly begin to move with crutches; and in time, in many cases, a tolerable use of the limb is regained.

Fig. 3. Reduction of Dislocation upon the Dorsum Ilii. In the first place, it will probably be necessary to diminish the force

of the muscles by a moderate bleeding, by immersion in a hot bath of 100° to 110°, and by the exhibition of half a grain of tartar emetic every ten minutes, until the patient feels nauseated and powerless. Then he should be wrapped in a blanket, and placed on his back upon a table; a leathern girth, or strong towel, should be passed round the upper part of the thigh, so as to bear firmly against the perineum and crista ilii, as represented in the figure, and this should be attached to a ring or hook, securely fastened into the wall or floor. A roller should next be applied to the lower part of the thigh, and over it the strap belonging to the pulleys, which last are to be fixed to the wall, or to some other firm object.

The extension is to be made in such a direction as to draw the thigh across the opposite limb, a little above the knee. After a short time, the surgeon should gently rotate the limb, or lift the upper part of it, when the head of the bone will probably return to the acetabulum. The patient should then be carefully removed to bed, with his thighs tied together.

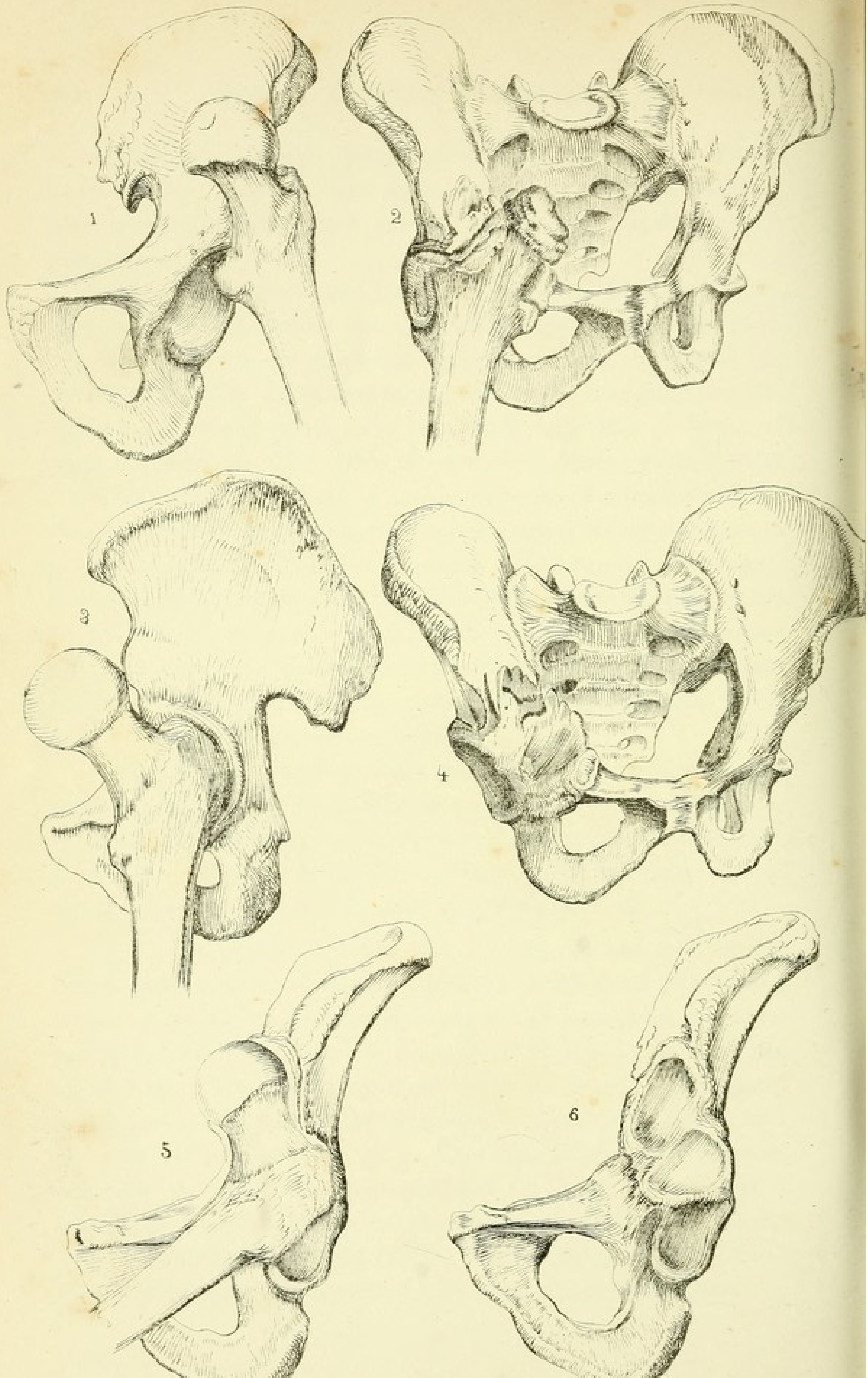
Fig. 1. Dislocation into the Foramen Ovale. The reduction of this dislocation is, in general, very easily effected. If the accident be of recent occurrence, the patient should be laid on his back, the thighs separated as widely as possible, and a girth placed between the pudendum and the upper part of the luxated thigh, to which is fixed the hook of the pulleys, which are to be attached to a staple, placed on the same side as the injured limb of the patient; while the counter-extending force for fixing the pelvis is composed of a girth, which is completely to surround both ilia, and one end of which is to be admitted through the noose formed by the girth attached to the dislocated limb. It then being attached to the opposite staple, the two girths, during the application of the extending power, are made to fix each other. The apparatus being now properly adjusted, the surgeon should direct that extension be gradually made with the pulleys, until the head of the femur can be felt moving from the foramen ovale. He is then to pass his hand behind the ankle of the sound limb, and grasp the ankle of the dislo-

cated limb, and draw it inward towards the middle line of the patient's body. He thus acts upon the femur with the powerful lever of the first order, and usually reduces the dislocation with ease.

Fig. 4. Reduction of Dislocation into the Ischiatic Notch. The reduction of this dislocation is, in general, extremely difficult, but it is to be effected in the same manner as directed for the reduction of a dislocation on the dorsum ilii, excepting that the direction of the extending force is to cross the middle of the sound thigh, instead of one third above the knee, and, moreover, the patient is placed on his side, instead of on his back; but the mode of fixing the pelvis, and the apparatus for extension, are precisely the same in both dislocations. While the extension is in progress, the head of the femur should be lifted out of the notch, and over the edge of the acetabulum, by means of a towel placed under the upper part of the thigh, and over the shoulders of an assistant, who, at the same time, resting both his hands upon the patient's pelvis, obtains great power over the dislocated head of the femur.

Another method, which has been successful, is the following: Extension is made with the pulleys in a right line with the body; at the same time, the trochanter major is pushed forward with the hand. In the case from which this description is taken, the bone returned into its socket in about two minutes with a violent snap.

Fig. 5. Dislocation upon the Pubes. In the reduction of this dislocation, the patient is to be placed on the sound side, upon a table. A girth is to be carried between the pudendum and inner part of the thigh, and fixed in a staple a little in front of the line of the body. The pulleys are fixed above the knee, as in the dislocation upward, and then the extension is made in a line behind the axis of the body, so as to draw the thigh bone backward. After the extension has been continued for some time, a towel is placed under the upper part of the thigh, and an assistant, pressing with one hand on the pelvis, lifts the head of the bone, by means of the towel, from the pubes and over the edge of the acetabulum.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Pl. 136.

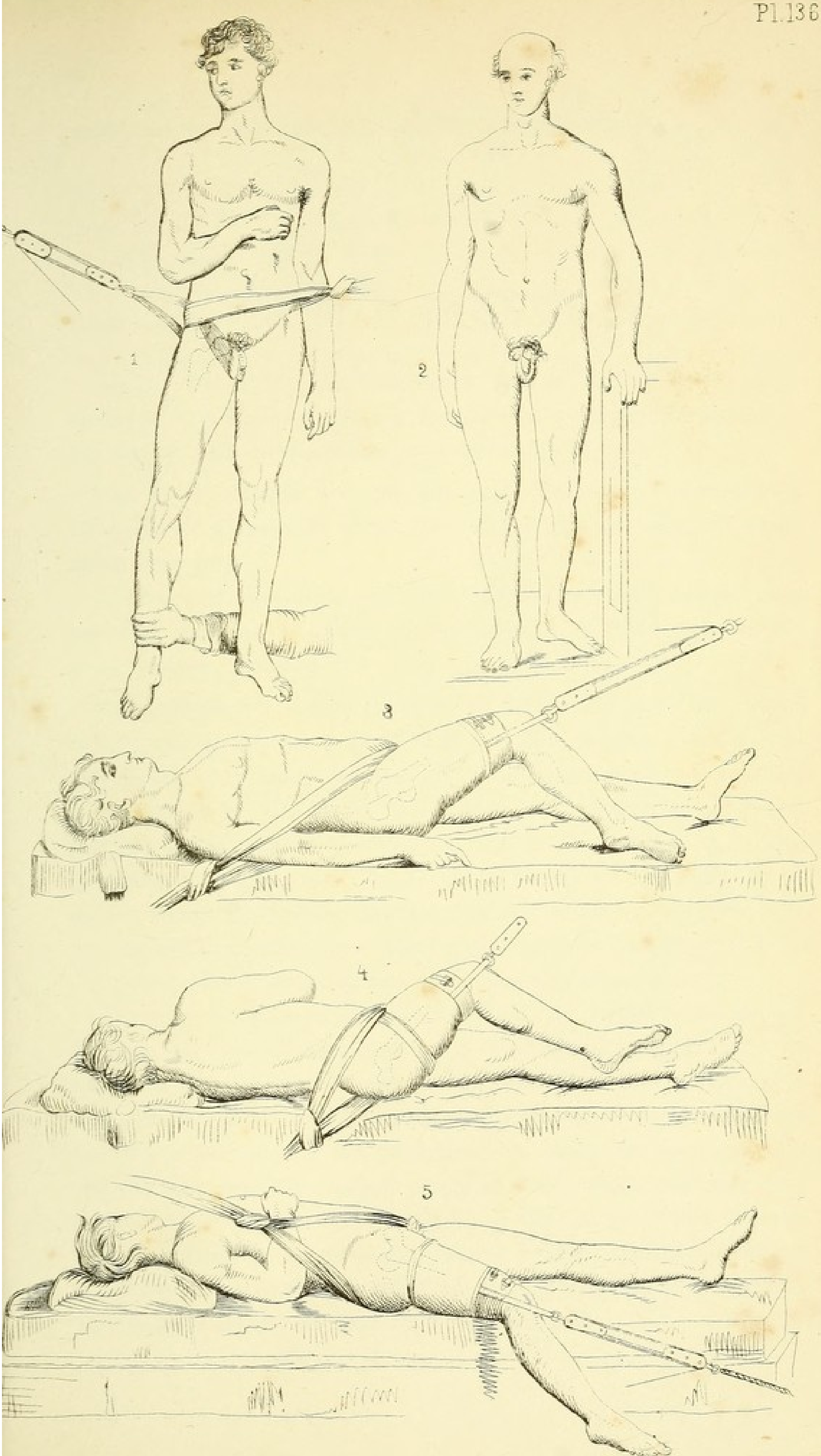


PLATE CXXXVII.

Fig. 1. Fracture of the Neck of the Thigh Bone. This specimen was obtained from a female who received the injury at the age of sixty-three, seven years previous to death.

Fig. 2. Fracture of the Pelvis. This case was caused by the pressing of the body of the patient between the wheel of a cart and a lamp post.

Fractures of the pelvis are often attended with some fatal complication, such as laceration of the bladder, or rectum, or of the great arteries, or veins.

Treatment. The only thing to be done is to place the patient at rest, and in as easy a position as possible; to keep a catheter in the bladder; to make incisions, if urine is extravasated into the perineum, as it will be, if the urethra is lacerated by fractured portions of the rami of the ischium and pubes; and to treat any symptoms that may arise. If it can be borne, a broad belt may be passed round the pelvis; and another under the nates, which may be attached to a pulley over the bed, so that the patient may raise the pelvis without exerting any of the muscles attached to it.

There are some cases of fracture of the os innominatum passing through the acetabulum, caused by falls on the hip, which might be mistaken for fracture of the cervix femoris. For instance, in some cases related by Mr. Earle, the foot was everted, and there was less prominence of the trochanter, but there was no shortening, and the limb could be turned freely outward, which motion is very painful after fracture of the neck of the femur. The surgeon will be guided in his diagnosis chiefly by the crepitus, heard on applying the stethoscope to the ilium, and by examination per anum. The patient should be kept on a fracture bed.

Fracture of the os coccygis, or of the lower extremity of the sacrum, may be caused by violent kicks or falls. The former may occur during parturition to women who bear children after the coccyx is united to the sacrum. The loose portions must be replaced by introducing the finger within the rectum, and the bowels must be kept relaxed, so that no disturbance may be occasioned by hard stools.

Fig. 3. Descent of the neck of the thigh bone, occasioned by interstitial absorption, in an aged person. " This figure," says Sir Astley Cooper, "shows the greatest descent of the neck of the thigh bone I ever saw."

Fig. 5. Gradual shortening of the lower extremity from interstitial absorption of the neck of the thigh bone often ensues upon contusion of the hip, in persons advanced in life. " Nor," says Mr. Liston, " are these pathological changes confined to the aged."

Fig. 4. Fracture within the capsular ligament, described in connection with Fig. 2, Plate CXXXVIII.

Fig. 6. Fractured cervix femoris partially united by bands of ligament. The neck of the bone is entirely atrophied, so that the head and shaft are brought into contact, and their surfaces are rendered smooth by friction. The capsular ligament is excessively thickened, and there is a projection, formed by the trochanter minor, on which the head of the bone rested.

PLATE CXXXVIII.

Figs. 1, 2, 3, 4, show the ordinary effect of removing a portion of the radius from the dog.

Fig. 2. In this figure, the ulna had also been fractured, and a portion of the callus projected into the space between the extremities of the radius.

Fig. 5. This figure shows an altered state of the neck of the thigh bone from disease, that might be mistaken for united fracture.

Fig. 6. This figure shows a section of the head and neck of the thigh bone, the neck in a great measure absorbed.

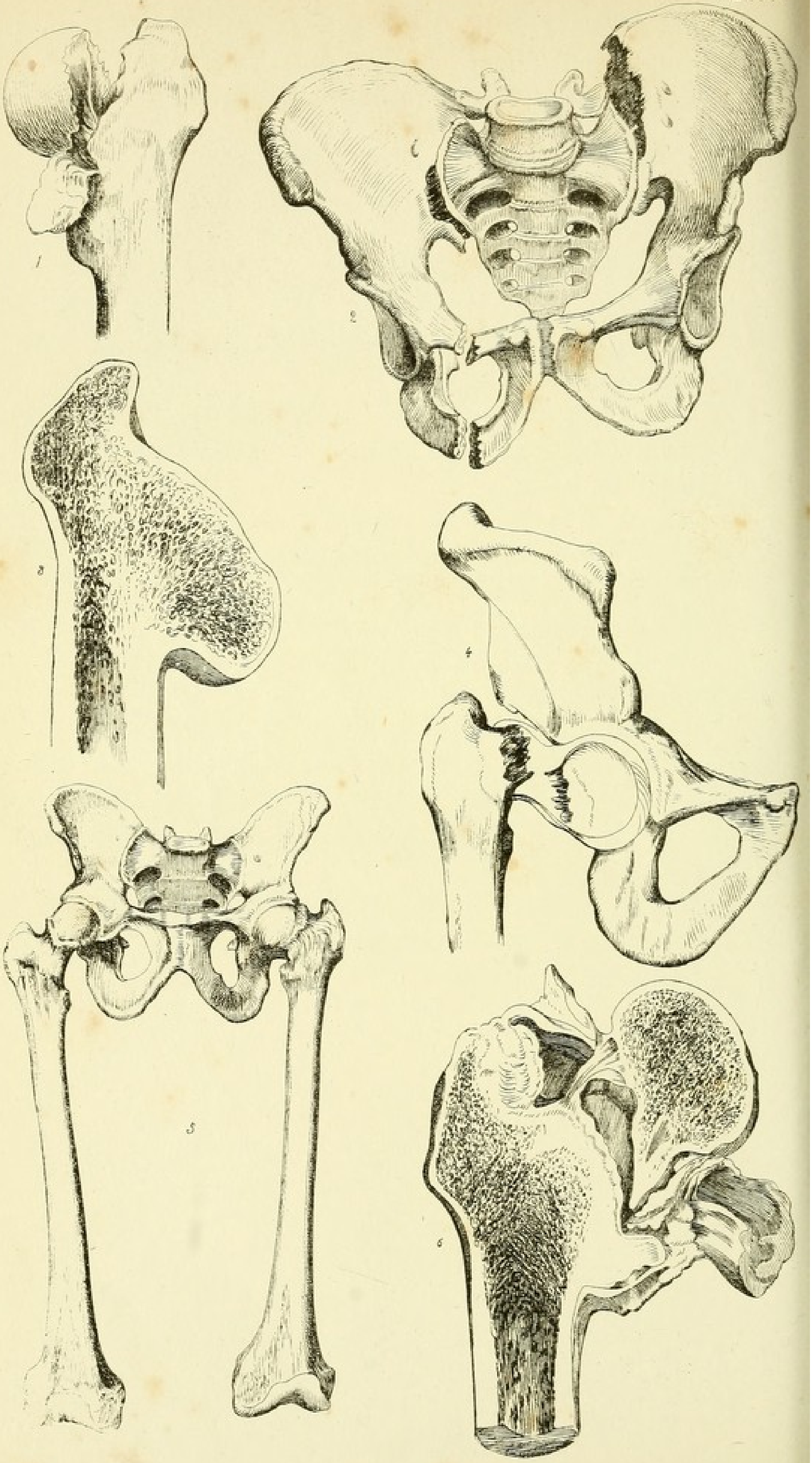
Figs. 7, 8. Fracture of the radius and ulna, with ligamentous union of the latter.

Fig. 9. Case of compound fracture of the tibia. The protruded end having been sawed off, the two extremities were prevented from coming in contact by the fibula; union by bone did not take place.

Fig. 10. Descent of the neck of the thigh bone from interstitial absorption.

Fig. 11. End of the os calcis of a rabbit, sawed off and suffered to be drawn up by the action of the gastrocnemius muscle; union by ligament.

PL.137.



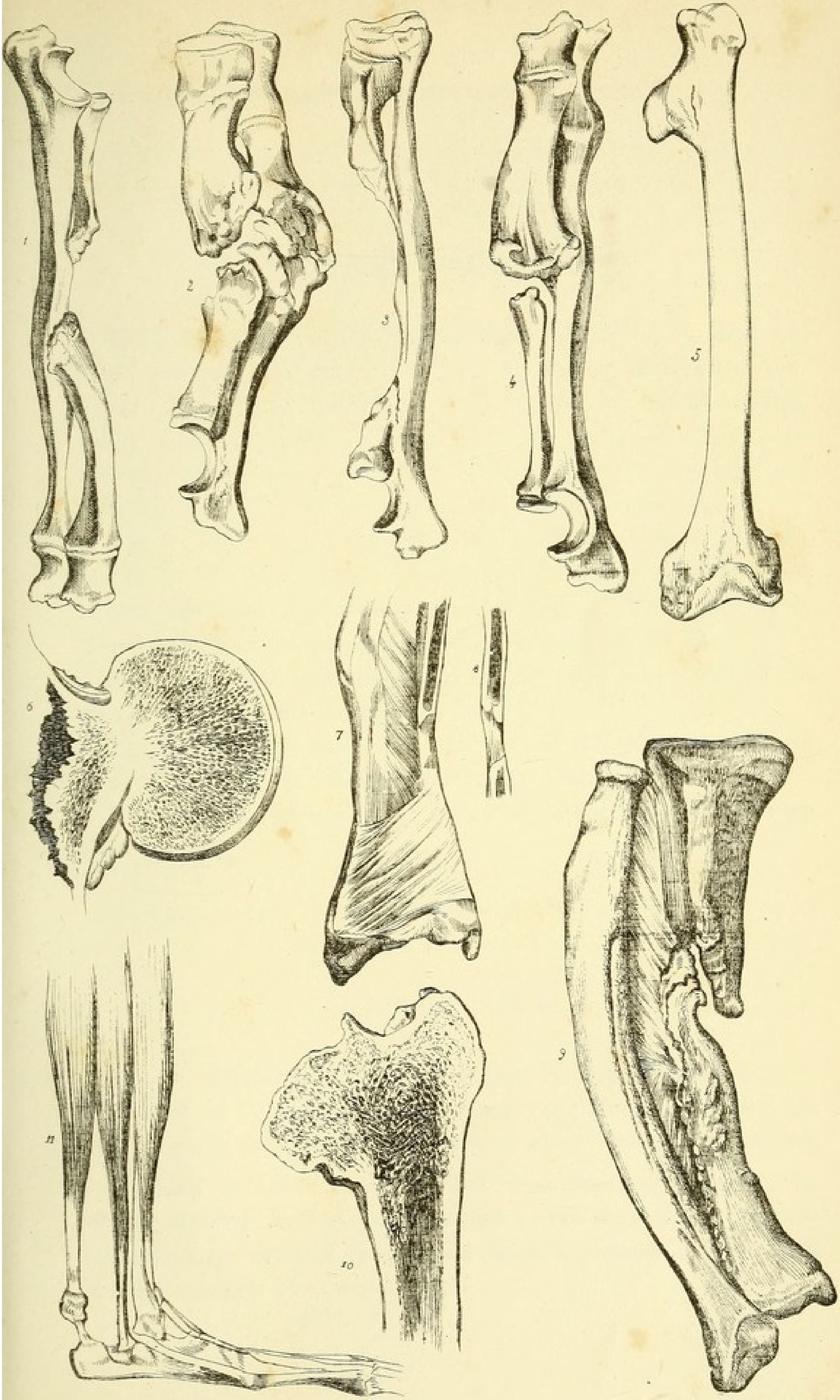

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PLATE CXXXIX.

Fig. 1 shows some of the changes which take place in the bones of old persons. The cancellated tissue degenerates into a coarse net-work. The shell of the bone becomes thin, and, as this takes place, ossific matter is deposited on the upper side of the cervix, opposite the edge of the acetabulum, and often at its lower part also, and thus the strength of the bone is, in some degree, preserved.

Fig. 2. This figure represents a fractured cervix femoris, removed by Mr. Mayo from a patient between thirty and forty years of age, who lived nine months after the injury. The projection of the trochanter minor prevented much shortening of the limb.

Figs. 3, 4. Changes, simulating fracture, and bony union of the cervix femoris within the capsule.

Fig. 5. Changes incident to the neck of the thigh bone in old age, which might be mistaken for united fracture.

Fig. 6. Changes caused by interstitial absorption; from a very aged patient.

PLATE CXL.

Fig. 1. Experiments on Animals. By Sir Astley Cooper. The neck of the thigh bone of a dog was broken, November 18, 1818, and the animal was killed on the 14th of December following.

Dissection. The trochanter was much drawn up by the action of the muscles, so that the head and cervix femoris were not in apposition, the capsular ligament was much thickened, and contained a large quantity of synovia.

The joint was lined with adhesive matter of a ligamentous appearance, adhering to the head of the bone, which did not seem to be changed by any ossific process, but the thigh bone around the capsular ligament, the trochanter major, and a little below it, were enlarged.

Fig. 2. The head, neck, and a portion of the trochanter major of the thigh bone of a dog, divided longitudinally, by placing a knife on the trochanter major, and striking it down towards the acetabulum through the head of the bone. The animal was killed twenty-nine days after, and the following appearances presented themselves:—

A portion of the trochanter major had been broken off, and was united by cartilage only. The head and neck of the bone, which had been longitudinally broken, were united; the neck, by a larger quantity of ossific deposit than that which joined the separated portions of the head of the bone, and so irregularly, as to make a beautiful preparation, and show the circumstances most clearly. This bone is in the collection at St. Thomas's Hospital.

Fig. 3. The neck of the thigh bone of a rabbit was fractured October 28th, 1818; and December 1st, as the wound had been some time healed, the animal was dissected.

Appearance on Dissection. The capsular ligament was much thickened. The head of the bone was disunited from its neck, but adhered by a new ligamentous substance to the capsular ligament. The broken cervix, which was very much shortened, played upon the head of the bone, and had smoothed it by the attrition. The head of the thigh bone did not show any ossific change.

Fig. 4. This figure exhibits one fracture internal to the capsular ligament, and another external to it; the latter firmly united by bone, the former not united.

Fig. 5. In this preparation, the neck of the thigh bone had been broken at its junction with the shaft of the bone, and had been forced into the cancellated structure between the trochanter major and trochanter minor, where it united with the cancelli. But the most curious circumstance in this dissection was, that, in order to

give the support which the body required, an addition had been made both to the trochanter major and the trochanter minor, by which they rested against the edge of the acetabulum, and in every slight change of position gave an opportunity for the weight of the body to be supported by those processes resting on the os innominatum.

Fig. 6. Fracture of the neck of the thigh bone, and of the trochanter major and trochanter minor.

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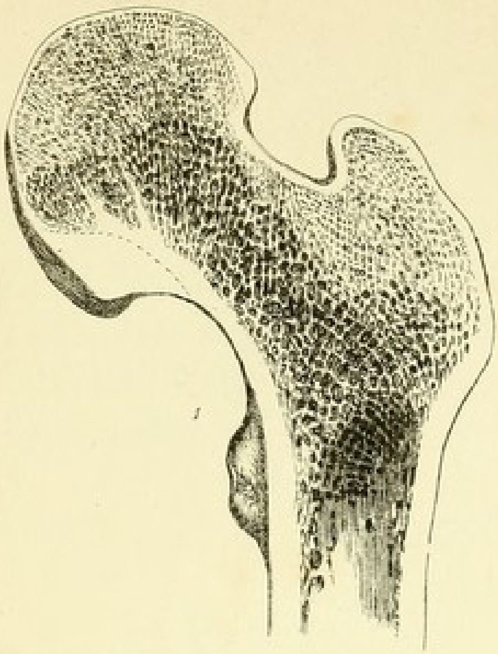
Fig. 6. Fracture of the neck of the thigh bone, and of the trochanter major and trochanter minor.



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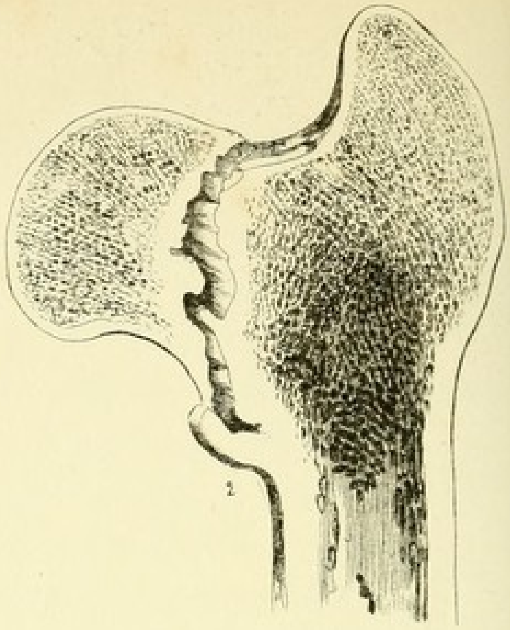

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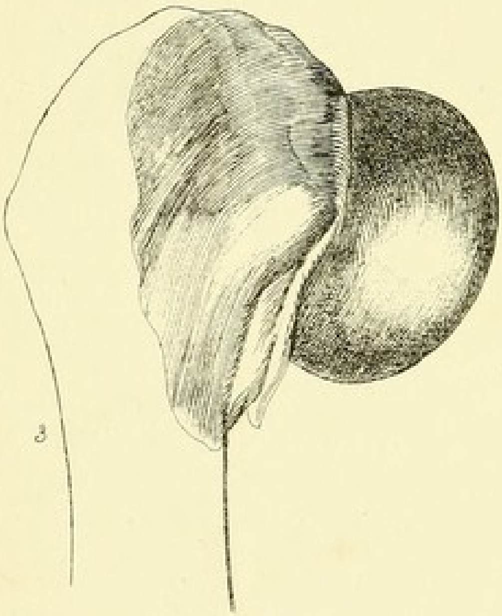

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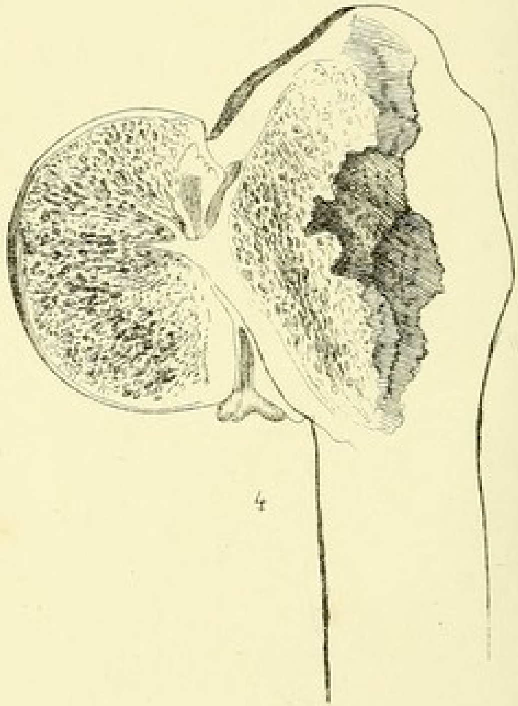

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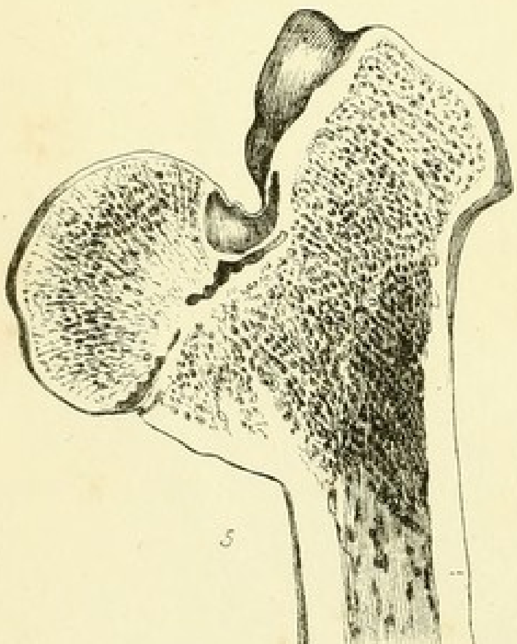

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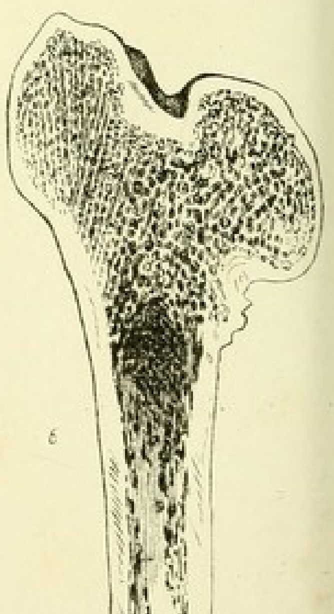

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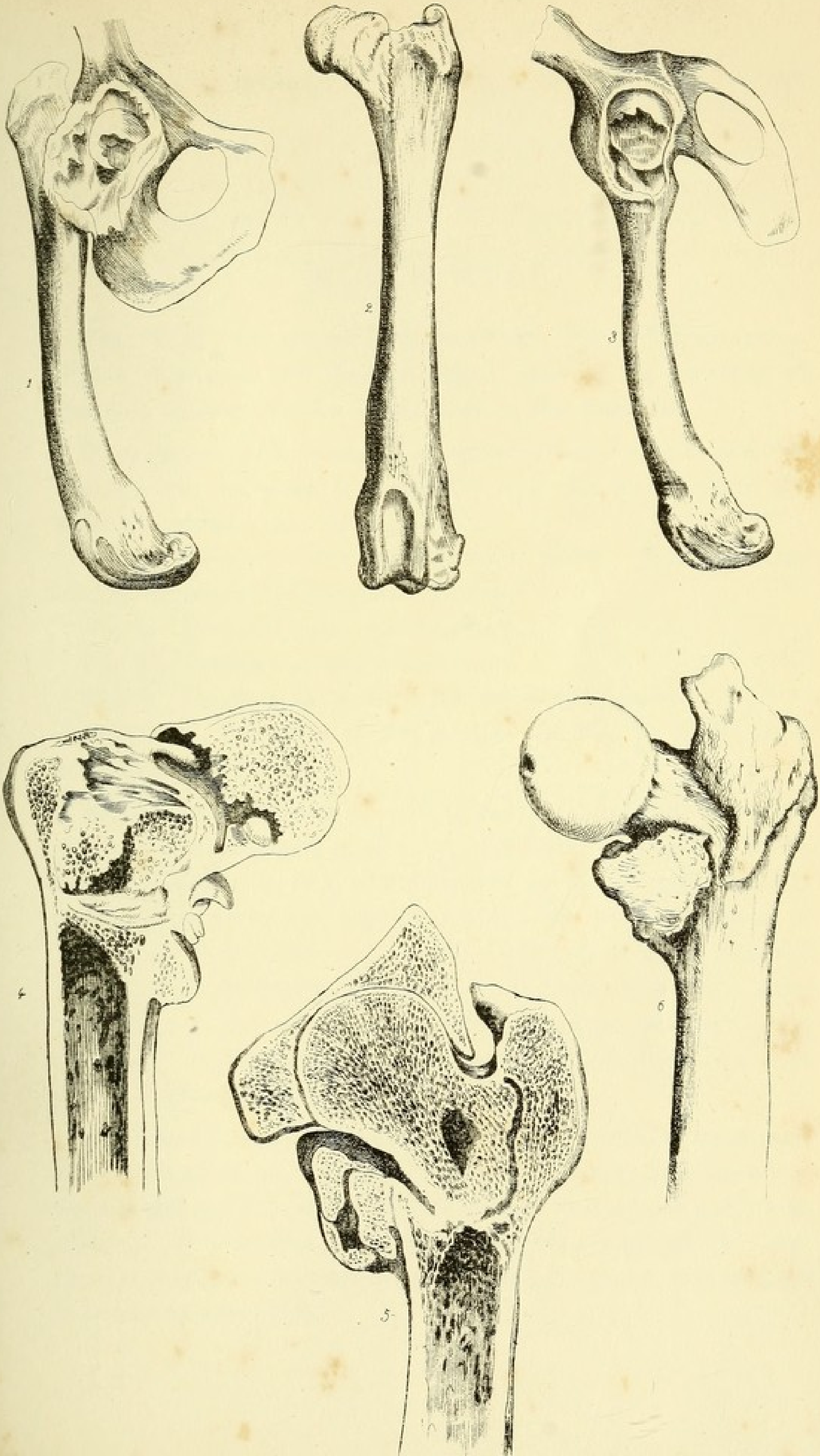


PLATE CXLI.

Figs. 1, 2. Fracture through the Great Trochanter. Fig. 1 represents this fracture united, showing the necessity of guarding against eversion of the limb in the treatment.

Treatment. The treatment of these various fractures and dislocations will be given in connection with the plates where the different processes are shown.

Fig. 4. Fracture below the trochanter minor. From the Anatomical Museum, St. Thomas's Hospital.

Fig. 3. Fracture below the trochanters.

Fig. 5. Fracture at the middle third.

Fig. 6. Fracture external to the capsular ligament.

Figs. 7, 8. Fractures of the patella. In Fig. 7, ossific union had taken place.

Fracture external to the Capsular Ligament resembles that within the ligament in many general features, but differs in the following points: 1. It is always caused by direct violence; 2. It may occur to persons of any age, whereas the fracture internal to the capsule very rarely happens before fifty; 3. It is not attended with so much shortening and eversion; 4. Crepitus is much more easily felt; 5. It is attended with great fever, pain, ecchymosis, and swelling. As a general rule, the reverse is true with regard to fractures internal to the capsule.

Fracture of the Femur just below the Trochanters (Fig. 3) is liable to be followed by great deformity and non-union, because the upper fragment is tilted forward by the psoas and iliacus muscles. Displacement and crepitus are the symptoms. In fractures of the shaft the symptoms are similar, though the displacement is frequently very slight.

The symptoms of fracture of the patella are inability to straighten the knee, and separation of the fractured parts, (the usual appearance is seen in Plate CXLII. Fig. 9,) which can be readily felt, and which is increased by bending the knee.

PLATE CXLII.

Fig. 1. SIR ASTLEY COOPER'S EXPERIMENTS ON THE PATELLÆ OF RABBITS AND DOGS. Appearance of the patella of a rabbit, forty-eight hours after it was divided with a knife. The space between the two parts is filled with coagulated blood. In these cases, the external wound was made so as not to be opposite the division in the bone.

Fig. 2. The same experiment repeated. Knee examined the fifteenth day; space filled with adhesive matter, which has a smooth and somewhat ligamentous character.

Fig. 3. The same experiment repeated. Examination in five weeks; the new ligament complete.

Fig. 4 shows the great distance the fragments of a fractured patella are liable to be separated if the case is left without proper treatment.

Fig. 5. Longitudinal division of the patella, showing the usual result in all these cases, that is, ligamentous union.

Figs. 6, 7. Longitudinal division of the patella of a dog; the division did not extend into the ligament above, or below. In this case, union took place partly by bone, partly by ligament.

Fig. 8. In 1822, a body was dissected at St. Thomas's Hospital, in which both the patellæ had been broken longitudinally, and although they were in contact, they were both united by ligament.

Fig. 8 is a drawing from one of these bones.

Fig. 9. External appearance of the limb in transverse fracture of the patella.

Figs. 10, 12. Dislocation of the Tibia forward. Symptoms. When the patient is recumbent, the tibia is seen elevated; the thigh bone is depressed, and is thrown somewhat to the side, as well as backward; there is absence of pulsation in the anterior tibial artery of the foot. The limb, in this case, is reduced by extending the thigh from above the knee, and by drawing the leg from the thigh, and inclining the tibia a little downward.

Fig. 11. Dislocation of the Tibia backward. Symptoms. The limb is shortened; there is projection of the condyles of the os femoris, and depression of the ligament of the patella, and the leg is bent forward.

In this case, from Sir Astley Cooper, the reduction was effected as follows: Two men made extension upward, one from the groin and the other from the axilla, while two others extended the leg from a little above the ankle in the opposite direction; and the force was gradually increased till the bone was reduced.

Fig. 13. Dislocation of the patella inward.

Fig. 14. Dislocation of the Patella outward. Both of these dislocations may be recognized by the projection of the bone, and a want of ability to bend the knee.

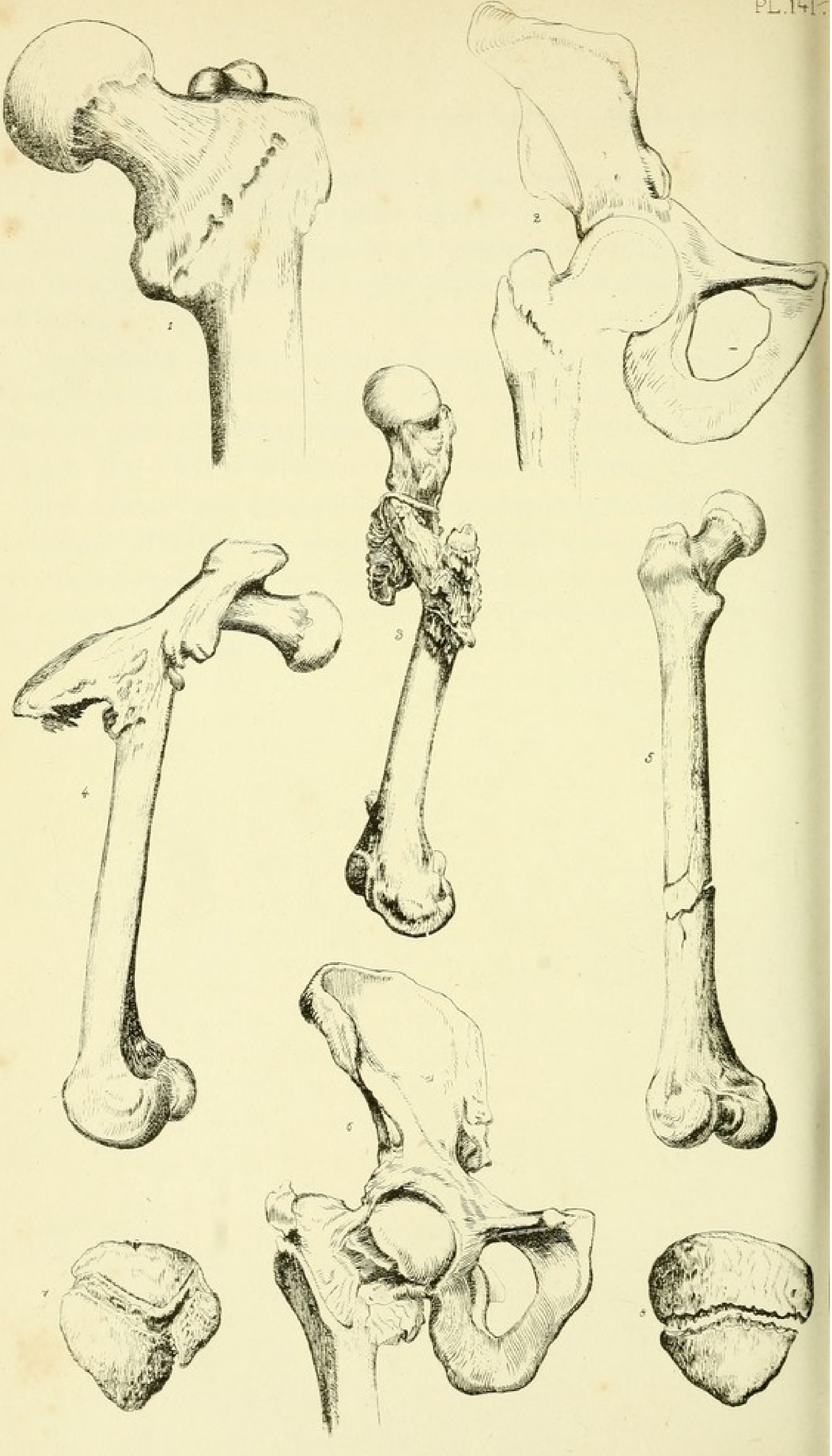
Treatment. The patient is placed in the recumbent posture, and an assistant raises the leg by lifting it at the heel; the surgeon then presses down that edge of the patella which is most remote from the joint, be it one luxation or the other; and this pressure raises the inner edge of the bone over the condyle of the os femoris, and it is immediately drawn by the action of the muscles into its natural situation.

In some cases, the reduction of this dislocation is very difficult. In a case of this character, the following course succeeded: The patient, a soldier, was laid upon his left side, and his right ankle was grasped by a comrade, who, when ordered by the surgeon, suddenly carried the heel back to the hip. The motion was scarcely completed, when the patella audibly returned to its socket.

Dislocation of the patella upon its edge has been reduced by pressing the edges of the bone in opposite directions while the leg was extended.

Dislocation of the Patella upward. The bone is drawn upward, and is easily moved from side to side; and the patient loses the power of bearing upon the limb. In a case from Liston, the bone was drawn three inches from its natural situation.

Treatment. The treatment which was adopted in this case was as follows: The limb was placed on an inclined plane, a bandage was lightly applied, so as to retain a pasteboard splint on the popliteal aspect of the bone. The parts, by this means, were brought into their natural situation.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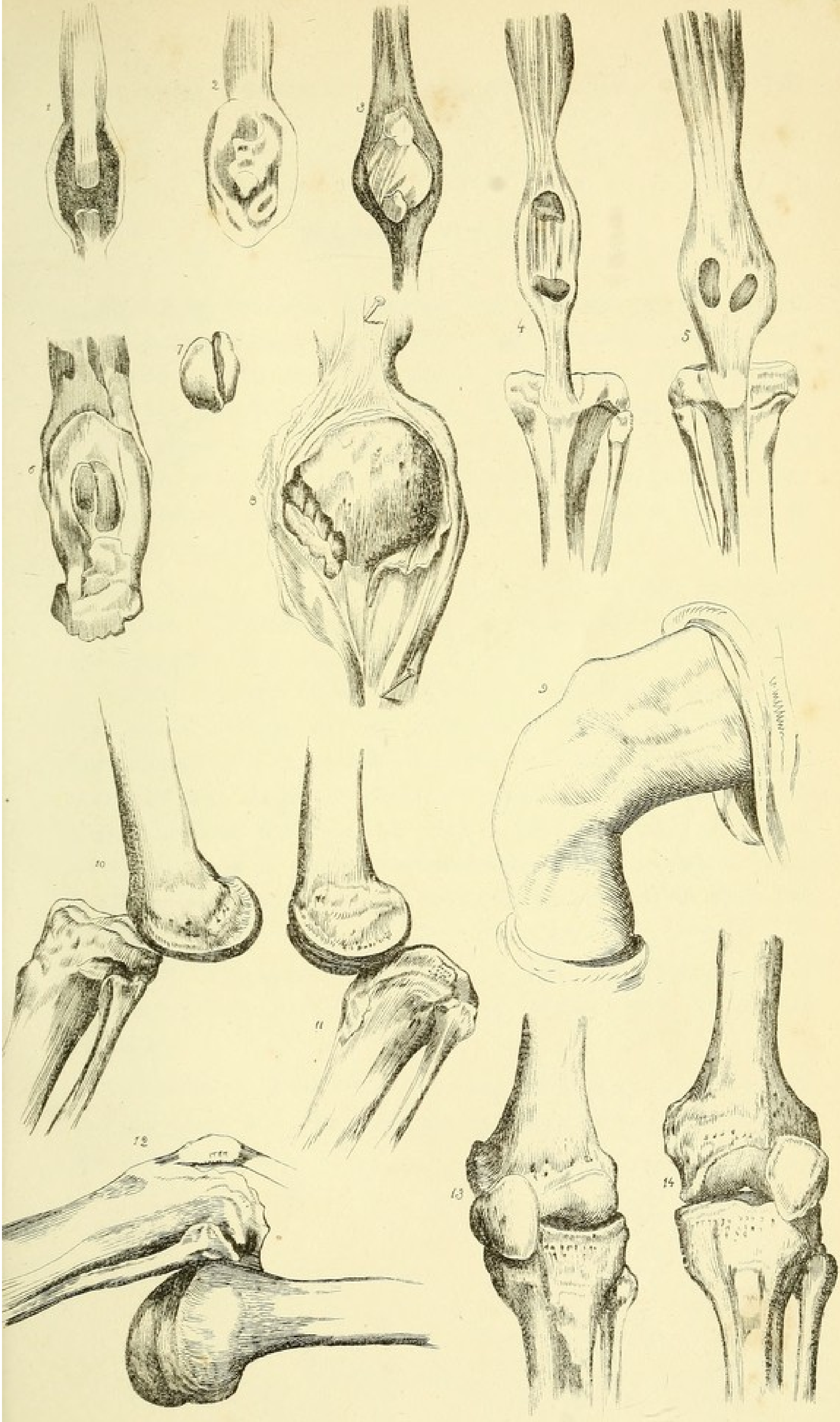

PLATE CXLIII.

Figs. 2, 3. Partial Lateral Dislocation of the Knee. In these cases it may be necessary to make extension and counter-extension, as in the other dislocations of this joint. There is, generally, but little difficulty in reducing these dislocations.

The utmost care must be bestowed in all cases of injury of the knee joint to avert inflammation. In spite of all our care, however, this sometimes supervenes, and results in the loss of the limb, or death of the patient.

Figs. 1, 4, 6, 8, 9. Various Fractures of the Bones of the Leg. The treatment of these cases is given in connection with the description of Plates CLVII., CLVIII.

Fig. 3. Fracture of the condyle into the knee joint mostly happens to old persons, and not unfrequently proves fatal. If much comminuted, or if compound, amputation will be necessary. Otherwise, the limb should be placed straight, so that the head of the tibia may keep the fractured parts in place; lotions and leeches should be used to prevent inflammation, and afterwards a pasteboard splint. Passive motion should be commenced in about five weeks.

Fig. 7. Oblique Fracture of the Os Femoris, just above its Condyles. This injury is very liable to produce deformity.

Treatment. Firm extension must be kept up by the double inclined plane and splints, and the knee must be well bent to relax the gastrocnemius.

PLATE CXLIV.

Fig. 1. Dislocation of the Tibia outward. This dislocation is attended with fracture of the internal malleolus, and may be known by the sole of the foot being turned upward.

Figs. 3, 5, 6, 7. Dislocation of the Tibia inward. This is the most common dislocation of the ankle. It is attended with fracture of the lower third of the fibula, and may be easily known by the sole of the foot being turned outward, its inner edge turned downward, and great projection of the internal malleolus.

Fig. 4. Displacement of the Tibia backward. This is an exceedingly rare dislocation.

Fig. 2. Partial Dislocation of the Tibia forward. In this case, the fibula is broken; the foot appears shortened, and is pointed downward. It is immovable, and the heel cannot be brought to the ground.

In the entire dislocation forward, the symptoms are similar to the preceding, with the exception, that the heel is more lengthened.

Treatment. The treatment in all these cases is similar. The patient must be laid on the affected side, and the knee be bent, and firmly held by an assistant. The surgeon must then grasp the instep with one hand, and the heel with the other, and make extension,—aided by pressure on the head of the tibia,—till he has restored the natural shape and mobility of the parts. Then the limb must be put up with a splint on each side, in the same manner as a fracture of the lower part of the leg, taking care to keep the great toe in its proper line with the patella.

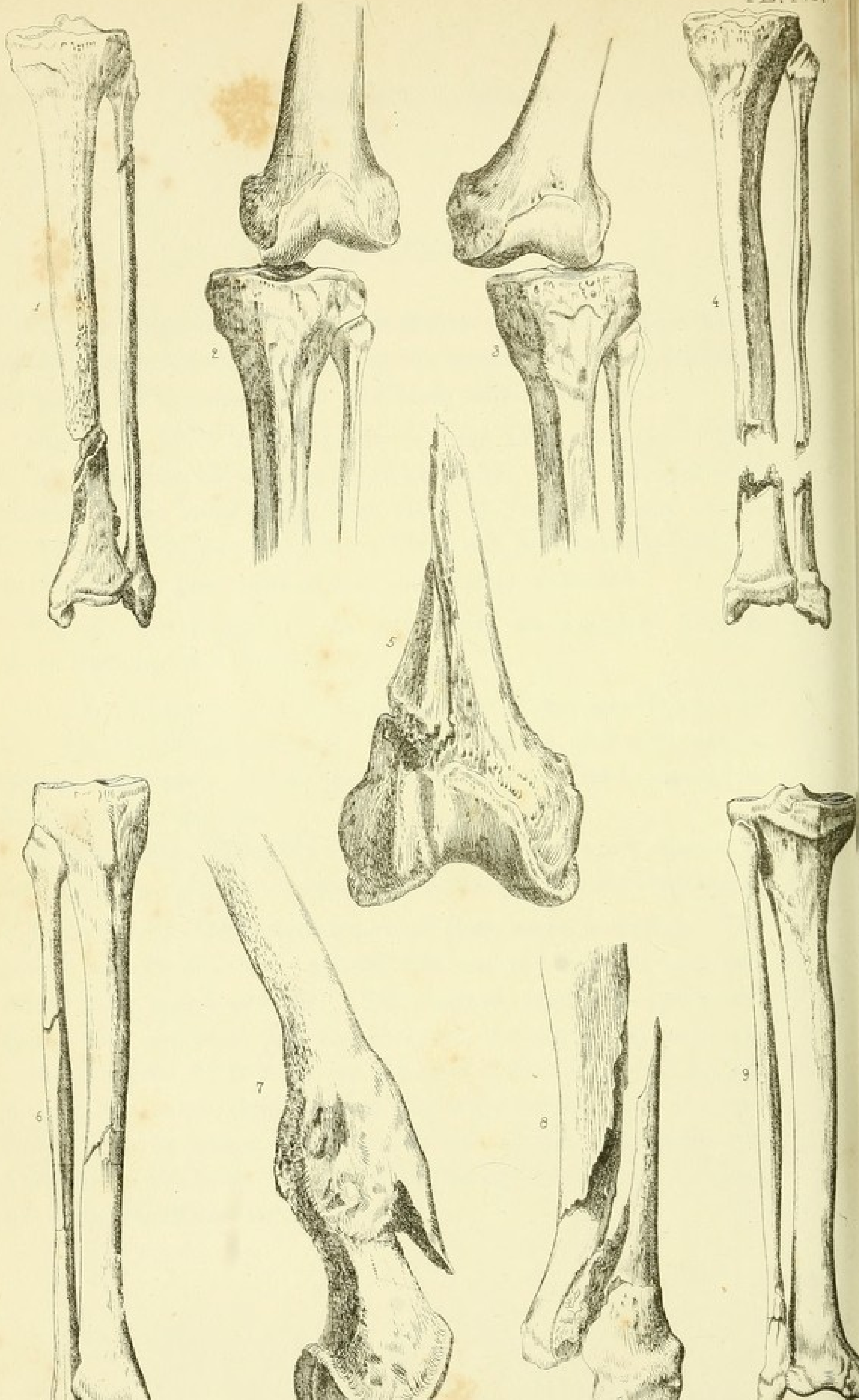
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PLATE CXLV.

Fig. 1. Fracture of the lower end of the tibia, with dislocation of the tibia.

Fig. 2. Dislocation of the tibia outward. From Fergusson.

Fig. 3. Dislocation of the tibia forward.

Fig. 4. External appearance of the foot, in dislocation of the astragalus outward.

Fig. 7. External appearance of dislocation of the tibia inward.

Figs. 5, 6. Compound Dislocation of the Ankle Joint. This dislocation is the most frequent example of this kind of injury. If the wound in the integuments does not heal by the first intention, the joint inflames, suppuration occurs in about five days, and much of the cartilage is destroyed by ulceration; at last, the wound is filled with granulations, and the patient recovers a tolerably good use of the foot in from two to twelve months. The first thing to be done is, to wash away all dirt with warm water, to remove all shattered pieces of bone gently with the fingers, and then to reduce the bone to its place, slightly enlarging the wound in the skin, if necessary, in order to effect this without violence. If it is very difficult to return the end of the tibia, or if it is fractured obliquely, or much shattered, it is better to saw it off, as the patient will have as good a limb afterwards. Then the external wound should be closed with a bit of lint, dipped in the patient's blood, and the leg be secured with a tailed bandage, and be wet with an evaporating lotion. Care must be taken not to let the foot be pointed, or turned to either side. When inflammation and swelling come on, the bandage must be loosened, and cold applied, if agreeable. Opium, with antimony and saline draughts, laxatives or enemata, if they can be given without disturbance, and sometimes, though very rarely, bleeding, are the general remedies in these cases, as also in compound fractures. The great object in the subsequent treatment is, to prevent the lodgment of matter, by sponging and pressing it out carefully at each dressing, and applying compresses to prevent its accumulation, and, if required, by making openings for its discharge. But if, notwithstanding the employment of tonics, wine, and good diet, the patient seems likely to sink under the discharge and irritation, amputation is the last resource.

Fig. 8. Dislocation of the Astragalus. The astragalus may be separated from its connection with the os naviculare and os calcis in various ways. Sometimes it is thrown inward so as to rest on the inner surface of the os calcis, and in this case there appears an unusual projection below the inner ankle, and a corresponding depression below the outer one, and the whole foot seems displaced outward. Sometimes it is thrown outward, and the foot seems to be displaced inward, (Fig. 4.) If the dislocation is simple, reduction should be immediately attempted by extension; the pulleys and tartar emetic will be needed, although the attempt will often prove unsuccessful. If the dislocation is compound, and the bone cannot be replaced, or if it is much shattered, it may be dissected out. In these two dislocations, the astragalus is separated from the other tarsal bones, but preserves its connection with the tibia and fibula so that they may be regarded merely as varieties of dislocation of the ankle joint, in which the tibia and fibula carry the astragalus with them in their displacement. It may, however, be completely shot out from under the tibia, and lie under the skin of the outer side of the foot. And lastly, it may in the same way be dislocated backward, projecting behind the ankle joint, and pushing the tendo Achillis backward. The reduction of this displacement, if only partial, will be extremely difficult, and if complete, it will be nearly impossible.

Besides these, the five anterior tarsal bones may be dislocated from the os calcis and astragalus. The cuneiform bones may be dislocated upward from the navicular, the metatarsal bones from the tarsal, and the toes from the metatarsal. In any of these cases, the proper position of the parts must be restored as much as possible by pressure and extension, and be fixed by bandages; but reduction will often be very difficult, if not impossible.

Fig. 4. Case of dislocation of the astragalus, from Sir Astley Cooper; ulceration followed the accident, and the bone was removed; the patient finally recovered a good use of the joint.

PLATE CXLVI.

Figs. 1, 3. Dislocation of the Under Jaw. Symptoms. The mouth is fixedly open, the chin protruding forward, and a prominence felt under the zygomatic process. If one side only is dislocated, the chin will be turned towards the opposite.

Treatment. The surgeon should wrap a napkin round his thumbs, and place them at the roots of the coronoid processes, behind the molar teeth; then he should press them downward and backward, elevating the chin at the same time with his fingers. Or he may place the handle of a fork upon the last molar teeth, and depress them with it, using the upper teeth as a fulcrum. Or a piece of cork may be put between the molar teeth, in order to act as a fulcrum whilst the chin is elevated. After reduction, the chin must be confined for a week or two by a four-tailed bandage.

Fig. 2. Fracture of the Lower Jaw. The most usual situation of this fracture is at the middle of the horizontal ramus, although it may occur at any point.

Symptoms. It is known by pain, swelling, inability to move the jaw, and irregularity of the teeth. On moving the chin, while the hand is placed on the posterior fragment, crepitus will be felt, and the gums are lacerated and bleeding. The diagnosis of fracture of the ascending ramus will often be obscured by the great swelling. Great pain and difficulty of moving the jaw are the chief signs.

TREATMENT. Plate CLIX.

FRACTURES OF THE OSSA NASI, AND OF THE MALAR AND SUPERIOR MAXILLARY BONES, may be produced by violent blows or falls on the face, or by gun-shot injuries.

TREATMENT. Displacement of the fractured portions should be rectified as soon as possible by passing a strong probe, or female catheter, up the nostril, and by manipulation with the fingers. A depressed fragment may often be raised by passing one blade of the dressing forceps up the nostril, and applying the other externally, so as to grasp the fragment between them. A plug of lint may be requisite to stop hemorrhage. Inflammation must be met in the usual manner, and if any collections of matter form, they should be opened without delay. If there are symptoms of pressure on the brain, and the vomer seems depressed, it should be carefully drawn forward.

Fig 4. DISLOCATION OF THE OUTER EXTREMITY OF THE CLAVICLE. In this case, the dislocation had been of long standing. The conoid ligament is converted into bone, so as to anchylose the clavicle to the scapula.

THE SYMPTOMS of this dislocation are, the shoulder is sunken and flattened, and, on tracing the spine of the scapula, the end of the clavicle can be felt on the acromion. The treatment is the same as for fracture of the clavicle, (Plate CLVIII.)

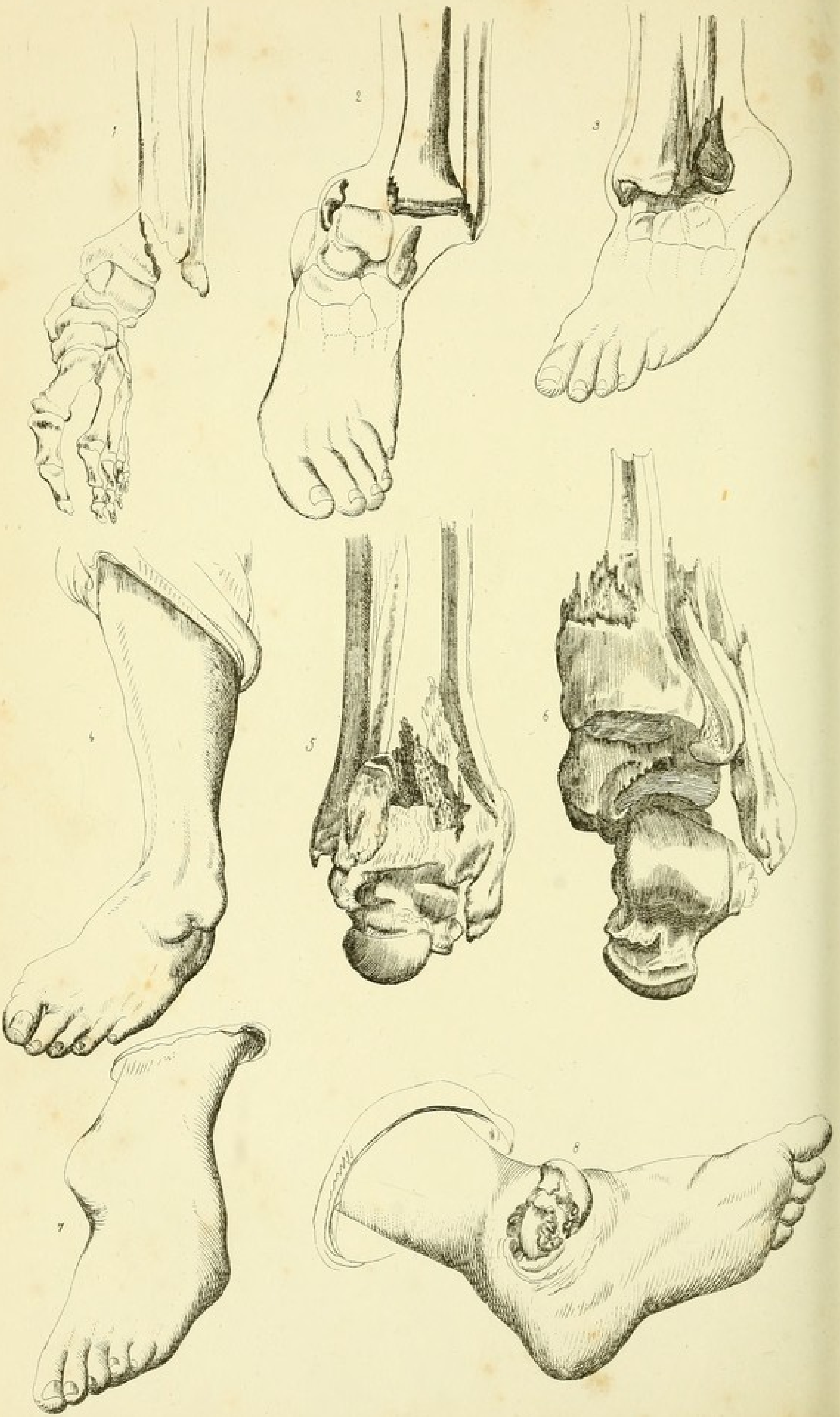
Figs. 5, 7. In these two figures may be seen dislocation forward of the external extremity of the clavicle; also, in Fig. 5, dislocation of the humerus downward, and partial dislocation of the humerus upward and forward.

Dislocation of the external extremity of the clavicle may be recognized by the extremity of the bone being felt on the anterior surface of the sternum. The treatment is the same as in fracture of the clavicle.

The external end of the clavicle has been dislocated backward. In one instance, it was necessary to extirpate the end of the bone, on account of pressure on the œsophagus.

Sir Astley Cooper mentions a case where the scapular end of the clavicle was dislocated under the acromion.

Fig. 6. Dislocation of the Humerus downward. Case dissected by Sir Astley Cooper. In this case Sir Astley discovered that the deltoid and supra-spinatus muscles most powerfully resisted reduction in this accident; he inferred from this that the best direction to extend the arm for reduction of the dislocation is at a right angle with the body. (See Plate CL.)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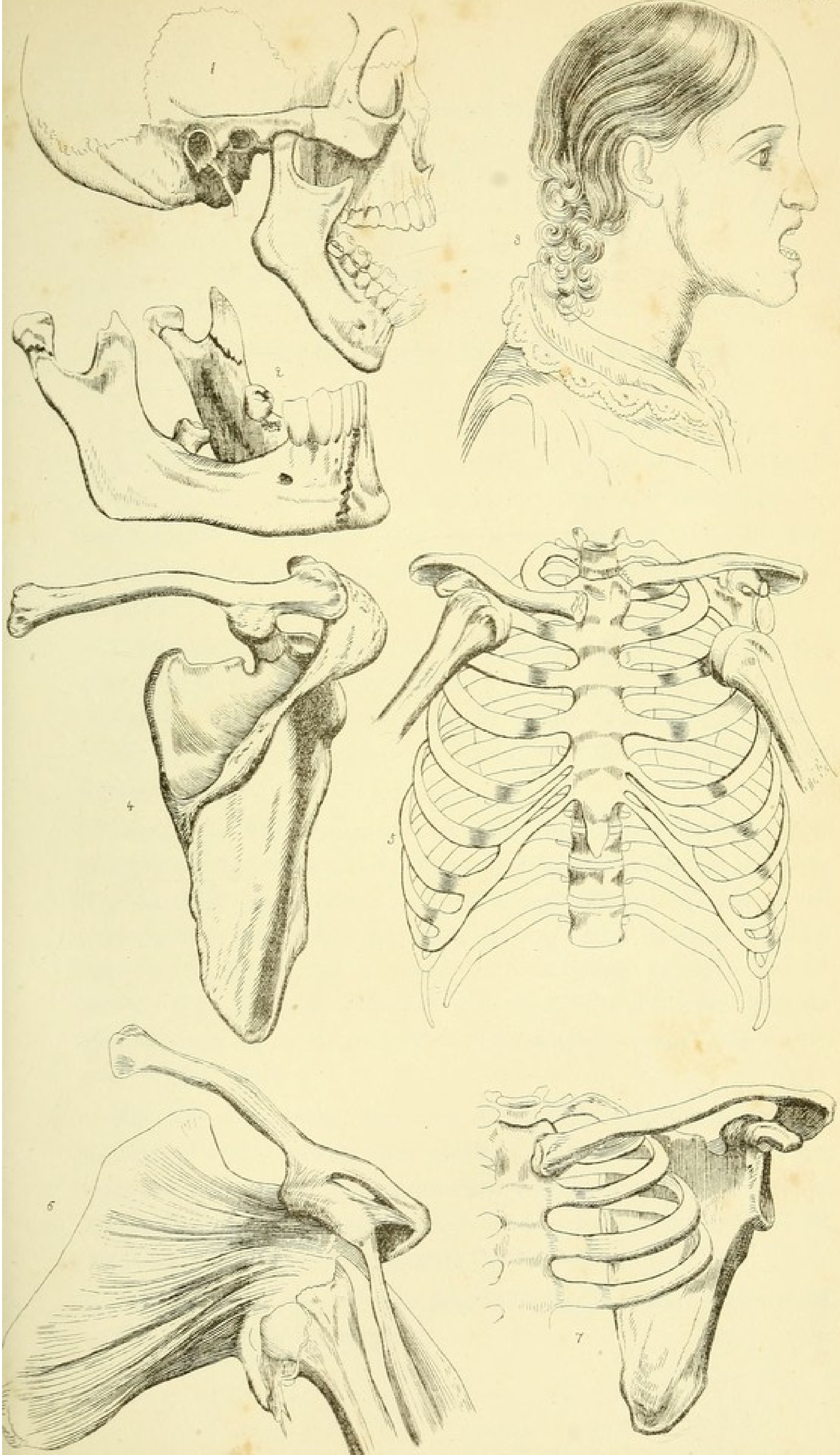
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PLATE CXLVII.

Fig. 1. Fracture of the glenoid cavity of the scapula. From Mr. Fergusson.

Fig. 2. Fracture of the Acromion is known by flattening of the shoulder, and by an evident inequality felt in tracing the spine of the scapula. It may be distinguished from any dislocation, by noticing that the humerus may be moved freely in any direction, and that, on slightly raising the shoulder, the fragment is restored to its place.

Treatment. The same as in fractured clavicle, only the pad must not be placed in the axilla.

Fig. 3. Case of dislocation of the humerus, of long standing.

Fig. 4. Fractured acromion; the edges of the fracture united by ligament.

Figs. 5, 6. Fracture of the Neck of the Scapula. This fracture is very liable to be mistaken for dislocation of the humerus. The head of the humerus falls, with the detached portion of the scapula, into the axilla; the shoulder also falls; there is a hollow below the acromion, and the head of the os humeri can be felt in the axilla. The points of difference are, crepitus, and the fact that the shoulder can be freely moved by the surgeon, though the motion causes great pain.

Fig. 8. Fracture of the Coracoid Process of the Scapula. Symptoms. The patient is unable to carry the arm upward; and motion of the detached process and crepitus may be felt by pressing the finger between the pectoralis major and deltoid, while the patient coughs, or moves the shoulder.

Treatment. The humerus must be brought forward and inward, and be confined to the trunk.

Fig. 7. Fracture of the Clavicle. The patient complains of inability to lift the affected arm, and supports it at the elbow. The shoulder sinks downward, forward, and inward; the distance from the acromion to the sternum is less than it is on the sound side, and the ends of the sternal fragment of the bone project.

Treatment. Plate CLVIII.

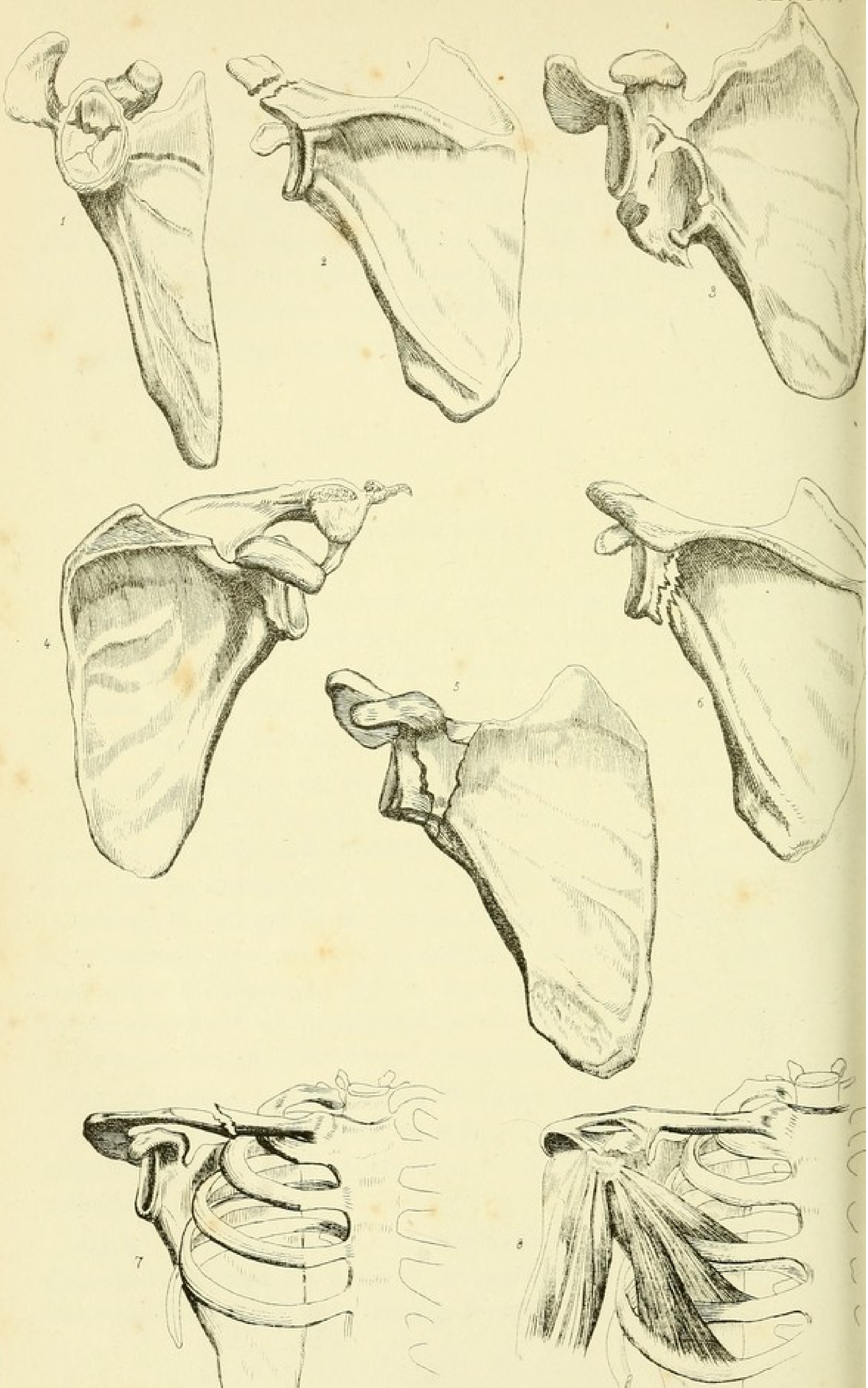
PLATE CXLVIII.

Figs. 1, 2, 3, 4. Dislocation of the Humerus downward into the Axilla. Symptoms. The arm is lengthened; a hollow may be felt under the acromion; the shoulder seems flattened; the elbow projects from the side, and the head of the bone can be felt in the axilla if the limb be raised.

Diagnosis. There are three fractures liable to be mistaken for this dislocation, viz., fracture of the acromion, of the neck of the scapula, and of the neck of the humerus. The first two may be known by the facility with which the form of the joint is restored by raising the limb, and by the crepitus felt on doing so. In fracture of the cervix humeri, the limb is shortened, instead of being lengthened as it is in dislocation; there is not so great a depression under the acromion; and the rough, angular end of the shaft may be felt in the axilla, instead of the natural, smooth head of the bone.

Fig. 7. Dislocation of the Humerus forward. Symptoms. The arm is shortened, the elbow projects backward, the acromion seems pointed, and the head of the bone cannot be felt under it.

Fig. 6. Dislocation of the Humerus backward. In the dislocation backward, the head of the bone may be felt on the dorsum scapulæ, and the elbow projects forward.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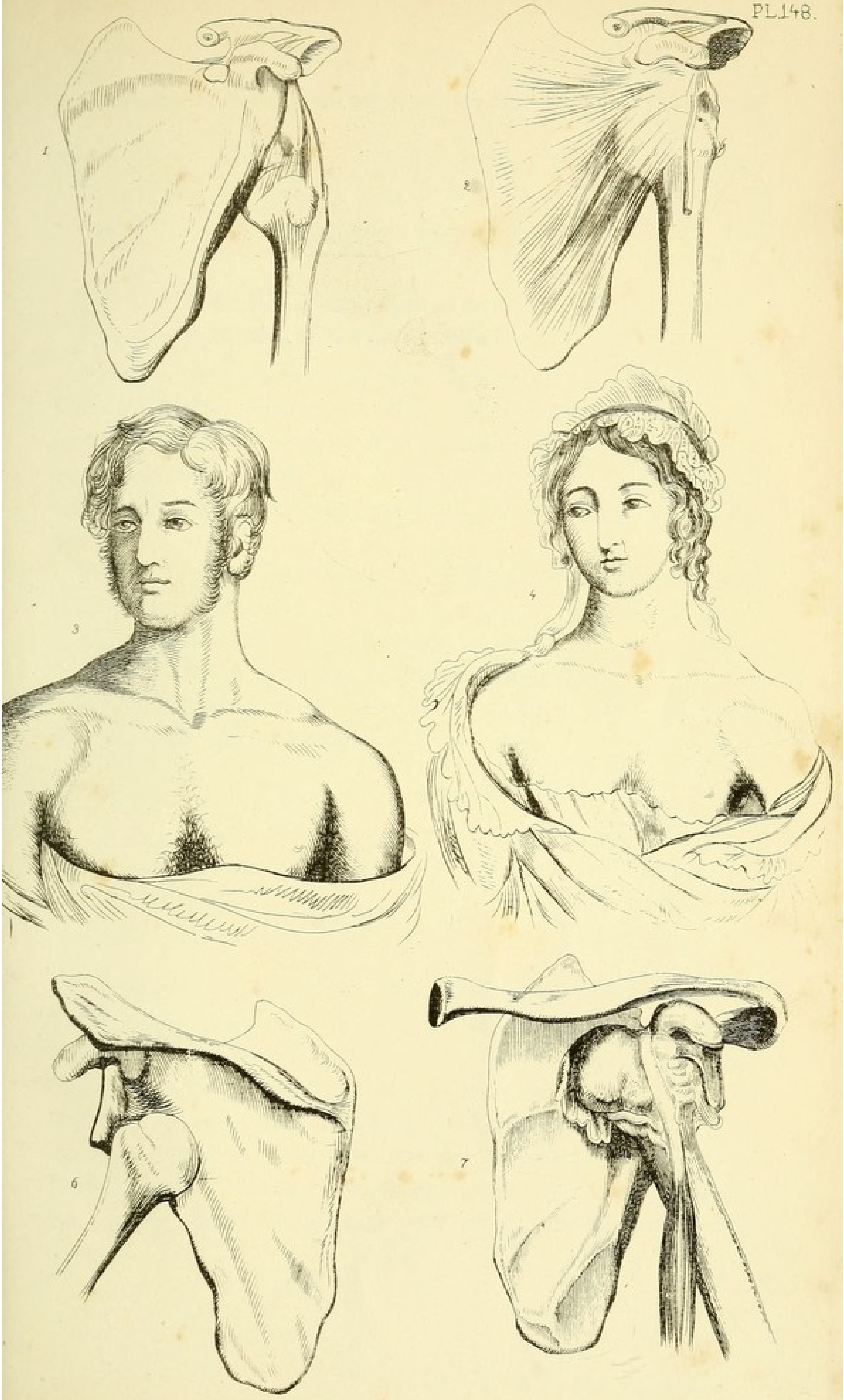
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PLATE CXLIX.

Fig. 1. Dislocation of the humerus forward.

Fig. 2. Dislocation of the humerus downward.

Partial Dislocation of the Humerus forward, (Fig. 5, Plate CXLVI.) Symptoms. The symptoms are, projection of the acromion, and a hollow under it at the back of the joint, while the head of the bone is prominent in front, and may be felt to move on rotating the elbow, cramps of the hand, and difficulty of raising the elbow.

Fig. 3. Partial dislocation of the humerus, found in a subject at St. Thomas's Hospital.

Fig. 4. Dislocation of the humerus backward.

Fig. 6. Partial dislocation of the humerus upward.

Fig. 5. Fracture of the neck of the humerus, with dislocation forward, under the pectoral muscle.

PLATE CL.

Treatment in Cases of Dislocation of the Humerus. 1. By simple extension. A towel, or an apparatus as in Fig. 3, is to be passed round the chest, so as to fix the scapula. Another should be fastened round the arm by means of the knot, (Fig. 2.) Extension should then be made by the latter, the patient sitting on the floor, his elbow being bent, and the humerus being raised and carried forward. When extension has been made for some minutes, the surgeon should lift the bone, and it will generally return with a snap.

2. Extension may be made with the pulleys, recollecting, always, that they are not to be used to exert greater force, but to exert it more equally. A damp bandage should be applied round the elbow, before the strap of the pulleys is attached.

3. By the heel in the axilla, (Fig. 1.) The patient lies down on a bed, and the surgeon puts his heel (without his boot) into the axilla, to press the head of the bone upward and outward, and at the same time pulls the limb downward by means of a towel fastened round the elbow.

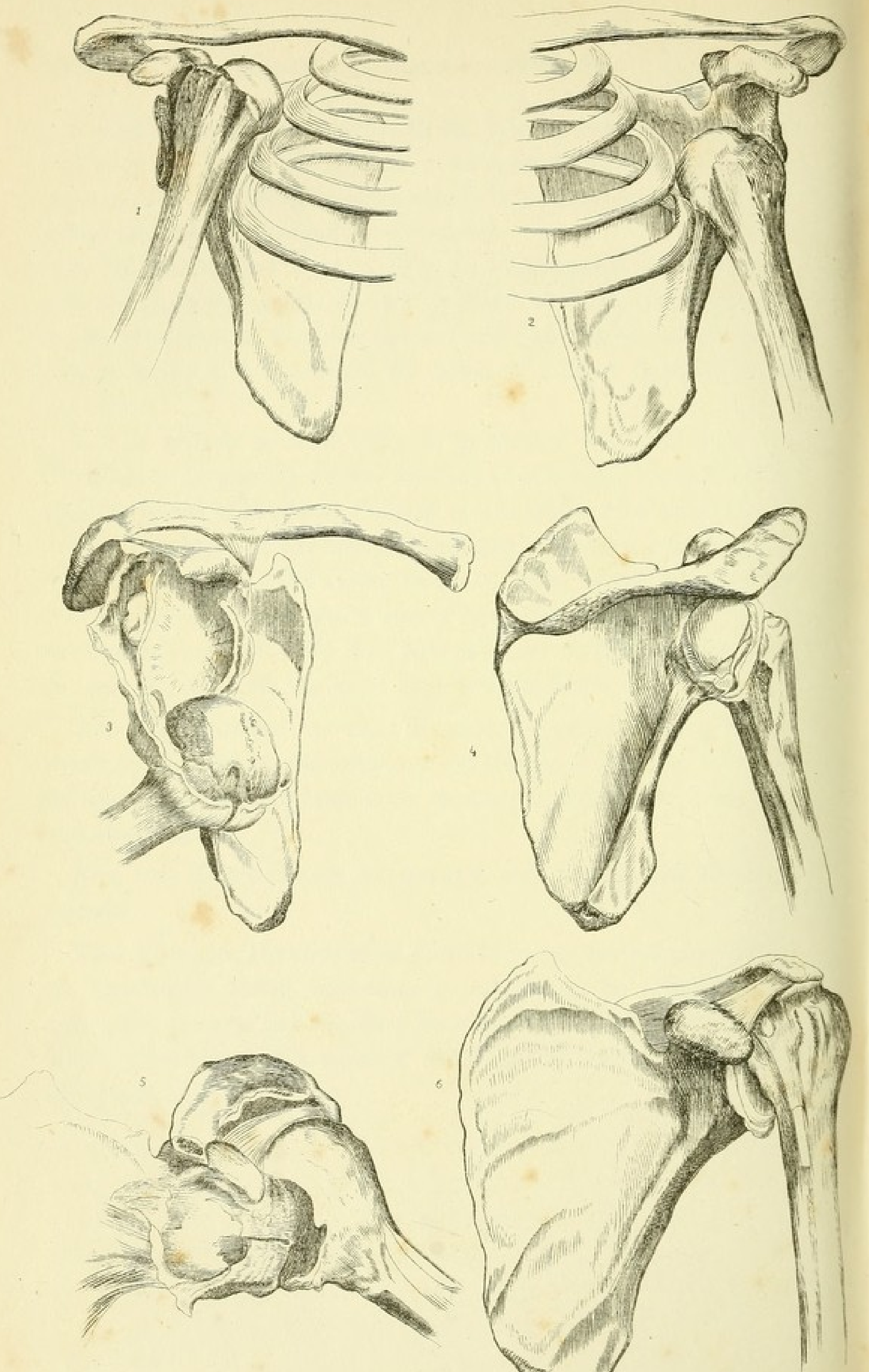
4. The scapula is fixed (Fig. 5) by placing one hand upon the shoulder, or by passing a towel over the shoulder and fixing it to the opposite corner of the bed; then the arm is raised from the side, and drawn straight up by the head, till the bone is elevated into its socket.

5. By the knee in the axilla, (Fig. 4.) The patient being seated in a chair, the surgeon places one of his knees in the axilla, resting the foot on the chair. He then puts one hand on the shoulder, to fix the scapula, and with the other depresses the elbow over the knee.

THE DISLOCATION OF THE HUMERUS FORWARD may be reduced by the heel in the axilla, or by extension with the towel or pulleys. But the extension must be made in a direction downward and backward.

FOR THE DISLOCATION BACKWARD extension should be made forward.

THE PARTIAL DISLOCATION FORWARD may be reduced by simple extension. After reduction, a pad should be placed in the axilla, and the arm and shoulder be supported for some days with a figure 8 bandage, a few turns of which should confine the arm to the trunk.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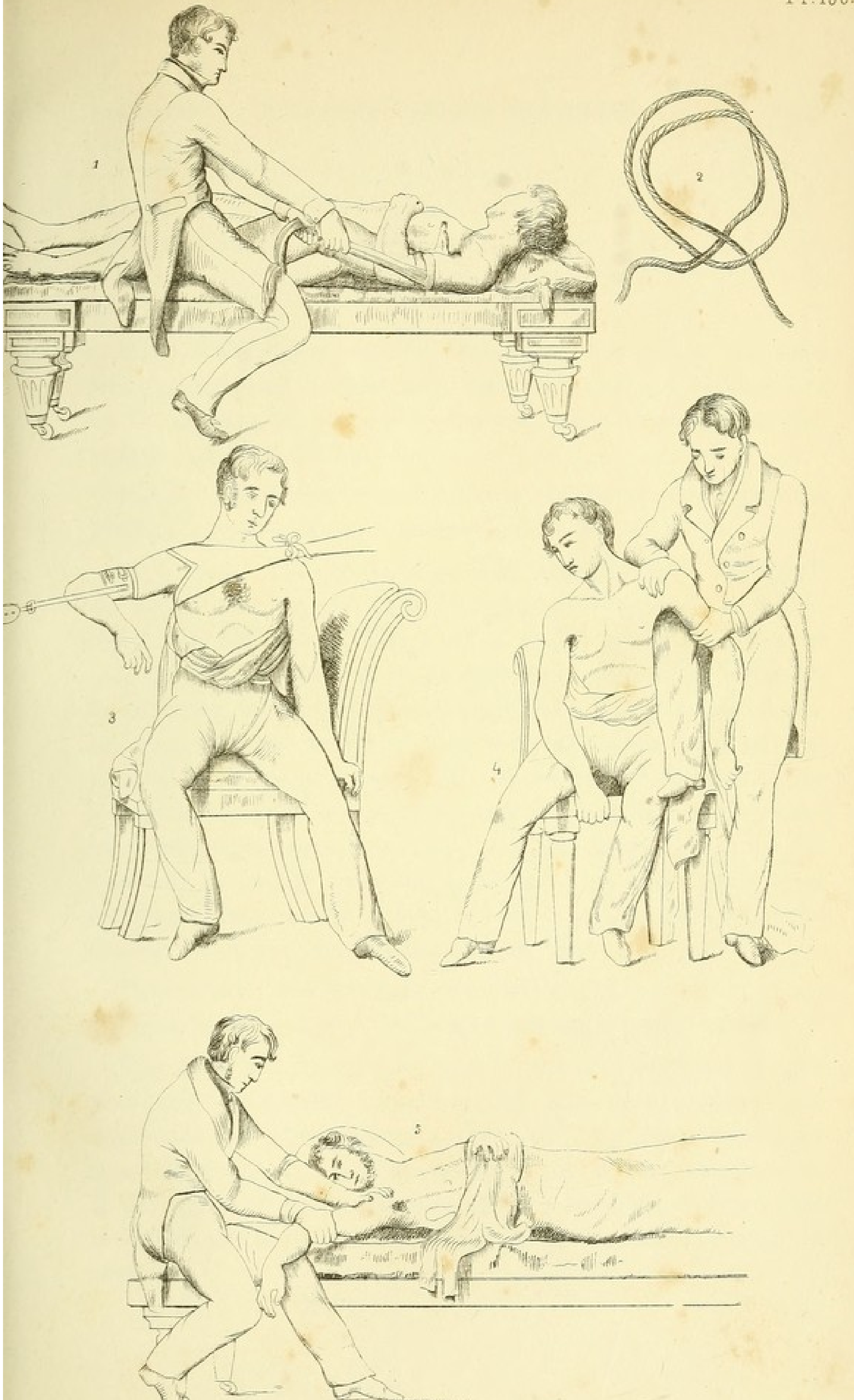
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PLATE CLI.

Fig. 1. Fracture of the Humerus. Fracture of the shaft will be known by the limb being bent, shortened, and helpless, and by the crepitus felt when it is handled. For treatment, see description of Plate CLIX.

Fig. 5. Fracture of the surgical Neck of the Humerus, Fracture may also occur at the anatomical neck.

Symptoms. The patient is unable to raise the arm. The shoulder seems flattened, but there is no hollow below the acromion, as there is in dislocation. The head of the bone may be felt in its socket, and the broken end of the shaft may be felt projecting either in the axilla, or near the coracoid process of the scapula. By grasping the neck of the bone, and rotating the elbow, the fractured shaft may be felt to move independently of the head of the bone. The natural condition of the parts is restored, when extension is made, by drawing the elbow downward; but the deformity returns immediately when the extension is discontinued, and during these movements crepitus may be felt. There is greater mobility in the fracture below the tubercles than above them.

Treatment. See description of Plate CLIX.

Fig. 4 shows a double fracture of this bone, firmly united.

Figs. 2, 10. Fracture of the External Condyle of the Humerus. Symptoms. Swelling, and pain upon pressure; the motions of the joint produce severe pain; but the principal diagnostic sign is the crepitus perceived on rotating the forearm. If the portion of the fractured condyle be large, it is drawn a little backward, and carries the radius with it; but if small, this does not occur.

Fig. 3. FRACTURE OF THE INTERNAL CONDYLE OF THE HUMERUS. SYMPTOMS. The ulna appears dislocated, but assumes its natural situation on bending the arm. By grasping the condyles, and flexing or extending the arm, a crepitus is perceived. When the arm is extended, the lower end of the humerus advances upon the ulna, so as to be felt upon the anterior part of the joint.

TREATMENT. The treatment, in both the above cases, consists in applying a roller around the elbow joint, to keep the bone in complete apposition; in combating inflammation; in bending the limb at a right angle, and adapting an angular splint to it, and placing it in a sling. At the end of three weeks, passive motion is to be commenced.

Figs. 6, 9. FRACTURE OF THE CORONOID PROCESS OF THE ULNA. SYMPTOMS. Difficulty of bending the elbow, dislocation of the ulna, with the olecranon projecting backward.

TREATMENT. The arm must be bandaged, and kept at rest in the bent position. Plate CLIX. Fig. 4 shows the form of splints for these cases.

Figs. 7, 8, 12. FRACTURE OF THE OLECRANON. SYMPTOMS. The patient bends the limb easily, but has great pain and difficulty in straightening it; a hollow is felt at the back of the joint, if the ligaments are torn through; if not, there is but a slight displacement, as will be readily understood by referring to Fig. 8. The treatment of this case is shown in Plate CLIX.

Fig. 11. FRACTURE OF THE HUMERUS ABOVE THE CONDYLES. SYMPTOMS. The arm is slightly bent, and the radius and ulna appear to project backward; just above the projection there is a hollow in the back of the arm; the limb is easily restored to its natural position by extension, but returns to its first position upon its discontinuance.

TREATMENT. See Plate CLIX.

PLATE CLII.

Figs. 1, 2, 3, 9. FRACTURES OF THE SHAFT OF THE RADIUS AND ULNA, together or singly, are known by the ordinary signs of fracture, especially by the crepitus felt on fixing the upper end, and rotating or moving the other. The objects in the treatment are to prevent the fractured ends of bone from being pressed inward towards the interosseous space, and to prevent the upper fragment of the radius from being more supinated or everted than the lower.

Fig. 7 shows a case of partial fracture, as described by Mr. Fergusson.

TREATMENT. The fore and upper arm should be bandaged, and a piece of pasteboard, gummed sheeting, or leather, softened in water, should be cut to a right angle, like the letter L, so as to fit the elbow when bent, and be applied on the inner and outer sides, and be retained by another bandage. Besides this, an angular splint may be employed. It is composed of two pieces, joined at a right angle, one of which is placed behind the upper arm, and the other below the forearm. But if the injury is attended with much inflammation, the patient must be confined to his bed for some days, with the arm on a pillow, and leeches and lotions be employed to reduce the inflammation and swelling. Passive motion of the joint should be commenced in a fortnight or three weeks, but the patient should be informed early that it is very difficult to avoid deformity and loss of motion.

Figs. 6, 10. FRACTURE OF THE LOWER EXTREMITY OF THE RADIUS, about half an inch or an inch above the wrist, is often caused by falls on the hand, and may be mistaken for dislocation of the wrist, as the hand, with the lower fragment, is drawn upward and backward by the extensor muscles. The distinction is, that if the hand be moved, the styloid process of the radius will move with it, if there is a fracture, but not if there is dislocation. Sometimes, in connection with this fracture, ulna is dislocated forward upon the carpus; and sometimes the fracture is confined to the posterior rim of the articular surface of the radius, which is obliquely broken off, and the hand partially dislocated backward.

TREATMENT. The hand is to be extended by the surgeon, and the fore and upper arm are to be drawn back by an assistant; then a cushion is to be placed upon the inner part of the wrist, and another upon the back of the hand; these are to be firmly bound down by a roller, for the purpose of keeping the ulna and broken end of the radius in place; a splint, well padded, is then applied to the back and inner side of the forearm, which is to extend to the extremities of the metacarpal bones; these splints are to be confined by a roller, reaching from the upper part of the forearm to the wrist, and no farther. The arm should then be placed in a sling. At the end of two or three weeks, passive motion should be attempted.

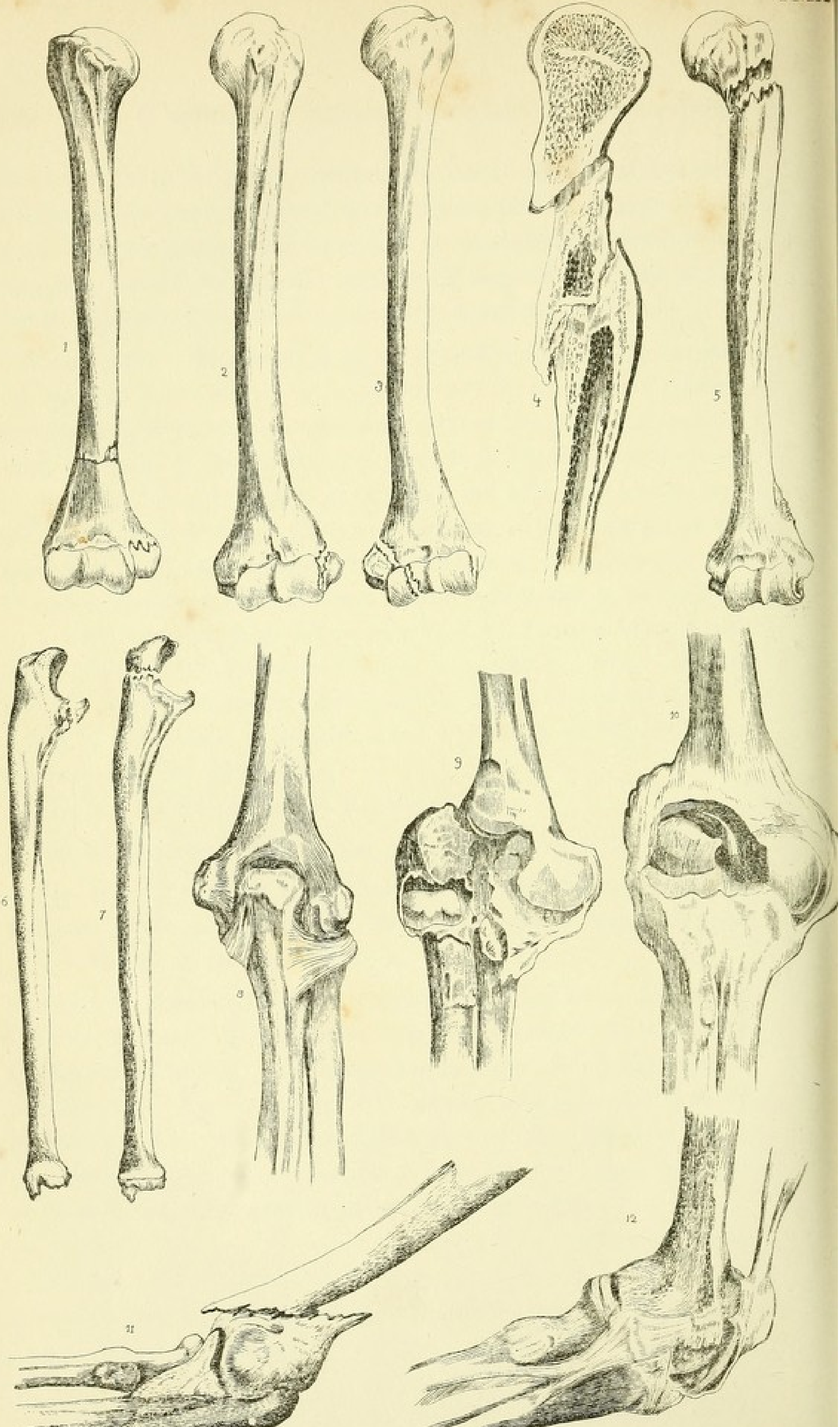
Fig. 4. Fracture of the olecranon. From a specimen in the possession of Mr. Fergusson.

Fig. 5. An old fracture of the humerus.

Fig. 8. FALSE JOINT. From a preparation in King's College.

Fig. 12. COMPOUND DISLOCATION OF THE WRIST. In this case, the inflammation was so violent that amputation was performed to save the life of the patient.

Fig. 11. COMPOUND DISLOCATION OF THE LAST PHALANX OF THE THUMB. In these cases, it is best to saw off the extremity of the second phalanx, taking care not to injure the tendon which is torn through. The extremity of the tendon should be smoothed by a knife, and the part be then bound up with lint dipped in blood, and confined by a roller; and it should be kept quiet for a fortnight or three weeks, when passive motion should be begun.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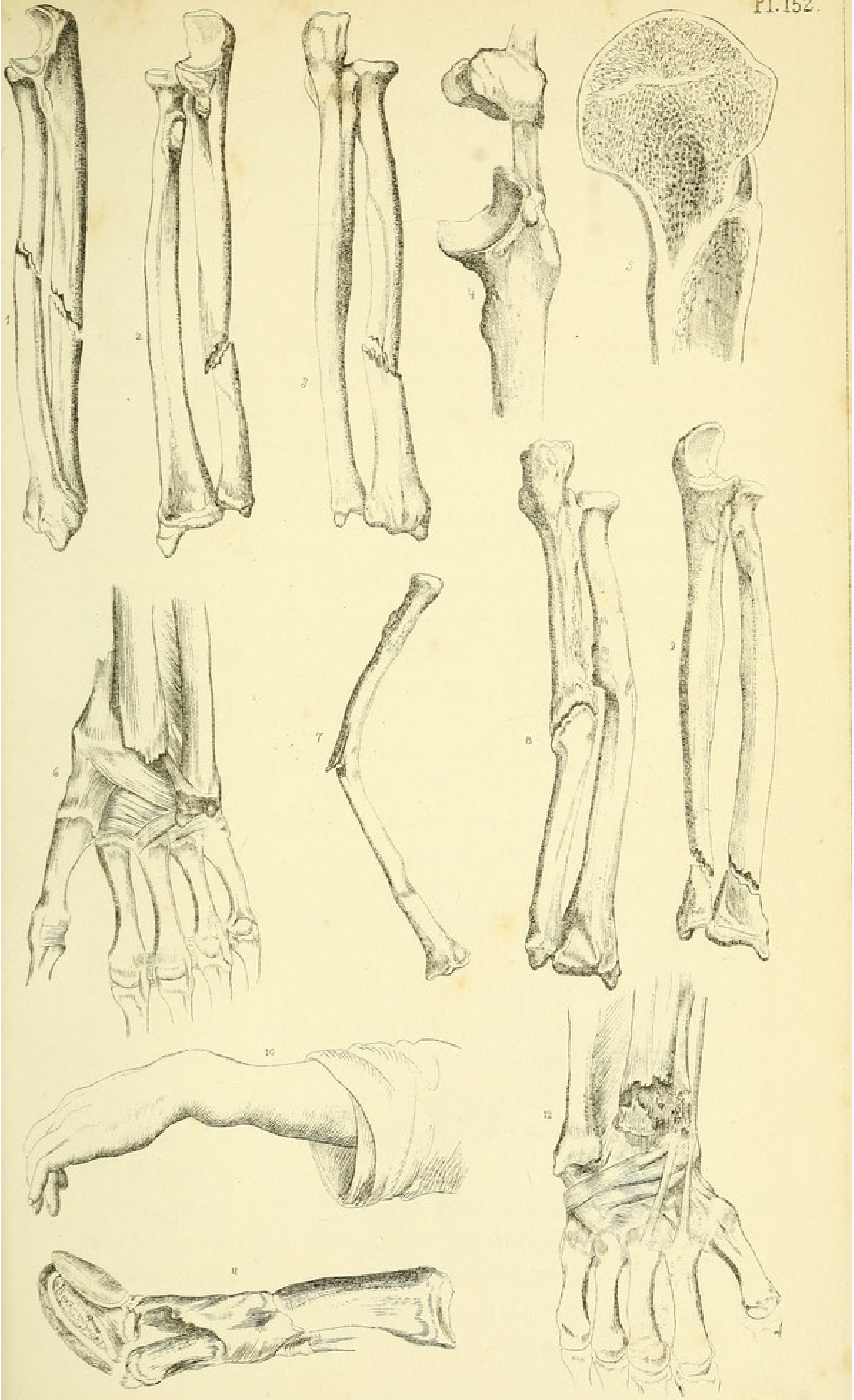
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PLATE CLIII.

DISLOCATION OF THE ELBOW presents six varieties. The radius and ulna may both be dislocated, 1, simply backward; 2, backward and inward; 3, backward and outward; 4, the ulna itself may be dislocated backward; and the radius either, 5, backward, or, 6, forward.

Figs. 1, 2, 3, 4. DISLOCATION OF THE RADIUS AND ULNA BACKWARD. SYMPTOMS. The elbow is bent at a right angle, and is immovable; the olecranon projects much behind; a hollow can be felt at each side of it, corresponding to the greater sigmoid cavity; and the trochlea of the humerus forms a hard protuberance in front. The coronoid process rests in that fossa of the humerus which naturally contains the olecranon.

Fig. 9. In dislocation of both bones backward and outward, the coronoid process is thrown behind the external condyle, and, in addition to the preceding symptoms, the head of the radius can be distinctly felt on the outer side of the joint.

Fig. 10. The dislocation backward and inward is known by a great projection of the outer condyle, in addition to the symptoms of the first variety.

Figs. 5, 6, 7. DISLOCATION OF THE ULNA BACKWARD. Figs. 5, 6, two views of the same preparation, in St. Thomas's Hospital. In this case, the coronoid process of the ulna was not broken.

SYMPTOMS. The olecranon projects backward, the elbow is immovably bent at a right angle, and the forearm is much twisted and pronated.

TREATMENT. The treatment of these four varieties is the same. Reduction may be effected, first, by fixing the lower end of the humerus, while the forearm is drawn forward; or, secondly, the surgeon may bend the elbow forcibly over his knee; or, thirdly, if the case be quite recent, he may forcibly straighten the arm, so as to make the tendon of the biceps pull the trochlea of the humerus back in its place.

Figs. 8, 11. Dislocation of the Radius forward. Symptoms. The elbow is slightly bent, and in bending it more, the head of the radius can be felt to strike against the front of the humerus.

Treatment. Simple extension from the hand, the elbow being straight.

PLATE CLIV.

Fig. 1. Dislocation of the Radius backward. Symptoms. The head of the bone can be felt behind the outer condyle.

Fig. 2. Dislocation of the radius forward.

Treatment. Simply bending the arm, which should be kept bent about three weeks.

Fig. 5. Dislocation of the radius backward. From a preparation in St. Thomas's Hospital.

Fig. 3. Dislocation of the radius and ulna, forward, at the wrist.

Figs. 4, 6. Dislocation of the Radius and Ulna backward at the Wrist. Symptoms. The hand is thrown either backward or forward, (as the case may be,) if both bones are dislocated; or twisted, if one only is dislocated. The natural relative position of the styloid processes of the radius and ulna with the bones of the carpus is changed.

Treatment. They are reduced by simple extension.

Dislocation of the Hand. The os magnum and os cuneiforme, are sometimes partially dislocated, and form projections on the back of the hand, which must not be mistaken for ganglia. The os pisiforme is also sometimes, though very rarely, dislocated.

Treatment. After reduction, cold affusion, friction, and mechanical support.

Figs. 7, 8, 9, 10, 11, 12. Dislocations of the Thumb, Fingers, and Toes are difficult of reduction, in consequence of the unyielding nature of the lateral ligaments, and the small size of the part from which extension can be made. Extension may be made as in Figs. 11 or 12. Sometimes it may be well to place the tape round the head of the dislocated bone, so as to pull it straight forward into its place. Extension should be made towards the palm, so as to relax the flexor muscles. "But before the reduction has been effected," says Mr. Liston, "it has been in some cases even found necessary to divide one of the ligaments; the external is most easily reached; it is cut across by introducing a narrow-bladed and lancet-pointed knife through the skin at some distance, and directing its edge against the resisting part."

Fracture of the Ribs is generally situated in their anterior half.

Symptoms. Fixed lancinating pain, aggravated by inspiration, coughing, or any other motion. By tracing the outline of the bone, or by placing the hand or the stethoscope upon it, crepitus may be felt during the act of coughing or inspiration, and the patient is sensible of it likewise. If the fracture is situated near the spine, or the patient is very corpulent, it may be difficult to detect it with certainty; but this is of little consequence, for in every case where a patient complains of pain on inspiration after a blow, the treatment is the same.

Treatment. The indications are, 1. To prevent all motion of the ribs by passing a broad roller, or towel, fastened with tapes, round the chest so tightly that respiration may be performed solely by the diaphragm. The same end may be obtained by applying broad, adhesive strips. 2. To obviate inflammation of the chest, by bleeding, rest in bed, and low diet; to unload the bowels by purgatives, and to give opiates to allay pain and cough.

If several ribs are broken on both sides, it may happen that no bandage can be borne, and the case becomes very serious.

Quietude and depletion are the only remedies.

EMPHYSEMA is an occasional complication of this fracture. Emphysema presents a soft, puffy tumor, that crepitates and disperses on pressure.

TREATMENT. Provided the air escapes freely from the cavity of the chest, little inconvenience results, and if the skin merely be very much distended, it may be punctured; but if the air accumulates in the pleura, and compresses the lungs, — which will be known by great dyspnœa, and a hollow sound on percussion, — and if the breathing is not relieved by free depletion, an aperture must be made in the chest to let the air escape.

Operation described in Plate XCIII.

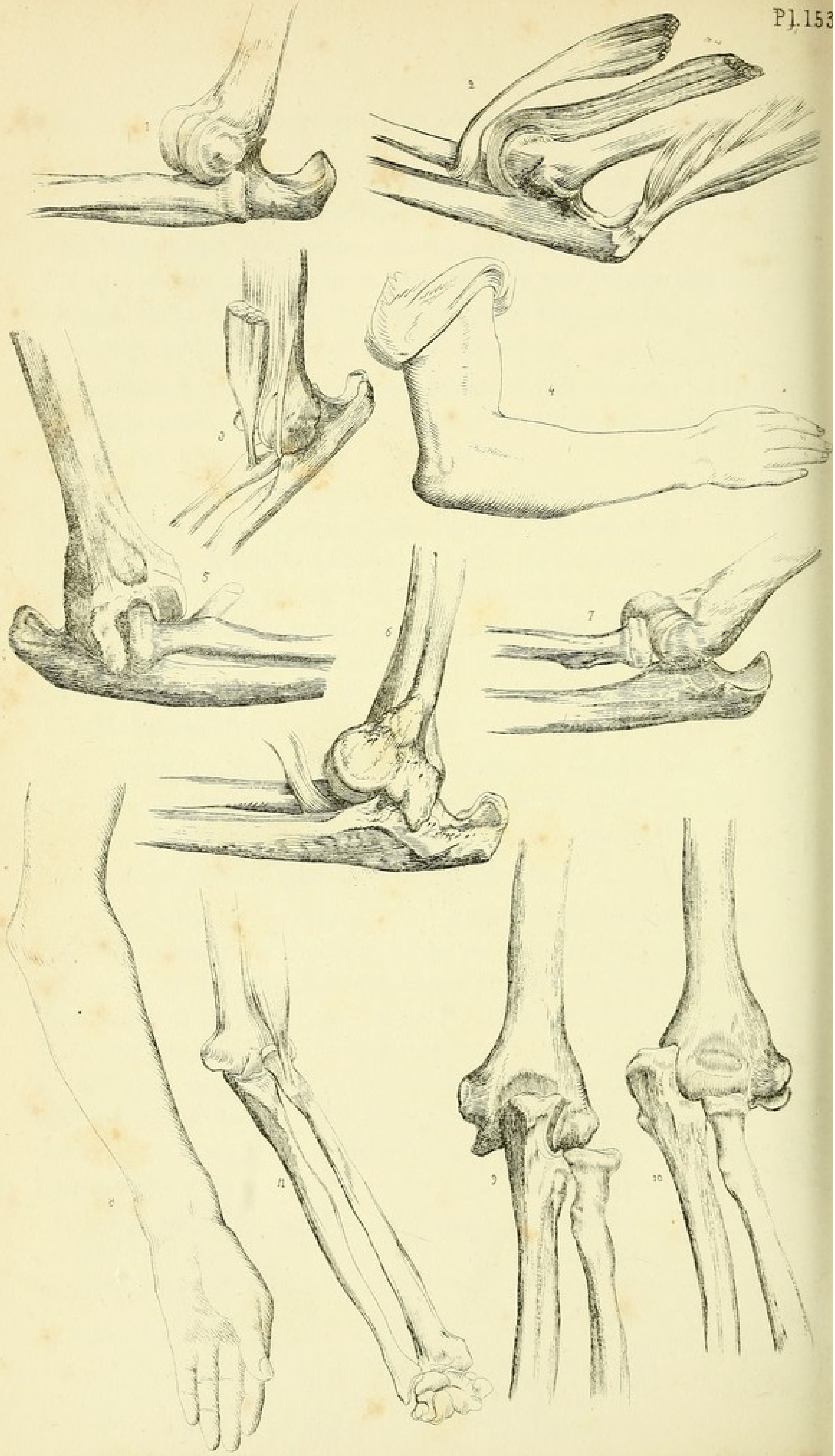
FRACTURE OF THE STERNUM. SYMPTOMS. Crepitus may be felt during inspiration, or other movements of the trunk; and displacement, if there be any, can be detected by examination.

TREATMENT. The same as in fractured ribs.

DISLOCATION OF THE RIBS. The costal cartilages may be torn from the extremity of the ribs or the sternum, and the posterior extremities of the ribs may be dislocated by falls on the back; but these accidents are very rare. A case is related in which the heads of the last two ribs were driven forward from the spine, in a boy of eleven, by a violent blow on the back. Abscess formed, and the case terminated fatally. The body of the sternum has also been dislocated in front of the manubrium, and the ensiform cartilage is sometimes separated.

TREATMENT. The same as in fracture.

Pl. 153



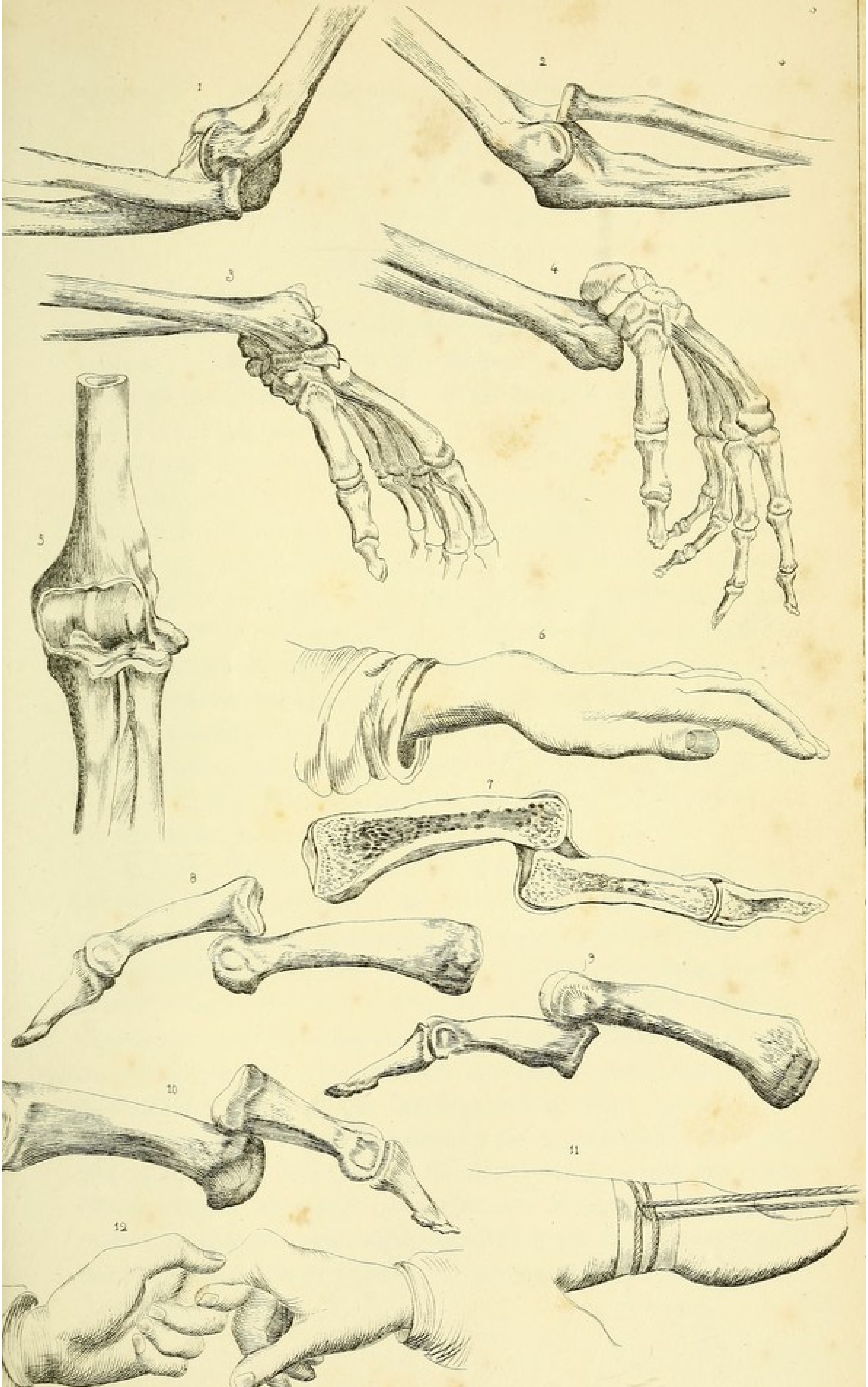

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PLATE CLV.

Figs. 1, 2. Treatment of Fracture of the Thigh. From Liston. "Certainly," says Mr. Liston, "much better and more creditable cures can be thus made of all fractures of the thigh than by any other position of the limb or trunk, by the use of any complicated and expensive machinery, or by any method supposed to be softer and more easy. The apparatus consists of a plain deal board, of a hand's breadth for an adult, and sufficiently strong; narrower and slighter, of course, for young patients. It is made to extend from opposite the nipple to from three to four inches beyond the sole of the foot. It is perforated at the upper end by two large holes, and provided with two deep notches at its other extremity; a sufficient hollow or perforation is made opposite the malleolus. A pad of corresponding length and breadth is attached by a few pieces of tape; a roller is split at the end, and having been tied through the openings in the top of the splint, is unrolled so far, and fixed for the time to the lower end of the pad, (Fig. 1.)

"Reduction having been effected by a little gentle and continued extension of the limb, while the pelvis is fixed, the position is preserved by an assistant placing one hand over the dorsum of the foot, and the other upon the knee, and now a roller is applied from the toes to a little below the site of the fracture with a moderate degree of tightness, to prevent infiltration of the limb in consequence of pressure by the perineal band, which is now placed under the patient; this consists of a large soft handkerchief, or shawl, containing the necessary quantity of tow, or wadding, and covered with oiled silk. The splint is then laid along the outside of the limb, and the roller, (shown Fig. 1,) is passed under the sole of the foot, and turned round the ankle and heel; these parts being previously thickly padded with tow, cotton, or wadding, to prevent the powerful effects of pressure, as upon these the resistance to the extension principally falls. The roller is carried repeatedly through the notches in the end of the splint, as it is crossed over the dorsum of the foot, and ultimately turned round the limb to near the groin. The ends of the perineal band are passed through the perforations, drawn with moderate tightness and firmly tied, and a few turns of broad bandage round the pelvis and chest complete the proceeding.

"The perineal band, by which the splint, and with it the limb, is pushed downward, is attended to from day to day, and tightened as it becomes relaxed, in order to overcome any tendency to shortening.

"In case of compound fracture, or fracture of both bones, or in injury or disease of the ankle or perineum, or in disease or anchylosis of the knee joint, the long splint is inadmissible."

In these cases, the apparatus Fig. 3, or the fracture bed, may be used.

Sir Astley Cooper directs, in fracture external to the capsule, the following treatment:—

The foot and ankle of the injured side should be firmly bound with a roller to the foot and ankle of the other leg, and thus the uninjured side will serve as a splint to that which is fractured, giving it support, and keeping it extended to a proper length. A broad leather strap should also be buckled round the pelvis, including the trochanter major, to press the fractured ends of the bone firmly together.

Fig. 4. FRACTURE THROUGH THE GREAT TROCHANTER. FROM SIR ASTLEY COOPER. This case was treated in the following manner: A mattress was made of horse hair, about five inches thick, and very smooth, and covered with a sheet; a part of the mattress was made to draw out on the opposite side of the fracture, so that, when the necessary evacuations took place, there should be no motion of the body. Before drawing out the piece of mattress, a board, two feet long and six inches wide, shaped like a wedge, was insinuated under the thigh, the two ends of the board resting on the mattress, thereby preventing the nates from sinking

into the opening when the piece of mattress was removed, and the injured side still rested on the body of the mattress; the board was of course removed after the piece of mattress was replaced. Upon the bedstead was first placed a thick, smooth board, sufficiently large to cover it, and upon this was placed the mattress, thereby preventing the body from sinking by its own weight.

A broad bandage, of sufficient length to go round the body over the hips, was fixed with two buckles and straps, and a piece was added to make it wider where it passed under the injured trochanter; this was bound with chamois leather, and stuffed; a pad of the same leather, about six inches long, three broad, and three inches thick, and ending gradually in a point, was placed immediately under the trochanter major of the injured side, so that, when the bandage was buckled, the pad passed into the hollow beneath the trochanter, and when the bandage was tightened, it forced the trochanter upward and forward into its natural position; then another very thick pad, about eight inches square, in the shape of a wedge, was placed under the upper part of the thigh, after the bandage was applied. The patient was placed on his back, the limb resting on the heel; and to prevent the possibility of any motion of the foot and of the body, a wide band was fixed on the bedposts at the foot of the bed, with two pieces of wood padded and fastened to it, into which the foot was received. A cushion was placed opposite the other foot, so that pressure could be made against the board, thereby preventing the body from slipping down in the bed.

Fig. 5. From Fergusson. He says that, where there is much contusion and swelling about the hip, and much extending force is requisite, the skin of the perineum and inner and upper part of the thigh, being frequently galled by the belt or napkin which is used for extension, such an apparatus as this, which has been used after excision of the head of the femur, whereby the femur of the opposite side to that on which the extension is required can be taken as the fulcrum, may answer in such examples.

Figs. 6, 7. MR. FERGUSSON'S SPLINT for fracture of the tibia, where a considerable degree of extension is required. The bars and foot piece consist of iron, the screws of brass; the long bar is of an average length to extend between the knee and the sole of the foot; the band is so attached that it can be slid upward or downward at will, and then be fastened by the side screw; it can also be moved in a lateral direction, so as to evert or invert the toes; and, moreover, it can be placed at such a distance from the splint at the ankle, as may be found best suited to the thickness of the patient's limb; the cross bar below prevents the member from rolling outward or inward, and by means of the screw, the side and foot splint may be raised or depressed as may be found most convenient. This bar can be attached to the screw at the knee, where it will sometimes be found to answer best, or they may be used one above and the other below, each being of service to raise the part above it to any required height.

Fig. 7 is a portion of another side bar; this is of the same size and shape as the other, and is intended to act as a thigh splint in case of fracture of the femur, or when it is necessary to apply extension in fracture of the leg. It can be firmly attached to the other portion at the knee, and when the upper end is fastened to the pelvis by a circular strap, and another under the perineum, as with Desault's apparatus, the whole is equally firm. Pads and bandages, as in other cases, must of course be used here.

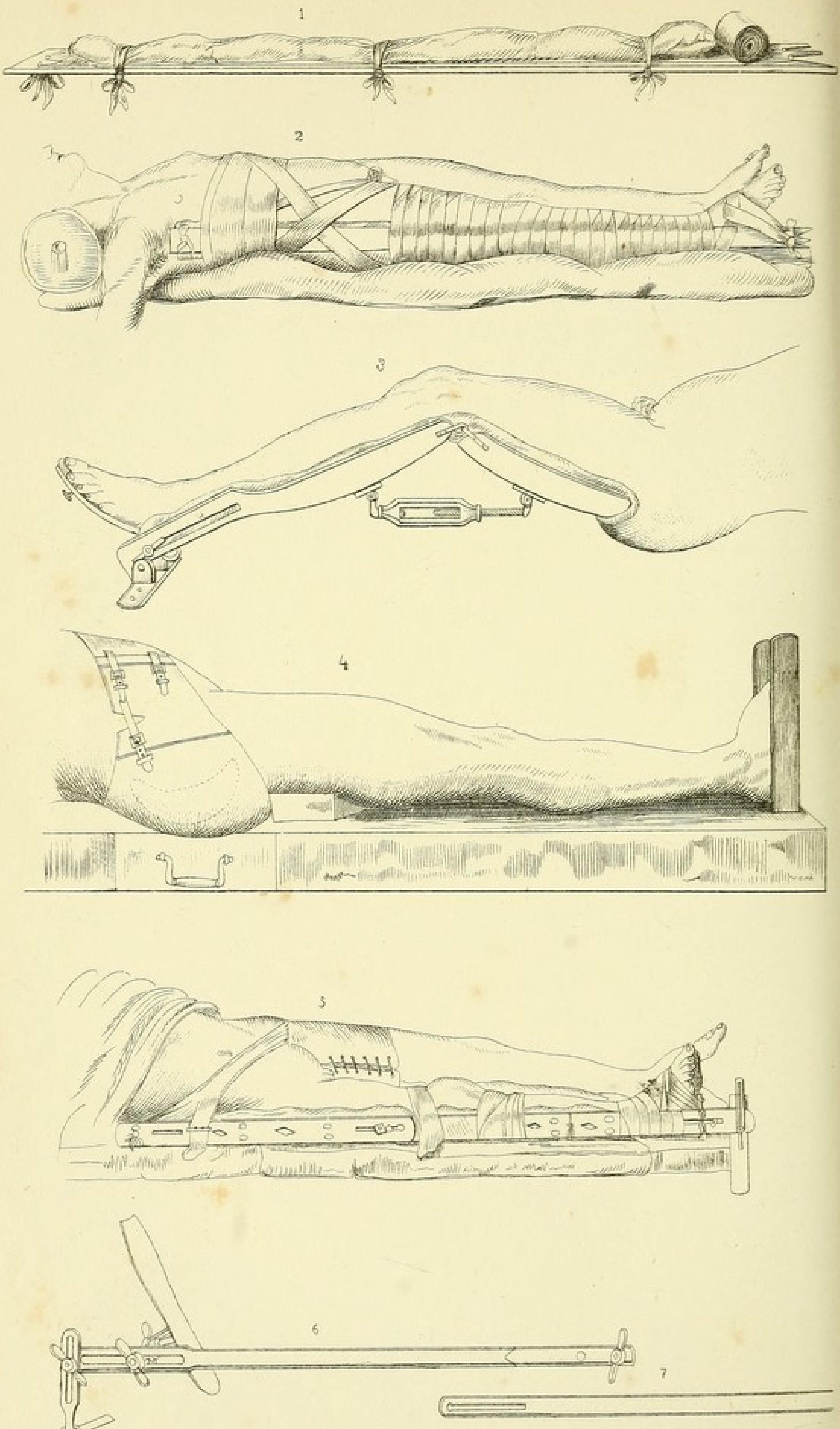
This splint will suit either side of either limb; it will answer for fractures of the leg, patella, or thigh; it can be put up in so small a space as to be easily carried in the hand. The movable bar may be attached to the cross bar on which the footboard is placed, and thus, if it should be deemed necessary, a splint may be kept on each side of the leg.

PLATE CLVI.

This plate illustrates the treatment of fracture of the thigh. From Syme's Surgery.

Fig. 2 shows the application of the splints.

Fig. 1 shows the limb with the whole dressing applied.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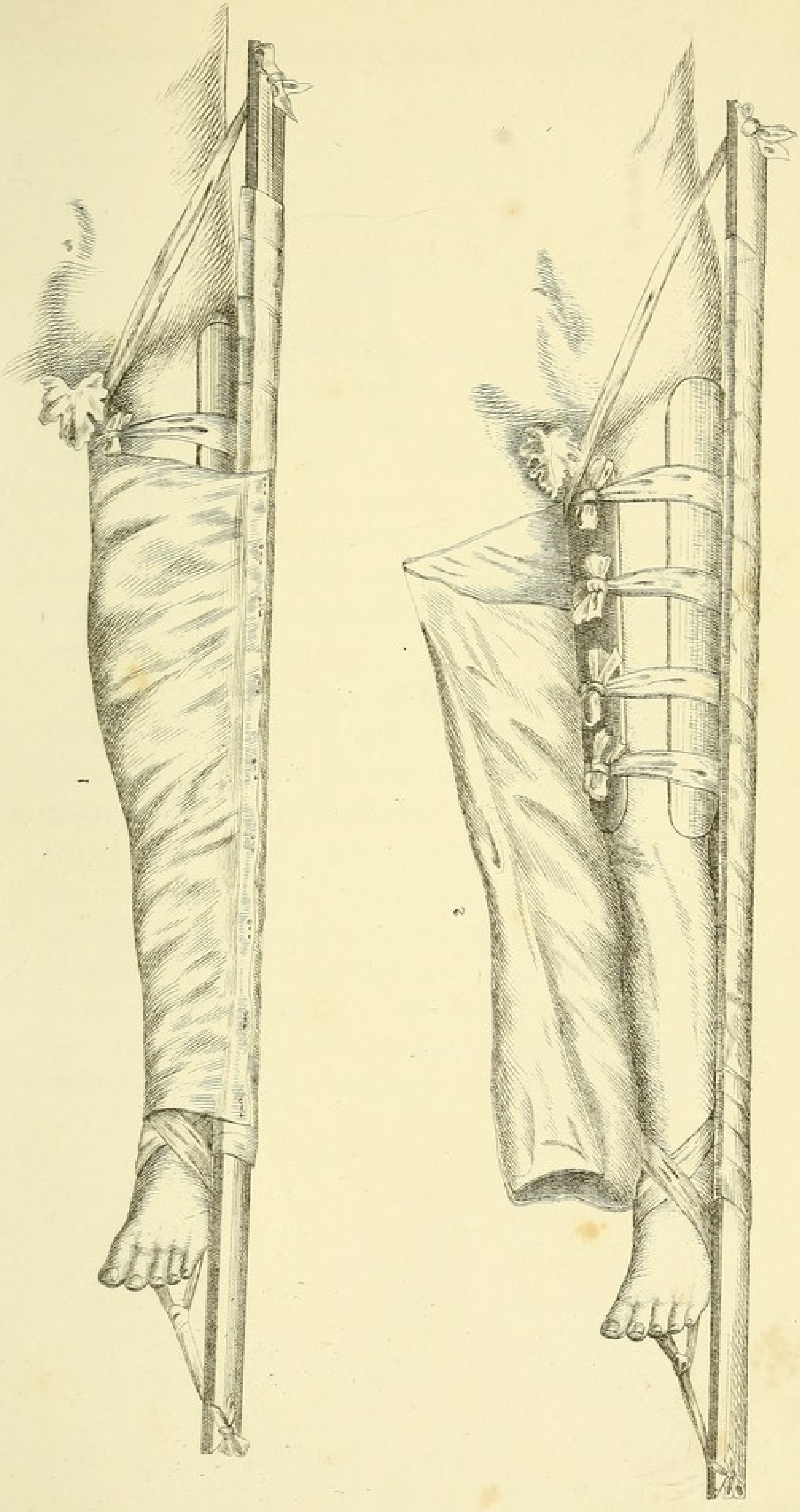

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PLATE CLVII.

Fig. 1. Application of the splint described in Plate CLV. Fig. 6. In this case the tibia was broken at its middle third.

Fig. 2. From Druitt. Splint of Desault modified. This is precisely the same as Plate CLV. Figs. 1, 2.

Fig. 3. Machine to be placed under a mattress, upon a bedstead, in order to make a sort of fracture bed. Mr. Liston, from whose book the drawing is taken, says that it is much superior to any other contrivance in the way of fracture bed or splint which he has ever seen used.

Fig. 4. Application of McIntyre's Splint. (Similar to the one in Plate CLV. Fig. 3.) Applied in case of compound fracture. The last figure referred to shows the manner of padding the splint previous to its application.

Figs. 5, 6. Treatment of Fracture of the Patella, and Dislocation of the Patella upward. Previous to the application of this apparatus, the limb must be laid straight, with a well-padded splint behind the thigh and leg, and the patient's body should be raised to a half-sitting posture, in order to relax the rectus muscle. Evaporating lotions and leeches must be used till pain and swelling abate, and then the apparatus may be applied.

PLATE CLVIII.

Figs. 1, 2. Application of Dupuytren's Splint in Case of Fracture of the Malleoli. The splint should be well padded, and applied to the side opposite the fracture. In case of fractured fibula, the foot should be inclined somewhat inward, over a fulcrum formed by the folded end of the pad, and by means of the turns of roller passed through the projecting end of the splint.

The surgeon will often find bags of sand very convenient auxiliaries in keeping fractures of the leg in proper position. In all cases of injury below the knee, the great toe should be kept in a line with the inner edge of the patella.

Fig. 3. Application of two side splints in fracture of the malleoli.

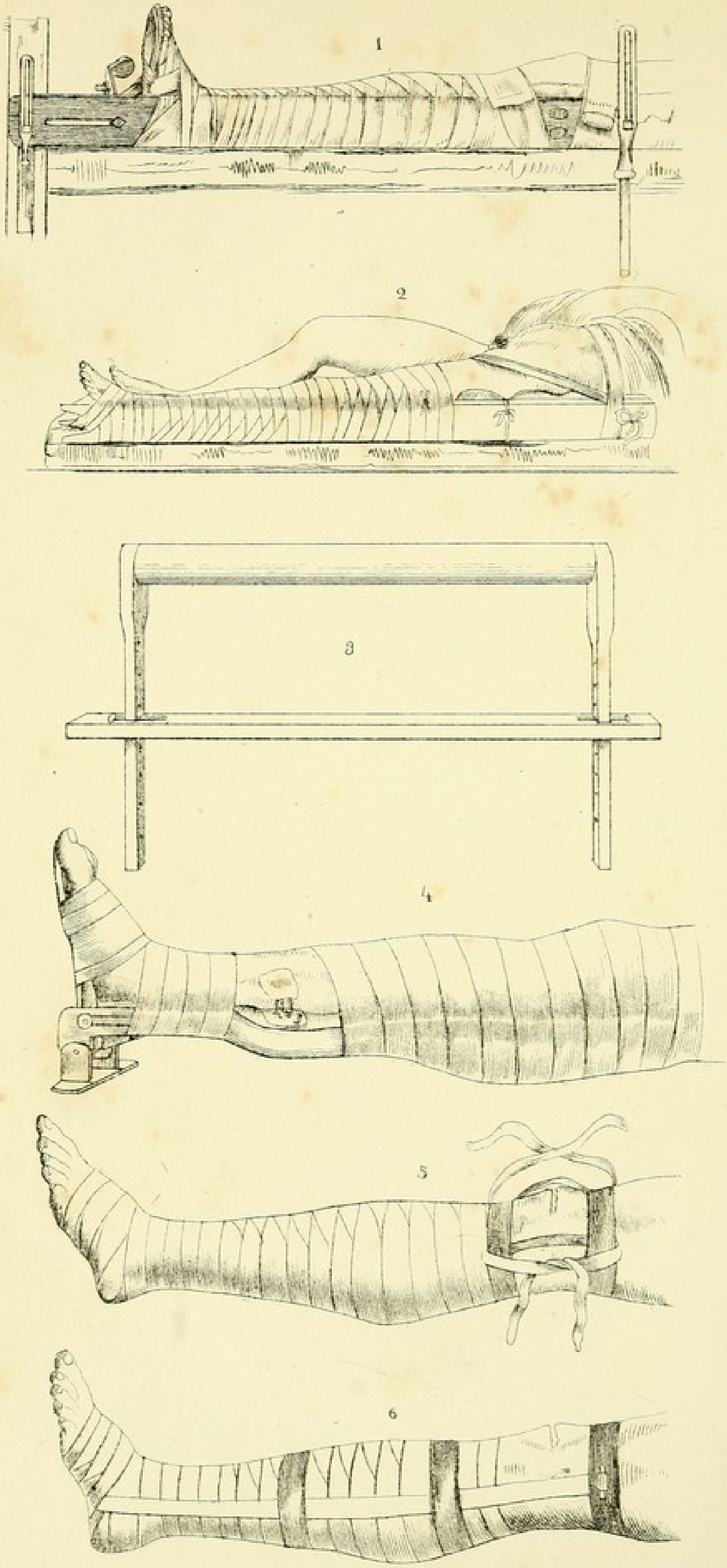
Fig. 4. Application of Starched Bandage. In simple cases of fracture of the leg, the patient may be permitted to leave his bed at the end of three or four weeks with the limb supported by the starched apparatus. First of all, a dry bandage should be applied from the foot, half way up the thigh; then a piece of stout pasteboard, softened in boiling water, should be adapted to the limb on each side, and the outer piece should be made to overlap the heel; narrow strips may be used in some cases, as in the figure. In the next place, the hollows about the ankle and tendo Achillis should be well padded with tow; and then four or five layers of roller must be put on, thoroughly imbued with mucilage of gum or starch, and, lastly, a dry roller. When this has become dry, which will be in a day or two, the patient may get up, and move to his chair; but the foot must be suspended from his neck by a sling, and he must be particularly cautioned not to attempt to move it by his own efforts.

Fractures of the foot will often be attended with so much other mischief as to render amputation expedient; but an attempt should be made to save a part of it, especially the ball of the great toe. Pasteboard splints and other contrivances must be used to preserve the proper position; and if matter forms, there should be no delay in dividing freely the dense fasciæ of the foot to let it escape.

The tuberosity of the os calcis may be broken; it will unite only by ligament. The treatment must be the same as for ruptured tendo Achillis. (Plate LXVII. Fig. 8.)

Fig. 5. Treatment of dislocated clavicle. From Sir Astley Cooper. The arm on the injured side is put in a sling.

Fig. 6. Mr. Liston's Apparatus for Fracture and Dislocation of the Clavicle, and other Injuries about the Shoulder Joint. The separate bandaging of the fingers, hand, and forearm, the position of the pads, the mode of fixing the shawl which contains the wedge-shaped axillary cushion, and the bandage surrounding the chest, are shown in the figure. In bandaging the hand, a pad of lint is first placed on the palm to fill up the hollow. A sling completes the apparatus.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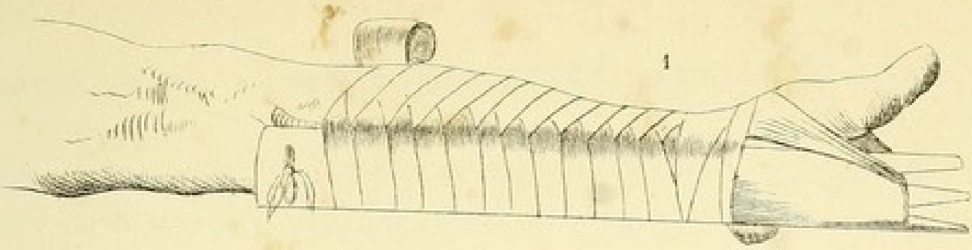

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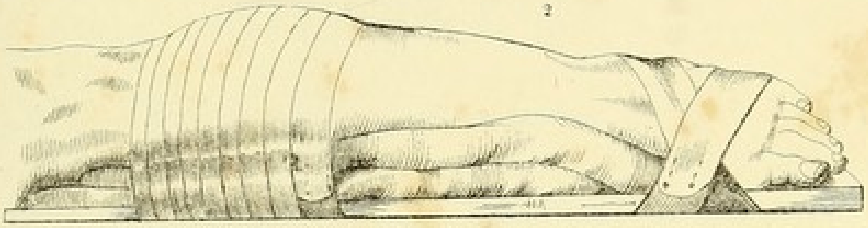

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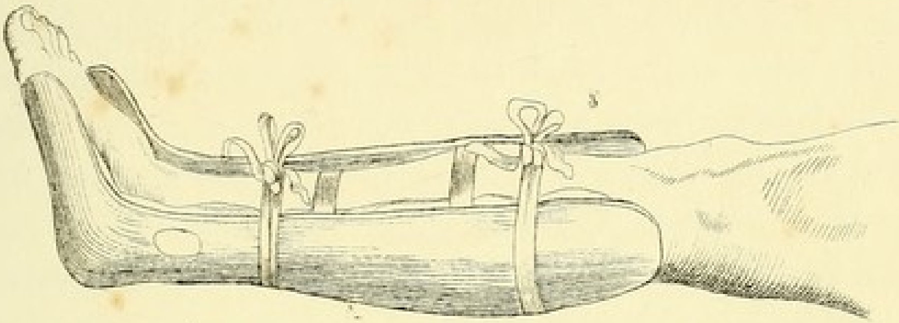

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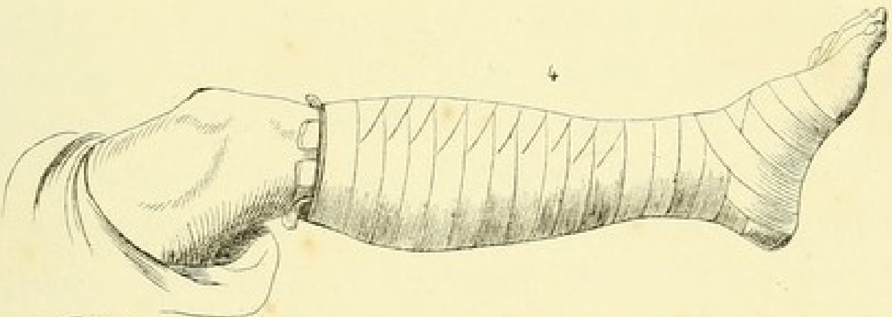

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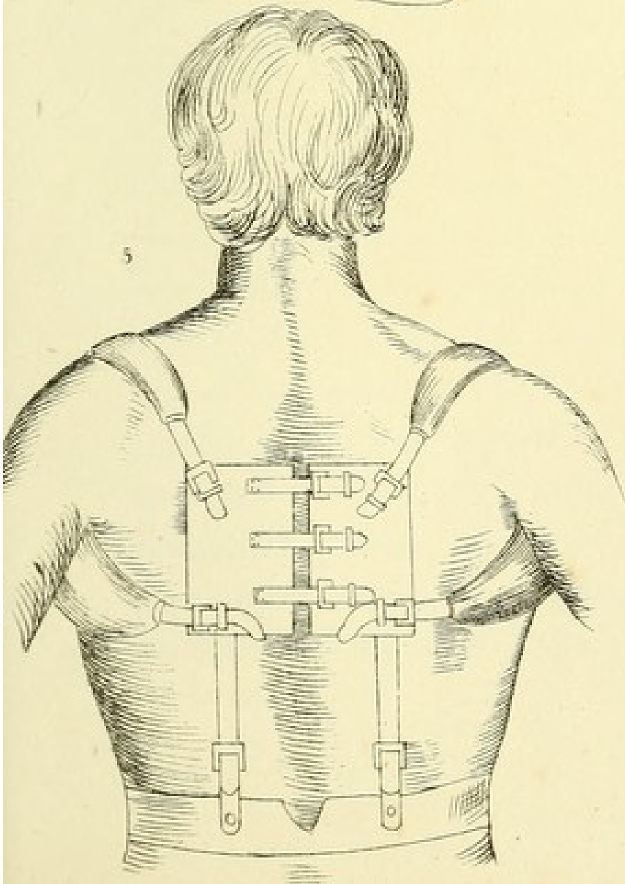

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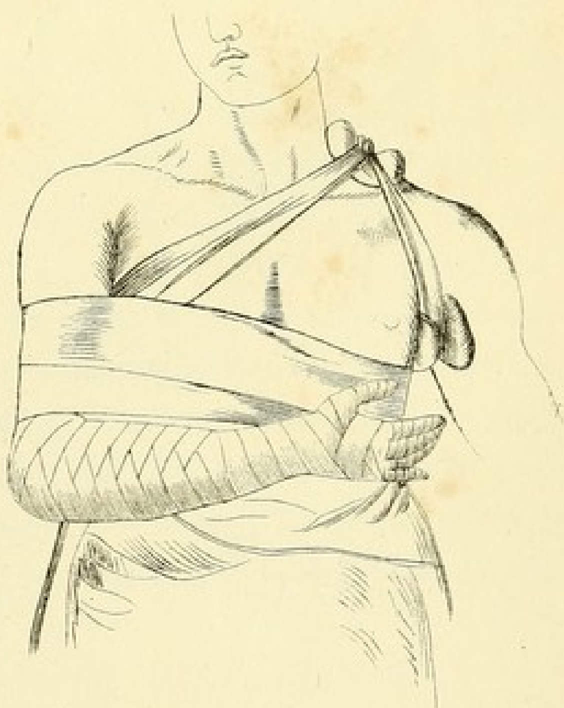


PLATE CLIX.

Figs. 1, 3. Treatment of Fracture of the Lower Jaw. A piece of pasteboard, (Fig. 3,) softened in boiling water, should be fitted to the jaw, and then a four-tailed bandage should be applied. This is made by taking a yard and a half of wide roller, and tearing each end longitudinally, so as to leave about eight inches in the middle untorn, with the exception of a short slit in it. The chin is to be put in this slit, and then two of the tails are to be tied over the crown of the head, so as to fix the lower jaw against the upper, and the other two are to be tied behind the head. The teeth on either side of the fracture may be fastened together with thread. It is useful to place a thin, wedge-shaped piece of cork between the molar teeth on each side, especially if any of the teeth at the fractured part are deficient. If a tooth falls down between the fractured parts, it should be replaced, or removed if necessary.

If this treatment does not succeed, Mr. Lonsdale's apparatus may be applied. It consists of a grooved plate of ivory to fit the teeth, and a wooden plate adapted to the base of the bone. These two plates are fastened together by screws.

Fig. 2. Treatment of Fracture above the Condyles. Case described in Plate CLI. Fig. 11. The treatment in this case consists in bending the arm, and drawing it forward to effect replacement; then a roller should be applied while it is in the bent position. The best splint for it is one formed as in the figure, the upper portion of which should be placed behind the upper arm, and the lower portion under the forearm. A splint must also be placed under the fore part of the upper arm, and both should be confined by straps. Evaporating lotions should be used, and the arm kept in the bent position by a sling. In a fortnight, if the patient be young, passive motion may be commenced to prevent anchylosis; and in the

adult, at the end of three weeks, a similar treatment may be pursued. After the most careful and judicious treatment, there is sometimes considerable loss of motion.

Fig. 4. TREATMENT OF FRACTURE OF THE CORONOID PROCESS OF THE ULNA. Case described in Plate CLI. Fig. 6. Ligamentous union takes place in these cases; the surgeon should, therefore, bring the fractured parts as near to each other as possible. The arm should be kept steadily in the bent position for three weeks.

Fig. 5. TREATMENT OF FRACTURES OF THE LOWER END OF THE HUMERUS. It will be noticed, that, in Plate CLI. Fig. 1, there is a fracture just above the articulation, which is not described in connection with the description of that figure. In that fracture, as well as most others of this extremity of the bone, and also the shaft of the bone, the apparatus shown in this figure will be applicable. A bandage is first applied to keep the fragments in place. But slight pressure is necessary for this purpose, in most instances. In the next place, a piece of pasteboard, or leather, cut at a right angle, should be applied on one side of the elbow, as in the figure, and another, of a like form, on the opposite side, and both should be retained with a bandage which should extend from the hand to the middle of the arm. If the fingers become œdematous, they should be enveloped in narrow rollers. In many instances, the swelling around the elbow will be so great, that it will be impossible, at first, to draw the bandage as tight as is represented in the sketch; indeed, a good deal must be left to the discretion of the practitioner: often it will be found necessary to temporize, until inflammation has subsided. Pasteboard and leather splints will be found the best when they are sufficiently strong; but wooden or iron splints will sometimes be preferable. Occasionally, when the condyles only are implicated, a bandage alone will keep the fragments in apposition.

Fig. 6. TREATMENT OF FRACTURE OF THE OLECRANON. If

there is much swelling and contusion, evaporating lotions and leeches should be used for two or three days; and after the inflammation is reduced, a bandage should be applied. If the swelling and inflammation do not prevent, the surgeon should place the arm in a straight position, and press down the upper portion of the fractured olecranon, until he brings it in contact with the ulna; a narrow strip of cloth should be laid on each side of the joint, a wet roller be applied above the elbow, and another below it; the extremities of the longitudinal strip are then to be doubled down over the rollers, and tightly tied, so as to keep the fractured parts in place. A splint well padded is to be applied upon the fore part of the arm, and confined by a circular bandage; the whole is to be wet frequently with evaporating lotions.

Fig. 7. Treatment of Fracture of the Upper Third of the Humerus. The lower part should be sufficiently drawn down, the upper kept in its natural place by a small pad in the axilla; a pasteboard splint about two inches and a half broad, and long enough to reach from the elbow to the acromion, should be laid on the outside of the arm, and both be retained by means of a roller, which should be first carried round the limb, and then round the chest, as represented in the figure. There is much difficulty in retaining a bandage round the chest, in a proper position, for any considerable length of time. This trouble may be avoided in these cases, and in many others, by moistening the bandage with a thick solution of starch or dextrine, at the time it is put on, which, when dry, causes the turns of the roller to adhere firmly to each other, and prevents their being displaced, either by movements of the patient, or by his dress.

PLATE CLX.

Figs. 1, 2, 3. Lumbar Abscess arises from those diseases of the spine causing curvature. Psoas abscess is produced by the same causes. Sometimes these abscesses point low down the back, when they are called lumbar abscesses. Sometimes the matter makes its way between the abdominal muscles, and may point at any part of the abdominal parietes. Sometimes it enters the sheath of the psoas muscle, passes downward in the sheath, causes absorption of the muscle, and points below Poupart's ligament, forming a tumor, which diminishes or disappears when the patient lies down, and receives an impulse on coughing. This is called psoas abscess.

Diagnosis. Psoas abscess may be known from aneurism by the precursory pain and weakness in the back, and by its disappearance when the patient lies down.

Psoas abscess resembles femoral hernia in dilating on coughing, and diminishing when the patient lies down. The points of distinction are, that it is generally more external; that it fluctuates, but does not feel tympanitic; and is attended with symptoms of disease of the spine.

Treatment. If these abscesses enlarge in spite of the issues and other measures directed against the vertebral disease, they must be treated in the following manner: A small puncture should be made at the most depending part of the tumor. As much matter as flows spontaneously should be permitted to escape, and then the puncture should be carefully closed by lint and plaster, and the patient be kept at rest till it is healed. During the flow of matter, the greatest care should be taken to prevent the admission of air into the sac. This operation may be repeated at proper intervals, taking care not to let the abscess become as much distended as it was before the previous puncture, and using moderate support by bandages in the intervals. This course, combined with proper constitutional treatment, will in some cases produce a cure.

Mr. Bonnet has suggested that the part in which the abscess is situated might be immersed in water at the time it is punctured. This would, of course, render the ingress of air impossible.

If air has gained entrance to the cavity of the abscess, and the pus has become putrid, and prostration of strength, and a dry, brown tongue show its influence upon the system, then the indications plainly are, to make free openings and counter openings, so as to prevent all lodgment of the putrid pus; and to wash out the sac occasionally with injections of warm water, containing a very little of the solution of chloride of soda. At the same time, the general treatment of typhoid fever must be adopted, and the strength be supported by wine, nourishment, opium, &c.

Figs. 4, 7. FRACTURE AND DISLOCATION OF THE SPINE. Dislocation of the spine without accompanying fracture is rare, except in the cervical region; but it occasionally does occur, even in the lumbar and dorsal regions.

TREATMENT. 1. If there be any displacement, an attempt may be made to reduce it by extension. In partial dislocations of the neck, however, the trial should be made very cautiously, as instant death has been known to follow. 2. The patient must be kept at perfect rest in the horizontal posture, and the greatest care must be taken to prevent or delay gangrene of the nates. The urine must be drawn off by the catheter, and the bowels be kept open by enemata. Tonics and muriatic acid may be given to support the strength, and obviate the derangement of the urine. The tympanitic state of the belly may be relieved by rubbing it with camphor liniment. 3. Bleeding in some cases may be employed, but as a general rule it is inadmissible.

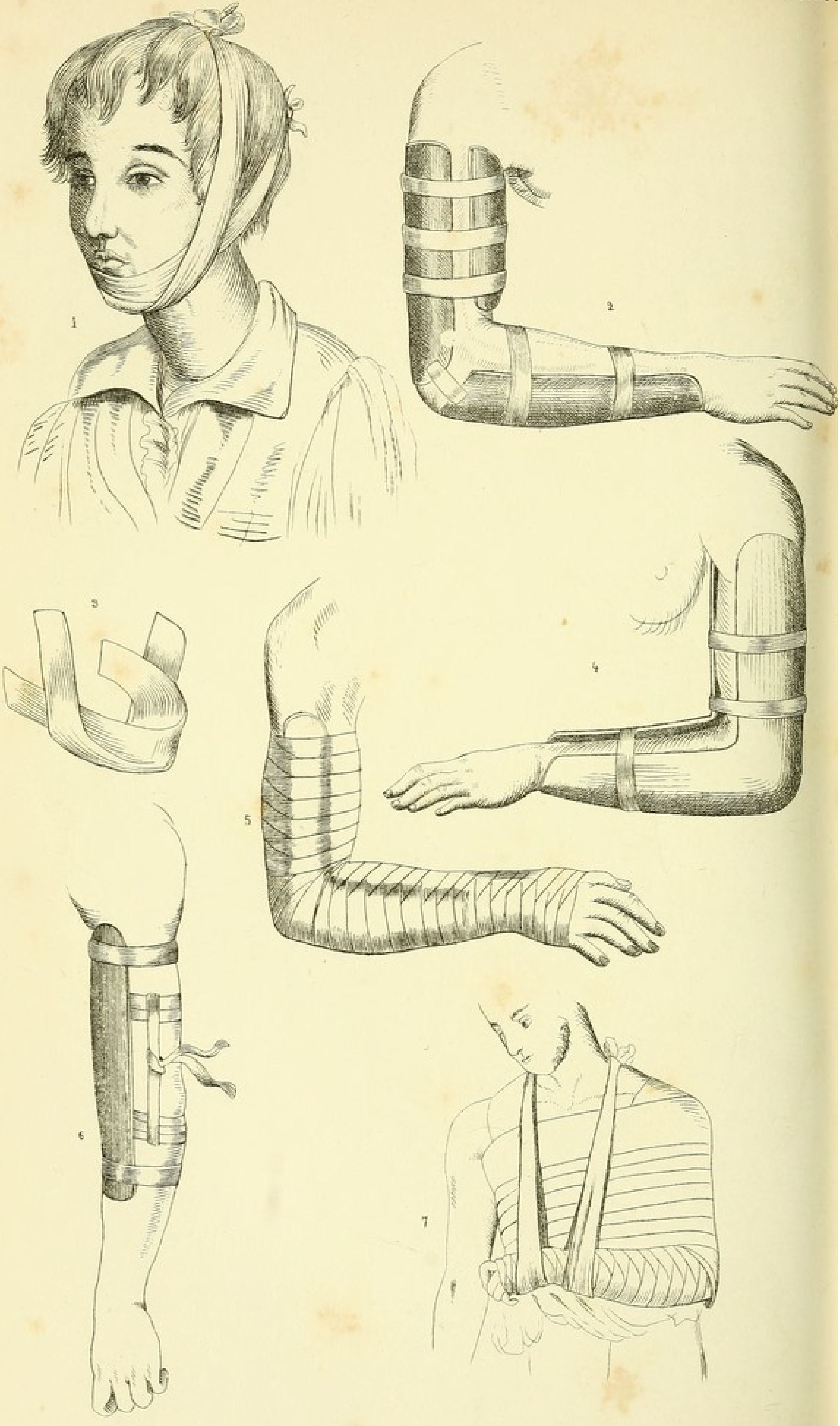
Figs. 5, 6. HIP JOINT DISEASE. The chief characteristics of this disease are certain alterations which occur in the length of the limb. In the first stage, the diseased limb acquires an apparent increase in length. At a subsequent stage, the limb becomes apparently shortened, as in Fig. 5. If the disease goes on, it is succeeded by another kind of shortening, caused either by the destruction of the neck of the femur by caries, or by destruction of the acetabulum and capsular ligament, and dislocation of the bone upward by contraction of the muscles, (Fig. 6.) This shortening is usually followed by abscess, which may burst in the thigh or the groin, or the acetabulum may be perforated, allowing the matter to pass into the pelvis, and burst into the rectum.

Diagnosis. The severe pain caused by pressing the femur against the acetabulum distinguishes this disease from sciatica; it may be distinguished from inflammation of the synovial membrane of the hip by the fact, that the pain in the latter complaint is referred to the upper and inner part of the thigh, and is not aggravated by standing on the limb.

Treatment. This must be the same in principle as the treatment of other diseased joints. If the patient comes under treatment in the earliest stage, the limb should be kept at perfect rest in the straight posture, by means of a straight splint reaching from the axilla to the foot. If distortion has already commenced, a leather or starched bandage should be applied, and the patient should not be permitted to lie constantly on the sound side, for distortion of the spine, and the chance of dislocation, are thereby enhanced. Cupping will be of great service in the early stages. But the principal dependence is to be placed upon the proper constitutional treatment, and counter irritation by means of an issue behind the great trochanter, or at the interior edge of the tensor vaginæ femoris, or by a seton in the groin; and these measures should not be neglected, even though suppuration has commenced.

When abscess forms, it should not be opened too early; and when it is opened, it should be done in a manner similar to that recommended for lumbar abscess. This plan of treatment, however, Sir B. Brodie does not believe to possess any advantage. Excision of the head of the femur was successfully performed by Mr. White, in 1818, and by Mr. Fergusson, in 1841, in cases that would, no doubt, have otherwise terminated fatally; but, as Mr. Fergusson confesses, the bones of the pelvis are often so extensively diseased as to preclude the possibility of a cure by this operation.

Mr. Fergusson's case is shown in Plate LXV. Fig. 1, and the manner of treatment after the operation in Plate CLV. Fig. 5.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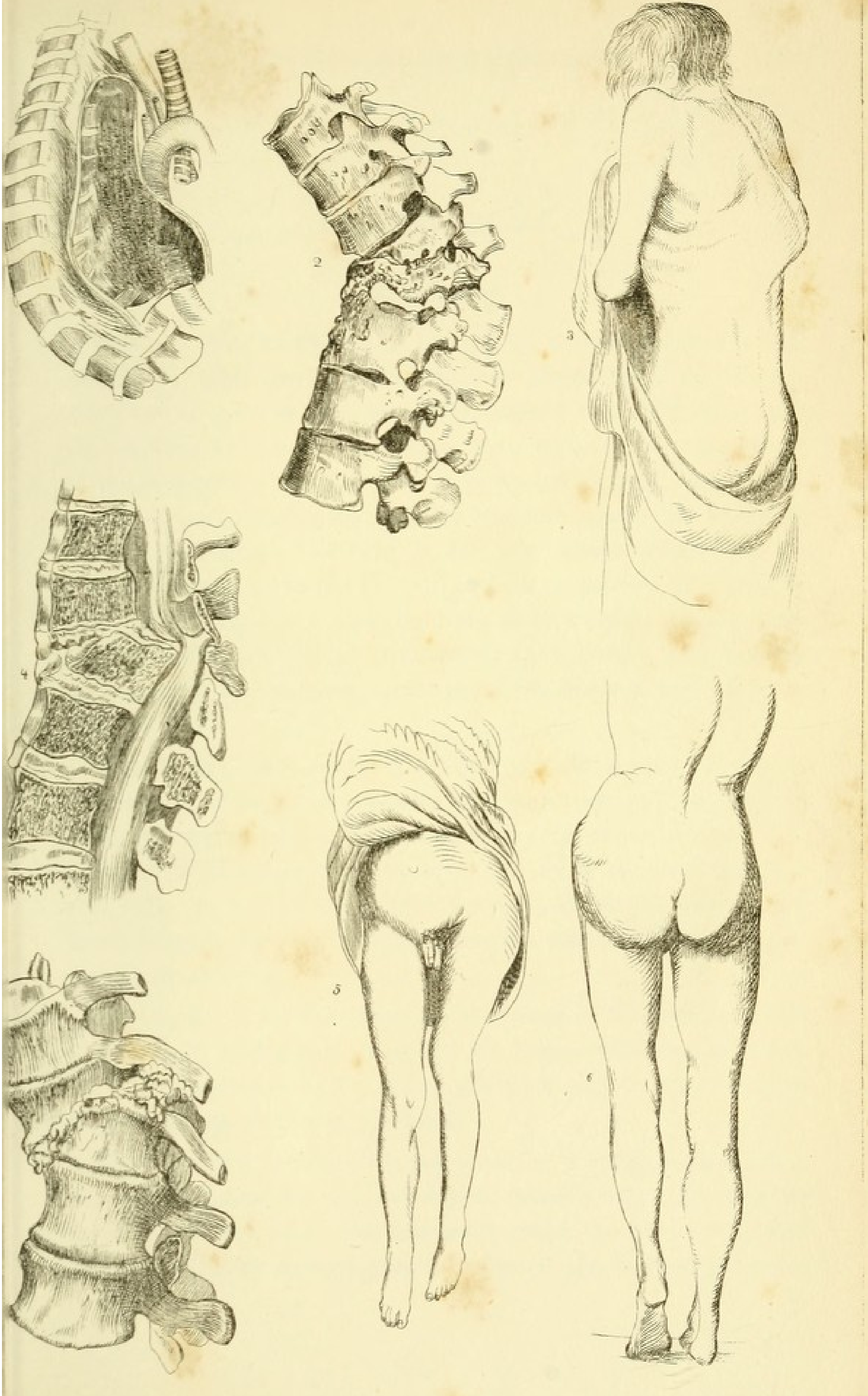
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PLATE CLXI.

Bandaging.

Fig. 1. The Capelina is formed by a double-headed roller, (Fig. 8.) The centre of the roller is placed upon the occiput. After two or three circles, the rollers intersect with each other upon the forehead and occiput, one being then reflected over the vertex to the forehead, while the other is continued in a circular course. They next cross each other upon the forehead, where the first head is carried obliquely backward to the occiput, and reflected by the side of the other; the last is continued in a circular direction, but the first is again brought over the head, and carried in this way backward and forward till the head is entirely covered. This bandage was used by the ancients to compress the heads of hydrocephalic patients.

Figs. 2, 14. The Six-tailed Bandage is formed of a piece of cloth a yard long, and a quarter of a yard wide, split at each end, as in Fig. 14, to within three fingers' breadth of the centre. The centre of the bandage is placed upon the top of the head, the anterior tails are tied at the back of the neck, the middle tails are fastened beneath the chin, and the posterior ones round the head, as seen in the drawing.

Figs. 3, 15. The Four-tailed Bandage of the head is formed of a strip of cloth a yard long, and six inches wide, torn as in Fig. 15. It is applied as in Fig. 3; its direction may be changed so as to press on any portion of the head.

Fig. 4. The Monacle is composed of a single-headed roller, four or five yards long, and two fingers' breadth wide. In applying it, two horizontal turns are first made round the head; it is then brought obliquely upward over the affected eye, and carried a few

turns in the same direction, and then horizontally, as seen in the figure.

Fig. 5. THE NODOSE BANDAGE is composed of a double-headed roller, first carried horizontally round the head, and made to meet over the wounded artery, where the two ends cross each other, and are then carried, the one over the head, the other under the chin, till they meet at the point of crossing, where they are again twisted and carried horizontally. This process is continued until the whole bandage is applied.

Fig. 11. THE DOUBLE T BANDAGE is formed as seen in the figure. It is applied as in Fig. 6. The horizontal portion is tied behind. The two parts which pass over the head are carried under the horizontal band behind, and reflected upward, and secured with pins.

Fig. 7. MANY-TAILED BANDAGE. This is made, as seen in the figure, by sewing narrow strips of cloth to a piece which they cross at right angles. It is applied as seen in Plate CLXII. Fig. 7.

Fig. 8. Double-headed roller.

Fig. 9. Single-headed roller.

Fig. 10. Maltese cross; to be applied over the stump of a member, after amputation.

Fig. 11. Double T bandage.

Fig. 12. Bandage for prolapsus ani.

Fig. 13. Single T bandage.

Fig. 14. Six-tailed bandage.

Fig. 15. Four-tailed bandage.

PLATE CLXII.

BANDAGING.

Fig. 1. BANDAGE FOR THE HAND. A bandage about two inches wide may be passed, in a figure of 8 form, round the hand and wrist, excluding the thumb, and may be fastened by one or two turns round the wrist.

Fig. 2. BANDAGE FOR THE FINGER. This is a simple strip of cloth, split at one end for the convenience of fastening. The two tails may be turned opposite ways round the finger, and tied.

Fig. 3. BANDAGE FOR THE FOREARM. After carrying the bandage round the hand and wrist, as in Fig. 1, carry it up the forearm, and at every turn fold the bandage back upon itself, in such a way that it may lie smoothly upon the limb.

Fig. 4. BANDAGE FOR THE FOOT AND THE LEG. The roller must be first passed round the metatarsus, and then be carried up round the ankle, and back again, as in the figure. The bandage should always be brought up on the inner side of the instep, in order to support the arch of the foot. After the foot and ankle have been well enveloped, let the bandage be carried up the leg, and be turned upon itself on the calf, in order that it may lie closely, and the folds not be separated.

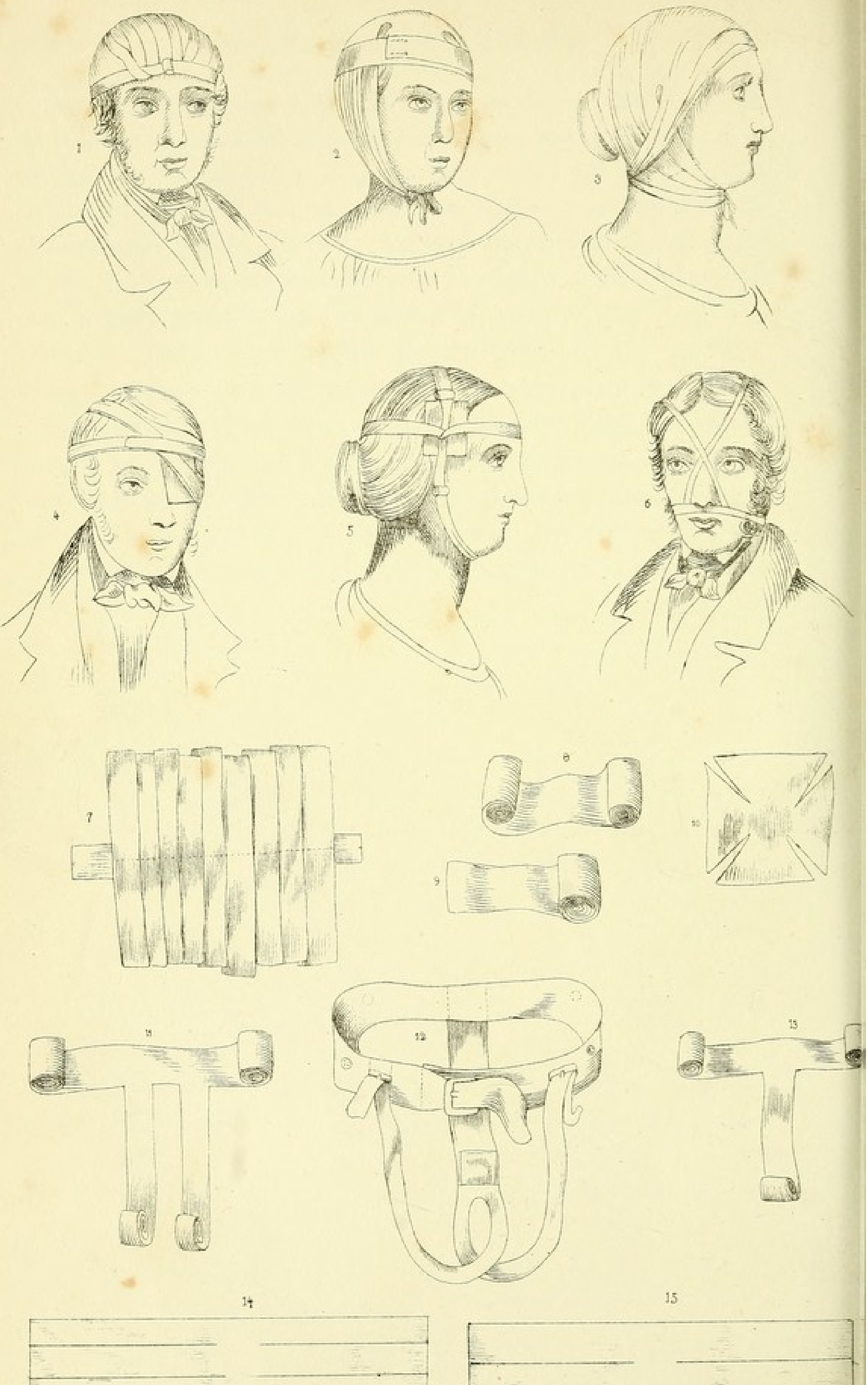
Fig. 6. BANDAGE FOR THE KNEE, to keep on dressings, or to give slight support. A piece of cloth, a yard and a half long and eight or nine inches wide, is split up in the middle, at each end, to within a few inches of the centre. The centre being then placed on the patella, the four tails are brought under the knee, crossed, and tied two and two.

Fig. 5. BANDAGE FOR THE ARM, after venesection.

Fig. 7. Many-tailed Bandage, applied to the Leg. In the first place, a strip of cloth is prepared long enough to reach from the knee to the foot, and overlap one third of the leg besides. The strips that surround the leg should be half as long again as the circumference of that part of the leg they are to encircle, and should be attached to the longitudinal strip in such a manner that each shall overlap one third of the preceding one.

Fig. 8. Figure of 8 bandage for the knee.

Fig. 9. Duncan's Bandage for Fracture of the Scapula. The body of the bandage is about a yard long. The elbow is fixed in the hole; the smaller strips pass back and front of the chest, and are buckled over the opposite shoulder; and the broad part is buckled round the chest, confining the arm to the side. The whole, being in one piece, cannot slip, and is very available for children.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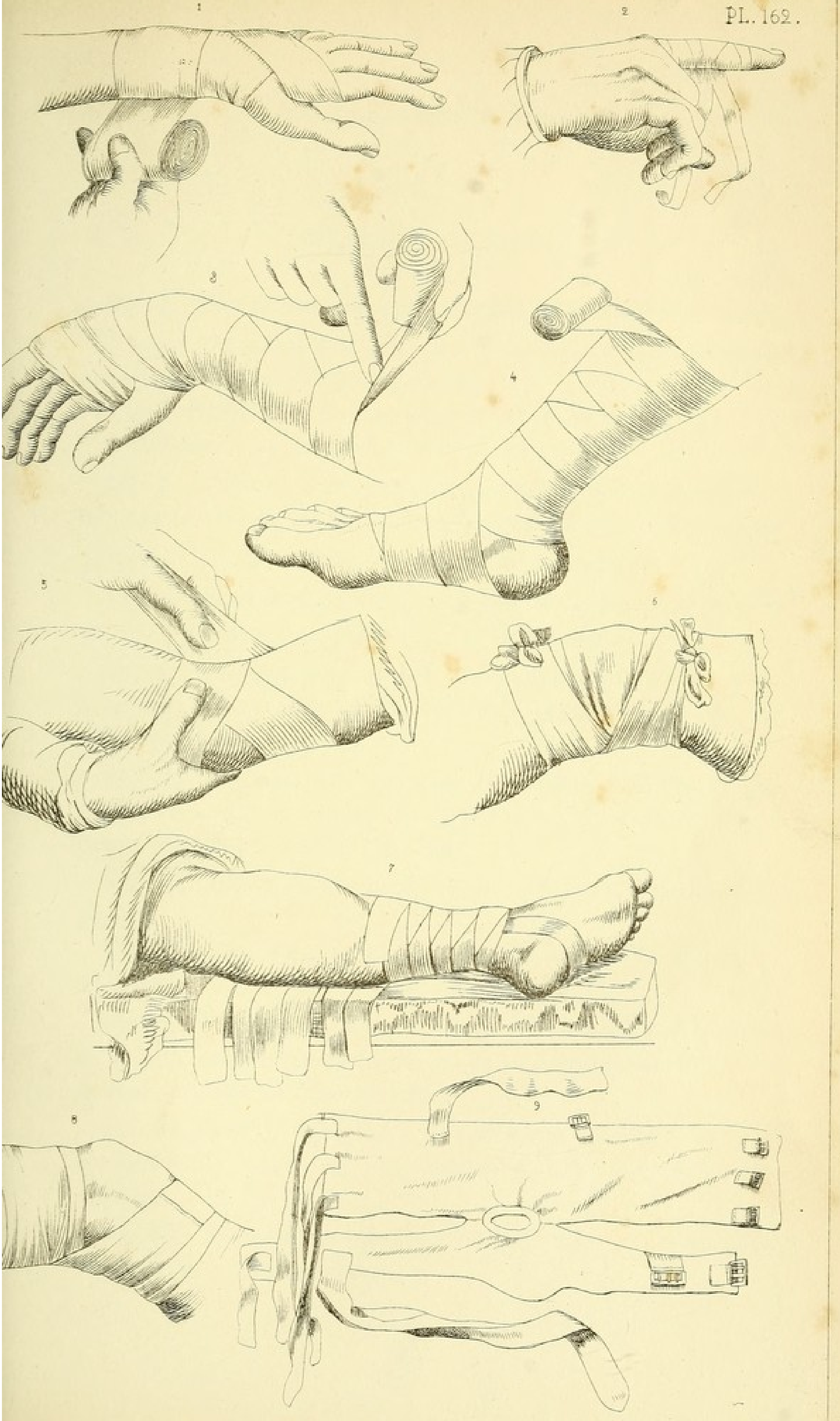
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PLATE CLXIII.

Fig. 1. Encanthis is a tumor situated in the corner of the eye.

Fig. 2. Pterygium is a disease characterized by a thickened and vascular state of the conjunctiva.

Fig. 3 exhibits the healing stage of an ulcer of the cornea.

Fig. 4 shows an encysted tumor of the eyelids.

Fig. 5. Fistula Lachrymalis signifies a fistulous aperture at the inner corner of the eye, communicating with the lachrymal sac.

Figs. 6, 9. Ectropion, or eversion of the eyelids.

Fig. 7. Myocephalon is a protrusion of a very small piece of the iris through an ulcerated opening in the cornea.

Fig. 8. Staphyloma of the Cornea is said to exist when a portion or the whole of the cornea is prominent, opaque, and white, the iris adhering to it.

Fig. 12. Staphyloma racemosum. When the iris is protruded at several openings, the appearance is somewhat like a bunch of grapes; whence the name.

Fig. 10. Central Opacity of the Cornea, concealing the pupil.

Fig. 13. The same as in Fig. 10, with the pupil dilated by belladonna.

Fig. 11. Conical Cornea. In this affection, tne cornea seems to become weak in its structure, so as to bulge out under an increased secretion of aqueous humor.

Fig. 14. Total Spherical Staphyloma. In this case, vision is entirely gone; but a perception of light and shade, &c., remains.

Fig. 15. Congenital Fissure of the Iris. In these cases, vision is, in general, unimpaired.

PLATE CLXIV.

Fig. 1. A CASE OF PHLYCTENULAR OR SCROFULOUS OPHTHALMIA, in which there is a burst phlyctenula on the cornea, with a fasciculus of vessels running from the conjunctiva into it.

Fig. 2. GRANULAR STATE OF THE CONJUNCTIVA in Egyptian ophthalmia.

Fig. 3. CATARRHAL INFLAMMATION of the conjunctiva.

Fig. 4. HYDATID in the anterior chamber of the eye.

Fig. 5. MEDULLARY FUNGUS of the eyeball, in its second stage.

Fig. 6. IRITIS.

Fig. 7. DISLOCATION OF THE LENS into the anterior chamber of the eye.

Fig. 8. SCLEROTIC STAPHYLOMA, from traumatic inflammation of the eye.

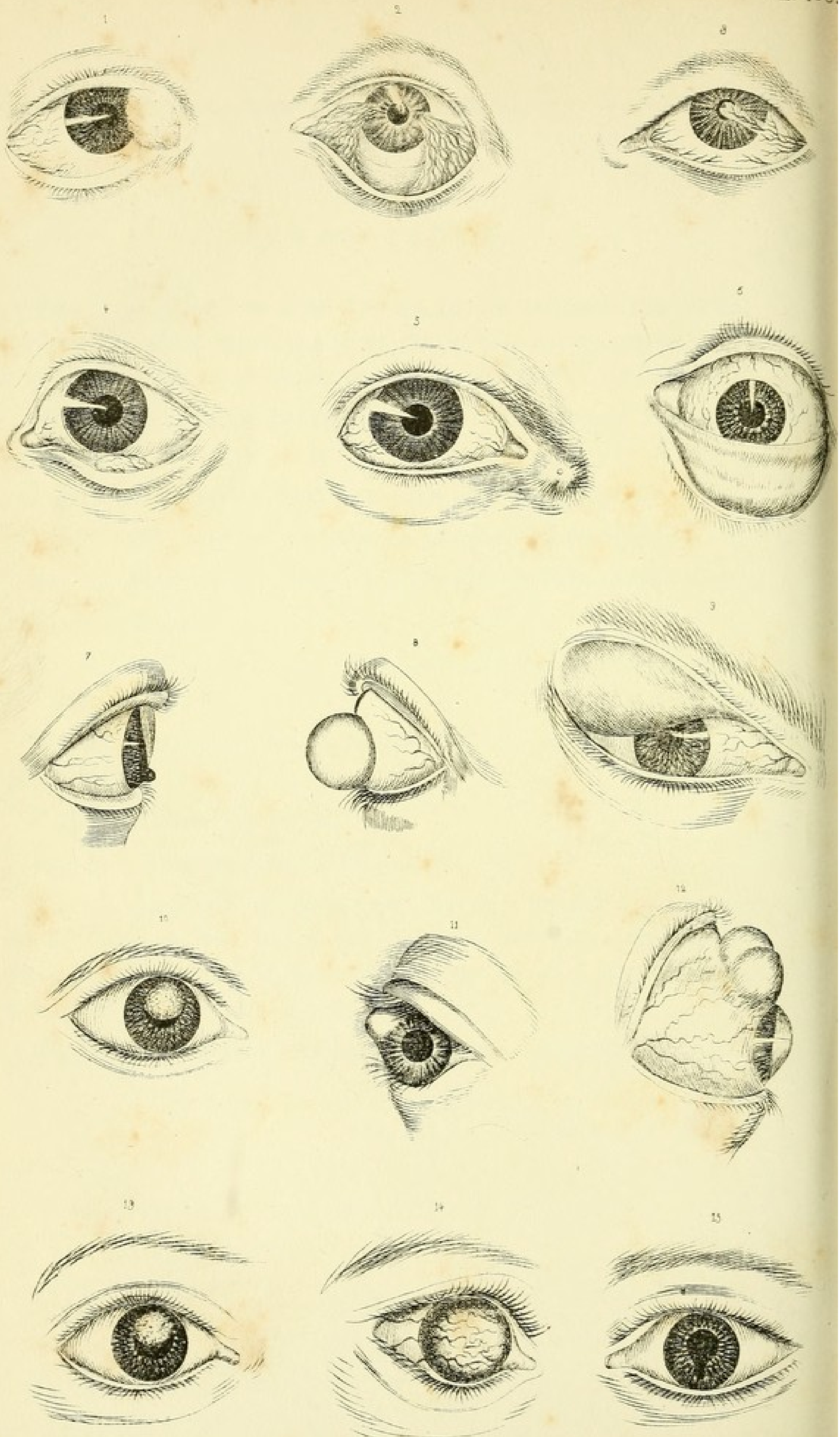
Fig. 9. ARTHRITIC IRITIS.

Fig. 10. CYST in connection with the iris.

Fig. 11. A CASE OF MELANOSIS OF THE EYEBALL, in which the iris has been detached at one part of its circumference, and the black mass is making its appearance from behind, as, also, through the sclerotica, near the cornea.

Fig. 12. ARTHRITIC POSTERIOR INTERNAL OPHTHALMIA.

PL. 163.



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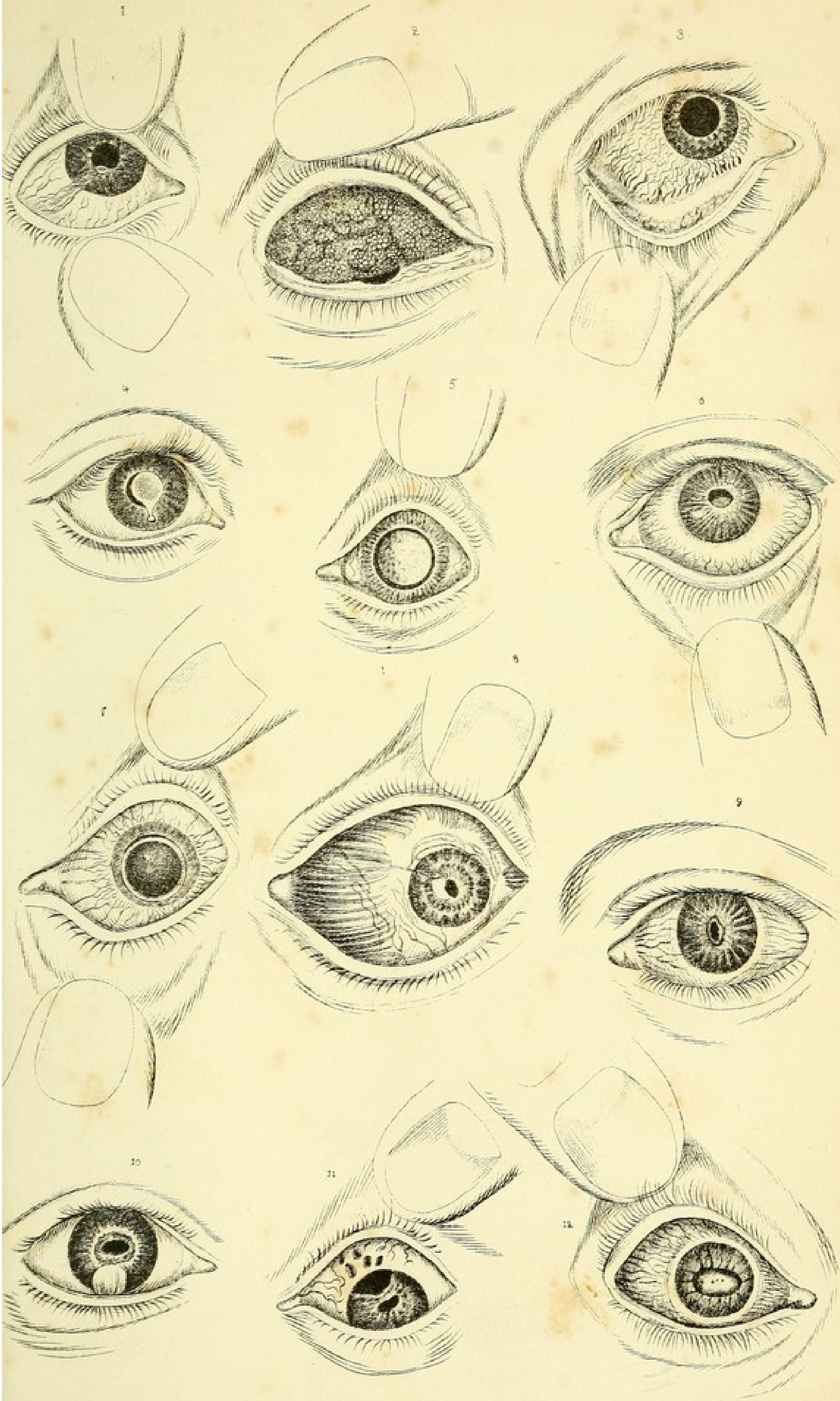

PLATE CLXV.

Fig. 1. Central cataract. From Demours.

Fig. 2. Capsulo-lenticular cataract. From Demours.

Fig. 3. Complete lenticular cataract. From Demours.

Fig. 4. Capsulo-lenticular cataract in a man sixty-two years of age.

Fig. 5. Capsulo-lenticular cataract in a man aged eighty-three years.

Fig. 6. Black cataract.

Fig. 7. Hypopion, (oculus purulentus.)

Fig. 8. Opacity of the crystalline lens, which has spontaneously burst its adhesion, and fallen nearly behind the iris. From Demours.

Fig. 9. Capsulo-lenticular cataract in an infant.

Fig. 10. Oval pupil, caused by iritis following a blow.

Fig. 11. Hypopion, following iritis. Two little abscesses are seen, formed in the thickened iris. The pupil is deformed, and nearly obliterated.

Fig. 12. Puncture of the anterior chamber of the eye.

Fig. 13. Artificial pupil. From Blasius.

Figs. 14, 15. Artificial pupils. From Demours.

PLATE CLXVI.

Fig. 1. Trichiasis and Districhiasis. Trichiasis is a growing in of the eyelashes against the eyeball, the border of the eyelid remaining in its proper position. Districhiasis, again, is merely a variety of trichiasis, in which the misdirected eyelashes are disposed, though not very regularly, in a row, distinct from the others, which remain properly directed.

Fig. 2. An eye with the eyelids divided vertically, and the outer halves everted, to show the orifices of the ducts of the lachrymal gland, in which the hairs are inserted. Along the border of the eyelids are observed the Meibomian apertures.

Fig. 3. Artificial pupil. From Blasius.

Figs. 5, 4. Sir William Adams's Operation for Ectropion. The breadth of the piece necessary to be excised being duly calculated, the eyelid is to be seized hold of, at the place, with the forceps, and drawn from the eyeball. Then, with a pair of strong, straight scissors, the surgeon cuts out the piece at two strokes, the first being made on the left-hand side of the forceps, and the second on the right-hand side. After the excision of the piece, the eyelid is to be restored to its proper position, and the edges of the wound to be united by the harelip suture. The pins are to be inserted, and brought out at some distance, — about one tenth of an inch from the edges of the wound, — and must not implicate the conjunctiva. The first pin introduced should be close to the ciliary margin of the lid, in order to insure evenness at this place. Lastly, the eyelid is to be supported by strips of plaster, and a compress and bandage.

Fig. 6. T. W. Jones's Operation for Ectropion, caused by a burn. In this case, two converging incisions were made through the skin, from over the angles of the eye, upward, to a point where they meet, somewhat more than an inch from the adherent

ciliary margin of the eyelid. By pressing down the triangular flap, thus made, and cutting all opposing bridles of cellular tissue, — but without separating the flap from the subjacent parts, — the surgeon was able to bring down the eyelid nearly into its natural situation, by the mere stretching of the subjacent cellular tissue. A piece of the everted conjunctiva was snipped off; the edges of the gap left by the drawing down of the flap were next brought together by suture, and the eyelid was retained in its proper place by plasters, compress, and bandage. In the case from which the figure was taken, there is some slight variation of the incision at the top.

Fig. 9 shows the eye after the parts had healed.

Fig. 7. Transplantation of a Flap of Skin from the Temple and Cheek. When, after the separation of unnatural adhesions, the extirpation of a cicatrix, or the division of the simply contracted skin, the gap left by the reinstatement of the eyelid in its natural position is very considerable, attempts have been made to transplant a portion of skin from some neighboring part into it. The flap of skin to be transplanted is usually taken from the temple when the upper eyelid is the subject of the operation; from the cheek in case of the lower eyelid, and is made of a form corresponding with the gap, but of a size somewhat exceeding it, in order to allow for the contraction which subsequently takes place. The flap, previously measured and traced in outline, is raised, by dissection, with as much of the subjacent cellular tissue as possible, but is still left in connection with the body by a slip, as broad, at least, as itself. After all bleeding has ceased, and after removing any clotted blood that may be in the gap in the eyelid, or adhering to the flap, the latter is to be so transposed that it may be adjusted to the former, to the edges of which it is to be fixed by stitches, strips of plaster, and bandage. The wound in the temple, or cheek, from which the flap was removed, is to be closed by bringing its edges together if possible; if not, it is to be allowed to granulate, and heal in the ordinary way.

Fig. 8. Ectropion from Caries of the Orbit. In this

case, the cicatrix occasioned by the healing of the ulcer causes the eversion of the eyelid. The operation consists in dissecting out the cicatrix, which sets the lid at liberty. The wound is closed by stitches, (Plate CLXVII. Fig. 3,) and treated as in the preceding cases.

Fig. 10. Operation for Ectropion; the Flap taken from one Side. Dieffenbach's Operation. This is commenced by extirpating the cicatrix and degenerated skin, the incision being made so that a triangular wound may be left, having the base towards the margin of the eyelid. The tarsus, if present, is to be carefully preserved; but if the whole eyelid is gone, whatever of the conjunctiva remains is to be detached from the margin of the orbit, and dissected up a little towards the eyeball, in order that it may afterwards be adopted as a lining to the new eyelid. From the outer extremity of the base of the triangular wound, an incision through the skin is to be carried towards the temple, or cheek, according as the upper or lower eyelid is to be repaired, the length of which incision must be somewhat greater than that of the base of the triangular wound of the eyelid. Beginning at the temporal extremity of this horizontal incision, another is to be made downward if it is the lower eyelid which is to be restored, upward if it is the upper eyelid. This second incision is to run not quite parallel with the outer edge of the triangular wound, but slightly approximating to its apex, on a level with which it is to terminate.

The flap of skin thus circumscribed is to be raised up by dissection along with its subjacent layer of fat and cellular tissue. After the bleeding has ceased, the flap and the triangular wound are to be carefully freed from coagula, and the former so transposed that it may fill up the latter. The flap is now secured in its new position, first, by a stitch at the inner angle of the eye. Its palpebral edge is then to be united by four stitches to the tarsus, if present, or, if this has been lost, with the conjunctiva at its cut margin. Lastly, the inner edge of the flap is united to the skin, forming the inner boundary of the triangular wound, by means of the twisted suture. The wound in the temple or cheek left by the removal of the flap of skin is to be dressed with charpie; and over the whole several strips of adhesive plaster are laid, in order to keep the transposed flap accurately adjusted in its new situation. Cold water dressings are then to be applied. Instead of taking the flap wholly from one side, a part may be taken from one side and a part from the other. The two parts are then to be united in the middle by the harelip suture.

Figs. 12, 11. WALTHER'S OPERATION FOR EVERSION OF THE EYELIDS, caused by cicatrices. In this case, the tarsal edges of both eyelids are excised, together with the commissure, and a triangular piece of the neighboring integument of the temple, the base being towards the eye, and the apex towards the ear. The edges of the wound are then united by two sutures.

PL. 165

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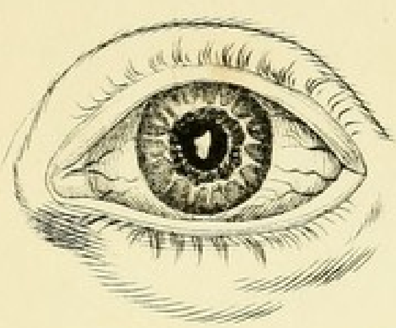

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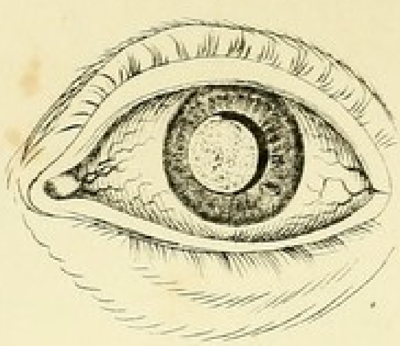

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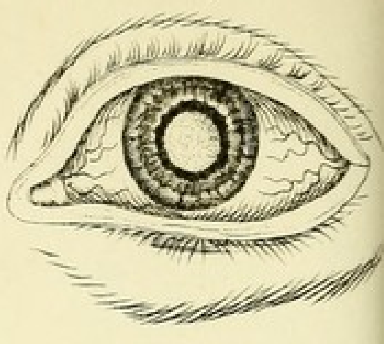

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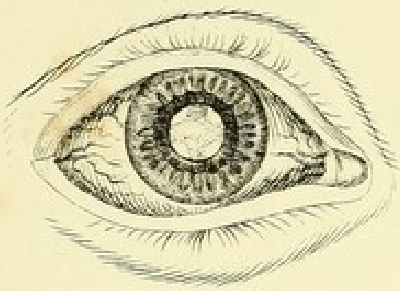

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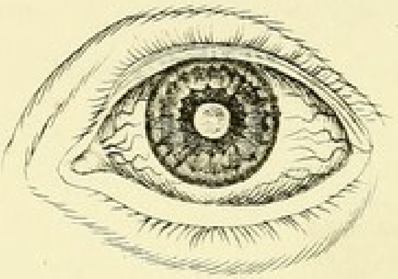

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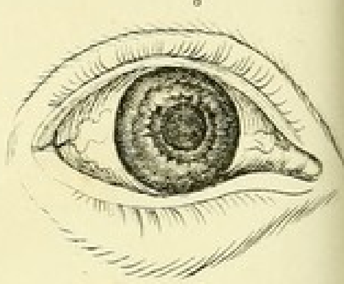

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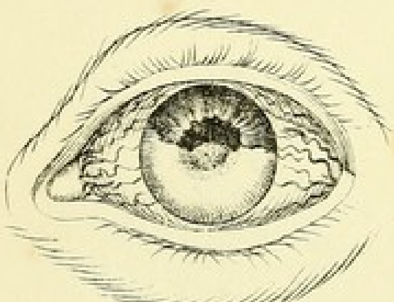

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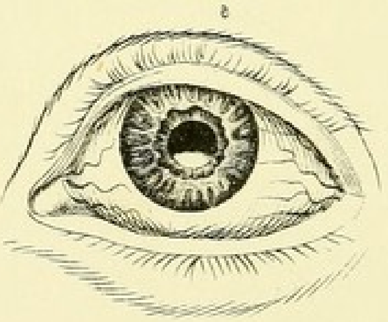

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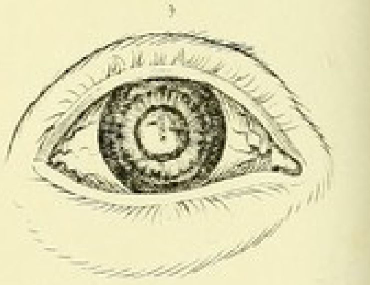

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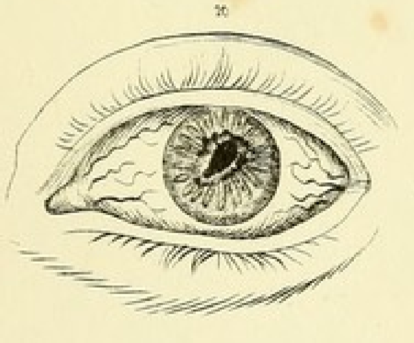

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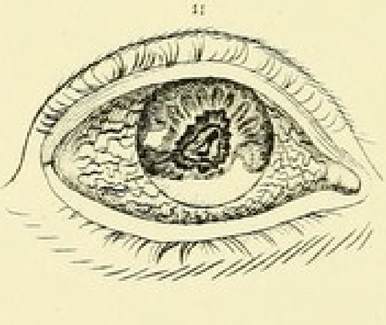

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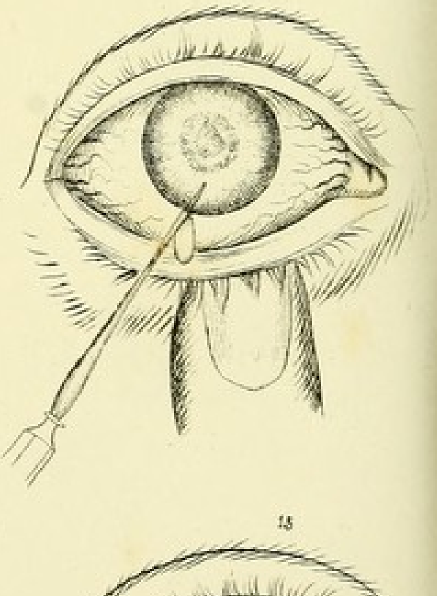

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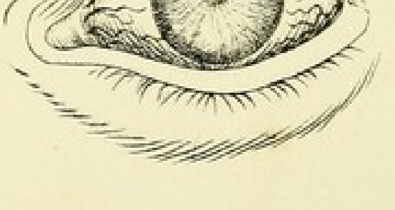

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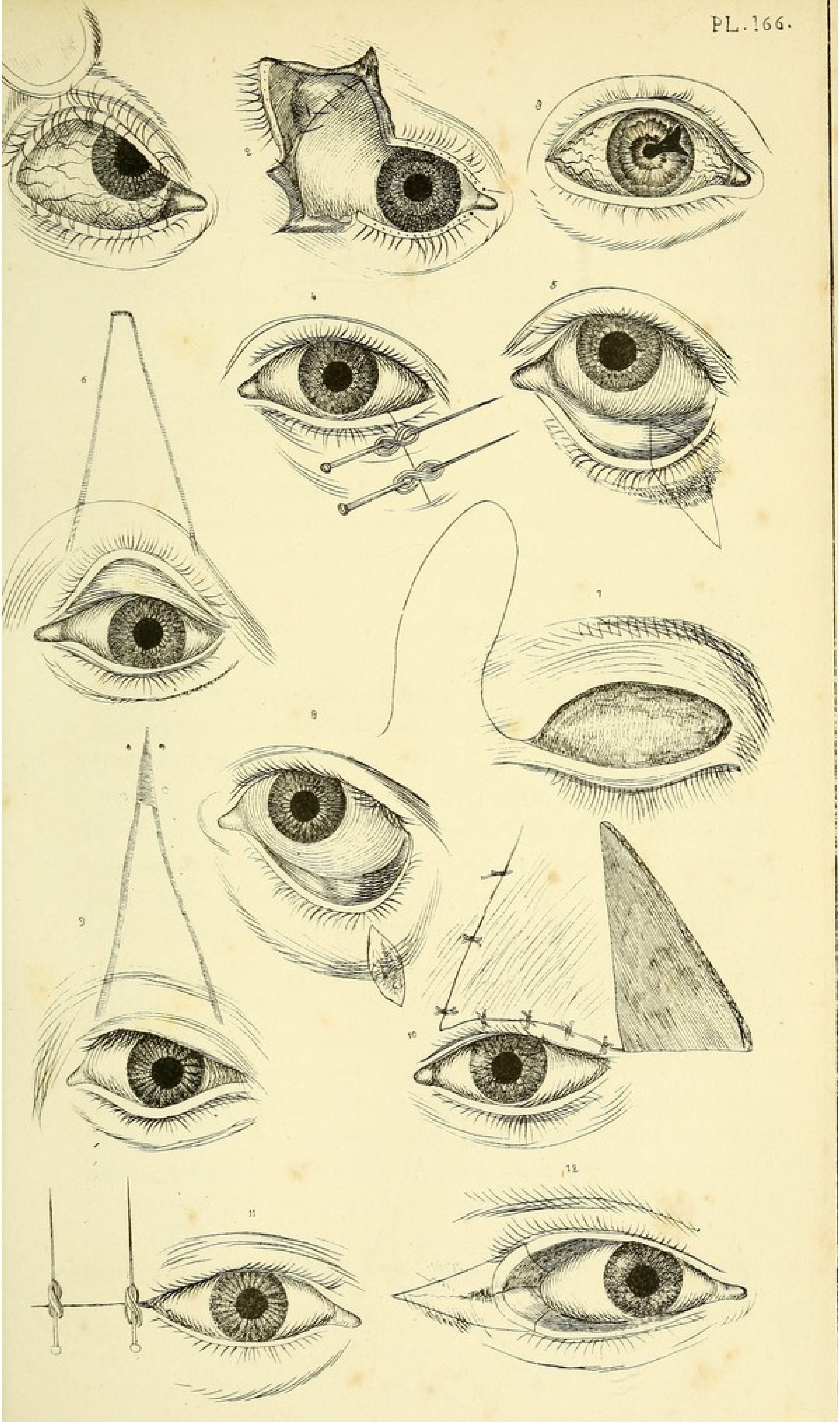
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PLATE CLXVII.

Figs. 1, 2. Operation for Ectropion. Process of Dorsey and Sir W. Adams. In Fig. 2 is represented the mode of removing a piece of the eyelid. A first incision has been made at the outer canthus, and the scissors are seen applied to make the second.

Fig. 1 shows the wound closed by the twisted suture.

Fig. 3 is described in connection with Plate CLXVI. Fig. 5.

Figs. 6, 5. Operation for Ptosis, from Extension and Relaxation of the Skin, or of the whole Substance of the Eyelid. A longitudinal fold of skin is raised by forceps, and removed with the scissors.

Fig. 5 shows the manner of dressing the wound.

In some cases, a similar portion of skin is removed from over the superciliary ridge and upper eyelid.

Ptosis from Injury of the Levator Palpebræ Muscle. This has been relieved by the removal of a transverse fold of integument from the eyelid in such a situation that, when the edges of the wound became united, the eyelid was attached to that portion of the skin of the eyebrow upon which the occipito-frontalis acts.

Chelius's Operation for Ectropion. An incision is made through the skin along the whole breadth of the eyelid, and as near its tarsal edge as possible. The edges of the wound are to be dissected from the cellular tissue so far as to relieve all tension of the skin, and allow the eyelid to be brought into its natural position. The fibres of the orbicularis are then to be divided by several vertical incisions. When the replacement of the eyelid is opposed by a considerable tumefaction of the conjunctiva, a portion of this membrane is to be removed by the scissors and knife, and the external commissure of the eyelids slit up to the extent of several lines in a horizontal direction. After this, two loops of thread are to be drawn through the skin by means of curved needles near the tarsal edge of the eyelid, but without the tarsus. These threads are to be fastened by adhesive plaster to the cheek if the upper eyelid is the subject of operation; to the forehead in the contrary case, so that the eyelid operated upon may be retained in its natural position. The wound of the eyelid, and the wound at the angle of the eye, are covered with charpie, which is to be retained in position by strips of plaster with no other dressing. In the course of the after treatment, nothing but charpie, dry, or spread with some mild cerate, is to be applied. The touching of the parts with lunar caustic, even when the granulations rise above the edges of the wound, is to be especially avoided, as contraction of the cicatrix is thereby very much promoted,

Entropion is the converse of ectropion. The margin of the eyelid may be inverted in part of its extent only, constituting partial entropion. More commonly, the entropion is total.

Entropion may be owing to, 1. Relaxation of the integuments of the eyelid, and spasmodic contraction of the orbicularis palpebrarum muscle, when long continued.

2. A contracted and deformed state of the tarsal cartilage.

Treatment. This consists in, 1. The excision, or destruction by caustic, of a portion of the relaxed integuments; 2. The subcutaneous section of the orbicularis palpebrarum muscle.

Excision. The portion of integument removed should be of an elliptical shape, and of such breadth, that when the edges of the gap which is left are brought together, the eyelid will be retained in its proper position. Though the piece of integument ought to be removed as near as possible to the margin of the eyelid, a sufficient breadth of skin must still be left at the margin for the insertion of stitches.

The operation may be performed as in Plate CLXVII. Fig. 6, or the curved entropion forceps may be used to raise the fold of skin. After the excision, the edges of the wound are to be brought together by two stitches.

CAUTERIZATION. By means of a wooden pencil, concentrated sulphuric acid is to be rubbed over an oval portion of the integuments of a length corresponding to the inversion, and about one quarter of an inch broad in the middle. After a few minutes, the eyelid is to be wiped with a bit of lint, and the application of the acid repeated, and this again and again, until a sufficient contraction of the skin is produced, so as to bring the eyelid into its proper position. It may be necessary, after a time, to repeat the application of the acid. Cauterization is not admissible where the skin is very superabundant. It is best adapted for slight and recent cases in young persons.

SUBCUTANEOUS SECTION OF THE ORBICULARIS PALPEBRARUM MUSCLE. This has been performed with success in cases of entropion from confirmed contraction of the orbicularis.

ENTROPION FROM A CONTRACTED AND DEFORMED STATE OF THE TARSAL CARTILAGE.

TREATMENT. WARE'S OPERATION. A perpendicular incision is made through the whole substance of the lid at its temporal extremity and in its middle. This section of the lid is followed by a separation of the edges of the wound in the form of a V. This wound afterwards fills up by granulation, and very little deformity results.

CRAMPTON'S OPERATION MODIFIED. Supposing the upper eyelid to be the subject of this operation, two perpendicular incisions through its whole substance are made — one near the external, the other near the internal canthus. The lid being thus set free, a transverse fold of the skin is then to be removed from near its ciliary margin, and the edges of the gaps thus produced brought together by two or three stitches. The threads forming the stitches are to be left long; the eyelid is now to be everted, and turned up and kept in this position for a few days, by means of threads fixed to the forehead by strips of plaster. The perpendicular incisions are thus prevented from uniting by the first intention. They are permitted to heal only by granulation. After the removal of the ligatures, the eyelid is, by the cicatrization of the perpendicular wounds which ensues, gradually drawn into its natural position without being again inverted. During the time the eyelid is kept everted and turned up, it is to be covered with a piece of linen spread with simple cerate.

In cases of entropion of the lower eyelid from transversely contracted tarsus, the operation has been performed in the following manner with perfect success: An incision through the whole thickness of the lid being made perpendicular to its edge near the outer canthus, a piece of the skin of the lid is excised, and the lid kept in the everted position, by fixing on the cheek the end of the thread forming the suture which unites the edge of the wound left by the excision of the piece of skin. When, as often happens in inveterate cases of this form of entropion, the operations just described prove ineffectual, recourse must be had to extirpation of the bulbs of the eyelashes, as in trichiasis.

Trichiasis and Districhiasis. Plate CLXVI. Fig. 1.

Treatment. These diseases admit of being relieved only by operation.

1. Evulsion of the misdirected eyelashes. The instrument for this operation is shown in Plate CXIV. Fig. 3. As this operation requires to be repeated, unless the misdirected eyelashes are few in number, this mode of treatment becomes very troublesome.

2. Excision or cauterization of the lid, as in entropion. Either of these operations may be had recourse to with advantage, when the eyelashes along the edge of either lid are directed perpendicularly to the eye.

3. Extirpation of the roots of the eyelashes. The lid to be operated upon is to be raised and stretched upon a horn spatula, held by an assistant, who, at the same time, retains the eyelid from

slipping away by pressing the eyelashes against the spatula with the thumb nail of the hand holding it.

The surgeon then, with a small scalpel, makes an incision parallel to the border of the eyelid, about one eighth of an inch from the edge whence the eyelashes issue, through the skin, cellular tissue, and ciliaris muscle, down to the tarsal cartilage. From each end of this incision, a short one is to be carried at right angles to the edge of the eyelid.

The flap of skin thus marked out, together with the subjacent cellular tissue, ciliaris muscle, and the bulbs of the eyelashes, is to be dissected from the tarsal cartilage, towards the margin of the eyelids.

The detached flap is next to be cut away, with scissors, along the margin of the eyelid, leaving a very narrow strip, however, for the insertion of stitches, if thought necessary.

If the case be one of entropion and trichiasis combined, it is advisable to unite the wound by stitches, and also to make one or two perpendicular incisions through the whole thickness of the border of the eyelid, as in Ware's or Crampton's operation, but not so long. The eyelashes, which are now loose, are to be plucked away.

4. Excision of a Wedge-shaped Portion of the Eyelid. When but few eyelashes in a bundle are turned in, this operation may be performed. The wound may either be closed by the harelip suture, or left to heal by granulation.

Lagophthalmos from Organic Contraction, or Adhesion of the Eyelids. This is the only form of the disease that can be relieved by operation.

Treatment. One of the operations described for ectropion, the choice of the operation being determined by the circumstances of the case.

Ancyloblepharon may be removed, in some cases, by passing a director behind the part where the borders of the eyelids adhere, while an assistant stretches the lids apart, and separates them with a scalpel, taking care not to cut the proper substance of the tarsus of either eyelid.

SYMBLEPHARON is irremediable if the adhering surfaces are extensive. Very slight adhesions may be divided, and be prevented from uniting, perhaps, by bringing the edges of the wound of the conjunctiva together with fine thread, the frænum being left in connection with the eyelid, and only removed, if necessary, after the union of the wound of the conjunctiva.

EPICANTHUS may be relieved by the vertical excision of an elliptical piece of skin from over the root of the nose, on a level with the epicanthus, and by bringing the edges of the wound together by suture.

Fig. 4. EXCISION OF THE MIDDLE PORTION OF THE TARSAL CARTILAGE for the cure of ectropion of the lower lid. Method of Weller.

Figs. 7, 9, 11. EXCISION OF FUNGOUS GROWTHS from the conjunctiva.

Fig. 8. EXCISION OF A PORTION OF THE CONJUNCTIVA.

Fig. 9. EXCISION OF A FUNGUS with the bistoury and hook.

Figs. 10, 13. EXCISION OF CYSTS FROM THE LIDS.

Fig. 12. EXCISION OF VASCULAR EXCRESCENCES from the conjunctiva.

PHLYCTENULÆ on the borders of the eyelids may be removed by lacerating them with the point of a pin.

MEIBOMIAN CALCULUS. The removal is effected by dividing the conjunctiva over it, and turning it out with a cataract needle or the like.

VESICLES OR PHLYCTENULÆ on the cutaneous surface of the eyelid, near its margin. The evacuation by puncture is sometimes sufficient; if not, the vesicle is to be snipped off with scissors.

WARTS ON THE EYELIDS. If pedunculated, it is best to remove them by ligature, or snip them off with scissors, and then to touch the root with strong acetic acid, or lunar caustic. If they have a broad base, their removal may be effected by escharotics alone.

HORN-LIKE EXCRESCENCES of the skin of the eyelids. The portion of skin in which they have their root is to be snipped off in a fold, with the scissors.

ENCYSTED STEATOMATOUS TUMORS, situated in the skin of the cheeks and the eyelids, are to be removed by dividing them, as well as the investing membrane, with a lancet, and squeezing out the cysts.

VERY SMALL TUMORS of this description are best removed by scratching through the epidermis covering them, with a fine-pointed instrument, taking care not to cut the capsule, and squeezing the body out of its nidus between the thumb nails.

GRANDO OR CHALAZION. Small tumors of the eyelids. *Grando* is here applied to the external form; *chalazion* to the internal.

TREATMENT OF GRANDO. Make an incision through the skin over the tumor, parallel to the margin of the eyelid, and try to squeeze it out. If this does not suceeed, seize the tumor with hooked forceps, snip it out with curved scissors, and cauterize the place with nitrate of silver.

TREATMENT OF CHALAZION. The operation consists in everting the eyelid, making a free incision into the tumor, and pressing out, or breaking down, its contents with the handle of the scalpel.

REMOVAL OF ENCYSTED TUMORS. The external incision should be free, and in the direction of the orbicularis palpebrarum. The cyst should be dissected out entire, if possible; at any rate, it must all be extirpated.

NÆVUS MATERNUS, AND ANEURISM BY ANASTOMOSIS in the region of the eyelids, must be treated like similar cases in other parts of the body.

Scirrhoid Callosity of the Eyelids. The operation consists simply in amputation of the diseased part.

Cancer of the Eyelids. Treatment. While the disease is wholly confined to the eyelids, the only effectual treatment is the removal of the affected parts, together with a portion of the healthy structure immediately around, with the knife.

Operation for the Removal of Pterygium. The patient being seated as in the operation for cataract, and both eyelids being secured by an assistant, the surgeon, — while the patient turns the eye outward, if the pterygium be on the nasal side, — with a hooked forceps, seizes the pterygium about its middle, and, keeping it raised from the surface of the sclerotica, passes a cataract or iris knife, with the edge towards the cornea, and one of the flat surfaces of the blade towards the surface of the sclerotica, behind it, and detaches it from the sclerotica by cutting inward as far as the margin of the cornea, where the knife is to be made to cut itself out. Still keeping hold of the pterygium, he now, with the same knife, or with a pair of curved scissors, separates the pterygium towards its base, where it is to be cut away without approaching too near the semilunar fold, if it be an internal pterygium.

Pinguecula may be removed by being seized with hooked forceps, and, together with a small portion of the surrounding conjunctiva, cut off transversely with a pair of curved scissors.

Trichosis Bulbi may be removed by seizing the tumor with the hooked forceps, while an assistant holds the eyelids asunder, and either transfixing it at its base with a knife, on the side next the cornea, and then completing its removal with a knife or with scissors, or at once cutting it off in a transverse direction, close to its root, with curved scissors.

Fungous Excrescence of the Corneal Conjunctiva has been successfully treated, by repeated extirpation of it, and of a considerable fold of the sclerotic conjunctiva, together with the over distended vessels, and by the application of caustic potash.

Polypi, and Warts of the Conjunctiva, may be removed with the curved scissors.

Vesicular Tumors of the Sclerotic Conjunctiva, about the size of pins' heads, are sometimes met with; they may be crushed with forceps, or cut off with scissors.

Entozoa of the Cellular Tissue, under the Sclerotic Conjunctiva. On dividing the conjunctiva, they may be readily removed.

PLATE CLXVIII.

Fig. 1. Introduction of the tube into the nasal canal, after the manner of Dupuytren.

Fig. 2. Introduction of a stylet through the superior lachrymal punctum.

Figs. 3, 5, 7, 8, 10, illustrate the various steps in the operation for strabismus, hereafter to be described.

Fig. 6. Introduction of an instrument into the inferior lachrymal punctum.

Fig. 9. Injection through the inferior lachrymal punctum.

Fig. 4. Perforation of the Lachrymal Sac, preparatory to the introduction of instruments into the nasal duct. Previous to the operation, the sac is allowed to become distended with fluid. The assistant, who holds the head of the patient, is to press the skin at the outer angle of the eye towards the temple, in order to stretch the skin over the sac, and thus to bring prominently into view the tendon of the orbicularis palpebrarum. The point of the knife is directed backward and inward, over the wall of the sac, below the tendon of the orbicularis, its edge being directed outward, and somewhat downward. The knife, in this position, having been made to penetrate the sac, which is known by the escape of fluid and cessa-

tion of resistance, its handle is to be raised, and then the point pushed down a short distance within the sac, in the direction of the nasal duct. The knife may now be partially withdrawn, and a stylet, or tube, introduced, if desired, as in Fig. 1.

Exploration of the Canalicules. Lower Canalicule. The patient being seated before a window, the surgeon holds the edge of the lower eyelid towards the inner angle, a little depressed, and everted with one hand, so as to bring into view the punctum, while with the other he introduces the point of the probe (Anel's probe) with a rotary movement, between his thumb and finger, into the lower punctum downward, in the direction of the vertical portion of the corresponding canalicule, into which he passes it to the bottom of this portion, that is, about one tenth of an inch; then he withdraws it a little, and changes the vertical direction of the probe downward for a horizontal one inward, or rather for one deviating from the horizontal inward, so as to be slightly oblique from below upward, which is the direction of the second part of the canalicule. At the same time that the direction of the probe is thus altered, the inner part of the lower eyelid is to be stretched by the finger holding it, towards the temple, and pressed slightly more downward, in order as much as possible to obliterate the curvature of the canalicule.

Exploration of the Upper Canalicule. The upper eyelid towards the inner angle being held raised and everted so as to expose the punctum, the probe is introduced into it, and pushed with a rotary movement upward in the direction of the axis of the vertical portion of the corresponding canalicule. Having reached the bottom of this portion of the canalicule, the probe is withdrawn a little, as directed for the lower canalicule; the change of the vertical direction of the probe upward is to be made for one deviating so far only from the horizontal inward as to be slightly oblique from above downward. While this is being done, the inner part of the upper eyelid is to be stretched towards the temple, and somewhat more upward, with the same view as that for which the analogous proceeding in the case of operation on the lower canalicule is directed. The probe is now pushed towards the lachrymal sac.

Treatment when both Canalicules are obliterated. Between the place of obliteration and the sac, the canalicule is to be opened by removing, along with a fold of the conjunctiva, where it unites with the skin, a portion of its inner wall, with the curved scissors, and attempting to maintain the opening next the sac patent, by keeping a probe more or less constantly in it during cicatrization. Or an operation may be performed as in Fig. 6. The lower eyelid being held everted, the sac is opened by thrusting the knife into it from the groove between the caruncle and lower eyelid.

Operation for Strabismus. Position of the Patient, Assistants, and Operator. The patient may either sit in a chair, or be extended upon a sofa, or table, with a pillow under his head. Infants are best secured by wrapping them in a shawl, to confine their arms and hands, and laying them on their backs upon a table.

When the patient sits, the operator usually stands; or, if he sits, it is on a high chair before the patient, while an assistant, standing behind, supports the head of the patient with his face looking somewhat upward. The eyelids may be secured as in Figs. 3, 7, or by assistants; one supporting the head of the patient and holding the upper lid, and a second holding the other lid.

Division of the Internal Rectus. The opposite eye being covered, the patient is to be directed to turn the eye to be operated upon as much outward as possible. Now, the surgeon, with a toothed forceps held in his left hand, seizes the conjunctiva at about a quarter of an inch from the margin of the cornea, on the nasal side, and raises it up in a large transverse fold, which he immediately divides with a pair of straight, blunt-pointed scissors, so as to make a free vertical incision through the conjunctiva. This incision may be enlarged by the scissors upward and downward, if not at first large enough;

but its whole length ought not to exceed one fourth or one third of an inch. By this incision, the tendon of the internal rectus, which is inserted into the sclerotica at about one sixth of an inch from the margin of the cornea, is exposed.

The next step is to pass a bent probe, or blunt hook, behind the tendon, between it and the sclerotica, from above downward, bringing its point, when fairly passed, behind the tendon, and through the lower end of the incision of the conjunctiva, by raising its handle.

The tendon of the muscle being thus raised on the hook, the next step is its section, which is effected with the scissors from below upward, near its insertion. If, after this is done, the eye does not admit of being freely everted, an exploration of the bottom of the wound is to be made with the hook, in order, if this be owing to any bands of cellular tissue remaining uncut, that they may be raised and divided. If, after the operation, the eye should still remain inverted, the internal rectus of the opposite eye should be at once divided.

Operation for Strabismus. Process of Dr. Pancoast.

Fig. 3. Division of the mucous membrane and the subconjunctival fascia, in order to expose the tendon. Every thing being prepared as above directed, the spring speculum is applied upon the cutaneous surface of the lids, so as to hold them asunder, and fully expose the ball. The surgeon then enters a double hook about two lines and a half at the inner side of the cornea, so as to steady the ball and turn it slightly outward, while he raises, with the lower point of the scissors, a fold of the membrane over the tendon, just behind its place of insertion.

Fig. 10. Elevation of the Muscle on the Blunt Hook. Without changing the hold of the sharp double hook, the blunt hook is passed round the muscle, as seen in the drawing. The operator has now the command of the eye with the latter instrument, and the sharp hook may be removed.

Fig. 5. Division of the Tendon. The operator holds the eye with the blunt hook, and reverses the scissors so as to pass the

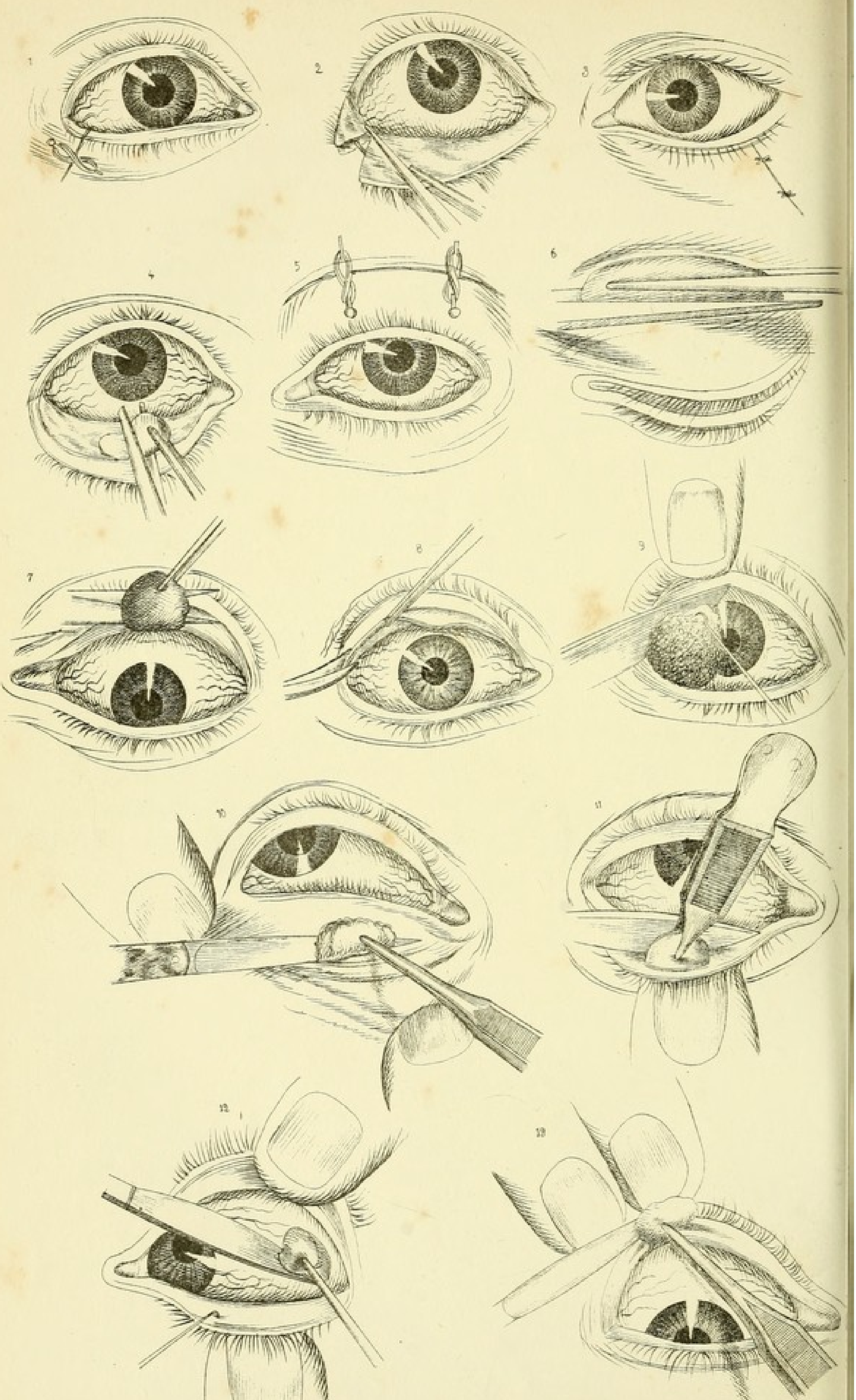
other point, which should be blunt, underneath the tendon, which he divides across.

Fig. 8. DIVISION OF THE INTERMUSCULAR FASCIA. In case this is found shortened, so as to prevent the eye from returning to the natural position, it is to be raised with the blunt hook, and divided to the requisite extent with the scissors, but most cautiously, for fear that, by dividing it too freely, the eye may be made to protrude from the socket, or turn in the opposite direction.

STRABISMUS DIVERGENS sometimes takes place after section of the internal rectus. If the eye does not eventually become right, the external rectus must be divided. This is performed in the same manner, essentially, as that of the internal rectus, it being remembered that the insertion of the tendon of the external rectus is usually a quarter of an inch from the margin of the cornea, and is thinner and more spread out than that of the internal.

Section of the superior rectus may sometimes be required. It is to be remembered that the insertion of its inner fibres is near the margin of the cornea, but the average distance is about a quarter of an inch.

When a return of the strabismus takes place, the operation may be repeated. Sometimes success has been obtained only after a second or third repetition.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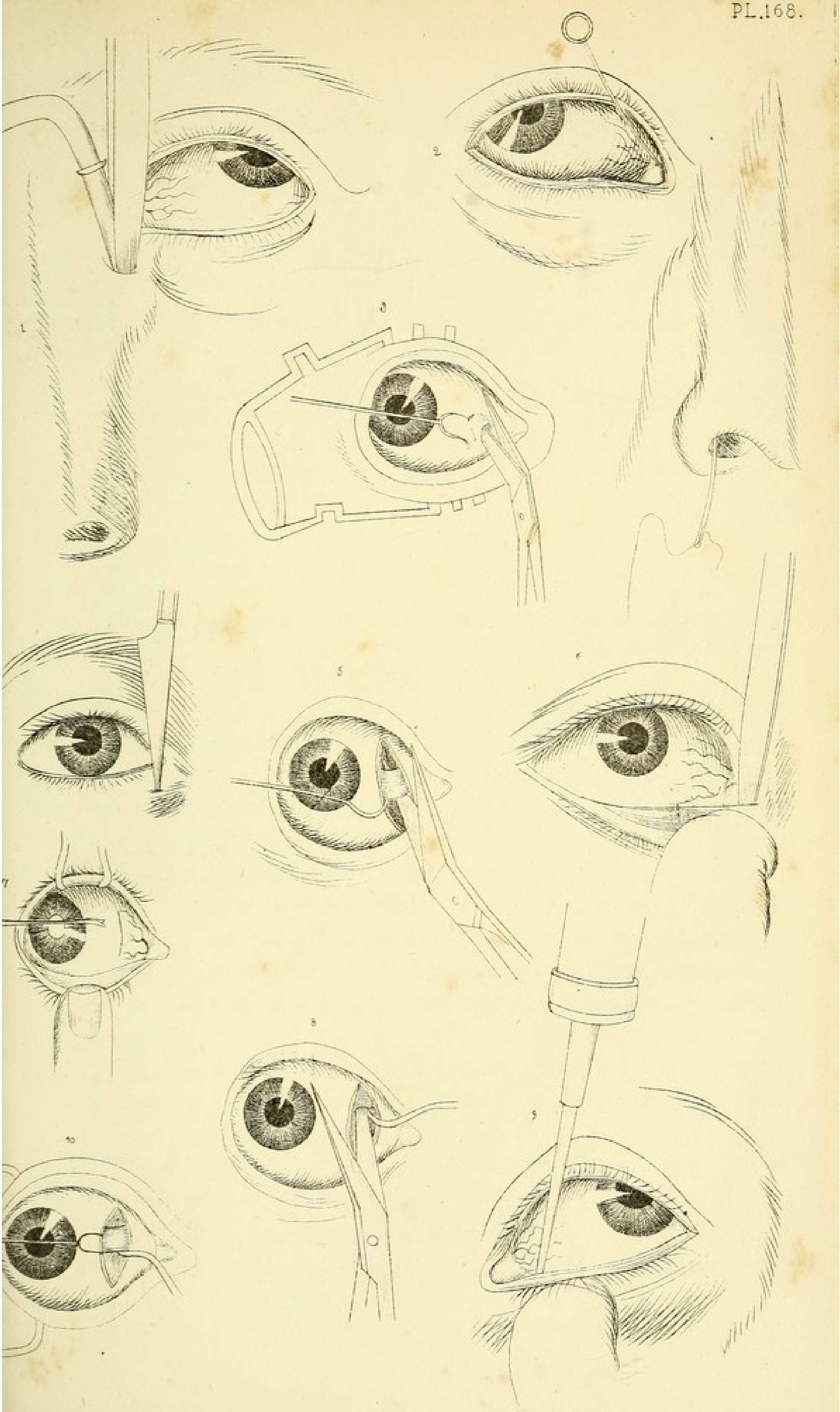


PLATE CLXIX.

Fig. 2. A Longitudinal Section of the globe of the Eye.

1. The sclerotica.
2. The cornea.
3. The choroid.
4. The ciliary ligament.
5. The ciliary processes.
6. The iris.
7. The pupil.
8. The third layer of the eye.
9. The canal of Petit.
10. The anterior chamber of the eye.
11. The posterior chamber of the eye.
12. The lens, enclosed in its proper capsule.
13. The vitreous humor.
14. The tubular sheath of the hyaloid membrane, which serves for the passage of the artery of the capsule of the lens.
15. The membrane of the optic nerve.
16. The arteria centralis retinæ, embedded in the centre of the optic nerve.

Fig. 1. Inferior Section of the Cornea with the Knife of Richter and Beer. The puncture of the cornea has been made at its outer margin, and the point of the knife pushed across the anterior chamber in front of the iris.

Fig. 4. Superior section of the cornea.

Fig. 6. Oblique section of the cornea with the knife of Wenzel.

Fig. 5. Incision of the capsule with the cystotome of Boyer.

Fig. 8. Vertical section of the eyeball. The lens is seen passing from its original seat, under the influence of the pressure of the fingers.

Fig. 3. Same as Fig. 8, with the exception that the handle of the instrument is used to make pressure on the upper part of the eye, instead of the finger.

Fig. 9. Removal of any opaque portion of the capsule, seen after the expulsion of the lens.

Cataract. Operation by Extraction.

Previous to the operation, the patient should be seated in a low chair with a high back, opposite a window that admits a good clear light, but no sunshine, and the eye to be operated upon should be turned somewhat obliquely to the window. The surgeon should sit immediately before the patient, on a higher chair, and should have a stool on which to rest his foot so as to raise the knee to a height sufficient to support the elbow of the operating hand. Behind the patient an assistant should stand, whose duties are, 1. To steady the head against the back of the chair, or against his own breast; 2. To elevate the upper eyelid, and fix it against the margin of the orbit, with one forefinger; 3. To drop it at a preconcerted signal from the surgeon.

Operation. 1. The surgeon depresses the lower eyelid, and stretches the globe with the fore and middle fingers of one hand, without exerting any pressure upon it. He particularly endeavors to prevent it from rolling inward during the operation; 2. Holding the cornea knife like a pen, (in the right hand for the left eye and vice versa,) and resting the other fingers on the patient's cheek, he touches the cornea once or twice with the flat part of the blade, in order to remove any existing alarm on the part of the patient; 3. He punctures the cornea close to its outer margin, pushing the point of the blade perpendicularly towards the iris, and not obliquely, otherwise it would pass between the laminæ of the cornea, instead of entering the anterior chamber; 4. He must push it steadily across, parallel to the iris, till it cuts its way out, making a semicircular flap of the lower half of the cornea, immediately upon which the eyelid should be dropped; 5. Waiting a few seconds, the surgeon takes a curette, introduces the pointed end with the convexity upward, and freely lacerates the capsule with it, and then withdraws it with the convexity downward; 6. He makes very gentle pressure on the under part of the globe, and on the upper eyelid, till the lens rises through the pupil and escapes. Lastly, the eye should be opened after a minute or two, to see that the flap of the cornea is rightly adjusted, and that the iris is not prolapsed. If it is, the eyes should be exposed to a bright light, so as to make the pupil contract, and the prolapsed portion should be gently pressed upon with the spoon of the curette: then the operation is finished.

It follows, as a matter of necessity, that there must be many variations in the manner of performing an operation comprising so many minute and delicate manœuvres as the one under consideration. Thus, if the surgeon be ambidexter, he may sit before his patient when operating on either eye; but if he can use his right hand only, he must sit behind his patient when operating on the right eye. Many surgeons make a flap of the upper half of the cornea, (Fig. 4,) instead of the lower half. The advantages of this method, according to Mr. Lawrence, are, that the operator has a more complete control over the globe. He can fix it very securely; the aqueous humor does not escape so readily, and, consequently, the section of the cornea is more easily accomplished. There is less chance of prolapsus iridis, and the upper lid keeps the flap of the cornea in exact apposition. Some operators, again, dispense entirely with an assistant, and fix the globe with the left hand. Mr. Guthrie objects to making the puncture of the cornea with the knife perpendicular to the eye. Some operators use belladonna to dilate the pupil; others are averse to it.

COMPLICATIONS. 1. Sometimes, in consequence of the premature escape of the aqueous humor, the iris falls forward under the edge of the knife. The best way of inducing it to retreat, is to press on the cornea with the forefinger, over the protruding part of the iris. If this fails, the knife must be withdrawn, and the operation be completed with Guthrie's double knife, which has a sharp blade sliding on a blunt one; the sharp blade being pushed out when the knife has reached the inner side of the cornea. But sometimes the point of the knife is so completely entangled in the iris, that it is necessary to withdraw the instrument, heal the wound, and repeat the operation afterwards. If, however, a small piece of the iris should get under the edge of the knife when the section is nearly complete, the operator may push on boldly, since it will be of no great consequence if it be cut. 2. If the opening in the cornea is not sufficient, it must be enlarged with a small knife. 3. If a portion of the lens remains, it should be left to be absorbed, unless it has passed into the anterior chamber, and can be very easily removed. 4. If the vitreous humor seems disposed to escape, the cataract should be hooked out with the curette. The escape of a little, however, is of no consequence.

PLATE CLXX.

Extraction of the Cataract. Process of M. Furnari.

Fig. 3. Incision of the cornea, with the Keratome of M. Furnari.

Fig. 2. Instrument represented larger than the first, which does not make an incision sufficiently broad to extract the cataract entire.

Fig. 1. Extraction of the cataract with the forceps.

Fig. 8. Introduction of the Needle. The upper eyelid is raised by the fingers of an assistant, and the lower depressed by those of the surgeon; a slight pressure with the fingers at the same time fixes the ball. The needle of Scarpa, held as a pen, is presented in the direction of the lens, so that the curve near the point shall pass perpendicularly through the sclerotic coat, as seen in the figure. If a needle of a less curve than Scarpa's is used, the direction of the handle should, of course, be more horizontal.

Fig. 4. Division of the Capsule. The needle, with the convex surface of the curve in front, is seen gliding between the front surface of the capsule, and the posterior face of the iris, so as to reach the centre of the pupil, which has been dilated with belladonna. The point which is turned towards the lens now begins the section of the capsule.

Fig. 6. The needle is here shown resting at the top of the lens, after it has completed the division of the capsule.

Figs. 7, 16. Depression or Couching of the Cataract. In Fig. 7, this operation is shown at its commencement; in Fig. 16, the depression is seen completed, the lens having been carried down out of view before the point of the needle, rendering the pupil clear.

Fig. 5 shows the changes of direction of the needle, in the various steps of the operation.

Fig. 10 shows the course taken by the lens in simple couching.

Fig. 13 shows the track of the lens in reclination.

Couching. There are four methods of performing this operation.

1. A couching needle is passed through the outer side of the sclerotica, about two lines behind the margin of the cornea, and a little below the transverse diameter of the eye, so as to avoid the long ciliary artery. It is carried upward and forward, behind the iris, and in front of the cataract, which is then steadily and gently pressed upon, till it is carried downward and backward out of sight. The needle should be held for a few moments to fix the cataract; then it should be lifted up, and if the lens rise also, it must be again depressed for a short time. Then the needle is withdrawn.

2. According to Scarpa's Plan, a curved needle, instead of a straight one, is to be introduced with its convexity forward, and the lens is to be depressed in the manner just described; but before withdrawing the needle, its point is to be turned forward, and made to lacerate the capsule freely.

3. King's Operation. A curved needle is passed perpendicularly through the sclerotica, as low down as possible; and if the patient's eye is directed upward and inward, the needle can be made to enter almost perpendicularly below the centre of the cornea, and one eighth of an inch from its margin. It should then be passed onward with a slight rotary motion to the pupil having its convexity forward, i. e., towards the back of the iris. When it reaches the pupil, the rotations are to be increased, so that the point may cut the anterior capsule into small pieces. The needle is then slowly with-

drawn, and the lens follows it, so that it is left at the bottom of the eye, close to the puncture made by the needle. If the lens should not immediately follow the needle downward, the latter is to be stuck into it again.

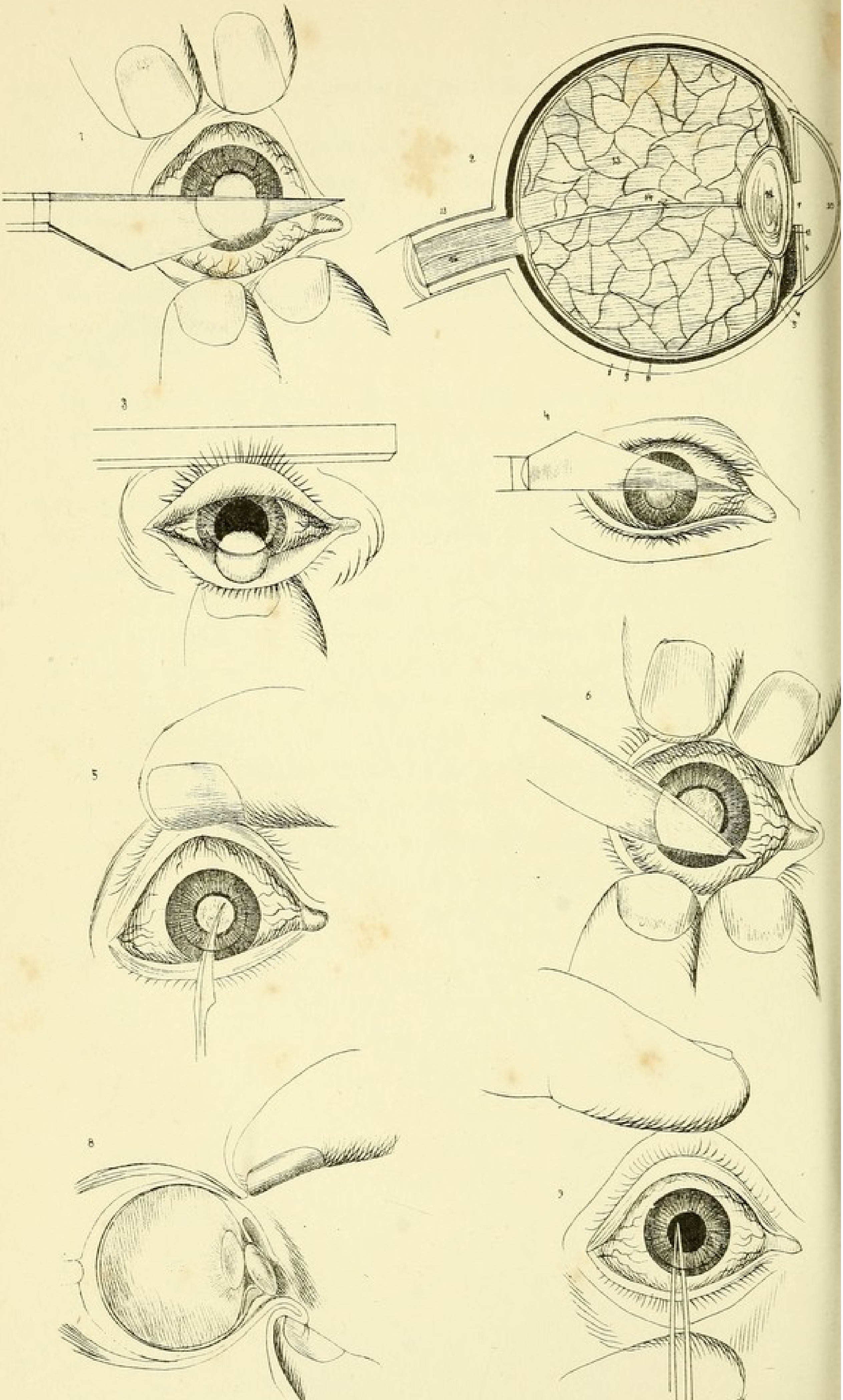
Reclination. This is effected by pressing with the needle upon the top of the lens, so as to reverse it, as shown in Plate CLXX. Fig. 13.

Depression and Reclination through the Cornea. The needle, with its point presented perpendicularly, is to be introduced through the lower part of the cornea, at the distance of about a line from its margin, the concave side turned upward. It is then to be pushed onward to the cataract through the pupil, which should be previously dilated. After lacerating the capsule, the concave side of the needle is to be rested upon the top of the lens, somewhat to the inner side of the middle line. By raising the handle, the lens is then carried downward and outward, and embedded in the vitreous humor. In this position it should be held for a few seconds, before the needle is withdrawn.

Figs. 9, 11, 12, 14, 15. Operation for artificial pupil.

Fig. 12. Incision through the sclerotica.

Figs. 9, 15. Incision through the Cornea. Scissors are introduced through the incision, and a triangular flap is made in the iris, which contracts and shrivels so as to leave an opening, (Figs. 11, 14.)



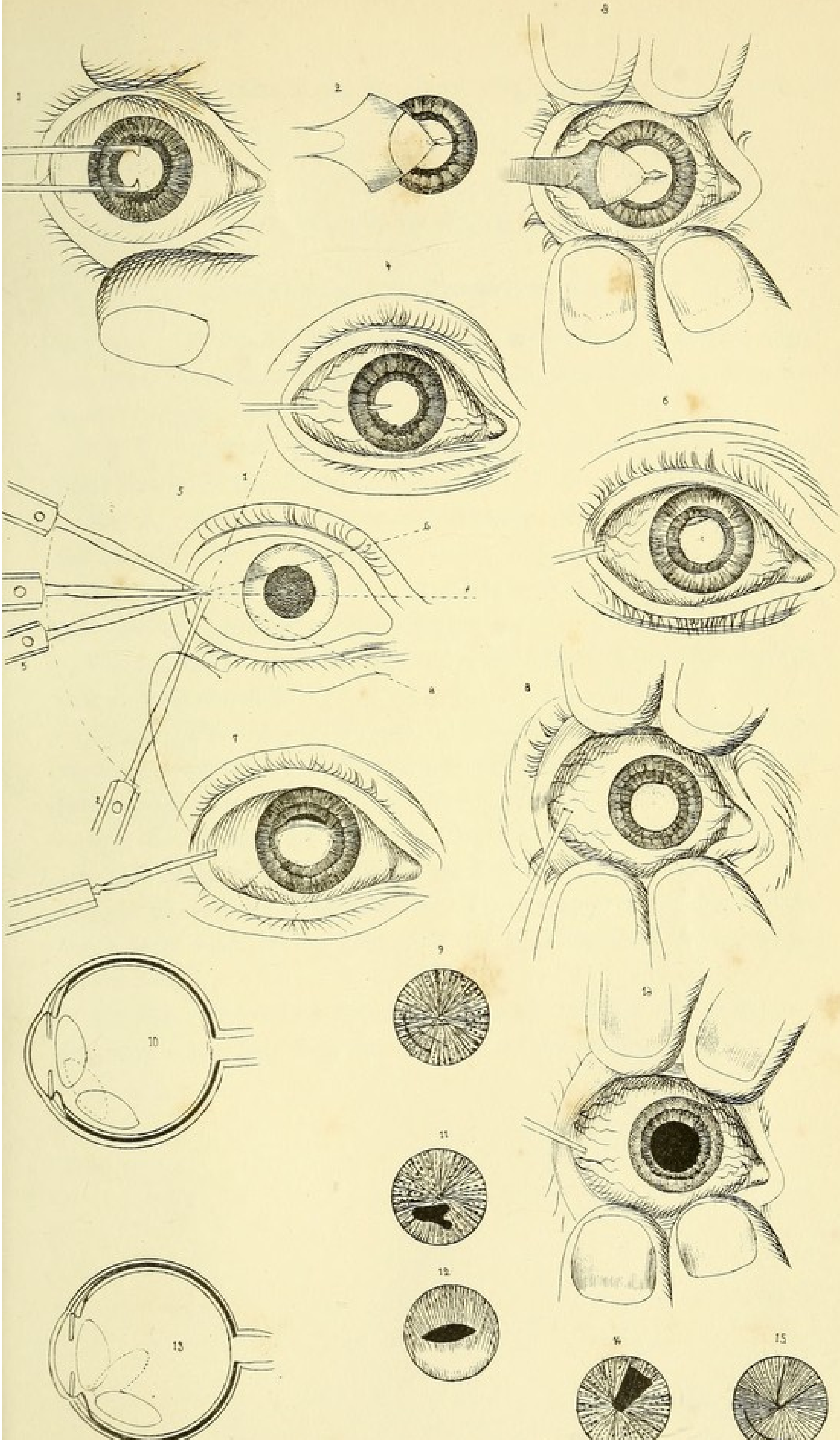

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PLATE CLXXI.

OPERATION FOR ARTIFICIAL PUPIL.

Fig. 1. Process of Chesselden. A needle, with a cutting edge, has been introduced behind the iris, and is seen dividing it from behind forward.

Fig. 2. Method of Maunoir. Double vertical incision of the iris, through an incision in the cornea.

Fig. 5. Method of Sharp and Adams. Transverse incision of the iris, from before backward.

Fig. 3. Method of Janin. Vertical section of the iris with scissors, through an incision in the cornea.

Figs. 4, 9, 11. Incisions in the cornea referred to in the description of the operation.

Fig. 7. Process of Wenzel. A double incision having been made, as practised by M. Velpeau, a portion of the iris is held by the forceps, and about being excised by the scissors.

Fig. 8. Process of Velpeau. Section at the same time of the iris and cornea, with a double-edged knife.

Fig. 10. Process of Gibson. The centre of the imperforate iris is seen raised by the hook, and the scissors, about to remove the elevated fold.

Fig. 12. Process of Guerin. A double incision of the iris having been made, four flaps are removed by the scissors.

PLATE CLXXII.

Operation for Artificial Pupil.

Fig. 1. Process of Donegana. Detachment of the iris at its superior and external border with a sharp needle.

Figs. 2, 5, 8, 11. Incision in the cornea referred to in the description of the operation.

Fig. 3. Process of Scarpa. Detachment of the iris at its superior and internal border, with the cataract needle.

Fig. 4. From Blazius. Excision of a fold first formed with the needle.

Fig. 6, from Blazius, shows the hook introduced at several points in the opaque cornea, and carried across in order to detach the iris at some point opposite a transparent portion of the cornea.

Fig. 7. From Bourgery. Extraction of the lens through an incision made to perform the operation of artificial pupil.

Fig. 9. Section of the iris, with the pince à dard (Plate CXIII. Fig. 23) of Mr. Onsenort. This figure shows the manner of using these instruments.

Fig. 10. Process of Langenbec. Detachment of the iris, and inversion of the flap in the wound in the cornea.

Fig. 12. Process of Langenbec. Extension of the natural pupil, one margin of which is drawn down with a delicate hook, and left wedged between the lips of the small corneal incision.

Operations for Artificial Pupil. An artificial pupil is an opening made in the iris to serve as a substitute for the natural pupil. There are three principal modes of operating for artificial pupil, viz., 1. Making the opening in the iris by means of a simple incision or simple incisions — the operation by incision. 2. By cutting out a piece of the iris — the operation by excision. 3. Detaching the membrane at some part of its circumference, from its ciliary connection — the operation by separation.

In some cases, the natural pupil admits of being so freed as to be again available for the transmission of light to the retina. The operations are, 1. The restoration to its natural position of the pupil, dragged opposite a leucoma by partial anterior synechia, by means of abscission of the band of adhesion. 2. The dislocation of the natural pupil to opposite a clear part of the cornea.

The artificial pupil should be made, 1. As near the middle of the iris as the circumstances of the case will allow. 2. After the middle, the nasal or temporal side is the next best place; then the lower; and lastly the upper.

Artificial Pupil by Incision. There are two principal methods of operating for artificial pupil by incision; viz., through the sclerotica and through the cornea.

Incision through the Sclerotica. In this operation, a single incision is made through the iris in a transverse direction, above or below the situation of the natural pupil. The radiating fibres being thus cut across, the edges of the incision retract, and a fusiform opening is the result, (Plate CLXX. Fig. 12.)

Puncturation. The point of puncturation is about three twentieths of an inch from the temporal margin of the cornea, and in the line of its transverse diameter. The operator holds the knife with its cutting edge backward; the point may be applied perpendicularly to the surface of the eyeball, when it is to be thrust towards the centre of the eyeball, to the depth of about one eighth of an inch. The handle of the knife is now to be inclined very much back towards the temple, in order that the point, when pushed on, may pierce the iris from behind near its temporal margin, say one tenth of an inch, and appear in the anterior chamber. The handle of the knife is now to be inclined forward a little, so that, when the knife is pushed farther on, its point may pass across the anterior chamber towards its nasal side. By now inclining the handle of the knife still more forward, so that its edge may be fairly applied against the iris, and then by withdrawing it somewhat, it

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is made to cut the iris. The incision should be at least one fifth of an inch in length.

Janin's and Maunoir's Operation consists in making a small section of the cornea at its lower and outer, or its lower part, and by means of Maunoir's scissors, introduced through the opening, dividing the iris by two incisions divaricating from the situation of the natural pupil, (Plate CLXX. Fig. 15.) Modifying this plan, Dr. Mackenzie cuts the radiating fibres only, (Plate CLXX. Fig. 9.) In either case, the result is a triangular flap of iris, which contracts and shrivels so as to leave a free opening, (Plate CLXX. Figs. 11, 14.)

1. The section of the cornea is to be made at the outer and lower or the lower part of the cornea, to the extent only of about one fourth of the circumference of the cornea, unless it is contemplated to extract the lens or an opaque capsule; when the section should be to the extent of one third of the circumference.

2. The surgeon introduces the scissors closed under the flap of the cornea, and when the point has arrived at that part of the iris where the incision is to be commenced, he opens them, thrusts the sharp-pointed blade through the iris, and pushes them on, the sharp-pointed blade through the posterior chamber, the probe-pointed blade through the anterior chamber, the iris between them, to the part of the opposite margin of the iris, where the incision is to terminate. By now closing the scissors sharply, the iris between the blades is cut. The second incision is now to be made; the scissors should be withdrawn, and reintroduced in the direction of the second incision. When the sharp point of the scissors is opposite the commencement of the incision which has just been made, the sharp-pointed blade is passed, and the scissors pushed on, then closed, and the incision made as before. An additional step, which may be called for, is extraction of the lens, if present, or of an opaque capsule.

Artificial Pupil by Excision. There are two principal methods of excision; viz., that of Beer and Gibson, or lateral excision, and that of the first Wenzel, or central excision.

Lateral excision is performed by making a small section of the cornea at some convenient part of its circumference, seizing with a forceps the piece of iris which protrudes, and cutting it off, taking care to include the pupillary margin of that part of the iris.

1. Puncture or Section of the Cornea. This is to be made close to the sclerotica, and to the extent of one fourth of the circumference of the cornea.

2. Excision of the Piece of Iris. If prolapsus of the iris takes place by the gush of aqueous humor which follows the section of the cornea, it is to be seized by the forceps, raised up, and a portion, including the pupillary margin, cut off. If prolapsus has not taken place, and cannot be made to do so by gentle pressure, the operator carefully introduces the blunt hook, draws it out, and cuts it off. Any portion of the iris that may remain protruding is to be gently pressed back with the curette. The eyelids are then to be closed, rubbed over the cornea, and suddenly opened to the light.

Central Excision as performed by Wenzel. (Plate CLXXI. Fig. 7.) This consisted, first, in making a half section of the cornea, as for extraction, with the additional manœuvre of so puncturing and counter-puncturing the iris with the point of the knife, in its passage through the anterior chamber, that, in the act of cutting out, a semicircular flap of the iris was formed. The flap of the iris was then cut off with a small pair of scissors, introduced through the incision of the cornea. If cataract existed, it was extracted at the same time.

Artificial Pupil by Separation. This operation consists in detaching the iris (Plate CLXXI. Fig. 4) from its ciliary connection at some convenient part, and drawing it aside, so as to provide a passage for the light. It may be performed through the sclerotica, or through the cornea. Performed through the cornea, the lens, if clear, may be preserved so.

1. Puncture of the Cornea. This should be about one tenth of an inch in length. The place where it should be made,

which is an important point to determine, depends principally on the part of the iris to be detached, but in some measure also on the state of the cornea; for the incisions ought, if possible, to be made at a part of the cornea where there is no adhesion of the iris. For example, if the iris is to be detached at the nasal side, and the cornea, though opaque, is free from adhesion to the iris, and admits of being cut in the middle, the puncture may be made there; (Plate CLXXI. Fig. 4;) but if the middle is not in such a state, then the puncture must be made either above (Plate CLXXI. Fig. 9) or below, (Plate CLXXII. Fig. 2.) Again, if there be nothing limiting the puncture of the cornea to any particular place, but the new pupil can be obtained only by detachment of the upper or lower part of the iris, then the puncture in the cornea will require to be made as in Plate CLXXI. Fig 11, or Plate CLXXII. Fig. 5.

The opening in the cornea is made by simple puncturation with the keratome or cataract knife, but, at the same time, care is to be taken to make the opening as wide within as without; otherwise the prolapsed piece of iris will not be so readily retained. Another precaution should be, to let as little of the aqueous humor escape as possible.

2. Introduction of the Hook. The hook should be introduced, convexity foremost and flatwise, through the opening in the cornea, and in the direction of its axis, into the anterior chamber. The handle of the instrument is next to be inclined so far backward, that its blade may be parallel between the iris and cornea. The instrument is now to be pushed on through the anterior chamber, the sharp point of the hook being, if any thing, rather towards the iris than the cornea, to the ciliary circumference of the part of the iris to be detached. Before attaining this point, a little of the extremity of the hook disappears behind the margin of the sclerotica.

3. Hooking and Detachment of Part of the Iris. The handle of the instrument is now to be so far rotated and inclined

that the point of the hook may be directed firmly against the iris, and fixed into it, and that as close to the ciliary circumference as possible.

The iris being hooked, the instrument is to be rotated and inclined so that it may be brought back to the position it was in before the iris was hooked. A steady and sustained, but gentle pull or two is now to be made until the iris begins to separate. When this takes place, and not before, the instrument is to be rotated half on its axis, so that the iris may be the more securely hooked. By now continuing to pull the instrument slowly and steadily, separation goes on.

4. When the hook arrives at the puncture in the cornea, some nice manipulation is required to bring it out without letting the iris slip away. The essential point is to press back the lips of the corneal puncture, which is behind the blade of the hook, in order to make the puncture gape. As much of the iris, at least, is to be prolapsed as will suffice to secure its retention in the corneal wound, and as much as may be necessary to make the new pupil of the proper size. In order to the retention of the prolapsed iris, it is to be drawn to one or the other end of the puncture, and left there between its lips.

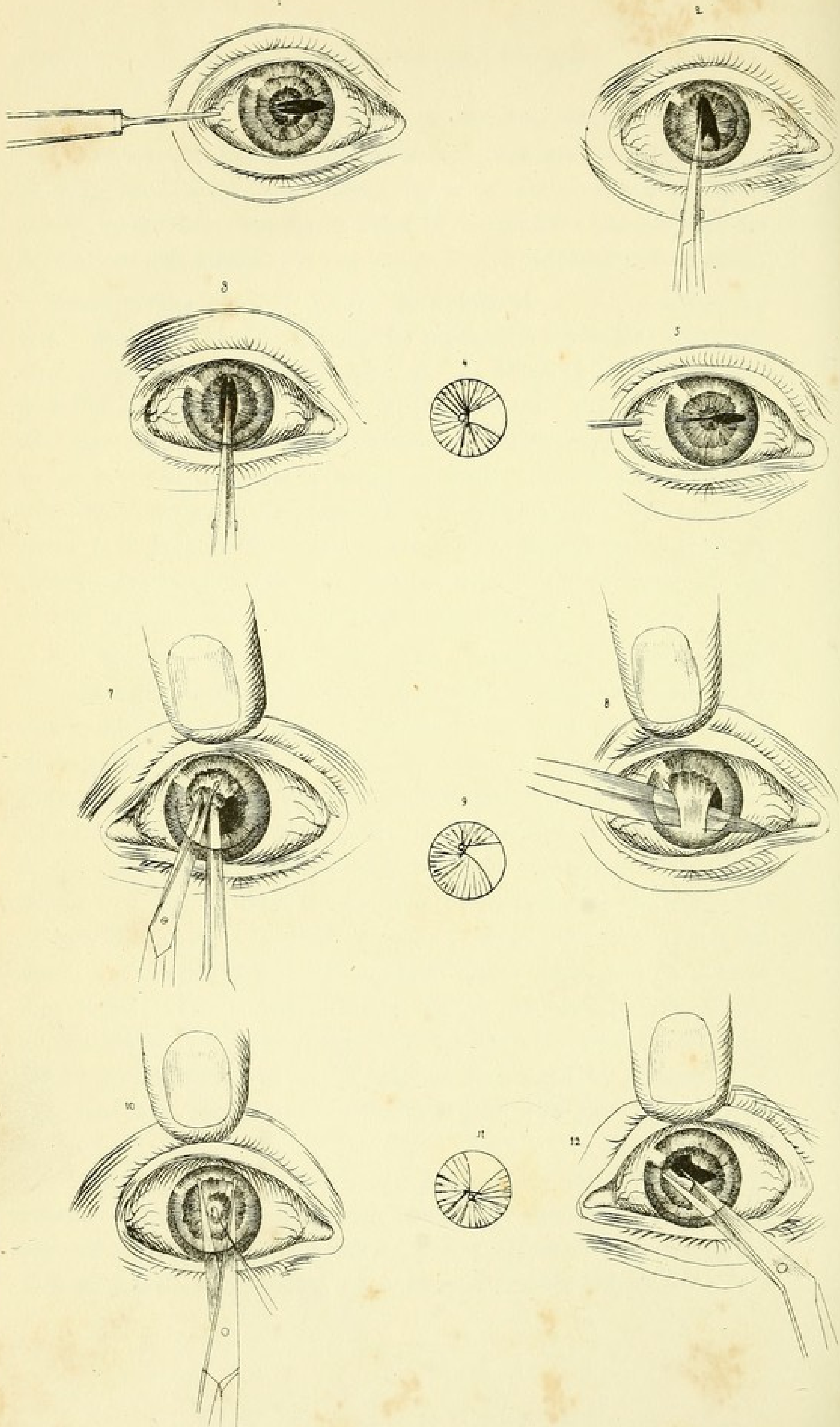
If it be necessary, in order to obtain a proper sized pupil, to draw more of the iris out than is requisite for its being retained in the corneal incision, the superabundant part should be cut off. When the prolapsed iris cannot be retained between the lips of the corneal incision, somewhat more should be drawn out, and the whole cut off.

RESTORATION OF THE NATURAL PUPIL TO ITS NATURAL POSITION, BY ABSCISSION. If the pupil is dragged by a small synechia anterior from its natural situation to opposite an opaque part of the cornea, and if it appears that, were the adhesion destroyed, the pupil would come to be opposite a clear part of the cornea, the operation to be adopted is simply the abscission of the adhesion. This is effected by means of a needle, cutting on the edges, and increasing in thickness towards the middle. It is passed through the cornea into the anterior chamber obliquely, in order that the aqueous humor may not escape, and the adhesion is cut. In doing this, great care should be taken not to injure the lens. Injury to the lens may be avoided if the aqueous humor has not been allowed to escape, but not easily, if this accident has occurred.

Dislocation of the Pupil to opposite a clear Part of the Cornea. This is effected by prolapsing a portion of the iris through a puncture of the cornea, and so dragging the pupil away from the opaque middle part to opposite the still clear circumferential part of the cornea. The puncture of the cornea is made with an iris knife, or the point of a cataract knife, close to the sclerotica, and should be about one tenth of an inch in extent. Through the puncture a blunt hook is introduced, the iris caught by its pupillary margin, drawn out, and left strangulated in the opening of the cornea, in order that it may adhere in the cicatrix.

Extirpation of the Eye. The operator first passes a ligature through the anterior part of the globe, in order to steady it, or else seizes it with a hook or vulsellum, and slits up the external commissure of the lids. Then he raises the upper eyelid, cuts through the fold of the conjunctiva reflected from it to the eye, and dissects backward so as to separate all the soft parts from the roof of the orbit. The same process is repeated below and on the sides, taking care to cut close to the bone, and to remove the lachrymal gland. Then a curved knife is introduced in the outer side to cut through the optic nerve and origin of the muscles, and so the eye is detached. The patient must be put to bed, with a cloth, dipped in cold water, laid over the face. If there is very great hemorrhage from the ophthalmic artery, it may be restrained by pressure with lint; but it is better not to stuff the orbit with lint, if it can be avoided.

If it is desirable that the lids be permanently closed, this may be effected by making a transverse incision in the upper eyelid, just below the orbit, and seizing the belly of the levator palpebræ as far back as possible, and cutting out a piece of it with scissors.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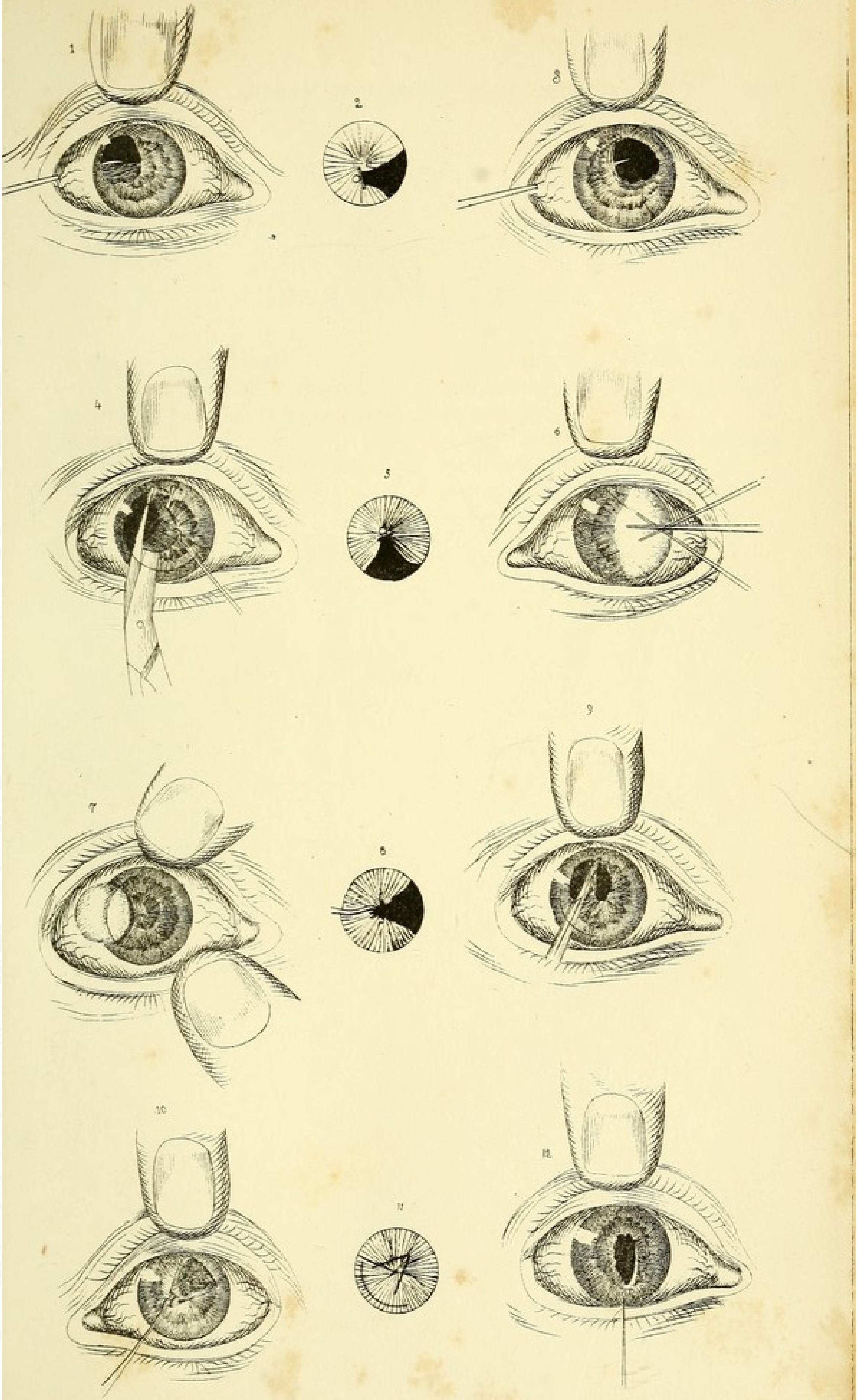
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PLATE CLXXIII.

Fig. 1. Scarpa's boot.

Fig. 2. Dieffenbach's contrivance for reducing talipes varus to talipes equinus.

Fig. 3. Little's apparatus for the treatment of varus.

Figs. 4, 7, 8, 9, 10, 11. Various methods for obtaining graduated movement.

Fig. 5. Contrivance for reducing varus to equinus.

Fig. 6. Sole of Scarpa's boot.

PLATE CLXXIV.

Fig. 1. Minerva of Delacroix, modified by Bouvier, for the treatment of torticollis.

Fig. 2. Side view of the upper joint, permitting forward motion.

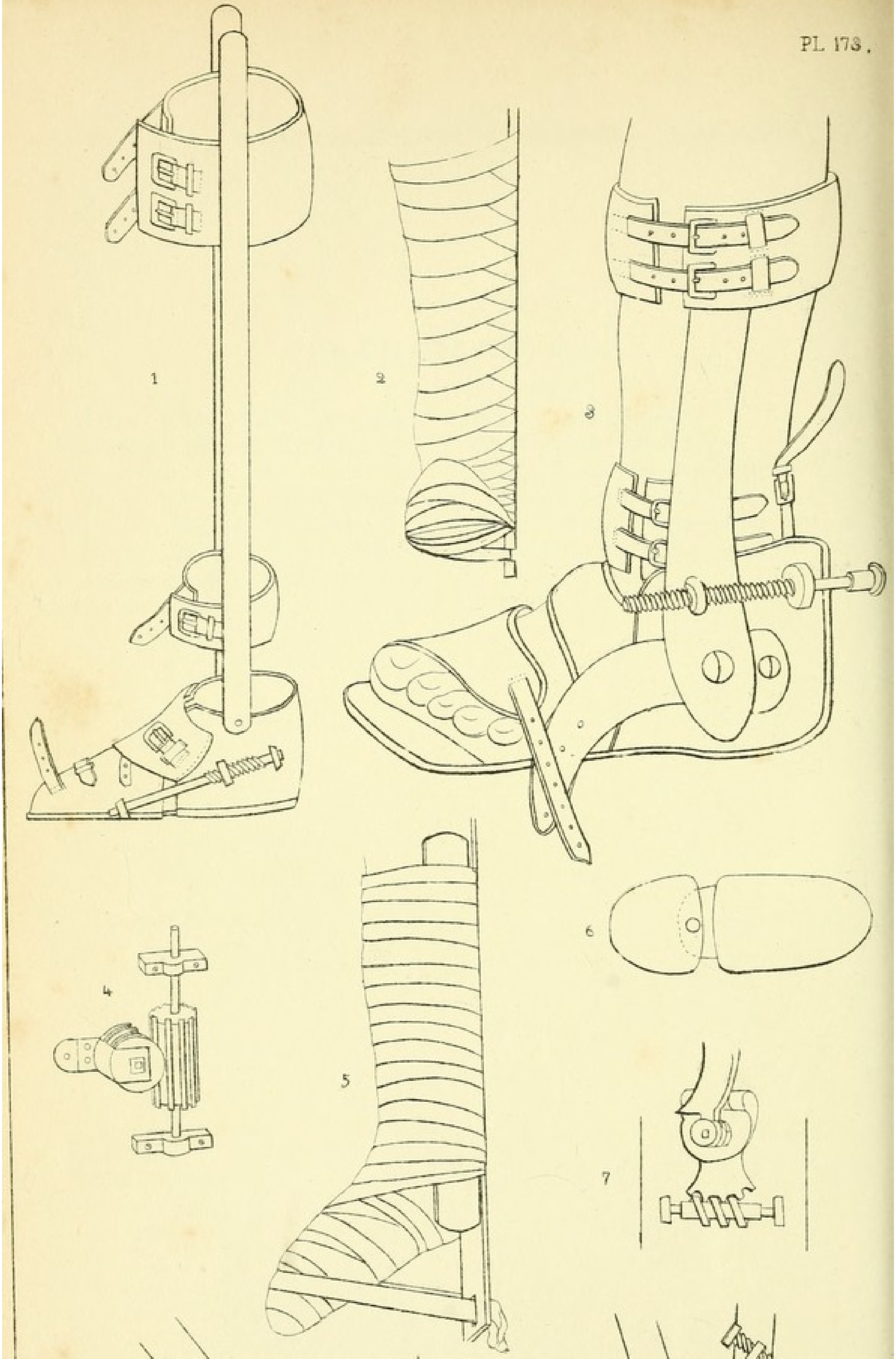
Fig. 3. Side view of the lower movement, which serves to bend the neck to one side.

Fig. 4. Phillips's cravat.

Fig. 5. Back view of Fig. 4.

Fig. 6. Duval's apparatus for false anchylosis of the knee joint.

Fig. 7. Bonnet's apparatus for false anchylosis of the knee joint.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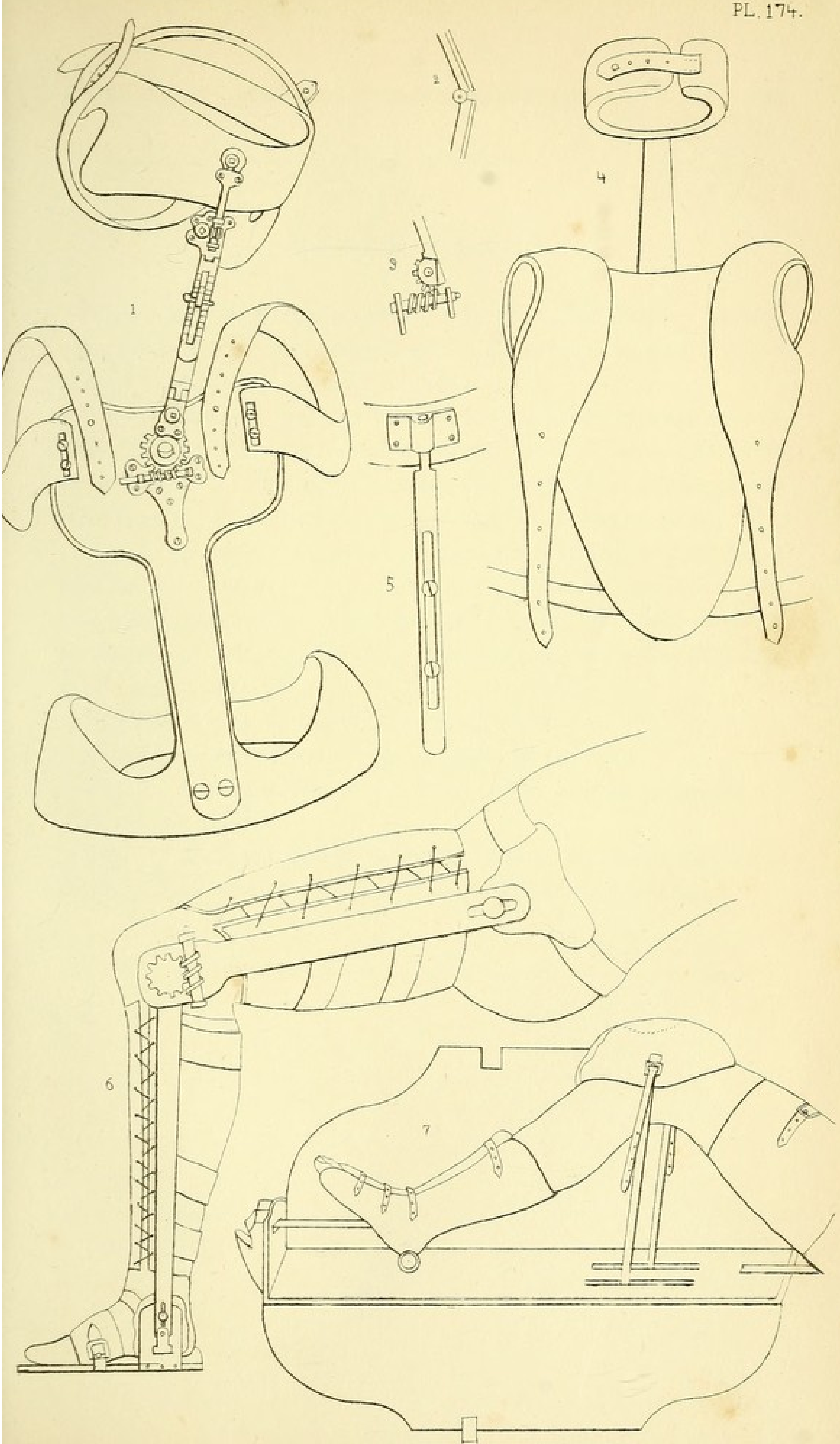
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PLATE CLXXV.

Figs. 1, 2. A Complicated Case of Club Foot. In this case, the heel is drawn upward, as in talipes equinus, and the fore part of the foot bent towards the heel.

Fig. 2 shows the process for the division of the plantar aponeurosis and the short flexor muscle of the toes. The toes are held by an assistant. The surgeon takes the heel in his left hand, and introduces the knife between the skin and aponeurosis with his right.

Fig. 3. A case of varus, complicated with retraction of the flexor tendons, and especially the long flexor tendon of the great toe. The toes being extended by an assistant, the surgeon introduces the knife at the inner border of the foot, and turns the edge downward to divide the tendon.

Fig. 4. A case of varus in a young child.

Figs. 5, 6. Retraction of the muscles of the ham.

Fig. 5. Internal view of the limb. This case was complicated with talipes equinus.

Fig. 6. External face of the limb, showing the prominence made by the gluteus maximus muscle by its action on the fascia lata.

PLATE CLXXVI.

Fig. 1. Section of the Tendinous Cord, (shown in Plate CLXXV. Fig. 6.) The knife is introduced from behind, forward, under the cord. The limb is held by an assistant, while the surgeon, with his left hand, presses the limb against the palm of the assistant's hand, so as to efface the curvature on its external face, and divides the cord with the knife.

Fig. 3. Section of the Semi-tendinosus and Semi-membranosus Muscles. The puncture is made from before, backward. The assistant presses with one hand upon the patella, and with the other endeavors to extend the leg. The surgeon applies his hand upon the posterior part of the thigh, while he makes the section with the right.

Fig. 4. Crescent-shaped tenotome of M. Guerin.

Fig. 5. Instrument for making the puncture, previous to introducing the tenotome.

Fig. 6. Talipes Varus. Section of the adductor muscles of the great toe. An assistant presses the heel outward. The surgeon carries the toes in the same direction with his left hand, and with his right introduces the knife flatwise between the skin and the muscle, and then divides the latter downward, in the direction of the scaphoid bone.

Figs. 1, 2, and Plate CLXXVII. Fig. 4. Talipes Equinus. Plate CLXXVII. Fig. 4, shows the first step of the operation for dividing the tendo Achillis. The patient is laid on the abdomen, while an assistant grasps the foot, and extends it on the leg. The surgeon, then, with the aid of another assistant, raises a fold of skin over the tendon, and introduces the knife flatwise through the skin, and carries it over the posterior surface of the tendon. At the stage of the operation shown, the surgeon has turned the edge on the tendon for the purpose of dividing it, as the assistant strongly flexes the foot.

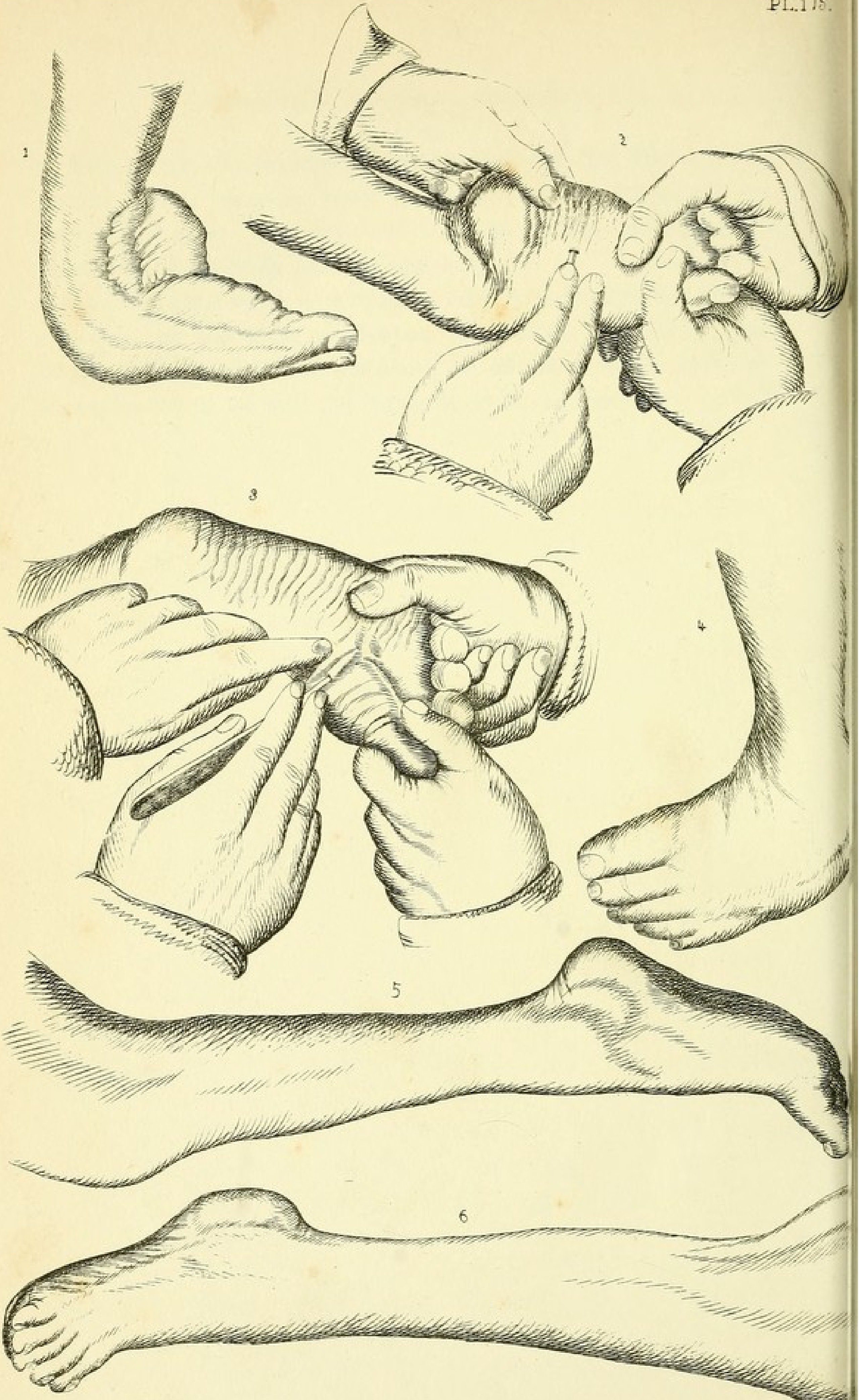
Fig. 2 shows the section of the tendon on the subject.

"There need be no set rules," says Mr. Fergusson, "for such operations," i. e., operations for club feet, "nor much hesitation in dividing every texture which seems to offer resistance to the removal of the deformity; the utmost care, however, should be taken not to wound important parts.

Operation for Flexed Knee. Division of the Hamstrings. From Fergusson. The limb being conveniently placed, with the patient on his side or face, two sections of the textures may be accomplished with great facility with the knife, (Plate CXIX. Fig. 13.) Often, in commencing the operation, the tendon of the semi-tendinosus seems the only part requiring division; as soon, however, as it has been divided, the leg straightens a little, and the semi-membranosus then seems equally on the stretch. The knife should therefore be applied again, and next, the biceps should be cut. The blade may be passed either between the femur and the hamstring, or between that and the skin. In the young subject, with the limbs much emaciated, the space between the hamstrings is very narrow, and the surgeon should not allow the point of the knife to pass so far into the middle of the limb as to endanger the popliteal vessels; for were the artery divided, it is questionable whether any other course than amputation of the thigh could be followed with propriety. The posterior tibial nerve must also be carefully avoided; this may be readily done, but the peroneal lies so close to the biceps, that it can hardly escape, unless great care be taken not to push the blade farther than is absolutely required for the incision of the tendinous and muscular fibres. With regard to the application of apparatus in these cases, Professor H. J. Bigelow, to whose work I am indebted for Plates CLXXIII., CLXXIV., says, "It may be asserted that a large majority of European orthopedic surgeons follow the example of Stromeyer, and wait for the cicatrization of the puncture before applying extension to the limb.

In this country, this practice was recommended by Dr. Hayward, of Boston, as long since as 1841." The adjustment of machines requires great care. The extension should be gradual, and inflammation should be carefully guarded against.

Some of these cases of deformity may be remedied without an operation, by the early application of suitable apparatus. The choice and application of machines, in all these cases, must, of course, be left to the skill and ingenuity of the surgeon.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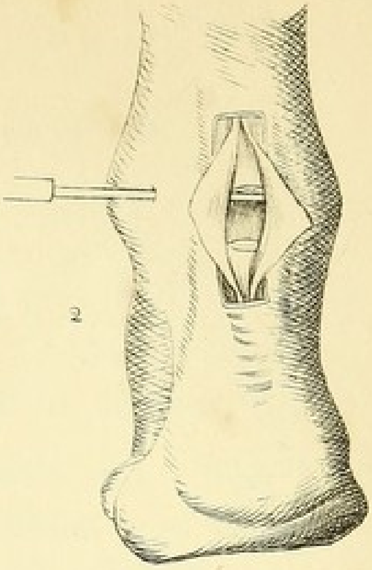

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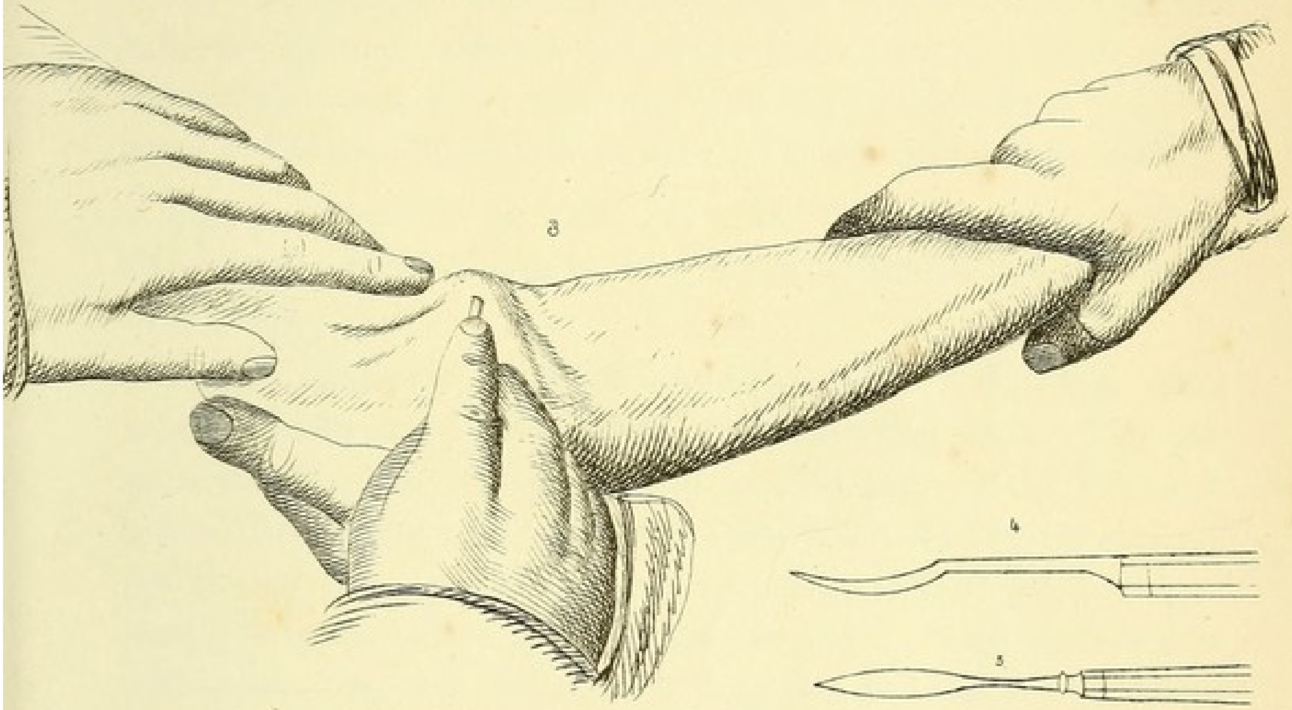

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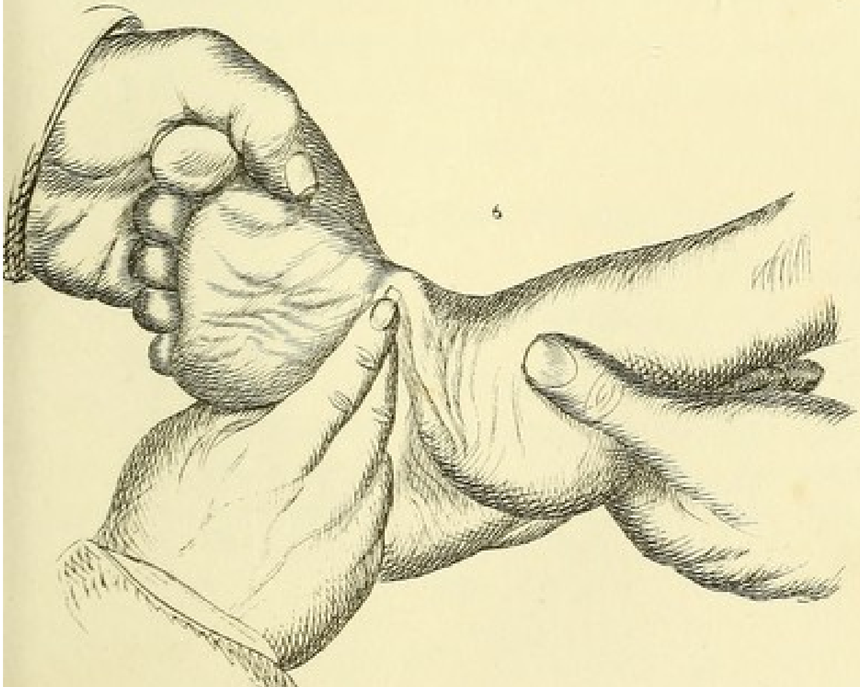

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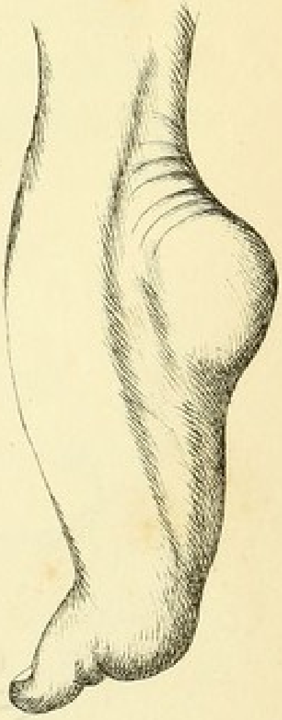


PLATE CLXXVII.

Torticollis. Process of M. Guerin.

Fig. 1. Section from behind forward. The head is held by an assistant in the position in which it is drawn by the contracted muscle. A longitudinal fold of skin is raised over the contracted sterno-cleido mastoid, between the hand of another assistant and the hand of the surgeon. The knife is seen about to be entered at the base of the fold, so as to be placed behind the muscle.

Fig. 3. Section of the Sternal Portion of the Muscle only. The knife is passed flatwise under the skin in front of the muscle.

Fig. 6. Section of both Portions of the Muscle, from behind forward, with a double-edged myotomy knife. The surgeon carries a fold of skin, with the middle finger of the left hand, behind the muscle. He then introduces the knife flatwise through the skin at the posterior side of the muscle, with which it is kept closely in contact till the point strikes the finger. The finger is then withdrawn, the knife following it, and piercing the skin a second time, but now in front of the muscle. The knife is then pushed on till the second edge (which is of the same form as the first, and should be shown just anterior to the thumb in the figure) is lodged behind the muscle. This is then turned forward, and the muscle divided towards the skin.

Fig. 2. Dissection of the Bend of the Elbow.

1. Biceps muscle.
2, 9. Tendon and aponeurotic expansion of the biceps.
3. Triceps extensor cubiti.
4, 5. Muscles of the forearm arising from the condyles.
6. Brachial artery.
7. Median nerve.
8. Profunda artery.
10. Basilic vein.
11. Median basilic vein.
12. Radial vein.
13. Median cephalic vein.
14. Cephalic vein.
15. Vena communicans.

Fig. 5. Subcutaneous Section of the Tendon of the Biceps, in a case of permanent flexion of the forearm, corresponding to Fig. 2. The puncture is made on the internal border of the tendon. The knife is held between the thumb and forefinger of the right hand, the three remaining fingers being made to press down, so as to carry the brachial artery and vein, and median nerve, away from the tendon. The left forefinger is made, in like manner, to press away the parts from the outer side of the tendon, so as to cause the latter to stand up in relief. The knife is then introduced from below the tendon, and made to divide it from below upward.

Fig. 4 is described in connection with Plate CLXXVI.

PLATE CLXXVIII.

Vesico-vaginal Fistula.

Figs. 1, 2. Closure of the Orifice by a Plastic Operation. Process of Leroy D'Etialles. In Fig. 1 is shown the outline of a flap, detached from the posterior face of the vagina at the anterior extremity of the canal.

In Fig. 2, the flap is reversed, so as to present its raw surface to the margin of the fistulous opening, which has been previously inflamed with caustic. The end of the catheter, passed from the bladder into the vagina through the fistula, is made to receive the threads of a double-quilled suture, by means of which the flap is held against the vesico-vaginal septum.

Fig. 3. Suture of a Transverse Fistula. Process of M. Deyber. A catheter, enclosing a dart stylet, is introduced through the urethra. On the right side, the stylet has been passed through the anterior lip of the opening, so as to lodge one of the sutures in the wound, and is shown passed again through the

posterior lip, to allow the other end of the ligature to be detached with the forceps.

Fig. 4. Recto-vaginal Fistula. Cure by the Process of Roux. The opening, in this case, existed between the vagina and rectum, at a little distance from the cutaneous surface of the perineum. A quadrangular flap has been detached from the posterior wall of the vagina, and drawn downward for the purpose of being fastened by suture to the margin of the fourchette, which has been made to receive the flap.

Fig. 5. Plastic Operation for the Closure of the Opening between the Vagina and the Bladder. Process of Jobert. A flap has been detached from the surface of the labium externum, turned upon its pedicle, and fastened by suture over the margins of the opening.

Fig. 6. Closure of a Longitudinal Recto-vaginal Fistula by Suture. The vagina is distended with a bivalve speculum. The edges of the fissure, previously inflamed by the application of caustic, have been made raw by the knife. The needle is passed with a porte-aiguille, the surgeon steadying one of the lips of the fissure with a pair of rat-toothed forceps in his left hand.

Fig. 7. Suture of the Perineum, with the Lateral Incisions of Celsus, as modified by Dieffenbach. The edges of the lacerated wound have been excised with the knife, and brought together by three points of the quilled suture. In order to allow a perfect approximation of the surfaces, two lateral incisions have been made through the integuments.

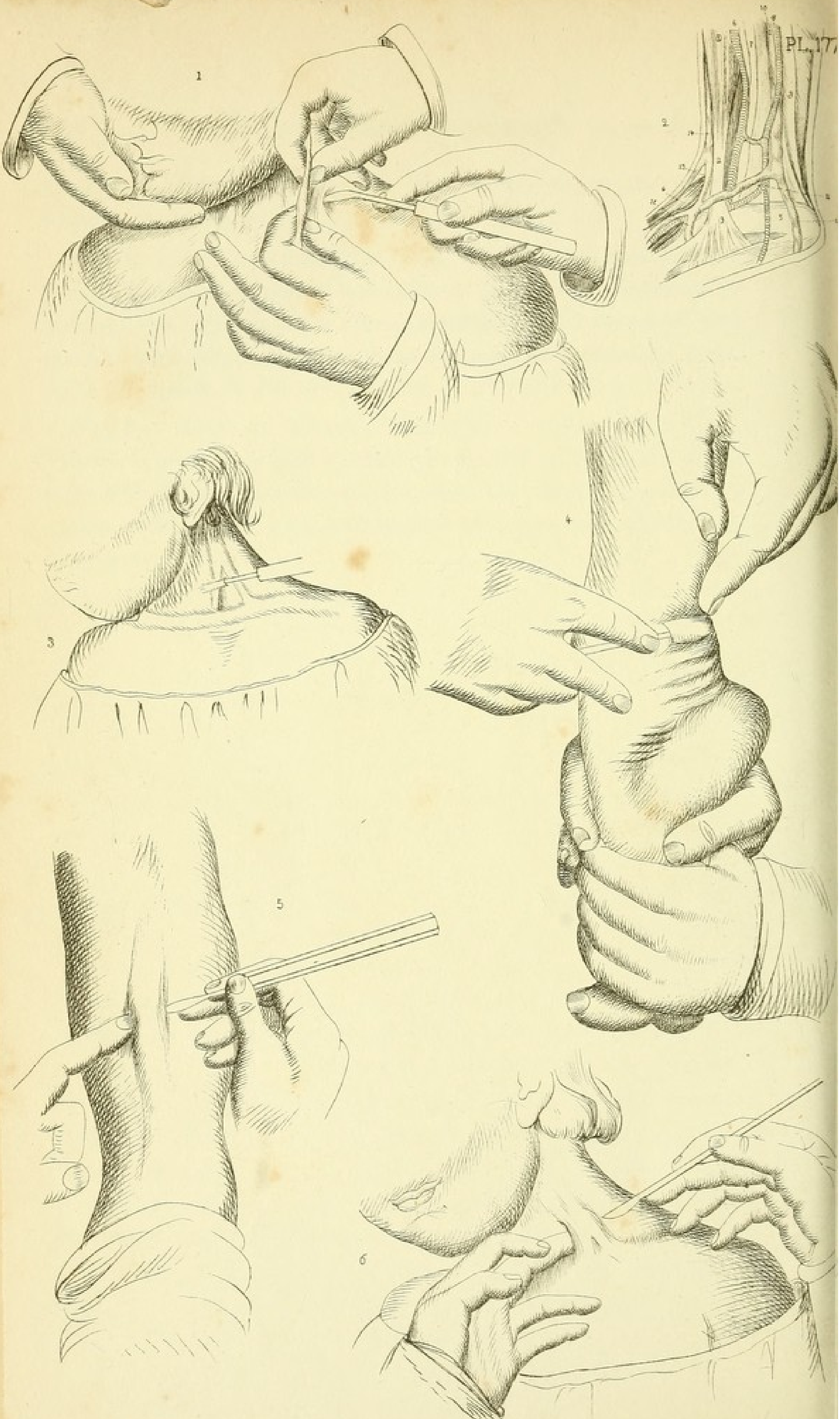
Fig. 8. Vesico-vaginal Fistula. Excision of the edges of a longitudinal fissure by the aid of the forceps of M. Fabri, one blade of which is constructed like the prongs of a fork. The upper blade, which is single and flat on its lower surface, is introduced by the urethra, and serves as a support to the pressure made by the forked

blade on the edges of the fissure. The knife is seen applied for the excision of the edges.

Fig. 9. Lithotomy in the Female. Vestibular Operation. The labia majora are separated by the two fingers of an assistant. A catheter, passed through the urethra, is depressed with the left hand of the surgeon, so as to make the vestibulum tense, while he incises it with the bistoury in his right hand.

Fig. 10. Incision of the Urethra upward. The mons Veneris is pressed upward by the right hand of an assistant. With a grooved director, the surgeon depresses the urethra towards the vagina with his left hand, and divides its upper wall with a bistoury in the right.

PL. 17.



PL. 178.

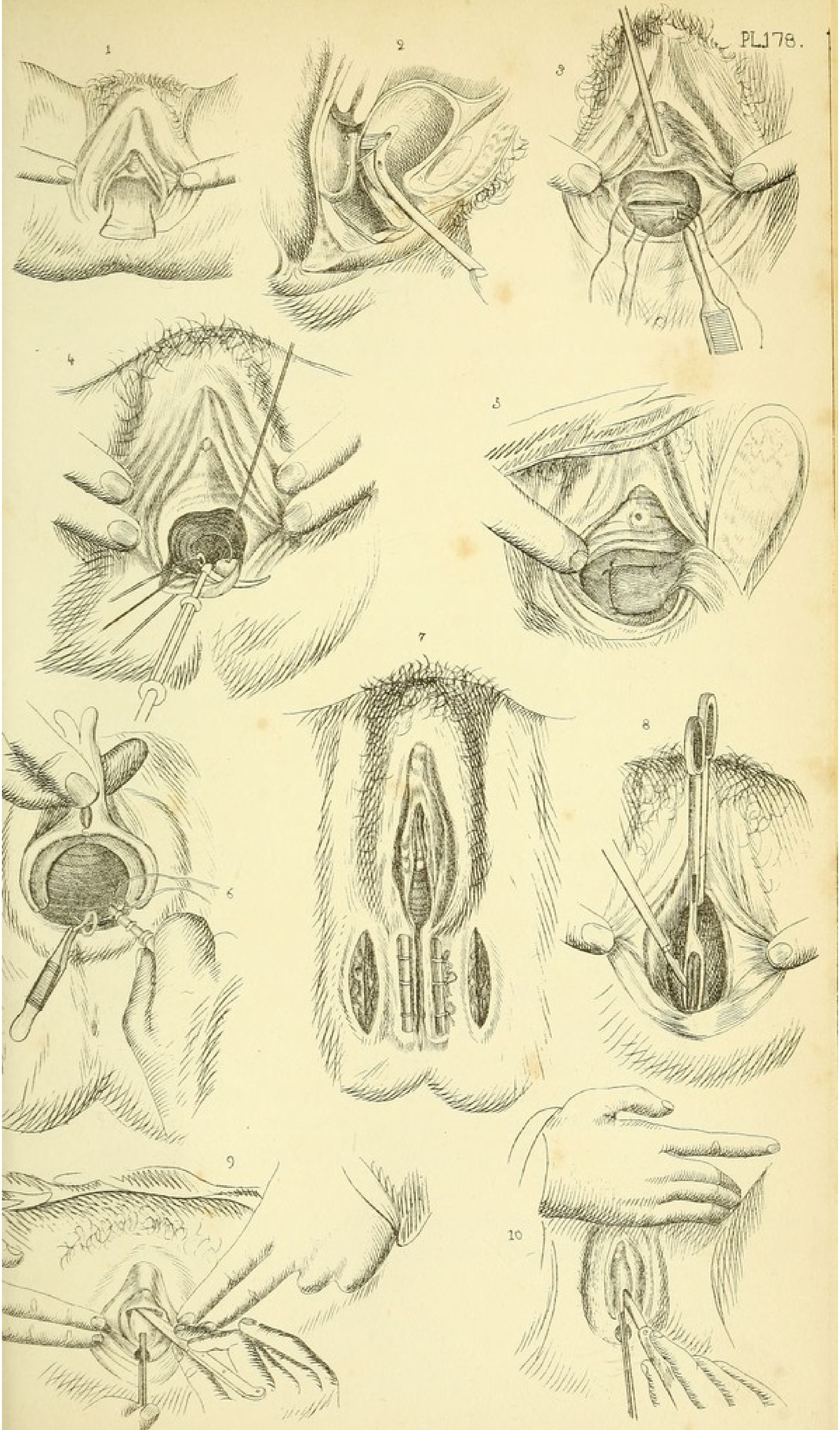


PLATE CLXXIX.

Figs. 1, 6. Canule à manche, to be placed upon the skin in cases of deep cauterization.

Figs. 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 25, 26, 27, 28, 29. Metallic cauteries.

Fig. 2. Section of Fig. 3.

Fig. 3. Halberd-shaped cautery.

Figs. 4, 9. End views of Figs. 5, 8.

Figs. 7, 23. Seton needles, by which the seton tape or skein of thread may be passed directly through without a previous puncture, as in Plate XI. Figs. 5, 6.

Figs. 11, 12. Cautery of M. Charrière, for the cauterization of poisoned wounds.

Figs. 15, 16, 17, 19. Various cupping instruments.

Fig. 18. Porte-moxa.

Fig. 19. Cautère en roseau.

Fig. 20. Common moxa.

Fig. 21. Moxa of M. Sarlandière.

Fig. 22. Blowpipe.

Fig. 24. Movable handle for the various cauteries.

Fig. 26. Section of Fig. 25.

Fig. 30. Several layers of leather, or adhesive plaster, to be placed upon the skin previous to the application of the caustic, for the purpose of forming an issue.

Fig. 31. Puncture of the ear.

The Actual Cautery is applied in the following manner: The knob or end of the instrument being heated red hot, it is applied to the skin to the extent, and in the direction, the surgeon may deem proper.

The Moxa is sometimes applied for the relief of chronic, nervous, and rheumatic pains, and for chronic diseases of the joints. One or more small cones, formed of the fine fibres of the artemisia chinensis, or of some other porous vegetable substance, such as German tinder, or linen impregnated with nitre, is placed upon the skin over the affected part, and then set on fire and allowed to burn so as to form a superficial eschar. The surrounding skin must be protected with a piece of wet rag, with a hole in it for the moxa.

Sometimes the moxa is used as a rubefacient, or vesicant, and not as a cautery. A roll of German tinder, ignited, may be held with dressing forceps at a little distance from the skin, the surgeon at the same time blowing upon it with a blowpipe till the skin becomes red.

ISSUES are made by caustic, or incision, or by the actual cautery. They may be made by caustic, either by rubbing a portion of the skin to the requisite extent with the potassa fusa, or by making a paste of equal parts of the potassa and soft soap, and applying it to the skin till the latter is converted into a black slough. The parts immediately round the issue should be protected with several layers of adhesive plaster, or leather, (Fig. 30.) After the application of the caustic, the part should be poulticed till the slough separates, and then the sore may be prevented from healing either by binding several peas firmly on its surface, or by touching it occasionally with the caustic. The second species of issue is made by pinching up the skin and slitting it with a lancet, and then placing some peas in the wound to prevent it from healing. It may be remarked that issues should never be made over projecting points of bone, nor over the bellies of muscles, for they might degenerate into very obstinate sores. Thus, for diseased vertebræ, the issues should be made between the spinous and transverse processes; for diseased hip, behind the great trochanter, and not over it; for diseased knee, just below the inner tuberosity of the tibia.

VACCINATION. The surgeon should make two or three punctures on one arm with a fine lancet, carrying the point of the instrument obliquely under the cuticle for about one eighth of an inch, drawing as little blood as possible. The matter may be introduced at once from the arm of another patient, or by the means of quill points. These last should be breathed upon in order to moisten the matter previous to their introduction, and be allowed to remain in the arm for two or three minutes.

ELECTRICITY AND GALVANISM may be applied in certain cases of defective nervous influence and circulation: when the thigh is weakened and benumbed after sciatica; in cases of atrophy of the extremities after fever; when the extensors are paralyzed from long disuse, as after disease of the joints ; in deficient menstruation ; in dyspnœa from weakness of the stomach ; in loss of voice from relaxation of the mucous membrane of the fauces ; in hysterical neuralgia ; and in other cases of nervous pain, unattended with increased vascularity, they may be resorted to with every prospect of benefit. But the cases to which they are most applicable, are those of asphyxia from poisoning, or hanging, when the affusion of cold water and other stimulants fails to excite the action of respiration. The best method in these cases is to place one wire at the nape of the neck, and the other at the pit of the stomach ; or, if the sensibility is so feeble that this fails to take effect, a needle may be inserted deeply between the eighth and ninth ribs on either side, so as to reach the diaphragm, and the current be passed between them.

Galvano-Puncture. In obstinate neuralgia, it is a good plan to insert two needles deeply at two points in the course of the nerve, and to pass a galvanic current through them.

Cupping. The patient being placed in a comfortable position, with towels arranged, so that his clothes may not be soiled by the blood, and being moreover protected from the cold, so that the flow of blood to the surface may not be checked, and the operator having his scarificator, glasses, torch, spirits of wine, lighted candle, hot water, and sponge, conveniently arranged on a table close by, — the first thing to be done, is to sponge the skin well with hot water, so as to make it somewhat vascular. The operator next dries it with a warm towel, and adapts his glasses to the part. Their number must depend on the quantity of blood to be taken, from three to four ounces being a fair calculation for each glass. In the next place, he dips the torch in the spirits, sets it on fire, introduces it for a moment into one of the glasses, and immediately places the latter on the skin, (Fig. 19,) and so with the other glasses in succession. As soon as the skin has become red and swollen, he prepares the scarificator, and takes it between the right forefinger and thumb, at the same time holding the lighted torch between the little and ring fingers of the same hand. He then detaches one glass by insinuating the nail of the left forefinger under its edge, instantly discharges the scarificator on the swollen skin, and, as quickly as possible, introduces the torch into the glass, and reapplies it. The same process is repeated with the other glasses. When they become tolerably full, or the blood begins to coagulate in them, they must be detached in succession, and reapplied, if blood enough has not been taken. The wounds should be dressed with lint and plaster. There are several points connected with this operation which require notice. 1. The glasses must not be too much exhausted; if they are, the pressure of their rims will occasion severe pain, the blood will not flow, and the operation will very probably be followed by a considerable ecchymosis. 2. The position of the glasses must be slightly varied each time they are applied, so that their edges may not again press on the same circle of skin. 3. The patient must not be burnt in the operation. 4. In taking off the glasses, the upper part should be detached first, so that the blood may not escape. 5. The length of the blades of the scarificator must be adjusted to the thickness of the skin; for if the incisions are too deep, the fat will protrude through them, and prevent the flow of blood. It is better that the direction of the incisions correspond with the direction of the muscular fibres beneath. For cupping on the temples, smaller glasses and scarificators are employed. A branch of the temporal artery is generally wounded, and the flow of blood may be expedited by slightly lifting the lower part of the rim of the glass. Pressure should be kept up on the wounds for some days afterwards, in order to prevent secondary hemorrhage or false aneurism. Sometimes the blood is drawn, as shown in Fig. 15, with a force pump.

Fig. 31. PERFORATION OF THE EAR is accomplished by applying a cork to one side of the ear, and passing a needle through from the opposite side.

PLATE CLXXX.

Fig. 1. Bicuspid forceps, used for the four upper bicuspid teeth.

Fig. 4. Bicuspid forceps, for the extraction of the lower bicuspids.

Fig. 2. Upper molar forceps, for the extraction of the two upper molars of the left side.

Figs. 6, 7, 8. Molar forceps, for the extraction of the two upper molars of the right side.

Fig. 3. Forceps, for the extraction of the lower molars.

Fig. 5. Forceps, for the extraction of the lower wisdom teeth.

Figs. 9, 10. Forceps, for the extraction of the upper wisdom teeth.

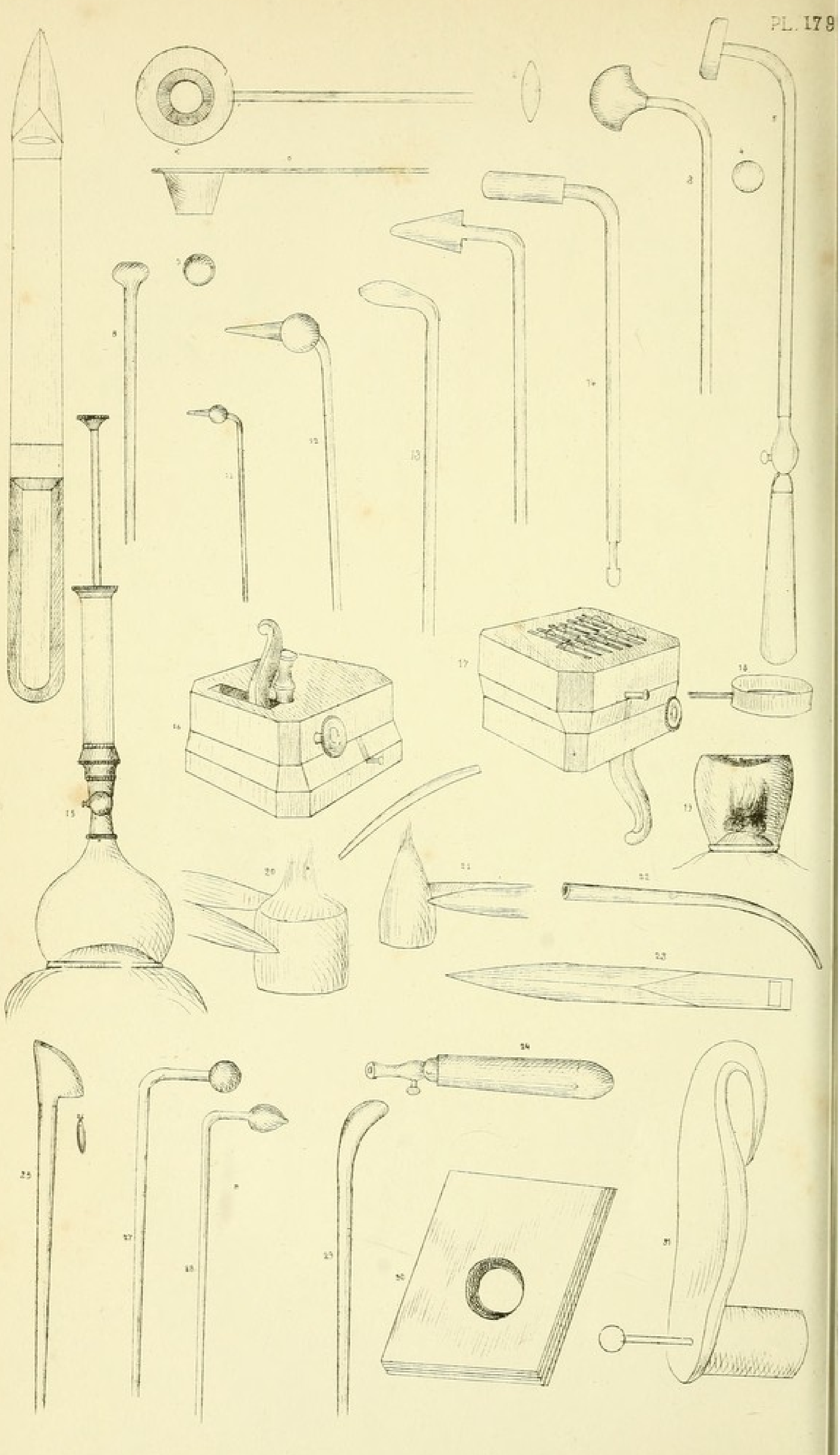
Fig. 1 is also used for the extraction of the upper cuspids and incisors.

Fig. 4. Lower bicuspid forceps, used also for the extraction of the lower cuspids. An instrument of similar form, with narrower blades, is used for the lower incisors.

Fig. 11 shows the use of the forceps and the elevator.

Fig. 12 shows the use of the key. Many dentists supply themselves with a variety of instruments, according to their tastes; but these are considered sufficient for all ordinary cases.

The very beautiful set of instruments shown in this plate, with their descriptions, were furnished me by my friend J. Clough, M. D., Boston.



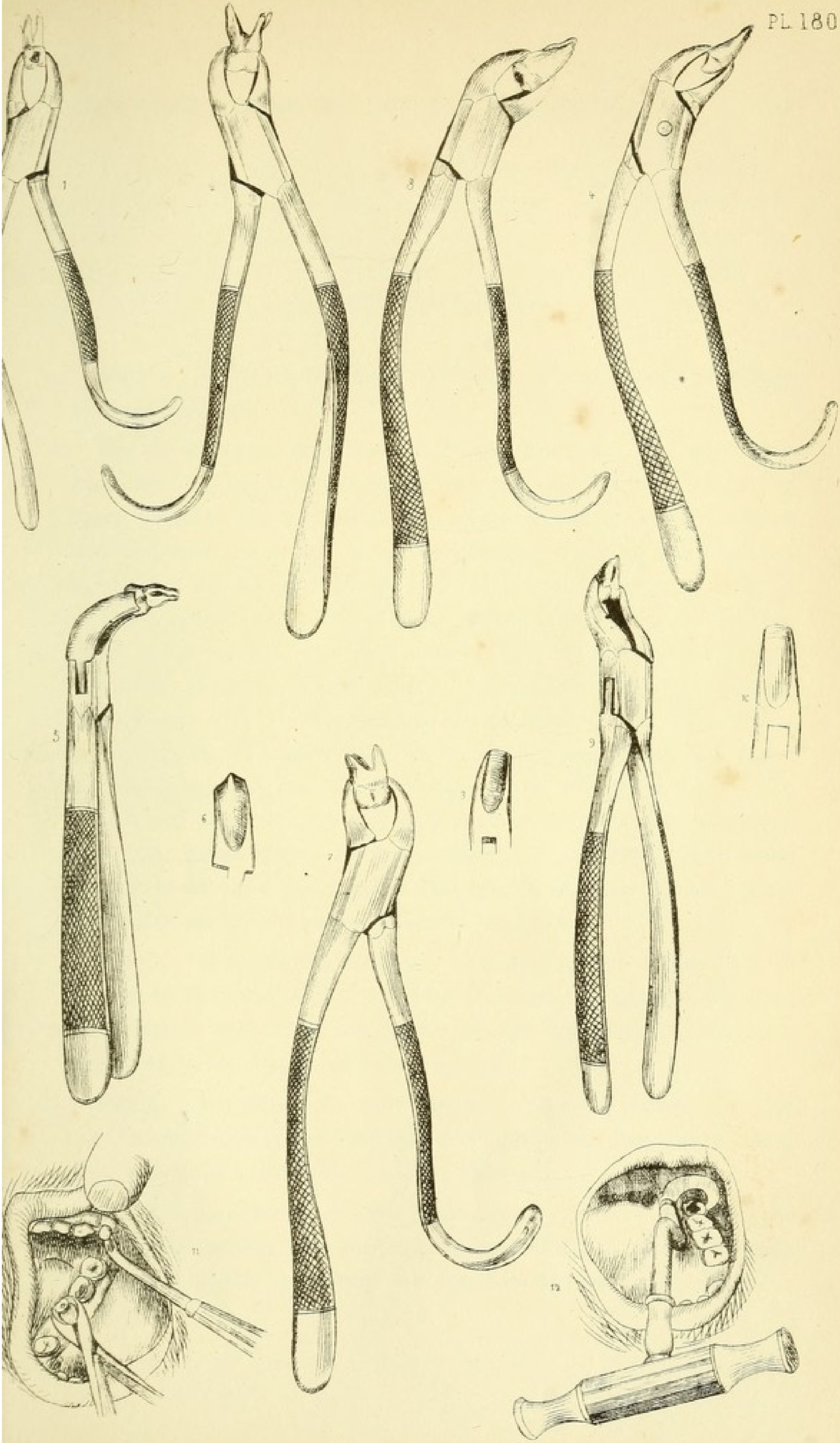


PLATE CLXXXI.

Fig. 1. Vesicular eruption. (Rupia.) From a cast in King's College Museum.

Fig. 2. False Aneurism. From Liston. He says that when the swelling is recent, small, and compressible, and disappears upon arresting the circulation, the artery should be cut down upon and tied, both above and below the opening. He has been obliged to resort to this in cases where the humeral artery had been tied.

The operation is performed in the following manner: An incision about three inches in length, following the course of the vessel, is made into the sac. The circulation is commanded by an assistant, who presses with his fingers upon the brachial artery. The opening in the vessel is seen when the cavity is sponged out. A probe is passed upward into the opening, and a little dissection of the sheath and venæ comites will enable the surgeon to pass a ligature under the vessel, where its connections are undisturbed. The same process is followed in regard to the vessel below the opening; there is no risk of interfering with nerves or veins.

Fig. 3. Varicose Aneurism. From Liston. This form is treated in the same way as the false aneurism, by ligature, either at the wounded part, or in the middle of the upper part of the arm, according to its degree of advancement.

Fig. 4. Aneurism in the Groin. From Liston. In this case, mortification of the limb followed ligature of the external iliac, from which the patient died in a few days.

Fig. 7. Aneurism of the Descending Aorta. From Liston. This patient had popliteal aneurism also. His death was occasioned by the rupture of the one represented in the figure.

Fig. 8. Aneurism of Three Days' Growth. From Liston. This followed venesection at the bend of the arm. The patient died from injury of the chest. In the same figure is shown the effect of the ligature of an artery.

Figs. 5, 6, 9, 10. Effects of wounds upon arteries.

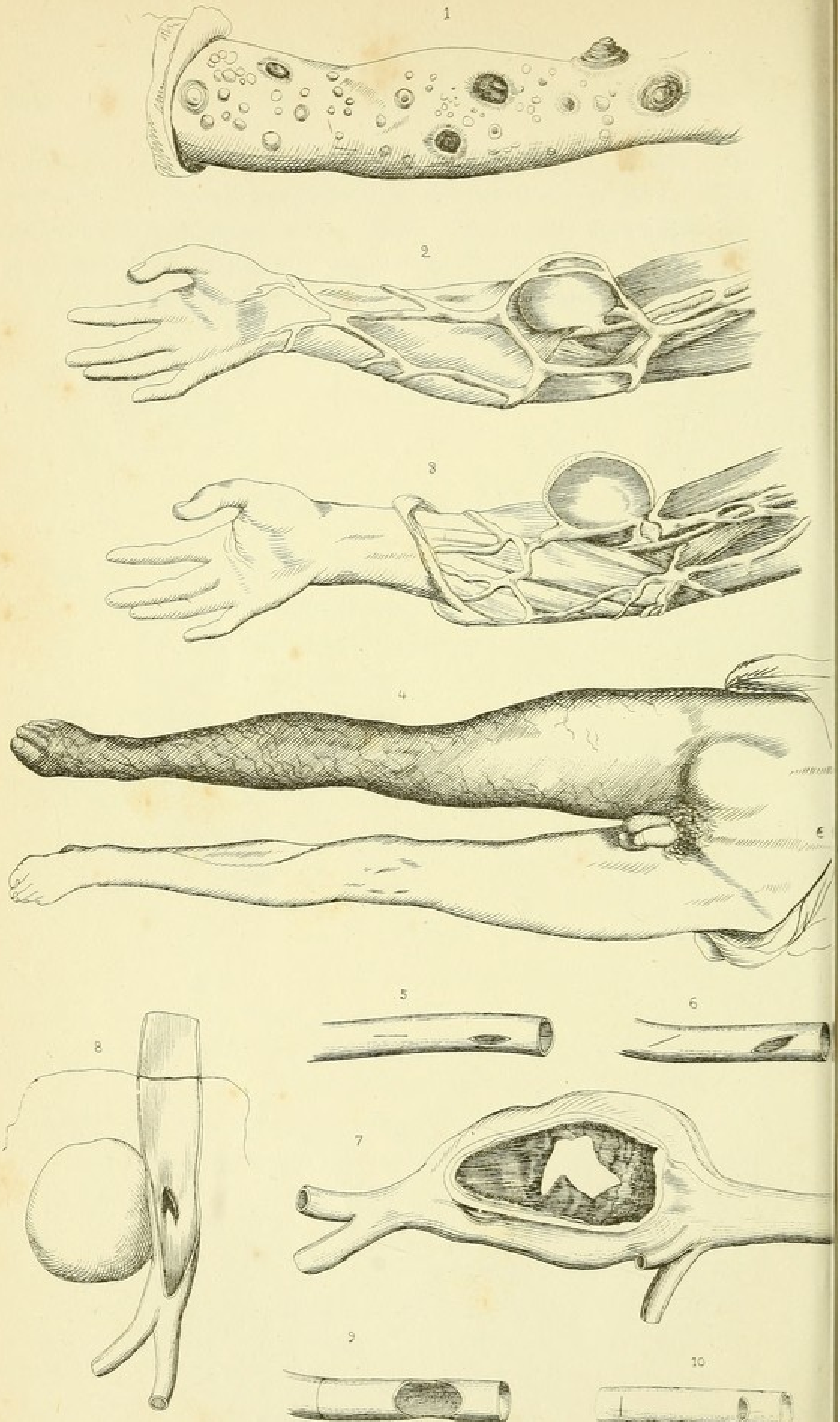
PLATE CLXXXII.

Figs. 1, 2. Carbuncle. Fig. 1 shows the disease in its recent state. Fig. 2 shows the appearance of the part after the cure.

Fig. 3. Fungous hæmatodes of the arm. From Hey's Surgery.

Fig. 4. Abscess, communicating with the arch of the aorta, and with the œsophagus. From Liston.

Fig. 5. Aneurism of the arch of the aorta, which burst into the trachea. From Mr. Lane's Museum.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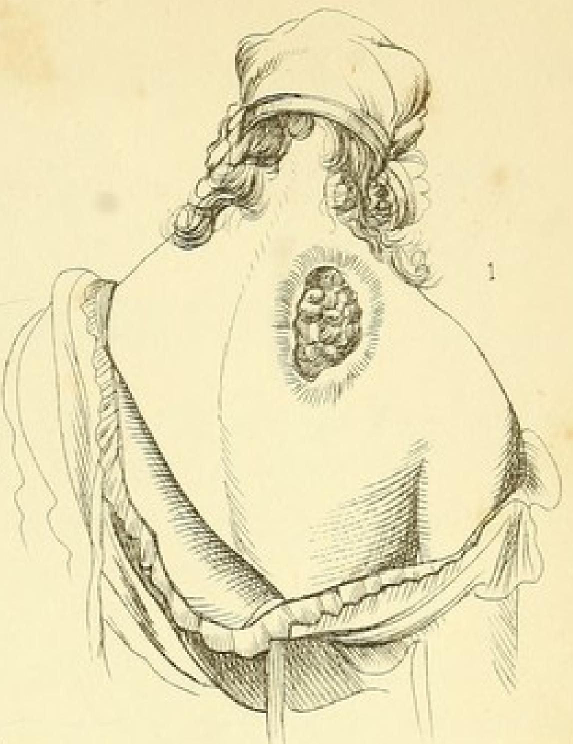

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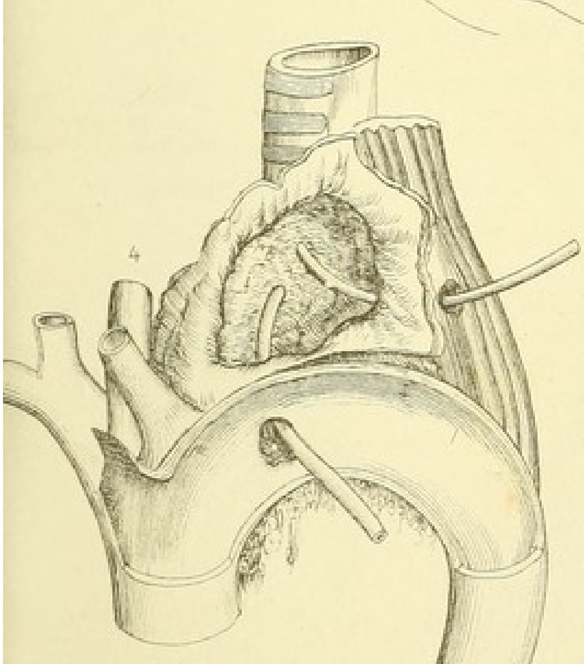

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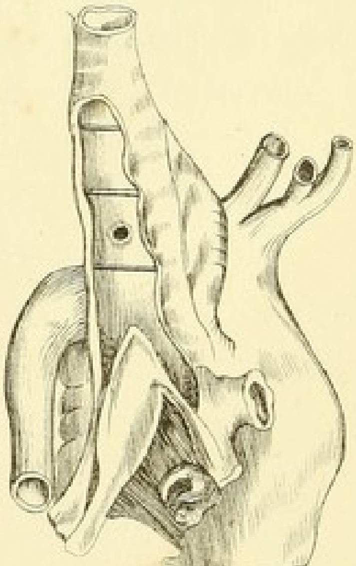


PLATE CLXXXIII.

Dr. Harlow's case of recovery, after the passage of an iron bar through the head. Reported by Dr. H. J. Bigelow.

Fig. 1. Lateral view of a prepared cranium, representing the iron bar in the act of traversing its cavity.

Fig. 2. Front view of ditto.

Fig. 3. Plan of the base of the skull, seen from within. In the above figures, the optic foramina are seen to be intact, and occupied by small white rods.

Fig. 4. Cast taken from the shaved head of the patient.

Figs. 5, 6. The iron bar, of the same proportionate size as the other figures.

The iron bar, and cast of the patient's head, may be seen in the Museum of the Massachusetts Medical College.

A case somewhat similar to the above is reported in Le Dran's Surgery, published in 1740. The patient, a female, received the contents of a pistol, held close to her head. Some portion of the charge must have passed through the brain, as there was an opening in the bone on each side of the head of sufficient size to admit the finger. After the lapse of a month, suppuration came on, and there were discharged, with the pus, five shot and two slugs. "I confess, with Confusion," says the surgeon, "that I prognosticated the Death of the Patient." She, however, perfectly recovered, and was living in the full possession of her faculties two years afterwards.

PLATE CLXXXIV.

Fig. 1. Necrosis of the Os Humeri. From a patient of Dr. H. J. Bigelow.

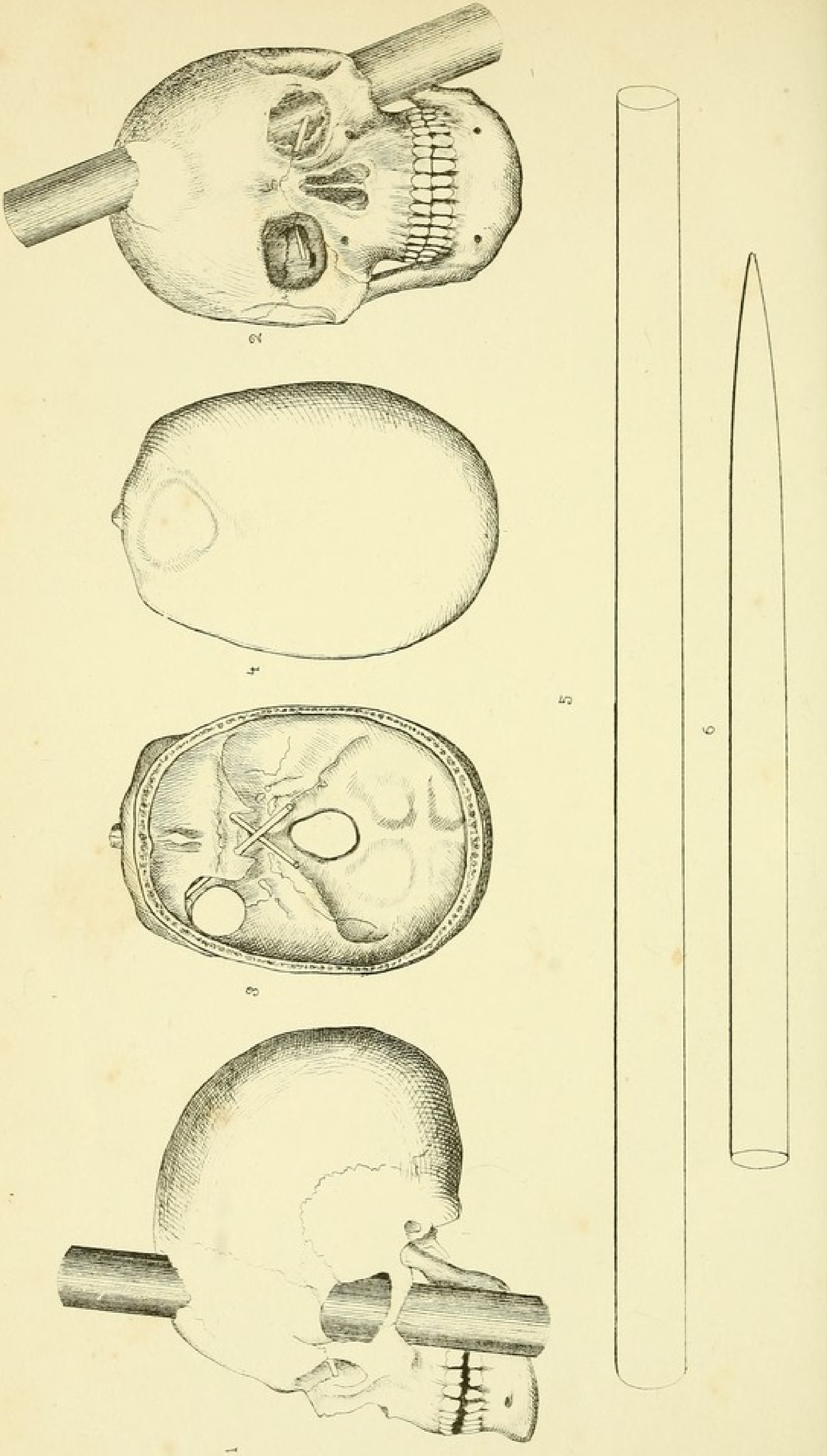
Fig. 6 shows the position of the bone for some time previous to its removal. The sequestrum was so bound in by new bone, that the surgeon was obliged to remove the last to some extent, before it yielded. The boy has a serviceable joint, bent at an angle of forty-five degrees.

Fig. 2. Excision of the Lower Jaw. By Dr. H. J. Bigelow. The patient was a young girl, about eleven years of age; the disease of about a year's standing. The tongue was displaced backward by the thickening of the jaw, which was quite large, in proportion to the size of the buccal cavity. An incision was made along the ramus of the jaw, to ascertain the character of the disease, it being the intention of the surgeon, if it proved to be of an encysted character, to remove only one of the walls of the bone. The diseased mass proving to be solid, the bone was removed as seen in the plate. Union by the first intention was complete in three weeks. The patient is now well, with very little deformity. Two points were accomplished in the operation. 1. The upward incision was terminated three quarters of an inch below the condyle, and the integuments being pushed upward, the facial nerve was thus preserved. 2. Almost the whole dissection was finished before the mucous membrane of the mouth was divided, so that no blood entered the mouth, and the patient took ether readily to the end of the operation.

Figs. 3, 4. Case of Whitlow upon the First Phalanx of the Thumb. The bone was extracted by Dr. Bigelow, through a longitudinal incision upon the back of the thumb. The wound is, at the time of writing this description, healed, the nail is retained, and there is every appearance of a useful finger, with but very little, if any deformity.

Figs. 5, 7. SEQUESTRA OF THE LOWER JAW. From Dr. H. J. Bigelow's collection.

Figs. 1, 2, 5, 7, are from daguerreotypes by Mr. Ives, of Boston.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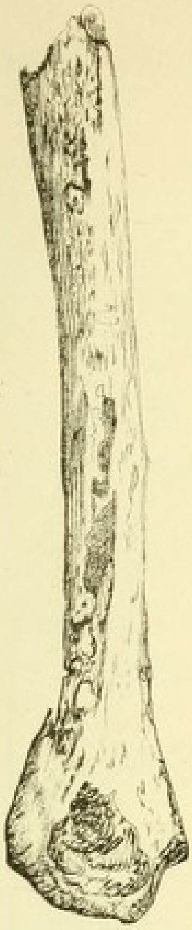

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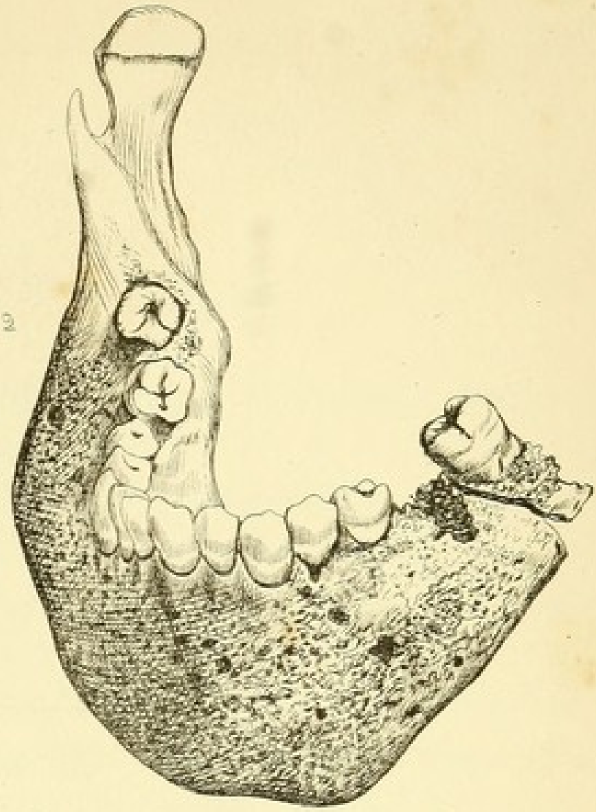

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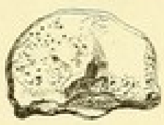

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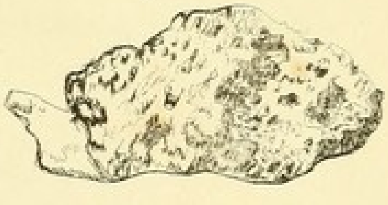

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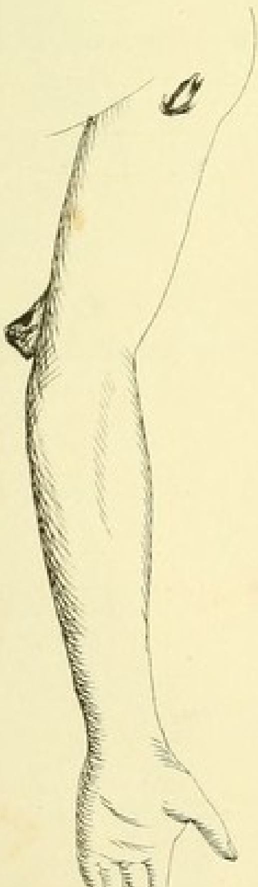

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PLATE CLXXXV.

Figs. 1, 2, 3, 4. LIGATURE OF THE POPLITEAL ARTERY. This operation is described on page 35.

Fig. 1. Refs. 1, 1. Deep fascia; 2. Semi-membranosus muscle; 3. Biceps; 4. Cutaneous vessels and nerves; 5. Internal saphena vein; *a*. Peroneal nerve; *b*. Popliteal nerve; *c*. External saphena vein; *d*. External saphena nerve; *e*. Communicans peronei nerve.

Fig. 2. Refs. 1. Semi-membranosus muscle; 2. Popliteal vein; 3. Popliteal artery; 4, 5. The two heads of the gastrocnemius muscle.

Fig. 3. Refs. *a*. Incision; *b*. Deep fascia; *c*. Adipose tissue; *d*. Peroneal nerve; *e*. External saphena vein; *f*. Popliteal vein; A. Popliteal artery upon the needle.

Fig. 4. Refs. 1. Femur; 2, 3. Condyles of the femur; A. Popliteal artery; *a*, *b*, *c*. Superior articular arteries; *d*, *e*. Inferior articular arteries; *f*, *g*. Sural arteries.

Fig. 5. Aneurism of the popliteal artery, which was cured by the application of ice. From Dupuytren's Museum. Refs. *a*. Aneurism; *b*, *b*, *b*, *b*. Articular arteries enlarged, in order to continue the circulation.

Figs. 6, 7. Articulation of the ankle bones, shown with reference to the amputation through the tarso-metatarsal articulation.

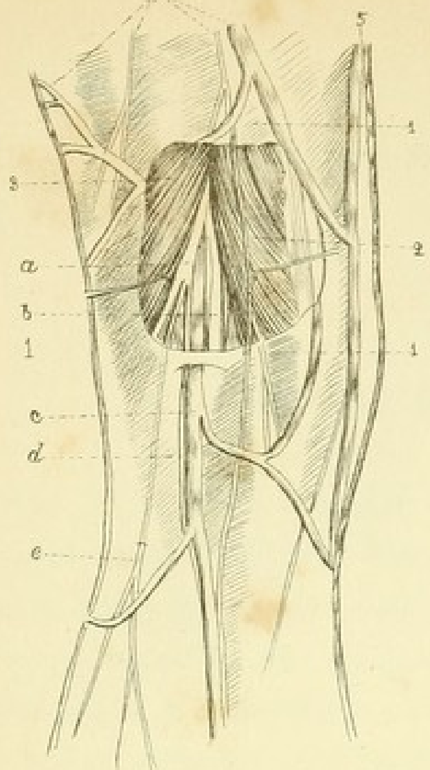
PLATE CLXXXVI.

Figs. 1, 3. Dr. Josiah Crosby's Method of making Extension and Counter Extension in Fracture of the Leg. The peculiarity of this method consists in attaching longitudinal strips of cloth to the limb, by means of adhesive plaster. The upper strips are fastened to iron bars, placed at right angles with the splint, as seen in Fig. 1. The strips by which extension is made are seen applied in Fig. 2. The free ends are tied to the foot board of the splint. Of course, the length and breadth of the longitudinal bandages must depend upon the place of fracture, and the degree of force requisite in making extension and counter extension.

The separation of the upper and lower longitudinal strips is covered in the figure by the bandage surrounding the limb; this separation must be at the point of fracture. The inventor believes that this method of treatment may be applied to fractures of the femur with the same advantage. It has been used with entire success in the Massachusetts General Hospital.

Figs. 2, 4. Case of a patient of the author whose finger was torn off by machinery. The metacarpal bone was denuded to the extent of half an inch. The patient's business was such that it was important to preserve the whole of the bone; this was done (all other means failing) by the gun cotton dressing described in another part of the book.

Fig. 4 shows the appearance of the hand one year after the accident.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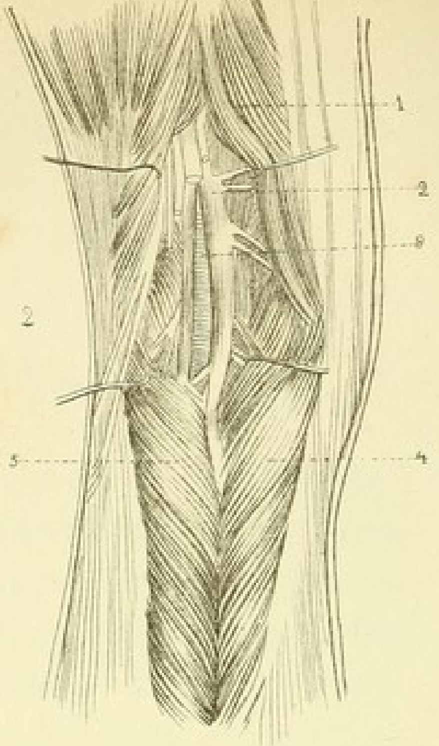
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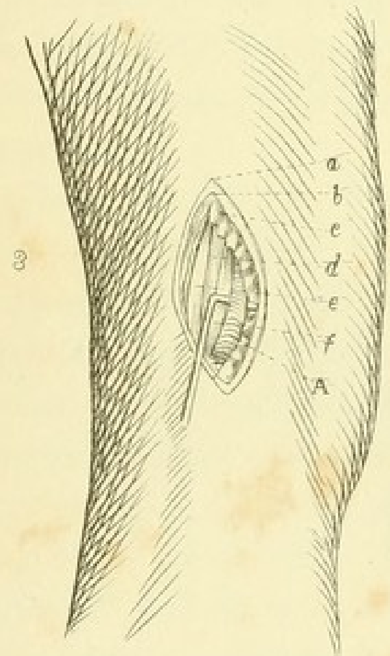
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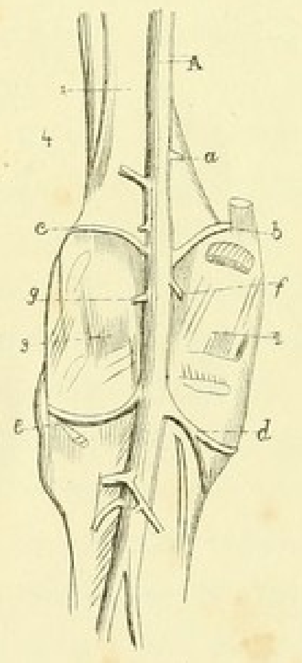
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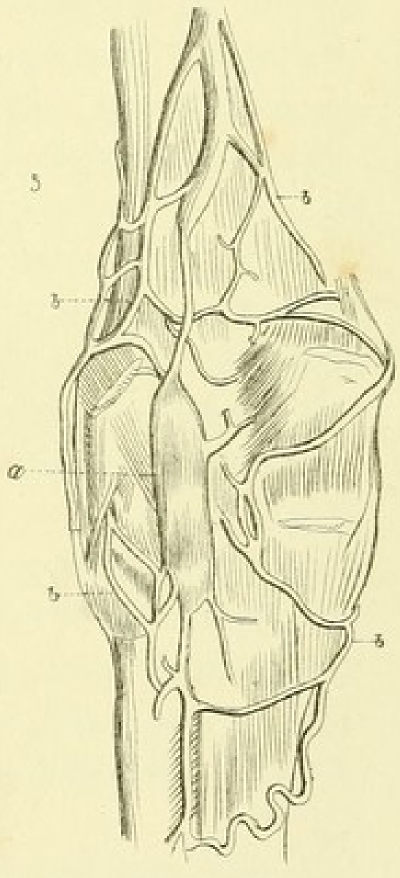
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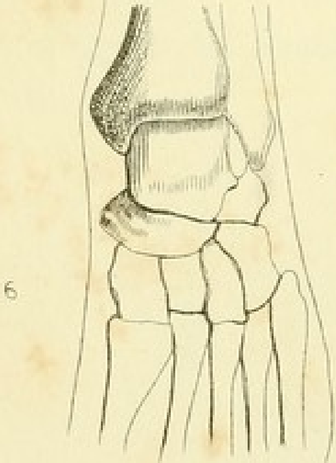
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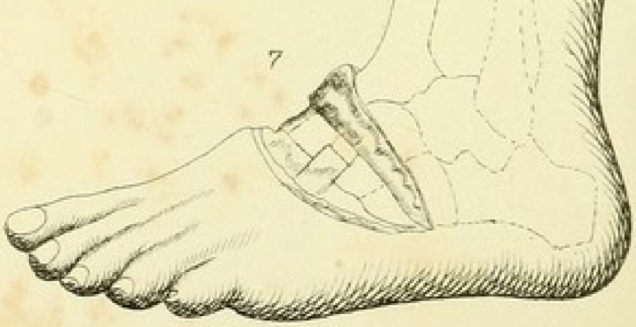
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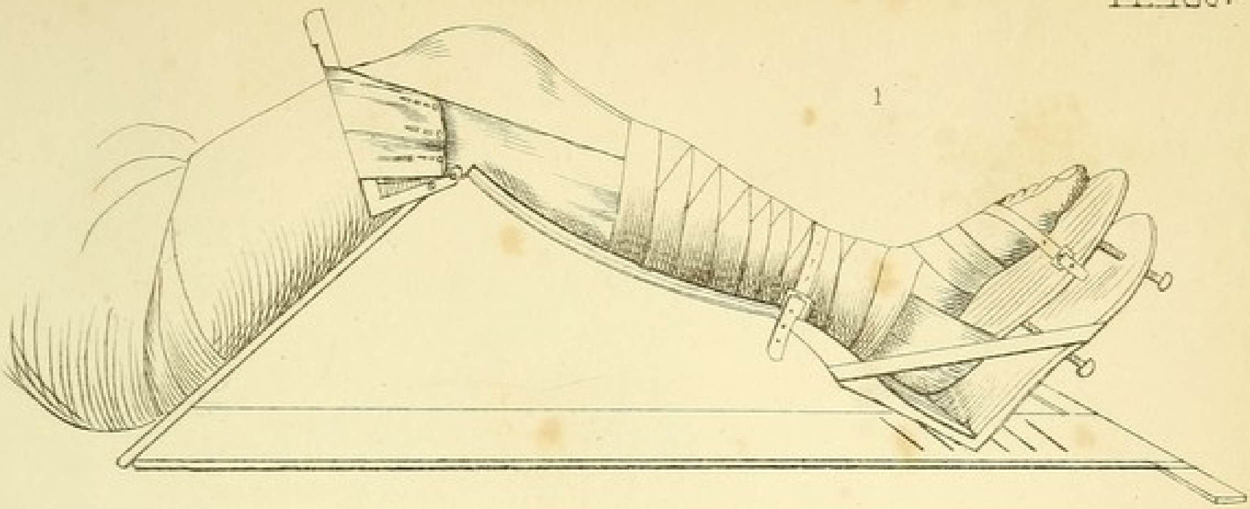

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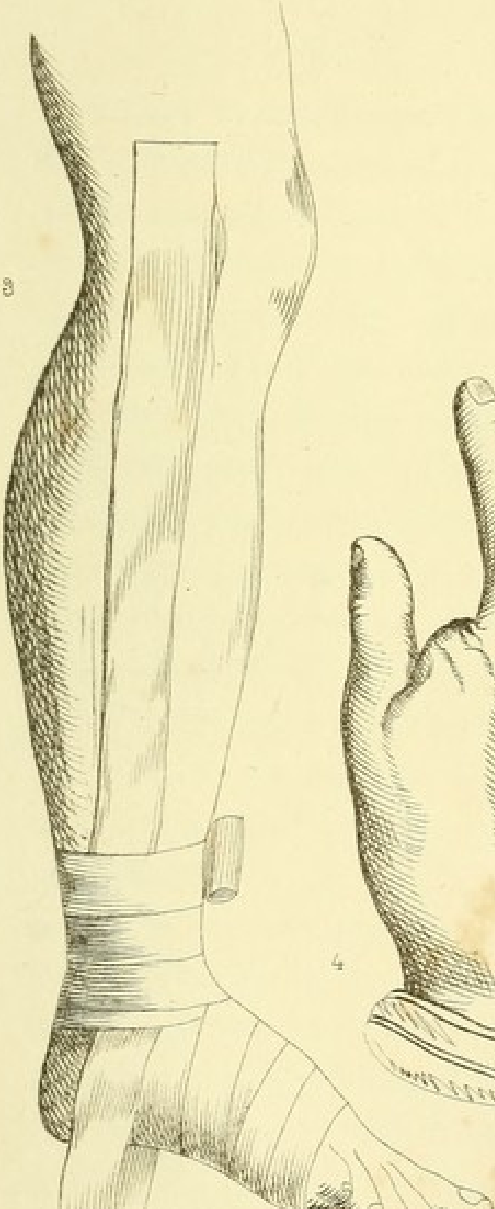

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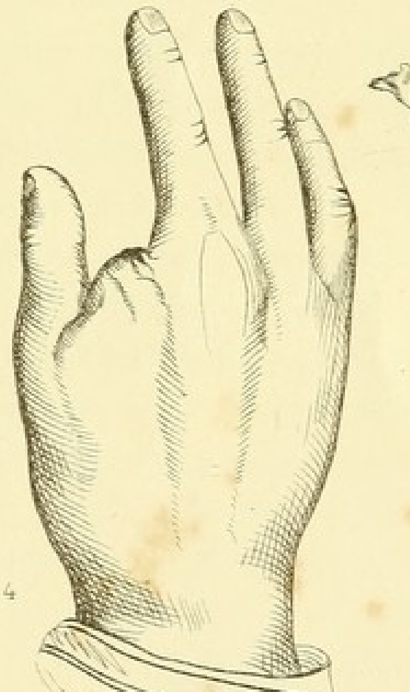

ANÆSTHETIC AGENTS,

THEIR MODE OF EXHIBITION, AND PHYSIOLOGICAL EFFECTS.

THERE is no difference of importance in the general character of the insensibility or other symptoms resulting from the inhalation of ether and chloroform. The latter, whose discovery in this relation the world owes to Professor Simpson, is much more potent than ether, more palatable, and less irritating to the lungs.

Chloric ether was extensively employed by Mr. Lawrence, and has been since used by other experimenters. Its effects are apparently identical with those of common ether, than which it is, if any thing, less powerful, while its vapor may be a little less irritating. Its odor is certainly more agreeable.

Nitrous oxide was employed by Horace Wells, in his experiments. It was then found to produce exhilaration out of proportion to its inebriating properties. In order to place this gas in circumstances favorable for its complete effect, it should be furnished to the lungs as freely and as pure as ether vapor from the evaporating surface of liquid ether. It should be supplied from a large gas holder, and not from a small gas bag; and that portion of the gas which has been deprived by the lungs of its inebriating principle, should be exhaled as waste. Thirty quarts thus inhaled by myself produced complete but brief insensibility; and on the 26th of April, I removed a breast by the aid of about twice that quantity, consumed during six minutes, and producing a most tranquil and complete insensibility. Though bulky, nitrous oxide is quite likely to prove a certain, as well as safe and agreeable anæsthetic agent, administered in the above manner, which I have not seen alluded to. In the case mentioned, the pulse, which Dr. Townsend was good enough to note for me, rose from ninety to one hundred and twenty, and continued at that point during the operation.

Aldehyde, used by Monsieur Poggiale, although it is said to be stronger than chloroform, is also conceded to be more suffocating than ether, the odor of which it has. It is probable, therefore, that ether is the less objectionable of the two agents. It produces, says Professor Simpson, much bronchial constriction and coughing.

Nitrate of ethyle, upon the same authority, is also rapid and powerful in its effects, yet produces excessive noise and fulness in the head, with subsequent headache and dizziness.

The bisulphuret of carbon, a rapid and powerful anæsthetic, has "a peculiarly offensive smell of putrid cabbage."

Benzoin. The vapor of this liquid, of rather a pleasant aromatic odor, is said to be less powerful than that of chloroform. In the hands of Mr. Snow, it produced in the patient certain convulsive tremors. The last four agents are "not comparable," says Professor Simpson, "with chloroform or sulphuric ether, either in their manageableness or in their effects."

By a rough estimate of the quantity consumed in operations, chloroform is eight times as strong as ether; and a drachm of the one or an ounce of the other is a fair allowance for inhalation at the commencement of the process. As it evaporates, the fluid may be replaced if necessary.

The absolute necessity of interposing something between the lips and the inebriating agent, when the latter, like chloroform, irritates the skin, was quite over-estimated in the case of common ether; and the public attached as false a value to the inhaling apparatus as to the stethoscope in a kindred science. In administering ether, an inhaling apparatus is occasionally convenient. The more complicated form, in all its modifications, contains as its chief element the double valve originally suggested by Dr. Gould; and a tube furnished with it may be dilated or constricted so as to represent almost all the principal inhalers in use.

For brief and repeated inhalation, and to avoid the odor of sulphuric ether, as well as to retard its evaporation, an inhaler is convenient; but for common purposes, a bell-shaped sponge is quite efficient, and is to be turned from time to time during an expiration, to bring the gravitating ether to the top.

With the introduction of chloroform, the invention of apparatus received new impetus. Its stimulant, and even vesicating properties, contra-indicate the direct application of this fluid to the skin. The simplest contrivance is the best, and Simpson's folded handkerchief rolled into a cone answers well for a brief inhalation. Channing's pasteboard cone, so cheap that each patient may have a new one, lasts through an average midwifery case; a lamp chimney, stethoscope, or other tube containing a sponge, answers equally the purpose, while for the rapid and complete insensibility required for surgical purposes, and for hospital use, some more durable form of apparatus is requisite. It should comprise a mouth-piece, a receptacle for the sponge, and a diaphragm to prevent the flow of the fluid towards the mouth.

It is optional whether the vapor enters the system simultaneously through the mouth and nasal orifices, or by the mouth alone, the nostrils being closed. It has been said, that the effect is more immediate when the nasal cavities are filled with vapor; but the difference in the time of inhalation, if any, is inconsiderable.

It is a striking fact, that in many of the first experiments both in this country and abroad, vapor was inhaled from a shut cavity or sac, in which the contained oxygen must have been rapidly exhausted. If there is one condition vital to the safety of inhalation, it is that an adequate supply of oxygen should be insured to the patient.

Inhalation should be of atmospheric air impregnated with vapor, and not of vapor alone. Air should be conducted through the medium containing the inebriating agent, and not merely to and from a closed cavity.

The production of the brief insensibility which suffices for the extraction of a tooth, is rarely accompanied with danger, or with embarrassing circumstances; but the administration of ether for a length of time in a surgical operation, demands much attention. Now, it is difficult for the surgeon to attend at once to a dissection, perhaps remote from the head, and, at the same time, to satisfy himself of the adequacy and safety of the anæsthetic state; and it is therefore not improbable that the part of etherizing, especially for a length of time, and to a considerable extent, will be soon recognized as involving an entirely distinct responsibility from that of the surgeon who performs the operation.

Let a patient be now subjected to any of the ordinary modes of inhalation, with the view of inducing for examination some of the ordinary phenomena of etherization. It is unnecessary either to extenuate or to dissemble in respect to the symptoms which occasionally occur during the approach or continuance of the anæsthetic state. Though alarming in connection with the causes which previous experience had assigned to them, many of them are of comparatively trifling import as a sequence of an anæsthetic agent; while, on the other hand, a few comparatively quiet indications stand at the limit of vital endurance, and give notice of real danger. The order of experience — a few type or model cases as they occur — will perhaps afford the readiest method of exposing these phenomena.

1. A patient courageously inhales the ether — a term intended to include the chloroform. Soon the respiration becomes more rapid, the chest heaves, the lips are blown out with the expiration, and while the patient is manifesting unequivocal signs of enjoyment, the head suddenly falls to one side, and the individual, during the next two or five minutes, is insensible to pain in any form. He awakes suddenly, smiles, is surprised to find the operation, if one has been performed, over; has had a pleasurable dream, and experiences no ill effects. This is etherization in its most favorable form, less frequent than the next.

2. A second patient averts his head to cough; inhales again, and again coughs; declares his inability to take the ether, yet perseveres. The trachea has now become less irritable; respiration is tranquil,

and insensibility of rapid access. Such cases are quite common in the practice of the dentist.

3. A third subject makes grimaces, and getting exhilarated, rejects the apparatus, but is still amenable to peremptory discipline; and being directed to be quiet and to close his eyes, is soon narcotized.

4. Yet not always at once. A large and muscular man, perhaps habituated to stimulus, sometimes modifies grimace into a demonstration of resistance; closes his lips and jaw firmly, and refuses to inhale; objects to verbal and other interference; at last becomes violent, and if athletic, requires the united force of several assistants to confine him.

Here is a sufficient reason for not attempting the etherization of athletic subjects when such aid is not at hand. I believe that the best practice, in such a case, is to confine the patient, and to apply the ether steadily to the mouth and nose. For some seconds, perhaps many, the patient may refuse to breathe, and bystanders unaccustomed to the phenomena exchange significant glances. But if the pulse is good, there is no real danger, and, at last, exhausted nature takes a deep and full inspiration, which, while it aërates the blood, is laden with the intoxicating vapor; color returns, and the patient falls back narcotized. Violent resistance is not common.

5. It is, however, less unfrequent for the patient to vomit soon after the appearance of the signs of etherization; and partly from the exertion, and partly from the inspiration of fresh air, he may then recover sensibility.

6. Lastly, the signs of insensibility having been manifested, the operation is begun. In a few moments, the patient partially regains his consciousness, and exhibits the unequivocal appearance of suffering, which may or may not be subsequently remembered; or, without being violent, is wild and uncontrollable.

It will be observed that, in all these cases, ether was administered for a comparatively short time. The result of such brief inhalation is brief narcotism, either complete or incomplete. If inhalation be arrested at this time, the period of subsequent insensibility to pain varies from one to three minutes. This short or partial insensibility is adapted to the operations of the dentist, which are usually rapid; the instrument is applied, and whatever be the demonstrations of the patient, it accomplishes its purpose. Here are no important nerves to be severed, or vessels to be wounded. But in a dissection, such as occurs in many surgical operations, especially in one of a formidable character, it is important that the subject of the operation should not hazard his safety by being liable to sudden and convulsive movements while the knife is dealing with the tissues. If the patient thus partially revives, assistance is not unfrequently required to confine him, and it is necessary to readminister the ether; the whole interfering materially with the tranquillity of the operation, and the comfort of those concerned — perhaps endangering the welfare of the patient.

Although many operations were performed abroad, both in England and upon the continent, and, at no remote date, upon patients still capable of movement and resistance, yet there is an obvious want of safety in operating under these circumstances. Decided preference should be bestowed upon a condition of complete and passive narcotism, provided it can be produced with equal certainty, and is equally free from serious results.

Such a condition is quite possible, and a short time suffices to induce a train of symptoms indicative of it. Let the inhalation be continued beyond the period during which the patient exhibits the earlier signs of narcotism. The muscles will be found gradually and completely to relax under its iufluence, and, at a later period, the inspiration becomes a snore. The patient exhibits no sign of consciousness, and is, in short, profoundly narcotized.

In the symptoms hitherto detailed, two stages of the anæsthetic state will readily be recognized; the first embracing the phenomena of partial consciousness, while the second presents the indication of total insensibility.

These two stages of anæsthesia demand separate consideration.

First Stage. The first stage is characterized, either by the incomplete or partial character of the narcotism, or by its brief duration. These phenomena suggest the notion, that the blood is insufficiently impregnated with ether, or that the vapor has affected a portion only of the circulating fluid, the influence of which upon the brain is soon counteracted by the arrival in the cerebral vessels of fresh and unadulterated blood. Such theory illustrates the degree and the duration of the phenomena attending such inebriation.

The first stage requires for its induction a comparatively small proportion of the ether vapor. Insensibility, if complete, is brief, and the patient revives in a period varying from one to three minutes, commonly without nausea, headache, vertigo, or other sensations of discomfort. But in certain cases, and especially when either from pulmonary irritability, or want of determination on the part of the patient, the dose has been insufficient, and its inhalation by consequence protracted through a period of six or eight minutes, a different range of symptoms is presented. The patient may be bewildered, like a man waking from a deep sleep, or uncontrollable, except by moderate coercion. At this time, the pulse is natural, or yet more frequently accelerated, either from exertion, or perhaps it has not regained its normal standard after the unavoidable excitement of anticipation. Though, in the first stage of anæsthesia, we might expect the pulse to be accelerated, yet it often deviates but little from its natural standard. Nor is the pupil especially affected in this stage. The muscular fibre is yet animated by the nervous influence, and is generally somewhat rigid — the arm resisting flexion or extension. Occasionally the patient exhibits the phenomena of catalepsy, the limbs retaining any position given to them. In rare cases, I have noticed the access of clonic spasm, local or general in its invasion. When the spasm affects the glottis, it gives rise to a peculiar symptom, to be alluded to hereafter.

To the first stage of anæsthesia belong those remarkable and unanticipated physiological phenomena, which seem to unlink the intimate connection between sensation and an intellectual recognition of it; between cognizance and memory; between will and action. A patient, thus partially etherized, is said quietly to criticize the amputation of his own leg, or resists the dentist's instruments, and, to appearance, suffers, and yet remembers nothing of it; or remembers, but has not felt; or, which is unpleasant and fortunately rare, has felt, but could not move. Such occurrences, familiar to the early history of etherization, have been somewhat less frequent, since the subject has been better comprehended. Yet at a comparatively recent date, partial consciousness of the patient during an amputation, for example, has been regarded as a circumstance of unforeseen occurrence, and not always amenable to ready influences.

The inconveniences of partial consciousness have been alluded to; and I am now especially desirous of exposing the advantages of a state of inebriation, during which the patient lies passive and motionless, exhibiting only the phenomena of deep sleep.

Second Stage. Such is the second stage of anæsthesia, essentially characterized and identified by muscular relaxation. Let the subjects of the last-mentioned experiments continue inhalation. The arm, from time to time, when raised from the side, resists. Soon, however, it becomes flexible, and at last falls passive and motionless. The voluntary muscles are now relaxed, and it is impossible at this moment to rouse the patient. This stage requires for its induction a considerable quantity of ether vapor, which may be presented to the pulmonary surfaces, either rapidly, in the course of two or four minutes, or a more diluted vapor may be administered during a protracted inhalation of many minutes. In the former case, anæsthesia is of rapid access, and in its most favorable form; but in the latter, the dilute and protracted inhalation is often accompanied with the annoyances of partial anæsthesia; and it will be stated in another part of this paper that other symptoms, especially that of vomiting, are quite apt to interfere with inhalation before the inebriation has reached its second stage. The commencement of this state of narcotism, characterized by passive flexibility of the arm, suffices for any brief surgical operation, which is not likely to be impeded by the movements of returning sensibility. Yet this insensibility, at its inception, though complete, is brief, and the revival of the patient often sudden.

A few additional inhalations so impregnate the system with the vapor, that revival is deferred for some minutes after the inhalation of pure air. Ether is in this way cumulative in its effects. Besides this, recovery is generally not instantaneous, but gradual, and preceded by the signs of returning consciousness, which indicate the readministration of the anæsthetic agent, and enable the surgeon thus to anticipate interruption. Protract the inhalation yet a little longer, and the inspiration becomes a snore; the pulse, which may or may not have been previously accelerated, beats slowly, while the pupil is frequently though not invariably dilated.

Some little familiarity with these phenomena is required to enable the surgeon so to graduate inhalation as to continue the patient in this state of tranquil and deep sleep with safety.

There is no doubt that it can be done, if necessary. I have frequently myself maintained insensibility, nearly or quite complete, for thirty minutes, and even for a longer period. While the snore is heard, the patient does not revive; yet the snore is an unnecessary symptom, and is an indication for the temporary suspension of inhalation, when a few inspirations of unadulterated air soon reëstablish quiet respiration; and the patient is liable, at any moment, to swallow, or give other indication of approaching consciousness. The cumulative effect of ether, before alluded to, is at this time to be borne in mind. Young subjects, too, require less than adults; so that, after eight or ten minutes of insensibility in the adult, or a considerably shorter period in the young subject, the system has become impregnated with ether, and inhalation may be discontinued, even before the snore is heard, without apprehension that the subject will rapidly recover. The signs of returning consciousness are the limit on one side of that degree of anæsthesia, which it is important to maintain during most surgical operations, and are indications for the reapplication of the inebriating agent, when it is desired to protract insensibility.

At the other limit of the second stage of anæsthesia is a far more important indication of over-narcotized vitality; and here is the protection against danger. Without this safeguard, I conceive that it might be hazardous to overshadow animal existence by this mysterious and powerful agency. The sign is the diminution of the force and frequency of the pulse.

In a case of the early administration of ether, at which I was present, and which has been reported, the danger from over narcotism was quite as imminent as in any case, not fatal, I have seen since alluded to. As a bystander, on that occasion, I casually felt the pulse, and found it barely distinguishable; and though it subsequently still decreased, the means at once adopted for the restoration of the patient proved ultimately successful. This occurrence pointed to the pulse as an indication of the stage of narcotism; a few subsequent experiments confirmed the opinion, and I have not since hesitated to push etherization to complete insensibility, and to continue it, if necessary, during a length of time, provided the pulse remained full and strong. If it be retarded, it is curious to observe with what certainty it recovers force and frequency, after a few inspirations of pure air. It will be inferred, from these remarks, that the pulse is to be carefully examined during the whole anæsthetic process, and that inhalation is to be temporarily discontinued at its indication.

Briefly to recapitulate: the first insensibility, partial though it be, suffices for the dentist. It exhibits the intellect and sensibility in novel and singular relations, while muscular force may or may not be impaired. Nothing is here infallible in pulse or pupil.

The second stage is of great value, and often essential to the surgeon. It lies between the signs of returning consciousness on the one hand, and the decreasing pulse on the other. It is ultimately accompanied by snoring inspiration, and the partially dilated pupil, which, together with the period of time necessary for the cumulative effect of ether, may be considered, each, as an additional indication for the temporary suspension of inhalation.

SIGNS OF NARCOTISM. The eyes are usually closed during inhalation. Let the patient be directed to open them. If etherized, he takes no notice of the voice. Perhaps the head droops, or the hand supporting the inhaling apparatus falls. These, alone, are signs of narcotism, which may be incomplete, or, if complete, temporary in its duration. If, in such a case, the arm of the patient be raised from his side, it is quite likely to resist the effort, or, when raised, remains extended — phenomena indicative of partial narcotism. If inhalation be now suspended, the patient soon regains his consciousness, either manifesting unequivocal signs of pain, or resisting interference, during the half-conscious state which often precedes recovery.

It should be added, that, if the patient has inspired a good dose, and for a length of time, the dentist may consider any unusual manifestation as an indication of but partial sensibility to sudden pain: protracted inhalation may be even taken as its priori evidence.

One of the early and occasional consequences of inhalation is a passive cessation of the respiration, while the pulse continues good. At this moment, a tooth may be painlessly extracted; but as the vapor has now temporarily ceased to gain access to the lungs, the patient may revive before the next inspiration.

Muscular relaxation, the temporary loss of muscular contractility, the passive flexibility of the arm, is the most valuable sign of complete narcotism. It is succeeded by snoring inspiration and slow pulse.

Signs of returning consciousness are, swallowing, coughing, moaning, an effort to articulate, and muscular movement.

RAPIDITY OF ACCESS OF THE ANÆSTHETIC STATE. Somewhat modified by the strength and temperament of the individual, the rapidity with which the system yields is generally in direct relation with the dose administered. The maximum dose will be again discussed under the head of dangers; but it may be here stated that many of the unfavorable symptoms owe their existence to the protracted inhalation of an inadequate dose, while after the first irritation of a large volume of vapor at once introduced into the air tubes has subsided, the patient yields tranquilly, and is much less liable to disagreeable and annoying symptoms.

Vomiting is especially connected with the long duration of the inhalation, and also with its inadequacy. So also are general excitement and resistance, and probably spasm, whether of the vocal chords, or of the muscular system generally.

The common imperfections of the inhaling process are, the use of too large a sponge for ether, and of too small a sponge for chloroform. The former distributes and evaporates the ether rapidly, while its interstices admit a good deal of air. The latter will not detain an adequate amount of chloroform, without endangering the patient's skin. If the sponge be previously wrung out in water, its capillary attraction is increased.

ANÆSTHETIC SYMPTOMS CONSIDERED SEPARATELY.

Intellectual Phenomena. It is said that a patient may take cognizance of the amputation of his own leg. This occurrence I have never seen, though it is far from improbable. It implies a distinct recognition of surrounding objects, through special sense, at a moment of complete insensibility to pain in its severer forms. Such complete insensibility is more frequently attended with entire disability of special sense; yet sensation may be partially annulled, and the patient continue quite cognizant of the external world.

The manifestation of acute suffering, and even of well-directed resistance, may occur without the patient's subsequent remembrance of it. Here the faculty of memory is extinct.

Or memory may recall the manifestations of an operation of which it has forgotten the sensations. And it is said that cognizance and memory may be distinct, while the machinery of muscular action is deranged.

Mental excitement, hilarious or hostile, is not uncommon in an early stage of narcotism, and is materially influenced by its rapidity.

Pulmonary irritability varies with the individual.

Chloroform is less irritating to the lungs than ether, and so, perhaps, is chloric ether.

Violent cough is occasionally excited by a small quantity of vapor, while a much larger quantity may occasion none; but by a little careful graduation of the first few inspirations, the patient may be saved much unnecessary irritation. Soon, pulmonary sensibility is narcotized, and the patient breathes quietly. Even habitual dyspnœa, or the paroxysm of asthma, is temporarily solaced by this agent. As the process is continued, the trachea becomes insensible to the presence of fluid, whether blood from operations near the mouth, or the increased natural secretions of the pulmonary surface.

Nausea and vomiting are not uncommon sequences or concomitants either of partial or complete anæsthesia; nor, beyond their interference with the progress of the inhalation, and with the mere comfort of the patient and of the operator, are they objectionable. They are allied to the nausea induced by other narcotic and inebriating agents, and have especial relation to the duration of the anæsthetic process.

The snoring inspiration indicates profound sleep. Varying a little in the facility of its production in different individuals, it is a constant phenomenon of a certain stage of narcotism. While it is often desirable to induce this symptom, its exhibition renders further inebriation unnecessary for the moment. It is always accompanied with muscular relaxation, and soon succeeds it. It results from the relaxation of the muscles of the palate, and in this connection, it is desirable to distinguish it from another symptom, of somewhat different signification, viz.: —

Stertorous respiration, due to spasmodic action of the vocal chords, and allied to the spasmodic action of other muscles. It is somewhat rare in its occurrence; once heard, it will be readily recognized, and indicates a brief suspension of the inebriating process. Though of itself it is quite unimportant, yet, as the immediate cause of another symptom, it deserves further consideration. The closure of the laryngeal aperture shuts off the supply of atmospheric air from the pulmonary tubes. The same condition results from the voluntary closure of the mouth and lips; but the last soon yields, while the spasm of the glottis gives rise, in rare cases, to a partial asphyxia, indicated by the then livid color of the cutaneous surface. Similar lividity is often exhibited during a spasm of whooping cough, or in a hysteric fit, and is of comparatively slight importance, from the fact that when the system feels peremptorily the necessity for air, the spasm resulting from the anæsthesia relaxes, the patient breathes freely, and the blood is aërated. Two or three inspirations suffice to restore to the cheek its natural color.

MUSCULAR SYSTEM. The ordinary affections of the voluntary muscles have been alluded to. Organized resistance resulting from nervous excitement; tonic and clonic spasm; the cataleptic state being not unfrequent; while in one case I observed a convulsive effort of the whole system of voluntary muscles.

Other muscles are partially affected. The sphincters very rarely lose their contractility. It is well known that the uterus contracts during partial and even complete unconsciousness, a diminution or cessation of its contractile action being the rare exception, and not the rule. The respiratory muscles play tranquilly during narcotism, while the heart, losing the force and frequency of its pulsations, slowly ceases to beat, in its latest and profoundest stage.

PULSE AND PUPIL. Incidental excitement usually accelerates the pulse, the relative frequency of which, during the earlier stage, it is difficult from this circumstance to estimate. It does not lose either in force or frequency until the whole system is profoundly narcotized. It is then, as at other stages of the process, a most valuable indication of the condition of the nervous system, and ultimately of the limits of vital endurance.

The pupil, though commonly at first contracted, and subsequently dilated, is less to be relied upon as an indication.

Prolonged insensibility is quite exceptional and rare. In the case of a young woman, of the details of which I am cognizant, such insensibility ensued upon a brief recovery of the ordinary character, and after the ordinary interval. The patient then again became insensible, apparently without cause, and slept heavily, in spite of efforts to arouse her, during an hour. The symptom that excited apprehension was the smallness of the pulse, which at times was barely perceptible at the wrist. This patient ultimately recovered, as, I believe, have all others similarly affected. The phenomena suggested those occasionally presented after an amputation, when the patient awakes in acute suffering, and again spontaneously sleeps while stitches are inserted.

A few phenomena only remain to be noticed.

Convulsions have been reported, occurring at the interval of many hours after inebriation.

A gentleman of Providence informs me that he has suffered for many months from vertigo, headache, and disability for labor, which ensued upon a dose of ether vapor.

Such cases, with others which have been detailed, must be considered as exceptional, due to peculiar and individual susceptibility, and they are also of exceedingly rare occurrence.

It may be convenient to arrange etherization under several distinct heads, adapting its degree to the character of the surgical operation for which ether is to be administered.

1. In Amputations and other brief Surgical Operations, and in the Extraction of Teeth. In this latter case, inhalation may be discontinued a few moments after insensibility. In the former, it is better to continue it two or three minutes longer, and till muscular relaxation takes place. For the extraction of teeth, the patient may himself retain the sponge. When the hand wavers, or falls, the mouth is carefully, but, if need be, forcibly, opened, without loss of time, and the forceps are at once applied. In this way, one or more teeth may be removed, while the patient is in an unconscious or half-conscious state, but free from pain.

2. Protracted Dissections may be commenced a short time after insensibility, the sponge being continued to the mouth, with an occasional interval to insure the patient an ample supply of oxygen. When there is snoring respiration, the sponge should be removed during the short time required to reëstablish quiet inhalation. The pulse is kept in hand, and any diminution of its frequency or force, especially the former, is an indication for the admission of unadulterated atmospheric air. Forty-five minutes is a somewhat unusual duration of insensibility, and is not to be attempted by those not conversant with the process. It is important to the operator, in these cases, that the patient should be fairly narcotized; and with a little experience, with a rigid attention to the above precautions, accident need not be apprehended.

It may be added that much of the pain of a dissection is not of an acute character, likely to arouse the patient, so that, after some time has elapsed, a state of semi-consciousness often suffices, the vapor being then applied, either during the intervals of the operation, or as manifestations of pain or resistance may present themselves.

3. Harelip. With this operation may be included others upon the nose and mouth, fauces and trachea. It has been presented as the type of such operations, because it embraces several particulars of interest. An operation in this region is often a dissection, and of the parts concerned in inhalation. It is, therefore, impossible to continue this process during manipulation. If, then, in such a case, the patient is to remain insensible, the surgeon has two alternatives; one of profoundly narcotizing the patient in the first instance; the other of readministering the ether, often at an inconvenient moment, and when the operation is materially interfered with. Of these alternatives, the former seems to me the least objectionable. Another important feature in these operations is the liability of the blood to accumulate in the trachea, which is no longer irritable or conscious of its presence. When a tracheal râle gives indication of the collection of a considerable quantity of blood, or other fluid, in this region, the patient should be made to lean forward to facilitate

the natural expulsive efforts of the expiration, or of the cough, as consciousness returns. In general, during operations upon the face and jaw, under the influence of ether, the patient should be sustained in a position inclining somewhat forward, and care should be taken to prevent, as far as possible, by sponges or otherwise, the recession of blood into the buccal cavity. Protracted operations upon the fauces are difficult, if not impracticable, with the use of ether. On the other hand, the admission of instruments to the trachea, especially from the outside, is, without doubt, thus facilitated.

4. In Dislocation, it is obvious that ether inhaled can be of no avail, unless continued to the relaxation of the muscles.

It is well known with what facility dislocation is reduced upon the dead subject, and it is quite probable that all recent and favorable cases in the living subject may be reduced with almost equal facility, when muscular relaxation is completely effected. This is confirmed by one or two cases of dislocated shoulder, which have fallen under my notice. I have met with no case of recent dislocated hip since the introduction of the anæsthetic agents. It would be desirable, in such a case, that an attempt should be made completely to annul muscular resistance, before efforts are directed to the replacement of the bone.

It is equally evident that the reduction of hernia can be facilitated only by muscular relaxation, and that any thing approaching to spasm would aggravate the difficulty of reduction during its access.

Lastly, ether has proved of service in abating the spasm of stricture, in lithotrity, and in the breaking up of adhesions resulting from fracture near the joints. Yet in the latter cases, pain has always offered sure indication of the advisable extent of the respective operations, and in its absence, considerable discrimination is to be exercised. I have myself seen an arm refractured by an attempt to overcome the resistance of a mass of callus, after the adhesion of the articulating surfaces had yielded.

Age. Experience shows that no especial ill effects result from the administration of ether to patients of average physical force at almost any age. Though I have operated on a child of three months, who was so far inebriated that its cries were modified into a sort of moan, yet I know of no case in which a young infant has been completely narcotized after its birth. Indeed, the facility of controlling a child of this age, together with the fact that it has neither the anticipation nor remembrance of suffering, however severe, seems to render this stage of narcotism unnecessary.

Antidotes. It has been well said that fresh air, and in an extreme case, artificial respiration, is the best antidote to ether inebriation.

The symptoms of spasm, vomiting, &c., generally subside when the patient is left to himself. When the pulse is small and slow, this state of narcotism must not be identified with that of syncope. Brandy and other diffusible stimulants, appropriate remedies for syncope, belong to the class of agents which induce the anæsthetic symptoms; and it is quite probable, though evidence is yet incomplete upon this point, that the difficulty would only be aggravated by their use. Besides, the patient cannot always swallow. Cold water dashed upon the face, or injected into the ears, undoubtedly aids in arousing the patient from the common ether narcotism. Galvanism to the precordial region has been suggested as a remedy in an extreme case; and it may be a question whether rest in the recumbent posture or active exercise, as adopted for the restoration of subjects affected with narcotism from opium, be best adapted for these cases. If any fluid is to be administered internally, analogy would suggest strong tea or coffee.

The nature of the anæsthetic state is a question of considerable interest. Perhaps the most satisfactory evidence upon this point is that afforded by the analogy between the symptoms resulting from ether vapor in the lungs, and those of alcohol in the stomach. Both, in small quantities, produce exhilaration. Both, in a large dose, produce the phenomena of dead drunkenness, and both, insensibility to pain. With alcohol, the state persists, while the fluid remains in the stomach; and patients have been at once aroused by the use of the stomach pump. In like manner anæsthesia continues, while ether vapor fills the lungs; respiration pumps the ether vapor from that receptacle, and gradually aërating the blood, terminates the anæsthetic state. Alcohol is found in the blood by chemical analysis; ether is equally detected in it by its peculiar odor.

Convulsions have been noticed in rare connection both with ether and with alcohol. Finally, there is, in ordinary cases, no great solicitude for the safety of a patient who is dead drunk, and experience has shown that ether narcotism is very rarely accompanied with danger.

Time does not serve for an analysis of the evidence relating to the effect of ether upon the different portions of the nervous system; nor is this evidence of a conclusive character. There may be some connection between the spasm occasionally produced by alcohol and ether, and that induced by opium, alluded to by Todd and Bowman, resulting from polarity of the spinal cord, in cold-blooded, and even in warm-blooded animals.

Upon the same authority, spasm of the glottis is among the results of irritation of the medulla oblongata. On the other hand, the medulla oblongata has been considered by Flourens, who claims this point as his discovery, to be the last stronghold from which life is driven by the anæsthetic agent. The animal then dies. Yet spasm of the glottis is not a formidable symptom.

The details of experiments in this obscure branch of physiology may be found in the papers of Flourens and of Longet, and may be compared with the intellectual phenomena elsewhere alluded to in this paper.

Dangers. It remains only to speak of the dangers of the anæsthetic state. From this category, the symptom of asphyxia may be rejected; this being an evil easily anticipated, when due to an imperfection in the process, to the non-admission to the lungs of oxygen. Gradual and overwhelming narcotism may also be anticipated and arrested. The danger arising from the specific effects of an inebriating vapor in the pulmonary tubes may be considered, 1. As a question of experience and fact; and 2. Of analogy and probability. As to the fact, I have been unable to find any fatal case clearly resulting from the inhalation of ether, until the very recent one at Auxerre, apparently resulting in part from convulsions improperly treated, and in part from a neglect of the indications which the pulse affords. Of this case the details are imperfect. Deaths, like those reported by Nunn and Robb, occurring at an interval of twenty-four hours or more after the operation, may or may not have been accelerated by ether, which does not prevent, nor is to be considered responsible for, the ordinary collapse resulting in certain states of the system, after certain injuries and certain operations. The strong argument in behalf of ether is, that so few opportunities have occurred in which it could be even suspected of agency in fatal results.

With chloroform the evidence is a little different. Two somewhat remarkable cases of death, occurring during the brief administration of this agent for surgical purposes, at once present themselves: the Cincinnati case, and that of Mr. Meggison at Winlaton. In these cases, death occurred in about five minutes from the beginning of the inhalation. In the Cincinnati case, the quantity inhaled must have been considerable — from a saturated sponge in a four-inch glass globe; yet in Meggison's case a drachm only was applied upon a handkerchief. It is quite possible that death resulted in the latter case, as Mr. Simpson avers, from asphyxia produced by the administration of brandy and other liquids before the patient was able to swallow. Such error would be easily avoided; yet these instances suggest a specific cause of danger: this is the sudden impression upon the system of a powerful inebriating agent. Abundant alcoholic stimulus has often produced immediate death; and analogy would suggest that inebriating vapor in the lungs may be the equivalent of similar fluid in the stomach, and that, in one or both the cases alluded to, chloroform may have produced a sudden and overwhelming shock upon the system.

Apart from the somewhat obscure case before alluded to, there is no authentic evidence that sulphuric ether has been a cause of sudden death; and there is little doubt that this immunity from danger in its use is due in part to the comparatively moderate degree of its inebriating property, and in part to its volatility. Chloroform is much stronger than ether, while it is less volatile; so that, although the vapor of a few drops may only give rise to moderate symptoms, and then escape by exhalation, that of a large quantity, whose volume the lungs might easily contain, might powerfully impress the system, while the delay of its evaporation would materially enhance its cumulative effects. Such theory suggests a consideration of practical importance: that in the use of chloroform a moderate dose should be inhaled gradually, and not at once.

It is obvious, too, that the agency of heat, to promote its evaporation, must increase the chance of danger. I think it may be laid down as a rule, that a drachm of chloroform, at ordinary temperatures, suffices for a gradual inhalation of three minutes in the average adult. In recognizing a possible danger from an instantaneous and powerful dose on the one hand, it must not be forgotten that many of the unpleasant symptoms of the anæsthetic state are undoubtedly induced and aggravated by protracted and futile attempts to produce insensibility with an insufficient dose. Experience shows that, after the first few minutes, and with due regard to the condition of the pulse, it is safe to increase the quantity of ether or of chloroform, until the inspired air is fully saturated, and the patient fairly narcotized.

If there is any one consideration calculated to arrest attention in the history of etherization, it is, that, although the anæsthetic agents have been open to liberal use in every part of the civilized world, whether experimentally, ignorantly, or carelessly, although thousands have experienced their good effects, and although the physiologist, the ether opponent, and the coroner, have been equally ready to seize upon and to exaggerate any case of accident that might seem to fall within their range, yet it is probable that the number of cases, thus publicly suspected, have been less than ten, while the only conclusive instances of direct relation between an anæsthetic agent and death are two in number. Can antimony or opium show as clean a bill of health for the same period?

Since the above chapter was written, but few facts have been added to this subject. Several additional cases of death have occurred during the administration of chloroform, and one case of death has been reported from the use of chloric ether, which is regarded by some chemists as simply dilute chloroform. Chloroform cannot, however, be ranked as a positively dangerous agent of anæsthesia; but only as relatively dangerous. Indeed, the liability to death from its inhalation, with ordinary care, is almost infinitely small; yet death has occurred from chloroform, without warning, and in spite of every care; and the same is true of the one case of death from chloric ether. This is not true of sulphuric ether, which still preserves its reputation as a safe anæsthetic. Indeed, the only objection to its use is its peculiar odor. Apart from this unimportant consideration, sulphuric ether approaches very near perfection as an anæsthetic agent.

Etherization is now employed in all cases where insensibility to pain, or muscular relaxation, is desirable. In dislocation of the hip, and in operations about the rectum, a large dose of ether will be found necessary to relax the muscles of the haunch. In dislocations of the large joints, and in the taxis for hernia, the administration of ether is unquestionably preferable to any other method whatever of producing muscular relaxation, and should supersede the use of antimony, tobacco, venesection, &c. In operations about the fauces, the escape of blood into the insensible trachea is a restriction to its use.

Finally, we recommend to the careful attention of the reader the remarks upon the state of the pulse in anæsthesia, contained in the above chapter.

R. U. P.

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