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PRACTICAL SURGERY.

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PRACTICAL SURGERY.

*MEMORANDA FOR THE USE OF
STUDENTS.*

BY

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P R E F A C E.

This little work comprises the main points dwelt upon in the Tutorial Class which I have for some time conducted in Practical Surgery.

In compiling the work, my object has been to place before Students, as shortly as possible, many of the salient points in Surgery in a form which will repay perusal by those who are preparing for examination.

The recognised authorities have been referred to, but special mention should be made of the works of

Erichsen, Heath, Bell, Holmes, Gray, and Heath's
Dictionary of Surgery.

I am indebted to Dr N. T. Brewis for kindly revising the section on Gynæcological Operations.

W. S. L.

I LEOPOLD PLACE,
EDINBURGH, *February* 1888.

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PRACTICAL SURGERY.

PART I.

GENERAL DIRECTIONS.

A "regional" grouping having been adopted, it is necessary, in order to avoid repetition, that some general directions be first given.

The student must be quite familiar with these, as a knowledge of them is implied before he can read with advantage the condensed descriptions in the sequel.

FRACTURES AND DISLOCATIONS.

It may be stated generally, that all fractures and dislocations are treated by reduction and retention. Fractures, as a rule, are easily reduced, but often difficult to retain in position. Dislocations, on the other hand, are not easy to reduce, but are easily retained.

For the retention of fractures, it is a valuable rule in the limbs to endeavour to command the joint above as well as that below the seat of fracture. Chloroform gives valuable aid in reducing dislocations.

LIGATURE OF ARTERIES.

Free incision is necessary over line of artery.

Careful dissection.

Sides of incision are held back by assistant with retractors.

Look for recognised landmarks in regular order, and do not proceed till they are found (*Bryant*).

Divide layers of fascia, and open sheath of vessel upon a grooved director. Vessel must be cleaned till it is clearly seen, but vasa vasorum should not be needlessly injured. Pass aneurism needle away from any adjacent structure, such as a vein, that might be accidentally injured.

It may be sometimes better to thread the aneurism needle after it has been passed, and then withdraw it, thus carrying ligature round vessel (*Bell*).

Catgut is now generally used for ligature. The ends are cut short, and the wound closed.

The relations of most of the principal arteries have been given after the fashion used by Gray. The structures anterior or superficial to the vessel are given above it; the structures internal are indicated on left side of the page, and the structures external on the other side; whilst the structures behind or beneath are indicated below the A, which indicates the artery.

It is only in deference to conventional usage that these relations have been tabulated, for questions in surgical anatomy may quite as readily necessitate knowledge of the course, relations, and distribution of nerves, or the position and relations of veins, muscles, &c.

AMPUTATIONS.

Requirements of a good Stump.

Flaps must be long enough to cover bone comfortably.

Nerves cut short.

Whole of disease removed.

Cicatrix non-adherent, and not on face of stump.

In all Amputations,

1. Control hæmorrhage.
2. Make coverings for bone (don't bevel flaps).
3. Remove limb (by saw or knife). Don't tear the periosteum left behind.
4. Tie vessels (all of them).
5. Stitch up and drain (leave no open spaces).
6. Apply dressing and splint (gentle pressure is useful).

Antiseptics are understood.

Methods.

It may tend to simplify matters if the methods are considered as two in number, viz., FLAP and CIRCULAR.

A flap may be defined as tissue or tissues attached by a base, and having a cut margin greater in extent than the base.

In the *true circular* method (triple incision of B. Bell), there are no flaps. It is performed in the following manner :—

A long-bladed knife is used, and is grasped firmly in the palm. Advancing his right foot, the surgeon passes the knife under and around the limb to be

removed. Whilst the skin is fully retracted by an assistant, an incision is made all round the limb, somewhat *below* the point where the bone is to be cut.

This incision should cut through skin and superficial fascia only, the surgeon recovering his position as he makes it.

Retraction being still fully maintained, the operator repeats the stroke, and cuts through, by a circular sweep, the muscles and other deep structures.

These other structures being also well retracted, the periosteum is divided, and bone sawn at a still higher level.

It will at once be seen that there are no flaps here. The cut end of bone lies at the bottom of a conical pit.

This method is now little used, but is applicable in the thigh and upper arm.

Flap Methods.

- | | | |
|---------------------|---|---|
| The Flaps
may be | { | 1. Rectangular (Teale) or oval. |
| | | 2. Dissected up or made by transfixion. |
| | | 3. Long anterior and short posterior. |
| | | 4. Long posterior by transfixion (<i>Liston</i>). |
| | | 5. Long anterior by transfixion (<i>Spence</i>). |
| | | 6. Single anterior flap of skin only
(<i>Carden</i>). |
| | | 7. Lateral flaps. |
| | | 8. { Part skin. Part skin and muscle.
Modified circular (<i>Syme</i>). |

This does not pretend to be a complete and perfect

list, but only to illustrate the classification. Thus it shews that, in order to answer the question, What is Teale's method? we say at once, It is a flap method, and that the flaps are rectangular.

Some of these methods were devised before anæsthetics came into use, and are now never used, because great rapidity in execution is not now aimed at.

Carden's amputation is applicable only at the knee, and will be described later.

Two methods which require special description here are, (1), Teale's; and (2), the so-called *modified circular* (or modified flap) (*Syme*).

Teale's Method.—The flaps consist of all the soft tissues, down to periosteum.

The flaps are rectangular.

One flap is four times as long as the other.

The short flap should contain the main vessels.

The long flap should be square, its length and breadth being each equal to half the circumference of the limb.

Thus, supposing the circumference of the limb to be 24 inches, Teale's anterior flap will be 12 inches broad and 12 inches long. The posterior flap will be 3 inches long and 12 inches broad at its base.

The long flap is doubled upon itself to meet the short one, and their margins are stitched together on the under or posterior surface of limb.

The bone is sawn at the angle of union of flaps.

This is a valuable method in leg, thigh, and forearm.

Modified circular (*Syme's method*).—This is, in

reality, a flap method, but differs from the true circular in regard to the first circular sweep only.

In it semilunar flaps of skin and subcutaneous fat are first dissected up and retracted, and the operation then proceeds as in the true circular (which see).

Oval Method.—This may be looked upon as a method by short lateral flaps. Used in amputating fingers.

EXCISIONS OF BONES AND JOINTS.

The main objects usually kept in view are, (1) to remove the whole of the disease; (2) to leave a useful limb. Thus, the elbow, to be useful, must be a moveable joint; the knee, on the contrary, after excision, should be stiff, with bony ankylosis.

When possible, hæmorrhage is thoroughly controlled, and a limb may be previously emptied of blood by raising it, or by applying Esmarch's bandage.

In order to assist the student in describing and remembering the different steps of these operations, I have endeavoured to group them under four headings, viz. :—(1) The Incision; (2) Dissection; (3) Bone removed; (4) After treatment.

This sub-division, although purely artificial, and not always quite distinct, may yet, it is hoped, be of some use in assisting the memory.

PART II.

UPPER EXTREMITY.

FRACTURES.

CLAVICLE.

Inner Third. Middle. Outer Third.

Inner Third. Very rare.

Middle. Most common. *Outer fragment* downwards, forwards, and inwards: downwards by weight of arm; forwards and inwards, by pectoralis major, pect. minor, serratus magnus. *Inner fragment* is slightly pulled up by sterno mastoid, but sterno mastoid is opposed by clavicular origin of pect. major, also by rhomboid ligament.

Outer Third. (a) Between conoid and trapezoid ligaments. Little or no displacement—requires rest only; frequently undetected. (b) Further external—outer fragment comes forwards, inwards, and slightly downwards. It spins round. Scapula, being freely moveable, carries outer end of clavicle forwards and inwards, making it form almost a right angle with main part of shaft (very troublesome to treat).

Treatment.—Seeing that the shoulder is always displaced downwards, forwards, and inwards, the object of treatment is to keep it upwards, backwards, and outwards.

1. Figure of 8 bandage round shoulders, with padding at axillæ (backwards), extra pad in axilla of

injured side (outwards), large sling supporting elbow (upwards).

2. *Sayre's Method*.—Broad strip of adhesive plaster fastened to upper arm, pulling it backwards, fixing the plaster around chest. Another broad strip of plaster, with hole for elbow, carried over opposite shoulder, supporting arm and fixing it to side; pad in axilla.

3 Large conical pad kept in axilla by bandage over opposite shoulder; arm perpendicular to side; broad bandage round chest enclosing and supporting arm.

Treatment will be much more effective if patient can lie in bed supine for some days, with small pillow between shoulders, so that shoulders may be thrown backwards.

SCAPULA.—Body may be broken by direct violence, such as blow with a stick.

Surgical neck, i.e., behind coracoid. Coracoid goes with arm.

Anatomical neck resembles dislocation of head of humerus into axilla, but recurs if reduced, and gives crepitus.

Treatment—Acromion.—Support elbow, draw arm inwards.

Coracoid.—Support elbow; flex forearm to relax biceps; draw arm inwards to relax coraco-brachialis, pad in axilla, or over seat of fracture; bandage, broad sling.

HUMERUS.—To measure length of upper arm.

1. Tip of coracoid to internal condyle; or,
2. Tip of acromion to external condyle.

Anatomical Neck—Rare ; often impacted — very little deformity ; pad in axilla ; leather shoulder cap ; bandage and sling.

Surgical Neck—Displacements.

Upper Fragment.—Upwards and outwards by supra-spinatus, infra-spinatus and teres minor.

Lower Fragment.—Inwards by pect. major, latiss. dorsi, and teres major.

Shortening, by deltoid, biceps and coraco-brachialis. Deltoid pulls elbow out from side.

Treatment.—Pad in axilla ; well fitting shoulder cap ; bandage from fingers (as flexors and extensors of fingers have origin from condyles, and there is danger of non-union) ; flex forearm ; carry elbow forwards and inwards, and bandage arm to side ; don't support elbow.

Separation of epiphysis resembles this.

Shaft.—Biceps and triceps produce shortening, associated with overlapping, the displacement varying according to direction of obliquity of fracture. Pect. major, latiss. dorsi, and teres major pull upper fragment inwards. Deltoid pulls its insertion upwards and outwards.

Treatment.—Three splints ; one being rectangular for elbow and extending down forearm, and with hole for internal condyle to fit into. Bandage from fingers. Large sling ; short splints on outer aspect of humerus. It seems useless to attempt letting elbow hang down when rectangular splint is used.

Another Method.—Four small splints encircling

humerus. Bandage from fingers ; lesser sling supporting hand and wrist only.

Lower end.—Transverse fracture, or separation of epiphysis, requires same treatment as fracture of shaft.

Fracture of internal condyle, may or may not enter joint ; common in children from falling.

Oblique fracture into joint.

Comminuted fracture into joint.

These necessitate less favourable prognosis.

Treatment.—Synovitis may first require attention. Rectangular splint or pad, and figure of 8 bandage ; larger sling in either case. Passive motion early. Considered again with Dislocations.

FORE ARM.

Shaft of radius	{	Wide splints ; hand semiprone ;
Shaft of ulna		elbow semiflexed ; padding to
Both Shafts		keep bones apart.

Apply with fore arm supine. Large sling.

Displacement.—Biceps and pronator teres pull up lower end of upper fragment. Pronators pull bones together.

The splints should be wide enough to obviate any chance of the bandages pressing the bones towards each other.

Radius alone.—Neck. Head will not roll with shaft in pronation and supination. Angular splint for elbow is required.

Colles' Fracture.—Occurs about $\frac{1}{2}$ or $\frac{3}{4}$ of an inch from lower end of radius ; generally from a fall on the

hand. The lower fragment is displaced upwards, backwards, and to the radial side.

Treatment.—Accurate reduction. Splints and padding should be applied with a view to press or keep the lower fragment in position. It should be pressed downwards, forwards, and to the ulnar side.

Various splints used :—

Carr's. Gordon's.

Pistol splint (Nélaton).

Ordinary straight splints will do. Anterior splint should be short, to allow movement of fingers, and part cut away to allow lower fragment of radius to be pressed forward. Arm in large sling.

Commence gentle passive movement in a few days, and re-apply splints.

There is a rare fracture of radius above insertion of pronator teres, in which the upper fragment is already supinated by biceps and supinator brevis, and cannot be commanded. Treat in supine position. If treated in usual way there will be a rotatory displacement or mal-apposition, and consequently inability to supinate the hand, upper part of radius being continuously supinated.

Ulna—Olecranon.—Triceps separates fragment. Anterior splint well padded. Treat in extended or very slightly flexed position.

Coronoid process.—Generally associated with dislocation backwards (which see).

Carpal Bones.—Rarely fractured ; much synovitis. Treat the joint.

Metacarpals.—Dropping of knuckle, crepitus ; loss of line of bone.

Treatment.—Ball in palm of hand to keep up knuckle, or palmar splint ; bandage and sling.

Phalanges.—Palmar splint, and put hand in sling.

DISLOCATIONS.

Inner end of clavicle.—(1) Forwards, on to sternum ; (2) upwards ; (3) backwards (very rare). May be secondary to spinal curvature.

Acromial end.

1. On to upper surface of acromion.
2. Under acromion.
3. Back on to spine of scapula.

Treatment. — Manipulate, pushing or pulling shoulder outwards and backwards ; pad and bandage.

Inferior angle of scapula may slip from under latiss. dorsi ; irreducible.

Shoulder joint.—Head of humerus takes various positions :—

1. Sub-coracoid (common) with or without fracture of great tuberosity.
2. Sub-clavicular.
3. Sub-spinous.
4. Sub-glenoid.

Brachial plexus is pressed on most in sub-glenoid.

Methods of Reduction.

1. Heel in axilla ; patient lies on his back, and sur-

geon having taken off his boot, sits by injured side, places heel in axilla and pulls arm downwards.

2. Manipulation; abduct, pull arm upwards and rotate head of humerus inwards into its socket, bringing elbow down.

Many other methods have been recommended. Heel in axilla is slightly dangerous, may injure axillary artery.

Elbow Joint.

1. *Both bones backwards* (frac. coronoid), common.
2. *Both bones forwards* (frac. olecranon).
3. *Lateral dislocation* (very rarely complete, as fracture will take place more readily).
4. *Ulna alone*; dislocation backwards (generally with fracture of coronoid).
5. *Radius alone*; forwards or backwards.
6. *Ulna backwards and radius forwards*.

Reduce by extension or bending over knee; pad in elbow, and figure of 8 bandage; large sling. Rectangular splint for fractures.

In cases of severe injury about elbow joint, the nature of the injury should be diagnosed by careful comparison of the injured with the sound limb. (See also Fractures.)

Wrist joint.—Very rare. Distinguish from Colles' fracture.

In Colles' fracture, the styloid process of radius goes with the hand, upwards, backwards, and to radial side.

Thumb.—Metacarpo-phalangeal joint, backwards.

Head of metacarpal goes on to palm through button-hole of flexor brevis pollicis.

Treatment.—Adduct metacarpal (to relax flexor brevis), and hyper-extend first phalanx; may be irreducible. Joint has been excised.

Other Dislocations.—Extension and rest.

LIGATURE OF ARTERIES, &c.

(See General Directions, page 2.)

AXILLARY (1st part).

Incision.—About one inch below clavicle, and parallel to it. Arm abducted, cut through *skin, fascia platysma, pectoralis major (clavic. head) (avoiding cephalic vein), cut costo-coracoid membrane, fat, &c.*

Axill. vein.	A	Brachial plexus.
1st Intercostal space.		
Serratus magnus.		
Nerve of Bell.		

2nd part.—Below pect. minor, not tied.

3rd part.—Arm abducted.

Incision.—2 inches long—inner border of coracobrachialis is guide, after artery has passed from under pectoralis major.

Skin, fascia and median nerve.

Ulnar nerve.	A	Outer head of median nerve.
Axillary vein.		Cor. brach. muscle.
		Mus. cutaneous nerve.
		Postr. Wall of Axilla.
		Mus. spiral, and circumflex nerves.

Brachial Artery.—Usually tied in middle third, where it is overlapped by *biceps*, and crossed by *Median nerve*. Inner edge of *biceps* is guide to vessel.

Median basilic vein } also cross
and Bicipital fascia } it.

Ulnar nerve

Med. and ulnar nerves.

Basilic vein.

A

Triceps.

Median nerve.

Biceps.

Mus. spiral nerve and

Sup. profunda vessels.

Coraco-brachialis and

Brachialis anticus.

(High division of brachial artery is not very uncommon.)

The termination of the brachial, and the commencement of the radial and ulnar arteries, is marked usually by a point a quarter inch below bend of elbow, and immediately internal to *biceps* tendon. The tendon is easily felt. Median nerve lies immediately internal to artery.

From within, outwards, N A T (Heath).

Radial artery in the fore arm is superficial in whole extent, covered only by skin, fascia, and superficial veins; and overlapped by *supinator longus*. On inner side, *flexor carpi radialis*; on outer side, *supinator longus*. Lies upon (from above downwards) tendon of *biceps*, *supinator brevis*, *pronator teres*, radial origin of *flexor sublim. digitorum*, *flexor long. pollicis*, *pronator quad. radius*.

May be tied anywhere.

Tied conveniently where it lies on pronator quadratus.

Radial artery in the wrist.—Underneath extensors of thumb, and between two heads of abductor indicis, passing into palm between first and second metacarpal bones; lies on external lateral ligament of wrist. May be tied in “snuff box,” formed by extensor secundi (on ulnar side), and extensor primi and ossis metacarpi (on radial side). Only skin, fascia and superficial veins cover it.

Ulnar artery.—In forearm is crossed by
 Median nerve.
 Palmaris longus.
 Flexor carpi radialis.
 Flexor sublim. digitorum.
 Pronator radii teres.

It lies upon

Brachialis anticus and
 Flexor profundus digitorum.

Its lower third is superficial, having on inner side
 Flexor carpi, ulnaris and *ulnar nerve*.

On outer side, flexor sublimis digitorum. Goes *over* anterior annular ligament. Tied easily at wrist. Ulnar nerve is generally in very close relation.

Superficial palmar arch.—Formed by ulnar artery and superficialis volæ (branch of radial).

It lies upon flexor tendons and median nerve. Is covered by skin, fat, and strong palmar fascia. Its position is represented by a line drawn across the

palm, on a level with the thumb, when latter is abducted.

Deep palmar arch.—Is one finger's breadth nearer to wrist than the superficial arch. Is formed by radial artery and deep branch of ulnar. Lies upon bases of metacarpals and interossei. Covered by

Skin, superficial and palmar fascia.

Superficial arch and median nerve.

Eight flexor tendons and lumbricales.

Deep part of flex. brevis pollicis.

Wound of palmar arch.

If cannot seize and tie bleeding point, plug firmly with strip of lint, apply compress, flex elbow firmly, and fix hand up to shoulder.

Should artery be only partially cut through, completely cutting it may cause hæmorrhage to cease. May try compression of radial and ulnar, but comes nervi mediani may assist largely in forming the arch.

Last resource is to apply ligature to brachial artery.

VENESECTION.

Median cephalic is safer, but median basilic is generally larger, and therefore preferable. It directly overlies the brachial artery, being separated only by bicipital fascia. Position of brachial artery easily found by N A T, see page 15. Tendon is easily felt.

Tape is applied in upper arm, only tight enough to stop venous return, and should not stop arterial flow. Wound in skin should be larger than wound in vein.

After blood has been drawn, apply pad of lint ; bandage, and place arm in sling.

AMPUTATIONS.

(See General Directions, page 3.)

SHOULDER JOINT.

1. *Larrey's Method.*

Straight incision from acromion, 2 inches downwards. Cut down to bone.

Curved incisions on each side to anterior and posterior folds of axilla.

Dissect back flaps, including muscles. Clear tuberosities, expose joint and dislocate. Small portion of skin remains undivided, also main vessels. Keeping knife close to bone, pass down behind humerus and complete circular cut in line with anterior circular incision, while assistant commands vessels.

2. *Spence's Method.*

Incision.—From a point slightly external to coracoid process, downwards and outwards for about $3\frac{1}{2}$ inches, cutting through part of deltoid and insertion of pectoralis major.

Carry incision *outwards* through fibres of deltoid to posterior fold of axilla.

On inner side, carry incision *through skin and fat only*, across inside of arm to meet incision at outer side.

Clear tuberosities, cut tendon of biceps, open capsule and dislocate.

Large posterior flap to be held back by spatula, and posterior circumflex artery to be protected.

Axillary vessels are controlled by assistant's fingers before being divided, as in Larrey's method.

3. *Large deltoid flap* may be cut by transfixion, the knife at the same time opening capsule of joint. Raise flap, clear tuberosities. Disarticulate. Pass knife behind head of humerus.

Not necessary to cut main vessel till it is thoroughly under control of fingers.

Hæmorrhage can only be imperfectly controlled by compressing subclavian artery upon first rib above clavicle.

UPPER ARM.

1. *True circular* may be used. (See page 3.)
2. *Modified circular*. (See page 5.)

Insertion of deltoid should be near centre of base of flap, so that it may not pull on cicatrix.

ELBOW JOINT.

Long skin flap from back of fore arm and short anterior flap. Rarely done, as it is difficult to cover large lower end of humerus. Smallest scrap of fore arm will be useful if can be left.

IN FORE ARM.

1. *Teale's method*.—The long flap being either from posterior (Teale) or anterior (Holmes) aspect.
2. *Modified circular*. (See page 5.)

AT WRIST.

- (1). Two semi-circular flaps; or (2), large anterior

flap containing all the soft parts. Tendons and nerves cut short.

THUMB AND ITS METACARPAL.

Avoid wounding radial artery.

1. *Incision along dorsum of metacarpal bone*, including metacarpo-phalangeal joint in an oval manner, and returning to starting point.

2. *Transfixion* of large flap from ball of thumb and short dorsal flap.

LITTLE FINGER OR FORE FINGER AND METACARPAL.

Use method like No. 1 for thumb, and its metacarpal.

THUMB.

Leave a little bit if possible. It is always useful, and freely movable, owing to numerous muscles inserted.

FINGERS.—*Metacarpo-phalangeal Joint.*

Incision begins over knuckle and passes round palmar aspect in ovoid manner, and back to starting point (short lateral flaps). Cut down to bone. Divide lateral ligaments. Open joint. Twist out phalanx and remove finger. Cicatrix should be linear.

If removing head of metacarpal bone, will require to begin incision a little behind knuckle. This gives neater result, but greatly weakens the hand.

FORE FINGER.

Cicatrix should be on dorsum and towards middle finger, hence take longer flap from radial side.

LITTLE FINGER.

Cicatrix should be on dorsum and towards ring finger, hence take longer flap from ulnar side.

PARTIAL AMPUTATION OF FINGER.

Don't amputate between first and second phalanges as both flexors will be lost.

Cicatrix on dorsal aspect.

Palmar flap.

Enter joint by keeping well forward on dorsal aspect, to allow for breadth of bone left.

EXCISIONS OF BONES AND JOINTS.

SHOULDER JOINT.

Incision.—About 4 inches long at anterior margin of deltoid, beginning just external to coracoid process and passing downwards and outwards.

Dissection.

Save Tendon of biceps.

Secure anterior circumflex artery, and all bleeding points.

Cephalic vein will be cut, and may require ligature.

Clear greater tuberosity, } Assistant rotating bone
Clear lesser tuberosity, } to suit.

Open joint.

Clear head of bone, keeping knife close to it.

Project it and apply saw.

Take care of posterior circumflex artery and circumflex nerve.

Bone removed.—Head of humerus, down to surgical neck ; may also gouge glenoid fossa.

After treatment.

Large pad in axilla.

Support elbow.

Ankylosis gives useful arm.

Other methods.

a. Single vertical incision.

b. Deltoid flap.

c. Posterior incision (downwards and outwards on posterior aspect of humerus).

The latter is sometimes used—

(1) If numerous sinuses already exist in that region.

(2) Is more convenient for glenoid disease.

Disadvantages.

(*a*) Cuts posterior circumflex artery (giving severe hæmorrhage, difficult to control).

(*b*) Cuts circumflex nerve (paralysing deltoid).

EXCISION OF CLAVICLE.

Very difficult and dangerous, on account of hæmorrhage.

SCAPULA has also been successfully excised. Crucial or tri-radiate incision on dorsum. Hæmorrhage difficult to control.

ELBOW JOINT.

Incision.—Single vertical $2\frac{1}{2}$ inches above and $2\frac{1}{2}$

inches below joint, directly over or slightly to inner side of olecranon process, cutting down to bone. (Skin, fasciæ, and triceps.)

Dissection.—Reflect sides. Keep close to bone. Ulnar nerve to be put safely over internal condyle. Snip off olecranon with forceps. Joint is then opened into. Divide lateral ligaments. Project lower end of humerus. Saw off the diseased portion. Replace humerus and project bones of forearm.

Saw them off together at level of neck of radius. Replace them in wound; stitch and drain.

Bone removed.

Olecranon.

Lower end of humerus.

Radius at its neck.

Ulna, at same level (part of insertion of brachialis anticus is left.)

After treatment.

Gentle extension to keep ends of bone apart and steady—relieves pain. No danger of ankylosis. Not too much extension, or will get a flail joint. Passive movement in ten days or so.

Some surgeons put the arm on a splint. Some use no splint, but depend on careful bandaging, others apply gentle extension, but all have the same object in view.

Other methods

Differ only as regards incision. H shaped in-

cision has been used, also T shaped, but are now seldom seen.

WRIST JOINT.

Excised by Lister's two incisions.

Radial incision—One inch upwards on dorsum of second metacarpal to its base, then parallel to extensor secundi internodii pollicis for another inch or $1\frac{1}{2}$.

Ulnar incision.

Between ulna and flexor carpi ulnaris from two inches above styloid process to middle of fifth metacarpal bone.

Dissection.

The radial incision cuts through extensor carpi radialis breviar. Through it, all the extensor tendons are raised from back of wrist, and the extensor carpi radialis longior is divided.

By ulnar incision, parts on anterior aspect are separated, keeping close to bone. The tendon of extensor carpi ulnaris is divided at its insertion, but flexor carpi ulnaris may be left along with pisiform bone. Divide ligaments, and pull out carpus with forceps. Project lower end of radius and ulna, by ulnar incision, and saw them off. Saw off bases of metacarpals. Trapezium and base of first metacarpal should be dissected out separately, avoiding injury to radial artery.

Don't injure deep palmar arch.

Bones removed.

Lower end of radius and ulna.

Bases of metacarpals.

Whole of carpus except hook of unciform and also pisiform bone. Cartilaginous surface of latter may be scraped if diseased.

After treatment.

Splint with cork pad for palm, and allowing early movement of fingers (Lister's). Passive movement should be commenced early.

After leaving off Lister's splint, use some light flexible support.

Other incisions.

(a) Single straight incision on dorsal aspect of carpus may suffice.

(b) The radial incision of Lister may be alone sufficient.

Excision of metacarpal bone of thumb.—Dorsal incision.—Leaves a useful thumb.

First phalanx of thumb.—May also be excised with advantage.

Other smaller joints may also be excised by linear dorsal incision, and applying usual principles.

MISCELLANEOUS OPERATIONS.

Axillary abscess.—When opening, cut downwards, parallel to long thoracic artery.

Whitlow.—Thecal—cut in middle line of finger, to avoid wounding digital artery. Cut into flexor sheath. Sheaths of thumb and little finger have open communication with common flexor sheath.

Webbed fingers.—Ring is left in web to make a hole. After it has cicatrized, cut rest of web open, and dress as ordinary wound. Apt to join again. Several operations may be required.

Dupuytren's finger contraction.

Palmar fascia is contracted. Allied to rheumatism. Flexor tendons are also sometimes affected.

Operative treatment.

(1) Multiple subcutaneous incisions, dividing tight bands of fascia only,—splint and bandage.

(2) **V** shaped flaps—divide bands—re-adjust skin—apply dressing—splint and bandage. Point of **V** should be towards wrist.

PART III.

INFERIOR EXTREMITY.

FRACTURES.

PELVIS—Falls from great heights.

Run over by cart, or, &c.

Patient can't stand.

Difficult to get crepitus.

Apt to injure bladder or urethra.

If urethra ruptured—to relieve bladder,

(1) Trocar per rectum (abandoned).

(2) Supra-pubic aspiration (now used) until instrument can be passed by urethra.

Rest, and broad bandage round pelvis.

Acetabulum.—Resembles dislocation of hip — *recurring after reduction*.

Treatment.—Rest and extension.

Long splint or double splint.

FEMUR.—Neck or shaft.

Neck,	{ Intra capsular.	(1)
	{ Extra capsular.	(2)

	{ Upper third.	(3)
Shaft,	{ Middle third.	(4)
	{ Lower third.	(5)

Fracture of great trochanter, (6)

Fractures going into knee-joint. (7)

To measure length of limb.

Anterior superior spine of ilium to tip of external malleolus (or to inferior border of patella) ; (limbs must be in similar relation to pelvis).

Fractures of neck.

Intra capsular.—In old people neck has come to be more at right angles to shaft, hence, when weight of body falls on it, fracture more readily takes place.

Shortening.—Rectus, hamstrings, glutei, &c.

Eversion.—Ilio-psoas and weight of limb.

Treatment.—Not too severe.—Beware of bed sores—Sandbags. Result is frequently fibrous union. Extension and long splints will be required if complete cure be attempted.

Extra capsular.—Generally impacted by splitting of trochanter major. Shortening not so marked if impacted—greater if unimpacted.

Treatment.—Do not reduce impaction.

Rest, long splint, extension, sandbags.

Fracture of Trochanter major.

Gives crepitus, but no shortening. Rest, and broad bandage round pelvis.

*Fractures of the Shaft.**Upper Third.*

Upper fragment.—Flexed on abdomen, and rotated outwards by ilio-psoas.

Lower fragment.—Adducted and drawn up.

Treatment.—Difficult, and often unsatisfactory.

1. Long splint, with extension and also anterior splint, with a view to press down lower end of upper fragment.

Other methods.

(a) Double inclined plane—with a view to relax origin of psoas.

(b) Position—limb on outer side—knee bent, and body bent forwards.

Middle Third.

Displacement slight if transverse.

Treatment.—Extension, and long splint, with two or three short splints, or encircling splint on inner side of thigh.

Lower Third.

Upper fragment inwards by adductors, upwards and forwards by psoas, &c., but is easily commanded.

Lower fragment.—Muscles of calf, pull broken end downwards and backwards. Apt to interfere with popliteal vessels.

Treatment.—(1) Knee flexed—pad in popliteal space, but not bandaged too tightly. ? Cut tendo achillis.

(2) Extension, and long splint; very difficult to get good result.

Fractures into knee-joint.

Lay limb on M'Intyre splint, and treat the synovitis.

PATELLA.

Transverse or Stellate.

Stellate.—By direct violence.

Transverse.—Direct violence or muscular action.

Treatment without cutting.

Treat synovitis.

Thigh slightly flexed on abdomen, and heel raised to relax quadriceps extensor.

(1) Malgaigne's hooks.

(2) Elastic extension to quadriceps.

(3) Plaster of Paris case.

(4) Side splints, with hooks to catch oblique or figure of 8 bandages, pressing fragments together.

Wiring fragments.

Suitable only for transverse fracture.

Longitudinal incision.

Bradawl to drill holes from superficial surface, *obliquely* to fractured surface.

May leave wire.

Side drains.

Gets osseous union.

TIBIA.

Displacement slight.

Heel drawn up by tendo achillis.

Lower end of upper sharp-pointed fragment may project, owing to action of quadriceps extensor.

Displacement may vary according to direction of obliquity of fracture. Treatment (see below).

Both bones of leg.

Usually in lower third.

Heel drawn up. Foot everted.

Fibula is broken at higher level than tibia.

Treatment (of both above).

(1) With knee extended.

Spence's box splint, with foot at right angles to leg.

Inner border of patella.	} In the	
Internal malleolus.		same plane
Inner edge of ball of great toe.		

(Chiene).

Stirrup splint may be useful, applied anteriorly.

(2) With knee flexed to relax tendo achillis. Leg lies on outer side. Cline's side splints—footpiece on inner side, to prevent eversion of foot.

FIBULA.

Pott's Fracture.

Occurs two or three inches above ankle. Internal malleolus, also broken or internal lateral ligament of ankle joint torn, giving partial dislocation of foot outwards. Peroneus longus and brevis cause eversion of foot, as broken surfaces of fibula fall towards tibia.

Treatment.

1. Dupuytren's single splint, applied on inner side—carefully padded and bandaged, so as to pull foot inwards. Does not do very well. Apt to roll on leg.

2. Spence's box splint, as for both bones of leg.

Metatarsals.—Very little displacement.

Treat as for a bruise.

Os Calcis—Flex knee. Rest, and bandage.

Rupture of tendo achillis.

Knee well flexed.

Slipper on foot, and foot tied up to thigh by strap fastened at heel of slipper.

DISLOCATIONS.

Nelaton's line.

From anterior superior iliac spine to tuber ischii—touches top of great trochanter (if normal).

Bryant's Iliofemoral triangle.

With body horizontal, from anterior superior iliac spine A, let fall perpendicular line A B. From tip of great trochanter C, draw C B at right angles to A B. Join A C. Then A B C is Bryant's triangle. C B can be compared with similar line on sound side.

The hypotenuse A C coincides with part of Nelaton's line, in normal subject.

Hip Joint.—Primary dislocation, said to be always downwards.

1. Upwards (on to dorsum ilii).
2. Backwards (into great sacro-sciatic notch).
3. Downwards (into foramen ovale).
4. Forwards (on to pubes).

No. 4. Resembles fracture of neck. Y ligament is relaxed, foot everted.

Nos. 1 and 2.

The Y ligament is tense, and prevents eversion of limb by external rotators.

No. 1.—Hip widened. Rotation inwards; slight flexion of hip and knee—heel raised. Ball of great toe rests on instep of other foot. Shortening, two inches.

Reduction.

a. Extension. Fix pelvis by perineal band. Pull knee across opposite thigh.

b. Flex knee firmly on abdomen—rotate inwards; abduct; rotate outwards, and straighten.

No. 2.—Shortening, about one inch. Ball of great toe rests on other great toe, otherwise resembles *No. 1.*

Reduction.—Same as for *No. 1.*

No. 3.—Body bends forwards; foot turned outwards. Hollow in place of trochanter; foot advanced. *Lengthening*, about 2 inches.

Reduction.

a. Bedpost in fork. Surgeon grasps foot and leg, and prises head of bone into position.

b. Flex; adduct; rotate inwards, and straighten.

No. 4. Flattening of hip; abduction and eversion; head of bone felt. Shortening, one inch.

Reduction.

a. Extension, and at same time pull upper part of thigh outwards by towel.

b. Flex on abdomen; pull; rotate inwards, and straighten.

Relation to tendon of obturator internus.

In getting on to dorsum ilii, head of femur passes between tendon and bone. In getting into great sciatic notch, it passes behind tendon, and the tendon lies between neck of bone and pelvis. (Bigelow.)

Knee joint.

Dislocation very rare, and apt to be accompanied by injury to popliteal vessels.

4 Varieties.

Backwards, forwards, inwards, outwards. Tibia may be dislocated backwards; easily seen when knee is extended; hardly shews when knee is flexed. Great difficulty in reduction, owing to having missed the threads of the screw (knee joint being a sort of double-threaded screw). (Goodsir.)
Try extension.

Semilunar cartilages.

Internal or external.

Frequently recurring.

Internal cartilage.—To reduce luxation, flex firmly; manipulate and extend while maintaining rotation inwards.

Keep leg rotated *inwards*, to prevent recurrence.

External cartilage.—Manipulate as above, but rotate leg outwards.

Keep leg rotated *outwards*, to prevent recurrence.

Mr Annandale stitches these cartilages to head of tibia in cases of obstinately recurring luxation.

Patella. — Dislocation on to internal or external condyle. Generally on to external. Inner edge of patella is directed forwards.

Treatment.

Flex thigh on pelvis, } To relax
Bend body forwards, } rectus femoris.
Manipulate.

Edge of patella may go between condyles, causing great difficulty in reduction.

Ankle Joint.

1. Foot outwardsPott's fracture.
2. „ inwards(with fracture.)
3. „ backwards.
4. „ forwards(rarest.)

Tendo achillis may require division before reduction is possible. This applies especially to Nos. 3 and 4.

In No. 4 reduction may be quite impossible.

After reduction apply Spence's box splint.

Compound dislocations at ankle.

Partial excision, or even amputation, may be the safest course. In all cases, flexion of knee is required to relax tendo achillis.

Dislocation of Astragalus.

Forwards or backwards. Forwards is not uncommon. Relax tendo achillis and manipulate.

Subastragaloid dislocation has been described. Also

Dislocation of first Metatarsal, together with Internal Cuneiform.

Metatarso-phalangeal Joint of Great Toe.

Phalanx goes on to inferior aspect of head of metatarsal bone.

Treatment.—Chloroform and extension.

LIGATURE OF ARTERIES.

(Including arteries of abdomen and pelvis.) See General Directions, p. 2.

Abdominal Aorta has been tied. Occlusion not very uncommon.

Anastomoses.

Superior epigastric of internal mammary, with deep epigastric.

Renal through cortex of kidney with lumbar arteries, &c.

Common Iliac.

Left side of body of fourth lumbar vertebra to sacroiliac articulation. Line is from half-an-inch to left of umbilicus to middle of Poupart's ligament. (Upper third of this line.)

Left shorter than right.

Right artery has two common iliac veins posterior to it, going to form inferior vena cava.

In front.—Peritoneum, ureters, intestines. Inf. mesenteric artery and vein (on left side).

Been tied by large curved incision and reflecting up unopened peritoneum.

Internal Iliac.

Same incision as for common iliac.

Relations.

Peritoneum and ureter—in front.

Psoas—on outer side.

Lumbo-sacral cord—is posterior.

Veins—posterior and to outer side.

External iliac.

Sacro-iliac articulation to middle of Poupart's ligament

Intestines and peritoneum.

Iliac fascia and spermatic vessels.

Genito-crural nerve.

Vas deferens	} Cross over lower part.
Circumflex iliac vein	

Ext. iliac vein.

Vas deferens.

A

Psoas muscle.

Vein (on right side).

Psoas.

Surface marking.

Continuation of line of common iliac.

Incision.—3 inches long. $\frac{3}{4}$ inch above Poupart's ligament, curving upwards and outwards, and gradually leaving Poupart's ligament.

Begin incision close to deep epigastric artery, but don't wound this artery.

Cut through

Skin and fascia.

External oblique.

Internal oblique and transversalis.

Transversalis fascia.

Reflect pouch of peritoneum, and keep genito-crural nerve out of the way.

Should be tied about its middle.

Anastomoses.

Ilio lumbar, with deep circumflex iliac.

Deep epigastric, with internal mammary.

Obturator, with internal circumflex (in thigh).

Gluteal and sciatic, with external circumflex (in thigh).

Femoral artery.—(Includes common femoral [and superficial femoral of surgeons.]

Surface marking.

Line from middle of Poupart's ligament to internal condyle of femur, when thigh is slightly flexed, and rotated outwards.

Common femoral.

Skin and fascia.

Superficial veins.

Fascia lata.

Crural branch of gen. c. nerve.

Femoral vein.

A

Anterior crural nerve.

Psoas.

Psoas and pectineus.

Nerve to pectineus.

Very unfavourable for ligature, as it is too short for good firm clot to form. Secondary hæmorrhage almost sure to occur, and to be fatal.

Superficial femoral.—(Surface line already given.)

Tied at apex of Scarpa's triangle.

Inner border of sartorius is guide.

Skin, fascia, and

Superficial veins.

Fascia lata.

(Pull sartorius outwards.)

Internal cutaneous nerve.

Femoral vein.
Adductor longus.

A

Sartorius.
Anterior crural nerve.
Vastus internus.

Femoral vein.
Adductor longus.

Anastomoses (after ligature).

1. Profunda femoris, with anastomotica magna, and numerous muscular branches.

2. Descending branches of external circumflex, with superior external articular branch of popliteal.

3. Descending branches of internal circumflex, with anastomotica magna and muscular branches.

4. Vessels of bone and periosteum.

Profunda branch.

Structures	}	Superficial to
already named.		

Fem. artery and vein.

Profunda vein and add. longus.

Adductors.

A

Bone.

Vastus internus.

Iliacus.

Pectineus.

Add. brevis and magnus.

No recognised operation for ligature.

Femoral in Hunter's canal.

Skin and fascia.

Sartorius (to be pulled inwards).

Fascial roof of canal. { Add. longus and
vastus internus.

Long saphenous nerve.

Add. magnus.

A

Vastus internus.

Vein.

Add. magnus.

Not now tied, as ligature at apex of Scarpa's triangle is preferable.

Popliteal artery.

Incision in middle of popliteal space.

Skin and fascia.

Short saphenous vein, and

Ramus commun. tibialis.

Popliteal fascia.

Internal popliteal nerve, } To be pulled
 Popliteal vein, } to inner side.

Posterior tibial artery.

From middle of popliteal space to a point midway between tendo achillis and internal malleolus (or rather nearer malleolus).

Tibialis posticus.

Flexor long. digitorum.

Tibia.

Ankle joint.

Post. tibial nerve.
 (Upper third.)

A

Post. tibial nerve.
 (Lower two-thirds.)

Nerve crosses.

Muscles of calf.

Deep fascia.

Superficial fascia and skin.

Tied in *upper half* or *lower half*.

Upper half. 2 methods.

(1) *Straight incision* in middle line, six inches long.

Structures.

Short saphenous vein.

Ramus commun. tibialis.

Gastrocnemius, plantaris.

Soleus—deep fascia (sheath).

Nerve close on inner side of artery.

(2) *Flex knee.*

Incision—from garter, 4"–5" long, on inner side—downwards, $\frac{3}{4}$ inch behind inner border of tibia, pull back gastrocnemius.

Separate soleus from tibia.

Push nerve aside.

Open sheath of vessel.

Lower half.

Incision.—Parallel to tendo achillis, rather nearer malleolus than heel. Cuts through skin, fascia, and deep fascia.

Flexor long. digit. *v* **A** *v* Flex. long. hallucis. Nerve

Mnemonic. — Does vex all very nervous pupils.
(Heath.)

Peroneal artery.

Tibialis posticus.

Flexor longus hallucis.

Sheath containing
posterior tibial.

A

Fibula.

Soleus.

Deep fascia.

Flexor longus hallucis.

Runs mostly in substance of flexor long. hallucis.
No systematic operation for ligature.

Anterior tibial artery.

Surface line.—From point midway between head of fibula and tuberosity of tibia to point midway between malleoli.

Upper part.

Tibialis anticus.

A
Interosseous
membrane.

Extensor longus
digitorum.*Lower part.*

Tibialis anticus.

A
Tibia.
Ankle joint.

Ext. prop. hallucis.

Incision.—Parallel to tibialis anticus. Nerve on outer side, at upper and lower parts—very closely related to artery in whole course.

Dorsalis pedis artery.

From termination of anterior tibial to outer side of base of 1st metatarsal bone.

Skin and fascia.

Innermost tendon of extensor brevis.

Ext. prop. hallucis.

A
Ext. longus digitorum.
Antr. tibial nerve.

Ankle joint.

Tarsal bones and ligaments.

Incision may be any where in line of artery. Branches

(1) Tarsal. (2) Metatarsal. (3) Communicating—passes between first and second metatarsal bones to form plantar arch on sole. (4) Dorsalis hallucis, supplies hallux and inner side of second toe.

Internal plantar artery.

Between abductor hallucis and flexor brevis digitorum—covered by

{ Skin, fat, and fascia.
 { Plantar fascia.
 { Abductor hallucis.

Is often very small.

Supplies inner side of hallux.

External plantar artery.

Lies upon *accessorius*.

Covered by { Skin, fat, and plantar fascia.
 { Flexor brevis digitorum.
 { Abductor hallucis.

Passes towards base of 5th metatarsal bone. Turns under *accessorius* to anastomose with communicating branch of dorsalis pedis, to form

Plantar arch,

Lying upon *bases of metatarsals and interossei*.

Covered by { Skin, fat, and plantar fascia.
 { Flexor brevis digitorum.
 { Flexor tendons and lumbricales.
 { Digital nerves.
 { Adductor hallucis.

Gives off

Digital branches to $3\frac{1}{2}$ outer toes.

Pudic artery.

(From anterior division of internal iliac.)

- | | | |
|------------|---|--|
| In Pelvis. | { | Lies in pelvis, in front of pyriformis and sacral plexus, and on outer side of rectum. |
| | | Leaves pelvis at lower margin of great sac. sciatic foramen. |
| Buttock. | { | Lies on spine of ischium. |
| | | Pudic nerve to inner side. |
| | | Obtur. intern. nerve to outer side. |
| | | Enters lesser sac, sciatic foramen. |
| | { | Covered by gluteus maximus. |
| Perineum. | | On outer side of ischio-rectal fossa. |
| | | In sheath of obturator fascia— |
| | | Runs along ramus of pubis, ends in Dorsal artery of penis, and artery of corp. cavernosum. |

Gluteal artery.—Postr. div. of int. iliac.

- | | | |
|----------|---|---|
| Pelvis. | { | Leaves pelvis between lumbo sacral cord and sacral plexus. At upper margin of great sac. sciatic foramen. |
| | | |
| Buttock. | { | Superficial and deep division in buttock. |
| | | Superficial div. ends in glut. maximus. |
| | | Deep div. { Superior—along mid. curved line. |
| | | { Inferior—across gluteus minimus. |

Anastomoses.—With ascending branches of external circumflex about great trochanter.

AMPUTATIONS.

HIP JOINT.

Three methods of controlling hæmorrhage.

1. Lister's aorta compressor.
2. Davy's lever per rectum—(to compress common iliac).
3. Pad on ilio-pectineal eminence and elastic bandage catching on tuber ischii, passing over crest of ilium, and held there from slipping by a trustworthy assistant—or may be kept from slipping by bandage round pelvis.

Transfixion.

(1) *Anterior and posterior flaps*, or (2) *long anterior flap* only, is better drained, but not so easily kept aseptic.

Enter knife midway between anterior superior spine and great trochanter—passes to a point just in front of tuber ischii. Knife passes behind femoral vessels. Cut downwards, making large anterior flap (about 8 or 9 inches long).

Open capsule of joint freely—assistant rotates limb inwards or outwards as required, so that knife may clear head of bone.

Divide ligamentum teres.

Disarticulate.

Cut posterior flap (long or short).

This description applies to left leg.

In amputating right limb—operator will require to

stand on inside, and enter knife just in front of tuber ischii, bringing it out midway between anterior superior iliac spine and great trochanter.

Jordan's method.

Restrain hæmorrhage with pad and tourniquet.

Longitudinal external incision over great trochanter, about 6 inches long.

Clear head, and disarticulate.

• Stop hæmorrhage.

From lower end of incision a circular cut is made, passing around inner side of thigh.

Vessels of thigh are under control of assistant's hands, and are divided last, and secured at once, as in amputation at shoulder.

Another method.

Amputate below trochanters, and afterwards dissect out head of bone.

Many other methods have been devised, *e.g.*

Lateral flaps.

Sub-periosteal operation.

THIGH.

1. True circular will do.
2. Flap methods, $\begin{cases} a. \text{Modified circular.} & \text{See page 5.} \\ b. \text{Teale's method.} & \text{See page 5.} \end{cases}$

CARDEN'S AMPUTATION.

Long anterior flap, of skin and cellular tissue only.

No posterior flap.

Incision.—Horse shoe shaped—condyle to condyle, and as low as *insertion of ligamentum patellæ*.

Dissect up anterior flap till see vastus internus muscle.

Take skin and all subcutaneous fat.

Join ends of incision *posteriorly*.

Clear lower end of femur.

Saw through cancellous bone.

Don't enter medullary cavity.

Mr Joseph Bell's modification is to leave a short posterior flap. It facilitates the securing of the popliteal vessels, and is now generally adopted.

Spence's amputation in lower third of thigh.

Long anterior flap.

Margin as low down as *lower border of patella*.

Dissect up skin, &c., as in Carden's, and then cut muscles obliquely to bone.

Posterior flap, convex, and about $2\frac{1}{2}$ inches long.

Length of anterior flap should be equal to *half circumference* of limb. (Spence.)

Bone will be sawn higher up than in Carden's operation. Medullary cavity will be entered, and risk consequently increased.

Gritti's modification of Carden.

Incisions are same as in Carden's.

Patella is preserved in anterior flap.

Saw off its cartilaginous surface.

Apply it to cut end of femur.

This lessens chance of sloughing of long anterior flap.

DISARTICULATION AT KNEE.

Seldom applicable, as so much skin is required to cover large lower end of femur.

Flaps may be of any variety. Large flap from calf will do if available, or lateral flaps.

Patella generally removed.

May use large anterior flap containing patella and short posterior flap.

AMPUTATION IN LEG.

Modified circular generally used.

Seat of election.

About 3 inches from upper end of tibia, leaving insertion of ligamentum patellæ.

Mark out large anterior semilunar skin flap.

Short posterior flap cut by transfixion.

Return to anterior flap and dissect up skin and fascia.

Retract both flaps fully.

Make circular sweep to cut muscles and periosteum.

Cut interosseous structures by passing knife between bones.

Saw bones as in Teale's operation (see below).

Round off sharp anterior margin of tibia.

Teale's Amputation.—(Specially useful in leg.)

Flaps have been already described. See page 5.

Anterior tibial artery is to be carefully preserved when dissecting up anterior flap.

Don't let knife get locked between the bones.

Fibula is well behind tibia.

Apply saw first to tibia, and when it is about half cut through, let saw reach fibula and finish section of the two bones together.

SYME'S AMPUTATION.—AT ANKLE.

Foot at right angles to leg.

Incision.—From *tip of* EXTERNAL MALLEOLUS to point on inner side corresponding.

This latter point will be a little below and behind internal malleolus.

Incision may curve slightly backwards.

Anterior incision joining those points (foot extended).

Incisions cut down to bone.

Plantar incision should cut the two plantar arteries—just after bifurcation of posterior tibial.

Dissect back heel flap till you reach tendo achillis.

Open joint from front.

Cut lateral ligaments and disarticulate.

Remove foot by cutting tendo achillis.

Clear tibia and fibula (lower ends).

Saw off thin slice.

Mr Syme dissected back heel flap before altering position of foot and making anterior incision. More brilliant, but perhaps rather more difficult.

Mackenzie's modification.

Lay foot on outer side and cut a *large internal flap*,

somewhat similar to Syme's heel flap. Short external flap.

Pirogoff's modification.

He makes the heel flap larger.

Retains part of os calcis with insertion of tendo achillis.

Cut surface of os calcis is applied to cut surface of tibia.

This modification does well in military surgery.

In civil practice, however, it is little used, as (1) os calcis may be carious and disease return. (2) Boot does not fit so well as it does on a Syme stump.

CHOPART'S AMPUTATION.—(Intra-tarsal.)

Leaving *astragalus* and *os calcis*.

Large plantar flap to roots of toes.

Short dorsal flap.

Plantar flap longer on inside, in accordance with thickness of foot.

Divide tendo achillis to prevent retraction.

Retraction tends to bring cicatrix on to the ground.

Points which guide incision :—

On inside—

Tubercle of Scaphoid

(begin rather behind it).

On outer side—

One inch behind prominent base of 5th metatarsal

(to get calcaneo-cuboid joint).

LISFRANC'S AMPUTATION.

This is a pure disarticulation at *tarso-metatarsal joint*.

Flaps as in Chopart's.

On inside.

Joint is found rather more than one inch anterior to tubercle of scaphoid.

On outer side.

Immediately behind prominent base of 5th metatarsal. Cut at first forward to get round base of metatarsal.

Hey's modification of Lisfranc.

Disarticulates on outer side of foot, but saws through internal cuneiform and removes part of it (Hey), or saws through second metatarsal bone, leaving its base (Holmes).

GREAT TOE AND ITS METATARSAL.

Incision along dorsum of 1st metatarsal.

Flap from inner side.

Throws cicatrix towards middle of foot.

Don't cut communicating artery.

AMPUTATIONS OF TOES.

Web is longer than in hand.

Articulation apparently higher.

May leave part of 1st phalanx.

(Strengthens transverse arch of foot.)

Oval incision as for fingers.

Great Toe.

Longer internal flap.

Throws cicatrix outwards (towards middle of foot).

Little toe.

Longer external flap.

Throws cicatrix inwards.

Same for little toe and its metatarsal bone. Cutting along dorsum of metatarsal.

EXCISIONS OF BONES AND JOINTS.

HIP JOINT.

Very fatal in gunshot wounds. Even worse than amputation.

Incision.—Straight or slightly curved, with convexity backwards over posterior part of great trochanter. 5 inches long, through gluteus maximus.

Dissection.—Skin, fascia, ilio-tibial band. Gluteus maximus. Gluteus med., minimus, pyriformis, obturators,—to clear great trochanter.

Open capsule. Better saw bone with chain saw before pulling out head of femur, to save risk of stripping periosteum from shaft.

Bone removed.

Whole of disease only.

Also trochanter major (Sayre).

May be done sub-periosteally.

May scrape acetabulum.

After treatment.—Light dressing, or weight and pulley.

Screw out bone to proper length (Sayre).

Result.—Ligamentous union, or osseous union, or none, and limb useless.

EXCISION OF KNEE.

Incision.

1. Straight transverse, cutting through patella.
2. Semilunar (condyle to condyle) will do for amputation.
3. Longitudinal (Ollier).

Dissection.—(Using incision No. 1).

Separate fragments of patella.

Divide crucial and lateral ligaments.

Cutting on bone for safety.

Flex knee fully and saw off condyles upon head of tibia.

Clear head of tibia.

Push it out and saw off thin slice with Butcher's saw from behind forwards.

Fit the cut surfaces of bone carefully together.

Wire fragments of patella.

Bone removed.

Not whole epiphysis of femur in the young.

All the disease.

After treatment.—Keep in rigid apparatus, *e.g.* P. H.

Watson's splint and sling.

Plaster of Paris to maintain rigidity.

Result.—Osseous ankylosis.

EXCISION OF ANKLE JOINT.

Incisions.

1. { Large incision curving under external malleolus,
 { and small one over internal malleolus.
2. By anterior flap.

Dissection.—(Using method No. 1).

Clear internal malleolus.

Saw it through with Hey's saw and remove it.

Clear external malleolus, open joint and project bones of leg through outer incision. Saving peronei tendons.

Saw off articular surfaces of tibia and fibula.

Remove whole of astragalus if much diseased.

Take hold of it with lion forceps and twist it out, cutting interosseous ligament with strong scissors.

May remove only slice of astragalus with chain saw.

After treatment.—Well fitting splint (M'Intyre's will do). Afterwards a plaster case with windows for applying dressings.

Recovery slow. Result good in the young.

EXCISION OF ASTRAGALUS.

Incision.

1. { Curved downwards and passing anteriorly from
malleolus to malleolus.
2. Two incisions as for ankle joint.

Dissection.—(Using method No. 1.)

Dissect up anterior flap.

Secure vessels.

Open ankle joint.

Divide lateral ligaments and ligaments to scaphoid.

Lever up bone.

Divide interosseous ligament.

Clean back part of bone very carefully.

Bone removed.

May remove upper part only with a chain saw.

After treatment.

As for ankle joint.

Above description will serve to indicate how ankle joint may be excised by anterior flap.

EXCISION OF OS CALCIS.

Incision.

On level with upper border of os calcis.

From inner side of tendo achillis round outer side of heel, and forward to calcaneo-cuboid joint, or rather in front of it—tendo achillis snaps.

(May require transverse incision also at anterior end of this one.)

Dissection.

Reflect flap downwards.

Open calcaneo-cuboid joint.

Open calcaneo-astragaloid joint.

Divide interosseous ligament.

Clean inner side of bone carefully, as vessels are here in danger.

After treatment.

Rectangular splint to fit.

CALCaneo-ASTRAGALOID JOINT.

Has been excised by Mr Annandale—2 incisions.

FIRST METATARSAL BONE.

Excised by incision along dorsum, and small trans-

verse incisions at each end. Making small rectangular flaps. Disarticulate proximal end first—taking care of communicating artery.

No splint required.

MISCELLANEOUS OPERATIONS, DEFORMITIES, &c.

OSTEOTOMY.

For hip-ankylosis, in bad position.

(a) When neck of femur remains.

Keetley.

Line from anterior superior spine to superior angle of trochanter.

Junction of inner and middle thirds.

Small incision.

Clear neck of bone.

Insert osteotome ; rotate it.

Cut nearly through, and break the rest.

Adams.

With long tenotomy knife.

Opens capsule freely.

Passes in saw (Adams' saw).

Divides neck of femur.

Volkman's.

Longitudinal incision on outer and posterior aspect of great trochanter.

Remove wedge of bone.

Snap bone in two.

(b) If neck has disappeared.

Divide femur with fine saw below great trochanter.

After treatment.

Straighten hip at once.

Tenotomy may be necessary.

Double splint.

Plaster of Paris corset may be useful to keep spine and pelvis straight.

GENU VALGUM.

Rest thigh on sandbag.

Incision. (MacEwen.)

Parallel to, and half an inch in front of tendon of adductor magnus.

One inch above level of upper part of external condyle.

Longitudinal incision.

Insert osteotome ; rotate.

Cut through only two-thirds of bone.

Break remainder (bending outwards).

Don't enter joint.

Ogston's Operation.

Cuts towards intercondyloid notch.

Breaks off internal condyle, and makes it slip upwards.

Chiene's Operation.—Removes wedge of bone, the long axis of which runs downwards and outwards. Bends leg inwards.

Barwell's modification of MacEwen's.

Cuts outer part of lower end of shaft of femur. Bends leg inwards to break through bone.

Straighten femur.

After treatment.

Double splint, with cross bar at lower end.

Careful elastic pressure.

Padding and bandaging.

Note that all these operations involve the risks of compound fracture, and Ogston's operation is a compound fracture, entering knee joint.

Rickets (in tibia).

Wedge of bone may be removed.

One incision suffices, as skin is moveable.

May cut through fibula, also by separate incision if necessary.

FLAT FOOT.

Chief structures supporting the arch of the foot are

Tibiales muscles.

Calcaneo-scaphoid ligament.

Plantar fascia.

But all the intertarsal ligaments, and also the flexor tendons, play their part.

Treatment.

1. Steel spring in boot, and supporting instep.

2. Soft pad for instep.

3. Strap and buckle fastened to sole of boot, and supporting instep.

Strap is fastened to strong rod passing up leg.

Rest, and constitutional treatment.

Exercise by walking for limited periods on toes, to brace up tendons. (Ellis.)

Excision of astragalus may require to be done.

TALIPES.

*Structures contracted.**Equinus*.—Heel drawn up. Tendo achillis.

Varus.—Foot turned in. { Tibiales.
 Inner part of plantar fascia.
 „ „ flex. brev. digit.

Talipes equino-varus.—Combination of above.

Calcaneus.—Toe drawn up. { Extensor longus and
 ext. brevis digitorum,
 peroneus tertius.

Valgus.—Foot turned outwards. *Peronei*.*Talipes calcaneo-valgus*. — Combination of above (resembles flat foot).

Talipes equino-varus is common from causes above indicated, but *paralytic forms* of talipes also occur. Thus, paralysis of tibiales will produce a *talipes valgus*. Paralysis of peronei will give *talipes varus*.

TENOTOMY.

Pass in tenotomy knife and turn blade against tendon—tendon snaps. Withdraw knife. Apply piece of boric lint—padding and bandage.

Careful after treatment. Plaster of Paris case.

(*For sterno-mastoid*.—Cut outwards for safety of structures in neck.)

VENESECTION.

Internal saphena vein may be opened above inner ankle. Same management as in arm. See page 17.

VARICOSE VEINS.—Operations for obliteration or excision.

1. *Subcutaneous loop*.—(2 punctures)—passing first under vein—emerging at puncture No. 2, re-entering at puncture No. 2; passing over vein, and emerging at puncture No. 1. Pull loop tight, and tie.

2. *Long incision*.—Ligature at two or three places, using aneurism needle—divide vein between.

3. *Excision*.—Formidable operation.

Double ligatures.

Raise vein from its bed.

Tie tributaries and lower end.

Excise whole vein.

4. *Acupressure*.—Two pins and bougie—figure of 8 ligature. (May cut through vein between pins.)

INGROWING TOE NAIL.

Local anæsthesia.

Pass blade of scissors under nail, and cut longitudinally.

Remove outer portion of nail with forceps.

STRETCHING GREAT SCIATIC NERVE.

Incision.—3-4 inches long.

Midway between great trochanter and tuber ischii, but rather nearer the latter point.

Incision is mostly below fold of nates.

Nerve is found external to long head of biceps, and at lower border of gluteus maximus.

Pull nerve steadily both upwards and downwards. Strength enough to raise leg from table—no jerks.

Nerve lies upon

Obturator internus and gemelli.

Obturator externus.

Quadratus femoris.

Adductor magnus.

P A R T I V.

RESPIRATORY PASSAGES.

Foreign bodies.—May be removed from nares by scoop or bent probe.

PLUGGING ANTERIOR NARES.

Only dressing forceps and lint are required.

PLUGGING POSTERIOR NARES.

1. *Bellocq's sound*; or,

2. *Soft Catheter*, with string attached.

Pass along floor of nose.

Seize string at velum palati.

Fasten pledget of lint about size of terminal phalanx of thumb.

Not at *end* of string.

Pull pledget back to posterior nares.

Tie two ends together, one coming out of mouth and other out of nostril.

Kept on cheek by adhesive plaster.

3. Wire off a soda-water bottle formed into loop, threaded with a piece of string, having bead attached to end.

Pass along floor of nose.

When bead reaches soft palate ask patient to "hawk" or spit, and bead with string attached will be ejected by the mouth.

Proceed with pledget of lint as already indicated.

NASAL DOUCHE (Thudicum's).

Use a syphon having reservoir higher than patient's head.

Stream of water enters by one nostril and runs out by the other. Velum palati becomes tense and meets wall of pharynx, thus preventing liquid from passing downwards.

MIDDLE LINE OF NECK.

Symphysis of jaw.

Mylo-hyoid junction.

Body of hyoid bone.

Thyro-hyoid membrane.

Thyroid cartilage Thyrotomy.

Crico-thyroid membrane
and Crico-thyroid arteries } Laryngotomy.

Cricoid cartilage
Trachea (two rings).
Tracheotomy (high operation). } Laryngo-tracheotomy.

Thyroid isthmus.

Trachea (again) Tracheotomy.

[This part must be known with utmost accuracy.]

THYROTOMY.—Splitting thyroid cartilage for removal of foreign body or tumours of larynx.

LARYNGOTOMY.—Opening into larynx through crico-thyroid membrane.

Vertical incision in skin.

Transverse cut through membrane.

Crico-thyroid arteries run *horizontally*.

This is the operation which may be done with a pen-knife in an emergency, when suffocation threatens, owing to foreign body in larynx.

TRACHEOTOMY.

Hard pillow or support under neck.

Incision.—Exactly in middle line, so as to strike *intermuscular septum*.

Having reached trachea, seize it with sharp hook, which is steadied or slightly pulled up by an assistant.

In cutting open trachea, cut upwards.

May enlarge opening with probe-pointed bistoury.

Notice that when head is thrown back, trachea becomes flattened, and hence posterior wall is in great danger of being injured.

Various methods of inserting tube.

1. Handle of knife to keep wound in trachea open.
2. Spence's double hook.
3. "Lobster-tail" canula.
4. Two blunt hooks, one held by assistant, the other in left hand of operator, while with right hand he inserts tube.

HIGH OPERATION.

Opening trachea above thyroid isthmus.

Applicable to short necked persons.

Structures met with.

Skin, fascia, and fat.

Intermuscular septum } Sterno-hyoid.
 } Sterno-thyroid.

Superficial veins.

In the trachea itself, above thyroid isthmus, there may not be sufficient room to insert tube. The operator may then extend incision upwards, cutting through cricoid cartilage. Should the cricoid cartilage be cut, the operation is then *laryngo-tracheotomy*.

LOW OPERATION.

Structures met with.

Skin, fascia, and fat.

Communicating vein between anterior jugulars

Intermuscular septum } Sterno-hyoids.
 } Sterno-thyroids.

Inferior thyroid veins.

Anterior thyroid gland } if present.
 Thymus gland

The trachea as it descends becomes deeper (farther from skin of neck).

USING POLITZER'S BAG.

Patient takes mouthful of water, but does not swallow.

Nose tube of Politzer's bag is then introduced into nostril. Surgeon grasps nose, closing both nostrils, and preventing escape of air.

Patient then swallows water, and when in act of swallowing, air is forced into nose and up Eustachian tubes. During the act of deglutition, the lower end of Eustachian tube is opened by tensor palati muscle.

PART V.

ALIMENTARY TRACT AND ABDOMINAL
ORGANS.

SURGICAL ANATOMY.

HERNIA.

INGUINAL CANAL.

From Internal abdominal ring to External abdominal ring.

The internal abdominal ring is an opening in the *fascia transversalis*, the external abdominal ring is an opening in the tendon of the *External oblique*.

The canal passes obliquely through the abdominal wall downwards, forwards, and inwards.

Length about $1\frac{1}{2}$ inches.

*Boundaries.**Anterior.*

External oblique tendon (in whole extent).

Internal oblique (origin) outer part.

Cremaster muscle (inner or lower end).

Skin and fascia of abdominal wall.

Floor.

Poupart's ligament.

Posterior.

Fascia transversalis (in whole extent).

Conjoined tendon (inner third).

Triangular fascia (inner half).

Deep epigastric artery and peritoneum.

Roof.

Arched border of transversalis blended with internal oblique muscle.

Looked at inside the abdomen, the deep epigastric artery is seen passing upwards and inwards. It leaves the external iliac artery on the inner side of internal abdominal ring.

HESSELBACH'S TRIANGLE.—Boundaries.

Internally.—Outer border of rectus.

Externally.—Deep epigastric artery.

Base.—Poupart's ligament.

Contents of Inguinal Canal.—The *Spermatic Cord*, consisting of,

- | | |
|---|---|
| { | Vas deferens. |
| | Spermatic artery. |
| | Artery to vas deferens (supr. vesical). |
| | Cremasteric artery (epigastric). |
| | Plexus of veins. |
| | Lymphatics. |
| | Nerves (sympathetic). |
| { | Fascia binding all together. |

Oblique Inguinal Hernia.—Passes along inguinal canal.

Coverings.

Peritoneum and fat.

- | | |
|------------------------------|--|
| { | Infundibuliform fascia (transversalis). |
| | Cremasteric fascia (internal oblique). |
| | Intercolumnar fascia (external oblique). |
| Superficial fascia and skin. | |

In reality, three which require to be remembered, and these have each a representative in the three layers forming chief part of abdominal wall.

Direct Inguinal Hernia.

Descends through Hesselbach's triangle and appears at external abdominal ring.

Coverings.

- { Transversalis fascia.
- { Conjoined tendon.
- { Intercolumnar and triangular fascia.

Besides the usual coverings of peritoneum, &c., and skin, &c.

In this form, the neck of sac is *internal* to *deep epigastric artery*.

In oblique inguinal hernia, neck of sac is external to deep epigastric artery.

In practice, owing to uncertainty, cut *upwards*, *parallel to deep epigastric artery*, when operating to relieve strangulation.

RADICAL CURE OF HERNIA.

So long as testicle remains, circulation must go on by spermatic vessels, and the inguinal canal must not be entirely occluded.

Wurtzer's Operation.

Invagination of scrotum.

Wooden plug (hollow).

Needle passing through abdominal wall.

Wooden case screwed on to compress tissues and cause adhesions.

Very dangerous.

Wood's Operation.

Invagination of scrotum.

Pillars of ring drawn together by sutures.

Wood was the first to maintain that the pillars and walls of inguinal canal must be stitched together. The peritoneum will not keep up a hernia.

Spanton's Operation.

Corkscrew, screwed along track of canal, and left for one week.

Sets up adhesions, and occludes canal to required extent.

VARIETIES OF INGUINAL HERNIA.

Congenital.—Sac is continuous with tunica vaginalis testis.

Infantile.—Sac passes down behind *unobliterated* processus vaginalis.

Ordinary.—Sac passes in front of obliterated processus vaginalis.

(See Heath's Practical Anatomy for diagrams.)

FEMORAL HERNIA.

Passes down *crural canal*.

Crural Canal.

Is inner compartment of femoral sheath.

Femoral Sheath.

Formed by transversalis fascia in front, and fascia iliaca behind, prolonged out of abdomen under Poupart's ligament.

It has three compartments (two septa).

Femoral artery, in outer compartment.

Femoral vein, in middle compartment.

Crural canal is inner compartment.

Crural Canal.—Extends from crural ring to upper part of saphenous opening in thigh.

Crural ring is bounded

Superiorly, by Poupart's ligament ; + *deep crural arch*

Internally, by Gimbernat's ligament ; + *pectineus & iliac f.*

Posteriorly, by bone (pubes) ; + *pectineus & iliac fascia*

Externally, by vein in its sheath.

Length of crural canal, about $\frac{1}{4}$ inch.

Contents.—Lymphatic gland, and fat called the *septum crurale*.

Saphenous Opening.—Is practically an opening in fascia lata, but is closed by *cribriform fascia*, which again is modified part of fascia lata. (Spence.)

Coverings of femoral hernia.

Peritoneum, &c.

Septum crurale.	} 3.
Femoral sheath.	
Cribriform fascia.	

Skin and superficial fascia.

After pushing the cribriform fascia before it, and appearing at upper part of saphenous opening immediately below Poupart's ligament, the hernia is directed upwards, along the groin, because there is a binding down of the under surface of the superficial fascia of the abdomen to the fascia lata about $\frac{1}{2}$ or $\frac{3}{4}$ of an inch below Poupart's ligament.

That femoral hernia appears in the thigh above the level of this attachment, is proved by the shortness of the crural canal, also by dissection *from above*. The fascia of abdomen can be thrown down till Hey's ligament and upper part of saphenous opening (*i.e.* the point where femoral hernia bursts forward) come into view.

Strangulation.

Occurs generally at crural ring, Gimbernat's ligament.

To relieve it.

Cutting *inwards* is safe, unless there be an abnormal obturator artery.

Obturator Artery.—Is usually a branch of anterior division of internal iliac. Not unfrequently it arises from the *deep epigastric* artery, and passes downwards to superior margin of obturator foramen. Generally it passes down on *outer side* of crural ring. Occasionally, however, it encircles, and passes down on *inner side*. In such case, it may be the cause of the strangulation.

It has been recommended to,

(1) Nick slightly all round crural ring, in order to relieve strangulation.

(2) Cutting backwards on to the bone is safe, but not likely to relieve.

(3) May snick Gimbernat's ligament, and take chance of abnormal obturator (about 80 to 1).

Taxis.—Flex leg upon abdomen and rotate inwards, in order to relax ligamentous structures. Chloroform is valuable in relaxing parts.

Inguinal Hernia.—Reduce a small portion at a time, and press upwards along inguinal canal. If reduced *en bloc*, strangulation may persist inside abdomen.

Femoral Hernia.

Is more difficult to reduce by taxis.

Press, at first, downwards and backwards to get hernia round margin of saphenous opening (Hey's ligament), and then upwards.

OPERATION FOR STRANGULATED HERNIA.

Crucial or free straight incision.

Skin is generally pinched up by assistant and trans-fixed, in order to lessen risk of injury to hernial protrusion.

Incise over tumour.

Layer after layer of fascia is divided upon a director till sac is reached.

Sac to be opened very carefully, keeping knife flat.

Strangulating structure cut as may be found necessary.

Broad director is used to keep bowel out of the way.

Contents of hernial sac.

Enterocoele = intestine only.

Epiplocele = omentum only.

Entero-epiplocele = both.

Bubonocoele = hernia partially descended.

OTHER VARIETIES OF HERNIA.

Obturator Hernia.

Passes through upper part of obturator foramen.

Position.—About one inch to inner side of femoral vein.

Coverings.

Skin and fascia.

Fascia lata.

Pectineus muscle.

Fascia and fat.

Some fibres of obturator externus.

Ventral Hernia.—On anterior abdominal wall.

Umbilical Hernia.—In children, and also in stout women.

Lumbar Hernia —In loin, very rare.

TRUSSES.

1. Common inguinal truss—single or double—encircles whole pelvis.
2. Spiral spring truss (has pad and spring ON LOINS).
3. Ball and socket truss (crossed if single), Salmon and Ody's.
4. Mocmain lever truss.

Soft belt encircles body.

Lever spring and pad attached.

To measure for a Truss.

1. Girth of pelvis just below anterior superior iliac spines.
2. Distance from hernial opening to a point just below anterior superior spine of same side.
3. Vertical distance of hernial opening from line joining anterior superior iliac spines in front.
4. If abdomen very prominent, distance of hernial opening from plumb line may also be useful.

A good Truss.—Should fit easily and accurately. Applying just force enough to keep up the hernia. Pad should be flat, so as not to increase size of opening.

Is frequently only palliative, but should cure in the young if carefully managed.

EXCISION OF TONGUE.

Syme's Method.

Attach piece of whip cord to tongue, in order to have it thoroughly commanded.

Cut through middle of lower lip, chin, &c., down to hyoid bone.

Extract incisor tooth.

Saw through symphysis menti.

Separate mucous membrane and muscles, and throw halves of jaw apart.

Pull tongue well forward.

Cut and ligature lingual arteries one by one.

Cut hyoglossi muscles, and remove whole tongue from hyoid bone.

Replace jaw, and wire it together.

Stitch up wound.

Drain through floor of mouth.

Whitehead's method (Modified).

A good gag in mouth.

Two pieces of whip cord, one commanding each half of tongue.

Divide frenum and pull tongue forward.

Split tongue up middle line.

Snip away with blunt pointed scissors, seizing bleeding points as they appear.

It is easy to get away the first half, but there is more difficulty with second, there being nothing left to pull stump forward with in order to command bleeding.

Preliminary tracheotomy.—(High operation.)

May be done and pharynx kept completely plugged. The increase of danger is slight, and it has the following advantages :—

1. More convenient for operator. Chloroform being administered by tracheotomy wound.

2. Blood does not go down larynx or œsophagus.
3. Septic pneumonia afterwards is avoided by leaving tube in.

Other methods.

1. May begin by tying lingual arteries, and then proceed to remove tongue with single stroke of knife, checking any further hæmorrhage.

2. Ecraseur or Galvanic cautery } may be employed and tongue slowly removed. The cheeks may be slit up to allow more room for working.

3. By incision below the jaw.

Semilunar from facial artery to facial artery.

Another incision passing downwards from symphysis menti (at right angles).

Tongue is pulled down through floor of mouth and removed.

EXCISION OF TONSILS.

Seize with vulsellum.

Cut off with probe-pointed bistoury.

Cutting downwards and inwards.

Arrest hæmorrhage.

Uvula may be cut off in same manner or with scissors. Hæmorrhage is trifling.

ŒSOPHAGOTOMY.

At level of cricoid cartilage on left side.

Pass bougie or guide down gullet.

Incision five inches long.

Along anterior border of sterno-mastoid.

See anterior belly of omo-hyoid.

Pass above it to carotid sheath.

Don't open carotid sheath, but pull it and its contents outwards.

Pull larynx inwards.

Take care of recurrent laryngeal nerve.

Feed for a few days by stomach tube.

Œsophagus may be opened on right side if foreign body project to right.

GASTROTOMY AND GASTROSTOMY.

Gastrotomy ought to be used to mean simply cutting into the stomach.

Gastrostomy implies leaving a fistulous opening or mouth by which patient may be fed through abdominal wall.

Incision.

About four inches long.

Along margin of cartilages of ribs on left side.

After opening into peritoneal cavity, fenestrated forceps are used to pick up stomach and bring it to opening.

Stomach wall is stitched to abdominal wall.

After a few days for allowing adhesions to form, the stomach is opened into.

Adhesions shut off track of fistula from peritoneal cavity.

ENTEROTOMY.—(Including Colotomy.)

To open descending colon (Amussat).

Patient lies on right side, with hard pillow under loin.

Line from middle of crest of ilium to free end of last rib.

Bisect this line.

Oblique incision four or five inches long, parallel to last rib.

The vertical line and line of incision bisect each other.

Pass down close to erector spinæ.

Through skin, fascia, latissimus dorsi, external and internal obliques.

Divide fascia lumborum on director.

Pass close to quadratus lumborum.

Perinephritic fat and loose cellular tissue.

Transversalis fascia (very thin).

Seize colon with forceps or finger.

Stitch at two places, transfixing bowel.

Open gut between stitches.

Inserting finger into bowel, pull out loops and cut them, thus making four separate stitches.

Other two stitches may be put in if required.

After treatment.

Protect skin, pad of tenax.

Remove stitches after six or seven days, or let them cut their way out.

Anatomy.

Petit's triangle is formed by the latissimus dorsi border (posteriorly), external oblique border (anteriorly), and crest of ilium (middle third) for base.

Structures cut through.

Latissimus dorsi border.

External oblique muscle.

Internal oblique.

White tendinous *fascia lumborum*, formed by the three tendinous layers of origin of transversalis, joined at outer border of quadratus lumborum.

Perinephritic fat and cellular tissue.

Transversalis fascia (with finger nail).

Peritoneal cavity should not be opened, as here the descending colon is uncovered by peritoneum on its posterior aspect.

INGUINAL COLOTOMY.—(Littre).

Incision.—Three inches long.

Parallel to Poupart's ligament.

Just external to deep epigastric artery.

Cut through,

External oblique muscle.

Internal oblique „

Transversalis „

Transversalis fascia.

Peritoneum.

Stitch bowel to wall of abdomen.

Open at later stage, after adhesions have formed.

Lower part of small intestine is generally opened.

ENTERECTOMY.

Removal of a portion of bowel.

Triangular piece of mesentery (with base towards bowel) must also be removed.

Stop all hæmorrhage.

Stitch cut borders of mesentery together.

Stitch open ends of bowel together, applying peritoneum to peritoneum.

Very fine stitches passing into but not through wall of gut are now recommended.

To effect this, the cut ends of bowel should be slightly curved in all round.

EXCISION OF RECTUM.

With scissors, snip round junction of skin and mucous membrane.

Stop hæmorrhage with forceps.

Seize rectum and pull it down.

Continue snipping upwards around bowel, and pulling loose end down.

Cut away portion of rectum diseased.

Pull down cut end and stitch it to skin, unless tension be too great.

FISSURE OF ANUS.

If caustics and ointments fail,

Cut through external sphincter and allow to granulate.

Cutting sphincter allows rest to ulcer.

FISTULA IN ANO.

Pass probe from external opening to opening in bowel.

Cut it out, laying channel open.

Stuff with carbolized lint and allow to granulate from bottom.

HÆMORRHOIDS.

Five hæmorrhoidal arteries and veins.

One superior (from Inf. mesenteric).

Two middle („ Int. iliac).

Two inferior („ Pudic).

The fact that free anastomoses exist between hæmorrhoidal veins and portal venous system is extremely important. Any liver disorder or stagnation of portal circulation at once aggravates piles.

EXTERNAL PILES.

Operative treatment.

1. Seize with forceps.

Clamp, cut off and cauterise.

Apply pad of oiled lint.

2. Pass catgut stitch through base of pile. Snip off pile without interfering with stitch.

Tie the stitch. Lessens danger of absorption.

Apply pad of oiled lint (Bell).

INTERNAL PILES { Bleeding.
 { Non-bleeding.

Operations.

1. *Ligature.*

Preparation by enema and warm water to relax parts and protrude piles.

Base of pile to be *completely* strangulated with a stout hempen thread.

May pass double thread and tie one on each side, thus strangulating pile in halves.

Or may first define pile by cutting around base at part next skin, so as to make it more easily secured and strangulated.

Ligatures separate in six or eight days.

2. *Clamp and Cautery.*

Prepare patient as already indicated.

Seize piles one by one with Smith's clamp.

Having screwed up clamp,

Cut off pile.

Cauterise with actual cautery at a black heat.

Unclamp slowly.

3. *Whitehead's Operation.*

First completely overcome sphincter by gradual dilatation with fingers.

With scissors, separate mucous and submucous tissue all around anus.

Dissect upwards between coats of bowel, and pull down tube consisting of inner part.

Cut off this tube of mucous membrane, and the piles with it.

Bring down cut end and stitch it to margin of anus.

The muscular wall of the bowel remains undisturbed.

N.B.—After any of these operations, morphia suppository should be administered.

Patient will be unable to micturate.

Urine must be drawn off by catheter.

FÆCAL FISTULA.

Endeavour to remove éperon, and bring lips of skin wound together.

1. Touching éperon with actual cautery, and use adhesive plaster to pull edges of skin together.

2. Dupuytren's enterotome. This instrument compresses and destroys éperon, causing it to become gangrenous. Adhesions ought to form beyond the gangrenous part, to obviate opening into peritoneum.

3. Enterectomy and suture of ends of gut together. At same time closing abdominal wound completely.

Both latter operations are very hazardous.

PROLAPSUS ANI ET RECTI.

Occurs in the very young and the very old.

Avoid straining at stool.

Child should defœcate in recumbent posture.

Oil and return. Apply pad and T bandage.

May incise freely strangulated prolapsed bowel, in order to facilitate its return.

FOREIGN BODIES IN ALIMENTARY CANAL.

Avoid purgation.

Give soft and bulky food.

"Coincatcher" may succeed.

Œsophagotomy may be necessary.

PARACENTESIS ABDOMINIS.

In middle line, midway between pubes and umbilicus.

Bladder should be empty.

May keep up pressure on abdomen with broad bandage.

Percuss before plunging in needle.

IMPERFORATE ANUS.

In new born infants.

May dissect carefully for lower end of bowel; or, do inguinal colotomy (Littre's operation).

CHOLECYSTOTOMY.

This operation consists in opening into the gall bladder to remove impacted gall stones.

Incision is made over tumour, at outer border of right rectus muscle.

Gall bladder is emptied by aspirator as ovarian cyst is emptied.

It is then incised and sponged out.

Calculi (if any) are removed.

Edges of gall bladder are stitched to abdominal wall, and drainage tube left in.

Nothing is allowed to enter peritoneal cavity.

CHOLECYSTECTOMY.

Excision of dilated gall bladder.

Difficult to see how this can do good, as obstruction may be in the common bile duct.

NEPHROTOMY.

Means simply incising a suppurating kidney.

The colon should be previously unloaded, and

kidney is reached by incision midway between last rib and crest of ilium.

Structures cut are as in lumbar colotomy (which see).

NEPHRO-LITHOTOMY.

Removal of calculus from a healthy kidney. Operation resembles above.

NEPHRORAPHY.

This term is applied to the operation for cutting down upon a moveable kidney, and stitching it to abdominal wall.

NEPHRECTOMY.

Kidney may be removed by lumbar incision as for colotomy.

The pedicle (consisting of renal arteries and veins) may be tied in two bundles and dropped back into wound.

The ureter should be brought out of the wound and fastened outside for safety, as there is danger of upward flow of septic urine.

Kidney may also be removed by incision at outer border of rectus abdominis — opening peritoneum. Cutting through posterior layer of mesocolon.

Median incision has also been used, so that both kidneys might be explored.

PART VI.

HEAD, NECK, THORAX, &c.

FRACTURES OF SKULL.

Besides being simple or compound, are divided into fractures of the *base* and fractures of the *vault*.

Of the base.

A fissured fracture may run into anterior, middle, or posterior fossa. It may end in any of the foramina in the base. Not uncommonly, the fracture runs through the petrous portion of the temporal bone, and its existence is shewn by persistent bleeding or escape of cerebro-spinal fluid from the ear.

Of the Vault.

Elevator is used to elevate depressed bone in compound fractures.

Hey's Saw.—Is used to saw off any sharp points of bone which may overlap and prevent elevation of other depressed bone.

Trephining.—May be necessary for depressed bone.

Should fracture be compound, these procedures are resorted to without hesitation, when called for by displacements of fragments of bone.

Should fracture be simple, however, great skill and

judgment are required to know when operative interference is called for.

How to Trephine.

Crucial incision of scalp was formerly used, but now a U shaped flap is thrown down as recommended by Mr Horsley.

Central pin of trephine is first projected, fixed, and rotated in same point till *crown of trephine* has made a groove for itself sufficient to give it a hold. Central pin is then allowed to slip up, so that it may not injure dura mater, and rotation of trephine is continued cautiously till disc. of bone is removed.

A toothpick is useful to pick out sawdust from groove, in order to see how deep the groove has gone.

Where not to Trephine.

Over great venous sinuses.

Over anterior inferior angle of parietal bone (mid. meningeal artery).

Over sutures ?

That is, if wishing to get at brain.

Where to Trephine.

Besides trephining over depressed and compound fractures, &c., the following operation has been done with a view to secure the *middle meningeal artery* (if bleeding). Make incision parallel to and about one inch above zygoma. Clear away temporal muscle and periosteum.

Apply trephine about $\frac{3}{4}$ inch from external angular process of frontal bone. (Heath.)

For motor areas. (Ferrier's.)

The best known of these areas (for limbs, face, &c.), are grouped around the *Fissure of Rolando* of the *opposite side*.

This fissure separates ascending frontal from ascending parietal convolution. Numerous motor areas are in relation to it. Grouped around its lower end are motor areas for *face and mouth*. Just anterior to its upper end are *centres for the leg*, and about its middle, both anteriorly and posteriorly, are *centres for the upper extremity*.

Position of Fissure of Rolando.

Its upper end is $2\frac{1}{2}$ inches behind the coronal suture (Turner), but its position in relation to the coronal suture is of little value in surgery, because the coronal suture can seldom be distinctly made out in the living subject.

"The upper end is placed about half an inch behind a point midway between the root of the nose and the external occipital protuberance."—Quain, 9th ed., vol. 1., page 668.

Its direction from this point is outwards, downwards, and forwards, for about four inches on the scalp.

Mr Hare has made out its commencement to be on an average 55.7 per cent. of the distance from glabella to external occipital protuberance, forming an angle of 67° with mesial line.

Generally stated, most of these motor areas lie very near a vertical line drawn upwards from external auditory meatus.

FRACTURES.

LOWER JAW.—Generally fractured about mental foramen.

Extract any loose tooth which may fall between fragments, and so prevent close apposition.

May wire teeth together (injures teeth).

Small plaster of Paris case, moulded to lower jaw, does well.

Interdental splint may be used.

Four-tailed bandage.

Liquid food for a time.

UPPER JAW OR MALAR BONE.

Get into position as well as possible, and treat on general principles.

NASAL BONES.

Penholder or female catheter may be put up nostril to work bones into position.

Clean and dress with collodion if compound.

Barnes' bags have been used to raise depressed bone.

Emphysema may result from injury to frontal sinuses.

HYOID BONE.—Fractured in "throttling."

Great difficulty in swallowing, breathing, &c.

Reduction may be better effected by putting finger in patient's mouth.

STERNUM.

Requires great violence.

Has happened during labour by muscular effort.

Treat like fractured ribs.

RIBS.

Indirect violence, e.g., crush in a crowd.

Breaks near angle.

Direct violence, e.g., kick of horse.

May be broken anywhere.

Treatment.

Strong strapping, passing from middle line behind to middle line in front, and supporting injured side.

Broad flannel bandage, kept up by braces or by being put outside and pinned to shirt.

SPINAL COLUMN.

Symptoms depend on level of fracture.

Attend to bladder and bowels.

Avoid bed-sores.

Perfect rest, and Sayre's jacket afterwards if necessary.

Immediate death if above 4th cervical vertebra.

DISLOCATIONS.

CERVICAL VERTEBRÆ.

Immediate death, unless below 4th or 5th vertebra (origin of phrenic nerve).

OTHER VERTEBRÆ.

Same as fracture (which see).

Trephining spine has been done.

Extension may possibly be of service.

LOWER JAW.

Bilateral or unilateral.

Cause.—Blow or fall on chin, with mouth open.
Yawning. Laughing.

Displacement.

Condyles come forward beyond eminentia articularis.

Symptoms.—Mouth open, chin advanced, saliva dribbles, hollow in front of auricle, speech bad.

If unilateral, chin will be turned to sound side.

Obstacles to reduction.

Coronoid process is said to oppose reduction, being caught by zygoma. Other view is that muscles fix condyle to base of skull.

Cartilage remains attached to condyle.

Subluxation (Cooper).

Jaw leaves cartilage,—the cartilage remaining in glenoid fossa.

Treatment.

Patient on low seat.

Surgeon's thumbs put well into mouth, to press down molar teeth.

Raise chin.

Or may put cork in between molars to act as fulcrum, then forcibly raise chin.

Bandage for a time, as for fracture of lower jaw.

LIGATURE OF ARTERIES, &c.

INNOMINATE.

Sternum.

St. hyoid and st. thyroid muscles.

Left innominate vein.

Right inf. thyroid vein.

Inf. cardiac branch of rt. vagus.

<i>Right side.</i>		<i>Left side.</i>
Vagus and phrenic nerves	A	Thymus gland
Pleura		Left carotid.
Right innom. vein.		
		Trachea.
		Pleura (at upper part).

May be tied by large V shaped incision, reflecting origin of st. mastoid.

Cutting through st. hyoid and st. thyroid, and dissecting down behind sternum.

Professor Annandale has compressed this artery against sternum for subclavian aneurism.

SUBCLAVIAN. — 3rd part.

From outer border of scalenus anticus to outer border of first rib.

Lies in "Spence's triangle," said triangle having for its sides, the scalenus anticus in front, the scalenus medius behind, and first rib for base.

Operation — Pull down shoulder and push head to opposite side.

Incision. — Pull down skin and cut on clavicle. When relaxed, incision will be about half an inch above clavicle.

Extent. — Base of posterior triangle, and may prolong it upwards along border of sterno-mastoid.

Structures.

1. Skin and fascia.
2. Superficial nerves and vessels.
3. Platysma.

4. Look out for ext. jugular vein. If in way, tie in two places and cut it.

5. Deep fascia binding down omo-hyoid.

6. See omo-hyoid and push it upwards.

7. Nerve to subclavius.

8. Suprascapular artery and vein.

9. Transversalis colli artery and vein.

10. Define outer border of scalenus anticus.

Pass finger down to scalene tubercle.

Artery is behind it; vein in front and at some distance from artery.

Third primary trunk of brachial plexus is in close superior relation to artery.

Pass needle from above downwards.

Chief Anastomoses.

Superior thoracic and long thoracic with intercostals.

Transversalis colli with subscapular.

Suprascapular with subscapular.

Muscular branches in pectoralis major and trapezius.

COMMON CAROTID.—(In the neck.)

Extent.—Sterno-clavicular articulation to upper border of thyroid cartilage.

Line.—From said articulation to ext. aud. meatus.

Skin, fascia, platysma.

St. mastoid, st. hyoid, } Muscles.
St. thyroid, omo-hyoid, }

Veins.—Thyroid, lingual, facial, ant. jugular.

St. mastoid artery, desc. noni nerve.

Trachea. Thyroid	} A {	Int. jugular vein. Vagus.
body and rec. laryngeal		
nerve, larynx, pharynx		
Inf. thyroid artery.		
Longus colli.		
Rect. cap. antic major.		
Sympath. and rec. laryng. nerve.		
Inf. thyroid artery.		

Incision.—Three inches long. Along anterior border of st. mastoid. Middle of incision to be at level of cricoid cartilage.

The artery is tied just above where omo-hyoid crosses it.

May also be tied below omo-hyoid.

Anastomoses.—Opposite side. } Circle of
Vertebral of same side. } Willis.
Inf. thyroid with sup. thyroid.
Profunda cervicis (Sup. intercostal).
with arter. princeps cervicis (Occi-
pital).

EXTERNAL CAROTID.

The structures superficial to this artery, besides skin and superficial fascia, are,

Platysma, deep fascia.

Hypoglossal nerve.

Digastric (post. belly) and }
stylo-hyoid muscles. }

Lingual, facial, and temporo-maxillary veins.

Parotid gland and facial nerve.

Hyoid bone	A	Int. carotid.
Pharynx		(at first).
Parotid gland.		
Sup. laryngeal	}	Nerves.
Glosso-pharyngeal		
Styloglossus	}	Muscles.
Stylopharyngeus		

Ligature is seldom applied, owing to numerous branches and danger of secondary hæmorrhage.

Incision.—Angle of jaw to thyroid cartilage.

Look for hypoglossal nerve.

Tied between sup. thyroid and lingual.

Anastomoses.—Opposite side.

SUPERIOR THYROID.

May be tied in cut throat (better seize bleeding point).

Also in bronchocele.

Incision as for external carotid.

Great cornu of hyoid bone for guide.

FACIAL.

Compress on lower jaw at anterior border of masseter.

Anastomoses soon come into play, viz., opposite side, angular (with ophthalmic).

Angular artery.—Passes internal to lachrymal sac.

LINGUAL ARTERY.

Skin, platysma, and fascia.

Submaxillary gland.

Digastric and Stylo-hyoid.	Ninth nerve. Hyoglossus.	Lingual vein.	Muc. memb.
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Genio hyoglossus.

Middle constrictor.

Incision.— $2\frac{1}{2}$ " long, having centre opposite great cornu, and about half an inch above great cornu of hyoid bone—cutting skin, platysma, and fascia. Pull up submaxillary gland. Look for hypoglossal nerve. Tie artery behind hyoglossus muscle ; or,

Scrape through hyoglossus.

Don't open into pharynx.

May be tied behind posterior belly of digastric.

CUTTING FRENUM LINGUÆ *in tongue-tied children.*

Blunt pointed scissors.

Cut muc. membrane only, and tear remainder with thumb nail to lessen hæmorrhage.

ARTERIOTOMY.

To draw arterial blood—an operation now abandoned.

Find anterior branch of temporal, about $1\frac{1}{4}$ inch behind external angular process.

Artery to be laid bare by dissection.

At first open artery, but don't cut it completely through.

In order to stop the bleeding, cut it through so as to allow coats to retract and contract.

Apply pad and bandage.

VENESECTION. *Ext. jugular.*

Compress vein at root of neck to make it rise and prevent entrance of air.

Divide platysma transversely and vein obliquely.

Cut parallel to fibres of sterno mastoid.

If cut parallel to fibres of platysma, they close up, and prevent the desired flow of blood.

EXCISIONS OF BONES AND JOINTS.

LOWER JAW.

Small portions may be removed by incisions within the mouth—using fine saw and bone pliers.

To remove half the lower jaw.

Incision.—Round angle, and along lower margin of jaw and chin—then prolonged upwards in middle line and through lip. Secure facial artery.

Dissection.—Remove tooth.

Clean outer surface of bone.

Tie vessels.

Saw bone in middle line.

Clean its inner surface.

Depress firmly, and clear coronoid process.

Divide inferior dental nerve and artery.

Twist out with lion forceps, so as to disarticulate from skull.

May open temporo-maxillary articulation from the front.

Keep knife close to bone, to touch through any ligaments which may hold.

Internal maxillary artery is in danger.
Replace flap, and stitch.
Drain by floor of mouth.

After treatment.

Feed by stomach tube.

The tongue should be commanded with whip cord.
This is imperative if symphysis is to be removed with attachment of genio-hyoglossus.

Unless there is special nurse in constant attendance, the tongue will require to be held forward by a stitch, say to nose.

Whole of lower jaw may be dissected out without dividing lip, or may take out the halves separately.

MECHANICAL TRISMUS.

Neck and condyle may be excised by incision parallel to zygoma (if joint ankylosed).

Esmarch's Operation is to divide the lower jaw in front of the angle, removing a small V shaped portion, and forming a false joint.

The operation is done from outside the mouth.

EXCISION OF UPPER JAW.

Partial or Complete.

Incision.—Under border of orbit, coasting round nose and down middle of upper lip.

Advantages.—Stenson's duct uninjured.

Pes anserinus less injured.

Less bleeding (arteries cut being small.)

Dissection.

Throw back flap. Tie vessels.

Pull incisor tooth.

Apply saw along hard palate.

Cut nasal process of superior maxilla.

Divide malar process with saw or forceps, cutting into speno-maxillary fissure.

Twist and depress with lion forceps, cutting infra-orbital nerve to avoid stretching it.

Sever from soft palate with knife in mouth.

Internal maxillary artery is in danger.

After treatment.—Stuff with lint; replace flap, and insert sutures.

Variation.—May leave orbital plate, opening into antrum with bone forceps.

EMPYÆMA.

If open between ribs, the ribs will fall together and compress drainage tube. Drainage tube will then cease to act, and will cause great pain by its presence and the ribs pressing on it.

(1) May remove a small square-shaped portion of one rib.

This will leave a square opening for drainage tube.

Tube ought to have a shield, to prevent it slipping in.

(2) Remove pieces of several ribs to allow chest wall to fall in and occlude cavity left by unexpanded lung. Hey's saw is useful in this operation.

Aspiration of pleural cavity.

Needle should be entered at upper border of rib.

Choose 6th or 7th interspace, just in front of posterior fold of axilla; or 8th or 9th interspace, slightly external to inferior angle of scapula.

EXCISION OF MAMMA.

Two oblique incisions from axilla downwards and inwards, removing elliptical piece of skin.

(Transverse incision is sometimes used.)

Dissect back flaps. Be sure they are viable.

Clear down to muscle.

Arrest hæmorrhage with pressure forceps as operation proceeds.

Glands in axilla or under pectoralis major are removed for malignant disease.

Axillary vein comes early into view, owing to head of humerus pushing it downwards when arm is abducted or pulled up.

Stitch and drain.

Bind arm to side.

HARE LIP.

Single or Double.

In double hare lip, the intermaxillary bone, containing the four upper incisor teeth, projects considerably, and has to be dealt with.

Single.

The operation consists in paring the edges of the cleft.

Separating lip from subjacent jaw by cutting mucous membrane freely, and using handle of scalpel to separate the parts.

Assistant controls hæmorrhage by holding lip in fingers on each side of cleft.

It is important that enough of the edge be cut off to leave good healthy surface.

Stay all bleeding before inserting sutures.

Sutures.—Silk in muc. membrane (to be introduced at first, but tied last).

Horse hair on red border of lip, for sake of delicate co-aptation.

Wire or hare lip needles outside.

Needles should be passed deeply, *nearly* through mucous membrane. (Bell.)

Apply strapping or Hainsby's truss to relieve tension.

Sutures may be removed in three or four days.

Many variations of this operation are performed. In order to avoid the slight notch apt to remain on the free border of the lip, one plan is to remove mucous membrane first from one side of the fissure, and to continue stripping it off round blunt angle of the lip. In paring opposite side of the fissure, as the edge of fine scalpel approaches the lower border of lip, it should be turned obliquely but boldly outwards through the tissues of the lip.

This having been done, a long strip hangs down from the lip, slender at the tip, but connected to the lip by a wide base.

When the edges of the fissure have been brought

together, this slip is bridged across the bottom of the vertical wound, and its raw surface attached by sutures of horse hair.

(E. Owen, in Heath's Dictionary of Surgery.)

Double Hare Lip.

The intermaxillary nodule is freely pared on both sides.

If intermaxillary bone project much, it should be broken off at its base and squeezed back.

Sutures as in single hare lip.

To remove the intermaxillary bone is objectionable, as four teeth are removed with it, and patient gets a nasty undershot appearance.

REPAIR OF CLEFT PALATE.—(*Staphyloraphy.*)

Soft Palate.

Introduce gag (Smith's).

Pare edges of cleft.

Stop all hæmorrhage (by pressure).

Insert sutures (silk, horse hair, or wire).

Method of introducing sutures is to use a long handled needle, introduce a single suture on one side of the cleft and a loop on the other, pass the single suture through the loop, and then withdraw loop and single suture with it.

Tie sutures after all have been passed.

Relieve tension by lateral cuts or by dividing leva-

tores palati with knife having blade bent at right angles (Fergusson).

Hard Palate.

Pare edges.

Scrape mucous membrane and periosteum off lower surfaces of palatal plates.

Make free incisions along near alveoli.

The soft parts on hard palate will then have appearance of two short straps attached at their ends.

Bring edges together and insert sutures.

Not very hopeful, should cleft be of any size.

ROUGE'S OPERATION.—(To remove bodies from nares.)

Evert upper lip and incise mucous membrane freely at its reflection on to gums.

Dissect upwards to nares.

Divide cartilaginous septum of nose from its anterior attachment.

Throw nose and lip upwards and remove polypus, necrosed bone, or, &c.

Replace carefully septum and lip.

No sutures are required.

PART VII.

GENITO-URINARY ORGANS.

LITHOTOMY.

Left lateral—suits right-handed surgeon.

Staff is grooved accordingly.

Preparation.

Empty rectum.

Introduce lotion into bladder.

Tie patient in lithotomy position.

Instruments to be placed within reach of surgeon's hand.

Incision.

From point in median raphé about one inch in front of anus, backwards and outwards into left ischio-rectal fossa. Rather nearer tuber ischii than anus.

Forefinger in rectum to protect it.

Cut through

Skin, superficial fascia, and fat.

Inferior hæmorrhoidal vessels and nerve.

Long scrotal nerves.

Transversus perinei muscle.

Triangular ligament (lower border).

Feel staff in membranous urethra.

Enter knife in groove, cutting urethra and compressor urethræ.

Pass knife on into bladder, cutting prostate.

Few fibres of levator ani (levator prostatae).

Sphincter vesicæ.

Extend incision when withdrawing knife.

If possible, do not injure capsule of prostate.

May increase opening with probe-pointed bistoury.

Insert finger into bladder (cautiously).

If insert finger roughly, urethra may be torn through and whole bladder may be pushed up in front of finger, the finger failing to enter it (Fergusson).

Having felt stone, withdraw staff.

Introduce scoop or forceps.

Gush of water will bring stone into forceps.

After extraction, it may be necessary to tie in a lithotomy tube to drain off urine, but many surgeons now dispense with this, as the wound being conical, with base downwards, ought to drain well without any tube.

MEDIAN LITHOTOMY.

Staff grooved in middle.

Avoid wounding bulb in front and rectum behind.

Cut through

Median raphé (skin and fibrous tissue).

Part of accelerator urinæ.

Membranous part of urethra.

Compressor urethræ muscle.

Prostate gland.

Prostatic portion of urethra.

Sphincter vesicæ.

Customary to cut from behind forwards. Then pass director along groove of staff and into bladder. With-

draw staff and pass finger along above director. This lessens danger of rupturing urethra at membranous portion and pushing bladder in front of finger (Heath).

CYSTOTOMY.—Corresponds to this operation.

BILATERAL LITHOTOMY.

A curved incision with concavity towards anus.

SUPRA-PUBIC LITHOTOMY.

Bladder must be pretty well filled. Patient lies on back. Rectum to be distended with Petersen's bag, pushing bladder upwards and forwards, and throwing point of reflection of peritoneum higher above pubes.

Incision.—Two or three inches long, in middle line.

Skin, fascia, and fat.

Sheath of recti and pyramidales.

Transversalis fascia.

Veins and fat.

Open bladder low down, behind symphysis pubis, first steadying it with a fine double hook.

Drainage.

By tube in wound or per urethram with soft catheter.

Necessary.—(1) For a large stone. (2) When hip is ankylosed. (3) Outlet of pelvis contracted.

LITHOTRITY.

Patient lies on his back.

Pillow under pelvis to tilt it forwards and allow stone to fall into base of bladder.

Two methods of catching stone.

1. Picking it up, bringing it to middle line, then crushing (French).

2. Press one (female) blade downwards and backwards in middle line. Wait till stone falls into it. Then male blade to be pushed and screwed down upon it, enclosing and crushing stone (English).

The fragments of stone must afterwards be passed by urine.

LITHOLAPAXY is now preferred to lithotrity.

The stone is first crushed, then washed out by aspiration (Clover's syringe). Repeating processes of crushing and aspirating till whole stone has been removed.

FOREIGN BODIES IN URETHRA.

Prevent such from passing further back along urethra.

Extract with delicate forceps or by manipulating penis.

External urethrotomy may be necessary.

FOREIGN BODIES IN BLADDER.

Median cystotomy is used.

Lithotrite may be used to extract a soft catheter.

In the female.

Urethra can be dilated under chloroform, first with

bougie, then little finger, going on to index finger and inserting forceps.

Incontinence generally supervenes, but is temporary.

Vaginal Lithotomy.—May be done for large calculus.

EPISPADIAS.—Deficiency of the upper wall of urethra.

HYPOSPADIAS.—Deficiency of the floor of urethra.

(Both congenital.)

Urethro-plasty.—May be attempted so as to form a urethra over the deficiency.

ECTOPIA VESICÆ.

Is extreme degree of epispadias, upper wall of urethra, symphysis pubis and anterior wall of bladder are all deficient, and openings of ureters are visible. Urine dribbles away as it escapes from ureters.

Operation.

Flaps may be brought from abdominal wall or scrotum, forming a pouch which will hold some water.

Shield to protect and hold urine is all that is generally used.

RUPTURE OF URETHRA.

Happens with fracture of pelvis or by fall, and perineum coming in contact with sharp body.

If catheter cannot be passed, aspirate bladder above pubes, and, after some days, a small instrument may be passed along urethra. If still quite impassable, will require perineal section, *q.v.*

Extravasation of Urine.

When urethra is ruptured in front of triangular ligament, urine escapes amongst the cellular tissue.

It cannot pass backwards, because the deep layer of superficial fascia is bound along the base of the triangular ligament.

This same deep layer of superficial fascia is bound to the rami of the ischium and pubes, and to the fascia lata of the thigh, about half an inch below Poupart's ligament. Hence, urine passes up by the sides of the penis, into the loose cellular tissue of scrotum, and on to abdominal wall, but does not pass down the thighs.

This is the same binding down of the deep layer of the superficial fascia which prevents a femoral hernia from passing down the thigh, and directs it upwards along the groin.

Treatment.

Prevent further extravasation by aspirating bladder, and by instructing patient not to attempt to micturate.

Free incisions and charcoal poultices for urine already extravasated.

Puncture of Bladder.

Rectal trocar—not now used.

Aspiration above pubes used instead.

Washing out Bladder.

A very convenient method is to use a soft catheter with T shaped glass tube. One limb of the T is con-

nected by tubing to reservoir of lotion ; the other limb of the T is for outflow tube.

Stop outflow tube, and allow inflow till bladder is full, then stop inflow, and open outflow. Repeat as frequently as desirable.

No air should be allowed to enter bladder.

TREATMENT OF STRICTURE.

(1) Gradual dilatation—passing graduated bougies at intervals of a few days.

(2) Continuous dilatation—tying in an instrument. After a small sized instrument has been tied in for a day or two, a larger size will readily pass—urethra dilates and urine escapes by sides of instrument.

(3.) *Urethrotomy*, { Internal.
External.
“ Holting.”

Internal.

Civiale's Urethrotome.—Cuts from behind forwards. Small knife is introduced shielded.

Best on floor of urethra.

Maisonneuve's.—Cuts from before backwards. A small triangular blade passed along in a grooved guide. The *apex* of the triangular blade is blunt, so as not to injure normal urethra.

“ *Holting*.”—The urethra is forcibly torn by introducing solid metal instrument between blades of a guide previously passed.

After any of these operations, pass full sized bougie, or tie catheter in for a time.

External Urethrotomy.

(For fistulæ in perineo.)

Syme's Operation.

"Shouldered" staff is used, grooved on convexity.

Pass in as far as possible, that is, till "shoulder" is stopped by the stricture.

Cut down upon it, and incise in groove from behind forward.

Shoulder of staff will then be able to pass on into bladder.

May tie in catheter; or,

Pass No. 12 bougie at intervals.

Perineal Section.—(Stricture *quite impassable*.)

Pass instrument down *to* stricture.

Dissect in middle line.

Open urethra half an inch in front of stricture.

Catch edges of urethra with forceps.

Pass fine director, and open up urethra by cutting.

Pass instrument into bladder.

Condition then becomes similar to "Syme's operation" above.

HYDROCELE.

(1) Draw off fluid with trocar and canula.

While canula is in, inject some tincture of iodine (Edinr.).

Shake up scrotum and testicle.

Keep patient in bed for a few days.

May prevent pain by pinching the cord.

(2) Old cases may be drained by free incision, and short tube of large calibre stitched to edges of wound.

HÆMATOCELE.

Generally requires free drainage and washing out.

Apt to suppurate.

CASTRATION.

Prevent cord slipping up,

(1) By assistant's fingers.

(2) Clamp.

(3) Needle passed under it, and figure of 8 elastic ligature over it.

Incision.

From external abdominal ring to lower end of scrotum.

Shell out testicle, and cut it off.

Tie bleeding points in cords one by one.

Heals quicker.

May be tied all in one, but slough then requires to come away.

Stitch up—drain and dress.

VARICOCELE.—Operations as for varicose veins of leg, which see.

CIRCUMCISION.

Restrain hæmorrhage by elastic band round root of penis.

Pull prepuce forward and apply forceps across it.

Cut off piece level with corona glandis, and pull back skin.

Mucous membrane will adhere.

Pass probe under it and slit it up.

Cut off mucous membrane close to corona. Secure bleeding points.

Stitch remains of mucous membrane to edge of skin. Dress and bandage, applying gentle pressure.

AMPUTATION OF PENIS.

Check hæmorrhage with tape or clamp.

Corpus spongiosum to be left longer than corpora cavernosa.

Skin should be cut short.

Edges of corpora cavernosa may be pulled together by stitch to mitigate hæmorrhage.

Split up urethra and stitch edges to adjoining skin.

There is great danger of contraction of meatus.

In malignant disease, corpora cavernosa may be completely removed from rami of ischium. Corpus spongiosum is then drawn down through hole in perineum, making micturition like that of female.

In such cases it is better to remove also the testicles.
(Gould.)

PART VIII.

OPERATIONS ON THE EYE.

EPIPHORA.

Pass a fine grooved director vertically into punctum lachrymale.

Bring it horizontal, and pass it along canaliculus.

Slit up canaliculus in its whole length.

Pass probe (Bowman's) into lachrymal sac, then turn it vertically downwards into nasal duct.

Gradual dilatation of nasal duct may be practised, the probe passing into *inferior* meatus of nose.

EXCISION OF EYEBALL. *Enucleation.*

The object is to leave muscles to form stump for an artificial eye.

Introduce speculum to keep eyelids opened fully.

Cut through conjunctiva all round margin of cornea, using scissors and dissecting forceps.

Seize tendons, one by one, with small blunt hook and divide them with scissors.

Push eyeball towards nose.

Pass curved scissors behind, and divide optic nerve close to sclerotic.

Apply pad or sponge to stay bleeding.

In cases of malignant disease, the whole contents of orbit, fat, muscles, &c., may be cleared out, restraining hæmorrhage by pressure.

STRABISMUS.

To cut tendon of *internal rectus*.

Introduce speculum, to keep eye well opened.

With forceps, pick up conjunctiva immediately below level of internal rectus.

Divide conjunctiva with scissors.

Also subconjunctival tissue, till sclerotic is clearly seen.

Pass strabismus hook and bring it forward, catching tendon of internal rectus as hook comes forward.

Divide tendon with scissors (near to sclerotic).

May stitch up conjunctiva.

Apply cold compresses for a day or two.

EXTRACTION OF LENS.

Introduce speculum.

Seize conjunctiva with dissecting forceps to hold eyeball steady, and pull it downwards.

Enter narrow knife at outer border of cornea, at level of junction of its upper and middle thirds.

Knife is pushed through anterior chamber till it emerges on inner border of cornea.

Cut upwards (making corneal flap), till knife comes through close to superior margin of cornea.

Introduce iris forceps.

Seize iris, pull piece of it out by wound and snip it off.

Introduce "pricker" to scratch through anterior part of capsule of lens.

Lens is then carefully edged out by pressure of curette below and forefinger on superior aspect of globe.

After treatment.

Apply cold compresses for a time.

Eserine may be useful to lessen risk of prolapse of iris.

IRIDECTOMY.

Corresponds exactly to first part of above operation, except that triangular bladed knife is preferred, and the cornea is cut rather higher.

Wound in cornea does not require to be so large.

Iris is seized with forceps, pulled up, and portion removed with delicate scissors.

PART IX.
IN THE FEMALE.

PLUGGING THE VAGINA.

Introduce Fergusson's speculum.

Pieces of lint are then to be stuffed in firmly and in large quantity.

FOREIGN BODIES IN BLADDER.

Dilate urethra in manner described at page 108 ; or,
Perform vaginal cystotomy.

IMPERFORATE HYMEN.

Slit up freely with bistoury ; or,

Use thermo-cautery. The latter is said to lessen risk of septic absorption.

REPAIR OF PERINEUM.

Incisions are made along margins of mucous membrane of vagina, separating two V shaped flaps, one flap being on each side of the rent in the vaginal mucous membrane.

Apex of V points backwards.

These flaps are carried inwards and stitched together in the middle line, the stitches being tied in the vagina.

Vaginal mucous membrane is thus completed.

Deep sutures, and also superficial, are then inserted into and across perineum, pulling raw surfaces together.

Should sphincter ani be destroyed, it will be necessary to form a lining of mucous membrane for rectum, with the ends of the stitches tied in the rectum.

See Hart & Barbour, p. 527, 3rd edition, for a useful diagram.

FISTULÆ.

Vesico-vaginal, }
Urethro-vaginal, } are common.

Vesico-uterine, very rare.

Fistulæ also occur from *ureters*.

Operation.

For *vesico-vaginal or urethro vaginal*.

Use Sims' speculum.

Genu-pectoral position suits best.

Pare edges.

Pass sutures of wire with Startin's tubular needle, or using a long needle holder.

Restrain hæmorrhage.

Twist sutures.

Bozeman's fork is used to bring through sutures and prevent them cutting or tearing vaginal mucous membrane.

After operation, draw off urine regularly.

SHORTENING ROUND LIGAMENTS (Adams and Alexander) FOR RETROVERSION OR PROLAPSE OF UTERUS.

Incision over external abdominal ring of each side.

Dissect down till find ends of round ligaments.

Having found both, pull them out so as to pull fundus of uterus upwards and forwards into normal position.

Bundle up the extruded portions of ligament and place them in the respective wounds, stitching them in position so that adhesions may form and the round ligaments be practically shortened.

OVARIOTOMY.

In these great operations which necessitate opening the abdominal cavity, the preparation of the patient, also the after treatment and nursing, are of great importance in order to ensure success. The following, however, are some of the chief points of the operation itself.

Incision.

Is usually in middle line, but may be over tumour on either side. It ought to be as small as possible. Hæmorrhage is arrested, and peritoneum opened carefully to same extent as incision.

Cyst contents.—Are evacuated by using a special trocar and canula. Cyst is drawn well forward, and none of contents allowed to enter peritoneum. Collapsed cyst is then drawn out of wound, and adhesions have to be carefully separated, and all hæmorrhage stopped.

Before cutting away the cyst it is necessary to secure its "pedicle" by means of either clamp, cautery, or ligature. The pedicle of an ovarian tumour usually

consists of the Fallopian tube, the broad ligament, the ovarian ligament, and the infundibulo-pelvic ligament.

Supposing cyst to be cut away, the raw bleeding surface of its "pedicle" will remain, and many different methods of treatment have been recommended for it.

The student should reflect that the raw bleeding pedicle cannot be dressed and drained like the stump of a limb, for the operator seeks to drop this pedicle back into the peritoneal cavity and to close at once the abdominal wound.

The pedicle may, however, in some cases, be brought up outside the abdominal wound, and secured there with a clamp.

This method is, however, now generally abandoned, for the pedicle may be too short to be treated thus, and, even if long enough at first, it afterwards becomes too short and drags on the wound, especially should abdomen become distended with flatus.

Most operators now drop the pedicle into abdominal cavity, having first tied it securely or seared it with the actual cautery.

Abdominal wound.

Should be carefully closed with sutures passing through *entire thickness* of wall.

CÆSAREAN SECTION.

Bladder and rectum emptied.

Incision in linea alba, about five inches long.

Bring uterus forward.

Incision in it to be made carefully and allowing no blood to enter peritoneal cavity.

Extract child and also placenta.

May pass fenestrated drainage tube through internal os and cervix down into vagina.

Stitch up uterus.

Also abdominal wall as in ovariectomy.

PORRO'S OPERATION.

This is Cæsarean section, plus removal of uterus just above internal os, also ovaries and tubes.

Pedicle may be treated by clamp.

LAPARO-ELYTROTOMY.

This operation is a substitute for Cæsarean section.

Long incision is made nearly parallel to Poupart's ligament.

Dissect through abdominal wall.

Throw up peritoneum without opening it.

Assistant puts hand in vagina and pushes uterus upwards.

Vagina is opened at its junction with uterus.

The opening is enlarged downwards, and child delivered through abdominal wall.

REMOVAL OF UTERINE APPENDAGES.—(*Lawson Tait.*)

Only a small incision is used.

Identify fundus of uterus and trace tubes to ovaries.

Separate adhesions.

Restrain hæmorrhage.

Tie pedicle and drop it back into peritoneal cavity.

Long glass drainage tube is occasionally used to drain abdominal cavity.

Sucker is employed by nurse to empty tube every few hours.

UTERINE POLYPI.

In operating for removal of these, the cervix uteri must first be dilated, either by sponge tents, tangled or tupelo tents ; or, by fingers of the operator, the patient being deeply anæsthetised.

Tumour is removed by scissors, snare, or écraseur.

AMPUTATION OF CERVIX.

Cervix uteri, if hypertrophied, may be amputated.

1. By écraseur.
2. By galvano-cautery ; or,
3. Hæmorrhage may be restrained by india-rubber ring passed on to cervix, and placed as high as possible.

Wedge shaped portions are then cut out (base of wedge being downwards) and mucous membrane of vagina is stitched to mucous lining of cervical canal. (Hart and Barbour, p. 251, *et. seq.*)

PART X.

BANDAGING.

The student ought to have a clinical acquaintance with the various forms of splints, dressings, &c., and he may practise with advantage the application of the following :—

SLINGS.

Fig. 1. *Large Sling*.—Supporting elbow, arm, and hand.

Fig. 2. *Smaller Sling*.—Supporting hand and wrist only.

In applying the large sling, the anterior layer of it should be made to pass to the shoulder of the injured side. With the small sling, it is more convenient to pass the anterior layer to the shoulder of the sound side.

BANDAGES.

Upper extremity.

Fig. 3. Spica of shoulder.

Figure of 8 over elbow (see knee).

Fig. 4. Reversing spiral for hand and forearm.

Fig. 5. Spica of thumb.

Fig. 6. Finger bandage.

Lower extremity.

Fig. 7. Single spica of groin.

Fig. 8. Double spica of groin.

- Figs. 9 and 10. St Andrew's **X** for perineum.
Figs. 11 and 12. Figure of 8 for knee.
Fig. 13. Divergent spica of knee.
Figs. 14 and 15. Reversing spiral for foot and leg.

Head.

- Figs. 16 and 17. Capelline.
Fig. 18. Stellate.
Fig. 19. For fracture of lower jaw.



FIG. 1



FIG. 2

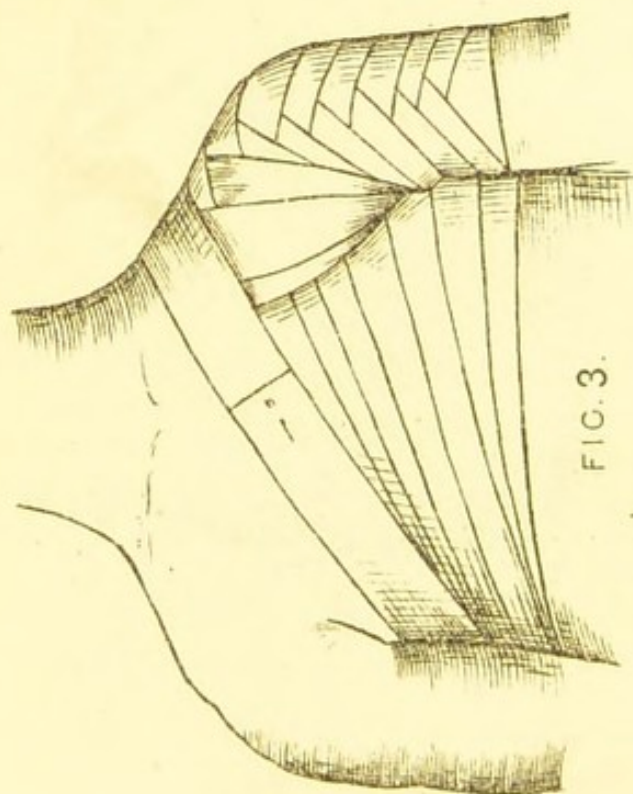


FIG. 3.

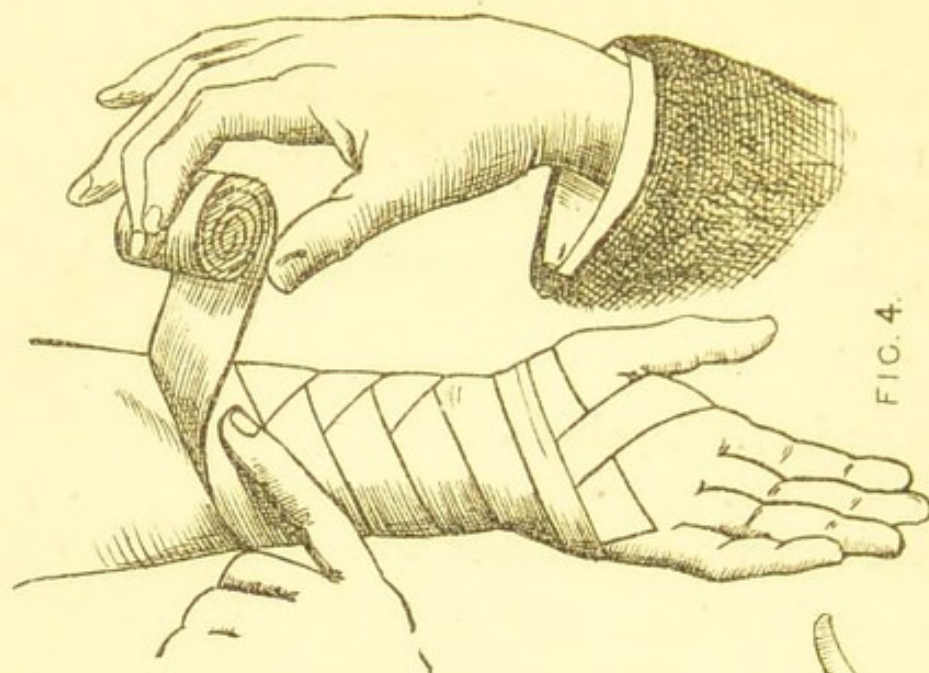


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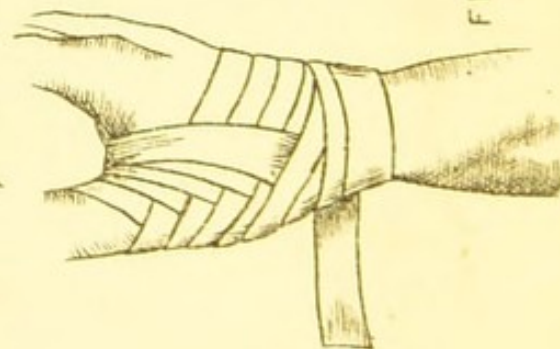


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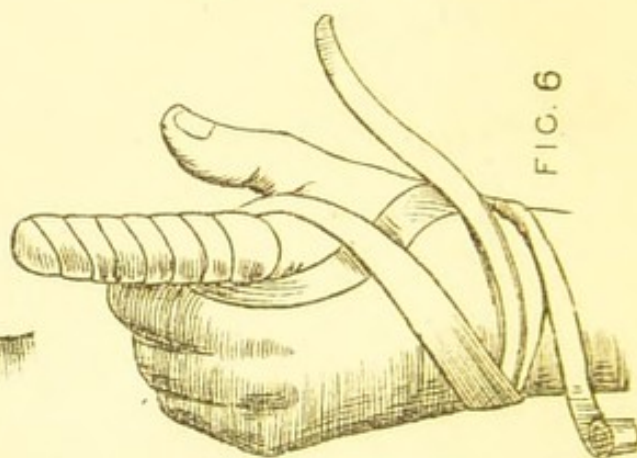


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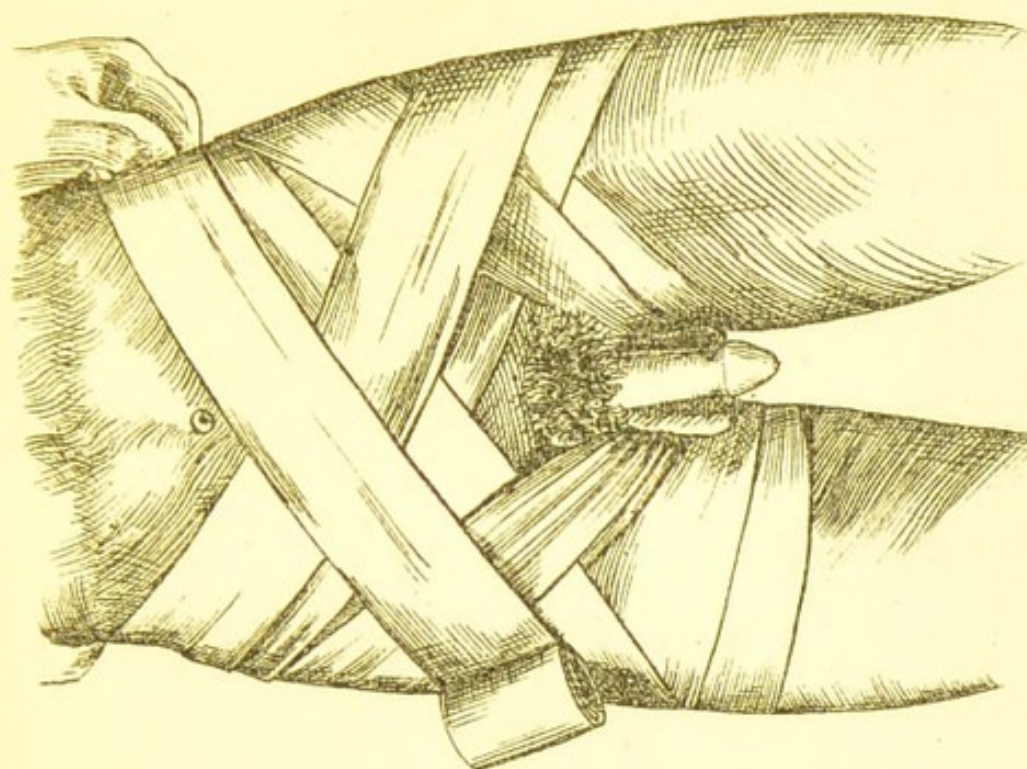


FIG. 8

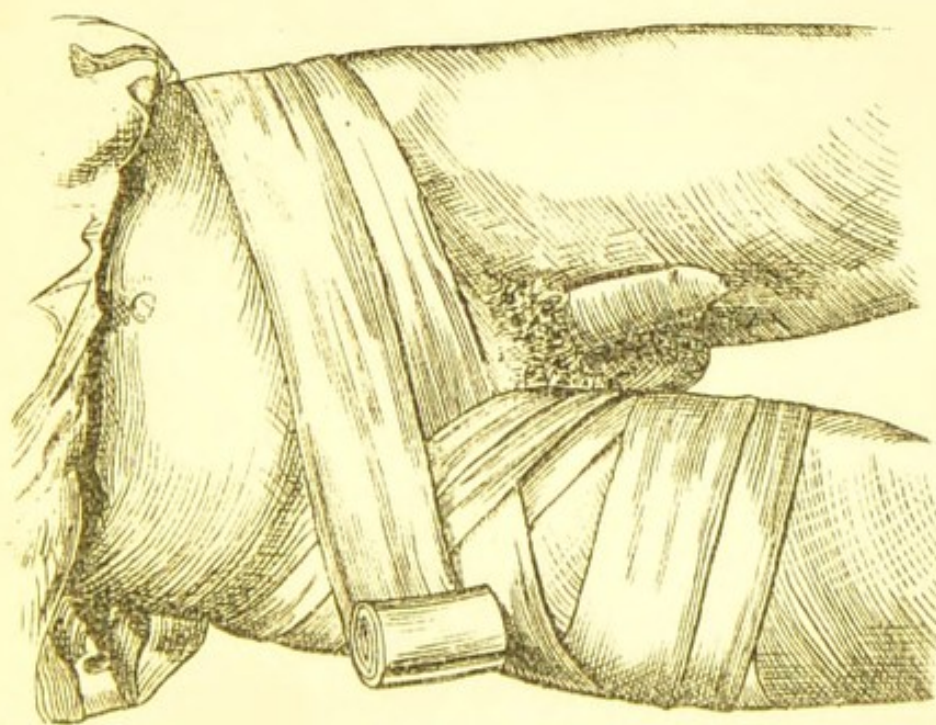


FIG. 7

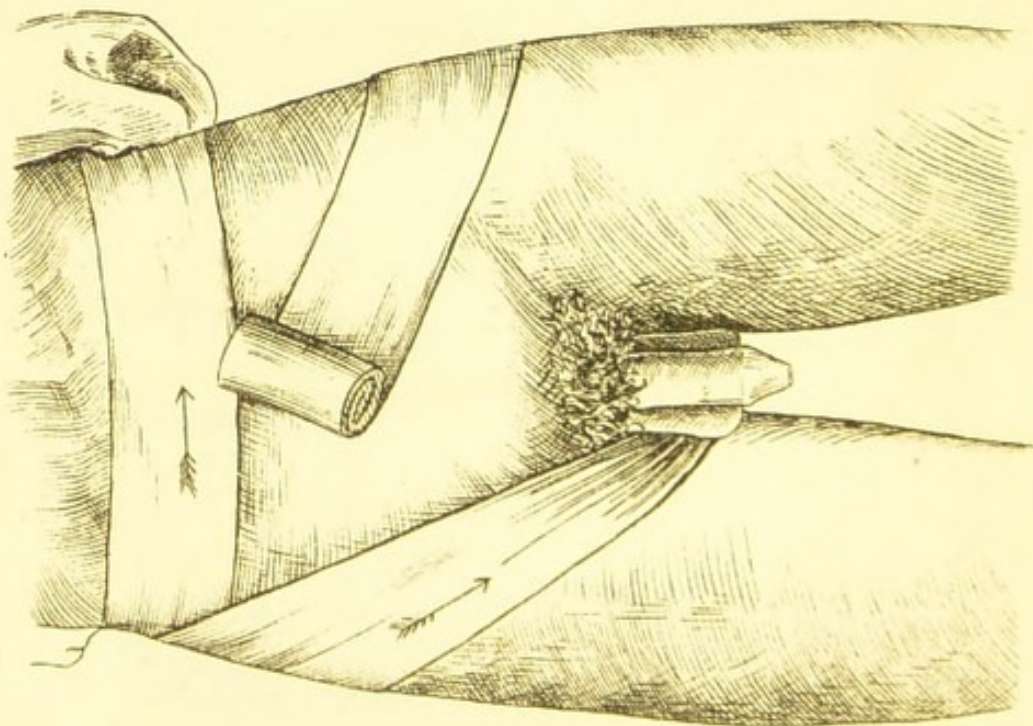


FIG. 9

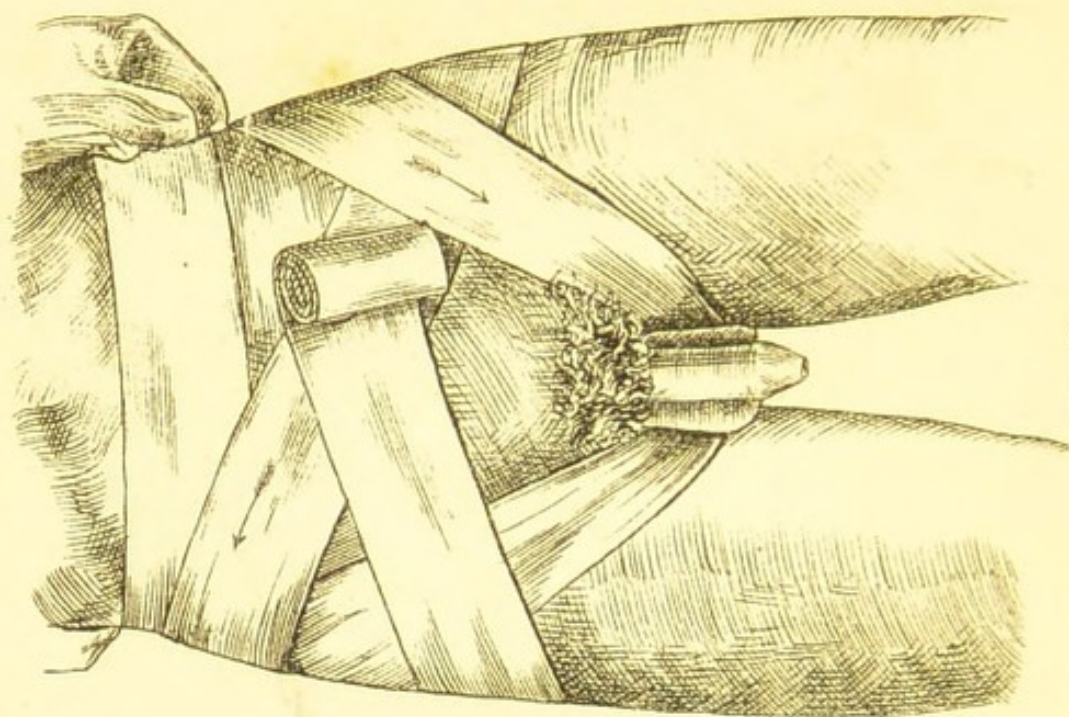
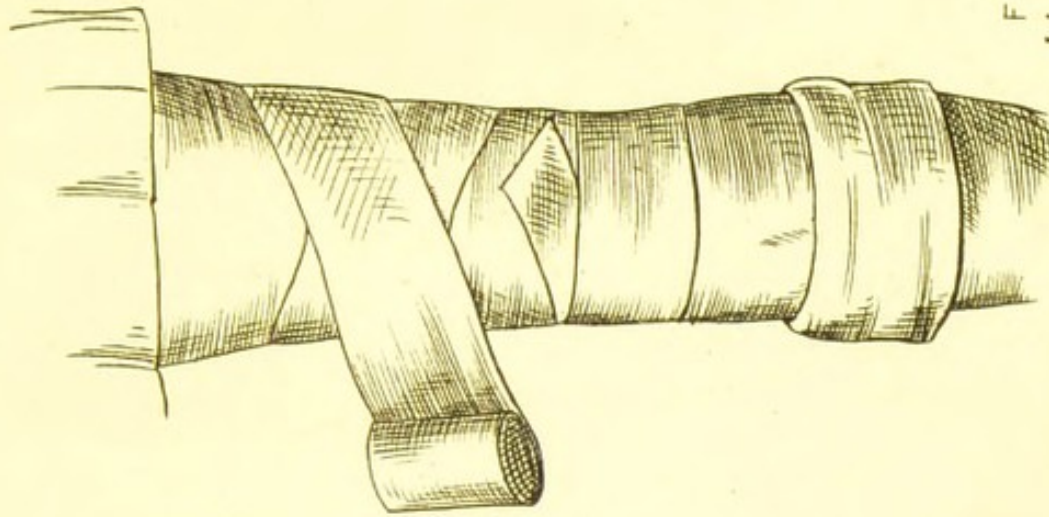
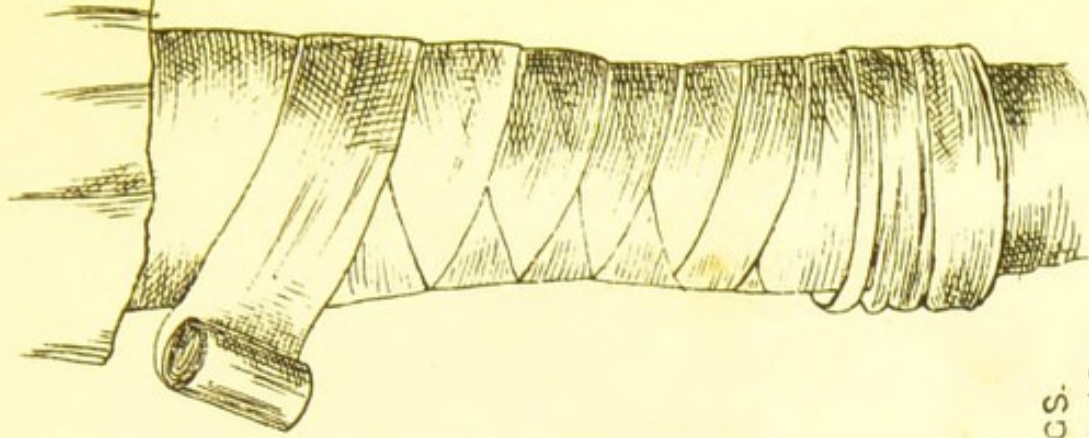


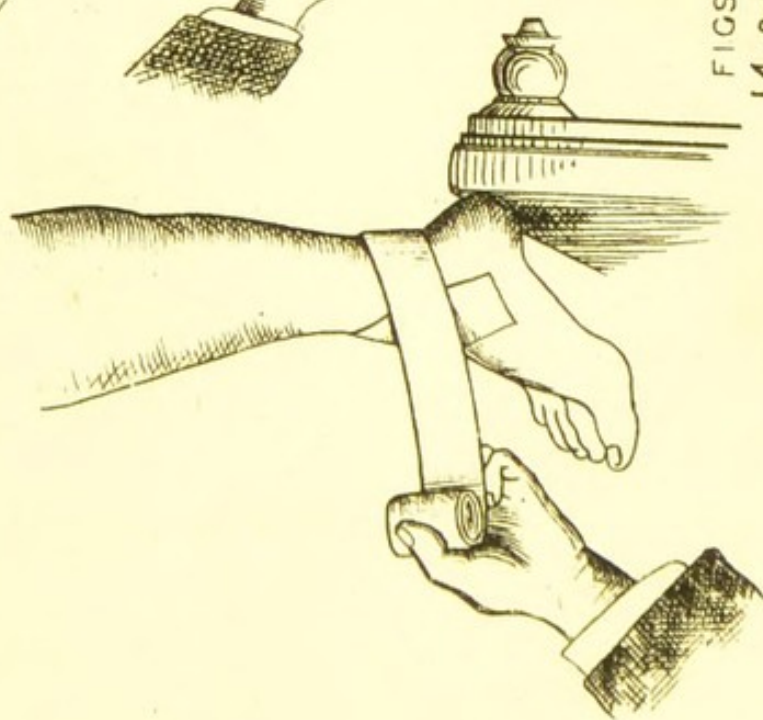
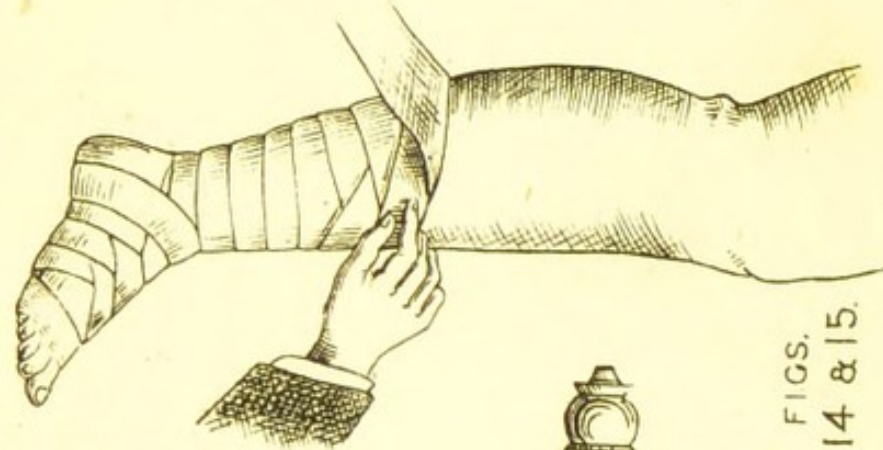
FIG. 10



FIGS.
11 & 12.



FIG. 13.



FIGS.
14 & 15.

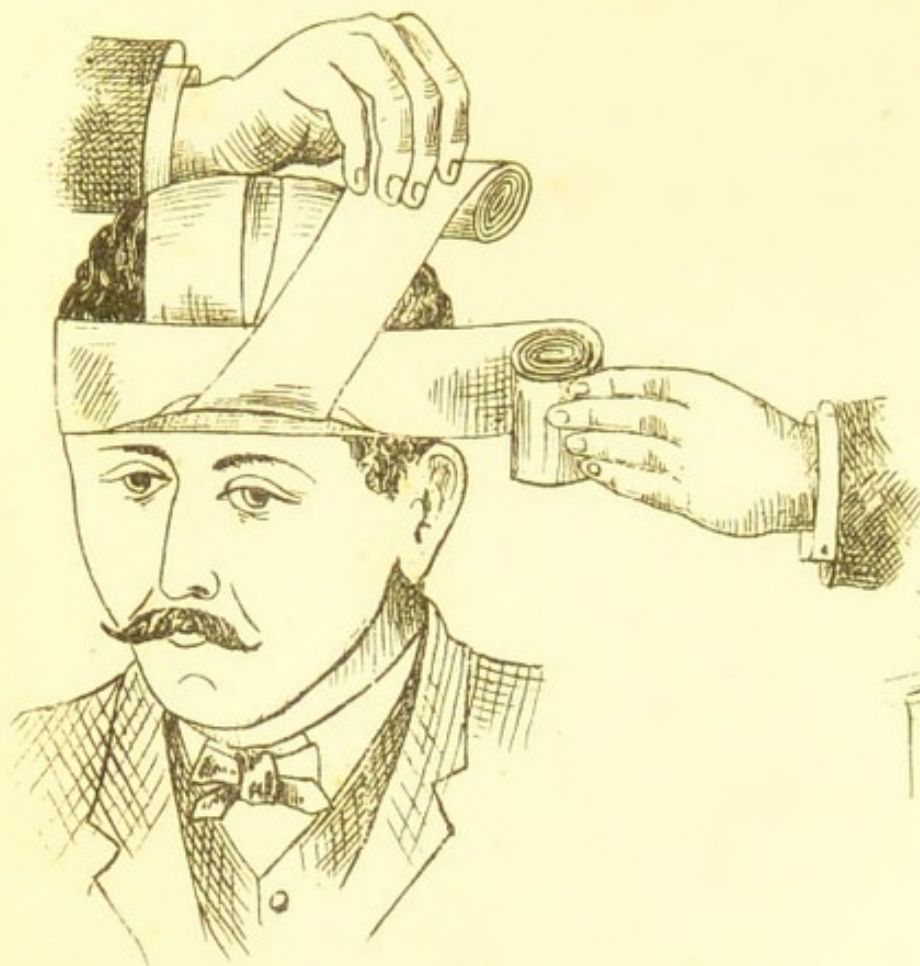


FIG. 16



FIG. 17



FIG. 18



FIG. 19

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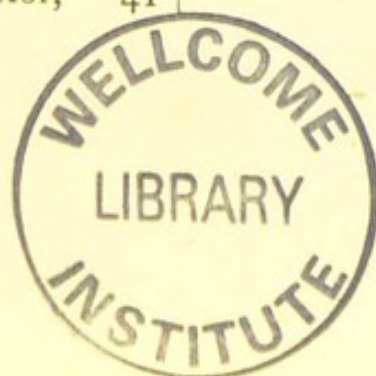
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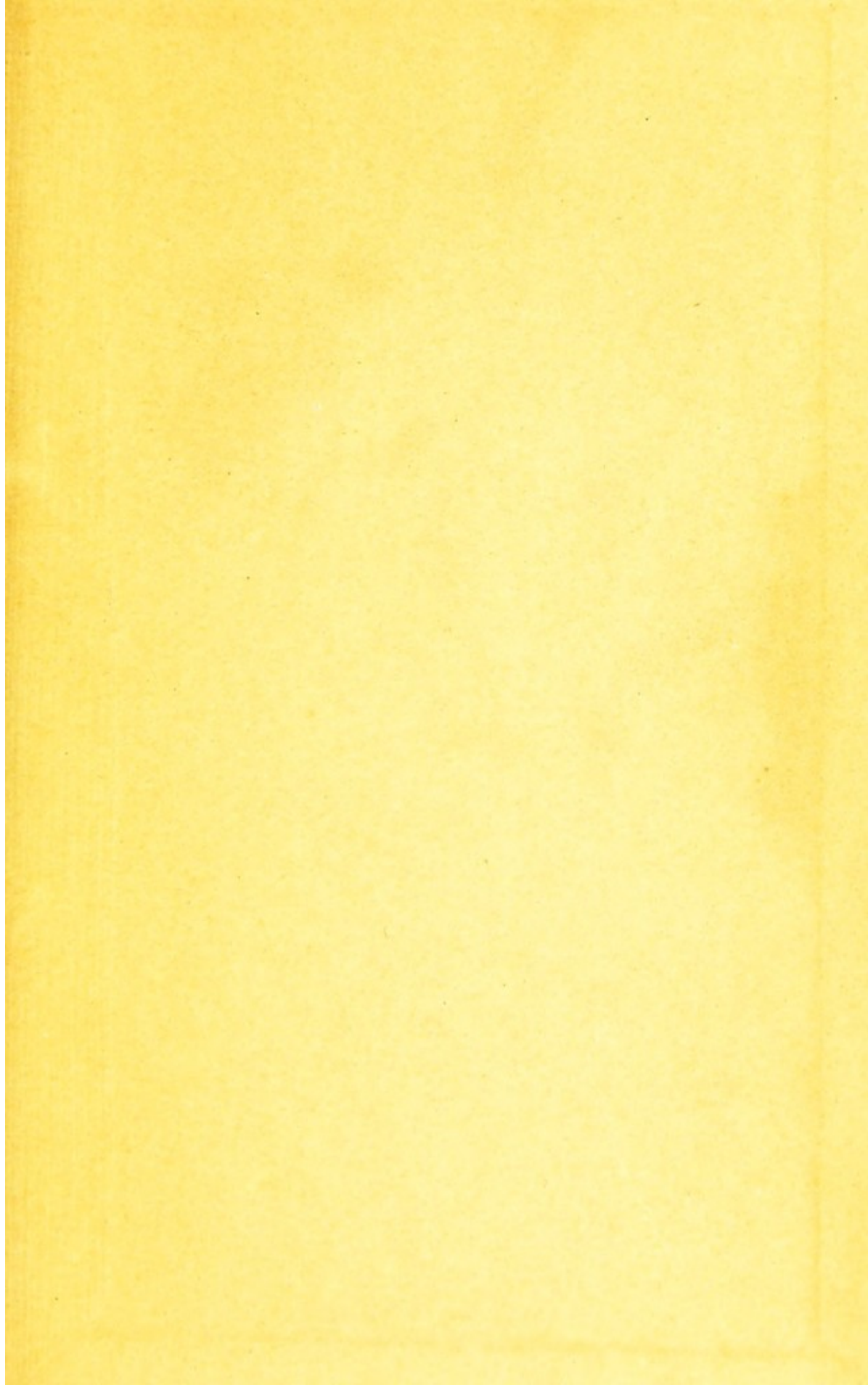
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