Diseases of women : a textbook for students and practitioners / by J.C. Webster.

Contributors

Webster, John Clarence, 1863-1950.

Publication/Creation

Edinburgh ; New York : Young J. Pentland, 1898.

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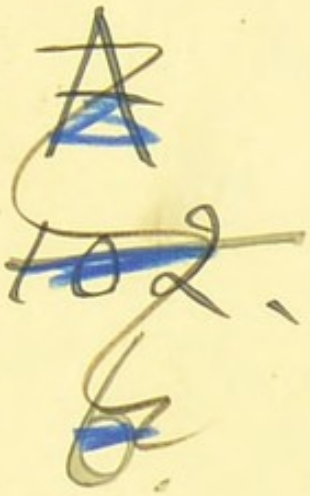

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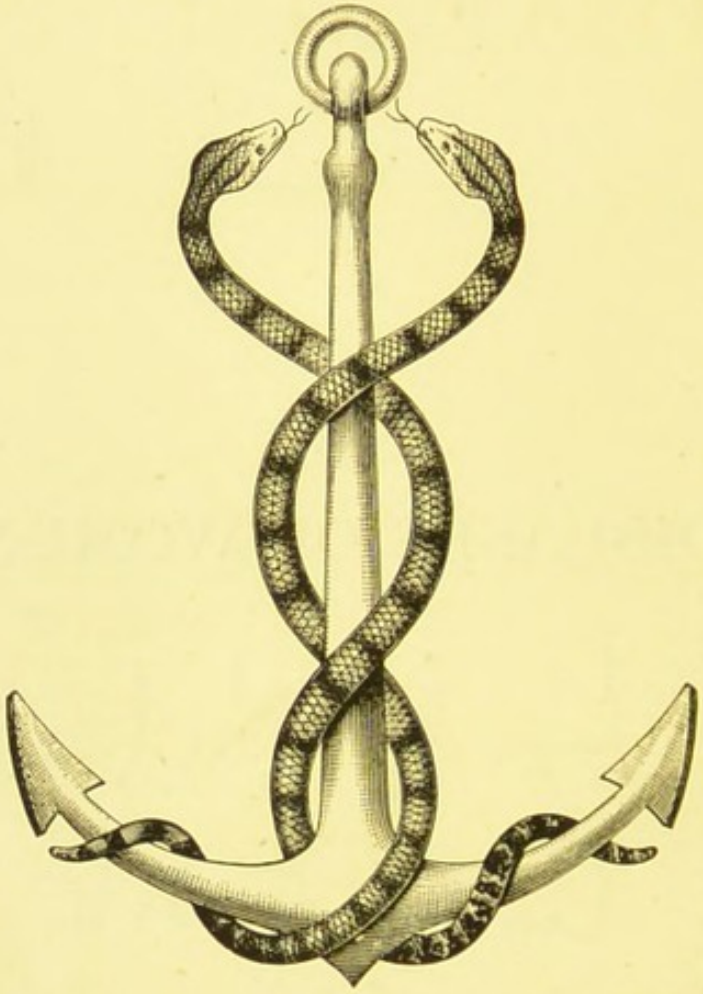

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DISEASES

OF

WOMEN

A TEXT-BOOK FOR STUDENTS AND PRACTITIONERS

BY

J. C. WEBSTER, B.A., M.D. (EDIN.), F.R.C.P. ED.

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ILLUSTRATED WITH 241 FIGURES

EDINBURGH & LONDON

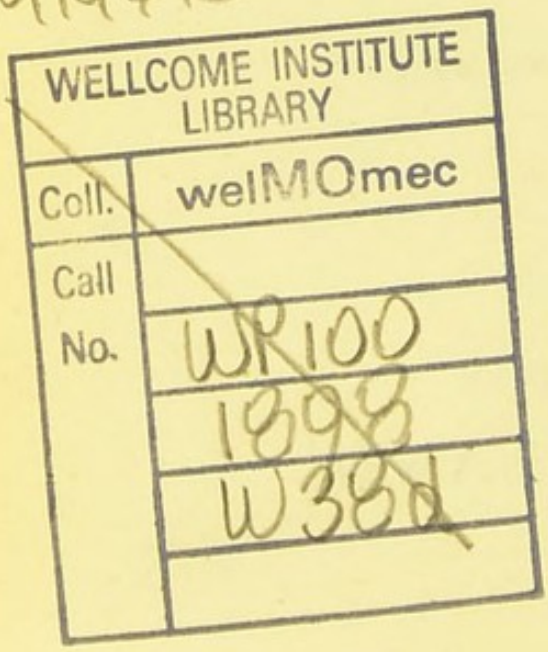
YOUNG J. PENTLAND

1898

7633033

EDINBURGH: PRINTED FOR YOUNG J. PENTLAND, 11 TEVIOT PLACE, AND
38 WEST SMITHFIELD, LONDON, E.C., BY MORRISON AND GIBB LIMITED.

M19715



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TO

WILLIAM GARDNER, M.D.

PROFESSOR OF GYNECOLOGY IN M'GILL UNIVERSITY

THIS BOOK IS DEDICATED

IN RECOGNITION OF HIS SPLENDID WORK IN

OPERATIVE GYNECOLOGY

AND AS A MARK OF SINCERE RESPECT

BY HIS COLLEAGUE

THE AUTHOR

PREFACE.

In preparing this volume I have endeavoured to keep constantly before me the following aims, namely:—

1. To give prominence to the scientific basis of each subject under consideration. For this purpose I have given the most careful attention to modern researches in sectional and dissectional anatomy, histology, embryology, comparative anatomy, pathology, and bacteriology, in so far as they bear on diseases of women, and have included the chief facts gathered by myself in original investigations carried on during the past nine years:

2. To study clinical features in their widest relationships, endeavouring to give to them their proper proportional values, and avoiding the faults of the school whose motto is Michelet's dogma, *Le bassin c'est la femme*, and whose work has led to the opprobrious denunciation, prevalent in so many quarters, of gynecological practice as a narrow and debased specialism:

3. To insist upon caution in the adoption of therapeutic measures not yet thoroughly tested, especially of many of those which, in these latter days, have been hurriedly and recklessly forced into publicity.

The illustrations have been chosen with special reference to their teaching value, and have, for the most part, been made from original drawings by myself.

J. C. WEBSTER.

M'Gill University, Montreal,
January 1898.

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DISEASES OF WOMEN.

THE MIDWIVES' INSTITUTE
-AND-
TRAINED NURSES' CLUB,
12, BUCKINGHAM ST. W.C.

DISEASES OF WOMEN.

CHAPTER I.

THE OVARIES.

THE ovaries, two in number, lie in the pelvis, one behind each broad ligament.

Form and size.—Each is a somewhat flattened body, with the following measurements :—

Length	.	.	1 to 2 in. (2.5 to 5 cm.).
Breadth	.	.	$\frac{5}{8}$,, $1\frac{1}{8}$,, (1.5 ,, 3 cm.).
Thickness	.	.	$\frac{1}{4}$,, $\frac{3}{8}$,, (0.6 ,, 1.3 cm.).

It is thus evident that the size varies considerably. The right ovary is usually larger than the left.

In describing the organ one can recognise two surfaces, a free border, an attached border, and two extremities.

One surface looks upwards and inwards, the other downwards and outwards. The free border is rounded, convex, and looks backwards and inwards. The border attached to the broad ligament is straight. The upper and outer or tubal extremity is directed towards the pavilion of the tube, the lower and inner or uterine extremity pointing towards the uterus.

Attachments.—The ovary is kept in place by the following structures :—

1. *The broad ligament.*—The posterior layer of this

ligament, to which the border of the ovary is attached, is generally somewhat raised as a kind of fold, and by some is called the mesovarium.

2. *The suspensory ligament.*—This is merely the upper free border of the outer part of the broad ligament—the infundibulo-pelvic portion, which runs from the ovary upwards, outwards, and backwards to the psoas muscle. It is made up of connective tissue and a few smooth muscular fibres. The ovarian vessels run in it.

3. *The ovarian ligament.*—This is a band in the posterior layer of the broad ligament, which extends from the uterine end of the ovary to the upper part of the uterus, where it is attached between the round ligament and Fallopian tube. It is about $1\frac{1}{5}$ in. (3 cm.) in length.

4. *The ovarian fimbria.*—One of the larger fimbriæ of the lower portion of the pavilion of the tube extends downwards and inwards along the broad ligament towards the tubal end of the ovary. In some cases it is directly attached to the latter, but in other cases it is not.

Position and relations.—The organ is attached to the upper part of the posterior layer of the broad ligament a short distance below the Fallopian tube. It is situated at the level of the brim, and near the lateral wall of the pelvis. From the tubal extremity the long axis runs downwards and inwards, crossing the plane of the pelvic inlet obliquely. The ovaries may not have the same relative positions on both sides, on account of variations in the position of the uterus. Thus, when that organ is nearer one side of the pelvis, the long axis of the ovary of that side crosses the pelvic brim more vertically than does that of the other ovary. The ovaries have a range of movement, varying according to the mobility of their ligaments. They are also affected in position by movements of the uterus, by varying degrees of distension of bladder, small intestine, cæcum, and rectum.

Naked-eye appearance.—The outer surface is pale, and with a lustre somewhat resembling that of a mucous

surface, and has not the smooth glistening aspect of a surface covered with peritoneum. It presents various rounded projections of varied sizes,—caused by the underlying Graafian follicles in different stages of development,—the largest of which may measure from $\frac{3}{8}$ to $\frac{7}{8}$ in. (1 to 2 cm.) in diameter. Furrows of different shapes and sizes are seen on the surface, and also puckered scars, due to the rupture of old Graafian follicles.

The ovary feels something like the testicle, but it is not so firm, being richer in lymphatics. When a section is made into it, clear fluid escapes. (This must not be described as an œdema.)

At the junction of the ovary and broad ligament a slightly raised white line of tissue is seen—"the white line of Farre" (or of Waldeyer). It marks the junction of the peritoneum and the germ epithelium covering the ovary.

Microscopic structure.—The surface of the ovary, as far as the white line, is covered with low cubical epithelium. The nearer the period of puberty the higher are the cells of this layer. In advanced years they become considerably flattened, and tend to disappear.

The substance of the ovary is made up of two portions :—

I. Cortical or Parenchymatous Zone.

This consists of a dense network of connective tissue, in the midst of which Graafian follicles of various degrees of development are found. It is more compactly arranged in the outer part. Elastic fibres are also found. According to Nagel there are no smooth muscular fibres in it.

In this layer are found three varieties of Graafian follicle, namely, primary, growing, and ripe.

The primary follicles are too small to be seen with the naked eye. In the adult they are found near the surface as an irregular double row, the individual follicles being considerably separated from one another. Each

consists of a covering of low epithelial cells, derived from the original germ epithelium, which surrounds the primordial ovum. The latter is a rounded cell with a single nucleus; very rarely with two nuclei. Nagel measured the ovaries fresh in salt solution, and found their diameters to vary from 48 by 54 μ to 64 by 69 μ.

The nucleus (germinal vesicle), situated in the centre of the ovum, measured from 29 to 32 μ; Trinchese and others have described around it a membrane with a double outline. There is a nucleolus (germinal spot) centrally or peripherally placed, as well as one or more paranucleoli.

The growing follicle.—These are found in the lower portion of the cortical layer. The first sign of growth in the primary follicle is that the epithelial cells surrounding the ovum increase in size and number, forming a mass of several layers—*stratum granulosum.* In this vacuolation occurs, in which gradually accumulates the liquor folliculi, formed partly by transudation from the surrounding tissues, partly by breaking down of cells of the stratum granulosum. Those cells which do not break down remain as a kind of stalk (*discus proligerus*, *cumulus oophorus*), in which the ovum is embedded.

While these changes are taking place in the stratum granulosum the surrounding connective tissue elements are being arranged concentrically, to form an outer covering of the follicle—the *theca folliculi.* This consists of two portions, the tunica externa or fibrosa and the tunica interna or propria. The latter is more cellular than the former, and is rich in capillaries. Between the theca and the stratum granulosum is a thin structureless membrane, produced by the epithelial cells, according to Waldeyer.

About the time of the appearance of this so-called basement membrane the thin structureless *zona pellucida* is formed around the ovum from the epithelial cells. According to Nagel a very thin space, the perivitelline space, exists between it and the ovum. Next appears in the

centre of the protoplasm of the ovum the yolk particles (deutoplasma). As it increases, the germinal vesicle is pushed more towards the periphery. The vesicle is never found surrounded by the yolk particles, and when the ovum is nearly filled with these particles there still remains a thin covering of unaltered protoplasm around the vesicle.

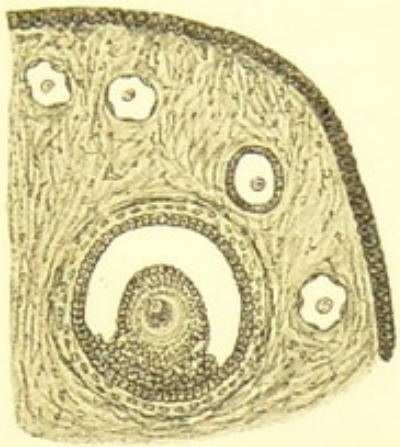

FIG. 1.—Section through ovary of a young woman. Several primary follicles and a nearly ripe one are shown.

The ripe follicle.—This is a more or less rounded structure, in which the following parts can be distinguished :—

1. **The ovum.**—(Sometimes two or more ova are seen.)

This is made up of the following :—

Clear protoplasm.—This is found as a peripheral layer, and as a thin layer surrounding the germinal vesicle.

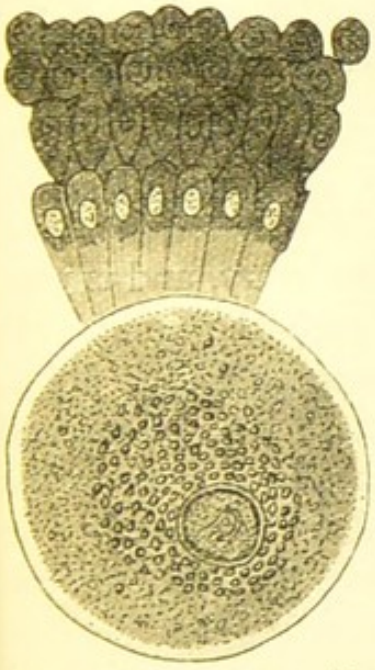

FIG.— 2. Ripe ovum, with a few of the surrounding epithelial cells.

Yolk protoplasm.—This fills the greater part of the ovum, and is made up of coarse and fine particles with strong refractile powers.

Germinal vesicle (*nucleus*).—This body is rounded, its border having a double contour.

Germinal spot (*nucleolus*).—This has a somewhat yellowish appearance, and is capable of amœboid movements. After death it breaks up into several parts.

Paranucleolus.—One or more can be seen. They appear to be thickenings in the protoplasmic reticulum of the nucleus.

2. **The perivitelline space.**
3. **Zona pellucida.**—This has a radial striation.

4. **The epithelial cells surrounding the zona pellucida.**—There are several layers of these, the inner two or three having their long axes arranged radially to the ovum. The inner row in particular has a longitudinally striated appearance; called by Bischoff the *corona radiata*. These striations appear to be continuous with those of the zona pellucida.

The outer cells are more rounded. They possess a finely granular protoplasm. The stalk of the discus proligerus is composed of cells very like those in the stratum granulosum.

5. **Stratum granulosum.**—This consists of two or more layers of low cylindrical cells, forming the inner wall of the follicle.

6. **Liquor folliculi.**—This is a clear, slightly yellow, glairy fluid, rich in par-albumin.

7. **Theca folliculi.**—The inner layer is made up of more numerous cells than at an earlier period. As the follicle approaches ripeness, there appear in these cells shining yellow particles. These are known, after the escape of the ovum, as the lutein cells of the corpus luteum.

II. Medullary or Vascular Layer.

This forms the central portion of the ovary, and is continuous with the broad ligament through the hilus. It consists of a connective tissue stroma, smooth muscle fibres, and is very rich in blood vessels. There is a well-marked plexus of arteries and veins in the hilus. Lymphatics exist and form networks around the Graafian follicles. The nerves seem to end largely in the vessel walls, but special plexuses are found around the follicles, from which delicate branches penetrate as far as the stratum granulosum.

Development.—The ovary is developed from epiblast and mesoblast on the inner surface of the Wolffian body. The epiblast, a specialised portion of the cœlomic lining, very early forms a mass consisting of several layers of cells, the germinal epithelium. In the

deepest portions certain of these cells increase in size and give rise to the primordial ova.

As this layer increases in thickness, processes of the underlying mesoblast of the Wolffian body extend outwards among the germinal cells, forming a network-like stroma, in the meshes of which lie primordial ova, surrounded by germ cells.

The manner in which the Graafian follicles develop I have already described. As the ovary grows, it becomes raised from the surface until it is attached only by a narrow hilus.

The surface remains covered with germinal cells. Extending inwards from this layer may be seen, occasionally, columns of similar cells, which have not been cut off by the stroma.

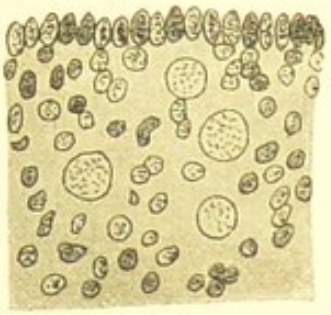

FIG. 3. — Section through developing ovary. The germinal epithelium and primordial ova are shown.

In fœtal life, and in the first period after birth, the majority of primordial ova and primary follicles disappear. Throughout sexual life this diminution continues, the stroma becoming more prominent as age advances. The development of the primary into the Graafian follicles begins before puberty, as a rule, though it may take place in fœtal life or in childhood. These early ripened ova have the same appearances as those found in the adult, but they never reach more than half the size.

The opening of the ripe follicle is a process which occurs independent of menstruation. It is now believed not to be due to increase of intrafollicular pressure, but to a great increase in the thickness of the inner layer of the theca folliculi, owing to the swelling of its cells with yellow particles (lutein cells), and to its becoming arranged in a wavy manner (Nagel). Into the portions which project inwards many vessels extend. Owing to this pressure from without, the contents of the follicle are forced in the direction of least resistance, namely, outwards, thus breaking the thin projecting covering of the follicle known as the stigma.

Pari passu with the development of the lutein cells, there is a fatty degeneration in the cells of the stratum granulosum, and in those of the discus proligerus. This enables the ovum to break loose from its covering cells.

Formation of corpus luteum.—After the ovum escapes, the follicle, containing degenerating epithelial cells, is filled with a blood effusion. The opening of the follicle closes, and the wavy yellow band of lutein cells presses further inwards. The blood gradually becomes absorbed, so that the space in the centre of the follicle is almost entirely

obliterated, being occupied by the yellow band. Then the lutein cells begin to disappear, so that the yellow colour is gradually lost, and in place of the yellow body is found a clear colloid mass, the corpus albicans, in the centre of which a few blood crystals may be found. This gradually diminishes in size.

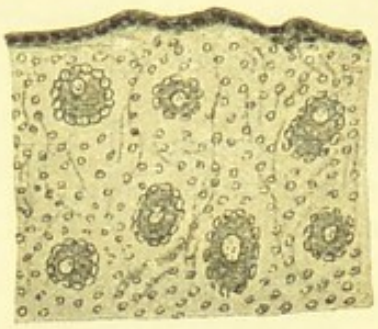

FIG. 4. — Section through developing ovary. The primary follicles are shown.

The terms "true corpus luteum" and "false corpus luteum" should be abandoned. The former is applied to the condition found when pregnancy occurs, the latter referring to that found in the non-pregnant state. There is no difference between them save as regards duration.

When pregnancy follows on ovulation, the corpus luteum takes several months to become reduced. When pregnancy does not occur, this happens in a few weeks.

According to Nagel, the corpus luteum acts as a kind of splint, steadying the ovary while repair takes place.

Besides the well-formed follicles which rupture, many seem to break down in the normal ovary. The ovum and surrounding epithelium degenerate and get absorbed along with the liquor folliculi. In these conditions leucocytes have been seen to penetrate to the ovum. Also, the epithelial cells surrounding it have been noticed to penetrate the zona pellucida, and to enter it.

Notwithstanding these changes in the ovary during sexual life, the size of the organ remains pretty constant. Towards the menopause it diminishes.

After the menopause it is hard, shrunken, and irregular; the covering epithelium becomes flattened, and largely disappears. The Graafian follicles are wanting. The connective tissue stroma is dense and hard, especially at the periphery (at this time often called the "tunica albuginea").

Physiological note.—The ovary is the most distinctive possession of the female sex. According to Nagel, it is the only part of the female genitals which may never be found with the testes in hermaphroditism. True essential hermaphroditism, in which both testes and ovaries are present, probably cannot exist. According to Nagel, this is because of the very early changes in the germinal epithelium, whereby the maleness or femaleness of the sex is first of all laid down. The rest of the genital apparatus is a later formation, and it is not surprising that hermaphroditism might occur in it. The relation of ovulation to menstruation and to the sexual characters is discussed in the Appendix.

The influence of the ovaries on metabolism is not well known. It is believed that some secretive product is introduced into the system by them, which can influence metabolism. Their removal is attended with various changes (*vide* pp. 654, 668).

THE FALLOPIAN TUBES.

The Fallopian tubes lie in the upper free margin of the broad ligaments, being joined to the uterus, one on each

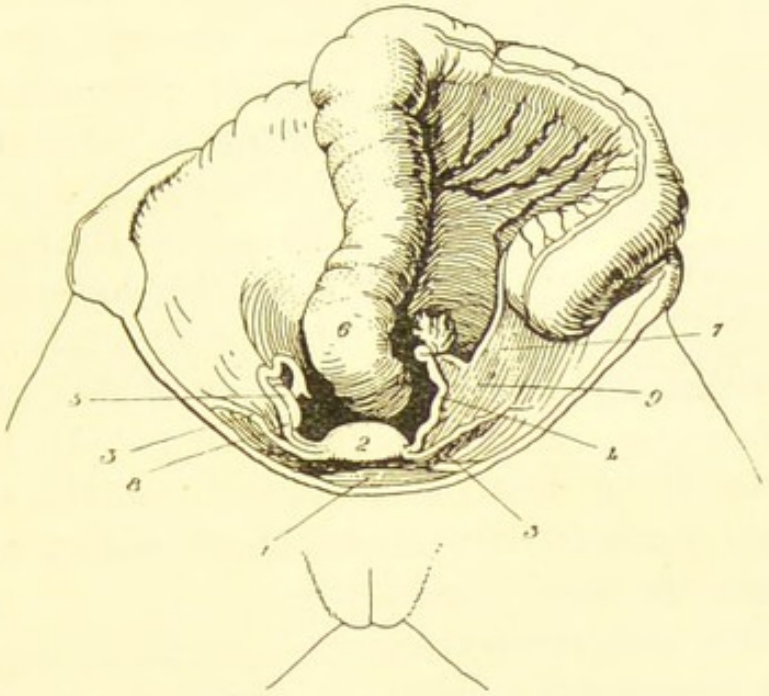

FIG. 5.—Female pelvis seen from above.—From NAGEL.

1. Bladder.
2. Uterus.
3. Round ligament.
4. Fallopian tube.
5. Ovary.
6. Rectum.
7. Infundibulo-pelvic ligament.
8. Ovarian ligament.
9. Broad ligament.

side, at the corner. Ordinarily they are from $3\frac{1}{2}$ to 5 in. (6 to 12.8 cm.) in length, and are often unequal.

The direction of the tube, when the uterus is anteverted, is from the uterine cornu upwards, outwards, and forwards, for a short distance; then upwards, outwards, and backwards; then downwards, backwards, and slightly inwards. In this way a curve is formed.

The inner part of the tube varies in position with move-

ments of the uterus. The ampulla is capable of moving also, owing to the mobility of that part of the broad ligament to which it is attached. The fimbriated end is also freely movable.

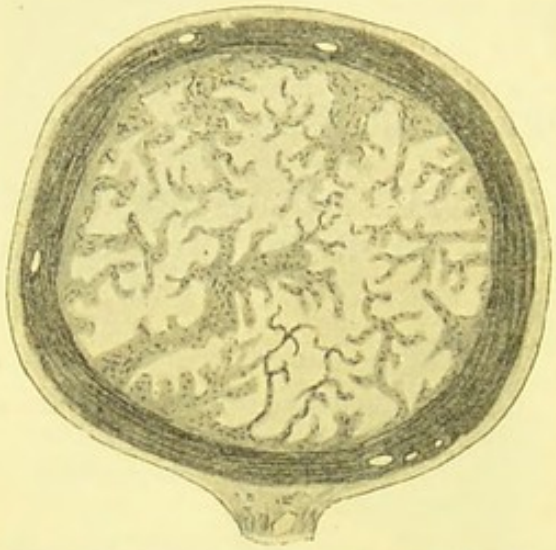

FIG. 6.—Transverse section through ampulla of Fallopian tube of adult.

The tube may be described in three divisions—

1. **Isthmus.**—This is the innermost portion which runs through the uterine wall, to communicate with the funnel-shaped depression of the uterine cavity at the cornu. It admits only a fine probe, and enlarges gradually from within outwards.

2. **Ampulla.**—This forms two-thirds of the tube, and extends from the isthmus to the pavilion. Its lumen is larger than in the rest of the tube; it admits a uterine sound, and increases in diameter from within outwards. Usually one or more curves exist in this part, remains of the spiral convolutions found in the fœtus. There is a slight constriction where the ampulla passes into the pavilion.

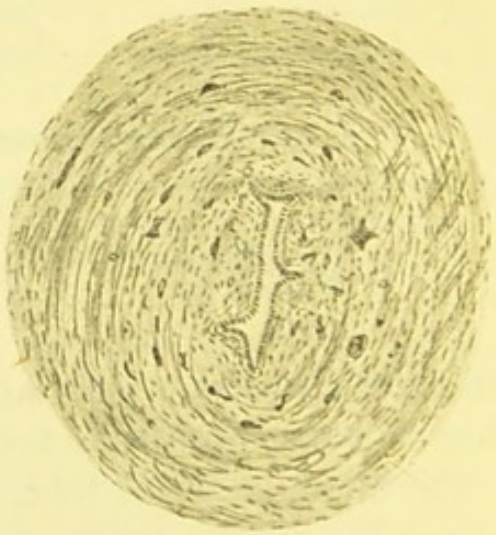

FIG. 7.—Section through interstitial portion of Fallopian tube.

3. **Pavilion, infundibulum, or fimbriated extremity.**—This is the outer funnel-shaped end of the tube, which is marked by a number of fimbriæ. A slight constriction of the wall marks its inner limit, but there is no muscular thickening worthy the name of sphincter. The ostium varies from 2 to 5 mm. in diameter, and is surrounded by

fimbriæ. Ballantyne and Williams divide these into the major (musculo-mucous) and minor (mucous). The former number from three to five, the latter being placed between them.

One of the former runs from the lower part of the tube along the free border of the broad ligament towards the

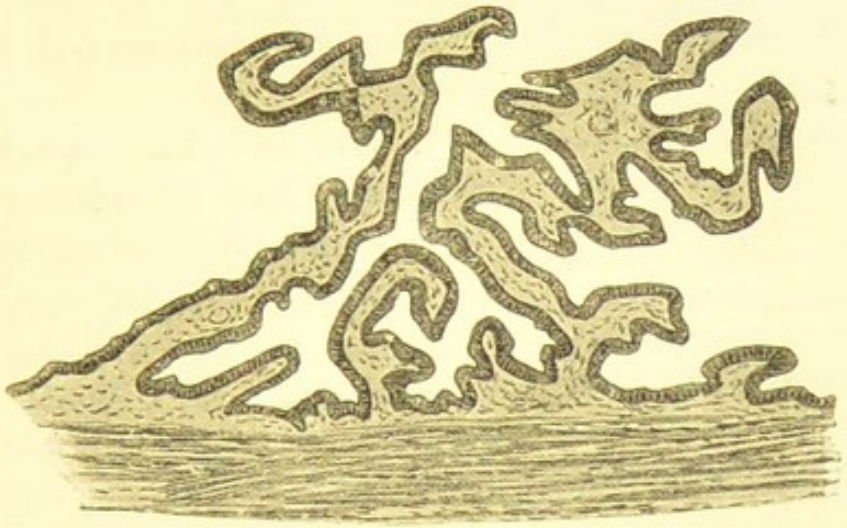

FIG. 8.—Section through folds of tubal mucosa.

ovary, to which it may or may not be attached. It is known as the ovarian fimbria, and is generally grooved on its mucous surface by a longitudinal furrow.

Structure.—It is usual to describe the tube as having a peritoneal, a muscular, and a mucous layer.

1. *Peritoneal covering.*—This covers the ampulla, save on the lower surface. It is in reality the junction of the anterior and posterior layers of the broad ligament, and is, for the most part, loosely connected with the muscular part of the tube. Close to the uterus it is more firmly attached. Between the two run vessels and nerves. (Remains of the primitive kidney are sometimes found here.) The large fimbriæ are covered on their outer surface and on their outer ends with peritoneum, the minor fimbriæ being usually entirely covered with mucous membrane.

2. *Muscular portion.*—This is composed of two layers of smooth muscular fibres, an outer longitudinal and an inner

circular. It is thickest near the uterus, and thins out towards the outer end. Both are of about the same thickness in the ampulla. At the isthmus the circular layer is most marked. Several observers have described a few longitudinal fibres internal to the circular layer. (These are well-marked in the cow.)

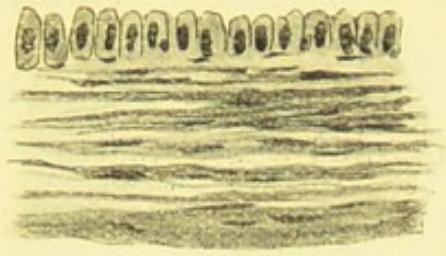

FIG. 9.—A small piece of normal tube wall, taken from a portion in which the mucosa is not raised in folds. The columnar ciliated epithelium is separated from the muscular part of the wall by a very small quantity of connective tissue.

3. *Mucosa.*—This increases in thickness and complexity from the uterine end outwards towards the pavilion. In the isthmus it is found in its simplest form, there being no fringes. The transverse section of the lumen has a somewhat stellate appearance. There is a small amount of submucous tissue of close texture. It is covered with columnar ciliated epithelium.

In the ampulla the mucosa is arranged in a series of longitudinal folds. These increase in number and size from the uterine end outwards. On transverse section they appear as a number of delicately branched processes, which occupy the entire lumen. These are covered with columnar ciliated epithelium. Under this is a delicate connective tissue, consisting of branching and round cells, vessels, and nerves. The amount of this submucous tissue resting on the muscular part of the wall is very small. No glands exist normally in the tube. Occasionally, the mucosa of the ampulla shows variations from this normal arrangement. It may in parts resemble that of the isthmus, even that of the corpus uteri containing glands; or there may only be a much less complex arrangement of the folds.

Development.—The Fallopian tubes are developed from the ducts of Müller. These structures arise as follows:—In very early life (observed by Nagel in an embryo $\frac{7}{16}$ in. (7 mm.) in length), the cœlomic

epithelium on the surface of the Wolffian body forms more than one layer, from the deepest of which Müller's duct forms in close proximity to the Wolffian duct, which is more deeply placed. In an embryo $\frac{7}{8}$ in. (12 mm.) in length Nagel found that the Müllerian duct was a short funnel-shaped tube open at its upper end. It was lined with columnar epithelium save at the distal end, where it was cubical. Thereafter the duct extended gradually along the ventral aspect of the Wolffian body, until it approached the urogenital sinus. At first they are connected with the cœlomic epithelium, but later they are cut off from it entirely save at the upper end, being embedded in mesodermal tissue. This stage has been found by Nagel in an embryo 1 in. (2.5 cm.) in length.

By means of a rotation inwards of the lower end of the Wolffian body, the Müllerian duct, which at first lay external to the Wolffian, is made in its lower part to lie internal. The lower ends of the two ducts are now closely applied. Their inner walls afterwards coalesce to form a single duct (the uterus). From the upper unblended portions the tubes are derived. The bend made in the ducts, owing to the inward rotation of the Wolffian bodies, marks the lower limit of the tubes, for here develop the round ligaments from mesodermal strands, leading to the anterior abdominal wall.

Around the primitive epithelial tubes the mesoderm has been arranging itself in a circular manner. This afterwards forms the muscular and connective tissue elements of the tube walls. These can be made out distinctly by the fifth month. The upper end of the tube is at first a well-marked, rounded projection. Early it shows shallow notches. By the fourth month small fimbriæ can be seen. At full time the epithelium lining the tube has cilia.

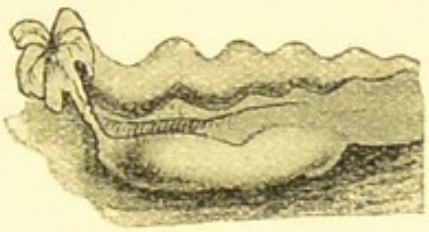

FIG. 10.—Fallopian tube and ovary of a fœtus.

The folds in the mucosa begin in the ampulla about the fifth month. They are well-marked at full time.

The Müllerian duct possesses a half-spiral turn inwards, as already stated. After the fourth month several folds may usually be noted in the ampullary portion of the tubes.

Physiological note.—The tube serves to convey the ovum to the uterus. The fimbriæ offer a large number of ways by which it may be led into the tube, though the fimbriated end plays but a passive part, so far as is known. There is no proof that it grasps the ovary while the ovum is being shed. It is well known, from experiments, that particles placed in the pelvic peritoneum are attracted to the tube by currents set

up in the thin layer of serum on the peritoneal surface by the action of the cilia lining the fimbriæ.

Probably many ova never reach the tubes, but are broken up in the peritoneal cavity.

After the menopause the tubes get thinner, the muscle atrophies, the connective tissues become dense, the mucosal folds gradually disappear towards the inner part of the tube, the epithelium is more or less cast off, and may form a plug in the lumen.

Comparative notes.—In several fishes there are no Fallopian tubes. The ova escape into the peritoneal cavity and afterwards to the exterior. In some varieties this takes place even where there are tubes. In the cartilaginous fishes tube and ovary are in close union; in some the ovary is covered with a firm capsule, through which the eggs must burst. In bony fishes this capsule passes into the tube. From the amphibia upwards, as a rule, the tube and ovary are separated, but in several species more primitive conditions are found. In ornithorhynchus each ovary has a peritoneal capsule, and the outer end of the tube is a very wide funnel without fimbriæ.

In the Carnivora, in the rat, mouse, hyæna, guinea-pig, ass, rhinoceros, and some other mammals, the ovary lies in an ovarian sac of peritoneum, which communicates with the peritoneum by an opening. In the porcupine and baboon the sac is only partly formed. In the highest mammals the ovarian sac is absent, though in the lemur a rudimentary one is found.

In the lower vertebrates the outer end of the tube is a mere non-fimbriated slit. In the Sauropsida and lower mammals it has a wide, funnel shape without fimbriæ. In the higher mammals the human condition is usually found. In the sea-mammals, however, there are no fimbriæ.

RELICS OF THE MESONEPHROS OR WOLFFIAN BODY IN THE BROAD LIGAMENTS.

In their very full account of these relics Ballantyne and Williams have pointed out the unfortunate confusion in the nomenclature employed in their description. I shall employ their terminology.

Organ of Rosenmüller.[1]—In the adult this is a triangular or trapezoidal mass of tubules, situated in the broad

[1] This term was introduced by Valentin. Synonymous with it is the name of *corpus pampiniforme*, used by Wrisberg, *corpus conicum* of Rosenmüller, *parovarium* of Kobelt, *epoophoron* of Waldeyer.

ligament between the ovary and Fallopian tube, anterior to the ovarian vessels. It consists of a basal longitudinal duct, the remnant of the upper third of the Wolffian duct, known as the duct of Gartner, situated close to the Fallopian tube, and of a number of tubules extending downwards from the longitudinal duct towards the hilum of the ovary. The duct of Gartner usually terminates externally in a small cyst, sessile or pedunculated, known as the hydatid of Morgagni; its inner end approaches the uterus, where it usually ends. Its wall consists of fibrous tissue and a few smooth muscular fibres. It contains a

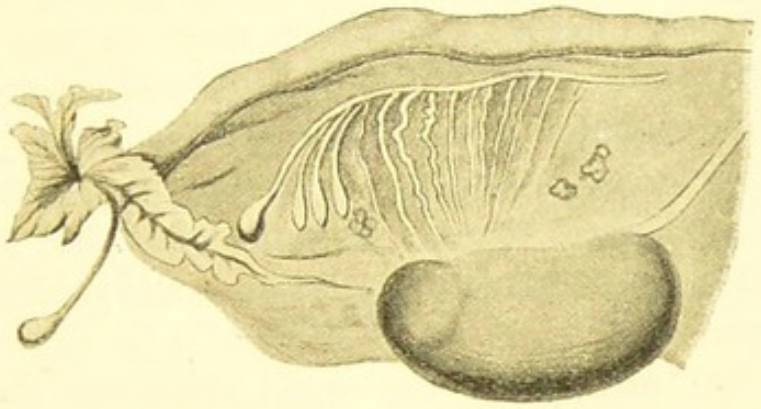

FIG. 11.—Fallopian tube, ovary, and remains of the Wolffian body in the adult.

lumen, lined with columnar epithelium, non-ciliated. In the lumen cell débris may be found. The vertical tubules may be divided into an inner and an outer group. The former, twelve or more in number, mostly reach the hilum of the ovary, though some fall short of it. They run towards the ovary, being slightly tortuous in their upper part, and appear to end in a small area, called by Rosenmüller the *locus obscurior*. On microscopic examination this area is composed of a network of the tubules—the rete ovarii, some of which enter the ovary. The outer tubules, four or five in number, run curved courses downwards and inwards, not reaching the ovary; they are known as the tubules of Kobelt, and may give rise to small cysts.

The walls of the vertical tubules are made up of connective tissue and a little smooth muscle. Few of them contain a lumen. When this exists it is lined with columnar epithelium in its upper portion and by cubical epithelium near the ovary; the latter are often ciliated. In the outer group of tubules the lining cells are usually cubical.

In the fœtus and child the vertical tubes are much convoluted in their upper portions. The outer group do not reach the ovary, but end below in a sac-like projection of the anterior layer of the broad ligament—the *corpusculum sacciforme* of Rosenmüller; small cysts may be sometimes found. The whole mass appears yellowish grey by transmitted light. The vertical tubes have a lumen lined with columnar epithelium in most cases. Between the tubules small yellowish-grey masses may often be seen —also mesonephric relics. Towards adult life atrophy of the tubules takes place from within outwards, and from below upwards.

After the menopause the organ atrophies, the vertical tubules become shortened, straighter, and tend to disappear.

Other relics.—Between the organ of Rosenmüller and the uterus small grey opaque areas[1] are found, varying in size from a millet-seed to a pea. They may also be found between the duct of Gartner and the Fallopian tube, and in some cases may be closely attached to the wall of the latter. (In the child they may also be seen between the vertical tubules.) Some of these masses are fibrous or fibro-fatty, with traces of tubule remains, in the shape of canaliculi or lumina filled with epithelium; others consist of small tubules lined with non-ciliated columnar epithelium.

These isolated masses are probably mainly derived from the glomeruli of the primitive kidney.

Origin of these relics. — They are derived from the Wolffian body or mesonephros, composed of an upper or

[1] To these Waldeyer applies the term *paroophoron* or *parovarium*.

sexual part, and a lower or urinary part. Ballantyne and Williams tabulate the various parts as follows, giving also the male homologues :—

Fœtus.	Adult Female.	Adult Male.
1. Upper part of Wolffian duct	= 1. Horizontal duct, duct of Gartner, or duct of epoophoron	= 1. Canal of epididymis testis.
2. Sexual part of mesonephros	= 2. Efferent canals of epoophoron 3. Tubular network, rete ovarii, locus obscurior 4. Masses of epithelial cells in the hilum of the ovary (medullary cords of Waldeyer) 5. Isolated tubular relics	= 2. Vasa efferentia. 3. Rete testis. 4. Tubuli seminiferi testis. 5. Vasa berrans Halleri.
3. Urinary part of mesonephros	= 6. Isolated solid relics in broad ligament	= Organ of Giraldès (paradidymis of Waldeyer; parepididymis of Henle) 6.

CHAPTER II.

THE UTERUS.

The uterus is a body resembling somewhat a flattened pear. When the organ is dissected from its attachments and viewed from the front or back, the upper end or fundus is the broadest part and is convex, the lower end or cervix being slightly conical and rounded. On each lateral wall is a depression, marking the junction of the corpus and cervix uteri; this part of the uterus is called the *isthmus*.

Viewed laterally, the posterior wall is seen to be more rounded than the anterior; it has also a depression at the level of the isthmus. At the junction of the fundus and lateral walls the Fallopian tubes enter the body. Seen from below, the appearance of the cervix varies according to whether the woman has borne children or not. If a nullipara, the os externum looks like a small rounded dimple. If a multipara, it is a transverse slit, and somewhat irregular owing to fissuring.

Component parts. — The *corpus uteri* measures 2 in. in width at the fundus and about 1 in. at the isthmus. Its antero-posterior measurement is 1 in. The vertical measurement from fundus to isthmus is 2 in. From the isthmus to the os externum the length is 1 in. Transversely the cervix measures about 1 in. in its widest portion.

The average thickness of the wall of the uterus is half an inch, the posterior being slightly thicker than the anterior. The walls are in apposition or are separated by mucus secreted from them.

The cavity of the corpus uteri, as seen on sagittal mesial section, is a vertical slit, $1\frac{1}{2}$ in. in length. On coronal section it is triangular in shape, the apex being at the *os internum*, the basal angles extending upwards and outwards towards the openings of the Fallopian tubes. On transverse section, the cavity appears as a transverse slit.

The cervical portion of the cavity measures 1 in. in length. It is somewhat narrowed at its upper and lower ends. The os externum measures transversely nearly a quarter of an inch; antero-posteriorly slightly more. The cavity, in its widest or antero-posterior diameter measures

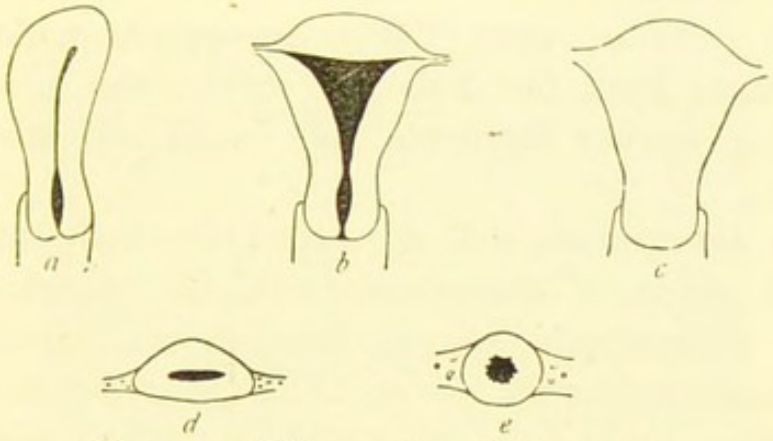

FIG. 12.—Different views of the uterus.

a. Vertical mesial section.
b. Coronal section.
c. The organ seen from the front.
d. Transverse section of upper part of body.
e. Transverse section of cervix.

about $\frac{5}{16}$ in., and in its tranverse diameter slightly less than a quarter of an inch. The os internum measures about $\frac{3}{16}$ in. in diameter. The diameter of the tube lumen at its junction with the cornu is about $\frac{1}{32}$ in.

That part of the cervix lying in the vagina is known as the vaginal portion (portio vaginalis), the rest being the supravaginal portion.

Schroeder divides the cervix into three parts, according to the attachment of the vaginal walls. All above the level of attachment of the posterior vaginal wall is the *supravaginal* portion, that below the level of attachment of the anterior vaginal wall the *vaginal* portion, while the part between these is the *intermediate* portion.

It is usual to speak of that part of the vaginal portion in front of the os as the *anterior lip*, and of the rest as the *posterior lip*.

Structure of the uterus.—Three coats are described —peritoneal, muscular, mucous.

The peritoneal covering. — This will be considered under "The Peritoneum" (*vide* p. 71).

The muscular part of the wall.—This forms the main portion of the uterus. It consists of interlacing bundles of smooth muscular fibres. It is difficult to make out as distinct an arrangement as in some of the lower mammals, but the following may be described :—

(*a*) An *external layer*, thinly developed, made up of prolongations from the Fallopian tubes, the broad ligaments, the ovarian ligaments, the round and utero-sacral ligaments.

(*b*) An *inner layer*, well developed, in which the vessels run, and which is continuous with the muscle of the vagina. Between the muscle bundles are found elastic and ordinary connective tissue. There is a special arrangement of fibres around the inner ends of the Fallopian tubes, os externum, and os internum.

In the cervix there is a larger proportion of dense connective and elastic tissue than in the body. It is thus made very tough.

The Mucous Membrane.

1. **Mucosa of the corpus uteri.**—The mucosa of the body of the nulliparous adult uterus has, when examined fresh in the intermenstrual period, a fairly smooth surface, and is of a greyish-pink colour. With a low magnifying-glass numerous small pits, the openings of glands, can be seen. These vary in number in different places.

On microscopic examination, the thickness of the mucosa is found to vary considerably in different parts. In my

specimens it varies from .5 to 2 mm. The average thickness is probably somewhat greater in the multipara than in the nullipara. In detail, the mucosa is best described under the following headings :—

Lining epithelium.

Glands.

Interglandular tissue.

Lining epithelium.—This consists of ciliated columnar epithelial cells. Their nuclei are mostly elongated in the direction of the long axis of the cell; they are like short

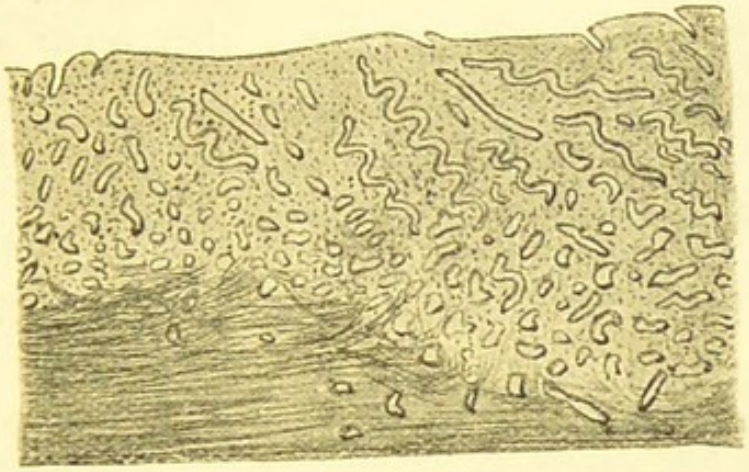

FIG. 13.—Section through the mucosa of the corpus uteri in the adult. A small portion of the muscular part of the wall is also shown.

rods with rounded ends. Many are oval or ovoid; a few are rounded. For the most part they are placed in the deeper portions of the cells, only a small amount of cell substance being below them; sometimes the nucleus is quite close to the margin. In some cases it is situated in the middle or outer division of the cell. The height of the cells varies. This variation is due to differences in the amount of cell substance, or of nuclear material. In many places small cells are found between the bases of the large fully-formed cells.

In many carefully prepared thin sections a layer of flattened connective tissue cells, belonging to the inter-

glandular tissue, can generally be recognised adhering closely to the under surface of the layer of columnar epithelium. It is to be regarded as a basement membrane. In some specimens it cannot be distinguished.

Glands.—The glands are not uniformly distributed, being more abundant in some parts than in others. They are tubular, and are single or branched. The number of branchings is usually only two; sometimes more may be found. The divisions occur mainly in the deepest portion of the mucosa; sometimes in the outermost portions, even close to the surface. Very often they occur about the middle of the mucosa.

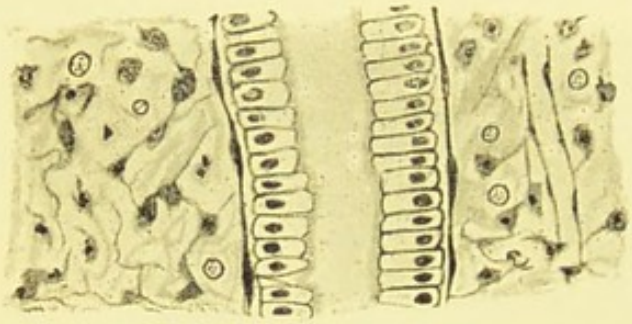

FIG. 14.—Section of part of gland and interglandular tissue of mucosa of corpus uteri.

Most of the glands run obliquely to the surface, some being found, occasionally, almost parallel with the surface. A few only run at right angles to the surface.

Some are straight, others slightly curved; most are more or less tortuous or wavy.

Of the latter, most are straight near the surface, but a few are wavy in their whole extent. On transverse section the glands are round or somewhat oval.

Most of the glands extend to the muscular part of the uterine wall, some reaching it, others stopping a little short of it. Here and there glands extend into the muscular layer for varying distances.

The gland epithelium is of the same nature as that lining the surface of the mucosa, though, on the average, its cells appear to be a little larger.

The size of the epithelium varies in different glands. When a surface view is obtained, the outlines of the cell ends appear to be more or less rounded, though some are quite irregular.

Interglandular tissue. — This forms the main portion of the mucosa. Its line of junction with the muscle of the uterine wall is an irregular one. Muscular projections of different lengths extend into the deep portions of the mucosa.

It is composed of connective tissue of a low or embryonic type. It is best described as consisting mainly of delicate anastomosing nucleated masses of protoplasm. In some parts it is like a network with well-marked spaces, the anastomosing filaments being very fine. In other parts the matrix is almost a homogeneous mucoid-like mass, containing rounded nuclei, very few spaces being seen, or scarcely any differentiation into distinct cells.

In general, however, more or less distinction exists between the cells, though, for the most part, they remain connected by strands of matrix of various sizes. Close to the surface of the mucosa, the cells are usually flattened parallel to it. The larger the cells the more elongated they are.

The nuclei are rounded or oval in general, the matrix surrounding them being irregular in shape, and possessing one or more branching processes. Here and there groups of cells are found which are rounded, oval, or spindle-shaped, with no anastomoses. Often the nuclei may be seen dividing. (This embryonic appearance of the interglandular tissue becomes more or less altered in chronic endometritis.)

Close to the epithelium of the glands and to that of the surface is a layer of flattened cells forming a basement membrane. To it the epithelium appears to be attached.

Arteries and veins extend from the muscular part of the wall into the mucosa for varying distances. The former run a tortuous or wavy course usually ; the latter a straighter course. At what level they pass into the capillaries, which supply the outer layer of the mucosa, it is difficult to say. As a rule, this seems to take place just outside the middle

part of the mucosa. In the outer part I can only find capillary vessels, mere tubes of flattened endothelium.

Occasionally a small arteriole, with scarcely any wall outside the endothelium, may be found in the outer portion of the mucosa.

In some cases the capillary wall may have one or more layers of flattened cells of the interglandular tissue surrounding it.

It is this appearance which has often been wrongly described by observers, who have supposed the vessels to be arteries. Arteries occur only exceptionally in the outer mucosal region. There it is chiefly capillaries that are found.

According to Minot the capillaries form a network around the glands. If he means that a special vascular mesh is particularly noticeable around them, I cannot agree with him. They are found no more numerous near the glands than in any other part of the interglandular tissue, in which they are distributed in no uniform manner.

As to the lymphatics, I am in agreement with Leopold. The spaces in the interglandular stroma contain lymph, and they are drained by lymphatics proper, which begin in the deeper layers of the mucosa or in the muscle. In these spaces leucocytes are found, varying greatly in numbers in different parts.

In conclusion, I would point out that the mucosa might well be described in terms which are generally only used in reference to the altered condition of pregnancy, namely, compact and spongy; the former being the outermost portion, in which the glands have not, for the most part, begun to divide; and the latter being the deeper portion, in which are the branchings of the glands. Strictly, the spongy layer might be considered as consisting of two parts, an outer and a deeper, the latter being that next the muscle containing the most numerous gland spaces.

The following points regarding the mucosa of the body of the uterus should be kept in view:—

(1) Its thickness is not uniform, but varies considerably.

(2) The lining cells show variations in their height, their thickness, the shape, size, and position of their nuclei.

(3) The same may be said of the cells lining the glands. In general these are larger than the surface cells.

(4) The interglandular tissue is mainly embryonic in nature, consisting of a nucleated protoplasmic reticulum. Here and there are found all stages of transformation to the more advanced spindle-shaped cells.

(5) The cells nearest the surface are mostly arranged parallel to the surface. A special layer of these exists as a distinct basement membrane, and is generally found under the surface epithelium, as well as under that lining the glands.

(6) In the outer layer of the mucosa, the capillary junctions of the arteries and veins are the only vessels usually found.

(7) The line of junction of mucosa and muscular wall is an irregular one. There is no special muscularis mucosæ.

2. **Mucosa of the cervix uteri.**—When the cervix is opened by a vertical incision, the mucosa, red in colour, is seen to be arranged in a series of folds On the anterior and posterior wall is a vertical ridge with branching ridges extending from it—the *plicæ palmatæ*, the whole arrangement being known as the *arbor vitæ*. This does not extend above the os internum, but stops short of it usually. The mucosa is lined with columnar epithelium, ciliated on the prominent parts of the ridges. Glands communicate with the cervical canal. They are short depressions with lateral diverticula. The outline of each gland is thus serrated in longitudinal section. They

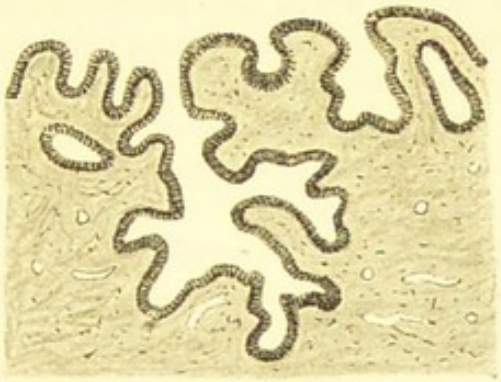

FIG. 15.—Section through a portion of mucosa of cervix uteri.

are lined with columnar epithelium, more or less ciliated, lying on a basement membrane. In the upper part of the cervix, the glands tend to resemble those of the corpus in type. The region of the os internum is, in fact, a transition area. Just within the os externum the transition between the columnar epithelium lining the cervical canal and the stratified squamous epithelium which covers the vaginal portion takes place. The latter has a pinkish-grey colour, very different from the red cervical mucosa.

The uterus at different periods of life.—At birth, the corpus is only slightly developed, being about one-third the length of the cervix, and of smaller width. It is usually bent slightly forward. The arbor vitæ extends to the fundus. This condition is found up to the period of puberty, with the exception that the lateral ridges of the arbor vitæ disappear from the mucosa of the corpus, and only a median ridge is left. At puberty the body increases in size until it reaches the normal adult relationship of the cervix.

In the nulliparous adult the uterus is smaller and less rounded than in the multipara. The external signs of the junction of corpus and cervix are better marked in the former. In the latter the cavity is wider, and its triangular shape, as seen on coronal section, is less clearly defined. The os internum is less pronounced, the cervix is slightly shorter, the os externum is a transverse slit, irregular from fissures. In a uterus which has passed through only one labour, the cervix not having been torn, it may be very difficult to distinguish it from a nulliparous one, after several years have passed.

After the menopause the uterus diminishes in size, and becomes hard, owing to the sclerosis in the connective tissue elements. The mucosa thins, the epithelial cells get smaller, lose their cilia, and may gradually disappear. The cervical glands are lost, and also those of the corpus to a large extent. Those which remain get completely surrounded and form small cysts. The interglandular tissue becomes dense and fibrous.

Position of the uterus.—In the great majority of cases the uterus is placed in the anterior half of the pelvis (anteposed). When the bladder is empty it lies so that the fundus is directed forwards (anteverted), there being a slight curve on the organ, the concavity being on the anterior surface (anteflexed).

It may lie exactly in the middle line, but is often, as a

whole, found somewhat to the right or left (more often the latter, according to Waldeyer). In some cases the long axis may not be sagittally placed, but may be directed so that the fundus looks slightly to the left or right (lateriverted). In rare cases the organ may be situated far back in the pelvis (retroposed). In other cases retroversion may be a congenital condition. Very rarely in childhood the anteverted uterus may be also retroflexed.

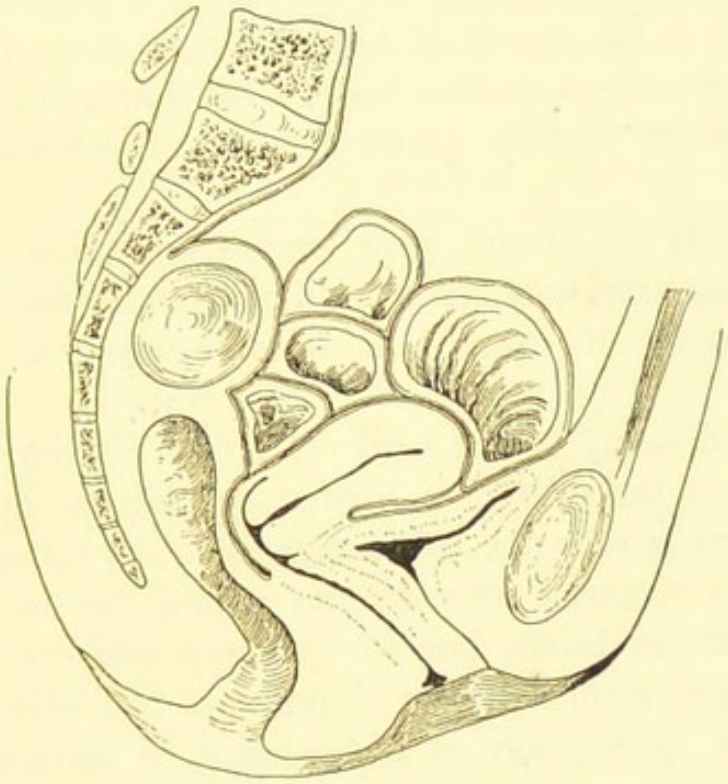

FIG. 16.—Vertical or sagittal mesial section through the pelvis of nullipara.

As regards rotation of the healthy nulliparous uterus there has been some discussion. In using this term it is necessary to distinguish between *inherent* or *true*, and *secondary* or *accidental* rotation. By the former I mean a quality impressed upon the organ in its development and growth. It is only found occasionally. In the living subject a slight degree of rotation cannot be determined by physical examination. One cannot be sure that a supposed rotation is not caused by artificial disturbance

of parts. Moreover, one cannot definitely eliminate accidental causes of rotation, *e.g.* altered states of intra-abdominal pressure, varying conditions of distension of bowel or bladder, old peritonitic or cellulitic cicatrisations. It is important to note also, that ordinary post-mortem examination is not satisfactory in the determination of the exact relationships of the uterus nor of any other organ. (Frozen sections are necessary.)

According to some writers this alleged characteristic in the uterus is the result of a tendency to torsion possessed by most structures in the body. No doubt this tendency does exist in certain parts, but its significance is not clear.

As regards the uterus, were long-axis rotation one of its growth characteristics we should expect to find it in the great majority of cases. As it is, we find it extremely rarely.

A careful study of the work of Ernst Fischer, the great authority on the subject of torsion, teaches us that we are not justified in referring this tendency to the human uterus.

Fischer's remarks refer to the organ, not in its single well-formed condition, but in its composite capacity as a double organ, formed by the blending of two lateral halves.

Fischer's description of a tendency to spirality in the uterus refers to each half, and he does not speak of a torsion of each Müllerian duct as a whole, but only of the muscular bundles. These, he says, show a tendency to homodromous spirality, according to the general law which he has formulated, namely, that structures in the right half of the body show a left spiral, and those in the left half a right spiral arrangement. His conclusions are derived from the study of animals with double uterus, and of cases of bicornuate uterus in women.

In early fœtal life there is no rotation distinguishable in the Müllerian ducts. But if this did exist we should expect that, after blending occurred, there would be no torsion in

the single organ, because of the neutralisation of right and left homodromous characteristics.

The foldings in the early Fallopian tubes develop after the fusion of those parts of the Müllerian ducts which give rise to the uterus. Nagel states that they are due to the rapid increase in their length.

Embryological explanations as to relationships of uterus.—In early embryonic life the Müllerian ducts have simply a curve corresponding to that of the body. When they have reached the uro-genital sinus, and have become blended with the Wolffian ducts to form the genital cord, the latter, at the part which afterwards becomes the uterus, forms a curve, whose concavity looks forward. The angle of the bend is at the part which becomes os externum (Nagel). This continues through development, the part above the angle forming the uterus. The condition is somewhat altered by the sinking down of the genital cord, and by the pressure of the intestines on the upper part of the uterus. A flexion tends to be especially marked on the upper part of the uterus, owing to the bending forwards of the small fundus. In the later months of embryonic life this condition is usually well-marked, though the angle of flexion varies according to the condition of the bladder.

In the adult state the attachments and relationships of the uterus are of such a nature as to explain why the normal conditions should be found. The cervix is more fixed than the body. It is slung in a bridge formed chiefly by the utero-sacral ligaments, the bladder and its ligaments. The body has a considerable range of movement, owing to the laxity of its connections. Born with a tendency to anteversion and anteflexion, the erect posture of the body and intra-abdominal pressure continue this. Probably the round ligaments, owing to their length, exert very little influence normally on the uterus.

Throughout the mammals the anteverted condition of the uterus is found.

Normal movements of the uterus.—The uterus is continually moving—with each respiration, in walking, in singing, and in all actions which alter the relationship of intra-abdominal pressure to the organ. It changes in accordance with the emptying or filling of the bladder, and, to a certain extent, is affected by the distending rectum. The uterus and bladder behave practically as one organ in

normal conditions. The anteflexion becomes less marked as the bladder raises the fundus.

The uterus can be made to move artificially through a considerable range. It can be pushed up about 1½ in.; it can be pulled down until the os externum is near the introitus vaginæ.

Special ligaments of the uterus.—The *broad ligaments* are described on p. 71.

The *round ligaments* are two flattened cords, 4 or 5 in. in length, which extend from the upper angles of the uterus in front of the inner ends of the Fallopian tubes. Each one passes upwards, outwards, and forwards,

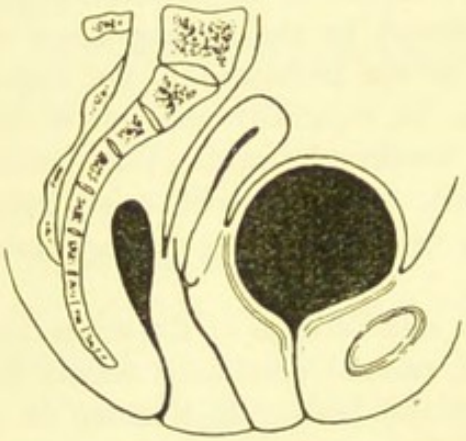

FIG. 17.—Displacement of uterus by distended bladder.

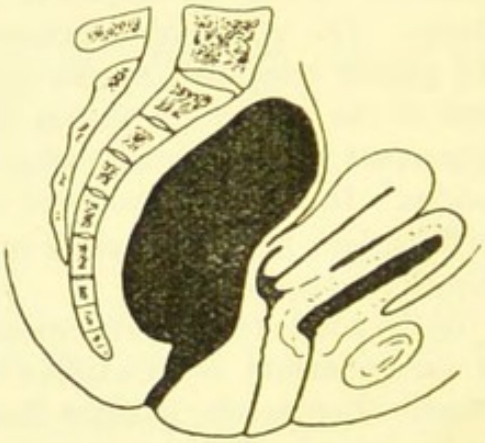

FIG. 18.—Displacement of uterus by distended rectum.

invested with a covering of peritoneum continuous with the anterior layer of the broad ligament. It goes through the inguinal canal, and is directed towards the pubic spine, where it blends with the tissues of the mons veneris and labium majus. It is composed of connective and elastic tissue; there is also some non-striped muscle, mainly in its inner portion, derived from the outer layer of the uterine musculature.

In the inguinal canal it gains a few striped muscular fibres, which arise from the internal oblique and transversalis abdominis muscles, as well as from the pubic spine;

these correspond to the cremaster muscle in the male. The part of the ligament outside the canal has no muscular fibres.

Developmental note.—In the fœtus its early covering of peritoneum projects as a tubular process into the inguinal canal. The peritoneal tube thus formed is called the canal of Nuck. It is sometimes permanent throughout life, though, generally, it becomes obliterated. It corresponds to the *processus vaginalis* in the male. When present after childhood it is a predisposing cause of hernia.

The *utero-sacral ligaments* are two peritoneum-covered bands, which pass from the outer parts of the posterior surface of the upper third of the cervix, outwards, upwards, and backwards, to the upper part of the third sacral vertebra, sometimes higher. The inner margin of peritoneum is thin, and forms the upper boundary of the pouch of Douglas. The essential part of each ligament is a flat band of muscle running along its outermost part. This band is called the *utero-rectal muscle*, or the muscular retractor of the uterus. The projecting portion of the ligament contains scarcely any muscle; it is made up of loose connective tissue, which is continuous with the paraproctal and parametric tissues. Posteriorly the tissues of the ligament blend with those surrounding the rectum. The function of these ligaments is considered on p. 92.

Development.—The uterus develops out of the Müllerian ducts below the round ligaments.—The development of the ducts has already been described. By the end of the third month the blending of the lower portions, by absorption of the contiguous inner walls, is complete. This takes place as far up as the attachment of the round ligaments.

For a time the uterus presents the external sign of its double origin, while at the part which afterwards becomes the fundus, there is a distinct indentation.

The lumen is lined with high columnar epithelium. The lower end is closed, and is composed of large irregularly rounded cells. This mass, on reaching the urogenital sinus, pushes forward its posterior wall and forms the eminence of Müller; from this mass of cells is developed the vagina (*vide* p. 36). The two varieties of cells pass gradually into one another. As the embryo grows, the distinction becomes sharper. The junction between the two is the *anlage* of the os externum.

Another difference becomes marked between the two portions of the genital tract, namely, in regard to their position. The lower or vaginal portion tends to be directed from above downwards and forwards; the upper or uterine portion upwards and forwards.

A differentiation also tends to become marked between the epithelium of the corpus and that of the cervix uteri. The former is less elevated than the latter, which is at first of several layers, the surface outline being wavy. This appearance is produced by the sinking inwards of the epithelium to form the glands of the cervix.

These cervical glands develop in the last half of intrauterine life. The glands of the corpus begin to develop just before birth, or soon afterwards; they are usually very scanty until puberty. No cilia are found on the cells at birth.

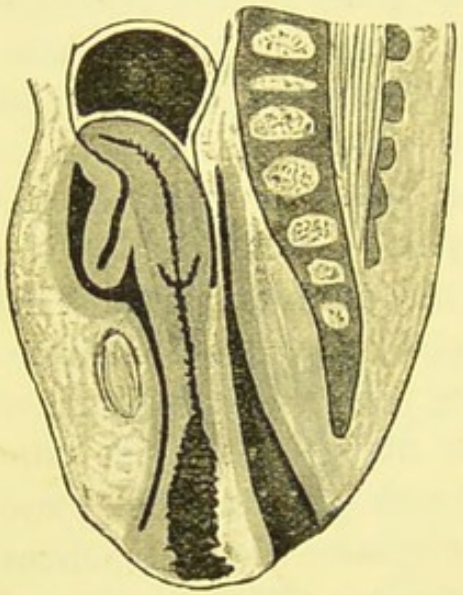

FIG. 19. — Vertical mesial section through pelvis of a fœtus.

In the differentiation of cervix from vagina, the posterior lip of the former first develops by the extension outwards and upwards of a sickle-shaped projection of the large rounded epithelial cells, just below the columnar cells. The anterior lip is then formed. The non-epithelial portion of the uterus is developed from the mesoblast which surrounds the epiblastic tube. According to Nagel, the muscle fibres do not develop before the fifth month.

Notes on the Müllerian tracts in the vertebrata.—In the Elasmobranchii, the Müllerian and Wolffian ducts are distinct, and open into a cloaca, as does the rectum.

In the Holocephala, where there is no cloaca, the distinct orifices of the Müllerian and Wolffian ducts open posterior to the anus.

In the Ganoidei, where there is no cloaca, the urinary and genital ducts open externally by a common aperture. In the Teleostei, the genital ducts have a single opening anterior to and distinct from the opening which communicates with the urinary ducts. In the Dipnoi, the blended lower ends of the Müllerian ducts open along with the ureters into a cloaca.

In the Amphibia the Wolffian and Müllerian ducts are distinct, and communicate independently with the cloaca.

In the Sauropsida the Müllerian ducts open independently or united, into a cloaca.

Among these various classes it is important to note the existence in a few cases of a uterus or brood sac. Thus in *Squatina angelus*, a dog-fish, the lower united ends of the Müllerian ducts form a dilatation in which the young are developed for a period.

The same thing is found in certain other fishes, and in several amphibians and reptilians. Thus in *Salamandra maculosa* each Müllerian duct, immediately above the cloaca, has a dilated portion in which the young develop. In these cases, it is to be noted, the uterus or brood sac is close to the outlet, there being no intervening vagina. Among the Mammalia various conditions are found.

In the lowest order is the ornithorhynchus, in which the Müllerian tracts open separately into the urogenital canal, distinct from the opening of the urethra. The vagina is apparently not represented, the lower ends of the ducts corresponding to the os externum ; they project somewhat like the portio vaginalis in the Primates. It is very interesting to note the presence in the virginal condition of hymeneal membranes which close the lower ends of the ducts, a very clear proof that a hymen may be formed between the urogenital canal and the Müllerian duct.

In the Marsupialia are found, generally, separate Müllerian ducts, each of which consists of a uterine and a vaginal portion. We find here, however, the first traces of blending. Thus, in *Macropus major*, the separate vaginæ blend in their upper portions in a kind of sac, into which the uteri open.

In all the other mammalian orders, the vagina is single. It is evident, then, that the higher we advance in the mammalian series, we find the uterus later in becoming single than the vagina. The first appearance of union in the uterine cornua is in the marmot, in which they are bound together at their lower ends for a short distance.

In *Capromys pelorides* there is a single portio vaginalis with one os externum, though both uterine canals communicate with it. The next stage is the development of a single cervical canal, found in many mammals, *e.g. Phocæna.*

In the Primates, the uterus is single and pyriform, except among the Lemuridæ, in which it is bicornuate.

THE VAGINA.

The vagina is a canal in the pelvic floor. It forms the passage from the cervix uteri to the surface of the body. In front is the bladder and urethra, behind the rectum and anus. In the normal adult, the vagina is about parallel

with the plane of the pelvic brim. Ordinarily, the walls of the vagina are in apposition from before backwards. The anterior wall is shorter than the posterior by the thickness of the cervix, which is attached to the upper end of the vagina. The measurements vary somewhat, the anterior wall being $2\frac{3}{4}$ to $3\frac{1}{4}$ in. (7–8 cm.), and the posterior $3\frac{1}{4}$ to 4 in. (8–10 cm.). The vaginal slit is widest in its upper part, and narrowest near the hymen.

On vertical mesial section, it has a sigmoid shape; on transverse section, near the cervix, it is bow-shaped; in the middle portion, H-shaped, and near the hymen it is an irregular transverse slit.

The upper end of the vagina is known as the vault or fornix. It contains the cervix uteri, whose os externum looks normally downwards and backwards. It is customary to divide the fornix into four parts in relation to the cervix, namely, anterior, posterior, right lateral, left lateral. The posterior fornix is the deepest, owing to the higher attachment of the vaginal wall to the cervix posteriorly, namely, at the junction of the lower two-thirds and upper third; the anterior wall is attached at the junction of the lower third and upper two-thirds.

Structure.—1. *The lining membrane* (so-called *mucosa*).—This consists of a sub-epithelial layer of loose connective tissue and a covering layer of stratified squamous epithelium. It is thin, and like skin, except that the *stratum corneum* is wanting. The epithelium is continuous with a similar layer on the vaginal portion of the cervix, on the hymen, and external genitals. Normally no glands are found in the vagina.

In the nullipara the wall of the vagina is markedly rugose, especially in the lower portion. Here is found a mesial ridge or fold, from which transverse ridges extend. The mesial column on the anterior wall is often double, and is usually longer than the posterior; as it is so intimately related to the urethra it has been termed the *carina urethralis vaginæ*.

Numerous papillæ are found on the vaginal walls. In the sub-epithelial tissue of these are found networks of capillary blood vessels.

2. *The muscular part of the wall.*—There has been some dispute as to the arrangement of the muscular layer of the wall. The main layer is one of smooth fibres, mainly arranged longitudinally, but many fibres are found running in other directions. It is continuous with the uterine musculature. It is stated by some that a special thin internal layer can often be made out.

At the vaginal outlet a special subcutaneous muscle has been described by Luschka, the so-called *sphincter vaginæ*. It is thin, $\frac{1}{8}$ to $\frac{1}{4}$ in. broad, and embraces in a forked manner the urethral orifice and the introitus vaginæ. External to the muscle is soft connective tissue and a thin layer of the pelvic fascia.

Physiological note.—The vagina serves as a collecting place for the semen in copulation, and forms a passage for the child during birth. It is, under ordinary conditions, merely a potential tube, its walls being in apposition. It is capable of great dilatation. This is especially seen during labour, and is due to the fact that there is a great deal of loose tissue surrounding it, that the epithelial layer is loosely attached to the muscular, that there are many foldings of the inner layer, and that its wall is exceptionally rich in lymphatics, by which much fluid can soften the tissues.

As there are no glands in the vagina, it is kept moist from the uterine secretion which runs into it; and, also, by the transudation of fluid from the sub-epithelial lymph vessels. The latter factor is most marked in pregnancy.

The secretion ordinarily found in the vagina is acid. The normal secretion of the uterine mucosa is alkaline. Consequently a change occurs in the vagina. This is probably due to the action of the numerous microbes which flourish there.

Development of the vagina.—According to most observers its development occurs as follows:—

Attention has already been directed to the differentiation of the epithelium, which is early found in the lower end of the Müllerian ducts (*vide* p. 31); the lumen of the duct possessing columnar epithelium, the solid end below consisting of large polygonal cells. This end has been described as projecting outwards to the wall of the urogenital sinus, as Müller's eminence. This spot marks the future hymen, the centre of the mass of cells gradually breaking down.

At first the vagina is very short, 1 mm. in length. It gradually elongates *pari passu* with the formation of the urethro-vaginal septum and shortening of the urogenital sinus. As it does so, its epithelial cells become somewhat smaller, those next the mesoblast getting to lie in regular rows, those furthest from the mesoblast becoming flattened. There is as yet no distinct lumen. In an embryo at the third month may be seen, at the lower end of the solid vagina, an accumulation of the flattened central cells to form a bulbous mass clear in the centre, in which afterwards the cavity of the vagina is formed. External to this mass is a thin partition, which afterwards forms the hymen; its central portion usually gets absorbed.

Hart has shown that this takes place by multiple tubular ingrowths of epithelium covering the wall of the sinus, *i.e.* the outer surface of the hymen.

This process of increase of the central stratified cells, followed by absorption, gradually extends up towards the cervix, and takes place in such a manner as to lead to the formation of the rugæ on the vaginal walls, and on the vaginal portion of the cervix. This is completed by the sixth or seventh month. The rugæ can be seen on the cervix at birth. At this time cast-off portions of the stratified epithelium are found lying in the vagina. The muscular fibres first appear in the outer part of the vaginal wall about the fifth month, the same time as it is first seen in the uterus.

Berry Hart's view.—Recently Berry Hart has advanced the following view:—

Until the third month of fœtal life, the vagina is formed by the coalesced Müllerian ducts, ending blindly at their lower end; there is then no lower aperture, no hymen.

In the beginning of the third month a proliferation of the epithelial lining of the lower ends of the Wolffian ducts takes place, forming what he calls the Wolffian bulbs; peripheral cells are active, the central ones become less active and arranged in layers of squamous cells, resembling the structure of the vaginal epithelium at full time, as in the adult state.

The bulbs coalesce and break down in the centre; at the same time their proliferating epithelium spreads up the Müllerian canal, displacing its epithelium, maps out the fornices, and covers the vaginal portion of the cervix, along with a small part of the lower end of the cervical canal. The hymeneal opening is brought about by the epithelial involution from the urogenital sinus meeting the distended Wolffian bulbs.

Hart believes that the Wolffian ducts are epiblastic in origin, and that this is the explanation of the skin-like covering of the vagina and vaginal portion of the cervix. The outer part of the hymen is, therefore, derived from the urogenital sinus, the inner part from the Wolffian bulbs.

Changes in the vagina after puberty.—In a woman who has been subjected to coitus for some years, the vagina is somewhat stretched, and the walls made less rugose than in the nulliparous condition. In a woman who has borne children, these features are very much more marked; indeed, the rugose condition may entirely disappear. After the menopause, the lumen shrinks in size, mainly in the upper part, so that it becomes somewhat conical, the vaginal portion of the cervix remaining as a very small papilla, often scarcely recognisable to touch. In a multipara the walls become smooth at this time.

In a woman who has married late and has become pregnant, the vaginal walls do not, as a rule, become so lax and distensible as in a young woman. They are of tougher texture.

THE HYMEN.

In the nullipara the hymen is usually a thin circular perforated membrane, which separates the vagina from the vulva. It consists of connective tissue, covered on both sides with stratified squamous epithelium.

Variations are found as regards the position of the hymen, according to the depth of the vestibule. In negro women the deep vestibule is common, the hymen, therefore, appearing rather far from the vulva.

Usually, the free margin projects outwards, the inner surfaces of the lateral halves being more or less in apposition. Sometimes it is formed as a projecting collar. The opening in the hymen is visible when the vulva is opened and the labia put on the stretch.

The opening is rarely central. Usually it is nearer the anterior than the posterior margin; often it is so far forward as to give the hymen the shape of a half-moon. The free edge is smooth or irregular. Sometimes there is a double opening, one being in each half. Occasionally, only a small, round opening or vertical slit is found, or there may be several small openings. Sometimes the slit is oblique, the left lip being rather posterior, and the right anterior. When the opening is very large, the hymen has a falciform shape. Sometimes the margin is notched so as to form the *denticulate* hymen. This may be taken for a lacerated hymen; the notches, are, however, usually regularly placed, two being in front and two behind (Pozzi), and the free border can be shown to have no traces of cicatrisation. Sometimes only one notch is found, sometimes two; in the latter case a tongue-shaped projection may be formed, giving rise to the *lingulate* hymen. Rarely a *fringed* hymen is found. Sometimes there is a thick band on the posterior part of the hymen—a prolongation of one of the columns of the vaginal walls, especially the posterior.

The size of the opening varies as well as the distensibility of the hymeneal structure. Ordinarily a finger can be passed into the vagina gradually without causing pain, if the hymen be not stretched by very wide separation of the legs. In all cases continued coitus causes a stretching of the structure, and, in most instances, laceration, varying in amount in different cases.

According to Brouardel and Laugier, a laceration of the hymen may heal completely, so as to appear uninjured; on careful examination, however, the white cicatrix may be found.

After the birth of a child it is usually torn and changed to a number (usually three to six) of tags, known as the *caruncul*æ *myrtiformes*. This may also take place after a miscarriage, to a certain extent. But it is important to note that often after a miscarriage, and occasionally after a full-time labour, no appearance of tearing may be visible, only great stretching having taken place.

Infantile hymen.—In the infant the hymen is relatively somewhat more deeply situated than in the adult, owing to the depth of the vestibule. As compared with the adult condition it is, relative to the size of the labia, rather largely developed, and may sometimes be mistaken for the labia minora. Usually it projects forwards, like the inverted finger of a glove, or with the lateral halves in apposition by their inner surfaces; it may be annular, or be folded like a tobacco-pouch (Pozzi). The rugæ and pillars of the vagina are prolonged upon the posterior wall.

In young girls, if the thighs be widely separated, the hymen is stretched, and is rendered more difficult to penetrate. If they be brought together, the hymen may be considerably stretched, so that sometimes a finger or even a penis may be able to enter the vagina (Brouardel).

Sometimes a congenital condition is found in which there is quite a depression external to the hymen, above the fourchette. A similar appearance has also been described by Dolbeau as the result of attempts at intercourse, when penetration of the hymen was not effected.

According to Pozzi, there may be very often seen in children (and sometimes in the adult), a kind of hymen surrounding the urethra continuous with a raised band (which is composed of two lateral halves), which is again continuous with the collar of the hymen at the entrance of the vagina. According to Pozzi, this whole hymeneal arrangement is the homologue of the corpus spongiosum in man, the mesial band being known as the male vesti-

bular band, and corresponding to the frenum found in male hypospadias.

Comparative note.—In none of the lower mammals is a distinct circular hymen found, though in many—*e.g.* horse, cow, pig, elephant, monkey, etc.—a constriction marks the lower end of the vagina.

In several, an antero-posterior band is found—a condition sometimes found in woman. In mice a plug of epithelial cells closes the lower end; this is renewed after each labour. I have already pointed out that in ornithorhynchus the lower end of each uterine duct is closed by a membrane.

Development of the hymen.—Various views are held:—

1. For a long time it has been held by many that the hymen was a mere projection of the vaginal walls (Blandin, Henle).

2. Pozzi, who regards the hymen and the rest of the hymeneal apparatus described above as the homologue of the corpus spongiosum in man, describes the hymen as being developed from part of two lateral elongated projections, arising from the junction of the vagina and urogenital sinus, extending as far forwards as the clitoris. These advance towards the middle line and blend completely in front of the vaginal and urethral orifices, the median blended portion left in the middle line of the vestibule being known as the male vestibular band.

The first distinct trace of this development is found at the nineteenth week. When complete, the male vestibular band, the urethral hymen, and the vaginal hymen may be recognised.

3. According to most authorities the hymen is simply formed from the septum, which early divides the urogenital sinus from the vagina. The opening in it is produced by the involution of the epithelial covering of the urogenital sinus.

According to Hart (*vide* p. 36), the lower part of the vagina is developed from the Wolffian duct. According to Nagel and others (*vide* p. 36), it is of Müllerian origin. The latter is most commonly believed.

THE EXTERNAL GENITALS.

The external genitals occupy a triangular area in the pubic region of the pelvis. They consist of *mons veneris*, *labia majora*, *labia minora*, *clitoris*, *vestibule*, *fourchette*.

The **mons veneris** is the thick, fatty prominence, situated anterior to the pubes. It is covered with abundant crisp, curly hair, the upper limit of which is a sharply

defined transverse border. Occasionally the arrangement of the hair, as it is found in males, is met with, namely, extending up towards the umbilicus in a triangular shape.

The **labia majora** are two thick folds of skin continuous with the mons veneris (sometimes known as the anterior commissure of the *labia*), extending backwards towards the perineum. Usually they thin out in their posterior parts, so that they are not raised above the level of the surrounding skin. The anterior margin of the perineum is called the *posterior commissure* of the labia or *fourchette*. Sometimes a distinct transversely curved ridge is formed by the union.

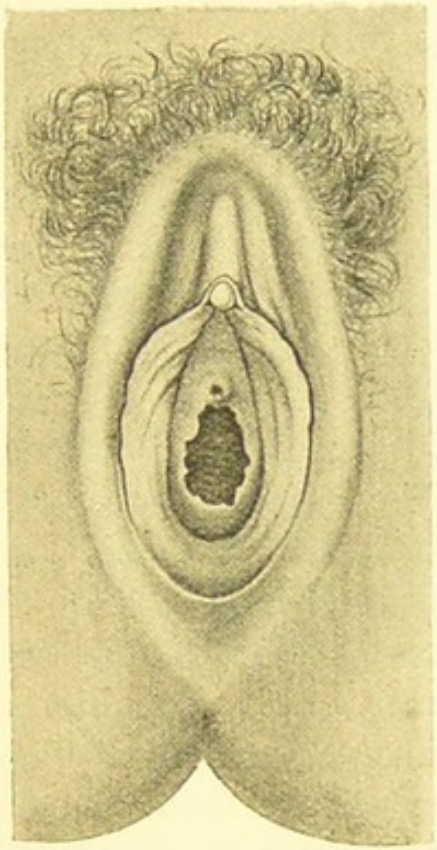

FIG. 20.—External genitals of virgin. The labia are separated artificially. The following parts are seen :—

Mons veneris.	Urethral orifice.
Clitoris.	Hymen.
Labium majus.	Fourchette.
Labium minus.	Anus.
Vestibule.	

On their outer surface they are covered with hair, which gets scanty and short towards the posterior ends. In the skin are numerous sweat and sebaceous glands. The subcutaneous tissue consists of a network of connective tissue, with abundant elastic fibres, in the meshes of which is a large quantity of fat. In the deepest portion is a rich plexus of veins communicating with those in the abdominal walls, with the vesical and vaginal, with the external hæmorrhoidal, and with the obturator veins.

The outer ends of the round ligaments blend with the tissue of the upper portions of the labia. Sometimes the persistent canal of Nuck extends into the upper end.

The **labia minora,** or **nymphæ,** are two small folds of skin internal to the upper parts of the labia majora, one on each side. They are moist and of a reddish tinge. Usually they do not project beyond the labia majora. When they do, the outer portions become brown in colour. Anteriorly, they approach the middle line, and each divides into two parts. The upper of these blend to form a covering to the glans clitoridis—the prepuce. The lower blend at a sharp angle under the glans to form the frenum or suspensory ligament of the clitoris. Posteriorly, the labia usually spread out gradually and are lost in the labia majora about half-way down the latter. Sometimes they extend backward as distinct structures, and form a well-marked ridge on the anterior margin of the perineum. (This condition is usually found in girls.)

The labia are covered with ordinary stratified squamous epithelium.

In the erect posture the labia majora and minora lie almost parallel to the horizon. The inner surfaces of the former are in apposition, when well developed, and under ordinary conditions. The latter are always in apposition save when actually moved apart.

Sebaceous glands are present, especially near the anterior ends. From these the smegma is formed, which is found about the clitoris. I have also found sweat glands. There are no mucous glands.

In the papillæ of the skin, I have found the following nerve endings :—

(*a*) **Krause's end bulbs.**—These are the most numerous in the labia minora. They are found in the papillæ of the skin and in the deepest layers of the chorium. They appear ovoid, oblong, and round in different sections.

In and near the prepuce are compound globular endings, consisting apparently of two single end bulbs bound together. Whether these have any relation to the genital corpuscles found in the clitoris, it is impossible to say.

(*b*) **Pacini's or Vater's corpuscles.**—These are few in number,

and are found in the upper parts of the labia. Besides the well-known single form, I have found double and triple forms. The double corpuscle consists of two single bodies, each of which has a central core surrounded by delicate concentric layers, both being enveloped in a common capsule made up of several concentric coats. In a few instances I have found that the individual corpuscles are separate at one end, though bound together in a common sheath in most of their length. In the triple corpuscle two are within a common capsule; the third, a small one, being in the wall of one of the larger ones. In some corpuscles a single axis cylinder, and in others a double one is found.

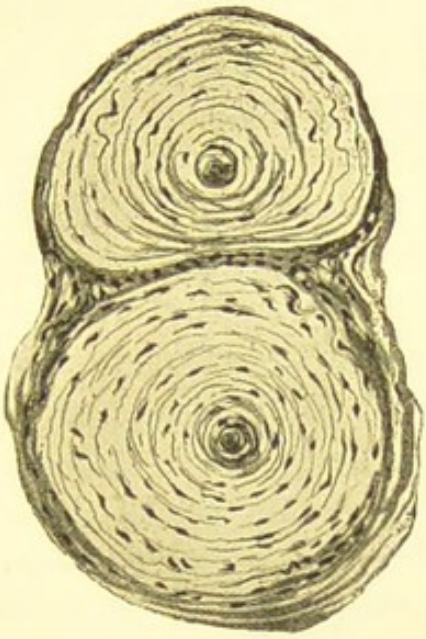

FIG. 21.—Double Pacini-Vater corpuscle.

(*c*) **Wagner-Meissner touch corpuscles.**—I have found a few scattered ones. Krause denies their presence. Those who have described large numbers have probably mistaken the ovoid or oblong sections of Krause's end bulbs for them. Krause has referred to the poorly developed sense of touch in the labia minora. I have tested the tactile sense, and have found that the prepuce is more sensitive than the labia minora, and these more sensitive than the labia majora and mons veneris. By Weber's test, the shortest distance at which two points can be distinctly recognised is, on the prepuce, 1 cm. ; on the labia minora, 1.25 cm. ; on the labia majora, 4 cm.

(Carrard has described in hypertrophied nymphæ an end organ like Ihlder's, found in certain birds. I believe this to be either a touch corpuscle or an end bulb, pathologically altered. I have been unable to distinguish it in the normal nymphæ.)

Note.—There are conflicting opinions as to the part played by the labia minora in the production of the sexual sense. If Krause be right in relating it to the special genital corpuscles first described by him, then, probably, the nymphæ serve no special sexual function. I have not found Krause's genital corpuscles in the nymphæ.

The clitoris.—The clitoris, corresponding to the male penis, is situated in front of the lower margin of the symphysis at the upper end of the labia minora. It consists of two crura, body and glans.

The *crura* are two in number, one on each side. Each is attached posteriorly to the bone formed by the blended descending pubic and ascending ischial ramus. Thence they run upwards, forwards, and inwards, and meet under the subpubic ligament to form the body of the clitoris. Each crus is covered with the ischio-cavernosus muscle.

The corpus clitoridis in the erect condition is about $\frac{3}{4}$ in. in length. It is not straight, but bent, so that a sharp concavity is on its under surface. It is made up of the two crura, consisting of cavernous tissue, bound in a fibrous capsule and with a septum between, which is perforated in several places. The fibrous capsule is continuous on the anterior part of the under surface with the frenum (suspensory ligament) by which the corpus is fastened to the lower anterior part of the symphysis pubis.

The *glans* is a small acorn-shaped body, varying in dimensions up to the size of a pea, and situated at the anterior end of the corpus. It is not directly continuous with it, but is connected by the pars intermedia of the bulb. It corresponds to the glans penis in the male, but is not perforated by the urethra. On its under surface is a triangular space between the attachment of the two layers of the frenum. It is made up of cavernous tissue, its outer surface being covered with a thin layer of stratified squamous epithelium.

The arteries of the clitoris are branches of the internal pudic. They run in the crura and become the dorsal arteries of the clitoris. The veins open into the pudic plexus; those of the glans open into the pars intermedia of the bulb.

In the glans I have found the following nerve endings:—

1. *Wagner-Meissner corpuscles*, very few in number.
2. *Krause's end bulbs.*
3. *Vater-Pacini corpuscles.*—These are few in number, and are situated in each half of the posterior part of the glans, near the junction with the prepuce. They are mostly compound.
4. *Genital corpuscles of Krause.*—These are found especially in two

groups, one on each side of the middle line, especially abundant in the anterior part. They are irregularly rounded or oblong, forming several compartments, in which the terminal nerve-fibres lie. These vary in shape considerably, according to the planes in which sections are made.

The nerve endings in the prepuce have already been described.

Note.—The clitoris is capable of becoming erect and hard; probably the mechanism by which this is brought about is similar to that found in the penis.

The ischio-cavernosus muscle (erector clitoridis) of each side is inserted into a fascia, which envelops the posterior part of the corpus clitoridis. By this arrangement, contraction of the muscles can cause a constriction which leads to a venous engorgement of the organ.

FIG. 22. — Genital corpuscle of Krause.

Development of the clitoris.—At first the clitoris appears as a projection—the sexual eminence, at the anterior part of the urogenital sinus. During the first two months no prepuce can be distinguished. This takes place probably about the third month, as Hart has described, as follows:—

A thimble-like involution of the epidermis occurs, the open base reaching what forms the corona of the glans. The central epithelial cells of the involution are less active, and desquamate, whereby a slit is left between the glans and the covering prepuce. If a coronal section be made through the sexual eminence at this stage, the epithelial involution appears sickle-shaped.

The vestibule.—The vestibule is the smooth, red, triangular surface, whose apex is formed by the frenum of the clitoris, base by the hymen, and sides by the labia minora. In the middle line at the base lies the external orifice of the urethra. In the nullipara the slit of the urethral opening is triradiate in shape; on stretching the vestibule transversely, the slit becomes transversely crescentic, the concavity looking backwards. Between the orifice and the clitoris is sometimes seen a slightly raised ridge, called

by Pozzi the "male vestibular band." It surrounds the orifice of the urethra, and passes into the hymen. Pozzi believes it to correspond to the anterior part of the corpus spongiosum, which surrounds the male urethra.

Several small depressions of various depths exist on each side between the urethra and the nymphæ; they are more noticeable in multiparæ.

Close to the hymen, behind the urethral orifice, a few small mucous glands are found.

The corpus cavernosum urethræ.—This structure, composed of erectile tissue, consists of a central and two lateral portions.

The central portion, known as the *pars intermedia*, lies in front of the urethra, and anteriorly forms the connection between the glans and corpus clitoridis. It rests internally against the lower anterior margin of the symphysis, the vestibule being external to it. The lateral portions, known as the bulbs of the vagina, are elongated bean-like structures (3–5 cm. long, 1–5 cm. wide, 1 cm. thick), which lie, one on each side of the *introitus vaginæ*, in relation internally with the anterior layer of the triangular ligament in the greater part of their extent; at their posterior extremities they partly cover the Bartholinian glands.

Considerable variations are found in the extent to which the spongy body is developed. Usually, the central portion becomes relatively less pronounced as the child grows older; generally, in adult life, it is not visible as a projection in the middle line of the vestibule. It varies also in the region of the urethral orifice and hymen. It surrounds the urethra, and may occasionally project somewhat into the hymen, making this structure very vascular.

The corpus cavernosum is erectile tissue, and is composed of tortuous anastomosing blood vessels in a framework of thin connective tissue. On section, it has a spongy appearance. Blood enters the bulbs at their posterior ends from

branches of the pudic arteries, while the pars intermedia communicates with the arteries of the clitoris. The outlet veins are mainly at the posterior ends of the bulbs, communicating with the pudendal veins, the inferior hæmorrhoidal and the vaginal plexus; the anterior parts of the bulbs and the pars intermedia join the veins lying under the vestibule.

Under sexual excitement, the corpus cavernosum enlarges owing to congestion of its vessels. This is brought about, partly, by the constriction of the clitoris, caused by the contraction of the ischio-cavernosus muscles, partly by the contraction of the bulbo-cavernosus (sphincter vaginæ). These latter cover the bulbs as they extend from the perineum forwards, to end in a fascia which embraces the corpus clitoridis.

The Bartholinian glands.—These structures, corresponding to Cowper's glands in the male, vary in size from a pea to a bean, and lie one on each side of the vaginal orifice, partly under cover of the posterior end of the bulb of the vagina, partly under the bulbo-cavernosus (sphincter vaginæ) muscle. In some cases they are entirely covered by the latter muscle. Sometimes they are partly embedded in the spongy tissue of the bulbs. Internally, they are in relation to the triangular ligament.

Each gland consists of a large number of divisions lying in a connective tissue framework, containing some smooth muscle fibres. Each division, lined with goblet-like mucus secreting cells, communicates with the main duct of the gland, which extends from the inner anterior margin forwards to the posterior angle of the vestibule, where it opens on the inner margin of the labium minus close to the hymen. In the multipara the opening may be hard to find owing to the irregularities of the caruncules myrtiformes. The outer part of the wall of the duct consists of connective tissue with some non-striped muscle.

It is lined in the great part of its extent with cylindrical

epithelium; at the outer end with stratified squamous epithelium.

Sometimes the gland is not a single mass, but consists of several separate portions. Sometimes it is entirely absent on one or both sides. Rarely, there may be two ducts on one side.

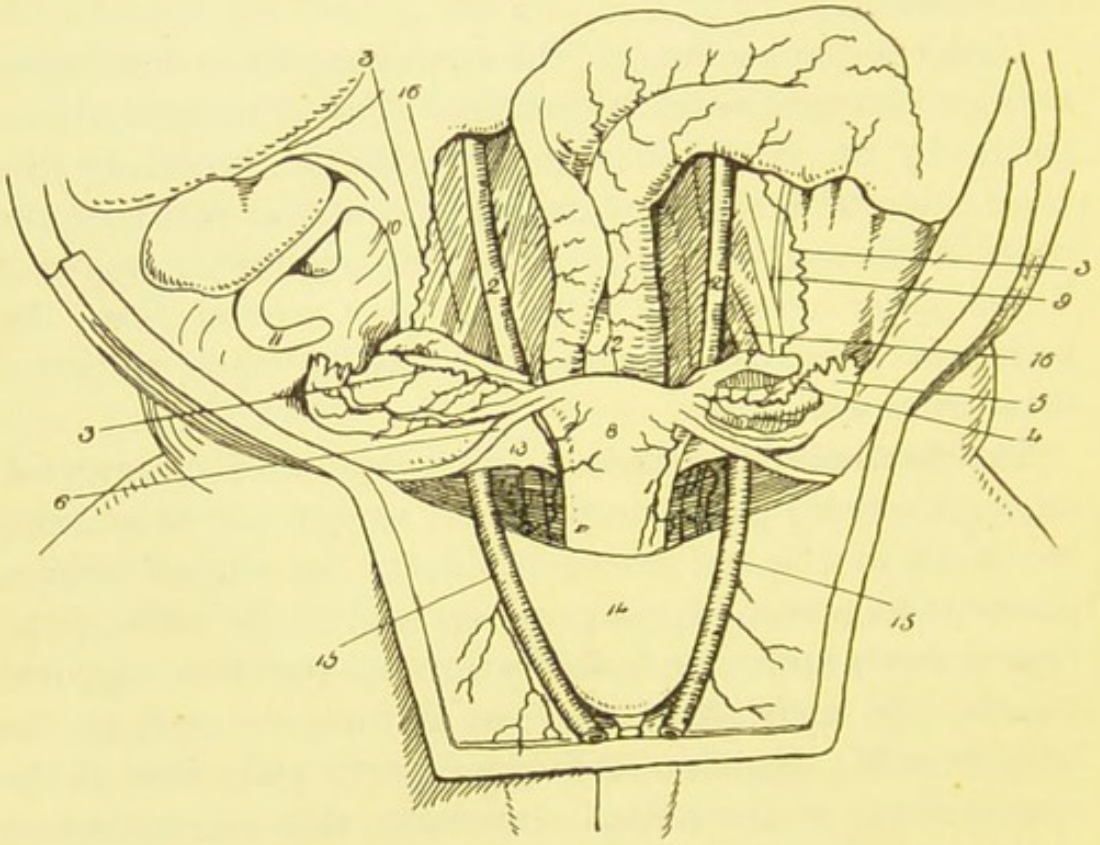

FIG. 23.—Internal genitals in new-born child.—After NAGEL.

1. Uterine artery.
2. Ureter.
3. Ovarian artery.
5. Fallopian tube.
6. Round ligament.
7. Ovary.
8. Uterus.
9. Ilio-inguinal nerve.
12. Rectum.
14. Bladder.
15. Umbilical artery.
16. External iliac artery.

Note.—The secretion is clear, glairy mucus, and serves as a lubricator of the vestibule and adjacent parts. During sexual excitement it may be expelled suddenly, by the muscular fibres in the gland stroma, as well as by the overlying bulbo-cavernosus muscle.

Development.—The Bartholinian glands are formed from a budding inwards of the epithelium of the urogenital sinus. By the time the uterus and vagina are distinct from one another, it is quite formed, though of small size. Mucus is secreted at an early age.

BLOOD VESSELS, LYMPHATICS, NERVES.

Arteries.

The **ovarian arteries** (named "spermatic" in the male) sometimes arise from the aorta, close to the renal

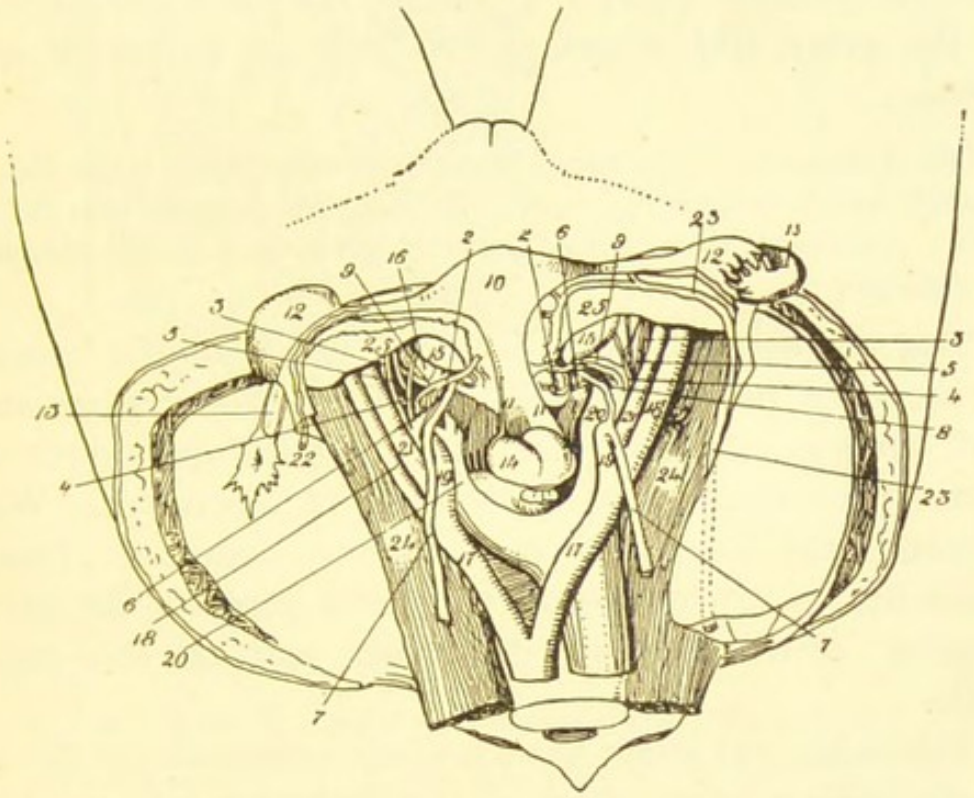

FIG. 24.—Dissection of pelvis from above.—From NAGEL.

1. Uterine artery.
2. Uterine vein.
3. Obturator nerve.
4. Umbilical artery.
5. Obturator artery.
6. Vaginal artery.
7. Ureter.
8. Vesical artery.
9. Vesico-vaginal vein.
10. Uterus.
11. Utero-sacral ligaments.
12. Ovary.
13. Tube.
14. Rectum.
15. Bladder.
16. Levator ani.
17. Common iliac artery.
18. External iliac artery.
19. Hypogastric artery.
20. Hypogastric vein.
21. External iliac vein.
22. Ovarian artery.
23. Ovarian vein.
24. Psoas muscle.
25. Broad ligament.

arteries. Usually, however, the left alone has this origin, the right artery arising from the right renal. Each extends

down the back wall of the abdomen, behind the peritoneum, on the inner aspect of the psoas, close to the inferior vena cava for a distance.

It crosses the ureter, enters the upper part of the infundibulo-pelvic border of the broad ligament, and runs tortuously through the latter, below the ovary, towards the upper lateral angle of the uterus, where it anastomoses with the uterine artery. Tortuous branches are given off to the ovary, and others, not so tortuous, to the Fallopian tube.

The explanation of the great length of these arteries is the distance through which the ovaries move. In early life they are near the kidneys. Afterwards they descend into the pelvis, their vessels elongating accordingly.

The uterine arteries.—These arise from the anterior divisions of the internal iliacs. Each passes downwards and inwards through the broad ligament, towards the cervix, near which it passes in front of the ureter. When it crosses the latter it divides into two branches. One of these breaks up into small twigs and supplies the cervix, sending divisions down the upper part of the vaginal walls.

The other and larger branch winds tortuously up the side of the corpus uteri as far as the Fallopian tube, where it divides into two parts, the upper of which runs along the whole length of the tube, the lower anastomosing with the ovarian artery; in this way a considerable arterial network is formed in the broad ligament near the angle of the uterus.

The branches to the uterus run under the peritoneum tortuously. An anastomosis takes place between the vessels of opposite sides. At the isthmus a *circular artery* is in this way formed; from it the *azygos vaginæ artery* runs downwards. The twigs which penetrate the muscular part of the wall run more or less at right angles to the long axis of the uterus.

The vaginal arteries.—As a rule, these arise from the anterior division of the internal iliac. Sometimes they spring from the uterine or middle hæmorrhoidal. They run downwards and inwards to the sides of the vagina, dividing

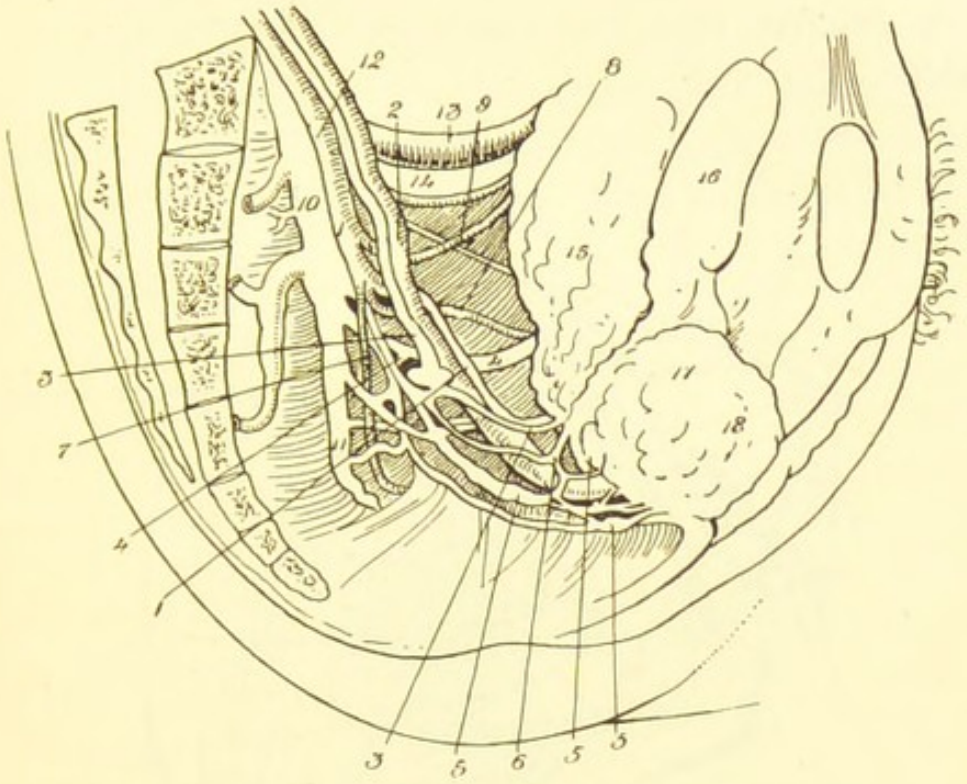

FIG. 25.—Dissection showing vessels of pelvis.—From NAGEL.

1. Uterine artery.
2. Ureter.
3. Uterine vein.
4. Obturator vein.
5. Vesico-vaginal vein.
6. Utero-vaginal vein.
7. Internal pudic vein.
8. Obturator artery.
9. Umbilical artery.
10. Hypogastric vein.
11. Internal pudic vein.
12. Hypogastric artery.
13. External iliac artery.
14. External iliac vein.
16. Uterus.
17. Cervix and vaginal fornix moved aside.
18. Vagina.

into several branches. Those of one side anastomose freely with those of the other, and with an azygos artery which runs down the middle of the anterior vaginal wall from the circular artery of the cervix.

Branches are given to the bladder and lower part of the rectum.

Vesical arteries.—The *superior vesical* are two or three twigs which spring from the pervious part of the obliterated hypogastric artery. They supply the upper part of the bladder, and give a branch to the urachus.

The *inferior vesical* is derived from the anterior division of the internal iliac, and supplies the lower portion of the bladder.

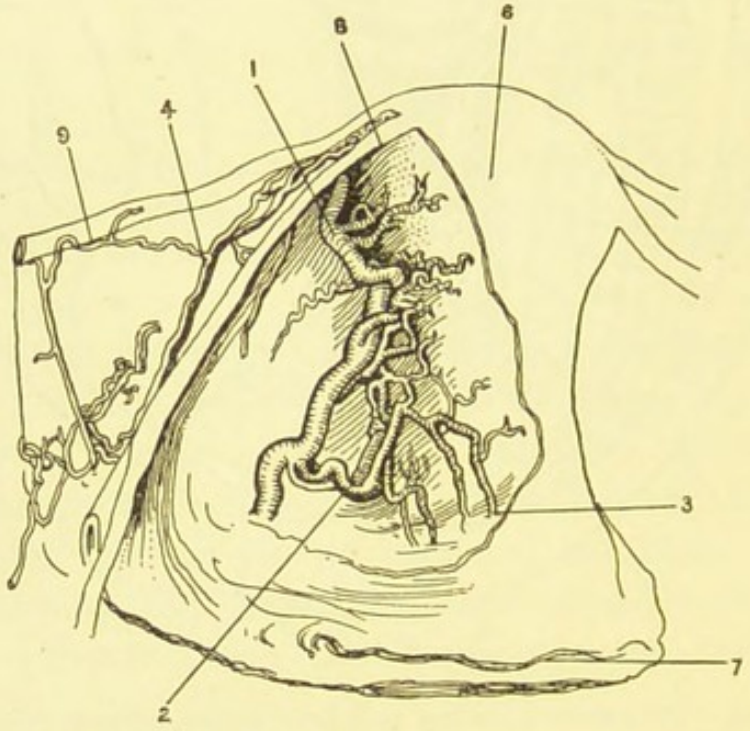

FIG. 26.—Dissection showing arterial branches in broad ligament of multipara.—From NAGEL.

1. Right uterine artery.
2. Cervico-vaginal artery.
3. Azygos vaginæ artery.
4. Right ovarian artery.
6. Uterus
7. Vagina.
8. Round ligament.
9. Fallopian tube.

The middle hæmorrhoidal arteries. — These vessels generally spring from the inferior vesical; sometimes, from the *internal pudic.* They ramify on the lower part of the rectum, anastomosing with twigs from the other hæmorrhoidal vessels and with the inferior vesical.

The internal pudic arteries. — Each of these forms one of the terminal branches of the anterior division of the internal iliac. After the vessel passes out of the

pelvis, it gives off the *inferior* or *external hæmorrhoidal artery*, supplying the region of the anus; the *superficial perineal artery*, supplying the labia; the *transverse perineal*; the arteries of the vaginal bulb; the *deep arteries* of the clitoris going to its body; the dorsal artery of the clitoris going to the glans. The inferior twigs of the *external pudic branches* of the femoral artery give some supply to the labia. A twig from the *deep epigastric* branch of the external iliac runs in the round ligament.

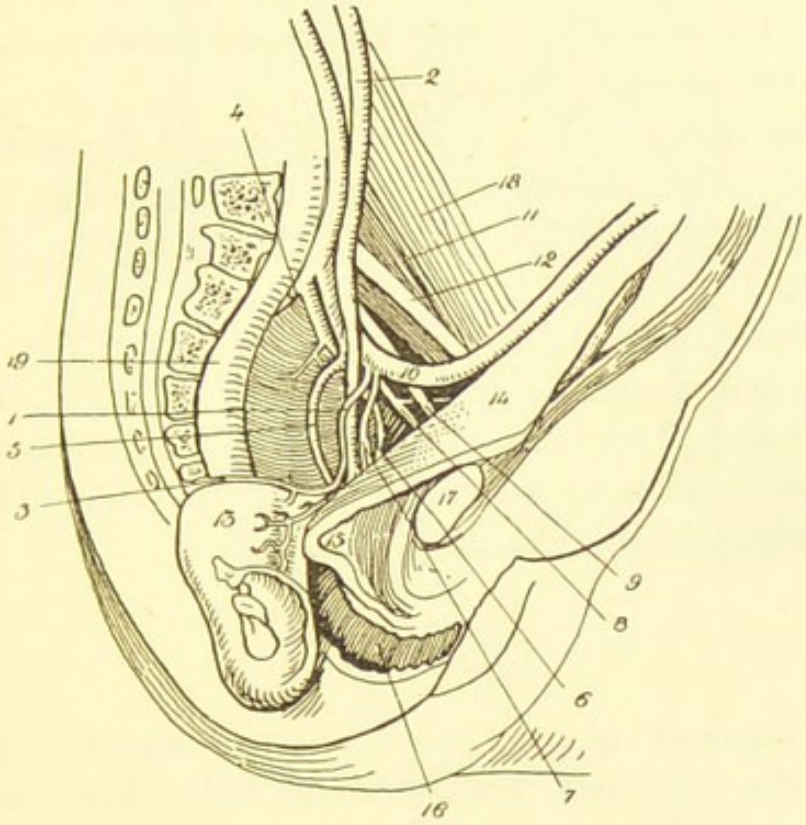

FIG. 27.—Left half of pelvis of new-born child.—From NAGEL.

1. Uterine artery.
2. Ureter.
6. Internal pudic artery.
7. Vesico-vaginal artery.
10. Umbilical artery.
11. External iliac artery.
12. External iliac vein.
13. Uterus turned down.
14. Bladder.
16. Vagina.

VEINS.

The veins of the pelvis form a large network. They possess as a rule no valves. To different parts of the

network special names are given:—The **uterine plexus,** surrounding the uterus; the **ovarian** or **pampiniform plexus,** in the broad ligament; the **vaginal plexus,** one outside the muscular coat, and one in the submucous tissue; the **vesical plexus**; the **hæmorrhoidal plexus,** outside the mucosa of the lower part of the rectum.

From these plexuses blood is carried into the main venous trunk by the ovarian, uterine, vaginal, and vesical veins. The hæmorrhoidal plexus is also drained by the superior hæmorrhoidal vein which enters the portal circulation. There is thus a communication between the pelvic and portal venous systems.

At the upper end of each ovarian vein there is usually a valve. This is often absent in the left side, when in place of it there is one in the left renal vein near the junction.

The veins of the labia correspond to the arteries. Those of the labia minora communicate with the pars intermedia of the bulb. The veins of the clitoris communicate with the vesical plexus by means of the dorsal vein. The veins of the bulb join the vaginal plexus.

Lymphatics.

The inguinal glands, external to Poupart's ligament, receive the lymphatic vessels of the vulva, lower fourth of the vagina, and lower part of the urethra.

The hypogastric or internal iliac glands, lying sub-peritoneally between the external and internal iliac vessels, receive the vessels of the bladder, upper part of the urethra, upper three-fourths of the vagina and cervix uteri.

The sacral glands, lying on the anterior wall of the sacrum and in the mesorectum, receive the vessels from the rectum.

The lumbar glands (median group), lying along the

common iliac vessels, the aorta and vena cava, receive lymphatics from the glands within the pelvis.

The glands of Guérin in the obturator foramen communicate both with the lymphatics of bladder, vagina, and cervix, and with external lymphatics in the inguinal region.

The uterine lymphatic system, by means of the round ligaments, communicates with the inguinal vessels.

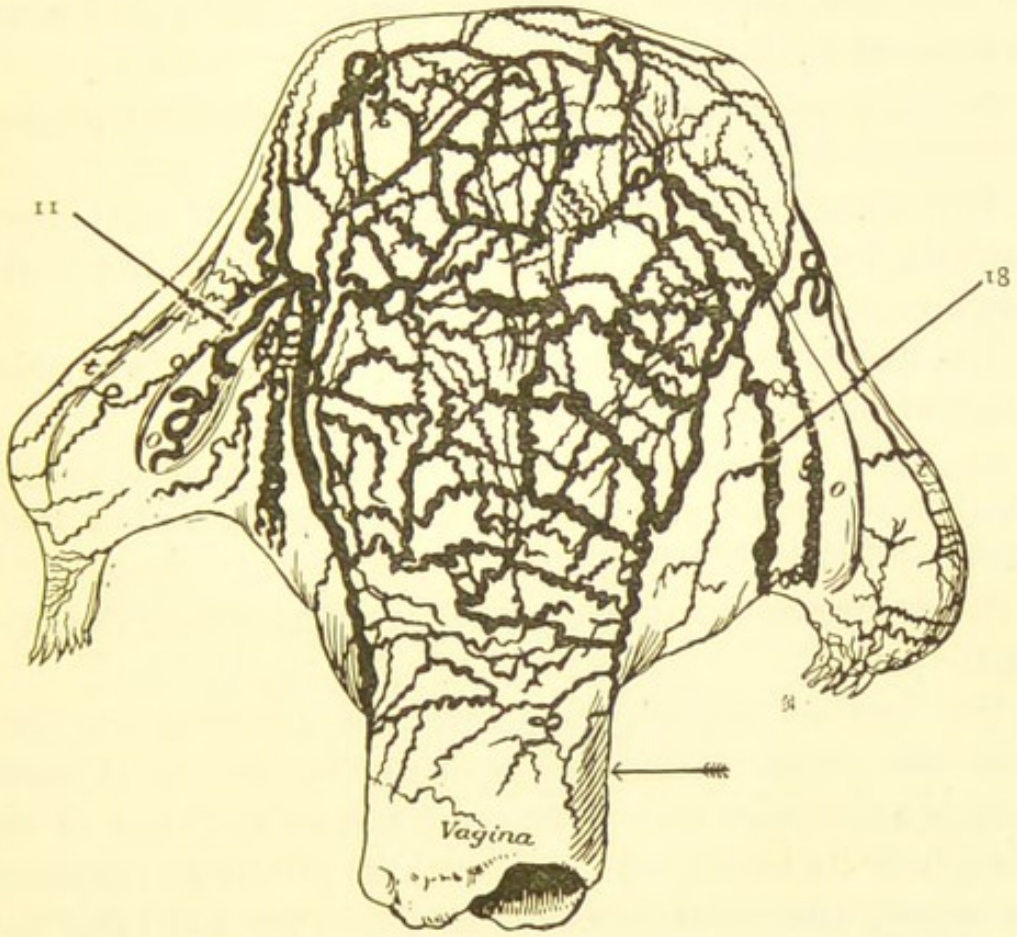

FIG. 28.—Post-partum uterus with injected arteries.—From NAGEL.

o. Ovary.
t. Fallopian tube.
11. Left ovarian artery.
18. Right ovarian artery.
An arrow is placed below the os externum.

NERVES.

The uterus is supplied both by the spinal and sympathetic nerves. The latter are derived from the hypogastric plexus, which lies between the common iliac arteries. It is a continuation of the aortic and renal plexuses. It extends down-

wards in two main branches, one on each side of the rectum. These are joined by twigs, especially from the third and fourth sacral, and also by branches from the sacral sympathetic ganglia.

From each of the pelvic plexuses is derived a vaginal, hæmorrhoidal, and a vesical plexus. The part which passes in towards the cervix joins the cervical ganglion, situated on each side, close to the vaginal roof. This ganglion was discovered by Robert Lee.

For a long time there was a dispute as to this ganglion, Sharpey being prominent in denying its existence.

This ganglion is surrounded by a dense plexus (utero-vaginal), and is connected with a vesical plexus, in which a ganglion is also situated.

The nerves of the uterus arise mainly out of these three ganglion plexuses, especially from the cervical.

Recently it has been suggested that the cervical ganglion plays an important rôle in connection with labour, pressure on it as the cervix expands leading to the continuance of the process.

A few nerves go directly to the uterus from the hypogastric plexus.

The ovaries are supplied from the renal plexus, and from the aortic plexus of sympathetic nerves. Usually there is an ovarian (spermatic) ganglion on each side of the aorta, near its lower end. The ovarian plexus accompanies the artery, and gives branches to the ovary and tube, and communicates with the uterine nerves, a ganglion being formed near the uterus.

The Fallopian tubes are supplied by branches of the uterine plexus as well as by the ovarian. The vagina is supplied by the cervical and vesical ganglia and by branches from the third and fourth sacral nerves.

As regards the finer ramifications in the uterus and vagina, there is a dense network in the muscular part of the wall and in the mucosa, containing many ganglion cells. End organs are found close to the epithelial layer.

The external genitals are supplied by sympathetic nerves running with the arteries, and by twigs of the genito-crural branch of the lumbar plexus, as well as by those from the inferior pudendal and internal pudic branches of the sacral plexus. The clitoris is supplied by twigs from the latter nerve.

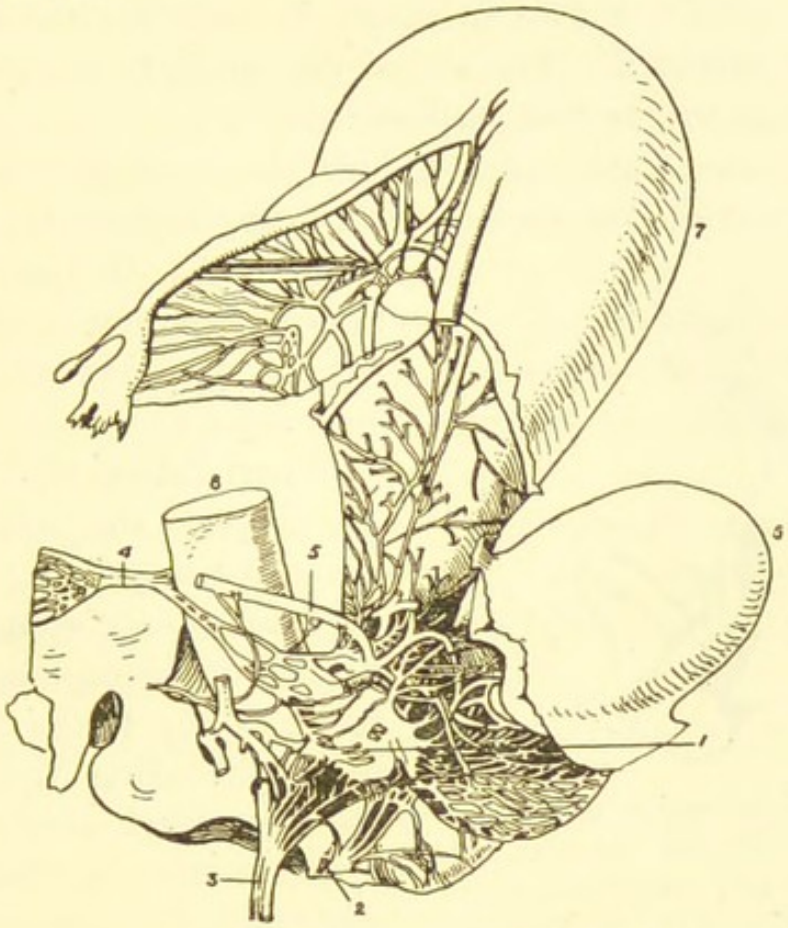

FIG. 29.—Nerves of right side of uterus, bladder, vagina, and rectum. —From FRANKENHAUSER.

1. Cervical ganglion.
2. Fourth sacral nerve.
3. Second and third sacral nerves.
4. Hypogastric plexus.
5. Ureter.
6. Bladder.
7. Uterus.
8. Rectum.

THE BLADDER.

The empty bladder normally lies below the level of the pelvic brim, behind the pubes.

In this state, when relaxed, the upper surface is concave.

On vertical mesial section the slit of the cavity forms with the urethra a Y-shape, the anterior limb being longer than the posterior. The bladder may now be described as having an *upper* surface; *an anterior*, in relation to the pubes; and a *posterior*, in relation to the vagina.

When empty and contracted, the bladder, on vertical mesial section, is oval in shape, its walls are thick, and its mucosa wrinkled. The slit of the cavity is a single curved one, its concavity looking forwards.

When moderately filled, the bladder is rounded on vertical mesial section, its upper surface being somewhat above the brim level. In this state the widest diameter is the transverse. (In man this is the narrowest.)

FIG. 30. — Section showing the shape of the bladder when empty and contracted.

When distended, it becomes egg-shaped, the lowest part being the large end. Its long axis varies according to the degree of distension, as well as according to the condition of neighbouring viscera. In the distended condition the longest axis is usually the vertical.

Distension may take place until the fundus reaches the umbilicus. In this state it sinks somewhat in the pelvis, unless prevented by some special pelvic condition.

The female bladder, according to Luschka and Henle, is naturally of smaller capacity than that of the male. Usually the female is thought to be greater.

The superior surface is covered with peritoneum, and is in relation to the uterus. The reflections of the peritoneum from the bladder form folds known as the *false ligaments*. There are two behind, the utero-vesical; two laterally, the lateral; one in front, the superior, which passes from the

apex of the bladder. The summit is connected to the abdominal wall by a mesial cord, the urachus—the remains of the stalk of the allantois.

When the bladder becomes over-distended, it rises faster than it strips the peritoneum from the anterior wall. In this way a pouch forms between the bladder and the wall. In the greatest distension, the peritoneum is stripped from the wall above the pubes for about 2 in.

The lateral limit of the superior surface is formed by the obliterated cord of the hypogastric artery, which is connected with the superior vesical artery, and runs forwards and upwards to the umbilicus. Below this cord the bladder is in relation to paravesical connective tissue.

The anterior surface is normally in relation to the pubes. Occasionally its upper end rests just above the bone. The loose areolar tissue between the bladder and the symphysis is sometimes called the *space of Retzius*.

The posterior surface is in relation to the cervix uteri and the upper part of the vagina. There is loose cellular tissue between them. This surface is also called the *base* of the bladder.

The bladder is generally situated mesially, but it is often found slightly more to one side than the other.

In the erect position the opening of the urethra is the lowest part of the bladder.

Structure.—The peritoneal covering of the upper wall has been referred to. The muscular part of the wall is made up of an outer more or less longitudinal layer; a middle, thin, irregularly reticulated layer; and an inner, longitudinal coat.

The mucous membrane is pale pink in colour, soft, and rugose, save when the bladder is distended. It is loosely attached to the muscular part of the wall, except at the trigone. It is lined with stratified transitional epithelium, like that of the ureter, the cells varying in appearance according to the state of the bladder; in the distended condition they are more flattened out. The

rugosities of the wall of the empty bladder are due to the wrinkling of the mucosa and also to the ridges formed by underlying muscular fasciculi.

At the internal urethral orifice the mucosa is corrugated longitudinally. (This part of the bladder is called the neck.) Immediately behind it is the *trigone*, a triangular surface bounded by imaginary lines joining urethral and ureteral orifices. The mucosa of this area is smooth, being connected to the muscular coat by dense, firm connective tissue. In the non-contracted state, the sides of the trigone are about $1\frac{3}{8}$ in. in length.

The ureteral orifices are oval slits, and are directed forwards and inwards.

Between them the bladder mucosa is raised in a curved ridge, the convexity looking forwards. It is due to a submucous muscular band, which joins the ureters and binds them to the bladder. The ridge usually runs outwards and backwards from the ureteral orifices for a short distance. From the middle of this ridge a slight elevation projects forwards towards the urethral orifice, the *uvula vesicæ*.

Note.—In infancy the chief part of the bladder lies above the symphysis. It gradually sinks as the child grows, partly owing to its weight, to the erect position of the body, and to the increasing width of the pelvis. In a child of 6, Symington found the bladder still partly abdominal.

THE URETHRA.

The urethra is about $1\frac{1}{2}$ in. in length, and is directed from the bladder downwards and forwards parallel to the vagina, sometimes with a slight sigmoid curve. Its anterior and posterior walls are in apposition, save during micturition. The width of the closed tube is about $\frac{1}{4}$ in. The *external orifice* is a vertical slit, with slightly projecting ridges, situated in the middle line at the base of the vestibule.

The muscular part of the wall consists of smooth and striped layers.

The smooth muscle is arranged in an outer circular and in an inner longitudinal layer, separated by a considerable amount of connective and elastic tissue. There is a rich vascular arrangement, so abundant that some have given the name of *corpus spongiosum urethræ* to the non-striped layers.

The striped muscle lies external to the smooth layer, but is not evenly distributed. It is mainly in a circular bundle—internal sphincter, around the upper end of the urethra. A similar arrangement exists at the lower end; it is embraced by the anterior fibres of the sphincter vaginæ, from which it may be derived.

The mucosa is raised in longitudinal folds, one being especially marked mesially on the posterior wall, the so-called *crista urethralis*. The epithelial lining in the upper part is like the transitional epithelium of the bladder. Towards the lower portion the most superficial cells are somewhat flattened. Under the epithelium is white connective tissue and elastic fibres.

On the mucosal surface are numerous lacunæ and also acinous mucous glands, especially numerous at the upper part of the urethra. They often contain, in old people, small brownish masses, like prostatic calculi in men.

Very often two small blind glandular ducts are found in the posterior wall, opening at the external orifice. Sometimes they are mere crypts, sometimes they may be $\frac{1}{2}$ in. to $\frac{3}{4}$ in. in length.

There is a discussion as to the nature of these. According to Nagel, they have long been known as the *para-urethral ducts*, or as the ducts of Malpighi. More recently they have been known as the ducts of Skene. By some they are considered to be the remains of the lower ends of Gartner's canals.

Nagel denies this origin, and says that they are formed in early embryonic life as a depression of the epithelium covering the urogenital sinus, at a time when Gartner's canals have disappeared from every part save the broad ligaments.

Note.—The urethra is very distensible, all the folds being flattened out, save the mesial one of the posterior wall.

THE URETERS.

The ureters extend from the sinus of the kidney to the bladder. Their upper ends are enlarged to form the pelvis of the kidney. From the lower end of the gland downwards the ureter is a simple cylindrical duct. The whole length varies from 14 to 16 in. It runs downwards and inwards on the psoas muscle, under the peritoneum, towards the brim of the pelvis. The right ureter lies close to the inferior vena cava, and sometimes gets in front of it. At the brim it lies in the hollow on each side of the promontory. It crosses the external iliac vessels and lies in the space between them and the internal iliac, and is directed downwards and forwards, lying against the pelvic wall, covered by the peritoneum continuous with the posterior layer of the broad ligament. At the level where the uterine artery begins to curve inwards, the ureter leaves the pelvic wall.

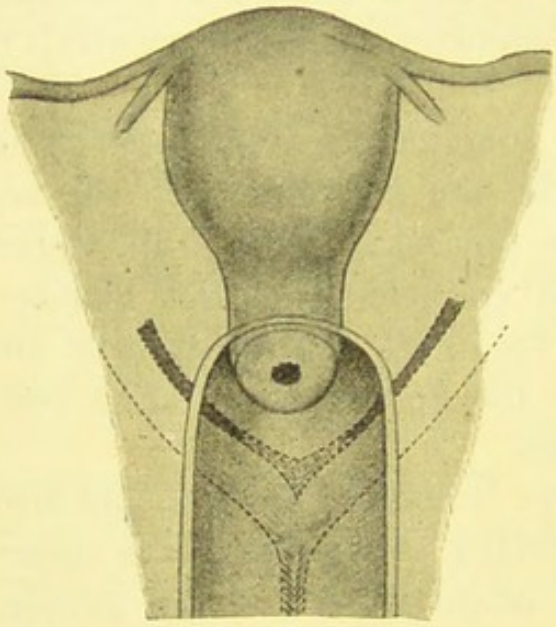

FIG. 31.—Diagram showing relation of ureters to cervix, vagina, and bladder.

Here the uterine artery, which has in its upper part passed external to the ureter, now arches in front of it, being separated from it by a space $\frac{2}{5}$ in. wide, filled with a venous plexus. The ureter curves in towards the cervix, approaching to within $\frac{3}{5}$ of an in. (0.8 to 2 cm. is the range of variation) from its lower portion. It then passes in front of the uterus towards the base of the bladder. Opposite the lateral fornix it is separated from the vagina by a distance of $\frac{7}{16}$ in. (1 cm.), being surrounded by richly vascular tissue.

From a point opposite the lower part of the cervix it extends forwards and downwards between the vagina and posterior wall of the bladder for about 1 in. ($2\frac{1}{2}$ cm.), when it enters the bladder base, and runs through

FIG. 32.—Development of the external genitals.

The Müllerian tract is shown communicating with the allantois and the latter with the rectum. The beginning of the vulva is seen as a small depression of the skin.

FIG. 33.—Development of the external genitals.

The median depression has sunk inwards, so as to communicate with allantois and rectum forming the cloaca.

FIG. 34.—Development of the external genitals.

The perineal septum is shown, dividing the cloaca so as to form the urogenital canal and the anus. The vagina and bladder communicate with the urogenital sinus.

FIG. 35.—Development of the external genitals.

The perineum is shown completely formed.

FIG. 36.—Development of the external genitals.

The urethro-vaginal septum is shown, the urethra and vagina opening into the vestibule (lower part of the urogenital sinus).

Figs. 32–36 are from SCHROEDER.

its wall, obliquely forwards and inwards for about $\frac{1}{2}$ in. (1.3 cm.).

The distance between the ureters, opposite their point of crossing of the cervix, varies from $2\frac{15}{16}$ to $3\frac{9}{16}$ in. (7.5 cm. to 9 cm.); between their points of entrance into the

bladder, $1\frac{9}{16}$ in. (4 cm.); between the points of junction with the bladder cavity—in the empty condition, 1 in. (2.5 cm.), and, filled, $1\frac{3}{8}$ to 2 in. (4–5 cm.).

Note.—The connection between the ureter and the vaginal wall and between the cervix and bladder varies in different cases. Usually it is a loose one. If it be more or less firm, there will be increased danger of wounding the ureters, or of tying them in the operation of vaginal extirpation of the uterus, because they will be dragged down considerably as the cervix is pulled on. It is important, before applying the ligatures to the broad ligaments, to free the bladder from its connections with the cervix, and to apply the lower ones close to the cervix.

Development of the urinary tract and outer genitals.—Nagel's description may be taken. The allantois begins as a hollow extension of the posterior end of the primitive gut.

In the young human embryo (8 to 12 mm. in length) it appears as a curved canal extending from the cloaca to the navel, completely separated below from the gut. It is lined with low cubical epithelium. The Wolffian ducts open into its posterior wall.

That part of the allantois below the Wolffian ducts forms the urogenital canal. The upper part narrows towards the navel and gets gradually solid. At this period the Müllerian tracts are in a very early stage, and are not to be found in the region of the lower ends of the Wolffian ducts. On each side the ureter is found opening into the Wolffian duct, from which they arise as outgrowths. The junction of these two tubes forms a funnel-shaped passage, larger than either of its component parts, opening into the allantois.

From this level the Wolffian ducts pass upwards and outwards to the Wolffian bodies; the shorter ureters pass upwards behind, and external to them. Gradually, the ureter and Wolffian ducts become distinctly separated at their lower ends, opening separately into the allantoic canal, the ureters being external. This occurs before the Müllerian ducts have reached the urogenital canal.

Then begins the formation of the bladder. The part of the allantois immediately above the ureters forms a short spindle-shaped dilatation. This is found, in embryos, 2.4 cm. in length. It is lined with cubical epithelium, which becomes arranged in several layers.

From the remains of the allantois above the bladder is formed the urachus. As the bladder increases in size, the ureteric orifices are raised somewhat.

In the earliest human embryos observed, both Wolffian ducts and the gut open into the lower part of the allantois at about the same level.

At this period the anus is closed by the anal membrane, but it soon becomes perforated. Then, through increase of the septum lying between the Wolffian ducts and the gut, the lower part of the allantois (endodermal cloaca) is divided into two parts, of which the former gives rise to the urogenital sinus and the latter to the anus, both communicating with the ectodermal depression on a lower level—the true cloaca.

If, after separation of the ureters from the Wolffian ducts, the outer surface of the embryo be studied, the cloaca is seen as an antero-posterior depression, into the posterior part of which the gut opens, and into the anterior part the urogenital canal, a septum existing between them. It is covered with stratified epithelium.

The Wolffian ducts do not open into the cloaca, it must be understood, but into the upper part of the urogenital sinus.

The antero-posterior extent of the cloaca corresponds to the adult limit between the frenum of the clitoris and the posterior anal wall in the female (between the anterior wall of the urethra and the posterior anal wall in the male).

In both sexes the sides of the anterior part of the cloaca first become blended. Gradually, also, bridges of epithelium extend across the cloaca so as to leave openings communicating with the passages above.

At the anterior end of the united cloaca is found a lozenge-shaped area, situated at the base of the glans, in both sexes; this disappears in males, but remains in females.

In the meanwhile the Müllerian ducts have been extending downwards to the urogenital canal. This is reached in the embryo of 2.5 to 3 cm. in length. When communication is established between them, four canals, in all, open into the urogenital canal, namely, the two Wolffian and the two Müllerian, the latter being internal to the former, but at the same level. On the posterior wall of the canal where they open, a small projection is found, known as Müller's eminence. Both the Wolffian and Müllerian ducts are surrounded by a common mass of tissue, thus forming the so-called *genital cord*.

Henceforth the course of development differs in males and females. In the female, the Wolffian duct disappears save in the broad ligament, where it forms the organ of Rosenmüller and other remains. In embryos of 4 cm. and upwards only the Müllerian ducts are found opening into the urogenital canal. The latter and the gut, only, open into the cloaca at this time.

Through the development of the vagina from the lowest end of the blended Müllerian ducts, through the simultaneous shortening of the urogenital canal to form the urogenital sinus, and through the

flattening of the latter to form the vestibule, the vaginal orifice is brought to the pelvic floor.

Along with the development of the vagina goes that of the urethro-vaginal septum and the urethra.

Posteriorly, the perineum develops through union of both sides of the cloaca, taking place by means of an epithelial proliferation.

As regards the Wolffian ducts Nagel points out that at the beginning of the development of the vagina they begin to shrink, and that thereafter, as a rule, remnants are not found below the level of the junction of the uterus and the vagina. He does not believe that they are found in adult life as low down as the urethral orifice. Before the vagina is much developed, or the Wolffian ducts degenerated, the latter open into the urogenital sinus close to the *anlage* of the bladder.

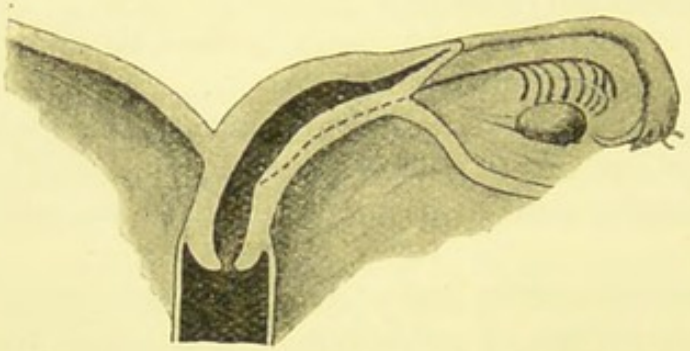

FIG. 37.—Diagram illustrating the persistent Wolffian duct in Kœberlé's case.

If the ducts persist they are more likely to be found in the anterior vaginal wall, opening at each side of the vaginal entrance, rather than in relation to the urethra; but no such occurrence has yet been clearly demonstrated.

Van Acheren has described a four-month embryo, in which small canals were found in the lower part of the vagina. They could not, however, be traced to the remains of the Wolffian duct in the broad ligament, and there is no proof that they were of Wolffian origin; Nagel regards them as the *anlage* of the Bartholinian gland.

G. Klein states that he found in a girl two ducts in the lower part of the vagina leading into the hymen, the lower end of one being slightly distended.

Kœberlé has described two interesting cases, in which the relations of persistent Wolffian ducts were clearly made out. In one of these there was a development of one horn of the uterus only, the other being rudimentary and imperforate. A persistent Wolffian duct (Gartner's canal) extended from the longitudinal tube of the organ of Rosenmüller, through the broad ligament, and obliquely down through the wall of the right cornu, entering it near the round ligament, and opening into the cavity of the uterus at the os internum.

In the other case there existed a uterus bipartitus and a vagina septa. The left half of the vagina was narrower than the right, and ended

about half-way down the latter, communicating with it by a small aperture. Opening into the left half of the vagina on its outer side was a small canal which extended upwards into the uterine wall—the remains of the Wolffian duct.

Dohrn has examined many specimens, but has never found traces of the duct much below the level of the vaginal fornix. Rieder has found remains in relation to the upper part of the vagina, but never near its lower end.

Nagel is inclined to believe that the condition of double ureter has been described by several writers as that of persistent Wolffian duct.

It is, indeed, not difficult to understand why Wolffian remains should rarely be found below the cervix. After the formation of the ureters, the ducts get cut off from the urogenital sinus, and, as the latter becomes shallower, its wall moves farther away from the ducts. At the same time, owing to the vertical development and extension of the vagina, the *anlage* of the cervix, at first on a level with the lower ends of the Wolffian ducts, and in very close relationship with them, is moved gradually farther away from the urogenital sinus, and with it, consequently, the Wolffian ducts are moved farther away.

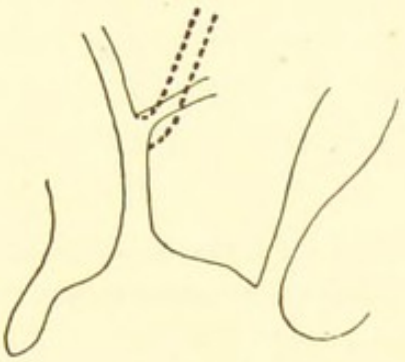

FIG. 38.—Development of the lower urogenital tract. —After NAGEL.

This diagram represents the ureters and Wolffian ducts (dotted line), opening at the same level out into the early urogenital canal.

It is, therefore, highly probable that the small crypts, known as Skene's or Malpighi's, or para-urethral ducts, are not derived from the Wolffian canals. According to Nagel these ducts are formed in early embryonic life by a depression of the epithelium covering the urogenital sinus, at a time when the Wolffian ducts have disappeared from the region of the vagina and bladder.

Very strong, too, is the evidence derived from pathological changes in the remnants of the Wolffian ducts. For a long time it has been known that the chief seat of such conditions is the broad ligament. Recently von Recklinghausen has shown, in an important monograph, that Wolffian remains may play an important part in the formation of adenomyoma and cystic adenoma of the wall of the tube or uterus. In the twenty-eight cases carefully studied by him, twenty-three presented these pathological conditions in the tube wall or upper part of the corpus uteri; but only in four cases could any trace of the Wolffian ducts be found below the level of the body of the uterus, and then only in the upper part of the cervix.

Cystic conditions below the level of the cervix are extremely rare. In the majority of cases they are lined with a single layer of cylindrical

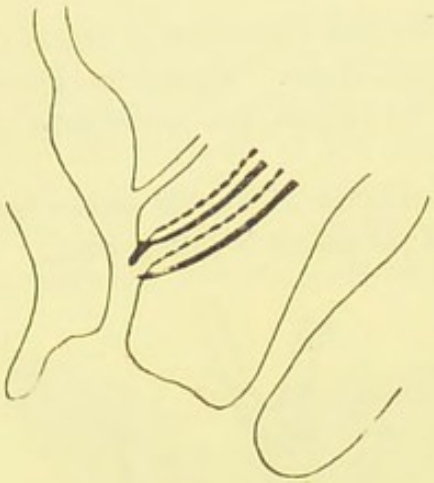

FIG. 39.—Development of lower urogenital tract. —After NAGEL.

The ureters and Wolffian ducts are represented opening into the urogenital canal at different levels. The Müllerian tract (heavy line) has reached the canal. The bladder has begun to develop.

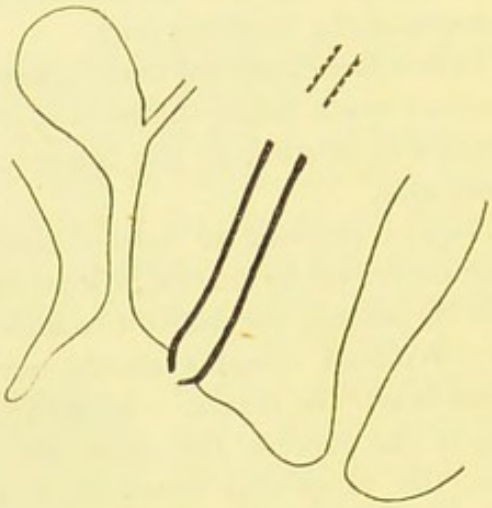

FIG. 40.—Development of the lower urogenital tract.—After NAGEL.

The vagina is represented as completely developed. Above it is seen a remnant of the Wolffian ducts. The bladder and urethra have become differentiated.

epithelium, sometimes with squamous epithelium. As to the Müllerian or Wolffian origin of these, no decision can be formed at present. Probably they are derived from both sources, most rarely from the latter.

THE RECTUM.

This part of the large intestine extends from the sigmoid flexure at the left sacro-iliac joint to the anus. The *first part*, 4 or 5 in. long, passes downwards, backwards, and to the right, as far as the middle of the third sacral vertebra; often this portion is displaced to the right half of the pelvis. It is covered almost completely in peritoneum, the two folds of which are attached to the sacrum as the meso-rectum.

The *second part*, 3 or 4 in. long, extends down and

forwards to the anal canal. In its upper part it is covered with the peritoneum, reflected from the posterior vaginal wall.

Below this the bowel is in relation anteriorly to the posterior vaginal wall. Its posterior wall is in relation to the sacrum, coccyx, and the ano-coccygeal body.

Structure.—The muscular wall is thick and consists of longitudinal and circular layers. The former extends all around the bowels, but is mainly aggregated in two bundles—an anterior and a posterior. The shortness of these leads to the sacculations found in the rectum.

The circular fibres are especially collected in thick bundles between the sacculations.

In addition, a small pair of muscles arise from the front of the second and third coccygeal vertebræ and pelvic fascia, and pass down to the posterior part of the anal canal, mingling with the longitudinal fibres. They are the recto-coccygeal muscles.

The **mucous membrane** is loosely connected to the muscular coat. When the rectum is empty and contracted, it presents numerous folds, most of which are obliterated when the bowel is distended. Some are permanent and are known as "valves" of the rectum or "plicæ recti." The largest is on the right side opposite the reflection of the peritoneum, the "*plica transversalis recti.*" On the left side, an inch above this, is another; and, an inch below, another, on the left side. The lower two folds together form a partial closure of the bowel, easily distinguishable by the examining finger. This sphincter-like arrangement has been called the "third sphincter of the anus."

The dilatation of the bowel below this valve is called the *ampulla* of the rectum.

The **anal canal** is the terminal portion of the rectum, surrounded by sphincters. It is an antero-posterior slit in the pelvic floor when closed, and is thus to be distinguished

from the lower part of the rectum, which is a transverse slit. It is an inch long in the empty condition of the rectum, shorter when the latter is loaded. It is directed downwards and backwards, and is related behind to the ano-coccygeal body; at the sides, to the ischio-rectal fat; in front, to the perineum.

Its mucous membrane is arranged in four or five longitudinal folds, the columns of the rectum.

The muscles which close the anal canal are the *external* and *internal sphincters* and the *levatores ani.*

The **external sphincter** is elliptical in form, and is placed beneath the skin around the margin of the anus.

The **internal sphincter** is continuous with the circular fibres of the rectum.

The **levatores ani** are described on p. 81.

The mucosa of the rectum and greater part of the anal canal is lined with columnar epithelium, and contains follicles of Lieberkühn closely arranged.

A narrow zone of the anus internal to the skin has no follicles. Its mucosa gradually changes into a skin-like character towards the margin of the anus.

CHAPTER III.

THE PELVIC PERITONEUM.

As the peritoneum descends from the posterior abdominal wall, it covers the first part of the rectum, forming a *mesorectum*, which is attached to the sacrum.

Gradually it leaves the gut posteriorly, then laterally, and then the anterior surface of the second portion of the rectum, being reflected on the posterior vaginal wall $\frac{1}{2}$–$\frac{3}{4}$ in. below the attachment of the latter to the uterus. It then spreads over the fundus of the uterus down its anterior wall, and at the level of the isthmus is reflected to the superior surface of the bladder, and then to the back of the upper part of the symphysis. At each side of the bladder it leaves that viscus along the line of the obliterated hypogastric artery, and passes to the pelvic wall.

From each lateral edge of the uterus, the peritoneum extends out as a double layer—the *broad ligament*—to the side wall of the pelvis.

The broad ligaments.—Each one extends from the uterus to the side wall of the pelvis, in front of the sacro-iliac joint, slightly behind the level of the transverse pelvic diameter.

The folds are close together in the main extent of the ligaments, but towards their base and towards their outer part they separate somewhat, there being more connective tissue in those portions. The upper free border is occupied in most of its extent by the Fallopian tube.

They contain mainly connective tissue. In their lower

parts is found a thin layer of smooth muscular fibres, continuous with those of the outer layer of the uterus and bladder. In the upper portions, very few muscular fibres are found; here the layers of the ligament can be easily moved on one another.

The portion outside the tube encloses the ovarian vessels and extends above the pelvic brim as the *suspensory ligament* (infundibulo-pelvic) of the ovary. Between the ovary and the uterus is a fold of the posterior layer, forming the *ovarian ligament* (*vide* p. 2). A fold of the anterior layer is also seen passing from the angle of the body of the uterus and enclosing the *round ligament* of the uterus (*vide* p. 30). Projecting from the posterior surface is the ovary (*vide* p. 3), and within its laminæ are the remains of the Wolffian body and duct, besides vessels, nerves, etc.

The position of the broad ligament varies according to that of the uterus as well as according to different variations in intra-abdominal pressure.

When the uterine body lies on the empty bladder, the inner part of the ligament is bent downwards and forwards. If there is a sharp flexion on the uterus, there is a corresponding fold across the ligament.

The portion attached to the outer end of the tube is quite movable, and may often be found folded over the ovary. The fimbriated end of the tube is thereby possessed with a considerable range of movement; sometimes it may be found as far back as the rectum.

The **recto-vaginal pouch**, or **pouch of Douglas**, is the depression of peritoneum between the supravaginal portion of the uterus and the upper part of the vagina in front, and the second part of the rectum behind. Laterally, the upper boundaries are best described as the utero-sacral ligaments. The pouch is often deeper on the left than on the right side. This is the lowest part of the peritoneal cavity in the erect posture. Normally the intestines do

not descend into the pouch. Sometimes the pouch dips abnormally low into the perineal body. Sometimes it is rather high, near the top of the fornix.

The **utero-vesical pouch** is that between the uterus and bladder, bounded laterally by the utero-vesical folds (false ligaments) of peritoneum. Normally, no intestines lie in this pouch. In the retroverted condition of the uterus they are found there, however.

Development of broad ligaments.—Each arises from an upgrowth of the epithelial covering and subjacent tissue of the Wolffian body in the shape of a fold.

CONNECTIVE TISSUE OF THE PELVIS.

Under this heading must be noted (1) the dense fascial layers known as the *pelvic fascia*, of importance in rela-

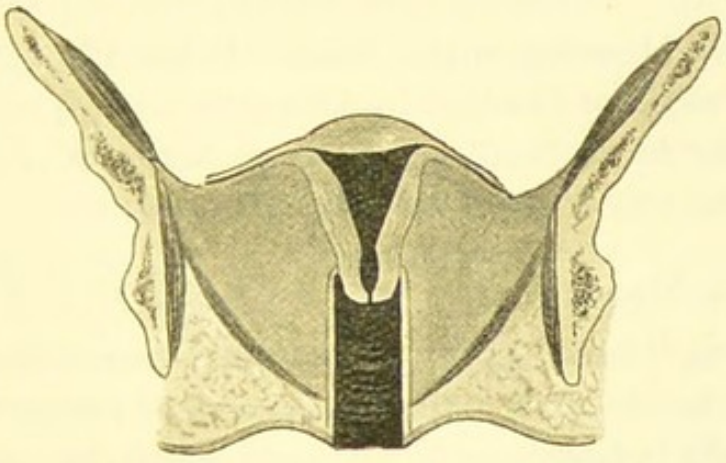

FIG. 41.—Coronal section through the pelvis, showing the relation of uterus and vagina to the laterally placed extra-peritoneal tissues.

tion to the support of organs and to the strengthening of the pelvic floor; and (2) the loose connective tissue between the various layers of the former, between muscles, and surrounding bladder, urethra, vagina, and rectum, of importance in relation to inflammation. The first of these has received scant attention at the hands of gynecologists. I have given it a prominent place in the considera-

tion of the nature of the pelvic floor, as I believe this necessary to establish a correct understanding of this important structure (*vide* p. 76).

The loose connective tissue to which reference must be made is found in the broad (lateral parametric) and utero-sacral ligaments (posterior parametric), at the sides of the bladder (paravesical), around the rectum (paraproctal), between the bladder and the cervix, on the side wall of the pelvis, in the round ligaments, around the upper portion of the vagina (paravaginal).

Most important of these, as regards the frequency of inflammation in them, are the broad and utero-sacral ligaments.

THE PELVIC FLOOR.

I shall consider this subject under the following heads :—

I. The Meaning of the Term "Pelvic Floor."
II. The Floor Studied by Dissection.
III. The Floor Studied by Frozen Sections.
IV. The Physics of the Pelvic Floor.

I. The Meaning of the Term "Pelvic Floor."

The term "floor" is not a good one, since it leads one to think of the floor of a house, *e.g.* a rigid partition running transversely between walls. Consequently, in looking for a floor in the pelvis, we are apt to seek for something which has the character of a house floor. The pelvic floor has no such structure. It is not a rigid partition, nor does it run transversely. It is elastic and movable, varying in its thickness, its nature, and its slope at various parts, while it runs across a very irregularly-shaped space—the outlet of the bony pelvis. It is composed of a variety of tissues, differing in their consistence, their strength, and the firmness of their attachment to the bony wall. The great purpose of the pelvic floor, as a floor, is un-

doubtedly to sustain the weight of the great mass of abdominal viscera, or, in other words, to resist the intra-abdominal pressure. As Hart has shown, an increase in the intra-abdominal pressure, a weakening of the floor, or both these conditions combined, may lead to a hernial protrusion of the floor, just as corresponding conditions in the abdominal wall produce a similar result.

In strict anatomical accuracy, therefore, it must be admitted that all those structures in connection with the pelvic outlet which help to resist and support this pressure, and whose removal would be a source of weakness, must be considered as forming a part of the floor. While sectional anatomy is of the greatest value in demonstrating the nature of the floor as a whole, there can be no doubt that dissectional work is the only method we possess of analysing its constituent elements and the part they play in resisting the intra-abdominal pressure. Neither Hart nor Symington have, it seems to me, given at all sufficient prominence to this method of study in their papers on the pelvic floor, formulating their conclusions almost entirely from the examination of sections.

According to Hart, whose views have been mainly followed during the last fourteen years, the floor is composed of those tissues which close the outlet of the pelvis, being bounded by skin externally and by peritoneum internally, the uterus and appendages being removed. He divides it into an anterior part called the pubic segment, and a posterior part called the sacral segment, the line of division between the two being the vaginal slit. Studied in vertical mesial section, the former is seen to be triangular in shape, loose in texture, loosely attached to the pelvis, and to include the structures lying between the symphysis and the vaginal slit, being chiefly composed of bladder, urethral and anterior vaginal walls; the latter, strong in structure, embraces the tissues between the vaginal slit and posterior bony wall, firmly dovetailed into the sides of the latter.

Symington, on the other hand, considers "that the rectum and the bladder, like the uterus, should not be regarded as parts of the pelvic floor, but as organs resting upon it." He further says, that "the anterior part of the pelvic floor is composed of firm tissue, and is connected as strongly with the anterior part of the pelvic wall as is the sacral segment with the sacrum and coccyx." He also says that "only the lower half of the vagina is in the pelvic floor." Both of these authors have formed these different conclusions from their study of the pelvis by frozen sections.

II. The Floor Studied by Dissection.

Dissection is of prime importance, and should precede all other methods of studying the floor, for by it alone do we gain a true knowledge of the nature of the floor and of the complex arrangement of the structures composing it. I shall describe these structures singly, and discuss the value of each in regard to the support and strength given by it to the floor.

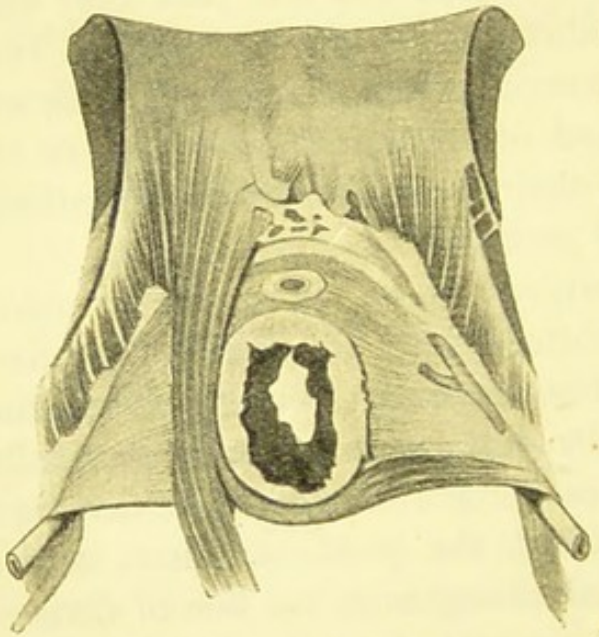

FIG. 42.—Front of pelvis from within, showing the relation of urethra and vagina to posterior layer of triangular ligament. Part of the pubo-coccygeus and obturator-coccygeus are also shown.—SAVAGE.

I. Pelvic fascia. — This structure is, undoubtedly, of the very greatest value in resisting the intra-abdominal pressure at the pelvic outlet.

1. PARIETAL LAYER.— In front, this layer, a strong aponeurotic membrane, for the most part, is continued across the subpubic arch, as the so-called "posterior layer of

the triangular ligament." Its lower border blends with the base of the so-called "anterior layer of the triangular ligament" (triangular ligament proper), which is attached at its apex to the subpubic ligament, by its base to the superficial fascia and central point of the perineum, and by its sides to the pubic arch. It is perforated by the urethra and vagina, and is thereby considerably weakened. This

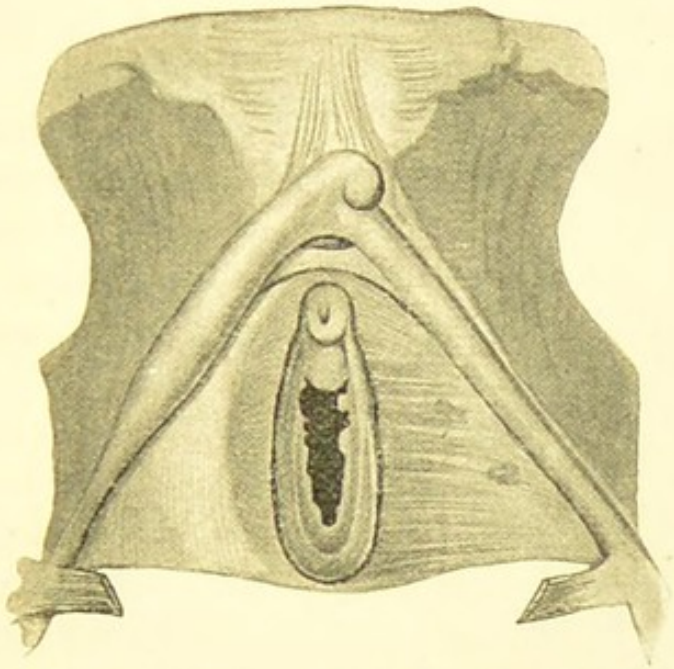

FIG. 43.—Portion of pelvis seen from the front. The clitoris, its crura and suspensory ligament are shown. On the right side the anterior layer of the triangular ligament is shown, and on the left the posterior layer. The urethra and vagina are also seen.—SAVAGE.

layer is never recognised as a distinct membrane in frozen sections because it is so blended with adjacent structures; it certainly forms part of the pelvic floor, strengthening its anterior part, helping to support and steady the urethra and vagina as well as the perineum. In the posterior part of the pelvis the parietal layer plays a less important part in helping to bridge across the greater and lesser sacro-sciatic notches. Here the great and small sacro-sciatic ligaments are the most important supports, though the parietal fascia internal to them and attached to them is an additional

source of strength. I do not think that the importance of the sacro-sciatic ligaments in regard to the mechanism of labour has been sufficiently noticed. From their position and strength they must influence considerably the course of the various parts of the fœtus as they appear successively at the pelvic floor in labour. As the coccyx is driven downwards and backwards they must also be considerably stretched.

2. VISCERAL LAYER.—This layer and its divisions are scarcely noticed by most writers in obstetrics. The pelvic fascia is generally studied in the dissecting-room in the male; its arrangement in the female is not usually dwelt on to any considerable extent.

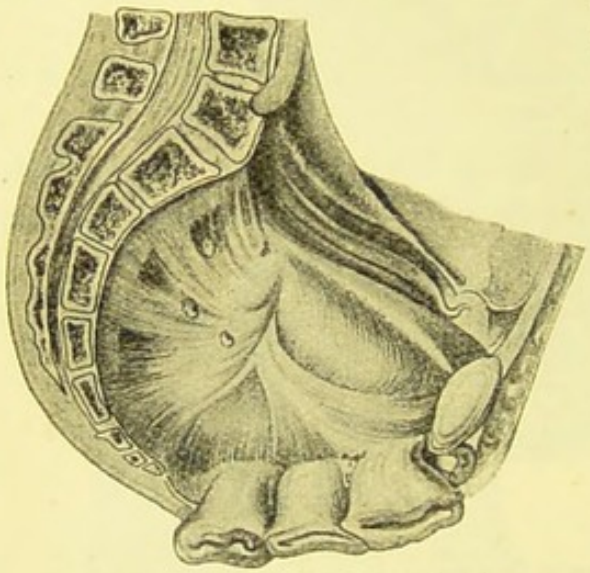

FIG. 44.—Parietal pelvic fascia seen from within.—SAVAGE.

There can be no doubt that it forms an important resisting structure to the intra-abdominal pressure.

What is its disposition? In the greater part of its extent it springs from the parietal layer along the *white line*. This *white line* passes around the pelvic wall from the ischial spine behind to a point on the posterior surface of the symphysis pubis, a little above its lower end. The visceral layer passes inwards, on each side, upon the upper surface of the levator ani to the lateral walls of the bladder, vagina, and rectum, where it divides into four layers:—

(*a*) *Vesical layer.*—This layer turns upwards upon the lower lateral aspect of the bladder, forming the "*lateral true ligament of the bladder.*" It is in firm union with the bladder wall, and thins as it passes upwards over the bladder, to be continuous with the corresponding layer of the opposite side.

(*b*) *Vesico-vaginal layer.*—This layer, thin but strong, passes between the bladder and the anterior vaginal wall, being in firm union with both, and being continuous with the corresponding layer of the opposite side. At its posterior part it blends with the connective tissue which attaches the posterior part of the bladder to the neck of the uterus.

(*c*) *Recto-vaginal layer.*—This layer passes between the

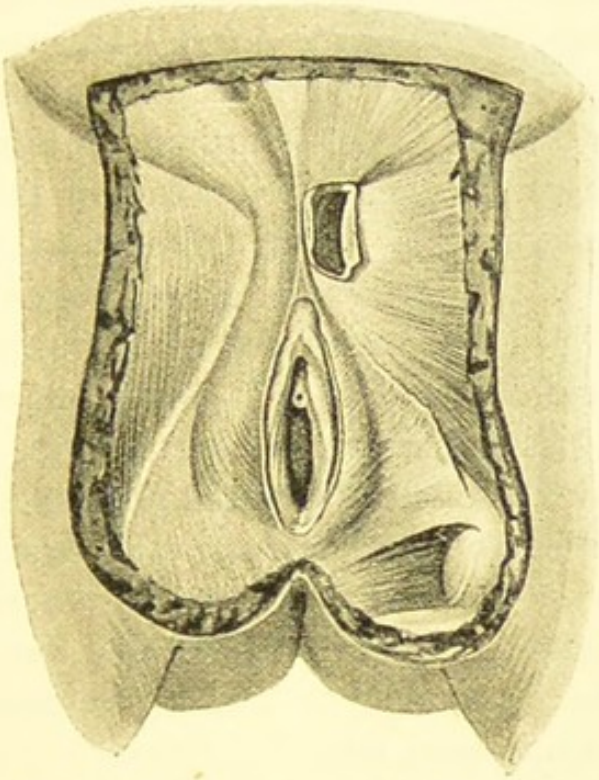

FIG. 45.—Superficial dissection of perineum and vulvar region, showing deep layer of perineal fascia.—SAVAGE.

vagina and the anterior wall of the lower part of the rectum. Except for a short distance behind the upper part of the vagina, the union between this layer and the vaginal and rectal walls is very firm. Below it is continuous with the strong connective tissue elements of the perineal body. It is continuous with the corresponding layer of the opposite side.

(*d*) *Rectal layer.*—This layer passes behind the rectum, attached to its walls, and joins the corresponding layer of the opposite side. It is prolonged downwards as a thin

layer towards the lowest part of the gut, being, of course, internal to the levator ani.

These layers in sections are not always made out with ease as distinct fascial structures, on account of their intimate blending with surrounding parts. They are more readily made out by dissection when traced from their parietal origin inwards in the uncut pelvis.

They are of great significance, and are undoubtedly of chief importance *in slinging the bladder*, *the vagina*, and *the lower part of the rectum in the pelvis*. In most obstetrical and gynecological works I find no mention of them whatever.

(*e*) *Anterior visceral layer.*—Further, the arrangement of the visceral fascia in the anterior part of the pelvis is of considerable importance. Here the visceral layer, arising from the back of the lower part of the pubes on each side of the middle line, above the point of origin of the anterior fibres of the levatores ani, as well as the attachment of the parietal fascia, passes backwards as two strong bands above them and on each side of the urethra to become blended with the anterior surface of the bladder. These are the *anterior true ligaments of the bladder*. Between them is a space filled with loose connective tissue and fat, continuous below with the retropubic fat and above with the suprapubic or retroperitoneal fat.

(*f*) *Anal fascia.*—Lastly, there is a thin aponeurotic membrane, which arises from the parietal fascia along the white line under the attachment of the levator ani, and passes downwards, closely attached to the muscle, and blending with the corresponding layer of the other side and with the other connective tissue elements of the perineum. In front it is attached to the posterior layer of the triangular ligament (parietal pelvic fascia). This layer is called by some the *anal fascia*, and by others the *aponeurosis of the levator ani*.

II. Superficial fascia.—Under the skin, over all the lowermost part of the pelvic floor, is a well-marked layer

of superficial fascia. Towards the skin it consists of fine fibrous trabeculæ containing a large quantity of fat, which is most abundant behind and on each side of the anus; over the tuberosities of the ischium, this superficial fascia becomes tough and stringy, the fibrous septa being thicker and stronger, attaching the skin to the bone. *The deep layer* is of more importance, being dense and aponeurotic, and giving considerable strength to the pelvic floor through its attachments. *Anteriorly* it is attached to the lower edge of the pubic and ischial rami, extending back almost to the tuberosities; *posteriorly* it blends in the perineum with the base of the triangular ligament.

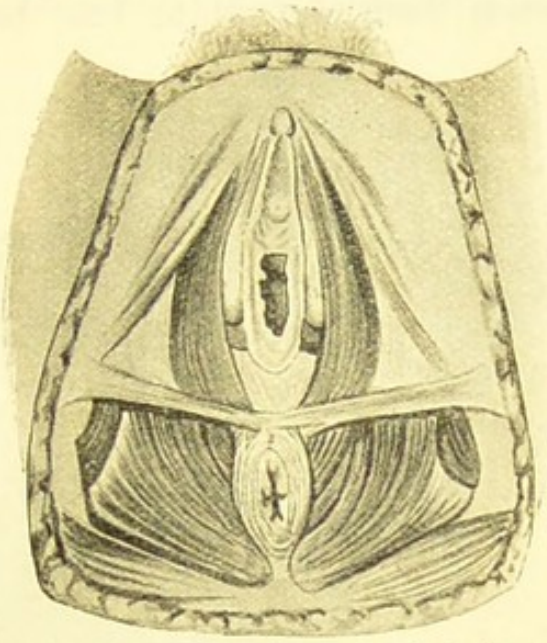

FIG. 46. — Dissection of pelvic floor, showing the muscles from below. On each side is shown the erector clitoridis, bulbo-cavernosus, transversus perinei superficialis, sphincter, ani externus, levator ani, coccygeus, gluteus maximus.—SAVAGE.

III. Pelvic muscles entering into the floor.—*Levatores ani.*—These muscles together form a muscular diaphragm with the concavity upwards. They are usually described as being of chief value in strengthening the pelvic floor. That they are the most important muscles in the floor is true; but on account of their thinness it seems to me that they cannot *per se* exercise a very great influence in resisting the intra-abdominal pressure. Savage divides each into two portions, namely, the *pubo-coccygeus* and the *obturator-coccygeus*. Symington has well described the arrangement and functions of these.

The *pubo-coccygeus* passing on each side, from the back of the pubes to the last two pieces of the coccyx, act as

sphincters of the lower part of the vagina and the anal canal, and tend to draw upwards and forwards the perineal body and coccyx. A few fibres blend with the urethral and vaginal walls, others turn inwards in the perineal body in front of the *internal sphincter* of the anus; behind the anus there is a blending of some fibres of opposite sides.

The *obturator-coccygeus*, the main part of the muscle, arises from the white line between the pubes and the

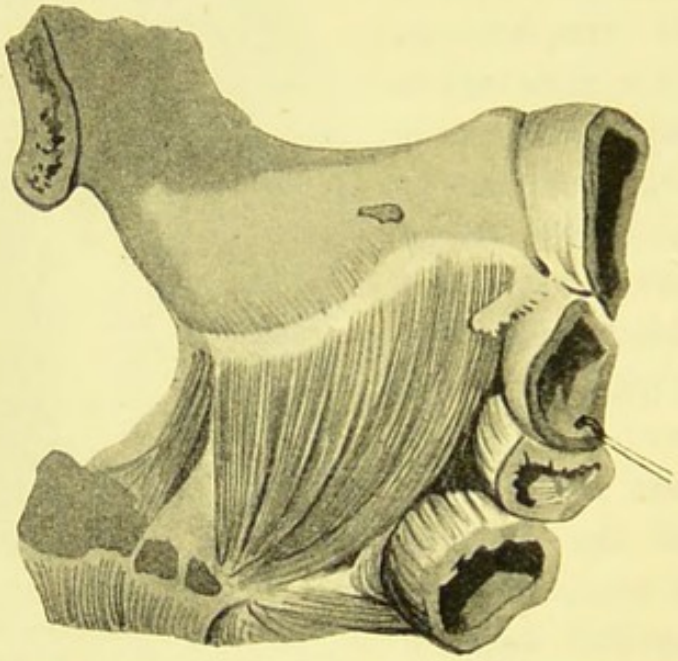

FIG. 47.—Part of pelvis showing the levator ani and coccygeus muscles from above. Parts of the bladder, vagina, and rectum are shown.—SAVAGE.

ischial spine. It runs backwards, downwards, and inwards to the sides of the coccyx. With these should be associated the thin *coccygei muscles* which arise from the ischial spines and small sacro-sciatic ligaments and are inserted into the sides of the last sacral and the coccygeal vertebræ. They have no direct action upon the pelvic viscera. They help to fill in the sides and posterior part of the pelvic outlet; they resist somewhat the intra-abdominal pressure, and they can elevate the coccyx after it has been bent downwards.

This is quite different from the ordinary impression which

the student has regarding the arrangement of these muscles. It is usually understood that the great mass of the *levator ani* arising from the white line passes downwards and inwards and, while being attached behind to the coccyx, mainly converges towards the middle line, where it blends with the muscle of the opposite side in the perineal body and behind the anus. Coronal sections are largely to blame for giving this false impression. For example, Hart and Barbour in their description of a coronal section of Barbour's passing through the *obturator internus* muscle, describe the *levator ani* as arising from the white line and as passing down to be inserted into the perineal body. The truth is, that the main part of the muscle arising from the white line passes backwards to be attached to the coccyx and lower part of the sacrum, and meets the corresponding portion of the opposite side in the middle line, only at the tip of the coccyx. It is the anterior and smaller portion, the so-called *pubo-coccygeus*, which alone, by means of its attachment to the urethral and vaginal walls and by its blending with the corresponding muscles of the opposite side in the perineum and behind the anus, helps to strengthen the pelvic outlet across the middle line. Its outer fibres are, of course, parallel to and continuous with the *obturator-coccygeus*, and hence the utterly erroneous impression which the coronal sections give of the *levator ani* arising from the white line and being inserted into the perineum. The presence of the vaginal slit is a great

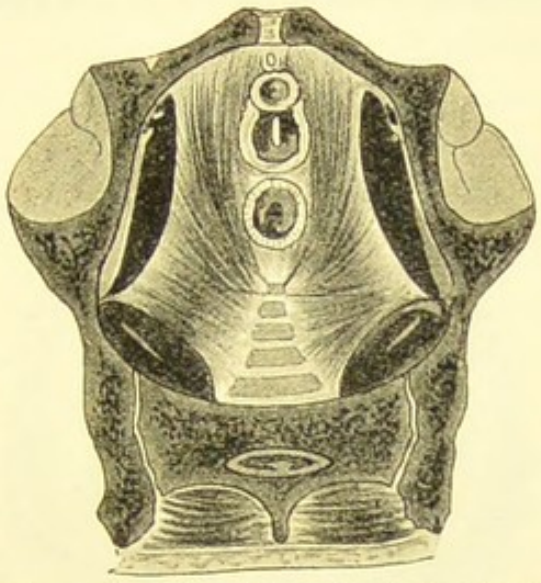

FIG. 48.—Dissection of pelvis showing levatores ani and coccygei muscles of each side from above. Relations to urethra, vagina, and rectum are shown.—SAVAGE.

source of weakness to this muscle. The value of the *levator ani* to the pelvic floor has, indeed, no doubt, been greatly overstated. Kelly goes so far as to describe the muscular part of the floor as its principal strength. If one imagines the visceral portions of the pelvic fascia and the anal fascia removed, it is not difficult to realise the comparative weakness of the muscular diaphragm in supporting the intra-abdominal pressure.

The other muscles of the pelvic floor play a very small part in strengthening it. The *transversus perinei* is a very small muscle, very difficult to define, and less developed in the female than in the male.

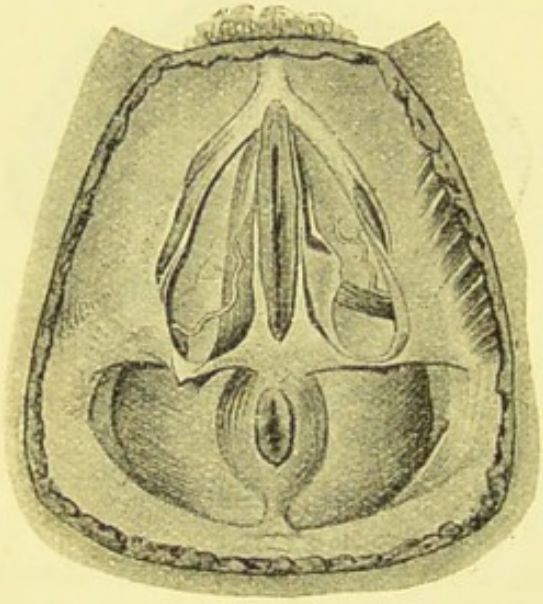

FIG. 49.—Deep dissection of perineal and vulvar regions. The deep layer and base of the triangular ligament are seen, also the anal fascia covering the levatores ani. —SAVAGE.

The *sphincter vaginæ* helps, in a very small degree, to strengthen the floor through its sphincter action on the vagina (though, according to Symington, this is very slight, its main action being merely to compress the vestibular bulb) as well as through its attachment to the clitoris in front and to the central point of the perineum behind.

The *sphincter ani* in the same way helps by its sphincter action on the anus as well as through its attachment to the central point of the perineum in front and the tip of the coccyx behind.

The *compressor urethræ* or *transversus perinei profundus*, arising from the inner aspect of the junction of the rami of the pubes and ischium, passes in front of the urethra and behind the vagina, being also attached to their walls, and blends with the corresponding muscle of the opposite side.

These four muscles are very small, and while undoubtedly helping to consolidate and strengthen the floor, play but a minor part in this capacity.

Gluteus maximus.—The lower part of this muscle as it passes downwards and forwards from the side of the coccyx over the ischial tuberosity is a source of strength to the pelvic floor in its posterior and outer part.

IV. Viscera and passages connected with pelvic floor.—Certain viscera are connected with the floor; certain passages pierce the floor. Are they to be described as forming part of the floor? Hart describes the bladder and urethra, the vagina and the rectum as forming part of the floor, the uterus and appendages resting upon it. Symington differs from Hart in saying that the upper part of the bladder, the upper part of the vagina, and the rectum are not a part of the floor. Ranney and Foster differ from Hart in including the uterus.

Putting aside for the present all considerations regarding parturition, prolapsus uteri, the action of pessaries, etc., let us ascertain the truth from a purely anatomical standpoint.

BLADDER.—This organ, independent of its being empty or filled, cannot but be considered as having a very intimate connection with the anterior part of the floor. *Per se* it does not resist the intra-abdominal pressure; *through its connections*, and those of the urethra, by which it is slung in the pelvis, it does perform this function to a very considerable extent.

These connections as as follows:—

Fascial.—Anterior and lateral *true* ligaments; vesico-vaginal layer of the visceral pelvic fascia; triangular ligament.

Muscular.—Pubo-coccygeus division of levator ani; transversus perinei profundus.

Ordinary connective tissue.—That connecting it with the bony wall and the structures in immediate relation to the bladder and urethra.

Peritoneal.—False ligaments (unimportant).

Other structures. — Urachus; obliterated hypogastric arteries; ureters.

Of all these, its connections with the pelvic wall through the visceral layers of the pelvic fascia are the most important.

Symington and Croom urge that the bladder should be regarded as resting upon the pelvic floor. The anatomy of the parts shows that it is embedded in the floor. Further, they say that because the organ fills and empties it cannot be considered as part of the floor. Is not this objection of the nature of a quibble? Are the anatomical connections not the same in all conditions of the bladder? If between two posts we tie a rope, forming a kind of suspension bridge, and then, cutting the rope in two, attach between the ends a strong bag which can be filled and emptied,—is the bag, because it is hollow, and capable of being filled and emptied, not to be considered as forming part of the bridge? The analogy is a fair one. The bladder is simply a bag slung between the walls of the anterior and lower part of the pelvis.

VAGINA.—The wall of this passage is slung in the pelvis by fascial and muscular attachments, and is thereby made to form an intimate portion of the pelvic floor.

These attachments are as follows:—

Fascial.—Triangular ligament which it pierces; vesico-vaginal layer of visceral pelvic fascia; vagino-rectal layer.

Muscular.—Pubo-coccygeus division of levator ani; sphincter vaginæ; transversus perinei profundus.

Ordinary connective tissue. — That connecting it with the bony wall.

Secondary.—Through its very firm junction with the urethra, the base of the bladder and the lower part of the rectum, it is supported by the attachments of these structures.

The analogy made in reference to the bladder will apply

here again. Symington is unwarranted, I think, in making the greater portion of the vaginal wall worthy of a place in the pelvic floor, and at the same time excluding the upper portion of the vaginal wall. His coronal section, passing through this portion, has evidently blinded him to the wider relationships of the vagina. That the upper part of the vagina is less strongly united to the bladder and rectum than the lower and larger part is to the structures in front and behind it, cannot be disputed. These connections are of small importance, *in re* the part they play in the pelvic floor. It is its lateral attachments to the pelvic wall, by means of the fascial structures of the floor, which are of chief importance. I quite admit, however, that the vesico-vaginal and recto-vaginal layers are thinner and weaker in their upper part than elsewhere.

Rectum.—Most of the authors already quoted are not precise in their reference to this structure. All are agreed that the lower portion of the wall of the gut forming the anus is an intimate part of the floor. It is disputed as to where the upper limit ends. The so-called *first part* of the rectum—that part provided with a mesentery, must be excluded. The *second part*, which extends from the first part to the tip of the coccyx and resting against the sacrum, coccyx, obturator-coccygeus part of the levator ani, and the coccygeus itself, to all of which it is attached, cannot be considered as forming a part of the pelvic floor, since the intra-abdominal pressure tends to push it, not out of the pelvis, but against the posterior wall.

From the coccyx downwards the wall is a part of the pelvic floor, its attachments being as follows :—

Fascial.—Recto-vaginal layer of visceral pelvic fascia; rectal layer of visceral pelvic fascia.

Muscular.—Pubo-coccygeus portion of levator ani; sphincter ani.

Connective tissue.—That connecting it with surrounding parts and with the bony wall.

Secondary.—Through its attachments to the posterior vaginal wall and perineum.

The lowest part of the rectum, therefore, is, like the vagina, a tube slung between the sides of the pelvis by the fascial tissues of the floor, supported by certain muscles as well as by the vaginal and perineal attachments.

It must be borne in mind that the gut is quite closed unless distended by flatus or fæces.

UTERUS.—Has this organ no claim to be considered part of the pelvic floor? According to Hart it has not. He says that it merely *rests* on the floor, not being *suspended.* He compares it to the male bladder, which he regards as resting upon the pelvic floor, its ligaments having nothing to do with its support. This statement is opposed to all the teaching of anatomists. I can find no one who at all agrees with him in this view. It is sufficient to quote from Sir William Turner:—"Passing to the bladder are two important membranes which, together with its vessels and ducts, retain it in position. These membranes are the peritoneum and the pelvic fascia." Hart strenuously contends that *the female bladder* is a portion of the pelvic floor, and it is impossible to understand why he should not place the *male organ* in the same category, since they are both attached to the bony wall in practically the same manner. His comparison of the uterus to bladder is, therefore, from his point of view, a bad one.

What, now, are the connections of the uterus?

1. IN THE FŒTUS.—The common origin of the uterus and vagina from the fusion of the lower parts of the Müllerian ducts must be remembered. In the third and fourth months there is no distinction between the uterus and vagina. After this the uterine wall gradually becomes thicker, especially in the cervical portion, while a vaginal portion at the same time develops. The important fact to be noted, however, is that while the uterus is, in the fœtus, relatively higher than in the adult condition, in other

respects it has relations the reverse of those existing in the adult condition.

Thus, in the fœtus, the cervix is both very much longer, as well as wider than the body—exactly the reverse of the adult condition. In the fœtus the thickness of the cervix in proportion to the pelvic diameter is relatively greater than in the adult condition. In the fœtus there is relatively much less of the uterus covered with peritoneum than in the adult. The broad ligaments are, therefore, in the fœtus, relatively very small.

The cervix, which forms three-fourths of the whole uterus, is, save on its posterior surface where it is covered with peritoneum, firmly embedded in the fascial and connective tissue structures, below the peritoneum. In front it is attached to the bladder, which extends across the pelvis from side to side, the vesico-vaginal layer of pelvic fascia passing between them and being connected with both; laterally it is connected with the pelvic wall. From its large size, relative to the width of the pelvic cavity, it is relatively nearer the wall in the adult condition. In several of my cases, from being somewhat nearer one side than the other, the attachment is very short, and the cervix is practically fixed in position.

In the fœtus and new-born child it is evident, therefore, that the pelvic floor is relatively thicker, and occupies more of the pelvis than in the adult. The greater portion of the uterus—the cervix—is also, in the early period of life, an intimate part of the floor.

2. IN THE ADULT.—The change from the fœtal to the adult condition is characterised by a marked increase in the length and width of the body in relation to the cervix of the uterus. The greater part of the organ is now covered with peritoneum, the broad ligaments being in relation to much more of the uterus than in early life. Owing also to the great growth of the pelvis, the cervix relative to the pelvic cavity is very much smaller than in the fœtus, and

is relatively, therefore, at a farther distance from its walls.

What, then, are the adult attachments of the uterus?

Fascial.—Posterior part of vesico-vaginal layer of visceral pelvic fascia.

Connective tissue.—That attaching cervix to bladder; that attaching cervix to side walls of pelvis (parametric); that attaching body to pelvis in the fold of the broad, utero-sacral and round ligaments.

Muscular.—Non-striped muscle in the broad, round, utero-sacral, and utero-vesical ligaments.

Secondary.—Through its connection with the bladder and the vagina, which are, as already seen, slung in the pelvis.

What importance is to be attached to these various connections?

The vesico-vaginal layer of pelvic fascia has not directly much influence in supporting the uterus, since it is very thin at its posterior limit, blending with the tissue joining the bladder and cervix.

The tissue between the bladder and cervix, though described as being loose in nature, is yet sufficient to unite them intimately. It is, indeed, partly through this junction that the pubic segment is elevated during labour by the upward tension of uterine retraction, though, of course, the tension tells mainly on the vaginal wall, with which the uterine muscle is directly continuous.

Schultze points out that this connection is very rarely disturbed. He says that, "not only does the uterus closely follow the posterior wall of the bladder in the movements due to the variations in the quantity of the urine contained in it, but the bladder also follows the anterior wall of the uterus so closely, when the latter organ is displaced or enlarged, that the relation of the posterior bladder wall to any tumour in or above the pelvis is of great diagnostic importance whenever there is any doubt as to the share the uterus has in the formation of the tumour."

The connective tissue between the cervix and pelvic wall on each side is loose in nature. Non-striped muscle is found in it.

What, now, is to be said regarding the broad ligaments? Have they nothing to do with the support of the uterus? The peritoneal covering is of very little practical importance in serving this purpose. Within this covering, however, is fibro-muscle and elastic tissue, which can be traced as bands in several places running from the uterus to the pelvic wall. The upper part of the ligament, which is freely movable, containing the tube and ovary, can have nothing to do with supporting the uterus. If one exercise the slightest downward pressure on the uterus in the cadaver, it is found that a line of resistance is formed in the broad ligament running from near the cervix upwards and outwards towards its upper parietal attachment. The same thing is found during pregnancy and the puerperium. In pregnancy the suspending action of the ligaments is very evident.

Sir William Turner says that they act as lateral ligaments for the organ.

In the non-pregnant woman, in normal conditions, this may scarcely at all be present, and it may serve merely to steady the uterus, but if the other supports of the uterus be removed, or intra-abdominal pressure be increased, then the ligaments are stretched and endeavour to support the organ.

In the operation of vaginal extirpation of the uterus, after the organ has been divided from its vesical and vaginal connections, although the vagina be distended as widely as possible, the uterus does not tend to fall down, but is kept in position by its ligamentous attachments.

If at this stage the uterus be pulled down to the vulva and then let go, it is instantly drawn up again. Indeed, the difficult part of the operation is the ligaturing of these structures and the removal of the uterus from them.

The utero-sacral and the utero-vesical act in much the same manner as the broad ligaments, *i.e.* they are in a condition of somewhat *elastic tension.* A. R. Simpson has emphasised the fact that in the normal condition the uterus may be pulled down to the vulva with ease. He says that "in general the organ must descend so far as to bring the os clear through the vulva before the utero-sacral ligaments are put on the stretch. It is when these become quite tense that the patient has any sensation of special discomfort." This is undoubtedly true regarding parous women, but in nulliparæ one has to exercise more force, and even then can rarely draw the uterus so far down as in parous women.

It is the elastic nature of the broad and utero-sacral ligaments that allows the uterus to be drawn down, and which helps partly to draw it up again. As already mentioned, this may take place even when the vaginal and bladder attachments are gone.

Inflammation in the ligaments renders them less elastic, and makes it difficult or impossible to draw down the uterus.

Where the tonicity has disappeared, and they have become stretched and thinned, it is always a very easy matter to pull down the uterus. Luschka has considered the utero-sacral ligaments of such importance that he has given the name of *muscularis retractor uteri* to the muscular tissue within them, and he says that they "determine and secure the normal position of the lower end of the uterus." It is objected by some that such thin folds cannot have much strength. The observations of Küstner on this point are worthy of special note. He has made a special microscopic study of the utero-sacral folds, and he says that while in the free portion of the fold there is very little muscle, at its lateral attachment there is a dense flat muscular bundle. He considers this almost equal in strength to the round ligaments.

Coe says that they commonly relax under the influence of an anæsthetic. It is to be noted also that the utero-sacral ligaments run backwards from the uterus in a direction practically parallel with the vagina. Through this tension they undoubtedly also act through the cervix on the vagina, helping to keep up its upper end. Foster, indeed, says that the vagina, attached to the bone in front through its connections, forms with the utero-sacral ligaments through the medium of the cervix an antero-posterior beam of considerable power.

The vaginal attachment is, it seems to me, a very important support of the uterus. The vagina is slung in the pelvis by the fascial layers around it, and by its attachment to the bladder, urethra, etc. The uterus being attached to the upper end of its wall is, in consequence, also supported.

Schultze corroborates this view. He says that the fixation of the vagina and its immediate surroundings is an essential factor in securing the position of the uterus.

It is rather remarkable that Hart should place no value whatever on the supporting or even steadying power of these ligaments in the non-pregnant condition, but that he should, when explaining the action of the retracting uterine wall on the pelvic floor during labour, say that, as a result of the longitudinal muscle bundles which pass into them from the uterus, they afford *external fixed points for uterine action*, whereby during the pains the uterus is steadied. Surely this steadying and fixing power must be no inconsiderable one.

From an anatomical standpoint it is evident therefore—

(*a*) That the uterus does not merely rest upon the pelvic floor as a chair or table rests upon a house floor, as Hart says it does, but that, through its cervical portion, it is embedded in and forms part of the pelvic floor.

(*b*) That, being suspended by its vaginal and bladder attachments, by the broad and utero-sacral ligaments, it,

therefore, as part of this suspension-bridge arrangement, helps to resist the intra-abdominal pressure in the same manner, though not in the same degree, as the bladder. This resistance is less than that offered by the fascial layers lower in the pelvic floor.

III. The Floor Studied by Frozen Sections.

The vertical mesial section shows, undoubtedly, in the non-pregnant woman, with parts intact, the appearance first described by Hart.

The pelvic floor stretches from pubes to sacrum broken only by the urethra, vagina, and anus. The vagina is a closed slit running practically parallel with the brim, and may be considered as dividing the floor into two parts—the pubic and sacral segments. Excluding the uterus, the former has a triangular shape and the latter an irregular quadrilateral shape.

Hart describes the former as consisting of bladder, urethra, anterior vaginal wall, and bladder-peritoneum. Its attachment to the pubes is a loose one, being separated from it by a pyramidal mass of fat; the posterior bladder wall is loosely attached to the anterior vaginal wall, while the urethra and anterior wall are closely blended.

He describes the sacral segment as consisting of rectum, perineum, posterior vaginal wall, and "strong resistant muscular and tendinous tissue"; the posterior vaginal wall and anterior rectal wall being loosely connected, as far down as the apex of the perineal body.

From these data he generalises as follows:—

"The pubic segment is loose in texture, has only a loose bony attachment anteriorly, and will evidently permit of mobility in an up and down direction. The sacral segment is made up of dense tissue, is strong in structure, has a strong dovetailed attachment to the sacrum, and is only movable downwards when it revolves round the sacrum

and coccyx as a whole." The weakness in the floor, due to the presence of the vagina, is in the virgin practically of no importance. The pubic segment cannot slip past the sacral because it is firmly pressed against it, the pressure acting at right angles to the vagina.

These are the data upon which Hart has chiefly based his explanation of the mechanism of parturition, and to a considerable extent that of prolapsus uteri.

Where are the fallacies in this view of the floor?

A false impression as to the anatomical nature of the floor is given as well as of its mechanics.

(*a*) The floor is only divided into these segments by the width of the vagina. The average width varies between, say 1 in. and $1\frac{3}{8}$ in.; the average width of the pelvic outlet is 5 in. The pelvic floor is, therefore, only divided into a pubic and a sacral segment in one-fourth or one-fifth of its width.

(*b*) Hart's description leaves out of account entirely the strong fascial layers, which I have already described, and which are so intimately connected to form the fascial framework of the floor. He describes strong tendinous and muscular tissues in the sacral segment, leaving them entirely out of account in the pubic segment. I have already shown that the visceral layers of the pelvic fascia are most strongly developed in the anterior part of the pelvic floor, while the *pubo-coccygeus* portion of the *levator ani* and the *transverse perinei profundus* have certainly as much influence in the anterior part as in the posterior part of the floor. Hart's description takes no notice either of the triangular ligament or of the important layer of deep superficial fascia under the skin.

These omissions are due to the fact that in sections these fascial structures appear so blended with the tissues about them that they are not distinguished.

(*c*) Though in the middle line the bladder is separated from the lower part of the symphysis by loose cellular tissue

and fat, behind the upper part it is close to the bone and more firmly attached. But it is chiefly on each side that the pubic segment is firmly attached to the lower part of the pubes. The loose cellular tissue surrounding the bladder has not the first part to play in allowing of or limiting the movements of that organ. *It is its fascial attachments—its true ligaments.* The range of movement of which the bladder is capable is in reality chiefly the range possessed by these ligaments.

All changes in position in the pubic segment, likewise, depend primarily upon the range of movement and elasticity of its fascial attachments to the bone; secondarily, of its muscular and other attachments.

(*d*) The description of the pubic as resting upon the sacral segment is a conclusion based entirely upon a fallacious conception of the pelvic floor which the vertical mesial section gives, and is entirely out of keeping with the structure of the floor as determined by dissection. The two segments are intimately connected; the fascial and muscular suspensory arrangements of the floor are common to both. The artificial division of the floor is not necessary, and is only of service in aiding us to comprehend more clearly the changes which take place during labour.

The perineal body.—The perineal body is situated between the vagina and anus. In the mass, it appears, on vertical mesial section, triangular in shape, the base being the skin surface; the sides, the anal and vaginal walls. Its vertical height is about $1\frac{7}{16}$ in.; the base measures from before backwards $\frac{3}{4}$ in. It is misleading to regard it as a solid mass. It is really the central point of strength in the pelvic floor, the meeting-place of important divisions of the vesical pelvic fascia and of certain muscles, namely, sphincter vaginæ, sphincter ani externus, levator ani, transversus perinei, bulbo-cavernosus. It is important in relation to the ruptures which may occur in it.

Above the perineal body the vaginal and rectal walls are in apposition, loosely connected.

Pelvic-floor projection.—This is the projection of the floor in the sagittal plane of the body beyond the conjugate of the outlet. It varies in different positions of the body and in various conditions of a woman's life, *i.e.* nulliparous, multiparous, pregnant, parturient.

In the erect nullipara the greatest projection averages about 1 in. In the multipara it is slightly less than this. The outer skin measurement from the coccyx to the sub-pubic ligament is in the nullipara about $5\frac{3}{4}$ in.

IV. Physics of the Pelvic Floor.

In considering the physics of the pelvis, it is necessary to refer to the following factors :—

1. *The structural arrangements and their relationships.*—These have been fully considered.

2. *The intra-abdominal pressure.*—This is the pressure exerted by the intestines on the parietes. For practical purposes it may be regarded as a fluid pressure—at right angles to all parts affected by it.

3. *The atmospheric pressure acting on the outer surface of the body.*

4. *The results of alterations in posture.*

When a fluid fills a cavity bounded by an expansile wall, the condition of the latter is affected by the fluid pressure which is everywhere at right angles to it, and also by the action of gravity, which causes the weight of the fluid to bulge the most dependent part of the sac. This is the case to a certain extent in the abdomen and pelvis.

In the erect posture the pelvic floor is acted on by the intra-abdominal pressure, and it is somewhat bulged down by the action of gravity. There is also a slight increase in the diameter of the abdomen just above the symphysis.

If the woman be placed on her head, a different state

of matters is brought about. Increase of the abdominal measurements takes place near the ribs, diminution above the symphysis, and the outer surface of the pelvic floor approaches somewhat to the bony pelvis. In this position, atmospheric pressure and intra-abdominal pressure are unaltered; gravity is the cause of these changes, the intestines tending to sink towards the diaphragm.

If the woman be placed in the genu-pectoral position the same changes occur as in the latter case, though to a less marked extent.

In the modified genu-pectoral or Sims' position the same changes, still less marked, occur.

In the Trendelenburg posture, or in the lithotomy posture with the hips well elevated, they are of the same nature.

In these alterations it must be clearly understood that no vacuum is caused in the peritoneal cavity. That is an impossibility, because the abdominal and pelvic contents are always in contact. It is only change in relationships that is brought about.

In these movements no dilatation occurs in the passages through the pelvic floor. They are kept closed by the two forces acting on opposite sides of the floor, namely, the intra-abdominal and atmospheric pressures, and, in the erect posture, by the action of gravity as well.

If, when the woman is placed in the genu-pectoral position, *i.e.* on her knees and chest, the hips being elevated, the vagina be artificially opened, air rushes in and distends it. Its walls elongate; the uterus descends nearer to the promontory; the bladder is pushed partly above the symphysis. In other words, as Simpson and Hart have shown, the pubic and sacral segments of the pelvic floor are separated, the former falling downwards and forwards, the latter remaining unchanged save for a slight recoil upwards. These changes are brought about by the action of the atmospheric pressure in the vagina.

If the perineum be held back by a finger, and light be reflected into the vagina, its walls and the vaginal portion of the cervix can be seen. The same changes occur when the woman is in the Sims' or semiprone position, and the vagina opened up.

The rectum and bladder become distended like the vagina, when air is admitted into them, the body being placed in these positions or in the lithotomy position with the hips well elevated. By the reflection of light into their cavities, they can be thoroughly examined (*vide* p. 182).

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CHAPTER IV.

PUBERTY.

The transformation period from girlhood to womanhood is characterised by the most profound changes in the constitution. These are held to be of such importance among most races in the world, that special regulations exist among them for the care and management of girls at this critical era. Some of these are of a most grotesque nature. In some African tribes, for instance, they are confined in huts and not allowed to touch the ground for periods of considerable length. In Borneo they are shut up for many months in dark cells, cut off from all intercourse with the world. In some parts of South America they are sewn up in hammocks, and strictly dieted. In India a Hindoo girl remains for days in a dark room, living on simple food. In many countries the girls are beaten severely, cut with knives, or exposed to the bites of insects, in order that a supposed evil spirit, thought to be troubling them, may be driven out of the body or allowed to escape. Though many of these absurd habits are the result of primitive superstitions and religious beliefs, it is interesting to note that they enjoin simplicity and quietness of life while the girl is in the transition period.

Systemic Changes at Puberty.

These are *psychical* and *physical.*

1. **Psychical.**—The character of the girl gradually changes. Her tastes, which have hitherto been those of

her young brothers, from whose general physical configuration she did not greatly differ, now become greatly changed. The romping, rollicking girl becomes shy and retiring; new desires and emotions take possession of her; womanly characteristics apppear. Sex asserts itself.

2. **Physical.**—The breasts, pelvis, and neck enlarge; hair develops over the pubes and in the armpits; the voice alters; the angular, gawky girl develops into a creature of graceful and symmetrical curves. The hitherto inactive and incapable generative organs take on new activity. The body of the uterus rapidly increases in size; the ovaries expel ripened ova—this feature usually develops shortly before the other phenomena of puberty. A discharge of blood takes place from the genital passage—the menstrual flow. This occurs at intervals, and continues throughout sexual life.

Age of Commencement of Puberty.

This varies considerably, and is influenced by different factors.

1. **Climate.**—In warm countries it is earlier than in cold ones. In the temperate regions it varies from 13 to 15. Thus, in Lapland, the age is about 18; in France and England, about 15; in Southern Egypt and Sierra Leone, 10.

2. **Race.**—Racial influences are important. They tend to be preserved even under altered climatic conditions. Thus in Jewesses the average age of commencement is the same throughout the world. It is earlier than the age in temperate regions. English girls in India preserve the temperate European type. Africans in Europe retain their own type. Race is probably, therefore, a more important factor than climate.

3. **Environment.**—Puberty is earlier in city folk than in country people. Luxury and rich living tend to hasten,

poverty to retard its onset. De Boismont found that in Paris the average age among the poorest labouring classes was 16 years, 1½ months; among the well-to-do middle classes, 15 years, 2 months.

4. **Sexual stimulation.**—It is widely believed that too early stimulation of the sexual instincts leads to a premature establishment of puberty. It is difficult to prove this, however. Many cases cited are no doubt those in which puberty and sexual instinct have been early developed.

5. **Heredity.**—In some families peculiarities may be transmitted from generation to generation, *e.g.* abnormally early development.

6. **Individuality.**—Statements are made regarding the influence of size, build, complexion, etc., on the onset of puberty, but these are not at all reliable.

Prematurity of Puberty.

In some cases all the physical signs of puberty, *e.g.* changes in breasts, general contour, menstrual flow, etc., may develop very early. A few cases are on record where they were noted before the age of 5. In one or two instances children have been born with all the marks of puberty (*vide* p. 665). In some cases menstruation may occur with few or none of the other signs. In other cases may be found the development of hair and breasts, without change in bodily contour or without menstruation.

We do not know what changes occur in the internal genitals in all these early cases. It is certain that pregnancy has taken place at the early age of 9. We do know that in some cases ova may be shed at a very early period, and that the uterus may develop prematurely.

We are not certain as to the relation of pathological conditions to the early appearance of puberty. In several cases where post-mortem examinations have been made, various conditions have been found, *e.g.* cystic ovary, sarcoma of the ovary, hydrocephalus, rickets.

In several cases, however, no abnormal conditions have been found.

Delayed Puberty.

Sometimes puberty may be delayed in all its manifestations as late as the age of 25. Many variations are found, however, as regards the various phenomena. Sometimes all may be present, save menstruation. It is important to bear in mind that delay may be caused by pathological conditions, *e.g.* anæmia.

First Onset of Menstruation.

Sometimes the first menstrual discharge appears suddenly, lasts for a few days, then stops, and reappears after an interval of three or four weeks, when the duration and quantity of the flow are the same as at first; in other words, the menstrual type and habit may be established at once. Uusually, it is a gradual process. Thus, the only indications may be a feeling of fulness, heat, or pain in the pelvis; chills or flushes of heat in different parts of the body. The girl may feel drowsy or irritable, may suffer from headache and neuralgia, may lose her appetite, and may have disordered stomach and bowels. There may be swelling and tenderness in the breasts, and some white mucous discharge from the vagina.

These symptoms may occur at regular or irregular periods before any discharge of blood occurs, and may take place in small amounts, gradually increasing at successive periods until the permanent habit is fixed.

In some cases there may be a discharge of blood at the first period and none afterwards for several months. In other words, menstruation may be established gradually, intermittently, or suddenly.

It must be remembered that certain pathological states

cause many of the disturbances found in connection with the onset of puberty.

Relation of Puberty to Nubility.

Though the reproductive life begins with puberty, the girl is not then fitted for marriage. Womanhood is reached only after years of slow and gradual growth. In the temperate regions of the world, there can be no doubt that the ripened condition of maturity is not reached before the age of 20 or 21. It is only then that the standard of development is reached which is compatible with the most successful bearing of the grave responsibilities of wifehood and motherhood. The too early exercise of the reproductive function leads to increased suffering on the part of the mother, depresses her vitality, and increases her liability to disease.

Bertillon's figures show the chances of death are much greater when girls marry below 20.

The offspring are apt to be ill-developed, and die in large numbers in early life; only a small percentage live long and robust lives.

Breeders of animals know well that the union of immature parents produces a feeble or stunted progeny. Dogs thus born are delicate, and are usually killed by the distemper.

Many dog-raisers destroy the first litter of a bitch even if she be nubile, because they have observed that the first puppies are rarely of the best quality. It was noted by Aristotle that the Greeks who married very early had small and weakly children.

In France, it has been observed that when fear of the conscription has caused many young people to marry, the offspring were small and lacking in vigour.

Among the offspring of immature parents there is a larger proportion of idiots, cripples, criminals, scrofulous,

insane, and tubercular than among children of nubile parents.

Disorders of Puberty.

Besides the normal disturbances which I have described, there are certain conditions, more or less grave in nature, which are apt to be developed in connection with this period.

Amenorrhœa is common.—It may be manifested either by a delay in the appearance of menstruation after the other signs of puberty have developed, or in the diminution or cessation of the menses after they have been established. Anæmia is present in the great majority of these cases, and is undoubtedly the cause of the amenorrhœa. The causes of the anæmia are not clear in all instances, but, in many cases, they are—over-work and imperfect nutrition among the poor, over-study and insufficient or irregular exercise among the well-to-do.

In some cases, the amenorrhœa may be due to some general disease, which has reduced the general health. In other cases, it may be due to some local pelvic trouble, such as atresia of some part of the genital tract.

In some cases it may be due to an abnormal rate of physical development.

Slight attacks of mental and nervous derangement are not uncommon, especially where there is some predisposition to neuroses; these are most apt to be marked where the general health and nutrition are poor (Clouston). These conditions may afterwards pass into insanity; but it is to be noted that the gravest forms of insanity are rarely developed at the period of puberty. Clouston points out that the chief neuroses met with in the pre-pubescent period, namely, from 7 to 14, are mainly chorea, somnambulism, asthma, megrim, some eye defects, and some amount of epilepsy; in the period from 14 to 25, epilepsy, hysteria, adolescent insanity, instinctive immorality, arrested

body growth, ugliness, joint disease, ingrowing nail, acne, many skin diseases, many forms of impaired vision, barrenness, and perhaps phthisis and acute rheumatism.

MENSTRUATION.

When thoroughly established, menstruation may be described as a cyclical change, with general disturbances, and marked by local (pelvic) phenomena, not yet definitely known, of which the most evident is the loss of blood from the cavity of the corpus uteri.

General phenomena.—Different general symptoms are found in women. Great variations are found as regards the degree in which they are present. It is hard to determine to what extent women are affected, owing to the marked differences in their nervous organisations. Some feel acutely distresses of which others scarcely complain. The following symptoms are met with:—Nervous and gastric disturbances, tenderness or swelling in the breasts, sensations of heat and cold, torpor or oversensitiveness, fulness of neck, pain or throbbing in head and neck. Many women have none of these whatever.

Just before the flow, the urea excretion reaches the maximum; afterwards, the minimum. The temperature rises half a degree above the average before the period, falls during the flow, and goes down to half a degree below the average immediately after the period. The pulse rate and arterial tension run a corresponding course.

Locally, there is a feeling of weight and fulness in the pelvis, irritability about the bladder, discomfort about the local parts, tenderness or pain in the lower part of the belly, and bearing-down in the back.

Local pelvic phenomena.—The outer surface of the external genitals becomes more oily, there is an increased flow of mucus from the vagina, often associated with a peculiar penetrating odour. This period is often called the *invasion stage.*

Then the mucus becomes tinged with blood, and soon the full bloody discharge is established. This lasts for a varying number of days, and is known as the *persistence stage.*

Gradually, the discharge becomes paler in colour, but very turbid. It soon clears up, and there is left only the secretions of mucus. This is the *stage of decline.* Normally, no clots occur in the discharge.

Physical changes in the pelvis.

1. There is general congestion of the viscera.

2. In the Fallopian tubes there is only congestion, no change being recognisable in the mucosa.

3. In the ovaries, ovulation may or may not be found to have recently occurred, or to be in progress. It is not an essential feature.

4. In the uterus.

As regards the uterus, there has been much dispute. We are not yet in possession of sufficient facts to warrant a complete account of the changes which are found. It may be definitely stated, however, that they are limited to the mucosa of the corpus uteri. Before the onset of menstruation the whole uterus is enlarged and firm. When the flow begins it gets softer and relaxed, and the cervical canal dilates somewhat during the first three or four days. For a considerable time the view of Williams has held ground, namely, that owing to hæmorrhages into the mucosa and to its fatty degeneration, it is entirely shed as deeply as the uterine musculature. As this view was based upon a study of uteri from post-mortems made in cases of acute febrile conditions, it cannot be accepted.

Bland Sutton, Johnstone, and Minot have examined fresh uteri during and at the end of menstruation, and have found that only small, superficial portions of the lining epithelium were shed. At first the mucosa swells owing to the dilatation of blood vessels, especially the capillaries. Some of the most superficial capillaries rupture, and the

blood escapes among the stroma and into the uterine cavity. Further than this we cannot go at present. There is no proof that fatty degeneration occurs normally.

Researches on monkeys may be referred to in this connection. The most elaborate have been carried out by Heape, who examined many uteri in various stages of menstruation in the case of *Semnopithecus entellus*, whose menstrual type is a four-week one, the duration of the period being four days. He found congestion and hæmorrhages, with the shedding of portions of the lining epithelium, along with small bits of sub-epithelial stroma.

Bland Sutton has also carefully examined menstruating uteri in macaque monkeys, and baboons, and found only congestion and loss of blood, without even shedding of epithelium.

Menstrual type.—By this term is meant the periodicity of the process. In about 86 per cent. of women the type is *regular*, *i.e.* menstruation occurs at regular intervals. It is calculated in terms of the number of days from the beginning of one period to the beginning of the next. The most common is the 28-day type, viz. in about 71 per cent. of cases. In 14 per cent. it is the 30-day type. In some cases the 21-day type is found, and a few others occur.

In a certain percentage of cases the type is irregular, the women being perfectly healthy. Such a case is one known to me, in which there was a mixture of 21, 25, and 28 day types.

Menstrual habit.—By this term is meant the duration and quantity of the flow. Normally, considerable variations are found. Thus it may last from two to eight days; occasionally for nine days. A large number of women have a discharge of blood for a week; many for three or four days. In health, the amount lost is generally about the same in succeeding periods. It is difficult to estimate the amount accurately; the average amount is said to be from 6 to 8 oz. Estimation by means of diapers is unreliable.

Very rarely healthy women are found who lose blood for less than two days or for more than eight. These extreme cases are mostly pathological.

Physiological absence of menstruation.—Menstruation is absent normally before puberty, in the intervals between the irregular discharges common during the establishment of the menstrual function at puberty, during pregnancy and lactation, in the intervals of the "dodging-period" at the change of life, and after the menopause.

Sometimes, from various causes (*vide* p. 119), there may be a discharge of blood from the vagina during pregnancy or lactation.

Vicarious menstruation.—For a long period it has been believed that a discharge of blood, of the nature of the menstrual flow, may take place from parts of the body other than the mucosa of the corpus uteri in certain cases. Gould and Pyle have recently collected a number of these. These discharges may occur regularly or irregularly, and usually occur when the regular menstrual flow ceases or becomes irregular. It is very likely that in some instances the hæmorrhages are due to some pathological cause, *e.g.* purpura. At anyrate, the phenomenon is a very rare one.

The discharge has been described as taking place from wounds and sores of the skin; from various parts of the normal skin, as a kind of bloody sweat; from the eyes, nose, mouth, ear; from the breasts. It has also been reported as coming from the bladder and rectum.

THE CLIMACTERIC.

One of the most important periods in a woman's life is that which is marked by the cessation of sexual activity. Various terms are employed in addition to the one above used, *e.g.* "the change of life," "critical time," "turn of life," "menopause."

The phenomena met with at this period are so varied in

character, the changes in the whole system of the woman are so profound, and the distinction between the normal and the pathological is so ill-defined, that the student should give the most thorough attention to the whole range of signs and symptoms which occur, not only for their scientific interest, but because of their great importance in relation to the practice of medicine. The greatest blunders are made continually by physicians as a result of careless observation and inattention regarding this period of a woman's life. What is natural may be treated as disease, and, on the other hand, pathological processes may be overlooked because the symptoms produced by them are thought to be merely phenomena of the menopause.

The age at which the climacteric occurs varies greatly, the range of variation being more marked than in the case of the development of puberty. In temperate regions it takes place in about 50 per cent. of women between 45 and 50; in 25 per cent. between 40 and 45; in 12½ per cent. between 35 and 40; in 12½ per cent. between 50 and 55. In some cases the menopause may develop prematurely, *e.g.* under 30, or may be abnormally late in appearing. It is impossible to state accurately what is the essential factor in inducing the climacteric, and what marks the limits of its duration. It is rarely quickly established, generally the phenomena which characterise it being *en evidence* for an extent of from one to three years.

The factors determining the appearance of the change of life are not well understood. It is usually later in cold than in hot climates. It is believed to be earlier in the hard-working and poor than in the luxurious and rich. Racial peculiarities are found, *e.g.* the Jews show the same tendency to early menopause in all parts of the world. The relation to the onset of puberty is not clearly known. It is stated by some that there is no special law of relationship; by others it is believed that when puberty appears early the

menopause will also be early; others think that the earlier menstruation appears the later it ceases.

Structural changes in the body.—Atrophy of the ovaries occurs, the Graafian follicles gradually becoming destroyed (? by fatty degeneration of the cells), and the connective tissue elements becoming more fibrous. They get harder, smaller, and irregular. These changes may take place quickly or they may be prolonged over years. There can be no doubt that their functional activity may continue in some cases long after menstruation has ceased, for pregnancy may take place at that time.

The uterus becomes smaller and its walls thinner. The cervix gets shortened, and may remain hard or flabby. The mucosa thins, the glands getting gradually obliterated and fibrous tissue developing. The lining epithelium becomes flattened and, in parts, destroyed. Adhesions may take place between opposed mucous surfaces.

The vagina becomes gradually contracted, especially in its upper part, and often assumes a conical shape. The rugæ gradually disappear. At first its walls are congested, and then, as its vessels atrophy in places, it has an irregularly mottled appearance. Afterwards it gets quite pale.

The Fallopian tubes atrophy, and the lumen gets often more or less obliterated. The external genitals gradually lose their fat, the labia becoming thin folds of skin. The introitus vaginæ becomes narrowed. The connective tissue elements become tougher and less capable of being stretched than in early life.

The body-contour alters somewhat. It may become less graceful, owing either to disappearance of fat or to great deposition of fat. Sometimes it becomes somewhat masculine in type; the skin may get coarser, and hairs may develop on the chin. The milk glands atrophy, and the breasts may be changed to thin flabby masses, but if the body takes on fat they may become full and large. There is generally less activity in the blood-forming tissues, some

of which shrink and harden. "Life becomes slower," as one author expresses it.

Menstruation comes to an end. This occurs in a variety of ways. In some cases the intervals between the periods lengthen; in others they are shortened. The flow may increase in quantity or duration, or in both; it may be diminished; or it may be irregularly greater or less, often alternating in quantity. Between the periods there may be small occasional losses of blood, continued dribbling, or sudden large losses. Sometimes menstruation may suddenly come to an end. In other cases it may gradually diminish and cease. In most cases the above-noted irregularities occur, the name "dodging-period" being given to the time in which the menstruation occurs at irregular intervals.

General phenomena.—The greatest variations are found as regards the general phenomena met with at the menopause.

In a few cases the woman may present no peculiarities whatever to distinguish her from what has been considered as her normal habit. In the great majority of instances, however, marked characteristics are developed, which may be noticeable not only to the woman, but to her friends and physician. Changes may be brought about which affect all the functions of the nervous system, *e.g.* mental, motor, sensory, co-ordinating, etc. Generally, she feels less inclined to indulge in her past activities. She is more easily bored and worried. Sometimes her tastes and disposition may entirely change. A vivacious and impulsive nature may become calm and melancholy, or a quiet, subdued nature may develop a tendency to irritability and impatience. Often the power of concentration of the attention is greatly lessened, and there may be forebodings of sickness, disaster, etc.

Some women suffer from a feeling of heaviness in the head; they may be dull and stupid, and inclined to sleep.

Sometimes a condition of stupor may last for hours. Loss of memory is often met with, and the woman may forget the names of those very dear to her.

There may be an abandonment of self-control or a fear that it will be lost. A woman may lose all interest in those she loves, and may even try to harm them, or she may be suspicious that they wish to injure her. Sometimes suicidal and homicidal tendencies are induced, but they are not strongly marked. There may be developed perversion of tastes; thus a woman who has always been temperate may be filled with a keen desire to drink alcoholic liquors.

Forced ideas may develop, in varying degrees of intensity and for shorter or longer lengths of time. Thus a woman may believe that she is to lose her reason, that she has a tumour. Or they may be of the nature of such a case as that reported by Börner, in which a woman believed that something was wrong with her bladder. She always took a seat near the door at a public entertainment, in order that she might retire easily if the desire to urinate should seize her. Gradually she gave up going out of her house altogether, from fear of not being able to hold her water.

The changes in disposition may be manifested intermittently or continuously. Thus, when ill-temper develops, it may exhibit itself in an occasional outburst, or continuously. Changes may be found in the sexual relationships.

The former vivid consciousness of sex differentiation becomes less marked. The influence of one sex on the other is less keen and subtle.

The sexual appetite very often disappears more or less completely, and suddenly or gradually; and, as Clouston says, "with it the affectiveness changes in its object and greatest intensity from the mate to the progeny, losing its imaginative force, its fire, and its impulsiveness." Sometimes sexual desire is abnormally intensified, and may have distressing results; this may be merely due to a condition of hyperæsthesia, or may be associated with a pathological

condition, such as tumour. This intensification may occasionally last long after the menopause.

Many peculiarities are found in connection with the sensory part of the nervous system. In some cases there is marked sensitiveness to bright lights, to loud noises, or to strong smells. There may be impairment in the power of determining the nature of impressions. Thus sour things may be considered sweet, or sweet things sour, and well-known smells may be entirely mistaken. Sometimes women complain of having bad tastes, of hearing strange noises, of deafness, of dimness of vision.

On the skin there may be areas of anæsthesia or hyperæsthesia; sometimes, a feeling as if the skin were being pricked with needles. Flushings or "heats" are often met with. They may affect one or more parts of the body, very often the head. They are usually most marked in nervous women, and are increased by emotional excitement, shock, great warmth, and other factors. Sometimes there may be considerable weakness or faintness during one of these heat spells.

Chills may alternate with the flushings. Sweating may also be a marked phenomenon. It may occur at irregular intervals, affecting one or other part of the body. Often one part tends to be specially affected. Sometimes it is worst at night; sometimes after exertion or emotion. It may occur along with the flushing or independent of it. Itchiness may occur in different parts, but especially on the external genitals. It may vary greatly from time to time as regards its extent and location, and it may occur only at intervals.

Pains may be felt in various parts, *e.g.* headache, sciatica, neuralgia, megrim. In some cases, a woman who has suffered in her past life from these conditions may be cured by the menopause.

Sometimes the chest or belly is the special seat of pain. Attacks like angina pectoris may develop. Palpitation of

the heart may be very troublesome. There may be a tendency to faintness and vertigo. Disturbances of the alimentary tract are common. If a woman has suffered from these in the past she generally complains more at the menopause, though, sometimes, improvement sets in then.

Cramps may occur in various parts of the body. These may affect the throat, interfering with speaking or swallowing. There may be stiffness or weakness in joints and muscles. In some cases, well-marked hysterical convulsions take place. True epilepsy may develop, though probably only in those with some hereditary taint, or in whom it had occurred in early life.

It is very evident from the consideration of the above-mentioned phenomena, that they may be regarded as falling under the heading of "neuroses." What the essential change is that brings about the altered condition of nervous stability, we do not know; probably it is related to metabolic changes (*vide* p. 668).

There can be no doubt that the symptoms are aggravated by various organic disturbances, which may exist at the time of the menopause. Anæmia, for instance, is very common, and may have a marked influence in determining certain distressing symptoms. Stomachic, pelvic, or other diseases may exist.

The menopause in relation to special diseases.—I have already pointed out how certain mental diseases and epilepsy may be induced at this period. Certain skin affections may develop, especially acne, herpes zoster, eczema, urticaria, pruritus; the latter is in some cases due to actual changes in peripheral nerves or end organs. Kraurosis vulvæ is often found. Disturbances of the alimentary tract resulting in vomiting, heartburn, constipation, etc., may be induced; pre-existing troubles may be intensified. Sometimes they may improve or disappear.

It is important to note that the menorrhagia and metrorrhagia, which I have described, may be aggravated by the

existence of such conditions as inflammations in the pelvis, subinvolution of the uterus, displacements of the uterus, new growths of that organ. It is, therefore, very important that these conditions should not be overlooked. Fibroids are very common causes of bad bleedings at the menopause. Carcinoma of the cervix is most frequent about this period.

Newman has analysed 500 cases of disease after the climacteric had been established a year or more. The following table gives his results :—

Disease.	With Hæmorrhage.			Without Hæmorrhage.		
	No.	Average Age.	Age at which Menopause occurred.	No.	Average Age.	Year of Menopause.
Carcinoma cervicis uteri	100	56.2	47.7	3	70.3	48
Prolapse of vagina or uterus	24	59	43.6	88	59.2	47.6
Carcinoma corporis uterus	18	57.4	49.5	...	...	...
Mucous polypus of uterus	8	55.4	47.25	...	...	...
Senile changes in genitals	5	63.6	49.4	80	54.2	46.7
Myoma uteri .	4	68	51.3	10	53.3	49.4
Ovarian cyst .	4	54	45.5	21	58.2	47.7
Doubtful conditions	20	61.7	47.4	20	58.5	46.1
Displacements and inflammations of uterus	...	...	...	35	49.2	47.5
Other affections of genitals	...	...	...	60	58.8	44.8
	183	56.5	46.5	317	56.1	46.9

It thus appears that out of these 500 cases, 183, or 36½ per cent., had a return of hæmorrhage after the menopause had been established a year or more. Of these, cancer caused the bleeding in 54 per cent. of the cases.

The question of early climacteric.—It is generally

believed that very few cases of premature establishment of the menopause occur under normal conditions, but that most are pathological in nature, being due to such conditions as the following:—Sudden shock, great anxiety, extreme exhaustion, severe cold, tuberculosis, exanthemata, septicæmia; various poisons—*e.g.* alcohol, opium, phosphorus, arsenic, mercury; inflammation of the uterus and appendages, new growths in the ovaries.

It is impossible, however, to speak with any accuracy regarding the influence of these various conditions. The metabolism of the body may be profoundly altered by some general influence on the nervous system, or reflexly through local irritation, *e.g.* inflammatory changes in the ovaries.

Delayed climacteric.—As I have already stated, there is undoubtedly evidence that sexual activity may be prolonged for years beyond the normal period. Menstruation may or may not be present, but ovulation may continue, and conception may take place (*vide* p. 657).

Many cases described as protracted climacteric are only cases in which pathological hæmorrhages take place. These may be due to the heart lesions, to uterine fibroids, carcinoma, sarcoma, adenoma, polypus, erosions of the vaginal portion of the cervix and of the vaginal walls.

DISTURBANCES OF MENSTRUATION.

Amenorrhœa.

Amenorrhœa means diminution or cessation of the menstrual flow. I have already referred to its occurrence in connection with the development of puberty (*vide* p. 105).

In the adult state, it is due to all conditions in which the health is reduced, *e.g.* anæmia, Bright's disease, malaria, phthisis, fevers, etc. It may be due to sudden shock, to great nervous depression, to chills. It may result from a change of life; this is often found in girls who go

from the country to the city to work; sometimes in those who go away to study; sometimes in those who go on a long sea voyage. It may be due to developmental defects, *e.g.* absence or rudimentary condition of the internal genitals; it may result from atresia in the genital tract preventing the escape of the menstrual blood; it may be due to cretinism; it may be caused by various pelvic diseases. In most of these it probably results from the action of the diseases in reducing the patient's health. It may be found in parametritis chronica atrophicans. It may accompany the anæmia succeeding a bad hæmatocele. It may be found in bad cases of tubal disease, *e.g.* pyosalpinx, where the patient is much run down. It may follow acute inflammation, *e.g.* in the exanthemata where the ovaries have been destroyed; or it may be due to gradual cicatrisation and atrophy of the ovaries from chronic inflammation in and around them, or from abscess formation. In tumours of the ovaries it may only be present as a result of the local condition, if the disease be bilateral and advanced.

It may be found in connection with an endometritis, where the hæmorrhagic or leucorrhœal discharge has greatly weakened the patient, or with old inflammation, where the mucosa has been changed to fibrous tissue. It is found in superinvolution of the uterus. In vesico-vaginal or recto-vaginal fistulæ it may be brought about. It is found after removal of the ovaries (*vide* p. 654). According to Lawson Tait it follows removal of the tubes alone (*vide* p. 655).

It is important, also, to emphasise the necessity of bearing in mind the periods of normal and physiological amenorrhœa, *i.e.* the period before puberty, the times between the irregular discharges so common in many cases at the establishment of the menstrual function, the months of pregnancy, the time of lactation (though in some cases menstruation may occur during nursing), the intervals of

the "dodging-period" at the change of life, and the period after the menopause. Another essential point must be attended to in this relationship, namely, the difficulties in the determination of pregnancy from the menstrual history. It is most important that the student should attend to these. Normally, when a woman becomes pregnant, her menstruation ceases, and it is customary to estimate the duration of pregnancy from her last period. Moreover, the history of the stoppage of menstruation in a woman should always suggest the possibility of pregnancy, particularly in a married woman. The student must bear in mind that a girl may become pregnant before she has ever begun to menstruate, that a woman may sometimes become pregnant during a period of amenorrhœa from some diseased condition, that it may occur during lactation and during the "dodging-period" of the menopause.

Further, irregularity of menstruation may interfere with correct calculation of pregnancy. Another set of cases present difficulty, namely, those in which discharge of blood may take place during pregnancy, *e.g.* in ectopic gestation, in pregnancy in one-half of a septate or bicornuate uterus, and in certain abnormal or diseased conditions.

If these important points be forgotten, serious error may be committed, *e.g.* a woman during the menopause, suffering from dyspepsia and flatulence, with a history of eleven months' amenorrhœa, was sent to hospital as a case of spurious pregnancy, whereas an actual pregnancy of four months' duration was found in her. A sound has been passed into the uterus of a woman during lactation, and an abortion caused; as the patient was nursing, it was not supposed that she would be pregnant, and a careless examination was made.

Menorrhagia—Metrorrhagia.

Menorrhagia means increased flow of blood from the uterus at the menstrual period, and may be expressed

in terms of quantity or duration, or of both. The normal variations found in women must be borne in mind. What is abnormal for one may be normal for another.

Metrorrhagia means hæmorrhage from the uterus at times other than the menstrual periods. In this connection must be remembered the irregular discharges of blood often found during the period of puberty before menstruation is well established, and also during the period of the menopause. The irregularity of type in certain women in a state of health must also be borne in mind. These two conditions may occur together or independently.

In this section attention is given chiefly to their occurence in the non-pregnant woman. They may be caused by various general disturbances and non-pelvic diseases, *e.g.* hæmophilia, scorbutus, acute specific fevers, Bright's disease, cirrhosis of the liver, heart disease, alcoholism.

Various pelvic diseases may lead to their occurrence, *e.g.* pelvic peritonitis ; hæmatocele and hæmatoma ; salpingitis, ovaritis, especially in early stages ; ovarian tumour in some cases ; endometritis, endocervicitis, metritis, though not in advanced cases ; retroversion and retroflexion of the uterus ; inversion of the uterus ; fibromyoma, sarcoma, carcinoma, polypus of the uterus, prolapsus uteri, subinvolution. Postclimacteric menorrhagia is referred to on p. 116.

The following conditions may lead to a discharge of blood which may be mistaken for menorrhagia or metrorrhagia, namely, lesions of the vagina and vulva, *e.g.* ulceration, tumours.

It must be remembered, also, that certain states connected with pregnancy may lead to hæmorrhages from the uterus, *e.g.* incomplete abortion, retention of bits of placenta or membranes, placenta prævia, hydatid mole, accidental hæmorrhage, inertia of the uterus.

Halliday Croom and other authors mention the occurrence of "idiopathic menorrhagia" where no cause, whatever, can be found.

Dysmenorrhœa.

By this term is meant pain associated with menstruation. In normal conditions usually no pain is felt; in a number of these cases only slight pelvic discomfort; and in others only a dull backache. When there is distinct pain it is sharp, dull, dragging, down-bearing, or labour-like. It may be felt in the loins, in the small of the back, in the pelvis; and from these regions may radiate into the thighs. Great variations are found as regards the time of onset and the duration of the pain. Thus it may be felt only for a day or two preceding the menstrual flow, ceasing at the commencement; for a day or two before, as well as for the first day or two of the flow; during the first day or two of the flow only; during the whole extent of the flow; during the last two or three days; during the day or two succeeding the flow.

At present we cannot satisfactorily distinguish the factors which determine these variations. The pain varies greatly in intensity. It may in no way interfere with the woman's regular life, or it may entirely incapacitate her for her duties.

Before considering the conditions in which dysmenorrhœa occurs, it is well shortly to recapitulate the physical factors in the pelvic phenomena of normal menstruation, so far as we know them.

1. According to Lindblom, the uterus enlarges slightly prior to the menstrual flow, and during the period is felt to be somewhat soft and lax, continuing so for a short time after the bleeding stops. The mucosa becomes congested and swollen.

2. Herman has shown that some widening of the cervical canal occurs during the flow, reaching its maximum on the third or fourth day. The widening is not at all proportionate to the quantity of blood lost.

3. The chief loss is in blood, small portions only of the

epithelial covering of the mucosa being shed, and possibly very minute bits of the sub-epithelial connective tissue stroma. The blood does not clot in the uterus in normal conditions, owing to the alkaline reaction of the uterine mucus, which is abundantly poured forth during the period, and owing to the continual passage outwards of the flow.

4. There is general congestion of the pelvic viscera.

5. Ovulation is not an essential part of the process, and may or may not accompany it.

Dysmenorrhœa is found in two sets of conditions:—

1. Associated with various pathological or abnormal conditions in the pelvis, recognisable on physical examination.

2. When no pelvic lesions, or only slight ones, can be made out.

I.—*In Relation to Changes in the Pelvis recognisable on Physical Examination.*

1. **Associated with chronic pelvic peritonitis and cellulitis.**—These varieties of pelvic inflammations are related to dysmenorrhœa in the following ways: In some cases there is no dysmenorrhœa. In other cases they lead to the formation of areas of resistance to the congestion which is general in the pelvis in connection with menstruation. The pressure of the congested vessels affects the nerves in the inflamed and rigid parts, causing pain. In other cases the dysmenorrhœa may be related chiefly to the effects produced in the uterus or appendages by the inflammation.

That variety of inflammation which is most often associated with dysmenorrhœa is utero-sacral cellulitis. I shall consider this in relation to pathological anteflexion of the uterus. In all conditions of pelvic inflammation the association of neuroses must be borne in mind.

2. **Associated with disease of the Fallopian tubes.**—Salpingitis is often the cause of severe dysmenorrhœa. The pains in the worst cases begin two or more days before the

period, and are of a spasmodic, agonising character. When the flow begins there is very often considerable relief, though frequently the pain lasts through the whole period. The explanation of the dysmenorrhœa, and of the variations which occur, is difficult. When the walls of the tube are thickened, it is possible that the premenstrual congestion causes the pain, owing to the resistance to the dilatation of the salpingeal vessels due to the inflammation. Yet there are cases of well-marked interstitial salpingitis in which there is no increase of pain in relation to menstruation. Probably the worst dysmenorrhœa is found with tubes moderately distended with pus. It is believed by some that the intense pain in these cases is caused by expulsive efforts set up in the wall of the tubes under the stimulus of the premenstrual congestion. It is remarkable, however, that some cases of marked pyosalpinx occur in which there is little or no pain at or between the menstrual periods. This is also markedly true of hydrosalpinx and hæmatosalpinx. Moreover, the amount of pain is not at all proportionate to the degree of distension of the tubes. Of great importance in these cases is the influence of the pelvic condition in inducing neurotic symptoms.

3. **Associated with disease of the ovaries.** — *Inflammation.*—The relation of pelvic pain and of dysmenorrhœa to ovaritis is little understood. It is impossible to eliminate the influence of periovaritis, or of perisalpingitis and salpingitis, with which the former condition is often associated. There is no doubt, however, that ovaritis, especially if associated with periovaritis, may give rise to dysmenorrhœa, of varying degrees of intensity in different cases; though, sometimes, it may not be marked by any special pain in relation to the menstrual period. Perhaps the most common type is that characterised by the exacerbation of the already existing pain a day or two before the flow, continuing throughout the period. Very often, however, the dysmenorrhœa develops only at the beginning of the flow;

in some cases it is continued for some days after the period.

As far as we know, the exacerbation of pain in connection with menstruation in cases of ovaritis can only be explained on physical grounds by the occurrence of congestion in an isolated organ whose expansibility is interfered with by inflammatory changes in or around it.

For a long time the term "ovarian dysmenorrhœa" has been applied especially to the cases in which the pain is most marked before or just at the beginning of menstruation, it being supposed that the pain is due to the process of ovulation. I object strongly to the use of this term in such a connection. In the first place, there can be no doubt that the special type of pain here referred to is found most marked in cases where severe tubal inflammation exists, so that no distinction whatever can be drawn between salpingeal and ovarian dysmenorrhœa. In the next place, while it is no doubt true that the escape of an ovum in marked ovaritis or periovaritis is associated with an exacerbation of pain, there is no reason whatever to believe that this process goes on in the majority of the cases of inflamed ovaries in which this special type of dysmenorrhœa is found. Ovulation may sometimes happen to coincide with the beginning of menstruation, but in most cases it does not. There is no necessary coincidence in the occurrence of the phenomena.

It is necessary to point out with great emphasis that the most marked cases in which reflex neurosis is established or aggravated are those in which the ovaries are the seat of troublesome inflammation. It is, therefore, difficult in any given case to establish a proper relationship between the physical and the neurotic.

4. **Associated with affections of the uterus.**—(1) *Malformations.*—In uterus septus and uterus bicornis, if one-half of the uterine cavity is atresic in its lower part, dysmenorrhœa occurs in association with the accumulation of menstrual blood in the part which is shut off. The same symptom is

met with when accumulation occurs in the rudimentary horn in a case of uterus unicornis. Dysmenorrhœa begins in the pelvis on the affected side at puberty. With succeeding periods the pain usually becomes more marked and more prolonged; it is often like labour pains.

(2) *Stenosis of the cervix.*—For a long time one of the most common causes of dysmenorrhœa has been thought to be a narrowing of one part or another of the cervical canal, causing a mechanical obstruction to the escape of the menstrual flow. In some cases the os internum, in others the os externum, may be the special seat of contraction. Sometimes both may be at fault or, indeed, occasionally the whole cervical canal may be narrowed.

The most erroneous ideas are prevalent in regard to this matter. No definite standards have been set up as regards the size of canal necessary to a painless passage of blood. No account has been taken of the fact that during menstruation the whole cervical canal becomes somewhat dilated. Measurements made, therefore, between the menstrual periods will not apply to the uterus during their progress.

It is interesting to note that one observer, Burton, passed the sound into the uterus at the menstrual periods in six cases of dysmenorrhœa, said to be due to stenosis of the cervical canal. In each instance he found that the sound passed very easily, the canal being much more patent then than between the periods.

It is extremely rare, as John Williams states, to find a case in which, in intermenstrual periods, a sound cannot be passed into the uterine cavity. The percentage of cases of dysmenorrhœa attributable to contraction, however, is very much greater. Moreover, the results of treatment based upon the prevalent hypothesis are very unsatisfactory, *i.e.* dilatation or division in a very large proportion of cases causes no improvement. In some cases of cure there can be little doubt that the operation has acted, not by its direct influence on the uterus, but by its influence in counteracting

a neurotic condition from which the patients have been suffering. In other cases, in which the dilatation has caused an improvement, the dysmenorrhœa has been due, not to the attributed stenosis, but to the fact that there is an abnormal tendency to clotting of blood *in utero*, to fibrin formation, or to the shedding of abnormally large portions of the uterine mucosa.

I wish particularly to emphasise the latter point. It is a well-known fact that occasionally a complete cast of the mucosa of the body may be expelled during a menstrual period, and though the cervical canal is normal and undergoes considerable dilatation the most intense dysmenorrhœa is induced. Now, there is, I believe, a proportion of cases in which bits of the mucosa of various sizes are expelled as a regular or irregular habit. And it is to these that the narrowing of the canal is due, interfering with the free escape of the menstrual blood. It does not take a large portion of tissue to block the cervical lumen at the upper or lower end.

It is extremely likely that in cases of dysmenorrhœa, said to be due to spasmodic contraction of the os internum or os externum, the contraction is induced by the presence of a portion of mucosa within the circle of muscle. This can be easily understood when one remembers how, in passing a sound into the uterus, it may often be held very firmly by a spasm of the musculature at the os internum. I am, therefore, of the opinion that a considerable proportion of cases of dysmenorrhœa should be classed as "membranous dysmenorrhœa," using this adjective to apply to portions of mucosa, great or small.

While in Edinburgh I had under my observation for over a year a most interesting case of severe dysmenorrhœa, in which in successive periods portions of mucosa, varying in size from a complete cast of the cavity of the body to a piece not larger than a ten-cent piece, were passed. The menstrual discharge was carefully collected and examined

at each period. She had suffered for over two years, the pain varying in intensity from time to time. At some of the periods, had not the discharge been most carefully examined, the true nature of the case would not have been made out.

In another set of cases, dysmenorrhœa is attributed to a narrowed cervical canal, when it is really due to an inflammatory condition in or near the uterus. Also the element of neurosis is undoubtedly overlooked in many instances, as an important factor in producing the dysmenorrhœa.

There is, therefore, but a very small residuum of cases in which it can be held that dysmenorrhœa is directly and solely due to a stenosis of the cervix. These are probably instances of congenitally elongated, conical cervix of abnormally small calibre, or of rigidity of the cervix induced by inflammatory changes, conditions interfering with the dilatation which occurs in the cervical canal normally during menstruation.

(3) *Inflammation in the uterus.*—Dysmenorrhœa is frequently found in association with endometritis. Under this heading must be included all the cases to which I have referred, under the name of "membranous dysmenorrhœa." When a complete layer of the mucosa is shed, it is due to the widespread interstitial inflammation rendering the superficial portion of the mucosa impermeable to blood. The latter escaping into the substance of the mucosa dissects a portion off. The loosened portion is expelled by the uterus, and as it is forced down it either breaks across or pulls after it part or the whole of the remaining superficial layer of the mucosa. The passage of the membranous masses through the cervix causes reflex spasms of the musculature, especially at the os internum; this further interfering with the downward progress of the uterine contents. The uterine wall is thus further stimulated to contraction, and so great pain is produced.

As I have already stated, apart from the shedding of

complete or very large casts of the mucosa, there is probably a considerable number of cases in which small portions of different sizes are expelled, the severity of the dysmenorrhœa varying greatly.

There is one uncommon form of endometritis, the villous or papillary, in which projections of granulation tissue extend into the cavity. These may cause dysmenorrhœa, either by becoming swollen with the congestion of menstruation and thus stimulating the uterus to contraction, or by being broken off and expelled, causing pain in the manner just described.

No doubt many cases of dysmenorrhœa attributed to endometritis are really due to chronic metritis. In this condition, the indurated state of the uterus, owing to the increased amount of fibrous tissue in its wall, opposes the softening and relaxation of menstruation, and the increased congestion leads to greater pressure on the nerve fibres in the wall.

Great variations are found as regards the occurrence of dysmenorrhœa in metritis. In some cases it is not present at all. These variations are probably dependent upon the extent and situation of the inflammation, the size of the lumen, and the amount of fixation of the uterus by outside inflammation. The latter point is of considerable import ance. Given a uterus in a condition of metritis, firmly fixed by peritonitic adhesions or cellulitic deposits, and there is the most favourable combination for the occurrence of dysmenorrhœa. The condition is exactly analogous to chordee in the male, in which intense pain is produced owing to the opposition to congestion of the penis, caused by the inflammation.

This combination is most frequently found in women in the diseased state known as pathological anteflexion, associated with utero-sacral cellulitis or posterior perimetritis. Here the dysmenorrhœa is due, not to the flexion in the uterus, but to the inflammation in and behind the organ

opposing the congestion of the menstrual period, thereby leading to marked pressure on the nerves.

Finally, in all cases of metritis, the importance of an accompanying neurosis as a factor in causing pelvic pains must be kept in mind.

(4) *Displacements of the uterus.*—It is probable that, in the great majority of cases, displacements of the uterus *per se* have nothing to do with dysmenorrhœa. If the condition of the escaping of menstrual blood be normal, there is no reason why the existence of an abnormal degree of version or flexion of the uterus should prevent the downward progress of the blood.

Schultze and Scanzoni demonstrated in a number of cases of intense dysmenorrhœa associated with anteflexion, that there was no retention of blood in the cavity whatever. The passage of the sound was in no instance followed by any relief or by any escape of blood.

Neither is there any ground for believing that a flexion interferes with the congestion of the uterus at menstruation. The blood vessels in the uterine wall run towards the mucosa mainly at right angles or obliquely from the vessels outside the wall, derived from the ovarian and uterine arteries, as Williams has shown. No flexion alone, therefore, can affect the circulation in the wall.

The explanation of dysmenorrhœa in cases of flexion is as follows:—In some cases the causes are metritis and fixation of the uterus, as held by Schultze, *e.g.* in the condition already referred to, where marked anteflexion is associated with inflammation in the uterus and behind it. The same conditions may be found in a marked retroflexion, where the fundus uteri is deeply placed in the pouch of Douglas.

It is a common clinical experience that many of these cases are improved by treatment of the inflammatory conditions present. Exact observations on this point have been made by Schultze, who points out that the dysmenorrhœa may be cured as the inflammatory products are absorbed, even

though the flexion of the uterus may remain exactly the same.

In another set of cases, where a very acute flexion exists, and where there is a tendency to fibrin formation or blood-clotting *in utero*, or to the exfoliation of portions of the mucosa owing to endometritis, it is not difficult to understand why there may be obstruction to the escape of the uterine contents, and consequently dysmenorrhœa. In a considerable number of cases also, the pain is referable to a neurotic condition.

That many cases of marked displacement exist in which there is no dysmenorrhœa, is a well-established clinical fact. Such examples indicate clearly that other factors are necessary to the production of the dysmenorrhœa.

In inversion of the uterus there may be great pain at the menstrual periods. In the slowly produced variety it is easy to understand why this should be so. The inverting portion becoming congested at the menstrual period stimulates the rest of the organ to contractions, which tend to increase the extent of the inversion. In chronic conditions there are usually marked inflammatory changes in the uterine wall, which tend also to induce the dysmenorrhœa.

(5) *Fibromyoma of the uterus.*—Dysmenorrhœa is a common symptom in fibromyoma of the uterus, and it occurs under different conditions.

In cases of submucous fibroids, which are tending to project into the uterine cavity, the pains are usually severe and labour-like. The polypus swells with the menstrual congestion, thus acting as a stimulus to uterine contractions. In large, pediculated, subperitoneal fibroids, there may be dysmenorrhœa of a stretching or dragging nature, due, according to Gusserow, to the distension of the tumour with blood. Great pain may also be produced when such tumours have fallen within the true pelvis, the congestion due to menstruation causing pain by increasing the weight of the tumour, by causing pressure symptoms on surround-

ing structures, and possibly by stimulating the uterus to contraction. Similarly, dysmenorrhœa may be caused when large interstitial fibroids cause the uterus to increase so that it fills the pelvis.

II.—*Dysmenorrhœa associated with slight or without any recognisable pelvic lesions.*

A large number of cases of dysmenorrhœa occur in women without distinct pelvic lesions sufficient to explain them. In these the predominant factor is disturbed innervation in one or other of its various manifestations. This subject is further considered in the chapter on "The Nervous System in Relation to Pelvic Diseases."

Menstruation in relation to mental irresponsibility in woman.—It is held by many, that in medico-legal investigations the mental condition of woman during her menstruation should be taken into account, and that inquiry should be made, in the case of a committal of a crime, whether it occurred immediately before, during, or after a period.

Krabt Ebing states that the examination of the mental condition is especially important, if any peculiarity in behaviour or nervous disturbance has been noted in connection with menstruation. He insists that if that process has had a marked influence upon the ideation of the woman, that fact should be regarded as an extenuating factor in deciding the punishment, even where there is no clear proof of menstrual insanity. If a crime has been committed during menstruation, by one who had been accustomed to be mentally disturbed at this time, and if the act denote impulsiveness, the accused should be regarded as irresponsible, in the opinion of this authority. But he adds that persons pardoned on such a ground should be kept under surveillance for a time, in order that their habits might be studied in connection with menstruation.

CHAPTER V.

THE NERVOUS SYSTEM IN RELATION TO PELVIC DISEASES.

NOTWITHSTANDING the great increase in neuroses among women during the present generation, it must be confessed that in the gynecological world scant attention has been paid to them.

Owing to the marked surgical trend in gynecological practice during the last twenty-five years, a narrow and debased specialism has been evolved which has resulted in the establishment of a school whose motto is *Le bassin c'est la femme*, and whose remedial measures are limited to different forms of mechanical procedure—from passing a sound to extirpating the appendages.

Too strong a protest cannot be urged against the centralisation of attention on the local pelvic condition, without regard to wider physical and psychical relationships. Pascal has a chapter, in his famous book, entitled "Man's Disproportion." The term might justly be applied to the mechanical school of gynecologists, who have done so much harm by their failure to give to the various symptoms related to the pelvis, their proper proportional values.

The accusation of the broad-minded physician, that the gynecologist works in ignorance of the neuropathies and organic diatheses in that region of the body where they are of chief importance, is a well-merited one; and the majority of specialists will, be they honest, acknowledge its force, and humbly confess, "Peccavi." I do not say that there is

no truth in the countercharge, brought by the specialist against the general physician, of a narrow sciolism which is incapable of estimating the significance of local pelvic phenomena; yet I firmly believe that the specialty of gynecology will never reach a position of highest repute until it is established "broad-based" upon the philosophic attitude, the wide culture, and the extensive knowledge which formed the *summum bonum* of attainment among the great masters of medicine in past generations.

These defects in us lead to error both in diagnosis and in treatment. In considering a case of pelvic pain, we should bear in mind the following points:—

1. The pain may be directly due to distinct pelvic lesions, sufficient in themselves to produce this symptom.

2. Pain may exist with minor degrees of pelvic trouble, insufficient in themselves to cause more than a small amount of suffering.

3. Pain may be a pelvic symptom in association with some condition which in itself cannot directly produce this symptom.

4. It may be a prominent symptom in cases in which no local changes of any kind can be made out.

It is, therefore, very evident that other than local factors must be taken into account as explanatory of the subjective phenomena which we are considering. Of chief importance among these is the neuropathic state—neurosis, in the widest meaning of the word. This condition is related to the pelvis in various ways.

In one set of cases, a local lesion, capable or not in itself of causing pain, may be the primary cause of development of a neurotic condition manifested by diverse phenomena. The more marked these become, the more is the pelvic pain intensified—a reactionary exhibition of the neurosis, as it were, on the seat of the primary affection. In another class of cases, there may be a slight pelvic lesion causing very little discomfort. A neurotic condition may

be developed from causes foreign to the pelvis, and this may manifest itself in intense pain, referred by the patient to the pelvic lesion. In another set, the symptom of pelvic pain is developed as one of the phenomena of a widespread neuropathic state, there being no local lesion of any kind.

There is another interesting class in which the local symptom is practically the only neurotic feature in the patient. In some of these cases the condition is somewhat like that in which the possession of a "fixed idea" is characteristic. In others, it is of the nature of a "secondary reflex action," induced by a former continuity of habit, when there was an actual painful local lesion which has since been cured. The patient's nervous system has so registered the former habit that it is reproduced apart from all contact of the higher inhibitory centres.

This power of impressing the nervous system is a well-recognised biological truth. It is well exemplified in the case of the gouty man whose foot has been amputated, and who continues to have attacks of pain in the same toes as of old. Of similar nature is the remarkable instance of the mare which, on being crossed with a stallion, bore a foal striped like a quagga—as a result of the influence of a previous conception following crossing with a male quagga.

Herbert Spencer quotes the case of a dachshund bitch which bore pups to a sheep-dog; in two succeeding years she bore them to a pure dachshund, but the offspring took after the sheep-dog as much as after the real fathers. In another case a pointer bitch bore puppies to a setter, and never afterwards was able to breed pure pointers though crossed with a pointer. Lord Polwarth, a great authority on breeding, states that if a ewe Leicester sheep breeds to a Shropshire ram, she is never safe to breed pure Leicesters from afterwards, as dun or coloured legs are apt to come even when the sire is a pure Leicester. Breeders of Bedlington terriers have taken advantage of this curious influence of telegony, as it is called, to breed dogs with strong jaws.

They first cross the Bedlington terrier bitch with a bull-dog, and destroy the litter which results. Afterwards, on crossing the same bitch with a Bedlington dog, litters are produced in which there is a good deal of the bull-dog jaw and spirit.

As regards man, Balfour pointed out in 1851 that in Surinam, if a negress had a child or children to a white man and later to a negro, the latter progeny had a lighter colour than the black parents. It has also been observed that children of white people had often shown traces of the negro character when the woman had previously had a child by a negro.

By the neuropathic or neurotic condition I do not mean hysteria. This is only one of a variety of neuroses. Yet too often are women turned away from the mechanical gynecologists, whose pelvic manipulations have failed to cure them, as wretched hysterics.

One of the greatest services rendered to medicine has been the establishment of the distinction between neurasthenia and hysteria. This we owe to the work of men like Weir Mitchell and Clifford Allbutt, who have taught us that these terms are not synonymous, though often certain phenomena are common to both conditions.

Neurasthenia, also known by the terms "nervous exhaustion," "nervosism," "spinal irritation," is a condition not yet clearly understood, though its varied manifestations are pretty thoroughly tabulated. The condition gradually develops in most cases, and is most common in the upper ranks of life.

That neuroses should be so common in women is not to be wondered at. Though Michelet's dogma is not true, that "woman's life is a history of disease," it must be admitted that it is one of physiological unrest, except in youth and old age. When we remember the great disturbances which mark the advent and departure of the reproductive era of her life, the profound changes taking

place during ovulation, menstruation, pregnancy, labour, and lactation; the subtle and complex activities of her physical life in its various diastaltic functions, it is not remarkable that neuroses should manifest themselves particularly in relation to her reproductive mechanism. That they are increasing *pari passu* with the advance in our higher civilisation cannot be denied,—among the poor, the inducing factors being over-work, over-worry, ill-regulated and poor nutrition; among the well-to-do, educational strain, over-indulgence, the stress of modern life, emotional excitement.

A condition is developed in which the whole nervous system is below par, due, it may be, to over-strain, imperfect nutrition, faulty development; the manifestations being irregular or excessive activity, abnormal sensitiveness, mental unrest and anxiety. According to Arndt, though there is a deficiency of nerve power, there is an increase in energising, due to a weakness in inhibitory power and to the too ready response of the nervous system to stimuli. In the worst stages of the condition the increased excitability has changed to a state in which there is a blunting of the nerve sensibility.

Hyperæsthesia and motor weakness, then, are the chief features of neurasthenia. Abnormal sensations and pains may be felt in different parts of the body. Cramps and twitchings may develop. The pupils may be unequal in size; the tendon reflexes are often exaggerated; there is often a feeling of languor and of unfitness for work. The appetite fails; pains in the stomach and bowels may develop, along with indigestion, constipation, etc. Emaciation is common; though, in some cases, fat is increased, the patient appearing pale and unhealthy, however. The urine is of low specific gravity, may contain deficient urea, and often abundant phosphates. Sleeplessness often develops. The woman may become very anxious and be subject to various fears; various other abnormal emotional

and mental symptoms may gradually become established, and in extreme cases some form of insanity may arise.

Neurasthenia may lead to hysteria, and may have symptoms which are found in hysteria, but it is important to keep in mind the great difference between the conditions. As Allbutt puts it, neurasthenia is the state in which there is "defect of endurance," hysteria that in which there is "defect of the higher gifts and dominion of mind." "The neurotic woman is sensitive, zealous, managing, self-forgetful, wearing herself out for others; the hysteric, whether languid or impulsive, is purposeless, introspective, and selfish."

Hysteria is a condition in which especially the higher nervous centres are at fault. Charcot calls it a psychic disease. According to Havelock Ellis, the general character of the mental phenomena in hysteria may be summed up in the word *suggestibility*. There is an abnormal degree of response to suggestion in the nervous system. There is a partial or complete loss of inhibition in regard to voluntary actions, and also a disturbance of the nervous centres regulating the automatic movements. The weakness of inhibition is associated with the tendency to erratic and extravagant reactions to stimuli—the state which has led Féré to give to the hysteric the name "frog of psychology." Then there is the tendency for many or varied nervous phenomena to spread from a small area of excitation.

The powers of the higher centres may greatly alter in regard to the initiation of movements; sensory perception may be partially or entirely wanting.

Bastian sums up the symptoms under the following heads:—

1. *Mental.*—Judgment, accuracy, and power of concentration are weakened. The emotions are easily excited and badly controlled. There is a morbid desire for the sympathy of others; she craves attention continually, is full of caprices, and makes excessive demands on those about her.

As Wendell Holmes says, "she is a vampire who sucks the blood of the healthy people about her." If she is checked or chided in any way, she takes offence, gets irritated, bursts into tears, or has an attack of pain, paralysis, or some other manifestation of the hysterical condition.

There is often a tendency to tell untruths and to practise deceptions. Clouston has pointed out particularly the changes due to the loss of inhibitory influence on the reproductive and sexual instincts. There may be various perversions of sexual emotion, *e.g.* abnormal yearning for love. Formerly these alterations were exaggerated; now, possibly, too little attention is paid to them. When these cases become extreme and hysterical insanity is developed, the prominence of sexual and erotic ideas is marked; there is often mock modesty; often a tendency to describe her pelvic condition with great detail; in some cases, they have visions in which coitus plays a prominent part; sometimes they imagine they give birth to various animals.

Lombroso has pointed out that criminal acts performed by the hysterical are very often connected with sexuality.

2. *Sensory.*—Pains, hyperæsthesia, and anæsthesia are found. Pain is apt to cease suddenly when the attention of the patient is taken from her condition. Common seats of pain are the lower part of the chest, especially on the left side; the region of the spines of the vertebræ, especially the upper ones; joints, especially if there has been a slight injury; the mammæ; the skull; the epigastric and iliac regions. Pressure over painful areas may cause marked changes, *e.g.* disturbances of respiration and circulation, great increase in the pain, hysterical convulsions, etc. In some cases, by pressure over the ovaries, marked hystero-epilepsy may be caused.

Anæsthesia may exist over the whole surface; more often it is one-sided, especially left. It may be confined to a small area or may be irregularly distributed. The special senses may be disordered, *e.g.* there may be intolerance of

light; loss of vision, smell, taste, hearing, etc.; numbness, coldness, prickings, etc.

3. *Motor.*—There may be various local spasms, general convulsions, paralysis. *Globus hystericus* is the condition in which the patient feels a lump pass from the epigastrium to the throat, choking her and often causing her to cry.

Cough is a common symptom when the patient is observed; it is absent when she is alone. Sometimes it is accompanied with abundant mucous discharge. In some cases, inspiration may be jerky and spasmodic, accompanied with a choking sensation; in other cases, expiration is of the nature of a wheeze, a whistle, a dog-bark, or it may be like laughing or crying. Yawning, hiccough, sneezing may be met with.

Clonic spasms may be met with in different parts, *e.g.* neck, back, thigh. Tonic spasm is more frequent. Contracture of limbs may thus be caused and may continue for years, lasting during sleep and anæsthesia. If this occurs in the abdominal wall, an abdominal tumour may be simulated.

Convulsions are common and may be ushered by various symptoms, *e.g.* pain, giddiness, choking, shrieking. When the patient falls in one of these attacks, she does not usually hurt herself or fall in the fire. There is often more or less opisthotonos. Consciousness is often retained, but it may be partly or wholly in abeyance. Self-infliction of injury is absent and the tongue is rarely bitten. These attacks may be single or multiple and successive. Paralysis may be found; paraplegia is common; hemiplegia less frequent. There may be incapacity for speech, or aphonia; sometimes the tongue or neck cannot be moved.

4. *Circulatory.*—Syncope may be developed and may sometimes be very marked, the pulse becoming feeble and the patient prostrated. In some cases irregular and bounding cardiac action is present. The aorta may pulsate strongly. There may be abnormal capillary action, *e.g.* hyperæmia, ischæmia.

5. *Visceral.*—Vomiting is common. Disturbed digestion, flatulence, constipation, diarrhœa may be found. Distension of the bowels may occur, forming phantom tumours. There may be retention of urine, dysuria or frequency of micturition; sometimes suppression of urine. Pains occur in the region of the kidneys, ovaries, uterus, coccyx, etc. Dysmenorrhœa is common.

Sequelæ.—It is important to remember that hysteria may pass into actual mental disease, *e.g.* mania, melancholy, dementia.

Reflex neuroses in pelvic disease.—It is to be noted that various forms of pelvic disease may be the starting-point of a variety of symptoms produced reflexly, and affecting mental, sensory, motor, circulatory, and visceral functions. These disorders vary greatly as regard the site, degree, and extent of their manifestation in different cases. Neuralgic pains are, perhaps, most common. In some cases the pelvic lesion may be the starting-point of a long spell of neurasthenia or hysteria, or of other nervous conditions, *e.g.* epilepsy or chorea.

Relation of pelvic diseases to insanity.—This relationship is not definitely established. Insane women undoubtedly have pelvic diseases just as sane women have, but whether there is any connection between them of the nature of cause and effect, it is impossible to say. It has been proposed by some to remove the appendages in cases where abnormal sexual aberrations are part of the insane manifestations, but there is no rational ground for such a procedure.

Rohé states that 60 per cent. of the women in the Maryland Asylum have pelvic disease or developmental defects, the latter being often found among "degenerates." He thinks that these lesions should be treated just as they would be in sane women. He gives an account of 34 cases on whom operations were performed, 30 being abdominal sections for the removal of the appendages. In 3 of these a secondary vaginal hysterectomy was done, in 2 repair of a lacerated cervix, in 2 vaginal removal of uterus and appendages.

Of the 30 abdominal sections, 10 were cured physically and mentally, 4 were decidedly improved, 13 were unimproved, 3 died. Of the 3 secondary vaginal hysterectomies, 1 was cured and 2 not improved. Of the 2 primary total extirpations, one was cured and the other

improved. The 2 trachelorrhaphies both recovered, mentally and physically.

The forms of insanity in which recovery took place were: puerperal mania, 4; melancholia, 6; mania, 3; hystero-epilepsy, 1. Total, 14.

Those in which complete recovery did not follow were: melancholia, 2; mania, 5; puerperal mania, 1; dementia (including 4 epilepsy), 7 (3 deaths); paranoia, 2; hysterical insanity, 2; adolescent insanity, 1. Total, 20. Rohé believes that early operation would increase the proportion of recoveries.

Treatment of pelvic pains in women.—In the treatment of pelvic pain the failure to consider the existence of relationships between local and general conditions, between pelvic suffering due to and commensurate with pelvic lesion and that which is due to neurosis, and the fixation of the attention upon the local state, have resulted in a form of practice very often fraught with disappointment both to physician and patient, not to speak of the evil consequences to which I have above alluded.

In one of the very latest articles on the treatment of dysmenorrhœa, by one of the recognised leaders among English gynecologists, not a single word is given to indicate that it is at all necessary to pay attention to neurotic complications, whereas I make bold to say that, taking all sorts and varieties of dysmenorrhœa into consideration, it is *the* factor which is most common to all, which requires most careful attention and in many cases sole attention.

The narrow and mechanically-minded specialist, on coming into contact with a case of dysmenorrhœa, at once proceeds to establish a *locus standi* in the pelvis. He argues: "The patient complains of pain in the pelvis; it must be in the pelvis; its cause is in the pelvis; its treatment must be by measures directed to the pelvis." He then has a choice of procedures. Probably he thinks first of uterine flexion, and a stem pessary may be brought into requisition; or he may diagnose a stenosis of the os, and proceed to a dilatation or to a cutting operation; or he may deem the ovaries at fault, and decide heroically on their removal.

It may be that he will carry out these different operations *seriatim*, in the chance that he will at last hit on the successful one. Sometimes he cures the patient—sometimes he does not. When he is successful, he attributes the good result directly to his operation, forgetting that very often benefit is obtained either through its indirect effect on her nervous system, or by the influence of the rest, change of scene, diet, etc., with which the operative treatment is accompanied.

The history of gynecology is one of a succession of periods of concentrated attention to one after another of the pelvic contents. Before the days of the bimanual examination, when every gynecologist wielded the tubular speculum, the supposed great source of pelvic trouble was the so-called "ulceration of the cervix," and there are well-founded traditions of fabulous fortunes made by those who devoted their lives to the touching of these diseased spots with various applications.

Then, with the discovery of the uterus, came the period of displacements and contractures, when nature's mistakes were remedied by pessaries and dilators and scissors. Then, the era of the ovaries, and finally, that of the tubes. Now, at the end of the chapter, what can the *fin de siècle* gynecologist do but practise upon the whole gamut of his predecessors, giving special attention to one or another according to his particular bent or predilection. And so we find the country getting filled with women nursing a grievance against their wombs, their ovaries, or their tubes, and in many instances possessing d'agrams of their pelvic topography furnished by their zealous gynecological physician, in order, I suppose, that they may, in their leisure hours, exercise their already over-stimulated introspective faculty with more scientific exactness.

Who that has read Clifford Allbutt's lectures on visceral neuroses, has not smiled at his account of the woman "entangled in the web of the gynecologist, who

finds her uterus, like her nose, a little on one side; or again, like that organ, running a little; or as flabby as her biceps, so that the unhappy viscus is impaled upon a stem, or perched upon a prop, or is painted with carbolic acid every week in the year except during the long vacation, when the gynecologist is grouse-shooting, or salmon-catching, or leading the fashion in the Upper Engadine."

Should the gynecologist's moral sense become somewhat blunted, it is not difficult to understand why he may fall into the reprehensible habit of trading on the fears which naturally fill the minds of women when their reproductive apparatus is out of order, and of elevating into an unnecessary importance conditions which are but trifling.

Let me not be misunderstood. I am not denouncing local and operative interference, only irrational and injudicious interference. We are all subject to this temptation. We all like short cuts to success. We are all prone to try, sometimes, like Allbutt's *bête noir*, "to stem the tides of general and diathetic maladies with little Partington-mops of cotton-wool on the ends of little sticks." It is much less troublesome to make a few cuts and to put in a few stitches, than to patiently analyse a subtle and puzzling case, and to exert our whole energy in overcoming an obstreperous or aberrant nervous system.

Yet it is this latter practice that must be our constant study throughout gynecological work; our chief study in many cases where pelvic pain and discomfort are prominent symptoms.

Throughout the orthodox medical fraternities of the most advanced modern civilised countries, there has been a widespread neglect of all remedial measures not of a tangible and physical kind. This attitude has no doubt been developed in antithesis to the ridiculous pretensions of the mystics of the dark ages in Europe who were the representatives of Eastern occultism.

We are taught to denounce with academic scorn, and

rightly in most cases, faith-healers, Christian scientists, hypnotists, religious miracle-workers, *et hoc genus omne.* Yet, if a man will but take the trouble to study this interesting congerie of empirics, with an unbiassed and absorbent mind, he will discover that amid their extravagant claims and sententious philosophies, they have all been nursed upon one common germ idea, namely, that the transcendent power in the human organism is that of mind, and that the effects of diseased conditions, especially of those due to neuropathic changes, may be enormously modified by influences brought to bear upon the higher centres.

If one investigates, for example, miracle-working in sacred shrines, one will easily be convinced that striking cures are there wrought, often in cases which have baffled the best medical skill. The great mass of these cases are examples of neurosis, and they are chiefly manifested in women. That the marvellous transformations which are brought about are due to the special interference of Deity, is a pretentious assumption. One can see as remarkable cures effected through the agency of hypnotism.

With these various methods of empirical procedure, the medical world can have nothing to do, save, perhaps, in the case of hypnotism. It is our duty, however, not to rail against them in aimless talk, but to sift their claims thoroughly, and to demonstrate with scientific surety wherein lie their errors. It is only in this way that the race of pretenders and charlatans can be eliminated from the earth.

Let us not, moreover, fail to recognise that all these healing methods have emphasised the fact that the supreme factor in altering neuropathic conditions is the power of conviction and auto-suggestion, acting on the dominant cortical control centres, and through them on the whole nervous mechanism of the body.

Realising this, it is our duty, in the treatment of pelvic pains in women, to impress strongly upon the mind of the

patient the necessity of taking her thoughts from pelvic conditions, to teach her ever to practise self-control, encouraging her sympathetically, removing from her anxiety and fear as to the gravity of her state, and insisting upon the importance of counteracting every development of neurosis that may become manifest in her.

General measures, *e.g.* change of scene and occupation, freedom from over-work and worry, improved nutrition, etc., are of the greatest value in many instances. In cases where hysteria or neurasthenia may be marked, the Weir Mitchell treatment should be carried out. This consists in isolation of the patient under the care of skilful nurses for several weeks; regular massage of trunk and limbs; improvement of nutrition by highly nourishing and easily digestible food, *e.g.* milk, eggs, beef-tea, the chief factor being milk; and, in some cases, faradic electricity applied to the muscles.

Operative treatment is necessary in many cases, where there is distinct remediable pelvic lesion. But it must be insisted upon that these shall not be placed in the forefront of the therapeutic measures at our disposal, nor shall be undertaken until the entire state of the patient has been investigated, and every effort made to improve her condition on the lines which I have laid down.

Moreover, it must be remembered that, when local treatment of a pelvic lesion is necessary, the cure will be hastened and more firmly established by careful attention to the improvement of the neuropathic complications with which it is so often associated.

The rash and wholesale manner in which, in particular, removal of the appendages for the cure of pelvic pain has been carried out, cannot be too strongly condemned. The uselessness of this procedure in a large number of cases has been clearly shown by Playfair in his article in the *Obstetrical Transactions, London* (vol. xxxiii.).

CHAPTER VI.

THE GENITAL TRACT IN RELATION TO MICRO-ORGANISMS.

In recent years an immense amount of work has been done in investigating the life-history of germs in the genital tract, and the part that micro-organisms play in pelvic disease whether they enter through the vagina or by some other route.

The Bacteriology of the Genital Tract in Various Normal Conditions.

In the new-born child, in almost all cases no germs are found in the vagina. Very soon, however, they enter, favoured by baths, washing, the application of oils, etc. Stroganoff states that a breech delivery of a female child favours their premature entry. Within the first two weeks gelatin-liquefying germs are rarely found.

In girls and women various bacilli and cocci may be found in the vagina, as well as sarcina, yeast fungus, etc. One of these germs is known as Döderlein's vaginal bacillus. These germs flourish best when the vaginal secretion is alkaline; in acid conditions they are killed or weakened in vitality. As a rule, in normal conditions, no germs are found in the uterus or tubes. Menge has carried out an interesting series of experiments regarding the bactericidal properties of the vaginal secretions in fifty non-pregnant women. He introduced into the vagina a number

of pathogenic organisms, namely, *Bacillus pyocyaneus*, *Staphylococcus pyogenes*, *Streptococcus*. In all cases he found that in a short time they had all disappeared, whether the vaginal reaction was acid or alkaline.

He believes that the following are the factors concerned in the germicidal action, arranged in order of importance :— (1) The antagonism between the normal vaginal bacilli and those which were introduced; (2) the products of the vaginal bacilli; (3) the acidity of the secretion; (4) the secretion of the vaginal wall; (5) leucocytosis; (6) the absence of free oxygen in the vagina.

He found these properties in the new-born child where no vaginal bacilli exist. He also found that if two similar specimens of acid vaginal secretion be taken, and one be sterilised by heat, this specimen loses its germicidal power. If to the other specimen an alkali be added, the germicidal power is diminished, but not destroyed; if this sample be sterilised by heat, it is lost entirely and then becomes a good nutritive nidus.

It is also believed that the cervical secretion though alkaline is very germicidal to pathogenic organisms. It is, therefore, important to note that the vaginal secretion may vary greatly in its effects on microbes lying in it. While it may soon destroy them in many cases, in others it may only weaken them and destroy their virulence, as Winter and others have shown. This virulence may be regained if the nature of the secretion be altered, *e.g.* by the action of gonorrhœal infection, the presence of organic débris, etc.

As regards the influence of menstruation.—Jacob and others state that the vaginal bacilli are increased during the period owing to the diminution in the acidity of the normal vaginal contents, as a result of the entrance of the blood. Stroganoff examined the cervix during the menstrual flow, and found that in many cases it contained germs, though none that would liquefy gelatin.

In pregnancy, the vaginal secretion is believed to be very germicidal to pathogenic organisms. Stroganoff found plenty of ordinary vaginal bacilli, but rarely those that would liquefy gelatin. Krönig performed a number of experiments on pregnant women, introducing many organisms into the vagina. He found that streptococcus was killed before the staphylococcus, and showed that douching of the vagina with antiseptic solutions reduced or destroyed its germicidal power, and that the use of plain water slightly diminished it. He thinks, therefore, that prophylactic syringing before confinement can do no good, and may be a source of harm.

Stroganoff has found germs in the vaginal mucus, but none of the gelatin-liquefying kind.

In the puerperium, the use of antiseptic solutions in the vagina after labour is being discarded by many authorities, save where digital examination has been carried out, labour has been abnormal, or operations have been performed; and in cases where the patient may be depressed in health from various causes, *e.g.* nephritis, heart disease, syphilis, anæmia, diabetes, etc.

In abortions, the vaginal reaction varies according to the amount of blood and débris found in the vagina. The germs also vary greatly in number and nature from time to time; the pathogenic organisms are more apt to be found in the vagina and cervix in connection with abor tions than in any other conditions, probably mostly due to digital examinations and manipulations.

In old women Stroganoff finds various microbes in the vagina, mostly rod-shaped, smaller on the whole than in sexual life. The vaginal reaction is faintly acid; in the neighbourhood of the cervix it is neutral or alkaline. In the cervix living germs were found in about 50 per cent. of cases. Very seldom are any detected which liquefy gelatin.

Micro organisms in the female urethra. — Gawronsky

made cultivations from the secretions in the urethra in sixty-two cases. In fifteen of these, bacteria were found; in three the *Streptococcus pyogenes*, in eight the *Staphylococcus pyogenes aureus*, in one the *Staphylococcus pyogenes albus*, in two the *Bacterium coli commune*. Amongst the negative cases were ten where the women had peri or parametritis; six, prolapse; three, pregnancy.

Relation of Micro-Organisms to Pelvic Diseases.

At the present time the tendency is to attribute the great majority of pelvic inflammations to the action of micro-organisms. The inflammatory processes are simply, to state the modern view, the series of phenomena caused by nature's resistance to the noxious influence of the infecting organisms. These processes are, therefore, not evil in themselves, but are beneficial and purposeful. The most important germs which act as infecting agents are as follows:—

Streptococcus pyogenes (most frequent source of trouble).
Staphylococcus pyogenes aureus.
Bacterium coli commune.
Gonococcus.

The following are less often a source of trouble:—

Staphylococcus pyogenes albus.
Staphylococcus pyogenes citreus.
Staphylococcus epidermidis albus.
Bacillus pyocyaneus.
Diplococcus pneumoniæ.
Tubercle bacillus.

These germs may gain entrance by the vagina, rectum, bladder, intestine, or may be carried from some distant part by the circulation.

The conditions which favour their entrance are a favourable soil, *e.g.* a raw surface, a tissue of impaired vitality, a general condition of poor health in which the resistance

of the tissues is below par, dying organic matter,—*e.g.* the remains of placenta or membranes *in utero* or blood clot that has been formed for a little time.

In some cases the micro-organism is capable of attacking the tissues when they are in a state of perfect health, *e.g.* gonococcus.

The most common source of entrance for the various germs is undoubtedly the vagina. They may spread up into the uterus and along the tubes, reaching the peritoneum, either setting up infective processes along this whole extent, or by growing in some suitable discharge or débris which lines the passage; or they may enter a raw, injured, or diseased surface, and spread to cellular tissue, peritoneum, tubes, or ovaries by means of veins and lymphatics.

The part played by germs which find entrance by way of the rectum and intestine is not yet well known. In all probability it is greater than has been understood. The frequency of retro-uterine inflammation in women, especially in the unmarried, is in my opinion not related so much to infection from the uterus as from the rectum. Experiments (I shall describe some of these on p. 300) clearly show how quickly the *Bacterium coli commune* can penetrate the bowel wall and adjacent tissues, if they be at all impaired in vitality.

In the rectum, the overstretching of the wall from constipation, so common in women, the continual soaking of the wall in this state with toxic matters being absorbed from the gut, the occasional occurrence of cracks and ulcers, are all factors which favour the passage of the bacterium coli into the utero-sacral ligaments, the surrounding cellular tissue and peritoneum, and even the uterus. Higher up in the intestinal tract, overloading of the bowel, pressure on it, ulceration, may also bring about the same movements in the bacteria.

The bladder is probably an uncommon source of entrance. Where it has become infected on its mucous surface, and

where the vitality of the wall is impaired, *e.g.* by ulceration, pressure, or tumour growth, germs may pass from it to surrounding tissues.

The exact relationship between germ action and various other factors, which have long been regarded as causal in the production of pelvic inflammations, has not yet been definitely established. I shall consider these in connection with the various diseases themselves.

Thus, menstruation has always been considered important in relation to the causation of inflammation, especially in the uterus, a chill or extra exertion being considered as playing a leading rôle. Now we are inclined to think that menstruation as a factor acts probably more by altering the nature of the vaginal secretion, rendering it more suitable for the growth of the pathogenic germs which might be lying in it, and thus making it more easy for them to extend upwards into the uterus. No doubt other influences, *e.g.* chill, fatigue, etc., might also favour their activity, by interfering with the normal resisting powers of the tissues.

Excessive coitus, especially at menstruation, is said to lead to inflammation, *e.g.*, in the uterus. There is no proof that the mere physical excitement can bring about this change. More likely it is associated with microbial activity, the irritation of the tissues caused by the excessive physical exercise favouring their activity.

In most cases, possibly, there is a gonorrhœal infection at the time of coitus. The influence of labour has long been regarded as a prominent factor. In the puerperium all the conditions favourable to germ activity are present. The woman is reduced in strength. The uterus is weakened by its great exertion in delivery, the condition of its circulation is greatly altered owing to the contraction and retraction of its musculature, and its tissues are below their normal standard of strength owing to the puerperal retrogressive changes which take place in them. The inner

surface affords a large absorbing area; the placental area presents a number of opened blood sinuses in which blood clots are formed; blood clot often lies in the cavity; the cervix is often torn; the perineum and vagina may be bruised and lacerated; portions of the placenta or membranes may be left *in utero*.

That the lacerations *per se* can start an inflammation is not now believed. Were it not for germ infection, they would heal by direct union or direct granulations, without the development of inflammatory phenomena.

There are certain conditions in the puerperium which may also predispose the uterus to infectivity, *e.g.* too early rising, walking, or working, but whether these conditions in themselves can lead to actual metritis is doubtful. One thing is certain, namely, that in many cases these conditions are followed by no disturbance whatever. It is common to find among the labouring classes those who systematically rise early after childbirth and go to work, in whom no inflammatory changes whatever follow.

Injuries resulting from operative measures may, by bruising, lacerating, or cutting the wall of the genital tract, afford a nidus for the development of germs; the irritation of a pessary may act in the same manner.

The influence of certain general conditions, *e.g.* rheumatism, malaria, scrofula, constitutional syphilis, probably plays some part in certain pelvic inflammations, but we cannot at present speak with any definiteness in regard to how they act nor in regard to their relationship to microbial action. They may certainly act in one way, namely, by depressing the vitality of the tissues.

Regarding the modes of action of the various germs it is needless to speak. Various tissues are affected; various results produced; these variations depending upon the mode of entrance of the microbes, their virulence, the nature of the soil on which they grow, the power of resistance of the tissues.

Gonorrhœa.—Special reference must be made to the part played by gonorrhœa.

Since Noeggerath published his first paper in 1872 great attention has been given to the study of gonorrhœa as a factor in the production of pelvic disease in women. In Great Britain, Sinclair, and in Germany, Sänger, have been most prominent in pointing out its importance.

A woman may acquire an acute gonorrhœa. In such a case the gonococcus develops by selection in the mucous glands of the urethra and urethral orifice, in the ducts of the Bartholinian glands, and often in the mucosa of the cervical canal. So far as is known, the vaginal wall is probably proof against the activity of this germ unless its vitality be impaired, or its epithelium thinned or cracked (*vide* p. 582).

In most cases the acute disease is set up in the cervix and vulva at the same time. Sometimes, however, as a result of the contaminating coitus, the cervix may be at first affected, and the vulvar region afterwards. In some cases only the external parts are infected.

In any case, it is of great importance to note that when all acute symptoms and signs have passed away, the disease may still be present in the crypts about the urethral orifice, in the ducts of the Bartholinian glands, and in the cervix.

In connection with gonorrhœal infection, sometimes in the acute stage, but more commonly after the acute stage has passed away, inflammation may spread up the whole mucosa of the uterus, may be found in the tube, ovary, or in the peritoneum round about these. It may spread to the bladder, ureters, and kidney. It may affect the Bartholinian glands.

Is the gonococcus the cause of infection in these cases? Do the products of its growth merely favour the activity of the streptococcus and other important organisms? Is the infection due to a mixed infection of gonococcus and streptococcus, or some other pathogenic germ?

These questions cannot be answered with accuracy. By

many it has been believed that the gonococcus is capable of carrying infection directly to all these different parts. Now the tendency is to limit the range of its activity. There are, however, great variations in opinion. One fact seems to have been established, namely, that the products of the gonococcus can so alter the secretions in the vagina (rendering it neutral or alkaline) as to render it favourable to the growth and activity of streptococci and other pathogenic organisms.

Regarding the spread of an inflammation from the urethra to the bladder and, it may be, up the ureter to the kidney, it is believed that the infecting agents are streptococci, etc., and not the gonococcus, the former having started on its course in the favouring conditions produced by the action of the latter in the urethra.

As regards the setting up of inflammation in the Bartholinian glands, some believe that the gonococcus may be directly responsible, while others think that the infecting agent is one of the other organisms referred to. Probably each may be able to infect the gland. Certainly in some cases the gonococcus may be found in the inflamed gland. It might be expected to infect that tissue because the gland is lined with a single layer of cylindrical epithelium, a favourable site for the gonococcus.

As regards the uterus, there seems little doubt that inflammation may be set up both in the mucosa and in the whole wall by the gonococcus. As to the frequency with which this occurs one cannot speak with accuracy.

In many cases of uterine inflammation, which clinically might be attributed to the influence of the gonococcus, the germ cannot be found at all. No doubt, in some of these cases, the infecting agent is some other organism, *e.g.* streptococcus.

But it must here be stated that Bumm, Gottschalk, and Immerwahr have recently reported that in a considerable number of cases of uterine inflammation they could not

find any germs in the secretions from the uterus. This, of course, does not necessarily prove that the cause of the inflammation in these cases was not micro-organismal.

Neither is Menge's report conclusive, namely, that in the examination of curettings from seventy-three cases of endometritis, he was unable to find micro-organisms, save, in some cases, the gonococcus and tubercle bacillus.

In some cases there may be an infection due to the activity both of the gonococcus and of one of the other germs.

As regards the tube, there is ample proof for believing that the gonococcus may infect it and lead to inflammation. A. Martin believes that in some cases it may reach the tubes by way of the lymph channels or spaces in the connective tissue of the parametrium instead of travelling along the mucous tract. Mixed infection may occur in some cases.

As regards the peritoneum, Sänger believes that the gonococcus is only capable of setting up localised pelvic inflammation, *e.g.* perisalpingitis, periovaritis. He thinks that it cannot initiate a widespread peritonitis, but regards this as being due to mixed infection, the active agent being streptococcus, or some other organism. The gonococcus does not appear to survive long in the peritoneal cavity. It is also believed by many that cellulitis is not due to the gonococcus infection directly, but to mixed infection; I mean, in cases where it follows gonorrhœal infection. As regards the ovary, it is also believed that the gonococcus may infect it from the tube, and set up inflammation.

Sänger lays great stress upon the marked liability of pregnant and puerperal women to acute gonorrhœal infection; and, also, on the tendency to the development in these states of an acute exacerbation of what was previously a slight infective inflammatory process. Thus a latent condition may develop into an acute outbreak in pregnancy or the puerperium without any fresh infection occurring.

Sänger points out that in the puerperium a special variety of acute inflammation of the tubes and ovaries of a pure gonorrhœal nature may be due simply to a recrudescence of an old gonorrhœal trouble, without any new infection.

It must, however, be remembered that similar phenomena may be produced by the action of septic organisms. These always find more favourable conditions for development where there has been a latent gonorrhœa. Possibly, therefore, some of the cases referred to by Sänger are of this nature.

The particular work of Noeggerath was to point out the importance of "latent gonorrhœa in the male" as a factor in the production of various diseases in the female pelvis, especially endometritis, salpingitis, ovaritis, and localised peritonitis. He pointed out, what is now generally recognised, that the male urethra may remain the seat of a latent power of infection long after all apparent signs and symptoms of acute gonorrhœa have passed away. This power resides in a discharge produced by the remains of the original gonorrhœal infection, and is probably limited to the crypts of the mucous membrane.

The excitement of marriage, of alcoholic indulgence, or of over-fatigue, may stimulate these areas of latency into renewed activity, and, as a result, the woman, after coitus, may be infected in the manner which I have described.

The manner in which this is brought about is not clearly known. In many of these discharges from the male urethra, no gonococci can be found. Very probably in such instances the discharge may act by modifying the vaginal or cervical secretion, as to afford a suitable nidus for the streptococci or staphylococci, which spread upwards, causing the various disturbances to which I have alluded.

Very often a perfectly healthy woman is infected this way at the time of her marriage, developing various forms of pelvic trouble soon afterwards.

The part played by the *Bacterium coli commune* is discussed in connection with peritonitis (*vide* p. 300).

Tubercle bacillus.—Tuberculosis in the genital tract may be set up in a variety of ways.

1. It may be primary, *i.e.* the bacilli may enter from the outside by way of the vagina, being introduced by dirty instruments, by examining fingers, by sleeping with a tubercular person, by coitus with a man suffering from genito-urinary tuberculosis. In such cases, the vagina and cervix may be first affected, the disease spreading afterwards along the uterine and tubal mucosa; or the upper genital tract may sometimes be first attacked, according to Whitridge Williams, the bacilli entering a denuded surface on the vaginal wall and being carried up by the lymphatics.

2. The genital organs may become affected by the direct spread from neighbouring tuberculous areas, *e.g.* tuberculosis of bladder or bowel; ulcers may perforate or abscesses burst, leading to fistulous communications.

Williams states that one of the most frequent sources of genital tuberculosis is tubercular peritonitis. Weigert has shown that in this disease the bacilli which become free in the peritoneal cavity tend to sink into the pelvis, setting up infection; they are there in the best position to be swept towards and into the tubes, and they may be undoubtedly carried into the latter, setting up disease, without infecting the pouch of Douglas at all.

3. The bacilli may be introduced directly into the vagina when the patient has tuberculosis in some other region, *e.g.* urinary tract, intestines, lungs, the infection spreading from the discharges.

Hegar has pointed out that genital tuberculosis is rare in childhood and after the climacteric.

Infection by men suffering from genito-urinary tuberculosis is of considerable interest. A good many cases have been noted in which tubercular epididymitis has given rise to infection. There are instances also in which men

suffering from pulmonary tuberculosis have infected the genitals of their wives, but it is not known whether, in such cases, the tubercle bacilli are contained in the semen.

Landouzy and Martin mixed the semen of a guinea-pig which had died of tuberculosis, with salt solution, and injected the mixture into the peritoneal cavity of fifteen guinea-pigs; five died of tuberculosis. Curt Jani found very few bacilli in apparently healthy testicles and prostates of persons with tubercular phthisis. Gärtner states, in reference to Jani's description, that in tubercular patients, before death occurs, the bacilli may spread to various parts of the body, and hence in this stage may often be found in the blood.

Spano injected semen from a tubercular man into the abdominal cavity of eight guinea-pigs, and produced tuberculosis in six cases.

In two other cases, by injecting it into the vagina, genital tuberculosis was caused.

Mafucci injected large doses of bacilli into the jugular vein of a dog, and found them afterwards in the semen of the animal.

Rohlff, however, introduced semen from a tubercular man into the anterior chamber of the eyes of goats and rabbits by means of a needle puncture, and got no results. The amount of virus introduced was, however, very small in these cases, and goats are not very susceptible to tuberculosis, so that these experiments are inconclusive.

Westermayer introduced testicular tissue from a tubercular patient into the peritoneal cavity of rabbits without setting up tuberculosis, but he was not able to distinguish tubercle bacilli on microscopic examination of the testicles. In a case of acute miliary tuberculosis, in which bacilli were found in the testicle, injections of portions of it into the peritoneal cavity caused tuberculosis in the rabbit. Walther examined several testicles in cases of phthisis and found no tubercle bacilli in them. Gärtner thinks that they are very

scanty in the semen in such cases. He injected tubercle bacilli in the trachea and lungs of male guinea-pigs, setting up infection, and after three or four days obtained semen from their testicles. In thirty-two cases he found tubercle bacilli only in five, and the semen in these few instances, when introduced into the peritoneum of other animals, set up only a mild form of tuberculosis. In another set of cases he set up tuberculosis in the testicle by local injection, and found that in 50 per cent. of the animals into which he introduced the semen severe tuberculosis was set up. Gärtner, therefore, believes that genital tuberculosis in the male is a very much more serious danger for the female than distant tuberculosis.

The various parts of the genital tract, including the ovaries, may be affected, though the vulva and vagina are very rarely attacked. Sometimes a mixed gonorrhœal and tubercular infection may take place. Pyosalpinx may develop in tubercular salpingitis, probably associated with a mixed septic infection.

CHAPTER VII.

CASE-TAKING.

The examination of a woman suffering from one of the diseased conditions peculiar to her sex is sometimes a very simple matter, but very often it is a difficult and unsatisfactory process. A physician may investigate the state of her lungs or nervous system with comparative ease, but when the region of the pelvis enters into consideration, exceptional tact and skill are, in many cases, essential to the acquirement of all the information that may be desired. It is most important that the investigation should be conducted so that the patient is convinced that she is being treated with the utmost consideration and delicacy. No definite method can be adopted for all cases. It is necessary to vary the method of procedure according to the nature of the case, the temperament and condition of the woman, as well as other factors. There must always be a judicious blending of the *suaviter* and *fortiter*. A physician may possess great knowledge regarding the pathology and treatment of diseases of women, but he will not make great headway in the practice of gynecology unless he ever appreciates the subtleties and peculiarities of the psychical organisation of women. Delicacy, tact, patience, and judgment must be brought into employment. Thoroughness, also, must be particularly enjoined. Owing to the peculiar difficulties of gynecological examination, there is a constant temptation to be satisfied with an imperfect acquisition of facts, and there is no department of medicine

in which more serious mistakes may ensue from want of thoroughness, than in gynecology. Finally, downright honesty should be the motto of the physician. There is no sphere in which there has been more dishonest practice, and it is not out of place to utter a strong protest against the crime practised by those who, for the sake of gain, trade on the fears which naturally fill the minds of many women when their reproductive apparatus is out of order, and who elevate into an unnecessary importance conditions which are but trifling.

In all first-class schools of medicine, students are taught to study their dispensary and hospital cases according to a systematic plan. Such a method is an admirable and necessary one on account of the training it gives, but it is needful to remind the student that, in private practice, the case-taking card may not, in many cases, be rigorously followed; he may vary his method for particular reasons in special instances.

The following plan is a somewhat modified form of the card used in the University of Edinburgh—drawn up by Professor A. R. Simpson :—

ANAMNESIS.

1. NAME; AGE; OCCUPATION; RESIDENCE; MARRIED, SINGLE, OR WIDOW; DATE OF ADMISSION.
2. COMPLAINT AND DURATION OF ILLNESS.
3. GENERAL HISTORY OF—(*a*) Present Attack; (*b*) Previous Health; (*c*) Diathesis; (*d*) Social Conditions and Habits; (*e*) Family Health.
4. SEXUAL HISTORY.
   (1) *Menstruation*—
      A. Normal—(*a*) Date of Commencement; (*b*) Type; (*c*) Habit—
         Duration.
         Quantity;
      (*d*) Date of Disappearance.
      B. Morbid—(*a*) Amenorrhœa; (*b*) Menorrhagia; (*c*) Dysmenorrhœa.

(2) *Intermenstrual Discharge*—(*a*) Character; (*b*) Quantity.
(3) *Pregnancies*—(*a*) Number; (*b*) Dates of First and Last; (*c*) Abortions; (*d*) Character of Labours; (*e*) Puerperia; (*f*) Lactations.

5. Local Functional Disturbances—(*a*) Bladder; (*b*) Rectum; (*c*) Pelvic Nerves and Muscles.

6. General Functional Derangements—(*a*) Nervous System; (*b*) Respiratory System; (*c*) Circulatory System; (*d*) Digestive System; (*e*) Emunctories.

PHYSICAL EXAMINATION.

1. General Appearance and Configuration.

2. Mammæ.

3. Abdomen—(*a*) Inspection; (*b*) Palpation; (*c*) Percussion; (*d*) Auscultation; (*e*) Mensuration.

4. External Genitals.

5. Per Vaginam—(*a*) Orifice; (*b*) Walls and Cavity; (*c*) Roof; (*d*) Os and Cervix Uteri.

6. Bimanual Examination (Abdomino-Vaginal, Recto-Vaginal, Abdomino-Rectal, Abdomino-Recto-Vaginal, Abdomino-Vesico-Vaginal)—
   (1) *Uterus*—(*a*) Size; (*b*) Shape; (*c*) Consistence; (*d*) Sensitiveness; (*e*) Position; (*f*) Mobility; (*g*) Relations.
   (2) *Fallopian Tubes.*
   (3) *Ovaries*—(*a*) Size; (*b*) Situation; (*c*) Sensitiveness.
   (4) *Peritoneum and Cellular Tissue.*
   (5) *Bladder.*
   (6) *Rectum.*
   (7) *Pelvic Bones.*

7. Inspection of Vaginal, Rectal, and Vesical Cavities.

8. Use of—(*a*) Speculum; (*b*) Volsella; (*c*) Sound; (*d*) Dilators; (*e*) Curette; (*f*) Aspiratory Needle.

9. Physical Changes in—(*a*) Nervous; (*b*) Respiratory; (*c*) Circulatory; (*d*) Digestive; (*e*) Emunctory Organs; (*f*) Skin; (*g*) Bones.

DIAGNOSIS.

PROGNOSIS.

TREATMENT.

PROGRESS AND TERMINATION.

ANAMNESIS.

It is most important that this plan should be carefully mastered by students. It is not to be hastily crammed at the last moment, immediately before their clinical examinations, nor to be held in their hands while taking a case, and used as a mere mechanical guide of procedure. A thorough mastery of the card involves a wide clinical knowledge, and the various divisions are arranged in a form convenient to the grouping of the details of information which we obtain for comparison with the records of past experience.

In Division I. there are some points of importance to be noted by students. The age of the patient must be determined; and the special disturbances which are found at puberty, during the period of sexual activity, and at the menopause, must be borne in mind. The occupation must be known; chiefly, in this connection, must we inquire whether the woman has too long hours, lifts heavy weights, stands too much, or works under unfavourable conditions. It is equally important, also, in certain other cases, to know whether the woman is one of those who have too little to do, or spends her life in idleness and excessive indulgence. The place of residence is noted as a matter of routine, but in certain cases it may be of some importance in relation to the health; thus, the patient might live in a district where rheumatism is prevalent, or she might have spent some time in a tropical climate.

In finding out whether the patient is married, single, or widowed, tact is necessary. Sometimes the patient volunteers the information, but generally it must be elicited. Awkward blunders are often made by students, *e.g.* asking a widow if she has pain on coitus, or a newly-married woman as to when she last had a child. It must be remembered, also, that widows and unmarried may come as patients either in a state of pregnancy or suffering from some condition related to an immoral relationship.

The examination of such a case must be conducted most cautiously. The physician may be suspicious, but he must be very careful in his questions lest he should be mistaken. Moreover, he must be prepared for deliberate falsehood from many such cases, and he must take care not to be thrown into error. Also in cases where the physician suspects some venereal complication, he must frame his questions in the most careful manner, in order not to arouse the suspicions of the patient, who may be an entirely innocent sufferer.

Division III. refers to some points which must be inquired into with care. The history of the illness of which the patient complains must be obtained most carefully. In some cases this is definite and distinctive enough to justify an immediate diagnosis, but in the great majority of gynecological troubles the indefiniteness of the history is most perplexing to the student. In the general run of cases previous health is not minutely inquired into, but it is necessary that nothing important be overlooked ; *e.g.* if the patient had had rheumatic fever some years previously, the neglect to find this out and to examine the heart might lead to very serious consequences. Moreover, if the patient be married, it is most important to compare her health before with that after marriage.

Diathesis and family health are not particularly considered in a large number of cases, but sometimes they may have an important bearing. Hereditary tendencies must sometimes be noted, *e.g.* mental diseases, tuberculosis, tumour-formation, hæmophilia. The social condition and habits of life are important points for consideration. Over-work, imperfect feeding, poverty, bad sanitary conditions, luxury, vicious living, care, and worry have an important bearing on many cases.

Division IV. requires to be considered with the greatest care and exactness. It deals with the sexual history. The normal menstrual history must be inquired into, and it is

important that the student bear in mind all the variations found in connection with normal menstruation. I note some of these.

The date or commencement or period of puberty occurs at varying periods. It is influenced by various factors.

Climate.—In temperate regions it occurs at the age of 14 or 15; in cold countries, at a later period; in warm ones, earlier.

Environment.—Rich living and city life tend to the development of an earlier commencement.

Race.—Racial characteristics are preserved, *e.g.* English girls born in India menstruate as do those of their race, not at an early period like the Indians.

Heredity.—In some families peculiarities as to menstruation may be transmitted from generation to generation.

It must be remembered that there are variations in the method of the establishment of the function of menstruation, *e.g.* it may take place gradually, intermittently, or suddenly. In some rare cases in our country menstruation may begin in childhood, at 8 or 10, or may be delayed until the age of 20, 22, or even 25. And these extremes may be found where the girl is quite healthy. In most cases of delay, however, there is some pathological cause. In particular, the serious condition of malformation of the genitals, *e.g.* atresia vaginæ, must be kept in mind.

Type refers to periodicity. It is the interval from the commencement of one to the commencement of the next menstruation (not, as is often said by students, "from the end of one to the beginning of the next"). In most cases the twenty-eight day type is found. In a small proportion the thirty day, the twenty-one day, and a few other types are found. In the great majority of cases, the type is regular, the patient being healthy, *i.e.*, the number of days is always the same. But it must be remembered that in some women irregular types are found not associated with

any unhealthy state. As an example, I may mention one case in which throughout a number of years the woman had a mixture of twenty-one, twenty-five, and twenty-eight day types.

Habit refers to the duration and quantity of the flow. Normally, considerable variations are found. Thus it may last from two to eight days; occasionally for nine days, the woman being quite healthy. A very large number of women have a discharge of blood for about a week. The amount of discharge lost is normally from 3 to 9 oz. Generally, 6 or 8 oz. are lost. The estimation of the quantity by means of diapers is unreliable, because of the variations in the habits of women as regards cleanliness. Some wear half a dozen where three would suffice, while others make three or four perform the need of eight or ten. Each woman, in a state of health, loses a fairly constant quantity at each period. On the average, perhaps, three or four diapers are used in twenty-four hours.

The date of disappearance of the menstrual function is a variable one. This cessation is one of the phenomena met with at the menopause, a period also known as the critical time, the turn of life, the change of life, or the climacteric. In about 50 per cent. of women, it takes place between 45 and 50; in about 25 per cent. between 40 and 45; in about 12½ per cent. before 40; in about 12½ per cent. after 50. In a few cases it may occur between 20 and 30, or as late as between 60 and 70. These advanced periods have been mentioned, but it is doubtful if they were not pathological. It is very rare to find a woman in a normal condition menstruating after 55.

Stoppage of menstruation is not synonymous with change of life. It is merely one of many phenomena. The change of life may take place quickly or slowly. Usually its duration is from one to three years. It is most important that the student should bear in mind the various methods in which the menstrual function ceases, whether gradually,

suddenly, or intermittently; and he should remember the diseases which are apt to occur at this period of life, and which may alter the normal menstrual condition.

It is often important to compare the menstrual function in the single and married state of the patient.

After the study of the normal, the morbid menstrual history should be investigated. It is of great importance that, at this stage, the student should be able to make a mental summary of the causes of the various abnormal conditions to be investigated.

Amenorrhœa means diminution or cessation of the menstrual flow. Students, as a rule, state in examination that it is "stoppage of the flow"; this is only a partial answer. A woman who normally menstruates for eight days, but who has gradually altered so as to menstruate for two days, is amenorrhœic, just as surely as if she had stopped altogether.

Menorrhagia means increased menstrual discharge, and may be expressed in terms of quantity or duration, or of both.

The variations normally found in women must be borne in mind. What is abnormal for one, may be normal for another.

Dysmenorrhœa means pain associated with the menstrual flow. Normally, in a certain number of cases no pain or discomfort is felt; in the majority of cases, a dull backache is complained of. The pains may be sharp or dull, dragging, down-bearing, or labour-like, and may be in the loins, in the small of the back, in the pelvis, or shooting into the thighs. Pains may be felt at different times, namely, for a day or two before the flow commences, ceasing at the commencement; for a day or two before as well as for the first day or two of the flow; during the first day or two of the flow only; during the whole extent of the flow; during the last two or three days of the flow; and for a day or two after the stoppage of the flow.

Intermenstrual discharges are of various kinds.

Metrorrhagia means uterine hæmorrhage occurring at times other than the menstrual periods. In this connection must be remembered the irregular discharges of blood often found during the period of puberty before menstruation is well established, and also during the period of the menopause. The irregularity of type in certain women in a state of health must also be borne in mind.

Leucorrhœa is the most common intermenstrual discharge. In its best-known form it is called popularly "whites." This discharge may proceed from the vulva, bladder, vagina, cervix, or body of uterus. It may be variously coloured, *e.g.* white, grey, yellow, green, etc., according to whether urine or blood be mixed with it, or according to the nature of the germs which may be growing in it. It is mucopurulent, the constituent elements varying in different cases, or it may be watery and acrid. It may be odourless, or may have an odour, which in some cases may be extremely bad. The discharge may in some cases be mixed with blood or urine.

The **pregnancy history** must be carefully considered. It is important to know the number of pregnancies, especially in relation to the duration of married life. Too frequent conception is a serious factor in several diseased conditions. The date of the first and last pregnancy must be known; conception, before nubility is well established, is a condition which may lead to disturbed health.

It is especially necessary to know the abortion history of the patient, for to abortion and its consequences much ill-health in women is due. The character of the labours must be known, *e.g.* whether they were easy, prolonged, difficult, or whether they required the assistance of the physician. It is necessary not to be misled by the patient's statements in regard to this point. Often a patient will state that she had a bad labour, or perhaps will say that instruments were used when she has only had chloroform.

It is also necessary to inquire as to how the patient recovered from her labours—whether she had suffered from pelvic inflammation during the puerperium, whether she rose too early, worked too soon, or carried her baby much. Some important gynecological troubles date from an abnormal puerperium.

Lactation has an important bearing on certain conditions, and the physician must know whether the patient nursed her children, and for what length of time.

Coitus must be inquired into in some cases. It should only be done when absolutely necessary, and with the greatest caution and delicacy. It may sometimes be difficult to elicit facts regarding some abnormal state, *e.g.* dyspareunia, even though the patient has come to consult the physician for nothing else. Coitus may be impossible in certain cases. In the general run of such cases, the condition is made known to the physician within a few weeks or months of marriage. The cause may lie with husband or wife. If with the latter, toughness of the hymen, malformation, vaginismus, or other conditions may be found. If the condition develops after some extent of married life, other causes must be thought of, *e.g.* inflammatory conditions, new-growth formation, etc.

Excessive coitus may have an important bearing on certain conditions, but it is difficult to get information on this matter in many cases. Questions must be asked with the greatest delicacy, but they are rarely necessary.

Sometimes a physician may suspect that a woman is doing injury to herself by using methods for preventing conception. It is difficult to find out the truth in such cases. Women who are guilty of this habit will readily tell falsehoods to a doctor.

An important abnormal condition to be considered is **dyspareunia,** difficult or painful coitus. This condition is a most important one in relation to the health and happiness of a woman. The causes to be kept in mind are many,

e.g. awkward attempts at coitus, disproportionate size of the male organ and vagina, imperfect development of the female parts, inflammatory conditions in vulva, vagina, uterus, pelvic peritoneum, cellular tissue, ovaries, and tubes; displacements of uterus, prolapse of ovaries, urethral caruncle, fissures of ostium vaginæ, or of anus, ulcers of rectum, piles, coccygodynia, tender carunculæ myrtiformes, vaginismus from whatever cause.

Local functional disturbances of bladder, rectum, pelvic nerves, and muscles, form a very important field for investigation.

Very often the bladder symptoms are the most valuable in leading the physician to a diagnosis. To neglect this viscus may lead to very serious error.

The state of the rectum must be known. The frequency of defæcation should be found out. Often women will state that they are all right when the bowels move every three or four days. If diarrhœa is present, its duration and nature should be investigated; sometimes it is caused by the irritation of an overloaded bowel. The various causes of these symptoms must be remembered, especially new growths inside and outside the bowel; ulcerations, simple or malignant; and pressure from various conditions, *e.g.* retroflexed and enlarged uterus, hæmatocele, inflammatory deposits. Pain associated with defæcation must be inquired into. It may be found before, during, or after the act, and may be due to anal fissure, ulcer, malignant disease, etc. Mucus or blood may be found in the motions, and the causes should be borne in mind, *e.g.* ulceration of bowel, new-growth formation, piles, and other causes.

Disturbed function in the muscles which are in the pelvic floor is to be investigated. There may be a spasmodic condition of some, *e.g.* the sphincter vaginæ. But the important points to consider are weakness and solution of continuity, *e.g.* rupture of the perineal body. The most frequent cause of these is to be found in connection with child-bearing.

The state of the pelvic nerves is in the great run of cases only considered in regard to the production of pain, which is the commonest symptom among gynecological patients. This symptom may be but one of a series of hysterical phenomena, but it is often due to inflammation in uterus or appendages, peritoneum or cellular tissues, pressure of new growths or other swellings. But the patient may also complain of numbness, cramps, and hindered movements in the lower limbs.

The last Division dealing with functional derangements of the various systems of the body requires a little attention.

In a great many gynecological troubles, no routine examination is made of these systems. Perhaps too often is there carelessness in this direction, and it may be necessary to warn the physician in regard to it. It is of the utmost importance that no condition be overlooked which might have some bearing in relation to the symptoms of which the patient complains, or to the course of the affection.

For example, a case with symptoms pointing to cystitis has been treated as a purely local affair, and it has turned out afterwards that the symptoms were really due to tubercular disease of the kidneys.

Of all the systems, I desire particularly to point to the *nervous* and *alimentary*, as being of chief importance. The disturbances of the nervous system known as neurasthenia and hysteria, in all degrees of their manifestations, must be kept in mind in the consideration of every gynecological case.

In very many cases symptoms are referred to the pelvis, which have no local explanation, but which are merely part of an extensive range of abnormalities due to the abnormal nervous state. Or, in such a state, pelvic symptoms which have been slight may become enormously exaggerated.

Much error has been committed in practice by concentrating attention upon the local and forgetting the general—the very worst possible course to pursue. Such a case, after

having undergone various tinkerings in her genital tract without improvement, may sink into a condition from which only the most judicious treatment can raise her.

Various disturbances of the alimentary system, especially dyspepsia and constipation, are to be inquired into. The relationship between these conditions and symptoms referred to the pelvis is important; also the relationship between pelvic troubles and reflex disturbances of stomach and bowel functions are matters of the highest importance in treating disease in women. Sympathetic or reflex symptoms are very common.

PHYSICAL EXAMINATION.

General Appearance and Configuration.

The physician should note while the patient is walking, sitting, or standing, or during the rest of the examination, whether there are any deformities to be seen, *e.g.* of spine, pelvis, or lower limbs. Such conditions are important in relation to child-bearing. Abnormalities of gait and posture should also be looked for; also, pendulous belly, swellings in the abdominal region. The condition of the face must be noticed, *e.g.* it may indicate a neurotic temperament, malignant disease, or some other trouble.

Mammæ.

In examining the mammæ, the following points must be noted, namely, size, general or local swellings, amount of fat, consistence, tenderness, venous enlargement; the condition of the nipple, whether prominent, retracted, tender, fissured; prominence of sebaceous glands around nipples—the so-called tubercles of Montgomery. Pigmentation should be noted; whether there be the primary areola outside the former. The presence or absence of colostrum or milk. In compressing the breast to make this out, use

both hands, and gradually squeeze the gland from the periphery to the nipple.

In some cases, *e.g.* unmarried girls in whom pregnancy is expected, one may sometimes, at an early stage of examination, desire to know the condition of the breasts. In order not to arouse any suspicions on the part of the patient, it is best not to squeeze the gland at once, but to palpate it, inquiring for painful areas; while so employed, one may be able to find out whether any milk be present.

Abdomen.

For the examination of the abdomen, the patient must lie on her back on the couch or examination table. In exposing the skin-surface, two methods may be employed. The most thorough is the following:—The patient loosens the waist-fastenings of her dresses and skirts and lies on her back, her body being covered with a rug. Under this cover the skirts are drawn down to the level of the pubes. The upper margin of the rug is then placed just above the mons veneris. The bodice and corsets are next loosened in their lower part, and the chemise drawn up, so as to leave the abdomen quite bare. A less thorough method is to draw the patient's clothes up under the rug as she lies on her back. The rug is then turned down, without exposing the hairs of the mons veneris; the skirts are pulled up by the patient, and a considerable portion of the abdomen is exposed.

Inspection.—The following points should be kept in mind in looking at the abdomen:—The shape, general or local swelling, state of nutrition, retraction; the condition of the umbilicus, *i.e.* whether it has the normal dimple, whether flattened or projecting; striæ, old or recent, due to stretching of the abdominal walls from various causes, *e.g.* pregnancy, tumours, etc.; pigmentation; distension of veins in wall; pulsations; influence of respiration on swellings;

movements of fœtus in pregnancy, which may first be seen about mid-term in thin-walled women; movements of intestines in thin-walled women.

Palpation.—Patient's knees should be drawn up, and she should breathe quietly with open mouth, or should sigh deeply. The hands of the examiner should be well-warmed, and should only gradually be applied to the abdomen. It is best that the patient's bladder and rectum should be emptied beforehand.

The palpation should be gentle though firm. If it be desired to adopt the method of suddenly forcing the finger-tips into the abdominal wall, it should not be adopted until gentle palpation has been done. Often if the patient be forcibly palpated at first, she will not relax the wall afterwards.

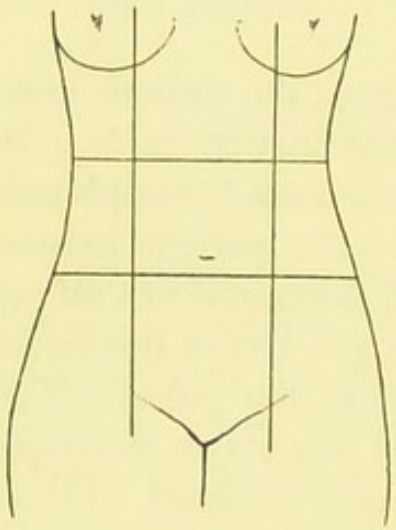


FIG. 50.—Outline diagram of the nine areas into which the abdomen is divided.

In some cases the whole abdomen must be examined carefully, and the student should not forget the nine areas into which the abdomen is divided.

By palpation we may gain information regarding the following:—Consistence of walls, state of nourishment, tenderness, tension; presence of tumours, their size, nature, mobility, relation to respiration, attachment to abdominal wall, relation to pelvis; presence and nature of other swellings, *e.g.* ascites, herniæ, glandular enlargements; fœtal parts, ballottement.

Percussion.—It is important to bear in mind the necessity of light as well as of forcible percussion. It is always best that bladder and rectum should be emptied beforehand. We gain information by this method regarding the size and position of the viscera; outlines of swellings and the relations of intestines to them; differential diagnosis

between free abdominal fluid and tumours, *e.g.* ovarian or fixed masses of abdominal fluid.

Percussion of the abdomen may be made while the woman sits or lies on her back or side.

Some recommend distending the bowel by gas or fluid in order to make more evident its extent for the purpose of comparison with some swelling under consideration.

Auscultation.—This method is applied to the abdomen for the purpose of making out the following: — Fœtal movements, which may be heard several weeks before the mother can feel them, fœtal heart sounds, fœtal heart murmurs, funic souffle; uterine souffle of pregnancy; souffle of fibroids; pulsation of aorta; friction sounds of roughened peritoneal surfaces rubbing together; gurgling murmurs due to gas and fæces in the bowel, the succussion murmur, the cracking sounds made by the bursting of small bubbles in the intestine.

Some of these intestinal sounds are often mistaken for friction sounds.

Mensuration.—Measurements of the abdomen are made chiefly with reference to the estimation of the size of abdominal swellings, especially for the purpose of estimating their increase or diminution in size during a period of weeks or months. A measuring tape is generally sufficient, but a cyrtometer, made of strips of flexible lead, may also be used. It is necessary to make definite measurements, namely, from the ensiform cartilage to the pubes; from the umbilicus to the ensiform and to the pubes; from the umbilicus to the anterior-superior iliac spines; from the ensiform to the anterior-superior spines; around the body at the level of the umbilicus—the greatest circumference; from the tip of the spine of a vertebra to the middle line in front.

In order that the comparisons from time to time may be exactly made, it is necessary that the patient should always be measured in the same position; the bowels should not be distended with gas and fæces; the diminution or

increase of fat on the body wall should be taken into account.

In some cases a complete and satisfactory examination of the abdomen can be made only when the patient is under an anæsthetic.

Examination of External Genitals.

It is not necessary to inspect the external genitals as a routine practice. It should be done as little as possible in ordinary consulting-room work. The patient is placed on her side, her feet being opposite a window. She is covered with a rug, and, after her knees are drawn up, the clothes are pulled up under the rug, and the pudenda exposed.

The lithotomy position may also be used, but only where absolutely necessary. This is undoubtedly the most convenient position when an anæsthetic is employed. For thorough examination of the parts, the labia must be separated with the fingers. The following conditions should be looked for:—Malformations, varix, œdema, pigmentation, discharges, inflammation, fissures, venereal or malignant disease, swellings, injuries, state of the hymen, state of the urethral orifice. The patient may be asked to cough or bear down in order that the effect on the perineum or vaginal walls may be noted.

Examination per Vaginam.

The patient is placed on her left side on a couch, a light rug being thrown over body and lower extremities. She should then bend up her knees, and the dress should be drawn upwards somewhat under the rug. (It is always best that the bladder and rectum should be empty during examination.) The physician's hands should be thoroughly cleaned. If the case is one in which there is some discharge

of blood, they should be made aseptic. The first two fingers should be anointed with vaseline, oil, glycerin, or soap and water, and are directed under the rug, bent into the palm of the hand in order not to soil the patient's clothes, and carried to the fold between the buttocks. The examiner must avoid the region of the clitoris. The student must be particular to begin well to the back in the region of the anus, and to pass the fingers carefully forwards. When the anterior edge of the perineal body is reached, both fingers may be at once inserted into the introitus vaginæ, if there be no doubt that it is large enough—*e.g.* in a multipara. In a doubtful case—*e.g.* in a nullipara—only the forefinger should be at first used. In introducing the finger-tips they should not press the anterior parts against the symphysis, and the clitoris should not be touched.

In passing the fingers upwards, they should be directed into the hollow of the sacrum, the perineum being pressed backwards in avoidance of the anterior delicate structures. In a case where the introitus is small, it is often advisable to ask the patient to bear down strongly while the finger is gradually pushed upwards.

The following points are to be borne in mind during the examination:—size and tenderness of the introitus vaginæ; condition of hymen or carunculæ myrtiformes; integrity of perineum; abnormal or diseased conditions of external genitals; size, temperature, moisture, rugosity, smoothness, distensibility of vaginal walls; sensitiveness, swellings in or outside the walls; polypi or other structures in the cavity; solutions of continuity in the walls; state of urethra, base of bladder and ureters; condition of rectum; size and state of cavity and outlet of bony pelvis.

The size, shape, and consistence of the vaginal portion of the cervix are noted; its mobility; whether it is split or intact; whether it is abnormally directed.

The size, shape, and consistence of the os uteri are to be made out. The condition of the fornix or vault of the

vagina is to be noted, but it is to be borne in mind that the investigation of conditions outside the vagina, which may be in relation to the fornices, is best carried out by means of the bimanual examination.

Of course the vaginal examination may be done when the patient is in the lithotomy position, but in the consultation-room only the lateral position is necessary.

It is necessary to be careful with regard to the examination of certain cases. If a mistress demands a vaginal examination of a servant who is suspected to be pregnant, the physician should refuse. If an unmarried woman, having been accused of illicit connection, asks for an examination and a certificate that she is not in the family-way, it is best not to accede to her request.

Bimanual Examination.[1]

This is the most satisfactory method of gaining information with regard to pelvic conditions:—There are several varieties of this method—*e.g.* abdomino-vesical, abdomino-vaginal, abdomino-rectal, abdomino-vesico-vaginal, abdomino-recto-vaginal, abdomino-recto-vesico-vaginal. The most commonly employed is the abdomino-vaginal, and this will be considered first of all. In every case the bladder and rectum should be empty.

Abdomino-vaginal bimanual.—In consulting-room practice, the following method is the best to adopt. The patient is placed on a couch on her left side, and the vaginal examination performed, according to the method just described. The fingers being still in the vagina, the patient is asked to turn from the lateral to the dorsal position. It is best that the back should rest on a plane which slopes upward somewhat towards the head. The knees

[1] The honour of first having pointed out the importance of the bimanual belongs to N. Puzos, a French accoucheur of the eighteenth century.

should be drawn up and well separated. The physician's warmed left hand should be placed on the patient's abdomen, the finger-tips at the umbilicus. The patient should breathe quietly and deeply with her mouth open. If she restrains her breathing she should be asked to make deep sighs.

This hand is then gradually pressed downwards and backwards towards the inlet of the pelvis, the ulnar edge rather than the surface being towards the abdomen. The fingers of the right hand which are in the vagina are pushed well upwards until they touch the fornix and the cervix. The last two fingers of this hand are flexed on the palm or lie in the hollow between the buttocks. Students often make the mistake of placing the outer hand on the symphysis and pushing downwards and backwards immediately above it, in this way disturbing the position of the uterus.

The examination should be conducted in the most systematic manner.

The uterus should at first be made out—its size, shape, consistence, sensitiveness, position, mobility, and relationships determined.

The Fallopian tubes and ovaries should be investigated with regard to the same points. In normal cases, unless the abdomen be very thin-walled, the tubes are not often felt.

The peritoneum and cellular tissue within reach of the examining fingers should next be palpated in regard to deposits, collections of fluid, tumours, old cicatrices, sensitiveness.

The bladder may be palpated in regard to sensitiveness, inflammations, thickenings, tumours, calculus, distension or thickenings of ureters.

The anterior part of the rectum and the condition of the recto-vaginal septum may, to a certain extent, be examined by the vaginal fingers, but for thoroughness the recto-vaginal examination should be made.

The condition of the brim of the cavity and of the outlet of the bony pelvis may be made out—abnormal measurements, deformities, enlargements of bone, shape, mobility and tenderness of coccyx, condition of sacro-sciatic ligaments and levator ani muscles.

The student, in particular, should bear in mind the following points in making the abdomino-vaginal treatment:—Through the anterior fornix one may feel for the body of the uterus, the bladder, ureters, round ligaments; rarely a pregnant Fallopian tube, a prolapsed ovary, a blood extravasation, inflammatory effusions, may be found; sometimes a subperitoneal fibroid. When the uterus is retroverted, coils of intestine will be found in the utero-vesical pouch.

Through the posterior fornix the following may be distinguished:—fæces or other swellings in the rectum; blood or inflammatory deposits in the peritoneum or cellular tissue; prolapsed tubes and ovaries, normal or enlarged from various causes; retroverted body of the uterus; fibroid of posterior wall of uterus; malignant growths; ascites.

Through the lateral fornices the state of the broad ligaments, tubes, and ovaries may be investigated in regard to cysts, tumours, inflammations, cicatrices, blood extravasations, etc.

Finally, it must not be forgotten that in the pelvis may occasionally be found certain abdominal organs or growths in connection with them, *i.e.* the kidneys or spleen; also growths of omentum, bowel, peritoneum, etc.

The abdomino-recto-vaginal examination is more valuable than the method just described, not only because the condition of the rectum is investigated, but because the rectal finger can explore the condition of the posterior part of the pelvis so easily through the thin rectal wall. It is not a pleasant method either for patient or physician, but it should be employed in every case where the other bimanual examination is not satisfactory. Having finished the ordinary bimanual, the middle finger should be withdrawn

from the vagina, and passed gradually into the rectum. It should be pushed well up through the folds of the third sphincter, 1½ in. above the anus; these sometimes obstruct the finger.

The abdomino-vesical and **abdomino-vesico-vaginal** examinations are made chiefly for the investigation of bladder conditions, and will be considered later (p. 184).

The abdomino-recto-vesico-vaginal examination is very rarely employed, and is practically unnecessary.

The abdomino-rectal examination is important. It is carried out in virgins when it is not considered advisable to pass a finger through the hymen, in atresia or narrowness of the vagina, in cases in which a tumour fills the vagina, in shortness of the vagina, in malformations of the internal genitals, for the purpose of studying the condition of coccyx, rectum, or recto-vaginal septum.

The forefinger is used. It should be lubricated, and gradually passed through the anus with a slightly rotatory movement. With it the state of the sphincters, sensitiveness of the parts, the presence of fissures, tumours, piles, or prolapsus may be made out. Above the anus the wide ampulla is entered, and the third sphincter passed. The following structures may then be palpated:—Posterior vaginal wall, cervix, posterior part of body, utero-sacral and broad ligaments, tubes, ovaries, posterior bony wall of pelvis; also, pathological conditions in these various structures.

Those who have not been accustomed to this method of examination are at first generally in doubt as to the relations of the uterus; the cervix may be mistaken for the body or for a tumour.

Bimanual examination must be conducted with special care in acute inflammatory conditions, in recent blood extravasations, in distended tubes, in ectopic pregnancy, in all thin-walled cysts, in advanced cancer of cervix or rectum.

In a great many cases a satisfactory examination can only

be obtained when the patient is anæsthetised, *e.g.* when she is very fat, when she keeps the abdominal wall rigid, or when there is much tenderness or pain.

When under the anæsthetic, the patient should be examined in the dorsal or lithotomy position.

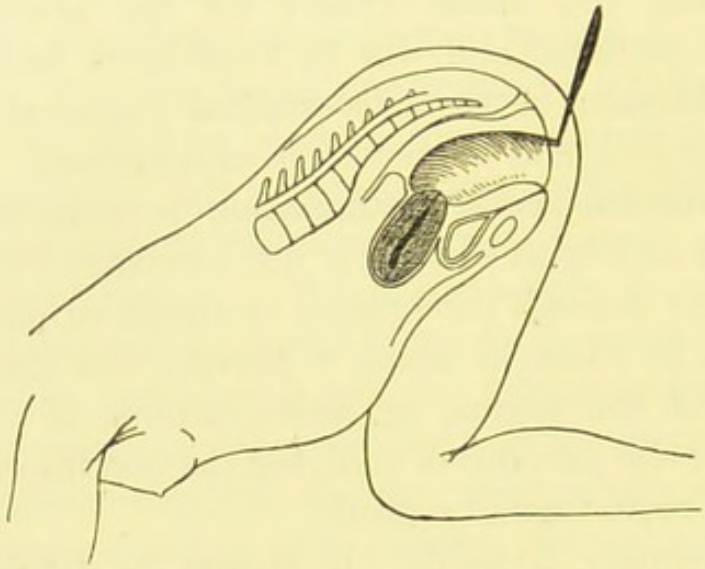


FIG. 51.—Genu-pectoral position. A speculum is placed in the vagina.

EXAMINATION OF VAGINAL, RECTAL, AND VESICAL CAVITIES.

Vagina.—The vagina may be exposed and examined by means of the speculum. I will consider this method when describing this instrument. The canal may be inspected without the use of a speculum in two ways :—

(*a*) If the patient be placed in the genu-pectoral position, and the introitus opened with the fingers, air rushes in, and the canal becomes distended. (The physics of the abdomen and pelvis have been fully worked out by Simpson and Hart.) If the perineum be held back by a finger, and the light from the window or an artificial light be reflected into the vagina, its walls and the vaginal portion of the cervix may be well seen.

(*b*) If the patient, while in the lithotomy position, have

her hips elevated somewhat, and the introitus be opened, air rushes in and distends the vagina, while the uterus gravitates towards the promontory. By means of a reflected light the cavity may be examined while the labia are separated and the perineum is pulled back.

Rectum.—(*a*) *Digital method.*—I have already described the method of examination by means of a finger. Simon has recommended the introduction of the whole hand. Such a barbarous method is never necessary, and must be condemned.

(*b*) *Storer's method.*—The patient is placed on her side with her knees drawn up, her buttocks being opposite the source of light. One or two fingers are passed into the vagina, and pressure is made downwards and backwards through the posterior vaginal wall; if, at the same time, the anus be opened with the fingers of the other hand, the anterior rectal mucosa can be everted and made visible.

(*c*) *Hart's method.*—The patient is placed in the lithotomy position, and the pelvis elevated somewhat. If the anus be opened with the fingers or with retractors, the air rushes in, dilating the lower part of the rectum. The walls may be examined by means of sunlight, or by reflected artificial light.

(*d*) *Genu-pectoral position.*—In this position, if the anus be opened, the air rushes in, distending the rectum. If the anus be kept widely opened by means of the fingers, or with retractors, the interior of the bowel may be studied by means of sunlight, or by reflected artificial light.

(*e*) *Use of the tubular speculum.*—The rectal speculum is of the tubular variety; its inner surface should be a reflecting one. On one side is a fenestra. The instrument may be made of polished metal or of glass, silvered, and covered with vulcanite.

It is best used while the patient is in the lithotomy posture. When it is passed through the anus, light is

reflected into it, and it is rotated in order to bring different portions of the wall into relation with the fenestra.

This method is not so satisfactory as the last two described.

Bladder.—(*a*) In many cases some information may be gained regarding the state of the interior of the bladder by the ordinary *abdomino-vaginal bimanual* examination, just described.

(*b*) *Digital examination.*—Vesical, abdomino-vesical, and abdomino-vesico-vaginal.—The patient is chloroformed in the lithotomy posture. The external genitals are thoroughly washed and made aseptic. The urethra should be gradually dilated until the index-finger can be passed. For this purpose Hegar's dilators are valuable. The finger should be lubricated with antiseptic vaseline. In this way the state of the mucous membrane may be investigated, *e.g.* with regard to inflammation, tumours, deposits of salts, fistulæ, presence of calculi. When the bimanual is performed it should be noted that the body of the uterus may be easily palpated, obscure conditions in front of the uterus, and the state of the Fallopian tubes made out. After the examination the bladder should be washed out with an antiseptic lotion.

Some recommend cocain application to the urethra preliminary to dilatation instead of a general anæsthetic.

It is best, in the adult, not to dilate the urethra beyond $\frac{3}{4}$ to 1 in. in diameter. Beyond this there is danger of permanent incontinence. In young women of 15 to 20 years of age the limit should be $\frac{3}{4}$ in.; in girls of 10 to 15 years it should be from $\frac{1}{2}$ to $\frac{11}{16}$ in. Of course, greater dilatation has been made, but there is always risk.

(*c*) *Ordinary specular examination.*—An ordinary small tubular speculum with a reflecting inner surface may be used for the examination of the bladder, the patient being placed in the lithotomy position. Antiseptic precautions are used

and the urethra is dilated sufficiently to admit the speculum. Light is reflected into the instrument. This is an unsatisfactory method. The urine trickles into the end of the speculum and the bladder walls fall over it, so that it is difficult to examine the mucosa systematically and thoroughly. The walls of the urethra may be studied by means of a tubular speculum fenestrated on one side, as recommended by Skene.

(*d*) *Kelly's special method.*—This is the most valuable method. The patient's bladder is thoroughly emptied. She is placed in the lithotomy position, and the urethra dilated to the size necessary for the speculum required. The hips of the patient are now elevated on cushions, from 12 to 16 in. above the table. A tubular speculum of polished metal containing an obturator is now passed. When the obturator is removed the bladder fills with air, and balloons. Any fluid still in the bladder can be sucked out with a syringe or with balls of cotton-wool. Light is reflected into the speculum by a mirror placed on the physician's forehead, from an electric lamp, an Argand burner, an ordinary lamp or candle, the room being darkened. Strong sunlight may also be used. By moving the speculum the posterior wall and base of the bladder may be studied. The surface, normally, is pale, the network of vessels being distinct. The inter-ureteric ligament shows by a slightly raised transverse fold. The ureteric orifice varies in appearance. Normally, it is seen as a dimple, pit, or a fine slit, sometimes as a truncated cone with gently sloping sides. The mucosa around the ureters is more pink in colour than elsewhere. In inflammatory conditions the ureteric openings appear as round holes in cushioned prominences, or "as a Λ with the point directed outwards." Often, the fluid may be seen to escape from the ureters in little jets.

In connection with this method the ureters themselves may be examined. They may be sounded by means of a

long, delicate instrument, the searcher, and they may be catheterised. This method of removing urine from the ureters is valuable in relation to the comparison of the kidneys in disease. The catheter is left in the ureter for a few minutes, or for an hour or more, and the urine collected. The other ureter is during this time discharging into the bladder, and its urine can be drawn off with an ordinary catheter.

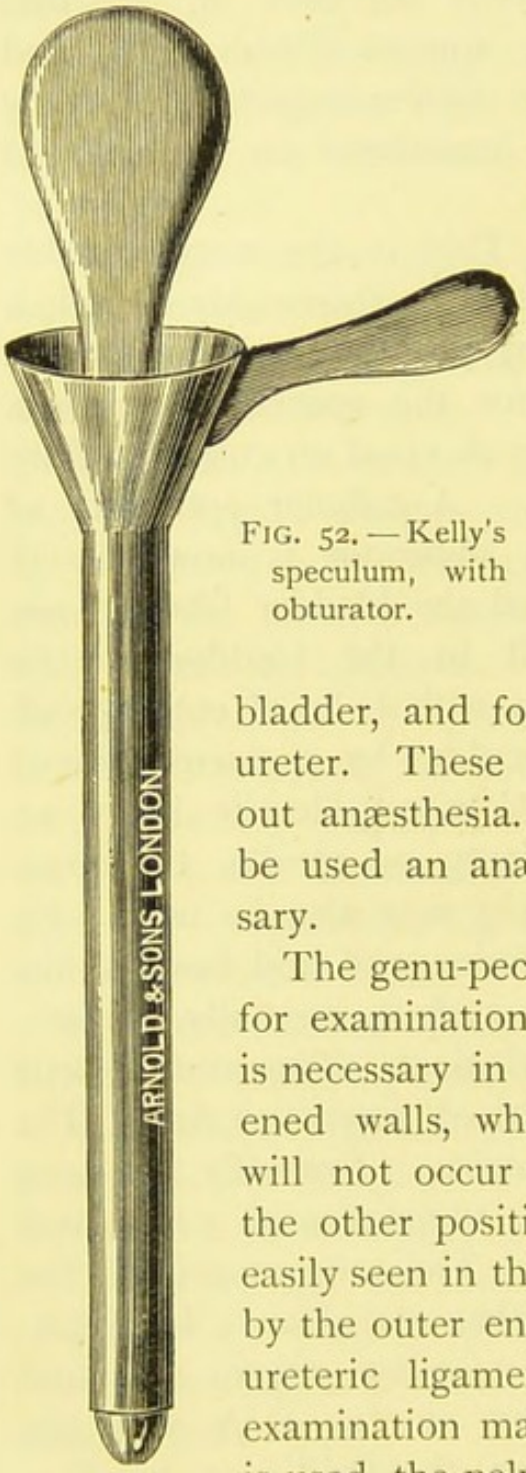


FIG. 52. — Kelly's speculum, with obturator.

The specula numbered from 8 to 16 will satisfy the requirements for most ordinary cases. No. 10 or No. 12 will suffice for inspecting the bladder, and for passing a catheter into the ureter. These numbers can be used without anæsthesia. If No. 14 or a larger size be used an anæsthetic will generally be necessary.

The genu-pectoral position may also be used for examination with these instruments. This is necessary in inflammatory cases with thickened walls, where ballooning of the bladder will not occur when the patient is placed in the other position. The ureters are not so easily seen in this fashion. They are concealed by the outer ends of the fold due to the inter-ureteric ligament. Sometimes a satisfactory examination may be made when Sims' position is used, the pelvis being elevated.

(*e*) The bladder may also be examined with a metal *sound* in cases in which stone is suspected, or small phosphatic deposits on the bladder wall. Stones of any size but the

very smallest should be made out on bimanual examination.

(*f*) Sometimes the base of the bladder may be opened into by a mesial cut through the interior vaginal wall in order that the vesical mucosa may be examined. Such a method is only employed where it is thought that some operative treatment may follow, *e.g.* the removal of a tumour, or where it may be necessary to drain the bladder by the vaginal opening.

(*g*) *Electric cystoscope.*—Leiter's instrument is a metal catheter, ending in a beak bent at an angle (*cathéter coude*). On the concave or anterior surface of the beak is a rock-crystal window. Within the catheter opposite the window is a small electric lamp. Close to the bend another window is placed on the anterior surface of the long part of the catheter. Inside the tube opposite this window is a prism, by means of which the rays of light are transmitted along the catheter to the observer's eye.

In the outer part of the instrument an arrangement of lenses causes a magnification of the field of view. The catheter above described is used for the examination of all the surface of the bladder save the base. For the latter a tube must be used with a window on the posterior surface of the beak.

Use of the instrument.—The urethra must be able to admit the catheter (No. 22 French). The bladder must be able to hold from 2 to 4 oz. of fluid. If the bladder be too sensitive to fill with the fluid, the preliminary injection of cocain may be carried out. Rarely is general anæsthesia necessary. If the urine be not clear, the bladder should be washed out first. The fluid used may be weak carbolic or ordinary salt solution. If more than 4 oz. of fluid be injected, the bladder is distended too much to allow of proper inspection of the walls.

Before the instrument is passed, it should be held under

water to see that it works properly. It should be lubricated with glycerin.

Vaginal Specula.

As has already been pointed out, we have a means of examining the walls of the vagina and the vaginal portion of the cervix without the aid of instruments. If a woman be placed in the genu-pectoral position, or in the lithotomy posture with her pelvis elevated, and if the introitus vaginæ be then opened with the fingers, the air balloons the vagina, and by means of a good light we can inspect the cavity thus formed. Had the physics of the abdomen and pelvis been known centuries ago, the history of the speculum would have been different from what it is. Moreover, had the normal condition of the vagina been known long ago, there would not have been so many imperfect instruments made. It is only recently that the vagina was found out to be a mere slit in the pelvic floor, and not the large cavity figured in the old books. The exact length of the vagina, also, has only been rightly known for a few years. For centuries it was described as being several inches longer than it really is, and the instruments were made accordingly.

The history of the speculum is interesting, but a detailed account scarcely falls within the limits of a practical work. The instrument was used among the Greeks and Romans by Hippocrates, Soranus, Paulus, and others. Specimens may be seen in Pompeii.

In later times it was employed by Ambrose Parè, Paracelsus, and many others. All the ancient forms were valvular or tubular, the latter being either funnel-shaped or cylindrical. The oldest forms were valvular; they possessed two, three, or more blades. For a considerable period before the time of Récamier, the speculum had largely fallen into disuse. This distinguished Frenchman reintroduced the instrument as an aid in diagnosis. His speculum was funnel-shaped, 7 in. in length, and made of tin. It

is to Marion Sims that we are indebted for the spatular form of speculum, which was introduced by him as a means merely of opening the introitus vaginæ while the patient was in the genu-pectoral position, in order that the air might rush in between the vaginal walls and distend them. Most text-books, at the present time, describe the three chief varieties of speculum, namely, tubular, valvular, and spatular, giving equal prominence to each. For practical purposes all, except the spatular variety, may be abolished.

Spatular speculum.—The classical instrument is that of Marion Sims. It consists of a handle with a duck-bill blade at each end at right angles to the handle. The blades are of unequal size. It is really a double speculum, and is made of polished metal. In Bozeman's modification of this instrument, the blades join the handle at a somewhat acute angle.

Though at first Sims got the idea of this instrument while examining a patient in the genu-pectoral position, he afterwards used the instrument to the same advantage when the patient was placed in the modified genu-pectoral, or, as it is generally called, the Sims' position. For many years the speculum has been used in connection with this posture, both for diagnosis and treatment.

Use of the Sims' speculum.—(*a*) In the Sims' position. The patient is placed semiprone. She lies on her left side on a couch or table, her left arm hanging over the edge next the physician; she then turns the upper part of the body so that the breasts touch the table; her knees are drawn up and the right one made to touch the table with its inner surface. It is evident that the transverse diameter of the pelvis is oblique to the table, and that the pelvis is on a higher level than the upper part of the abdomen.

The speculum is now introduced. The blade to be used is warmed and oiled on its convex surface. Hold it by the other blade in the left hand. Pass two fingers of the right hand into the vagina to open it. Introduce the blade

between them and push it upwards and backwards towards the hollow of the sacrum, until the end lies in the posterior fornix, the fingers of the right hand being withdrawn. The perineum is now drawn well back, and the upper end of the blade can be manipulated so as to move the cervix backwards or forwards. The opening of the vagina has led to the inrush of air, ballooning occurs, and the cavity can be examined with a good light. To hold the instrument steady, the left hand should be placed under the handle, its ulnar surface resting on the right buttock, the handle being held between the thumb and forefinger. By keeping the outer blade on a higher level than the inner, the right labium can be kept up somewhat, so that the entrance to the vagina is made more open.

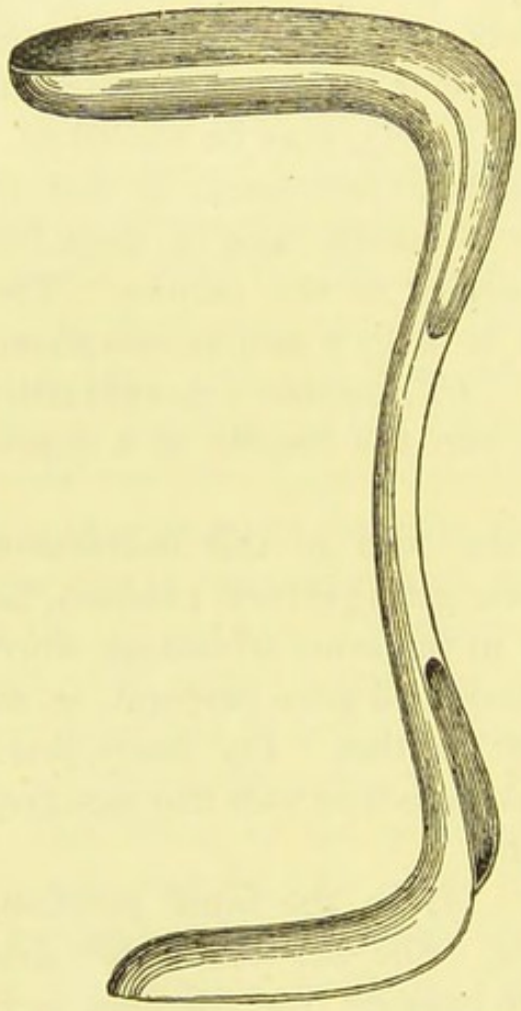


FIG. 53.—Sims' speculum.

The inner surface of the labia—the surface of the vagina except the posterior part—and the vaginal portion of the cervix, can now be examined. If necessary, for better admission of light, the labia may be held aside, or a retractor used to pull forward the tissues of the pubic segment.

In this position, by shortening the length of blade in the vagina, the uterus may be pulled down by means of a volsella. A sound may be passed into the uterine cavity, applications made to it, to the cervix, or to the vaginal wall.

Until recently this position has been largely employed for the performance of several operations on the cervix, anterior vaginal wall, and base of bladder. It will, however, be found that it is most convenient to do almost all of these operations in the lithotomy position. The Sims' position is, therefore, becoming much less frequently employed.

(*b*) In the lithotomy position. The Sims' specimen may be used in this position, but, of course, only as a spatula, not in the same relationship as that which exists in the genu-pectoral or modified genu-pectoral. It may be used advantageously in the lithotomy position, but far more convenient for most purposes is the spatular speculum of Simon.

Simon's set of spatular specula.—By far the most convenient series of specula, both for examination and operation purposes, is some such form as that devised by Simon. It consists of two handles, into which may be fitted a set of spatular blades varying in length and width. Some of these are concave, others are almost flat. One handle is used for the posterior wall, the other can be used with a retractor-like blade for the anterior wall. The blades are arranged to suit vaginæ of different sizes. In operative procedures the greatest advantage can be obtained with little trouble. For operations in which we want the introitus kept as wide as possible, and the uterus pulled well down,—*e.g.* in amputation of the cervix,—the short broad blade which fits the handle at an acute angle is most advantageous; a long narrow blade in such a case being most unsuitable. Blades may also be obtained with wide lateral flanges which protect the labia. A hollow anterior blade is used by some in operations for the purpose of irrigating the parts with an antiseptic lotion, a rubber tube from the reservoir being fastened to a tap on the blade.

The Simon instrument is meant to be used in the lithotomy position, and it is evident that besides its great value in operative work, it is most valuable in examination.

The combined use of two blades enables the physician to inspect the vaginal portion of the cervix and the vaginal walls. In operating, it is sometimes helpful to use retractors as well, for the purpose of drawing the labia farther apart. Ordinary copper retractors suffice for this purpose.

It is also evident that a handle, with one of the concave blades, may be used in place of a Sims' speculum if it be desirable to examine a woman in the genu-pectoral or modified genu-pectoral position. If one be in possession of a set of Simon's specula, it is not necessary to have a special Sims' or a tubular speculum.

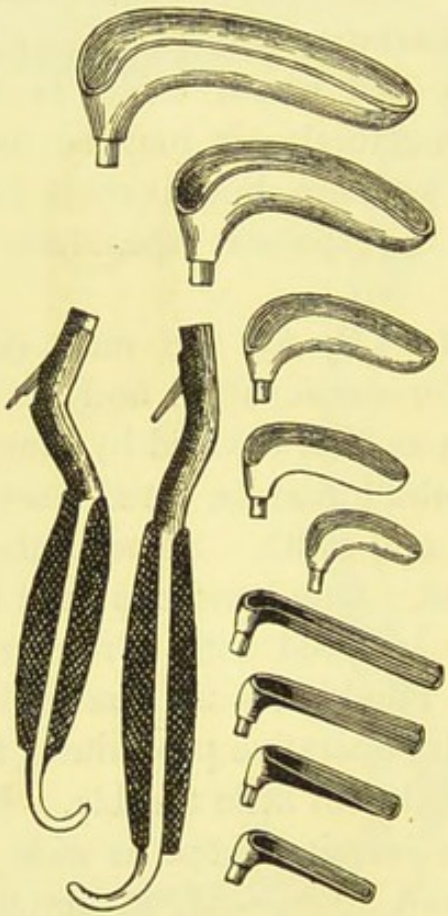


FIG. 54.—Simon's set of spatular specula.

Some of the procedures for which this instrument may be used, besides its use in examination, are the following:—Packing the vagina, making applications to the endometrium, to the cervix, and to the vaginal walls; operations on the vaginal walls, on the base of the bladder, on the cervix; curetting, removal of polypi, ligature of uterine arteries, extirpation of the uterus, colpotomy.

Tubular speculum.—This is made of various materials, *e.g.* celluloid, metal, wood, glass, vulcanite. The one most commonly employed is the Ferguson speculum. It is a cylindrical tube with one end trumpet-shaped and the other bevelled. Owing to the bevelling, one side is longer than the other, so as to suit the vaginal walls. Several sizes of this instrument are used.

This speculum is passed ordinarily when the patient lies in the lateral position, but it may be used in the lithotomy. When it is introduced the cervix should be in the upper end.

Such a speculum is of very little use. Through it the vaginal portion of the cervix only can be seen. No operations can be performed with it save pricking Nabothian follicles. Practically, it is only good for making applications to the vaginal portion of the cervix, and to the lower portion of the cervical canal in certain cases. A sound cannot be passed into the uterine cavity through this speculum without difficulty, and, indeed, it should not be attempted.

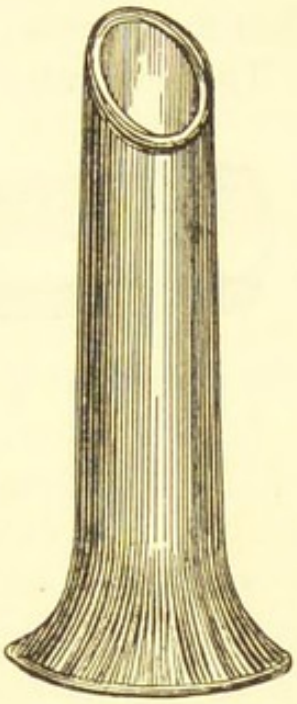


FIG. 55.—Fergusson's speculum.

I have also used it to advantage in making applications to the vaginal walls, in the following manner:—The speculum is introduced. Through it a pledget of wool, soaked in the fluid to be applied, is passed up to the cervix by means of a pair of long forceps. The speculum is now gradually withdrawn, the pledget following it. In this way the vaginal walls close on the wool from above downwards, and so get touched by the medicinal fluid.

Unless care be taken, the tubular speculum may give a wrong impression as to the condition of the cervix. When it is in position it may bring the flaps of a split cervix together so as to hide the lesion. The ordinary long instrument, by being pushed well up into the fornix, may give a false impression as to the length of the cervix; it may cause it to be apparently elongated.

Valvular speculum. — Of this form there are many varieties. Perhaps the best known is Cusco's bivalve

speculum. Neugebauer's and Barnes' instruments are also described in the books.

The Cusco speculum is introduced into the vagina with the blades closed. In position, they should lie against the anterior and posterior walls. By means of the attachments at the outer ends of the handles the inner ends of the blades can be separated.

The Neugebauer and Barnes instruments are introduced in the same manner. The posterior blade is passed, and then the anterior, the latter sliding along the former.

These valvular specula are of no greater value than the tubular forms. Indeed, the gynecological specialist never uses them. The cervix may be examined by means of them, but they are of no use for operative procedures. It is important to note that they may give an entirely erroneous impression of the cervix in certain states, *e.g.* if a cervix be lacerated, the valvular speculum when opened, by separating the flaps and causing the red mucosa of the canal to appear, may lead the physician to think that marked endocervicitis, with the formation of a catarrhal patch, exists. In the olden days it would probably have been diagnosed as an ulceration.

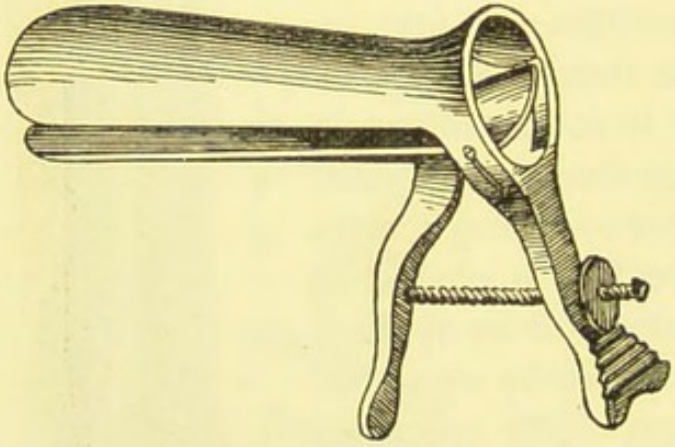


FIG. 56.—Cusco's speculum.

Finally, in all cases, before a speculum be used, the bimanual examination should be made. For mere purposes of diagnosis, owing to the importance of this latter method, the gynecologist rarely nowadays requires to use any speculum. It is only in certain cases that it is of

benefit. Its great value is in operative procedures. As an aid in diagnosis it is generally found that the instrument is most used by the practitioner who has had little experience in the special diseases of women.

The Volsella.

This instrument is used for grasping tissues during operations, or in examinations. It is simply a pair of forceps. For holding the cervix an instrument 8 or 9 in. in length may be used. It may be straight or curved; the latter form is more easily kept out of the way of the physician when the anterior lip of the cervix is held during an operation. The blades should have a separable joint, as indeed should all forceps, in order that the instrument may be kept easily aseptic. Near the handle there should be a catch by which the blades can be held together when they are closed. The simplest and best form is that which is found on the well-known Pean artery forceps; it can be opened and closed without the use of two hands. The grasping teeth at the ends of the blades are two, three, or four in number, and vary in size. This instrument may be used, also, to hold tumours, to grasp the vaginal walls or external genitals in operative procedures. For most vaginal and perineal operations, however, artery forceps may be used to hold up the tissues. The most suitable form is that devised by Kocher; at its end is a sharp tooth by which the tissues are firmly held.

Ordinary bullet-forceps can also be used for the same purposes.

A special uterine volsella may also be used for certain cases of vaginal extirpation of the uterus or for colpotomy. One blade longer than the other ends like a uterine sound; it is meant to be passed into the uterus. The other blade is like that of an ordinary volsella, and fastens into the outer surface of the cervix. This instrument gives a firm

grip of the uterus, and the inner blade keeps it stiff, so that it can be better palpated and manipulated during the operation.

With the volsella the uterus, in normal conditions, can be pulled downwards almost as far as the introitus vaginæ. In many pathological conditions—*e.g.* cellulitis and peritonitis—this is impossible. As it is pulled down it tends to become straightened and to lie in the long axis of the vagina. The vaginal walls become inverted, and the bladder and ampulla of the rectum somewhat drawn down.

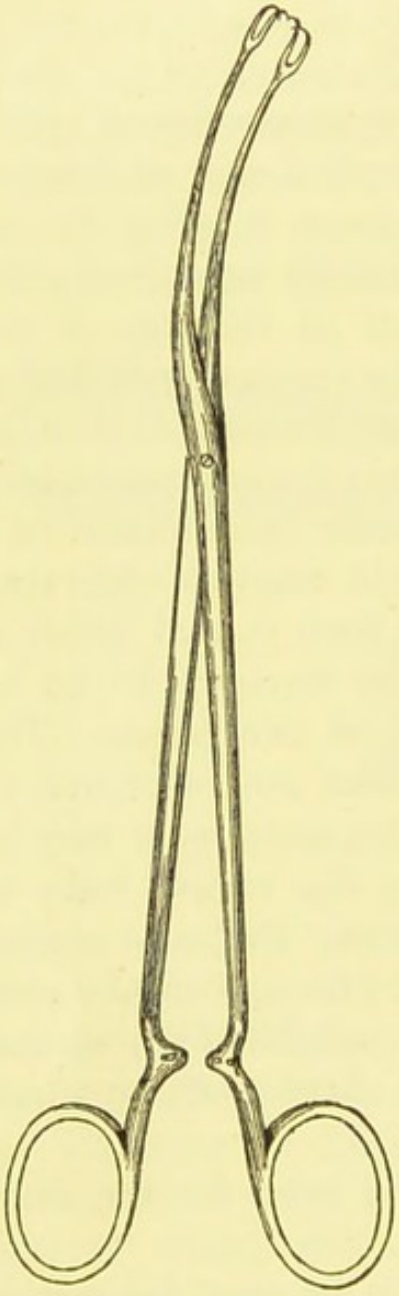


FIG. 57.—Volsella.

The cervix may be seized by the volsella without or with the use of the speculum. Generally the anterior lip is caught, but the other may be held if it be necessary.

(*a*) *Without the use of the speculum.*—The patient may lie in the lateral or lithotomy position. The two first fingers of the right hand are passed until the cervix be touched. The volsella, held by the left hand, is passed along these fingers and the anterior lip grasped and pulled down.

(*b*) *With the speculum.*—When the vagina is opened either in the Sims', the genu-pectoral, or the lithotomy posture, it is a simple matter to pass the speculum and grasp the cervix.

The following are the uses of the speculum :—

(*a*) In diagnosing the extent of a cervical laceration, and judging the presence or extent of a catarrhal patch. Each flap is grasped with a volsella, and they are approximated and separated. If, when the lips are brought together, the red patch does not disappear, an endocervicitis is present, and is extending downwards on to the vaginal portion of the cervix.

(*b*) In diagnosing the relation of the uterus to large tumours which occupy the abdominal cavity. An assistant holds the tumour, and the physician pulls on the cervix by means of a volsella, or the latter may merely steady the instrument while the assistant pulls upward on the tumour. If the tumour be adherent to the uterus, or grow from it, they will move together during the examination, save when the adhesions are very long, or the tumour has a long pedicle. Of course, where the tumour or the uterus be fixed to other structures, their movements may be interfered with, and we may gain little information from the use of the volsella.

(*c*) In performing the rectal examination, we may often be greatly helped by drawing down the cervix with a volsella. The examining finger can more readily palpate—uterus, tubes, ovaries, and broad ligaments.

(*d*) The chief use of the instrument is in operations on the genital tract, wherever it is desired to hold a piece of tissue steadily or to make traction on it, *e.g.* in curetting, amputation of the cervix, etc.

FIG. 58. — A pair of bullet-forceps.

The volsella should not be used to pull down the cervix in acute peritonitis or cellulitis, in pyo-, hæmato-, or hydrosalpinx, in tubal gestation, in hæmatocele or hæmatoma, or in advanced cancer of the cervix.

A simple tenaculum is recommended by some for the

purpose of steadying the cervix. It is not so serviceable as a volsella. Such an instrument is practically only of service in vesico-vaginal fistula operations.

The Uterine Sound.

In ancient times a sound was used in examining the genital tract, but it is highly probable that it was limited to the vagina. Mention is made of the instrument by Paulus Ægineta and Soranus. For a long time its use was forgotten, until it was reintroduced by Levret. It is, however, to Sir James Y. Simpson that we owe the wide use to which the sound has been put in gynecological practice during the last fifty years, though there is no doubt that the instrument has been far too extensively used. In the pre-antiseptic days it was often a source of infection. But its employment in diagnosis has, during recent years, been very largely diminished, as a result of the perfected methods of examining patients by the hands alone. In the consulting-room the sound need be used but rarely.

Many sounds have been made by gynecologists, but only one or two need be described. Any flexible metal rod, with a knob-pointed end, will serve as a sound. One of the best known and most serviceable is Sir J. Y. Simpson's sound. A. R. Simpson's sound is a modification of it, and was introduced for a special purpose. Sir J. Y. Simpson's sound is about 12 in. long, and made of nickel-plated copper. It can be moulded to any desired shape, yet it is not too soft. The handle has a rough and a smooth surface, the rough being on the side towards which the point of the sound looks. When the sound is *in utero*, we thus always know the direction of the point.

The end of the sound is rounded and blunt. Two and a half inches from the end is a round knob, and at every inch beyond this there is a mark. On the old forms of this

sound there was a notch 1½ in. from the point; this is a source of weakness, and is unnecessary.

Points to be observed before passing the sound.—It should not be passed during menstruation, nor during an acute attack of inflammation in the peritoneum, cellular tissue, or internal genitals, nor in a case of uterine cancer, except when there is some special reason for its use. Above all, care should be taken that the woman is not pregnant. If she has missed a period, the sound should not be passed unless it be certain that there is no ovum in the uterus.

A careful bimanual examination should always be made before the sound is used. The physician should gain a good idea as to the position and shape of the uterus, and should curve the instrument accordingly.

Method of using the sound.—The sound may be passed when the patient is in the Sims', in the lateral, or in the lithotomy position. If she be in the Sims' posture, the cervix should be pulled down with a volsella before the instrument is introduced.

The lithotomy position may be used if the patient be anæsthetised. In ordinary practice the left lateral position is satisfactory.

After the bimanual has been performed, the patient turns on her left side, and draws up her knees. The sound is rendered thoroughly aseptic, and its point is dipped in antiseptic vaseline. The first two fingers (or the index only) of the right hand are introduced into the vagina so that the tips touch the cervix, the palmar surface being turned towards the sacrum. The left hand holds the handle of the sound lightly, so that its rough surface is directed towards the back, and guides the point along the palmar aspect of the vaginal fingers until it enters the os uteri.

In cases where the uterus lies to the front, the end of the sound is gently directed into the cervical canal for about half an inch. The handle of the instrument is next carried by a

long sweep until it lies under the symphysis, its rough side directed towards the front. The handle is next simply moved backwards towards the perineum. By the latter manœuvre the point of the sound moves forward to the fundus of the uterus.

If the uterus be retroverted the method is simpler. No long rotation of the handle is necessary. After the point of the sound has entered the cervical canal, the handle of the sound is moved directly forwards towards the symphysis. In this way the point of the instrument moves backwards to the fundus uteri.

When the patient is in the lithotomy position, the sound is passed directly, being held according to the position of the uterus. Thus, if the uterus lie to the front, the handle is held at first in the middle line opposite the symphysis, and then moved backwards; at the same time the point of the sound moves directly to the fundus.

In all cases no force is to be used; the sound should merely glide into the uterus. In normal cases no pain should be caused, though often the patient has an unpleasant feeling. In nervous women, or in cases in which the canal is very narrow, there may be a feeling of colic or of sickness. No bleeding should be caused by the passage in normal conditions.

Difficulties in passing the sound.—The point may catch in a fold of the arbor vitæ of the cervical mucosa. It should not be forced through the obstruction, but should be withdrawn somewhat, and passed along again until it slides by the fold. Owing to marked displacement of the uterus, it may be impossible to get the sound into the os; in such a case it may be necessary to pull down the cervix with a volsella. In cases of marked anteflexion or retroflexion it may be impossible to pass the sound round the bend; by pulling down the cervix or pushing up the fundus with the vaginal fingers (or with a finger in the rectum if the uterus be retroflexed), the difficulty may be overcome.

If there be stenosis, either of the external or of the internal os, it may not be possible to pass the instrument. If the uterine cavity be tortuous, owing to the bulging of a tumour in its wall or to the presence of polypi, it may be impossible to guide the sound through the whole length of the canal. For these last-mentioned cases a soft bougie or catheter is recommended by some; one may be deceived in their use, however, because they may curl up in the cavity, and give one a false idea as to the length of the canal. When there is atresia of the uterine cavity, of course the sound cannot be passed. There are different conditions in the vagina also which make it impossible to sound the uterus, *e.g.* narrowing, the presence of large polypi in it, etc.

Use of the sound.—(*a*) *In diagnosis.*—1. To ascertain the length of the uterine cavity. In ordinary practice this is the chief use to which the sound is put.

2. To determine the thickness of the walls of the uterus. This rarely is done. For the posterior wall, a finger is introduced into the rectum; for the anterior, it is passed into the anterior fornix, into the bladder or against the abdominal wall.

3. To estimate the degree of patency of the uterine canal. This has special reference to the cervical portion. In the great majority of cases it is only the os externum or the os internum to which attention is paid. Atresia or stenosis may be diagnosed.

4. To ascertain the presence of tenderness in the walls of the uterus, and to detect irregularities or tumours of the inner surface. In several diseased conditions bleeding may be caused.

5. To determine the direction of the uterine axis, and the relation of the body to the cervix, in cases where this is impossible by means of the bimanual examination. In the great majority of cases the bimanual alone is sufficient for the determination of the position and flexion of the uterus. But in certain cases—*e.g.* in tumours of the uterine wall,

in large, bloody, or inflammatory exudations around the uterus; in cases of small exudations, cellulitic, or peritonitic; in irregular or multiple tumours of various kinds in close relationship to the uterus—the bimanual may not be able to distinguish the fundus uteri.

The sound must be passed most carefully. While it is in position, the bimanual is performed, the instrument being held by the vaginal hand. The abdominal hand may feel the fundus uteri pushed upwards by the end of the sound. It is for such an examination that the A. R. Simpson sound is more useful than the Sir J. Y. Simpson instrument. Owing to the length of the latter it is not easily held by the vaginal hand. The shorter A. R. Simpson sound when passed rests by its handle on the hand, where it is held by the ring and little fingers against the hypothenar eminence.

In cases of flaccid uterus it is valuable to do the bimanual while the sound is *in utero*.

6. To determine the mobility of the uterus in certain cases. The sound is rarely required for this purpose. When it is desired to make out the relation of a large tumour to the uterus, the sound may be passed and its movements noted while the tumour is moved by the other hand, or by an assistant. It is never justifiable to attempt to move the uterus in order to determine the effect on the tumour. Nor is it right, in a case where there is no tumour, to move the uterus about by means of the sound. Mobility of the uterus should be determined by the bimanual examination.

(*b*) *In treatment.*—1. To replace a retroverted or retroflexed uterus (*vide* p. 458).

2. To dilate a stenosed uterine canal. For this purpose it is generally used along with special dilators.

3. To apply fluids to the uterine mucosa; for this purpose its end is covered with wool (*vide* p. 223).

Dangers in the use of the sound.—The great danger is that connected with the introduction of septic organisms,

as a result of which general blood poisoning may follow, or local pelvic inflammation of various forms. The uterine wall may be perforated when it is thin, as in superinvolution; or when it is soft, as after an abortion. Cases have, however, been described where this accident has been unattended with serious results. Severe hæmorrhage may be caused sometimes, *e.g.* when the mucosa is in a condition of hæmorrhagic endometritis, or in new-growth formation in the mucosa. Another great risk is the passage of the sound in cases where the physician has failed to exclude the existence of pregnancy. The greatest caution should be exercised.

Dilators.

Dilatation of the genital tract.—Dilatation is employed both for purposes of examination and of treatment.

(*a*) *Vagina.*—For purposes of examination it may sometimes be necessary to dilate the introitus or the canal itself. The following means are used:—

1. The continued plugging of the vagina.
2. Gradual dilatation with Barnes' bags.
3. The introduction of different sizes of hard rubber or glass tubes.
4. The insertion of round or oval dilators, *e.g.* Bozeman's.

The dilatation may be continued for one, two, or more days, according to the nature of the case, and the examination should be made as soon as the dilatation is completed.

In the treatment of such conditions as stenosis of the vagina, or atresia which has been opened, or in cases where more room is needed for operations on the vaginal walls, base of bladder or uterus, the canal may be dilated by one or other of these methods. In addition, however, the two following plans must be kept in mind:—

5. Dilatation with the hand under chloroform, the fingers being arranged as a cone. This method is used in certain

forms of dyspareunia, and to gain more room in operations on the upper genital tract.

6. Incision of the perineum. This may sometimes be necessary in operations, *e.g.* the removal of an intra-

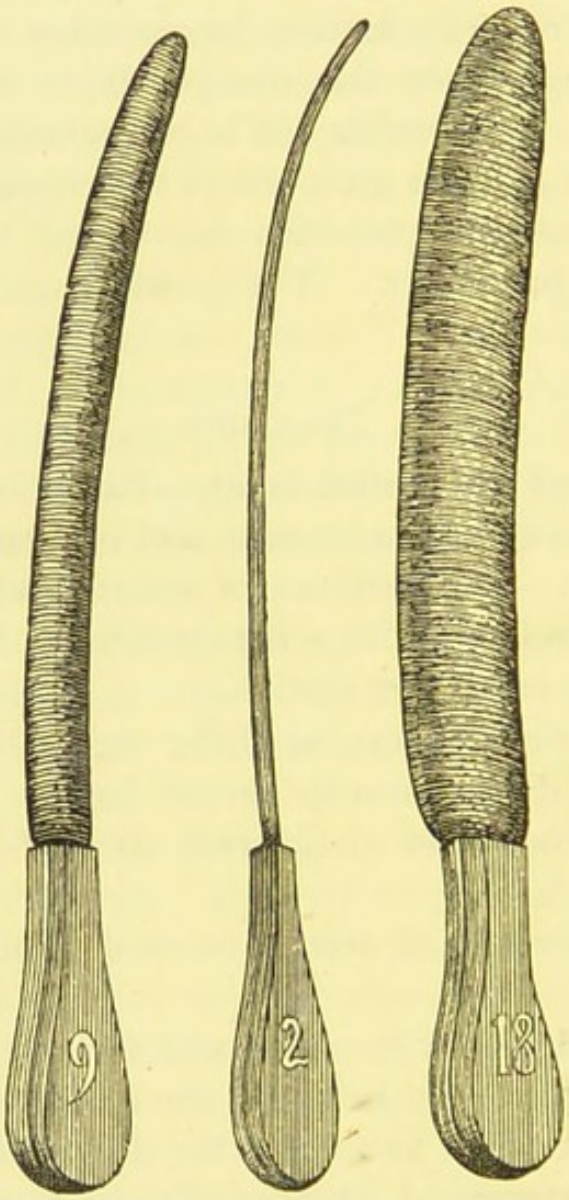


FIG. 59.—Hegar's dilators.

uterine polypus in a nullipara. The incision should be made on each side, a short distance from the middle of the anterior margin of the perineum. The cut should extend as deeply as is necessary in a backward and outward direction. Bleeding points must be tied, and antiseptic precautions

observed. At the end of the operation the wounds are closed with catgut suture.

(*b*) *Uterine canal.*—The uterine canal may require to be dilated both for purposes of diagnosis and of treatment, *e.g.* where a polypus, malignant disease, or remains of placenta and membranes may be suspected to exist in the uterine cavity, in stenosis of the canal, to allow passage of a curette, or application of medicaments to the mucosa, etc.

The following methods may be employed :—

1. *By the use of a series of graduated dilators.*—Hegar's instruments are very suitable. In a complete set there are thirty, measuring in diameter from $\frac{1}{12}$ to $1\frac{1}{12}$ in. Their length should be 6 or 7 in. They are made of vulcanite

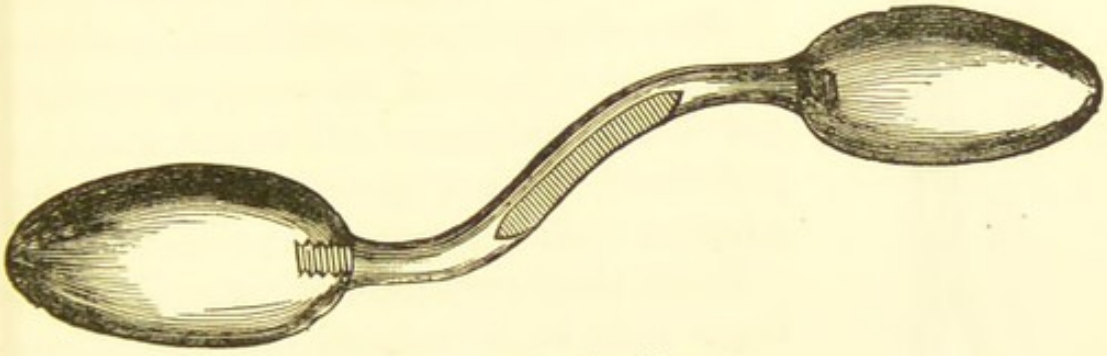


FIG. 60.—Hank's dilators.

or metal. The smallest sizes are apt to break when made of the former material. Hank's dilators are also serviceable.

Method of use.—It is generally most convenient to anæsthetise the patient, who is placed in the lithotomy position. The vagina is made thoroughly aseptic. The dilatation is carried out with thorough antiseptic precautions. The position and relations are made out by means of the bimanual. The cervix is drawn down and held steady by means of a volsella or two. The size and direction of the canal is estimated with a sound, and the dilators, dipped in antiseptic oil or vaseline, are passed in succession until the necessary degree of dilatation is reached.

There may be difficulty owing to a marked flexion of the uterus. In such a case a finger placed in the anterior or posterior fornix, or in the rectum, may help to straighten the uterus while the dilators are being passed; or special metallic curved bougies may be used. In extreme rigidity of the wall there may be difficulty in introducing the dilators. In such a case it is often advisable to use a metal instrument, like that of Sims or Ellinger, along with the Hegar dilators.

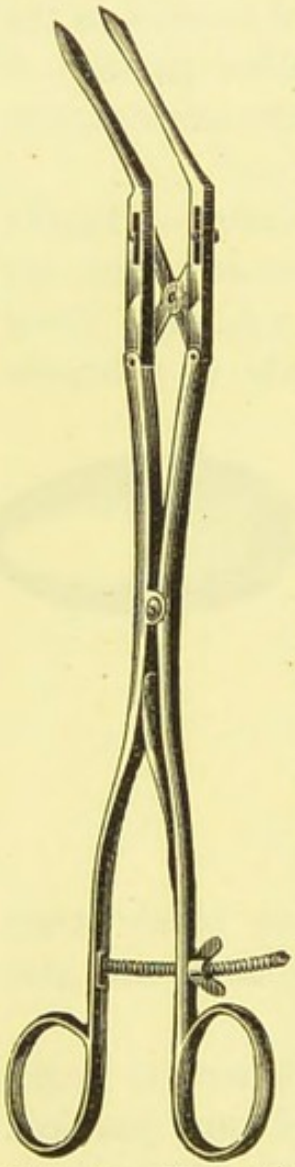


FIG. 61.—Ellinger's dilator.

In very many cases the wall of the uterus is not torn when dilatation is complete, but sometimes it is, especially at the internal or external os.

After dilatation is completed, and the examination finished, the canal is washed out with an antiseptic. If an operation be performed, various procedures may be adopted (*vide* Various Operations).

In certain conditions of the uterus the finger may be introduced into the uterus without preliminary dilatation, namely, after an abortion or full-time labour; or after a polypus has passed through the cervical canal.

2. *By the use of steel dilators with separable blades.* — Sims' and Ellinger's instruments are very serviceable if made of good metal. The former has three blades, the latter two.

Method of use.—Patient is arranged as before described. The dilator is passed, with closed blades, through the cervical canal, and then either the screw at the end of the handles is turned, whereby the blades separate slowly and dilate the cervix, or the hands may press the handles together, whereby more forcible dilatation is caused. If

the dilator will not enter the canal it is necessary to pass several small Hegar bougies, in order to enlarge the passage sufficiently. It is best not to attempt great dilatation with this instrument. It should only be used for moderate degrees.

3. *Enlargement of the cervical canal* may sometimes require to be brought about by means of cutting operations. (These will be described later, *vide* p. 435.)

4. *By the use of tents.* — Formerly tents were largely employed in gynecological practice. Now they are but rarely required. Three varieties are employed, namely, sponge, tangle, and tupelo tents.

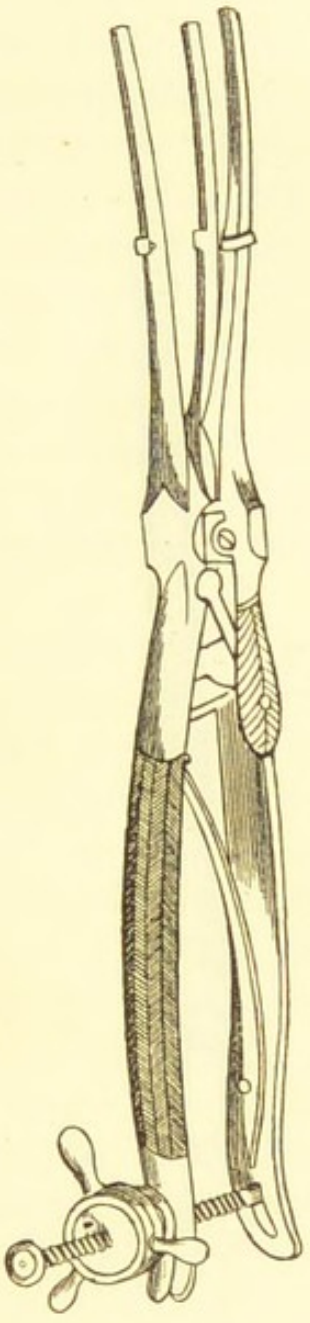


FIG. 62.—Sims' dilator.

Sponge-tent.—The sponge-tent is an elongated cone-shaped piece of dried, compressed sponge, impregnated with an antiseptic. When introduced into the uterus it stimulates the mucosa to secrete, and the fluid soaking into the sponge causes it to expand, and so to dilate the canal. Before it is used it may be immersed in a concentrated alcoholic solution of carbolic acid, or in a saturated solution of iodoform in ether, with a little alcohol. Then it may be rapidly scrubbed in 1 in 500 corrosive solution. Each one is provided with a string by means of which it may be pulled out of the cervix after use.

Method of use.—The patient is placed in the lateral, in the Sims', or in the lithotomy posture, and the genital tract thoroughly cleansed with an antiseptic lotion. A

speculum can be used to expose the cervix, which is pulled down with a volsella. The tent is then passed into the cervical canal by means of the fingers or a pair

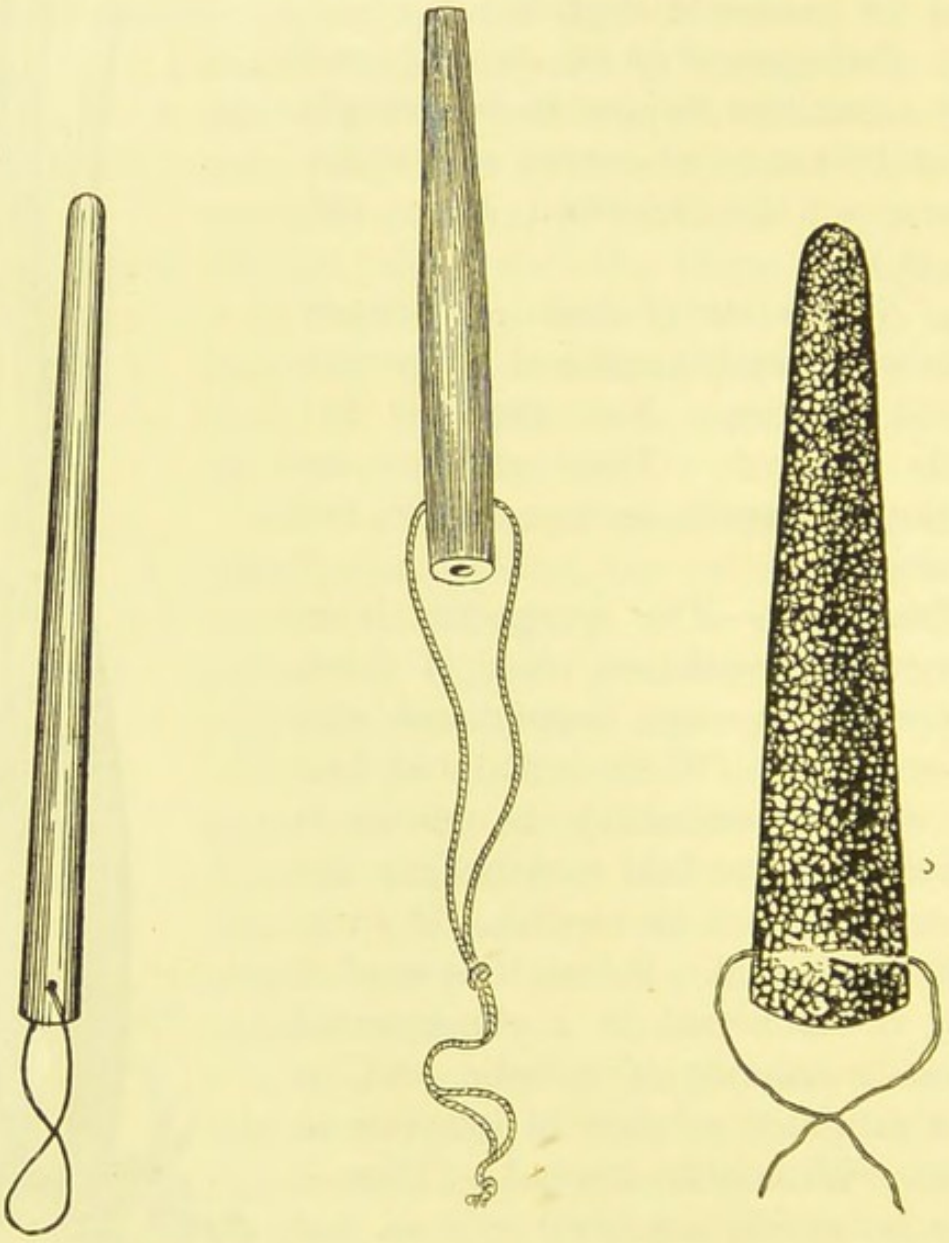


FIG. 63.—Tents.

1. Tangle; 2. Tupelo; 3. Sponge.

of curved dressing forceps; special tent-introducers are not necessary.

In some cases no speculum need be used. In other

cases where one lacks assistance, the tent may be introduced while one hand steadies the fundus through the abdominal wall.

When the tent is in position its base should remain outside the os externum. It should be held in the cervix for a little. If it shows no tendency to slip out, no vaginal plug is necessary. If it tends to move, an antiseptic tampon should be introduced. The tent should not be left in the cervix longer than twelve hours. During the process of dilatation an occasional antiseptic douche should be given, and after dilatation the douche should be repeated. If necessary another and a larger tent can be introduced. The tent is removed by gentle oscillatory traction on the string. Care should be taken that no piece is torn off and left behind in the uterus.

Tangle-tent.—This is made of the stem of the sea-tangle (*Laminaria digitata*). It may be solid or perforated. The latter expands more rapidly than the solid form, but is not so effective. This tent may be impregnated with an antiseptic, because after soaking it will, if dried, get smaller again, though it may somewhat lose its rounded shape. It can, however, be smoothed off. Before its introduction it can be softened in a hot antiseptic, and bent to the curve of the uterine canal. If placed in a cold lotion for a little it retains this form. If necessary several small tents, bound together by a rubber band, may be introduced into the cervix instead of a single one. Tangle dilates least rapidly of the three forms.

It is introduced in the manner described for the sponge-tent. It tends to slip out unless kept in position by a vaginal tampon.

Tupelo-tent.—This is made of the root of the *Nyssa aquatilis*. It cannot be soaked with an antiseptic, because if once expanded it will not return to its original size. It

dilates rapidly when in position, but not to such a marked degree as the sponge-tent.

Dangers connected with the use of tents.—All tents are dangerous because of the risk of introducing septic material. The most dangerous is the sponge-tent, because it tends most of all to injure the mucous membrane, and to produce a profuse secretion which may collect and decompose; it is difficult to cleanse it thoroughly; a part of it may be torn off and left in the uterus, when its removal is difficult owing to the contraction of the uterus on it. Tangle and tupelo tents are much safer.

Points to be observed with regard to their use.—If possible pass the tent only once. Do not introduce more than two in succession. The patient must remain in bed during and after their use. They must be introduced under strict antiseptic precautions. While in position the vagina should be douched every three or four hours. Tents are not to be used in acute inflammation in the pelvis, nor in blood extravasations, nor in cancer of the cervix, nor where distended Fallopian tubes are present.

The Curette.

This instrument was first employed by Récamier in 1846. It is used in scraping the endometrium for diagnostic purposes (*i.e.* for the examination of the tissue removed), and also for treatment.

Various forms of curette are in use. The following need only be described:—Roux', Simon's, and Récamier's. Roux' has an elongated hollowed-out portion, with sharp edges at each end of a handle, one of which is larger than the other; it is made of steel. The ends should be rounded, not pointed. This form is used by Martin of Berlin.

Simon's curette has a round, spoon-shaped end, with sharp edges.

Récamier's instrument has a loop end, one end of which is sharpened.

Dull wire curettes have been used, but they are quite unnecessary. Perforated spoon curettes are used by some; they allow a stream of antiseptic lotion to irrigate the uterine cavity during the curetting.

Method of using the curette.—The patient, with empty bladder and rectum, is placed in the lithotomy position (some use the Sims' position). A careful bimanual is performed. The vulva and vagina are thoroughly cleansed. Anæsthesia is advisable, though without it the operation may sometimes be performed without causing pain.

A short-bladed spatular speculum is introduced posteriorly, and held by an assistant. The cervix is drawn down by a volsella placed in the anterior lip; the handle is held by the assistant over the symphysis. A sound is next passed to estimate the size and direction of the uterine cavity. If the cervical canal is large enough to admit the curette quite easily, no dilatation is necessary. If it be not, Hegar's dilators or an expanding dilator may be used. The cavity is next washed out by means of a double catheter. Then the curette is introduced as far as the fundus. If the whole endometrium is to be scraped, the operation should be done in a systematic fashion, *i.e.* the anterior wall should first be attended to, then the posterior, then the fundus, and, finally, the lateral borders.

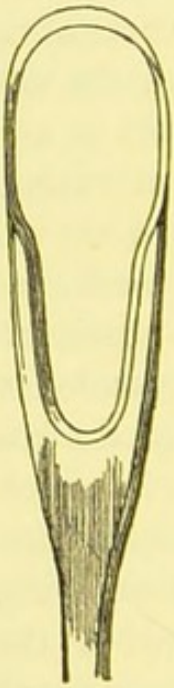
Unless such a methodical process be adopted, some parts of the mucosa are apt to be left untouched.

In scraping, the forefinger of the left hand should be placed in the fornices against the uterus, and it should be moved about so that the instrument always works against it.

When a scraping is to be made for examination, only the part desired need be removed. If there be endo-cervicitis around the os externum, the diseased part may also be scraped off. In many cases, as the curette touches

1

2.



3.

FIG. 64.—Curettes.

1. Roux' (often named Martin's).
2. Simon's.
3. Loop of Récamier's.

the muscular wall, a grating sound is made. The same sound is produced if dense new growths are present; also when the curette scrapes the folds of the cervical mucosa in certain cases of hyperplastic endocervicitis.

All débris is now washed out of the uterus and vagina with a hot antiseptic lotion. Iodised phenol or some other styptic is generally applied to the rawed surface, an antiseptic tampon is placed in the vagina, and the patient is put to bed. In cases where the uterus is soft or hæmorrhage is feared, an antiseptic tampon may be placed in the uterus.

After-treatment.—The vaginal tampon is removed on the day following the operation, and an antiseptic douche given. This is continued twice a day for a week; thereafter once daily as long as may be required. The patient may get out of bed at the end of eight or nine days, save after abortions, and in cases where it may be necessary for other reasons to keep her at rest. She must only gradually return to her duties.

Conditions in which the curette is employed.—In inflammatory conditions of the uterine mucosa; in incomplete abortion; in adenoma, sarcoma, and carcinoma of the mucosa; in conditions of the mucosa whose diagnosis is uncertain.

In the great majority of cases Roux' curette will be found to be the most serviceable.

In abortion cases, or in sarcoma or adenoma cases, where large masses are to be removed quickly, a large Simon curette is, perhaps, the most convenient.

Contra-indications and dangers.—Pregnancy, acute inflammatory conditions in the pelvis, distended Fallopian tubes. Formerly chronic inflammation in the pelvis was mentioned as a contra-indication, but this belief must be abandoned. Curetting is not risky in these cases if thorough antisepsis be carried out. Moreover, the curetting may benefit the chronic condition by removing what is so often

an area of germ infection, namely, the diseased mucosa of the uterus. In regard to acute inflammations, it must be noted that if they occur in the puerperium, they may be related to diseased conditions in the interior of the uterus, and in certain of these cases it is recognised that curetting is not only justifiable, but absolutely necessary.

The dangers of curetting are the introduction of septic infection, perforation of the uterus, causation of hæmorrhage.

Antisepsis must be thoroughly carried out. The instrument should be handled carefully. Perforation is most apt to occur when the uterine wall is soft, as after an abortion, or as a result of the infiltration of a rapidly growing sarcoma, or when it is abnormally thin.

In the majority of cases there is little loss of blood during or after curetting. It may be considerable, however, in hæmorrhagic or fungous endometritis, in incomplete abortion, or in malignant disease. For such cases the uterine tampon of iodoform gauze for a day or two is most valuable.

The Aspirator.

In gynecological practice the aspirator is employed both for purposes of diagnosis and of treatment. Its main use is for the latter.

1. In the examination of women, in the majority of cases, we are able as a result of the clinical history, and of careful physical examination (especially under an anæsthetic), to ascertain the presence of fluid, and to have a fairly correct idea as to its nature. Still there are certain conditions in which, owing to our uncertainty regarding these points, we may desire to employ the aspiratory needle.

The swelling may be punctured through the vagina or through the abdominal wall. The instrument must be used under the most careful antiseptic precautions. In some cases an ordinary hypodermic needle may suffice. In other

cases a small aspirator with a long needle is required. The larger aspirators used in treatment are not necessary for the exploratory puncture.

2. Various forms of aspirator are used in treatment. These will be described in connection with the operations in which they are used.

CHAPTER VIII.

MINOR THERAPEUTIC MEASURES.

The Vaginal Douche.

This valuable therapeutic agency has been employed for centuries. In the time of Hippocrates it was employed merely to apply certain medicaments to the vaginal walls.

It was first employed for the purpose for which it is mainly used nowadays in the fifteenth century.

Nature of apparatus.—The best form of douche apparatus is one which allows of the flow of a continuous stream of water, under the influence of gravity. The ordinary douche-can, with rubber-tube attached, is the most convenient instrument. According to the elevation of the can above the patient, the force of the stream varies. The can may be obtained in various sizes. The tube is furnished with a stop-cock, and should have at its end a vaginal nozzle, 5 or 6 in. long, with lateral perforations near the distal end. This nozzle may be straight or curved, and should be made of vulcanite, though glass is largely employed. Instead of the douche, a tube may be used with an ordinary pitcher, the flow being obtained by syphon action.

A less convenient instrument is the largely used rubber-syringe worked by means of a bulb. This allows only of an intermittent stream, it is apt to fatigue the hand of the person who works the bulb, and is liable to get out of order.

Method of use.—The douche may be taken by the patient

herself, or may be given by a nurse or other person. The most thorough method is to place the patient in the dorsal position with a large bed-pan under her hips. The can, filled with the necessary lotion, is placed at a suitable distance above the patient, on a shelf, hung on a nail, or held by someone; the stream is started, and the nozzle, thoroughly clean, is passed into the vagina as far as the cervix; the water which escapes from the vagina enters the bed-pan.

If the patient has no assistance, it is usual for her to use the douche sitting astride of a vessel. This position is not so satisfactory, the fluid escaping too rapidly from the vagina.

The lithotomy position is a convenient one, but is rarely necessary.

When the douche is used there must be room enough for a good return outflow; otherwise there is danger of fluid being forced into the uterus and Fallopian tubes. Where the vagina is not roomy, a large double catheter, like that of Budin, may be used.

The patient should lie at rest for fifteen minutes or more after the douche.

Indication for use. — To remove secretions from the vagina, during the healing of wounds, *e.g.* after operations on the cervix or vaginal walls; to apply astringent, antiseptic and anodyne agents; to get the benefit of the thermal property of the stream.

Nature of fluids used.—In cases where the influence of heat is not wanted, the fluid need only be warm. When the hot douche is to be taken, the temperature of the fluid should be somewhere between 100° and 120° F.; it is best that the patient should begin with the lower temperature and gradually increase it. Ordinarily the patient is told to use water as hot as the hand will bear. Cold douches need not be employed.

Various medicaments are used in certain cases, according

to the nature of the disease, *e.g.* alum (ʒ i. to O i.), copper sulphate (ʒ ss. to O i.), zinc sulphate (ʒ ss. to O i.), corrosive sublimate (1 in 3000 to 8000), carbolic acid (1 in 30 to 60), formalin (1 in 1000 to 6000), permanganate of potash, thymol, hydronaphthol, boric acid, etc.

When, along with the influence of the hot douche, the benefit of an astringent or antiseptic lotion is required, it is best that the patient should first use pure hot water, and immediately afterwards the medicated fluid.

Frequency of employment.—In the ordinary run of cases the patient is ordered to use the douche both in the morning and evening, or only at one of these times. In special cases it may be necessary to order it to be used more frequently.

It is important in inflammatory cases that the douche should not be of too short duration. Where the contraction of blood vessels, the relief of congestion, or the promotion of absorption is desired, from two quarts to two or three gallons should be used on each occasion. A considerable quantity should be used when an antiseptic is employed. When a cleansing or an astringent action is desired a couple of pints of fluid usually suffice.

When a patient is to use the douche on account of its thermic effects for some weeks, she should only gradually work up to the larger quantities.

Dangers.—In the great majority the use of the douche is not associated with any unpleasant effects. The danger of fluid being forced into the uterus has already been alluded to. Care must be taken to ensure a return outflow from the vagina.

In acute inflammatory affections, especially of ovaries, bladder, or rectum, the douche must be used cautiously. Pelvic pain may be increased or colicky pain started, faintness or marked perspiration is sometimes brought about. When new growths are present care must be taken not to damage the tumour wall and cause hæmorrhage.

The Vaginal Plug.

The introduction of a plug into the vagina may be employed for various reasons.

1. To check hæmorrhage, *e.g.* from the uterine cavity in various conditions.

In such a case the most convenient material to employ is iodoform gauze. In introducing it the patient should be placed in either the Sims' or lithotomy position, a speculum should be passed, and the gauze firmly packed in the vagina from above downwards, the fingers being used for the purpose. If the vagina be long or narrow, dressing forceps may be required.

If an astringent—*e.g.* a solution of alum or glycerin of tannic acid—be used, along with the plug, the vaginal walls contract more firmly, and the pressure of the plug is thereby increased. Packing may be more easily introduced and removed if the vaginal walls be smeared with an antiseptic vaseline. An antiseptic plug may be left *in situ* for one, two, or three days.

If there be retention of urine during this time, the urine should be drawn off. If there be much pain, either an anodyne should be given or the lower end of the plug withdrawn.

If another plug is to follow, it is well to give the patient a vaginal antiseptic douche before it is introduced.

2. To keep tents in the uterus, iodoform gauze or a ball of antiseptic wool may be used. The plug need not be large. If the wool be used, a piece of string must be tied around it to aid in its extraction.

3. To act as a pessary.

4. To absorb secretions after an operation has been performed, *e.g.* after an amputation of the cervix. An iodoform gauze plug should be placed against the wound, and left there for twelve or eighteen hours; afterwards the vaginal douche is used.

5. To introduce certain medicinal agents.

For a considerable period the value of glycerin plugs in the treatment of chronic pelvic inflammation has been recognised. They were introduced by Marion Sims.

To prepare a plug for use, take a piece of antiseptic absorbent cotton wool, 4 or 5 in. square, and half an inch thick, pour on its centre about half an ounce of glycerin; fold in the corners, and compress the mass until it is saturated, and then tie a piece of string around it. If necessary, two or more may be tied in series on one piece of string.

To introduce the plug, the patient is placed in the Sims' or lithotomy position, and a speculum passed. The plug is then pushed well up into the fornix vaginæ.

It may be left in position for twelve to twenty-four hours. It causes a transudation of serum into the vagina from surrounding parts, which is the chief value in the treatment of inflammations. So profuse is the discharge sometimes, that the patient may not be able to walk about without discomfort. In the continued use of plugs they may be introduced two or three times a week.

In these inflammatory conditions a solution of ichthyol in glycerin, 1 in 10 to 20, instead of pure glycerin, may be used. Or the following mixture in certain cases :—glycerinum boracis, 1 part; alum, 1 part; pure glycerin, 14 parts.

Other Methods of Medicating the Vagina.

1. *Swabbing the walls.* — Sometimes it is desired to apply some medicament to the vaginal walls, with the use of douche or plugs—*e.g.* in granular vaginitis.

The patient is placed in the Sims' or lithotomy posture, the cavity exposed with spatular specula, and the walls touched by a swab of wool soaked in the medicament.

A Fergusson speculum can be used conveniently for this purpose. It is passed up to the fornix, and a medicated

swab on the end of a holder introduced until it touches the cervix. The speculum is withdrawn a little, and then both speculum and swab are slowly withdrawn. The vaginal walls close on the swab as it projects above the end of the speculum, and thus the medicament becomes applied to them.

2. Powders may be insufflated into the vagina, when it is opened up by a speculum or by the fingers.

3. Medicated suppositories may be introduced, *e.g.* iodoform suppositories may be used after operations on the vagina or cervix.

Absorption does not take place through the vagina so quickly as through the rectum.

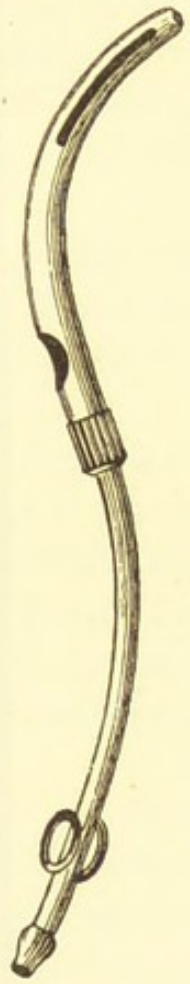


FIG. 65.—Fritsch's double catheter.

THE UTERINE DOUCHE.

In the treatment of various affections of the uterus it is necessary to douche the uterine cavity. The stream of fluid is obtained from a reservoir elevated above the patient. The elevation must be slight, because only a stream of small force is wanted. The instrument, which is passed into the uterine cavity, should be of such a nature as to allow of an easy return outflow through the cervix; for this purpose the double catheter of Fritsch or Budin is very suitable.

Method of use.—As the uterine douche in gynecology is generally only used with some operative treatment in which the uterine cavity is involved, it is given when the patient is in the lithotomy position. The vulva and vagina should be thoroughly cleansed. The cervix may or may not be

steadied with a volsella. A speculum may or may not be introduced into the vagina. The cervix must be large enough to admit the catheter easily without filling it. Artificial dilatation must be used if necessary.

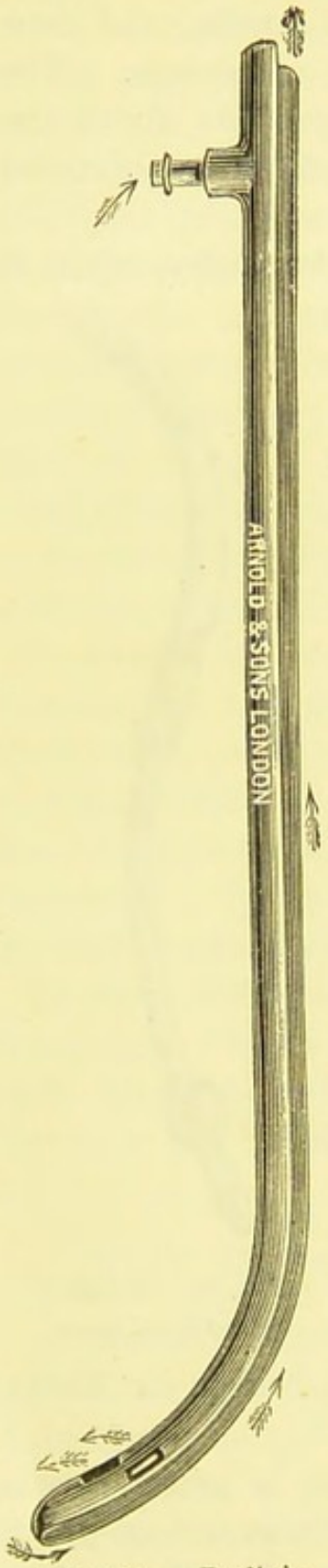


FIG. 66. — Budin's double catheter.

The stream should flow through the instrument before it enters the cervix, in order that no air may be introduced. It must be allowed to enter the uterus slowly.

Various forms of lotion are used, *e.g.* boiled hot water; antiseptic solutions, *e.g.* formalin, boracic, corrosive sublimate, carbolic, etc.

The great danger in the use of the uterine douche is that the outflow may be stopped, and the fluid forced along the Fallopian tubes.

THE UTERINE PLUG.

In gynecological practice the introduction of a plug for any length of time into the uterine cavity is rarely required. It is used to cause the uterus to contract and to check hæmorrhage in certain cases, *e.g.* after the removal of an intra-uterine polypus, sometimes after the removal of an incomplete abortion where the uterine walls are flabby, in some cases of severe bleeding from cancer or sarcoma of the uterus. In such cases it is usually combined with the vaginal plug.

In such cases, iodoform gauze is the best material to use.

It should be carefully introduced by means of a speculum and a long pair of forceps.

In cases in which the cervix is split for stenosis, a small plug of iodoform gauze may be introduced between the raw surfaces for one or more days in order to prevent them from coming together.

In inoperable cases of carcinoma cervicis, the excavated cavity may sometimes be treated by introducing a plug soaked in some antiseptic and astringent lotion, *e.g.* liquor ferri subsulphatis (1 to 2 of water), or carbolic lotion (1 to 40) in which is dissolved alum (1 of alum to 12 of lotion). In such cases the vagina is packed as well.

Other methods of applying medicaments to the uterine cavity.—Besides the use of the douche and of the plug in the special conditions indicated, the following methods may be employed :—

1. *The swab* may be used. In order to apply a styptic or an antiseptic to the uterine cavity in diseased conditions or after operations, an ordinary sound or a special vulcanite or metal applicator may be used, its end being covered for an inch or two with a layer of antiseptic cotton-wool ; or a wooden applicator may be employed and afterwards destroyed.

The patient is placed in the Sims' or in the lithotomy position, a speculum passed, and the cervix steadied with a volsella. The cervical canal should be large enough to easily admit the sound. After curettings and other operations there is usually no difficulty in regard to this. First a clean dressed sound should be passed to cleanse the cavity. Then the sound, soaked in the desired medicated fluid, should be introduced. In order to make the application to the whole cavity it may be necessary to pass two or three swabs.

During the application cotton-wool should be held in the vagina, against the cervix, in order to catch any excess of the fluid that may run back from the cervix.

Some of the medicaments employed are an alcoholic solution of iodine (iodine, gr. lxx.; iodide of potash, ʒiss; alcohol, ʒi), iodo-tannin (a saturated solution of tannin in this iodine mixture), strong carbolic acid, iodised phenol (iodine, 2 parts, with carbolic acid, 8 parts), strong formalin solution.

To remove the dressing from the sound after use it is best to unroll it between the thumb and forefinger under water.

2. *A small syringe* with a narrow nozzle is used by many instead of the swab, especially after curetting, the removal of polypi, etc.

The patient is placed in the lithotomy position, a speculum passed, and the cervix pulled down and steadied with a volsella. The cervical cavity must be large enough to allow of *a free return outflow* alongside the nozzle. The fluid must be injected very slowly.

The objection to this method is that fluid may be forced along the Fallopian tubes. If, however, the cervical canal be roomy and the injection be made slowly, there is no danger. In many schools it is largely used.

3. *Solid medicaments* are seldom introduced into the uterus nowadays. The use of solid caustic is practically given up.

Sometimes for purposes of antisepsis, iodoform pencils are introduced into the cavity, *e.g.* after operations on the uterus.

The Use of Baths.

In chronic inflammatory pelvic conditions, the judicious use of baths may lead to great improvement in the patient's health. *Entire baths* may be employed. Such a form of treatment is usually carried out at a watering-place, *e.g.* Bath, Kreuznach, Kissingen, etc. The benefit derived in such cases is partly due to the improvement in the circulation, skin, bowels, kidneys, and other organs from the

action of the baths, but mainly to the changed surroundings of the patient, freedom from care and over-work, regularity and simplicity of life, which are part of the bath-treatment. Various saline waters, *e.g.* those containing common salt, bromides, and iodides, are mostly employed.

In the treatment of uterine fibroids, also, similar means may lead to good results. Sea-baths are also good in many cases.

Hip or sitz baths are also very beneficial. They may be hot or cold, and may be given at special watering-places or at hydropathic establishments, or used by patients at their own homes.

The hot hip-bath should be taken immediately before the patient goes to bed. The temperature should be the highest the patient can bear comfortably (110° to 120° F.). She should sit in the tub so that the water covers the pelvis. Her body should be warmly covered at the time. At first, she should remain in the bath only for a couple of minutes. Afterwards the length of time should gradually be increased, and she can remain seated till the water gets tepid. After the bath, the skin should be thoroughly rubbed, and the patient should go to bed.

Sea-water may be used, or water in which two or three handfuls of common salt are dissolved. Two or three tablespoonfuls of mustard, also, improve the condition of the water.

If the patient is using the vaginal douche, it is convenient to take it before she leaves the bath.

This treatment should be discontinued during menstruation. It is continued according to the nature of the case. Thus, in certain cases of dysmenorrhœa, where the pain occurs just before or at the beginning of the menstrual period, the hip-baths may be taken only for three or four nights before the flow begins.

In old inflammatory conditions they may be used every other night for one or more weeks.

Cold hip-baths are also valuable as a stimulus to the circulation. They should be taken in the morning.

Massage.

The value of massage in the treatment of many bodily ailments has been thoroughly established. In recent years its beneficial influence in many chronic pelvic diseases has been pointed out. Massage may be general or local.

General massage.—In many cases of neurasthenia in women, from whatsoever cause, the employment of systematic massage combined with seclusion, rest in bed, careful feeding, and, perhaps, electricity, have proved of great value in restoring the patient to health.

In some of these cases, the advice of the gynecologist is often sought, because one or more of the most prominent symptoms are referred by the patient to the pelvis. There may or may not be any local trouble of importance. If there be none, no local treatment should be undertaken, even though the patient should locate the cause of her illness in the pelvis. Such a case will be best helped by the treatment above indicated, generally referred to as the Weir Mitchell method.

In this treatment, the skin and muscles of the whole body, and the joints of the limbs, are carefully massaged once or twice a day for half an hour or more at a time; the course lasts for several weeks.

In the majority of instances, the patients are restored to health.

Local massage.—In recent years, owing to the work of Brandt, Hartelius, Nissen, Asp, and others, local massage of the pelvis has been employed by different gynecologists in the treatment of chronic pelvic conditions, *e.g.* versions and flexions, prolapsus uteri, chronic inflammation, fibroids, etc.

These various forms are used:—

External—which consists in the stroking and kneading of

the lower abdominal region, the flat hand, the fingers, or the knuckles being employed.

Bimanual.—In this, the fingers of one hand are passed into the vagina, into the rectum, or into both of these passages, the outer hand being on the abdomen. The internal finger should not be moved, but should push up and steady the parts which are massaged by the other hand.

These forms of massage should last only ten or fifteen minutes. The periphery of swellings should be first manipulated.

Passive.—This consists merely in exercising steady pressure or traction on adhesions. This method should last only a few minutes.

After massage, the patient should lie quiet for a little.

It is always well that this form of treatment should be combined with the use of vaginal douches and baths. The introduction into the vagina of dilators, *e.g.* Bozeman's, or of vulcanite plugs like those of Prochownik, for a few hours in the day, in cases of pelvic adhesions, may help to soften and stretch the tissues, and so will aid the massage.

Contra-indications.—All acute inflammations, menstruation, pregnancy, phthisis, distended tubes.

Expediency of local massage.—Though the circulation of blood and lymph is undoubtedly benefited, and though the absorption of exudations may be promoted, I think the dangers to the woman's psychical organisation are too great to admit the method of pelvic massage to a place among the therapeutic agencies of the gynecologist. It is stated by those who practise this system, that the manipulations require to be carried on for weeks or months. This is sufficient, in my mind, to condemn the method. Stimulation of the sexual centres cannot fail to be brought about, and, as a result of this, the patient may suffer in various ways. I believe that there is scarcely a case in which massage is at all necessary. Equal or better results can be

obtained by other therapeutic means. A striking example of this is seen in the treatment of prolapsus uteri. Brandt's massage method in the treatment of this condition is as follows :—

The patient, with loosened clothes, lies on a table or couch, cushions being placed under her chest. An assistant passes his fingers into the vagina, and pushes the uterus upwards and to the front. It is then drawn up as far as possible. The woman next supports her body on elbows and feet, while the physician forcibly separates and closes her knees three times. This method is troublesome and unpleasant to the patient, and is of very little value. By pessaries or operation much surer benefit may be derived.

Schultze's method.—Schultze recommends the breaking-down of adhesions under chloroform.

This plan has not been much tried. It should be practised with great care. There is considerable risk of setting up hæmorrhage or of injuring viscera. Above all, the physician should feel very sure that the tubes are not distended, and that there is no pus collection anywhere in the pelvis.

The Thermo-Cautery.

The thermo-cautery is valuable in certain cases. It may be used to remove urethral caruncles, small growths on the vulva, piles ; to open abscess cavities and cysts of the vulva, to puncture and destroy Nabothián follicles, etc. It is also used as a hæmostatic on wounded surfaces.

Instrument.—Paquelin's cautery is the best form. The cones are kept hot by the burning of benzoline vapour, which is pumped continuously through the hollow handle. Cones of various sizes and shapes may be obtained.

Before pumping the vapour, it is necessary to heat the end of the cone in a flame. Care should be taken not to bring the reservoir of benzoline near a flame.

The cautery should be used when the cone is dull-red in colour. If white-hot the hæmostatic action is lost.

A button-cone may be used with this cautery if applications are to be made to the spinal region.

The Electro-Cautery.

Skene advocates the use of forceps, heated by an electric current, for the purpose of closing vessels. The heat is used to desiccate or dry the tissues without charring them. He employs a clamp, in the same way, for the purpose of dividing the pedicle of a tumour, *e.g.* an ovarian, and in dividing the broad ligaments in vaginal extirpation of the uterus. The required temperature varies from 170° to 190° F.

Abdominal Bandages.

Abdominal bandages may be of service in various conditions, *e.g.* pendulous belly, with or without pregnancy, tumours of large size in the abdominal cavity, floating kidney, after operations on the abdominal wall, after abdominal section, after child-birth, in separated recti, and umbilical hernia. Abdominal bandages may also be used to keep dressings over the genitals, to hold vaginal pessaries, etc. The most common form used after operations is a wide bandage, made of domette or of linen, long enough to encircle the abdomen and pelvis with the dressings, and to overlap. It should reach from the level of the great trochanters to near the ensiform cartilage. The dressings of wool should be so distributed as to allow of equable pressure by the bandage. With such a bandage, the patient must remain as quiet as possible in bed. It is very apt to slip upwards.

When a patient has to wear a bandage, *e.g.* in a case of pendulous belly, while she moves about, such a form is not convenient, because it tends to become greatly wrinkled

and to slip. It can be much improved by the addition of shoulder and thigh straps. In all such cases special bandages made of elastic material, or containing elastic, should be employed. Support is needed, particularly for the lower abdominal region.

Complete elastic bandages may be used ; they are slipped on over the legs. But more convenient are the forms which can be strapped on one side or at the back.

When the bandage is only partly elastic, the elastic portion may be in front, behind, or at the sides. The lower border should fit rather tightly, in order that it may not easily slip up. To prevent creasing and slipping upwards with certainty, it is a good thing to attach thigh-bands to the bandage. These may be made of silk, covered cloth, or, better, of rubber. These must not fasten too near the middle line, or the bands will tend to slip into the fold between the nates. The chemise should be worn under the bandage.

For floating kidney a similar bandage may be used, along with a hard cushion of wood, vulcanite, or metal, covered with leather, attached to the spot over which the special pressure is to be made. Or a mere abdominal belt with the cushions attached may suffice, if, in addition, thigh-bands be used to keep the belt in position. Also, a cushion may be kept in position by a truss-like arrangement.

Abdominal bandages are also used for the purpose of keeping dressings in the vulvar or sacral region in position. The commonest form is the well-known T bandage. A special bandage may be obtained ; it consists of an abdominal girdle with four straps attached, two in front, and two behind. These straps support a pad which rests against the perineum.

Dressings may be kept in place by straps of adhesive plaster, unless the patient objects strongly to their use.

Abdominal bandages are of service in giving attachment

to certain vaginal pessaries, or perineal supports, in cases of bad prolapse of the uterus or anus, when the patient will not allow operative measures to be employed.

Pessaries.

During the last few years the opinions of many of the leading gynecologists have undergone a marked change with regard to the value of pessaries in the practice of gynecology.

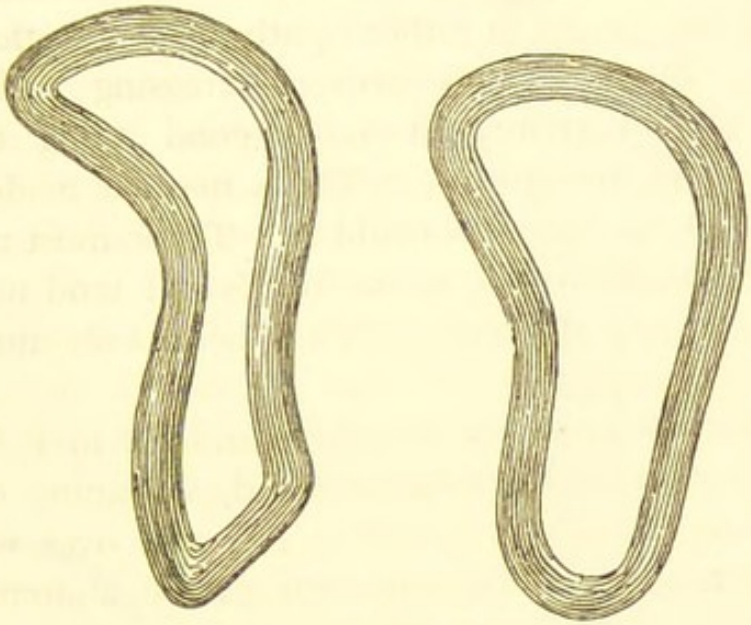


Fig. 67.—Hodge and Albert Smith pessaries.

Many forms of pessary have been devised during the present century, and their claims have been advocated by many physicians of greater or less renown. To refer to them many pages would be needed, and though such a survey might prove interesting, it would scarcely be suitable for a practical treatise at the present time.

Owing to comparatively recent researches, whereby we have acquired much accurate knowledge regarding the physics of the pelvis, the normal relations and movements of the various parts of the pelvic floor, the real significance of their various displacements and the correct estimation of

the symptoms caused by them, the employment of pessaries has been largely lessened. Of very great importance also in bringing about this change, are the advances which have been made in the operative treatment of some of the conditions for which pessaries have long been used.

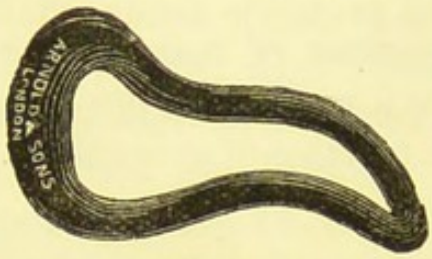


FIG. 68.—Thomas' pessary.

Forms of pessaries. — Hodge's pessary is a valuable one. It consists of two parallel side-bars joined at the lower end by a straight cross-bar, and at the upper end by a curved bar, whose concavity looks towards the lower end of the pessary. When viewed from the side, it has a sigmoid curve, in order that it may, when in position, fit the vagina properly. It is best thus made of vulcanite, because it is pliable if placed in hot water for a little, and so can be moulded to any desired shape; it gets firm again when cold.

Vulcanite does not get soiled as does guttapercha, and it does not soften in the vagina so easily as celluloid.

The pessary can be obtained in various sizes, and with different degrees of sigmoid curve. Very often the upper end curves too markedly forward.

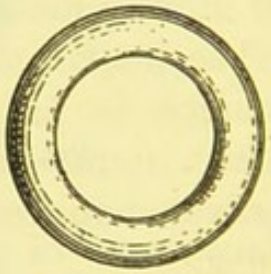


FIG. 69.—Ring pessary.

Albert Smith's pessary consists of two lateral bars joined by rounded ends. The bars are not parallel, but are wider apart at the upper end of the instrument than at the lower. Viewed laterally it has the sigmoid curve. It is best made of vulcanite. Very often this pessary is made too markedly curved forwards at the upper end, and the lower end is in many too pointed. It is then apt to slip out of the vagina if the introitus is wide, and is liable to interfere with coitus.

Both of these pessaries may be obtained with transverse bars across their lower part.

Gaillard Thomas' or Munde's pessary is somewhat similar in shape, but the upper end is thick. It may be made of vulcanite or of guttapercha; when of the latter, this end forms a soft cushion, which fills the posterior fornix when the instrument is in position.

Schultze's figure-of-eight pessary is greatly used in Germany, but it has no advantages over the above-mentioned forms.

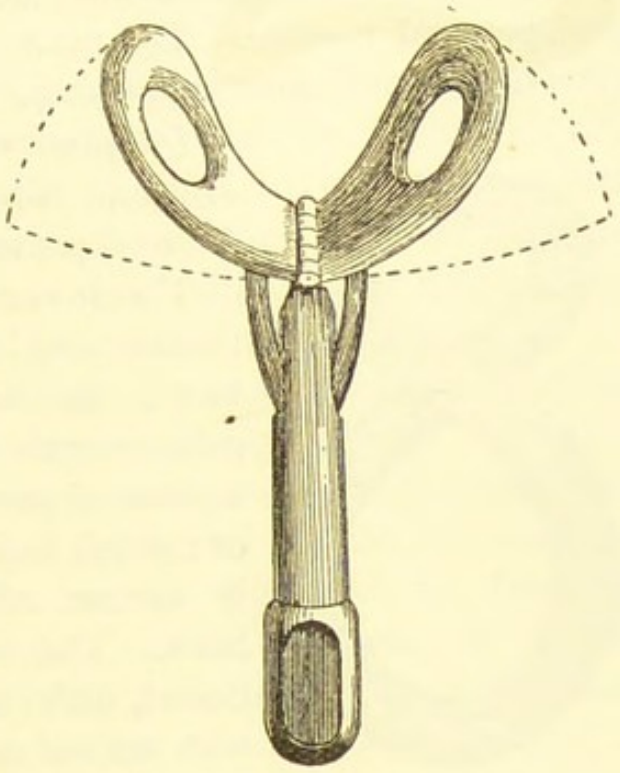


FIG. 70.—Zwanck's pessary.

The ring pessary is made of various materials, *e.g.* wood, vulcanite, metal, india-rubber. The most convenient are the indiarubber forms. Some are hollow, containing a spring, others are of solid rubber.

The diaphragm-ring is simply the last-mentioned form, with a perforated rubber diaphragm.

Ball or egg pessaries are made of vulcanite or wood.

The Zwanck or Zwanck-Schilling pessary consists of two perforated wings of vulcanite or metal, connected by a hinge joint. At right angles to them run bars, which are joined to a screw-stem. By means of the screw the wings can be opened out or brought together.

Vagino-abdominal pessaries are those which, though meant for the vagina, are kept in position by means of abdominal support. There are various forms of these. Cutter's may be taken as a type. In it there is a curved stem, which is

fastened to an abdominal belt in the middle line of the back, passes down over the sacral region, anus and perineum, into the vagina, where it supports a cup on which the uterus rests.

Method of using pessaries.—*Preliminaries.*—A careful bimanual examination must be made in order to determine the special requirements of the case, as well as the size of the instrument necessary. If the uterus be retroverted, it must be turned so that the fundus looks towards the front, by means of the sound, or by the fingers, assisted by the genu-pectoral posture. The patient is then placed on her left side, with the knees drawn up, under cover of a sheet.

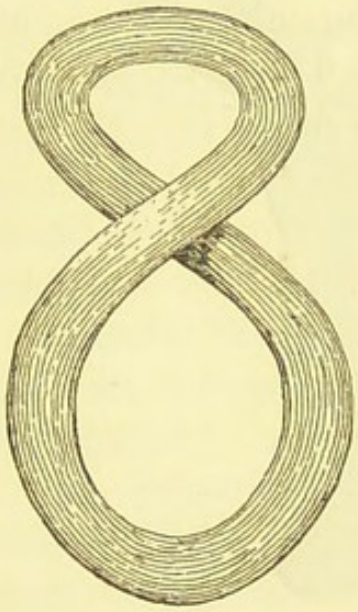


FIG. 71.—Schultze's pessary.

Introduction of instrument. — (*a*) Hodge, Albert Smith, Thomas or Mundé pessary.

The lower end is grasped between thumb and forefinger of the right hand, the upper end having been greased with vaseline. The labia are separated posteriorly with the fingers of the left hand. When the introitus is narrow, the perineum is pulled back. The instrument is then introduced, with its plane surface, in line with the vulvar slit, *i.e.* parallel to the table. It is directed backwards towards the sacral hollow, until it is little more than half within the vaginal orifice. The right index-finger is then placed under the pessary against the upper bar, and the instrument is rotated so that its plane surface lies parallel with the vaginal walls. It is then pushed upwards until the upper end rests in the posterior fornix.

In pushing it upwards the finger must be directed well backwards in order to oppose the tendency of the instrument to slip into the anterior fornix. The most difficulty is found where the vagina is narrow, and the parts rigid. No pain should be caused by the introduction.

(*b*) *Ring pessary.*—This form is introduced in much the same manner as that just described. When a soft, rubber ring is used, it is compressed by the thumb and forefinger of the right hand while it is being passed through the vulva in order not to stretch the parts and cause pain.

(*c*) *Zwanck pessary.*—The wings are brought together, and are then passed into the vagina. The screw of the handle is then turned so as to cause the blades to be separated sufficiently to enable the instrument to remain in position.

After-considerations.—When the pessary has been passed the patient is asked if she feels any pain or discomfort, and she is made to press down or to cough, in order to determine how the pessary fits. She then rises, and is tested standing erect, with her body bent at right angles to her limbs, in the position of micturition (if necessary), and walking.

The lower end of the instrument must not project beyond the vulva—must not press against the symphysis. It should lie just within the introitus, and should not press hard against the urethra. The upper end should not push up the fornix unduly. The vagina must not be stretched transversely by the Hodge, Smith, Thomas or Mundé forms. With the others it must not be too much stretched in this direction. The patient should be instructed to return if she is troubled with discomfort or pain while wearing the instrument.

If the woman douches, the pessary need not be removed and cleansed oftener than once in eight or ten weeks, if it be of vulcanite ; sodium bicarbonate in the douche has a cleansing action. Removal should be more often in the case of soft rubber, though it is difficult to get patients to bother to return in order to have the instruments changed. The pessary may be worn for months, or for more than a year, according to the necessities of the case.

Contra-indications to the use of pessaries.—Fixation of the uterus, so that the fundus cannot be turned to the front.

Interference with the mobility of the uterus, as a result of some swelling, *e.g.* tumour of ovary, etc. Recent acute inflammation in any of the pelvic tissues or viscera. Tenderness of the vagina from vaginitis. Certain tumours of uterus or of vaginal wall.

Some ill-effects of pessaries.—Pain may result. The functions of the bladder or of the rectum may be interfered with. Ulceration of the vaginal walls or cervix may occur. Perforation of the rectum, of the bladder, or of both, may take place. Coitus may be made difficult.

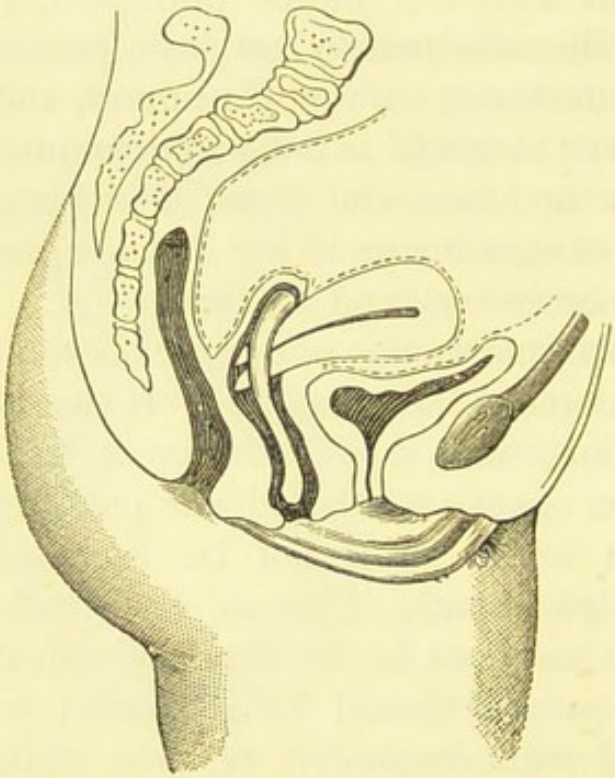


FIG. 72.—Pessary (Thomas') in position.

These troubles may result from pessaries when they are too large, when misplaced, when not kept clean, when worn too long without change, or when some contra-indication has not been regarded.

Mode of action of pessaries.—1. Pessaries of the Hodge type.

It used to be taught that when this pessary is in position the intra-abdominal pressure acts chiefly on the lower end of the instrument, thus pushing it downwards, and causing the upper end to rise and move somewhat forwards in the posterior fornix, thus pushing the uterus forwards. This is not the explanation. When the pessary is in position it lies in the vaginal slit between the pubic and sacral segments. Intra-abdominal pressure acts at right angles to every point of the floor, and consequently acts with equal force on all parts of the pessary.

The pessary acts in two ways :—

(*a*) It helps to keep up the uterus as a whole, thus tending towards the relief of the congestion of the organ.

(*b*) The upper end of the pessary affords a support over which the posterior vaginal wall pulls on the cervix in an upward and backward direction, the body of the uterus consequently tending to be kept forwards. In fact, this action makes up for the loss of function in the utero-sacral ligaments which, in the normal state, draw the cervix upwards and backwards, but which in cases of retroversion of any length of duration lose this power through the stretching to which they are subjected.

2. Ring pessaries act merely as a general means of support. They lie between the pubic and sacral segments, stretching the vagina more or less. They tend to prevent the vagina or uterus from becoming prolapsed. The ring does not act in the posterior fornix like the Hodge pessary in the majority of cases. Sometimes, it may have this action, and prevent the uterus, which has been replaced, from becoming retroverted again.

3. Zwanck's pessary acts in virtue of the width of its wings. These remain in the vagina, and tend to keep the uterus from descending. Patients sometimes prefer this instrument because they can so easily introduce and remove it.

4. Ball pessaries act merely through occupying a large amount of space in the vagina.

5. Vagino-abdominal pessaries keep up prolapsing parts, by means of the suspension from the abdominal band.

The Use of Electricity.

The exact value of galvanic electricity as a therapeutic agent has not yet been definitely established. By some authorities it is employed to an enormous extent in their practice, by others it is not at all used, and by others it is used to a very limited extent. One school holds that

in certain cases, *e.g.* fibroid tumours, its action may lead to the disappearance of the abnormal growth; another holds that it is merely to be ranked among other methods of bringing about improvement in certain symptoms.

One great objection to its use is the time and trouble required.

Apparatus employed.—The galvanic current is produced by the action of certain solutions on two different metals. In practice, batteries of different sizes are used. It is convenient to employ one in which a considerable strength may be obtained. Stationary or movable batteries may be used. They are usually in the form of a cabinet. Each battery must possess apparatus by which different numbers of cells may be connected with the circuit.

There should be a galvanometer, an indicator of the nature of the two poles, a current interrupter, and a commutator, which enables the current to be quickly altered. With these batteries also the necessary apparatus for producing faradism or electric illumination may be employed.

The rheostat, an instrument which alters the strength of currents by placing resistances in the line of the currents, may also go along with the battery. It is useful in allowing the current to be gradually increased or diminished without the slightest shock, and thus serves well with nervous patients.

Different forms of terminals or electrodes are employed to bring the current into relationship with the diseased tissues of the pelvis. Electrodes are external and internal. The external electrode is generally applied to the lower part of the abdomen above the pubes, where direct electrical action is required; sometimes over the sacrum, where indirect action is wanted. They may be made either of wet potter's clay, half an inch thick, or of block tin or lead, perforated with small holes and lined with a layer of cotton wool, chamois leather, or rough towel cloth. These elec-

trodes vary from 4 to 10 in. in diameter. The smaller they are the more the patient is apt to feel pain. Before use it should be moistened in warm water. It should be kept steady while the current is passing by a bandage passed lightly around the abdomen.

Internal electrodes are used in the vagina, in the uterus, in the bladder, in the rectum, or in the substance of masses, *e.g.* certain fibroids. Most commonly vaginal ones are employed.

Vaginal, rectal, and vesical electrodes are of various shapes and sizes, *e.g.* round, bulbous, or elongated. The staff on which they are held should be covered with vulcanite or rubber tubing to insulate it.

For the vaginal portion of the cervix a cup-shaped end may be used. For the uterine cavity various forms are used. The most common is that shaped like a uterine sound. Platinum ends should be employed; the positive pole will not corrode this metal, nor gold nor aluminium. For puncture of tissue a steel needle is used.

Action of galvanic current.—It is taught that there is a *polar* action chemical in nature, that at the positive end differing from that at the negative; and, also, an *interpolar* action as the current flows from one pole to the other. The effects depend upon strength of current and duration.

The effect of the positive pole is described as the hardening, coagulating, and hæmostatic one; it is less painful than the other pole. The effect of the negative pole is said to be to disintegrate tissue, to cause congestion, to favour hæmorrhage; it is the caustic, painful pole, being more active chemically than the positive.

Puncture of tissue is carried out chiefly in cases of fibroids where a sound cannot be passed into the uterine cavity. But it may be combined with intra-uterine electrisation.

Faradic electricity.—This may be used externally, internally, or both externally and internally. Where the internal

application alone is used, a double electrode, with an insulator between, may be employed.

The chemical action resulting from faradic electricity is very slight. It has mainly a stimulant and contracting effect.

Nature of applications.—The patient should be douched before and after the application with an antiseptic. She should rest for a little afterwards. The length of the application is from five to eight minutes in most cases. Where pain is being treated the applications may be longer. They may be given daily, every other day, or twice a week, according to the conditions present. Various strengths of currents are used. The highest limit may be considered 300 milliamperes. A very common range is from 50 to 150.

Conditions in which Galvanism has been Recommended.

Uterine atrophy, superinvolution, infantile uterus, associated with amenorrhœa and local loss of tone.

Faradic or galvanic electricity may be tried externally, or best, both externally and internally at the same time. In virgins it may be impossible to carry out the internal application. When the faradic current is used it does not matter which pole is in the uterus or vagina. When the galvanic is used, there is a difference of opinion as to which should be introduced; the current should not be strong.

Dysmenorrhœa associated with, or without, local inflammatory conditions. In these cases, the combined external and internal galvanic currents of mild strength are used, the positive pole being internal. In virgins it may only be possible to make external application.

Myoma uteri. — The galvanic current is used. The internal electrode is placed in the uterine cavity when possible, and is the negative pole unless it is a hæmorrhagic

case, when the posterior pole is placed there; or the inner electrode may penetrate the tumour for 1 to 2 in. The puncture is made on a part of the fibroid within easy reach. Vessels of any size should not be wounded, if possible. The puncture is usually made with the negative pole. The most thorough antiseptic precautions must be observed.

Puncture of the tumours through the abdominal wall is to be deprecated.

Metritis, endometritis may be benefited.

Chronic cellulitis, chronic ovaritis, salpingitis, perimetritis, periovaritis, old hæmatocele, and perisalpingitis are often improved. Also pelvic pains in neurotic patients may be helped by applications. The negative pole is usually placed in the vagina.

Affections of the rectum.—Electricity is used by some in the treatment of hæmorrhoids and of prolapse of the bowel. The galvanic current may be passed, one pole being on the abdomen the other in the rectum. Where the piles are large, electro-puncture with the positive pole may be used.

Faradism of the bowel is recommended for chronic constipation by some.

Bladder troubles.—For irritability or incontinence, abdomino-spinal, abdomino-vaginal, or abdomino-urethral applications of galvanism may be employed. When there is hypersensitiveness of the neck of the bladder, the positive pole is passed as far as this region.

Ectopic pregnancy.—The value of electricity in destroying an ectopic pregnancy has not yet been definitely ascertained. Some authorities would never employ it, others believe in using it during the first three months of pregnancy. Faradism and galvanism have both been used. The patient should be in bed. One electrode—the negative—is placed in the rectum or vagina, the outer on the abdomen over the cyst.

Contra-indications and dangers.—The electrical treatment should not be carried out where there is any acute inflammatory condition in the pelvis. Nor is it advisable where there is any collection of pus. In some cases it may be advisable not to employ it if the patient is particularly sensitive.

We are not yet sufficiently aware of the dangers that may result from the use of electricity, even in supposed suitable cases. Pelvic inflammation may undoubtedly be set up. Hæmorrhage may be started. This may result from the influence of the negative pole, from irritation of the uterine mucosa, or from the perforation of a large vessel when electro-puncture has been tried. Septic infection may be caused.

Points to be attended to during the application.—The patient must be placed in the dorsal position. It is well to assure her that the application will not be of the nature of a shock. The clothing is loosened, and the external electrode is placed on the abdomen and kept steady by the use of a lightly-applied bandage. This should be allowed to remain for a little before the current is passed in order that the skin may be well moistened. If there is dryness, more pain will be caused. Any abrasion of the skin should be protected with oiled silk. The electrode should be covered with a dry piece of cloth or of oiled silk to protect the clothes from moisture. The internal electrode is then introduced, the vagina having been cleansed before the patient has lain down. The end of the electrode should be cleansed and dipped in an antiseptic solution. It is introduced as a uterine sound would be, being guided by fingers placed in the vagina. There should be little or no pain in introducing the instrument. If electro-puncture is to be made, the uterus must be steadied through the abdominal wall. The wires are now attached to the electrodes, the condition of the apparatus having been tested beforehand. The galvanometer needle is at zero.

The outer electrode may now be lightly pressed against the belly by the patient's or by a nurse's hands. The electrodes must be steady, and the legs should not be allowed to touch them.

It is best not to employ a vaginal speculum. If it must be used, the electrode must not touch it, or a shock will be caused. Neither must it be allowed to burn the vaginal wall.

No sudden shock must be allowed, *e.g.* by the slipping of a wire from a screw. In stopping the application it is best gradually to reduce the strength by turning off the current bit by bit, or by increasing the resistance by the rheostat, until the galvanometer points again to zero. The wires are then removed, then the internal electrode, then the outer. The vagina is then cleansed. After puncture a styptic may be used and a vaginal plug. The patient must rest afterwards.

(For full details regarding the use of electricity, the works of Apostoli, Engelmann, Cutter, Keith, and others may be referred to.)

CHAPTER IX.

OPERATIVE MEASURES IN GENERAL.

Asepsis and Antiseptics.

A wounded surface may be infected with germs or their products in the following ways :—

By the hands of the operator, of his assistants, or of nurses.

By means of instruments, apparatus, and other paraphernalia used in the operation.

Owing to the non-cleansing of the patient.

By means of the air.

In gynecological operative work, as in all surgical work, our aim should be not merely to use antiseptics, but so to handle the patient as to keep every wounded surface *aseptic* from the beginning of the operation until the end of the repair process, which leads to the closure of the wound. In the later stages of the evolution towards what is now known as aseptic surgery, the part played by antiseptics is more restricted than in the early Listerian days.

It is necessary that every operator should thoroughly master the details of the modern method of clean surgery. There is no doubt that partial knowledge may in certain cases lead to errors as serious as those which proceed from ignorance. Thus an operator may take a piece of silk ligature from a drawer, soak it for a few minutes in 1 in 30 carbolic solution, or 1 in 2000 corrosive sublimate, and then use it as a suture, under the belief that he has satisfied all

the requirements of the aseptic system. Such a proceeding, in the light of present knowledge, is as serious as if he were to pick a suture from the floor and use it. Because it has been shown that certain micro-organisms will not be destroyed by these solutions unless left soaking in them for hours. Then, again, some think that if ligatures or instruments are placed in water raised to the boiling-point for a minute or two, all germs and spores will be destroyed. This is well known not to be the case. Then, again, many believe that certain dry dressings which are impregnated with antiseptics, now so largely used, are all powerful destroyers of germs; whereas, in reality, it is only when in contact with liquids that their activity is shown. It is evident, then, that dry dressings, unless sterilised immediately before application to wounds, may be carriers of living germs and spores.

It is necessary, therefore, to study the best means of carrying out all operative procedures, in order that the wound may not become infected.

The operator, assistants, and nurses.—The operator should not, immediately previous to the operation, have visited any infectious case, nor have been in contact with putrefying organic matter, *e.g.* post-mortem specimens.

Before all major operations, it is advisable that a special clean suit of linen clothes should be put on. It is, however, considered by some sufficient to remove the coat, roll the shirt sleeves up as far as the shoulder, and to envelop the body in a long sterilised apron, with short sleeves, which fastens behind. This apron should be waterproof. Some operators prefer to wear a sterilised linen or cotton apron outside this.

To cleanse the hands and arms, turpentine, soap, and warm running water should be first used, the skin and nails being carefully cleaned with a brush. Many operators follow the plan, after washing, of soaking the arms and hands in a solution of permanganate of potash, and afterwards in one of oxalic or sulphurous acid. Then the surface should be

well brushed with 1 in 1000 acid corrosive sublimate solution, 1 in 500 formalin solution, 1 in 1000 iodic hydrarg. solution, or 1 in 100 warm lysol solution. They may afterwards be soaked in these solutions for a little before the operation is begun. Alcoholic solutions of the mercuric salts are probably better than watery ones.

During the operation the hands should be washed from time to time in one or other of these lotions. In abdominal sections, however, weaker lotions should be used as a rule, or only sterilised water.

Every assistant and nurse who may touch the wound, or handle anything which comes into contact either with the operator's hands or with the wound, should cleanse hands and arms in the same manner as that just described.

The most glaring faults may be committed through non-attendance to this rule. Thus one may see a nurse looking after dressings, sponges, or instruments, with the sleeves of her dress scarcely raised above the wrist; and in the intervals of her occupation she may be noticed to pull up the sleeves from time to time. Or she may rush to secure an arm or leg of the patient which has broken loose. Or she may carelessly place the dressings on her sleeve before passing them to the operator. In the training of nurses it is most important that they should be taught the necessity of attention to minutiæ. They should, moreover, have a thorough understanding of the *rationale* of the aseptic system, in order that they may work intelligently.

Instruments, apparatus, swabs, ligatures, etc.—(*a*) *Instruments.*—Instruments should be made as simple as possible in order to afford no gathering-places for germs. They should be made entirely of metal where possible. All locks should be separable. By careful scrubbing and polishing, all gross or perceptible dirt can be removed from them. Before they are used in operations, they require to be made aseptic.

Sterilisation is most surely carried out by means of heat.

A dry heat of 150°–180° C., kept up for a few minutes, will suffice. Moist heat is more efficacious. Compressed circulating steam at 130° C. will destroy all micro-organisms and spores.

Various forms of sterilising chambers are used. These methods cannot in all cases be easily carried out. A simple substitute consists in boiling the instruments. Half an hour's boiling will ensure complete disinfection. According to Tavel, less time is required with a $\frac{3}{4}$ per cent. solution of common salt. If sodium carbonate (exsiccated) be added, sufficient to make a $\frac{1}{4}$ per cent. solution, the instruments will not rust.

After being sterilised, the instruments should be placed, during the operation, in an antiseptic lotion, *e.g.* 1 in 40 carbolic, 1 in 200 lysol, 1 in 4000 hydronaphthol, or 1 in 40 boric, 1 in 4000 formalin. Some operators use plain sterilised water.

After operations, the instruments should be thoroughly washed in warm soap and water, sterilised, and then dried.

Drainage-tubes should always be kept in a jar of antiseptic solution.

Rubber articles should not be boiled. Dishes which hold instruments should be made of glass or porcelain.

(*b*) *Apparatus.* — All basins, ewers, douche tubes, etc., which may be used by operator, assistants, or nurses, or which may be brought near the wound, should be thoroughly washed beforehand in a strong antiseptic lotion, *e.g.* 1 in 500 corrosive sublimate, 1 in 500 formalin, 1 in 20 carbolic, etc.

(*c*) *Gauze, cotton-wool swabs, ligatures, towels.*—Sponges are now almost entirely unnecessary in gynecological operative work. Instead, pieces of gauze or cotton-wool, medicated or not, are used. For abdominal sections, prepared pieces of gauze are the best; a square is made of eight thicknesses of gauze, each side measuring about 10 in., the edges being hemmed. Or they may be made of rolls of wool enclosed in sewed bags of gauze.

These swabs must either be sterilised by moist air or boiled for half an hour in the above-mentioned soda-salt solution. Afterwards they may be kept in carbolic, formalin, or other antiseptic lotions. Before use they may be soaked in sterilised water and thoroughly squeezed. They may be used several times during an operation if the blood be washed out. But if any dirty matter like pus touches them, they should be at once thrown into the fire. No swabs should be used in more than one operation.

All towels and cloths used during the operation should be sterilised in the moist-air chamber or boiled for half an hour in the soda-salt solution, afterwards being wrung out of an antiseptic lotion or used in the dry state.

Silk ligatures are to be boiled in the same manner, and then placed in an antiseptic lotion.

Catgut ligatures are prepared in various ways. The best are chromic gut and gut prepared in the oil of juniper wood. Before being used they should be washed in ether, and then thoroughly soaked in an antiseptic solution, *e.g.* 1 in 1000 iodic hydrarg. It is well to have a small supply constantly soaking in the antiseptic.

Sponges should be prepared as follows:—At first they should be washed in water slightly acidulated with hydrochloric acid until all effervescence, due to the action on lime contained in the sponge, has ceased. They are then soaked in sterilised water for an hour or two, and carefully cleaned. Then they are placed in an antiseptic solution, *e.g.* carbolic, for twenty-four hours. Afterwards they are squeezed and thoroughly dried, and preserved dry in a closed bag until wanted. Before the operation they should be soaked for twenty-four hours in 1 in 20 carbolic lotion. After an operation they are soaked in water until all the blood is dissolved out; then placed in a covered dish containing soda solution (one pound of soda to twelve sponges) for twenty-four hours. Then they should be thoroughly washed

for hours in hot water, and afterwards in the antiseptic lotion as above described.

Dressings, whether of wool or gauze, should be freshly sterilised. Dry dressings from the manufactory, even if impregnated with an antiseptic, may contain germs. The antiseptic is active only in the liquid state. The sterilisation may be carried out by means of a hot chamber, by boiling in the soda-salt solution, or by soaking in an antiseptic lotion.

Cleansing of the patient.—(*a*) *In operations on the external genitals, perineum, and natural passages.* — If possible, the patient should take a bath the night before the operation, the body being well scrubbed with soap and warm water. It is well that the vagina should be thoroughly douched with an antiseptic for several days beforehand. Some pack the vagina each night with iodoform gauze as well. A purgative should be given at bed-time, and an enema in the morning. After the bowel is moved, the nurse should thoroughly wash out the lower gut with warm boracic lotion (1 in 30). Before the operation, the bladder should be emptied.

If the external genitals are to be operated upon, as much hair should be shaved from the labia majora and mons veneris as is necessary to give a clear field of operation.

In such cases, some prefer to apply a boracic or carbolic poultice to the vulvar region during the night before the operation. This is really only necessary when there is a very dirty surface, which may be difficult to clean thoroughly otherwise. In the ordinary run of cases, it is sufficient, after shaving off the hairs, to scrub the vulva, the perineal and anal regions, the vagina, and the inner sides of the thighs with warm water, turpentine, and soap. Then these parts are thoroughly washed with an antiseptic solution, *e.g.* 1 in 1000 of corrosive sublimate, or formalin.

Some operators always use the permanganate of potash and oxalic acid solutions after washing in water.

During the operation the instruments may lie in sterilised water or in weak antiseptic lotions.

The field of operation may be irrigated if necessary with an antiseptic lotion by means of a douche, or it may simply be swabbed from time to time. The lotion should not be of such a nature as to hurt the instruments, *e.g.* formalin lotion (1 in 4000), solution of iodic hydrarg. (1 in 5000), or of hydronaphthol. Some use the simple boiled soda-salt solution. It is quite non-irritating to wounds.

The interior of the uterus is cleansed by strong antiseptic lotions introduced by swabs or by a double catheter.

After operations, the tract may be insufflated with iodoform or naphthalene powder, and a dressing of sterilised antiseptic gauze or wool used.

(*b*) *In operations in which the abdominal cavity is opened.*

a. Per vaginam.—The method already described will suffice. In such a case it is well to pack the vagina with iodoform gauze two or three nights before the operation, as well as to douche the passage. Before the peritoneum is opened into at the operation, the interior of the uterus should be thoroughly cleansed.

b. Through the abdominal walls.—The vagina should be douched with an antiseptic for several days before the operations. The evening before, a thorough cleansing of the body with soap and warm water should be made. Afterwards the nurse should wash the abdomen, mons veneris, and upper aspect of the thighs with soap, turpentine, and water; the navel should be cleaned with chloroform or ether. It is a good thing to shave the mons veneris at this stage. Some prefer to do it when the patient is under chloroform. A poultice of iodic hydrarg. (1 in 4000), or of formalin solution (1 in 1000), is then applied by some to the abdominal wall, and not removed until the patient lies on the operating table. Solutions in glycerin are best. They penetrate the skin, and do not dry up. A purgative is given, and an enema in the morning. The rectum is washed out with warm

boric or formalin lotion, and the vagina is douched. The urine is then drawn off if the patient cannot empty her bladder.

In every case where the uterine cavity is likely to be opened during the abdominal section, it is well to endeavour to disinfect it before the operation by a douche, swabs, or by curetting. This is best done when under the anæsthetic. When the patient is placed on the table, the abdominal dressings are removed; the skin is again washed with turpentine and water, and then bathed with an antiseptic lotion. The abdominal surface is then surrounded with sterilised Mackintosh sheetings, on which sterilised towels, wrung out of a warm antiseptic lotion, are placed. On these, instruments may be laid when necessary.

The instruments are taken from trays of weak antiseptic lotion. Sterilised gauze and wool swabs may be washed in the sterilised soda-salt solution, or in sterilised water alone. They should be thrown away when saturated with blood.

If sponges are used, they should be washed in a series of basins of antiseptic (not corrosive) and soda-salt solutions. Before the swab or sponge is used, it should be taken from the latter lotion, because it is quite non-irritating to raw surfaces or to the peritoneum.

If it is necessary to wash out the abdominal cavity, the sterilised soda-salt solution suffices, though simple boiled water may be tried. Some recommend weak boracic lotion, sublimate lotion (1 in 10,000), or iodic hydrarg. (1 in 15,000) in cases where pus or other germ-carrying material has found its way into the peritoneum. Such antiseptic lotions are of very little use. They are not strong enough to kill all germs and spores, and they may damage the peritoneum somewhat.

In all cases the cavity should be thoroughly dried before closure. Strong antiseptics easily damage the peritoneum, and so interfere with its action. Serous surfaces will better digest infectious matter if the endothelium be normal.

In all abdominal sections this power of the peritoneum should be remembered. The greatest danger of the local overcoming of this power results from the presence of fluid, *e.g.* blood, in which the germs may rapidly grow. The line of the incision and the surrounding parts should be dusted with iodoform or naphthalene powder, and covered with sterilised antiseptic gauze pads, or with gauze pads containing wool. The pads should be held in position by a piece of iodoform gauze, which is fastened to the abdominal wall with collodion. Outside this, layers of sterilised antiseptic cotton are placed, and the whole enveloped in a bandage, or held in position by adhesive plaster.

Cleansing of the air and contents of the room.—In the early days of antiseptics, great attention was directed to the *air infection* of wounds. Now it is recognised that it is very much less to be feared as a source of danger than infection by *contact* or by *implantation.*

To reduce to a minimum the risk of air infection, operations should be done in rooms with smooth clean walls and ceiling, with simple fittings and furniture. There should be no hangings, mats, carpets, nor any unnecessary articles which might collect dust. The dust is to be removed by ventilation, and by washing the room and its contents thoroughly.

Some operators like to burn stick-sulphur all night before the operation, the doors and windows being firmly sealed. In the early morning the smoke is removed by ventilation. I think it is better to carry out this procedure the day before, and to allow fresh air to remain in the room all night. In this way there is less sulphurous acid gas in the room during the operation. This is apt to irritate the patient's throat, causing spasm of the larynx, thus rendering the administration of the anæsthetic unpleasant.

A spray of formalin is now believed to be the best bactericide to employ in the cleansing of a room.

It goes without saying that no source of decaying organic

material should be near the room, *e.g.* a faulty drain pipe or water-closet.

Various Chemical Antiseptics.—I. Those used in Solution. II. Those used in Solid Form.

I. Those used in solution.—*Corrosive sublimate.*—This is a valuable antiseptic. It must be remembered that it is not active when dry. Therefore, germs and spores may lie in or on dressings containing it, without being destroyed. In strengths which can be used without great risk of absorption, its solutions vary greatly in their destructive action on germs and spores. It is important to bear this in mind. Some think that mere contact with a 1 in 1000 solution is sufficient to destroy all organisms. This is not so. Some will withstand its action for hours or for a day. Zimmermann found that pieces of flesh soaked for five minutes in this solution were not with certainty sterilised, though there is no doubt that the germs that are not destroyed are weakened in activity. For this reason, it has been recently recommended that at the end of an operation the wound (not peritoneal) should be washed out with a solution of the strength of 1 in 500.

With corrosive solutions, especially if strong, there is danger of absorption by the system, and consequently of toxic symptoms.

The risk of this may be diminished if, after the sublimate is used, the wound be washed out with a $\frac{3}{4}$ per cent. sterilised salt solution.

A pure corrosive solution should not be used, because it forms with albumin insoluble and inactive albuminate of mercury, its power in this way being weakened. This is especially marked when there is much fluid, *e.g.* leucorrhœa, cancerous discharge, blood.

To the corrosive solution should be added a little tartaric acid, in order to prevent the formation of the albuminate.

A ¾ per cent. or 1 per cent. solution of tartaric acid should be used in making up a 1 in 1000 corrosive solution. Common salt has the same action. Tartaric acid is best added before using the corrosive. If it be added to a strong solution, it changes the mercuric salt to calomel in two or three weeks.

The objections to the use of mercury are that it is toxic if absorbed to any extent into the system. It corrodes metallic instruments, and loses its strength somewhat when they are immersed in it, because the mercury tends to be deposited on them. Sponges, also, are hurt by it. Glass and porcelain are not injured by it.

Biniodide of mercury or mercuric iodide.—This salt is believed to be very valuable. It does not form insoluble compounds with albumin, and it does not corrode metals much. It is used in strengths of 1 in 1000, 1 in 2000, etc.

Iodic hydrarg. —(Mercuric-potassio, mercuric iodide.) This is a most valuable antiseptic. It is a soluble form of mercuric iodide. It does not form an albuminate with albumin. It is not irritating nor so toxic as sublimate when it is absorbed by the system. It is rapidly eliminated by the kidneys. It is said to have twice the germicidal strength of corrosive, and it is safer to use in the peritoneal cavity.

Formalin, formaldehyde, formol, formic aldehyde.—This substance is prepared by passing a mixture of air and vapour of methyl alcohol over incandescent platinum. The liquid which condenses is formic aldehyde dissolved in methyl alcohol. The commercial solution is usually 40 per cent. in strength. At an ordinary temperature formic aldehyde is a colourless gas with an irritating odour. At a temperature of 20° C. it changes to a polymeric form, known as para-formaldehyde, a white substance, soluble in water and alcohol. Formalin is in its gaseous form the best and most convenient germicide which can be used for the purification of rooms, furniture, books, etc. Its solution is probably more quickly destructive to organisms and their spores than

corrosive sublimate. Unlike the latter, it is not toxic as a result of absorption, save in very strong solutions administered in large quantities. In ordinary solutions it is, moreover, but slightly injurious to tissues. Its vapour diffuses quickly, and can penetrate the skin and its glands. It is non-corrosive, and does not hurt instruments.

It may be used in the strengths of 1 in 500, 1 in 1000, etc. If eight drops of the ordinary 40 per cent. formalin solution be added to a pint (20 oz.) of water, the strength of the latter is 1 in 3000.

The pure solution may be applied to dirty sores, ulcers, chancres, etc. Mixed with an equal part of water the uterus may be swabbed out after a curetting. The most resistant microbes are killed by an hour's contact with a 1 in 1000 solution.

The action of formalin can be stopped with ammonia, which forms with it a harmless compound.

Hydronaphthol.—This material is non-poisonous, non-irritating, non-corroding, and a strong antiseptic. It may be used in solutions of 1 in 1000, 1 in 2000, etc. Weak-solutions may be used to flush out the peritoneum.

β-naphthol.—This may be used in watery solution. The saturated solution is only 2 per cent. in strength. Boracic acid helps its solubility.

Carbolic acid.—The ordinary 1 in 20 solution is a good antiseptic, save in the case of the spore-bearing bacilli. But contact for several hours is necessary in the case of some. It is in favour of carbolic lotions that they do not hurt instruments.

Carbolic acid is easily absorbed into the system by means of raw surfaces, and may cause toxic symptoms. It also acts unpleasantly on the skin of the operator. This substance is, therefore, not so serviceable as some other antiseptics. Supplies of ligature may be kept in solutions of it, to be ready for use.

Lysol.—This is an alkaline fluid, derived from the saponi-

fication of cresols. It is incompatible with acids. It is said to be a stronger germicide than carbolic acid, and less poisonous. It is used in a strength of 1 in 100 as a douche, for washing the hands and for instruments.

Boracic lotion (30 in 1000) and salicylic lotion (1 in 1000) are non-irritating, and may be used for instruments or for washing out the rectum or bladder.

Thymol.—This substance is a good antiseptic. As 1 part is soluble only in 1500 of water, glycerin should be added if stronger solutions are desired. Ordinary strengths employed are 1 in 1000 to 1 in 2000.

Iodoformised or *bichloride* collodium should be used when it is desired to fasten dressings to the skin around the wound.

Ferripyrin.—This substance is highly recommended by Witkowski as an astringent, anæsthetic, antiseptic, without irritant action. A 16 per cent. watery solution can be applied to a bleeding or diseased surface, with a swab or dressed sound. A $1\frac{1}{2}$ per cent. solution can be used for irrigation of wounds or on plugs. Solutions varying in strength from 1 to 16 per cent. can be used for bladder bleedings. In stomach or bowel hæmorrhage it can be administered by the mouth.

II. Used in solid form.—(*a*) *Iodoform.*—This substance is used as powder, in pencils for introduction into the uterus, as pessaries for the vagina, and in gauze. It may also be used in a solution of alcohol and ether, as follows:—Iodoform, 10 parts; alcohol, 80; ether, 20. It is a valuable antiseptic, but it becomes active only when fermentation has begun. By this action the iodoform is decomposed, and the products are said to unite with the ptomaines and toxalbumins, and so to prevent the development of the germs.

Germs and spores may live among iodoform without being affected. They cannot, however, continue septic processes where the iodoform is abundant.

It is, probably, according to Kocher, the most active agent in combating decomposition. It really serves no purpose when placed on wounds which heal aseptically, but it is of great value in those where sepsis usually occurs.

Toxic effects are produced by its absorption, *e.g.* rise of temperature, frequent pulse, mental dulness, and there may be delirium, collapse, and coma.

Iodoform gauze may be made as follows:—Pure gauze is sterilised by boiling, and then soaked in the following solution:—

Iodoform . .	50 grms.
Glycerin . .	100 „
Ether . . .	700 „

The gauze is then passed through a drying roller-machine, and then dried at a temperature of 30° C. It can then be preserved in air-tight cases.

Tannin may also be added to give the gauze an astringent hæmostatic action.

Sterilisation of iodoform gauze can be carried out by boiling or by hot air.

Corrosive sublimate.—Sublimated gauze and wool may be made by boiling the pure material in sodium carbonate solution (20 in 1000), then in corrosive solution (1 in 1000). Afterwards it is dried. Dry gauze or wool is inert as regards germs and spores. All articles, therefore, from manufactories should be sterilised before being used.

Salicylic acid is also used in powder or in gauze.

Naphthalene.—This is a cheaper material than iodoform, and may be used as a powder for sprinkling on raw surfaces or in abscess cavities. It may be used, combined in equal parts, with iodoform, or it may be mixed with a little calamine powder in order that it may be less sticky.

Ferripyrin can be used in powdered form.

Apparatus, Ligatures, Instruments, etc.

The *operating table* should be simply constructed. It should be made of metal, *e.g.* galvanised iron, so as to be easily cleansed.

For operations on or by way of the natural passages, the patient should be placed in the lithotomy position, her buttocks projecting slightly over the end of the table. The legs may be held up by assistants, but it is more convenient to employ leg-rests fastened to the end of the table, or a special leg-holder, which is attached to the knees, and is held by a strap passed around the table.

A simple arrangement may be adopted by means of a walking-stick and a long bandage. The stick is placed in the flexion of the knees, fastened to them by the bandage, which is also passed around the neck of the patient or under the table. The feet and legs of the patient should be covered with clean stockings and sterilised linen coverings.

The patient's hips should rest on a piece of rubber cloth, or, better, on a circular rubber pad with a raised rim on a projection, which extends over the table-end into a collecting basin.

In private practice these operations may be performed on a convenient table, but sometimes it is necessary to place the patient on the edge of the bed. In the latter case, the knees may be held up conveniently by means of the walking-stick and bandage.

Attached to the operating table may be stands to hold dishes of instruments and swabs. These may be placed on chairs, or may be given to the operator by assistants.

A good window-light should shine on the patient's buttocks. The operator sits on a stool facing the end of the table.

For operations in which the incision is made in or through the abdominal wall, the patient may be placed on a high

table covered with a blanket and sterilised rubber cloths. The patient lies on her back, wearing clean stockings and a flannel night-dress. The latter is well drawn up under her chest. Hot-water bottles are placed on each side of her legs. The latter are covered with a sterilised cover, which is securely fastened around the table. The patient's arms should be fastened to the table or pinned to the pillow.

The operator stands on one side, usually the right, and his assistant on the other.

A good window-light should shine on the abdomen of the patient, either from above or opposite the end of the table.

An improvement upon the flat table is an arrangement by which, during abdominal sections, the lower limbs may be somewhat elevated. This is the position which is most favourable to the administration of anæsthetics, and is most apt to benefit those cases in which the cerebral circulation tends to become dangerously disturbed.

Some operators prefer to operate standing or sitting at the end of the table between the patient's legs, which are raised and held by supports. Frau Horn's table is the best-known one, and is used by Martin of Berlin.

In certain cases the Trendelenburg position may be employed. To place the patient aright, the lower end of the ordinary flat table may be raised, or a specially constructed apparatus may be employed to raise the patient's pelvis to a higher level than that occupied by her head.

For use in abdominal sections, a good electric lamp with a reflector is often valuable in illuminating deep parts of the pelvis or abdomen when the window-light is not good.

The operating room must be well warmed (25° to 30° C.). The air should be moist, in order that exposed peritoneum may not suffer.

Needles.—For passing ligatures through the pedicle in the removal of tumours by abdominal sections, in vaginal

colpotomy or in vaginal extirpation of the uterus, the best needle is one attached to a long handle. It should be full curved, and the point should not be sharp. Different shapes are used. The needle may be in line with the handle, at right angles to it, or at an obtuse angle. The latter forms may be obtained with the needle attached on the right or left side of the handle. Some operators, however, prefer to use ordinary full-curved needles with needle-holders in these operations.

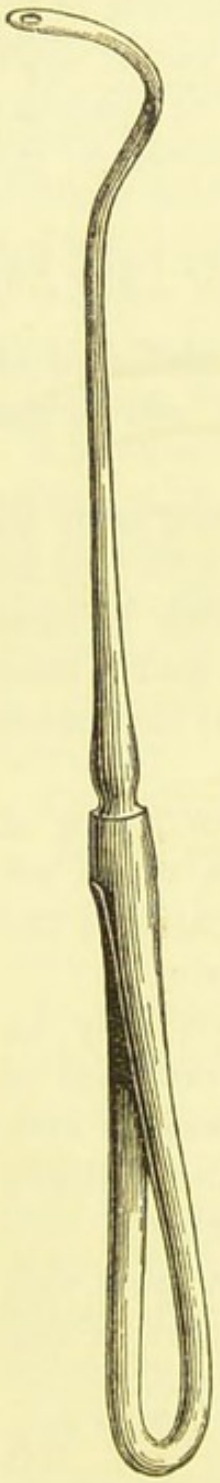


FIG. 73.—Pedicle needle.

For other purposes, *e.g.* the repair of the perineum, amputation of the cervix, etc., it is best to use needles with a needle-holder. The most convenient needles are the full-curved ones, such as are so largely employed by Martin of Berlin. The curve allows them to be passed easily when working in a deep wound. Different sizes may be obtained, from the large ones used in suturing the abdominal walls after section, to the small ones used in suturing a wounded intestine. In passing these needles the hand must turn well, because of the curve they have. The simplest and best needle-holder is Martin's. It should have a separable lock.

Sutures.—Silver wire has been used in gynecology, but it may safely be said that it is practically unnecessary.

Silk is largely used in various sizes, twisted or plaited. Its chief use is in securing the pedicle of ovarian and uterine tumours, in suturing the abdominal walls after section, and in extirpation of the uterus. The thickest silk is generally known as "pedicle silk." It is

twisted. For the abdominal walls plaited Chinese silk is largely employed (Nos. 7 and 8).

The value of silk is its strength and durability. Its resistance to absorption is the great objection to it. It is apt to set up irritation, and may lead to the formation of a sinus. Being very porous, it may easily carry germs. For these reasons some operators never use it where sutures are buried, *e.g.* in the abdominal cavity or in the bottom of deep wounds. Martin, for example, uses it practically only for the closure of the abdominal incision, catgut being employed for all other purposes.

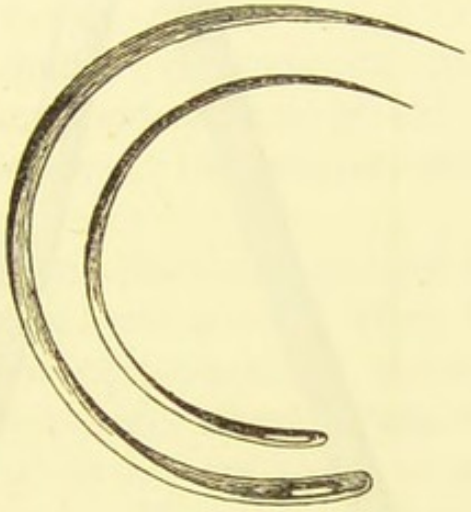


FIG. 74.—Martin's full-curved needles.

Catgut.—There is no doubt that this is by far the most widely used and most serviceable material for most ligatures and sutures. It may be obtained in four sizes, from No. 0, used in suturing a wounded intestine, to No. 4, used where important vessels are to be secured. No. 4 is used by Martin in abdominal operations, where most other operators use silk.

The great advantage of catgut is that it lasts long enough for purposes of healing, and that it is then absorbed by the tissues when in position. Its durability depends upon its size and nature. The range of juniper gut is from one to three weeks. Chromic gut is more durable.

It must be noted that catgut may easily rot if kept too long, or if not carefully prepared or kept. It tends to fray out if at all injured, and the knot may slip if not carefully tied. The knot should be triple and not double.

Different preparations of catgut are employed. The

well-known carbolised gut should not be used. It is not so reliable as the following forms :—

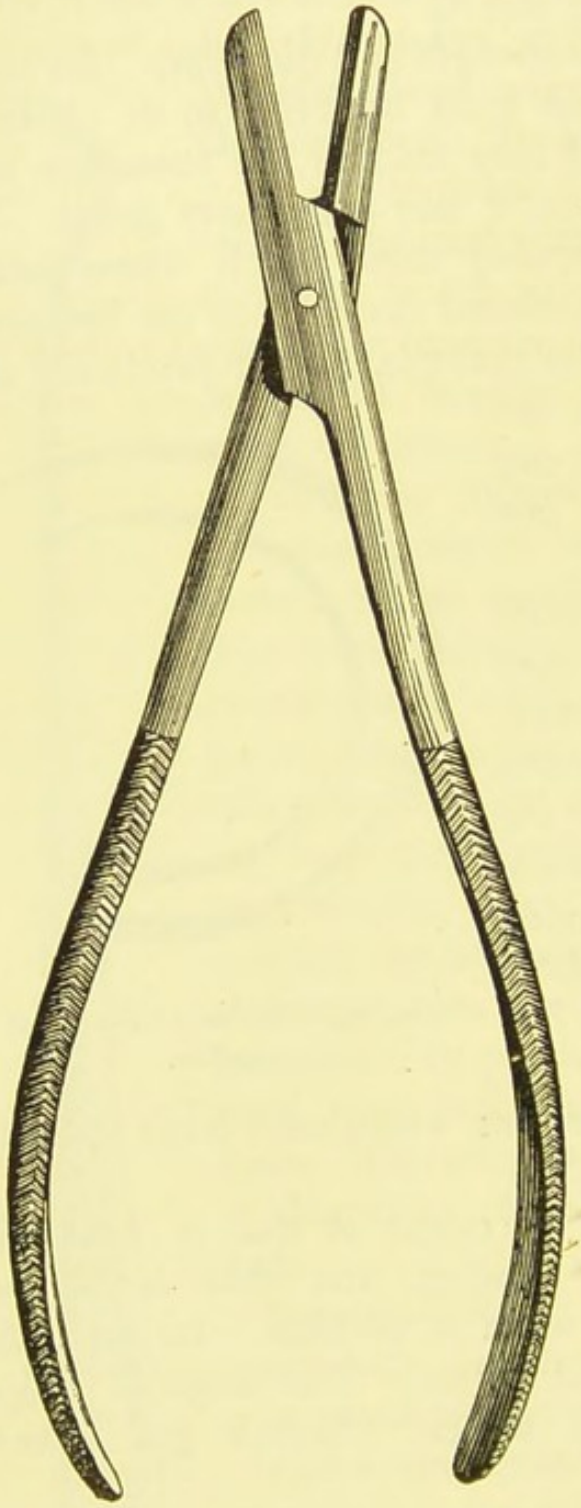


FIG. 75.—Martin's needle-holder.

Chromic catgut. — This is prepared by taking 5 parts of the best gut, on the stretch, soaking it in a mixture of chromic acid (1 part) and distilled water (12 parts), then, after wiping it in a cloth, placing it for twelve hours in 100 parts of sulphurous acid. It is then dried.

Juniper catgut.— The best gut is soaked for five or six hours in corrosive solution (1 in 1000). It is then placed in the oil of juniper wood for eight or more days, and afterwards preserved in alcohol, to which a tenth of the essence of juniper is added. Some recommend sterilising the gut for three or four hours after it has soaked in the corrosive solution.

However catgut is prepared, it is perhaps well at first to wash it in ether or benzene, in order to remove any grease that may be on the surface. The chromic gut is the longest to disappear.

Before being used in operations the gut must be thoroughly sterilised.

Silk-worm gut.—This is impermeable and non-absorbent, not so strong as silver, and less flexible. It may be used where silver would be used. Some use it in cases where silk might be employed. Its knot is apt to give. It should be soaked in an antiseptic before use. It is easily cleaned.

Horse-hair is seldom used, and is not necessary. It is used by some to bring skin surfaces of an abdominal wound together. Catgut, however, or silk-worm gut, serves well for this.

Linen sutures. — Gubaroff highly recommends linen sutures as having none of the disadvantages of silk or silk-worm gut and being inexpensive. He prepares them as follows :—

The threads are boiled in a soda solution, to remove the fat, and afterwards are washed in cold water. They are then boiled for six minutes, and next placed in absolute alcohol for six hours, when this process is again repeated. From the alcohol they are placed in a warm room to dry, and are then rolled on glass spools. These are placed for twenty-four hours in a 30 per cent. solution of celloidin in equal parts of alcohol and ether, to which is added 1 per cent. of sterilised oleum ricini. The sutures are then rolled on a wooden frame to dry, and the excess of celloidin is removed by the fingers or with clean paper. They are kept in a closed glass vessel, and before use are twice boiled in a 1 in 1000 solution of corrosive sublimate.

Different forms of sutures.—*Separate sutures.*—These may be passed in a single row, or there may be two or three rows, according to the depth of the wound. In such cases the ligatures are tied on the skin.

Separate tiers of sutures may be used in order to close the wound thoroughly from the bottom upwards. The buried sutures should be of catgut.

In the closure of wounds the great desideratum is, if

possible, to bring the raw surfaces together accurately, without leaving spaces between them in which serum or clot can accumulate. The raw surfaces should be aseptic, they should not be injured by chemical reagents, nor by mechanical means, *e.g.* squeezing, compression. Healthy tissue is not a good soil for bacteria. It has a resisting influence against them. Blood clot or serum lying in a wound, on the other hand, is a splendid soil.

When in any case we cannot ensure this exact closure of a wound, it is best to establish free drainage, and to dress regularly with antiseptics. Separate sutures are not so reliable in thoroughly closing wounds of some depth as the continuous suture.

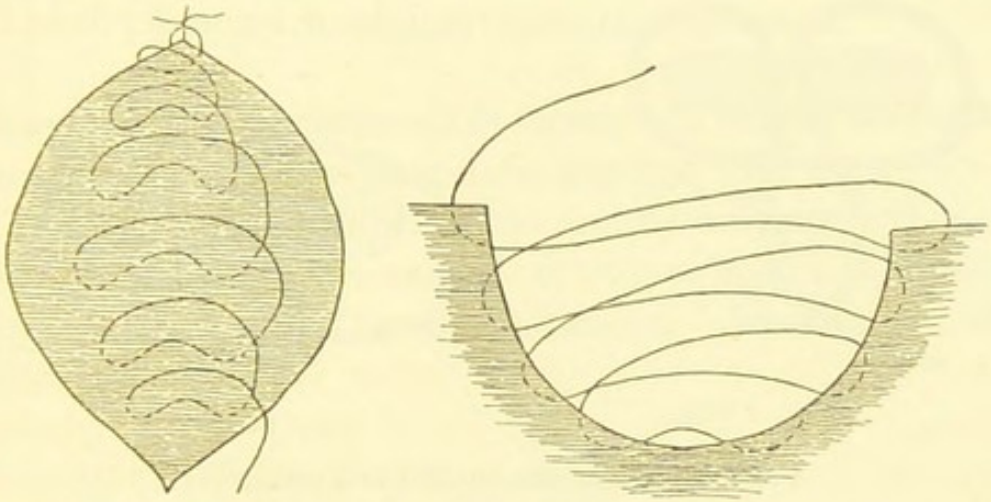
Continuous catgut suture.—This suture is most valuable. It serves not only to bring wounded surfaces together; but it is also a splendid means of checking hæmorrhage. The gut is passed continuously by means of a curved needle, the full-curved form being best for difficult cases.

A single row of turns of the suture may be sufficient in the case of a small wound. These may pass through skin and as much subjacent tissue as is wounded. In beginning the suturing it is best first to close the upper skin angle of the wound by tying a knot. On the short end of the suture a pair of forceps is fastened, and held tight by an assistant. In this way a *point d'appui* is afforded for the suture. The wound is then closed as the needle is passed through the skin surface, a quarter of an inch or more from the edge. After each passage of the needle the suture is pulled tight, and is held out by the left hand of the operator, or by an assistant.

Some prefer to pass the needle under the loop made immediately above, before the latter is drawn tightly. To tie the knot it is best to follow Martin's procedure. When the needle is to be passed for the last time there should be an end to the suture, of some length, projecting from the needle. The end is held on the side of entrance, while the

needle is passed completely. With the latter are two pieces of the gut. They are pulled tightly, and then tied to the single end on the other side of the wound. In making a knot the first turn should be double and the rest should be as in an ordinary reef-knot. Besides this, it is well to add a third part to the knot.

When a wide or deep wound is to be closed, the same method is employed in a series of stages, from the bottom of the wound to the skin-surface. The upper angle of the skin portion of the wound is closed as described. The



1. 2.

FIG. 76.—Diagrams to illustrate method of using the continuous catgut suture.

1. Surface view; 2. Sectional view.

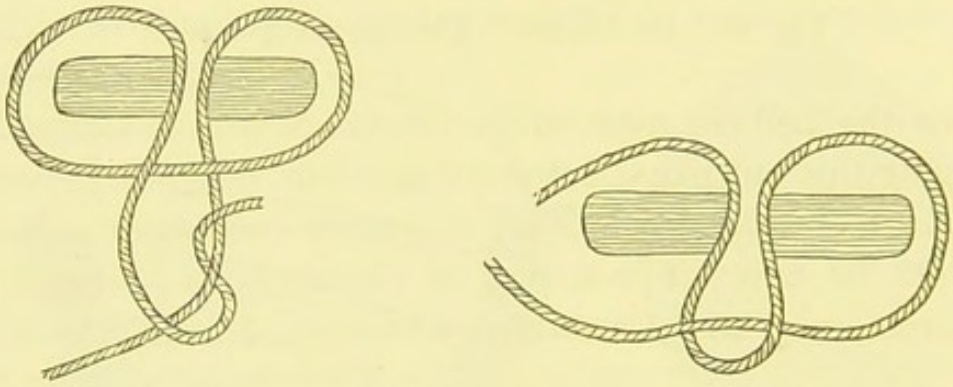
needle is then entered deeply, passing from side to side, bringing the lowest portions of the raw surface together. The assistant keeps the suture constantly tight. A second stage is now passed with the same suture, bringing together the wounded surfaces just above the level of the first stage. Third and fourth stages may be added if necessary. Finally the skin is closed.

In closing a deep wound a little caution is needed not to allow little cavities to remain, nor to cut with the needle previously passed sutures. If a suture is too short for the

complete closure, it may be tied, and another one started, beginning by a knot near where the other stopped. The whole process must be carried out with strict regard to asepsis.

Ligature en masse.—It is important that the different methods employed to control bleeding from the pedicle in case of the removal of the appendages, of tumours, etc., should be thoroughly known.

When the pedicle is not large, the Staffordshire knot of Lawson Tait, Bantock's knot, or several interlacing ligatures,



1. 2.

FIG. 77.—Ligatures applied to a pedicle.

1. Staffordshire knot; 2. Bantock's knot.

may be used. For each of these the ligature is passed through the pedicle by means of a pedicle needle. A part is chosen which has no large vessel. The needle is then withdrawn.

Staffordshire knot.—The loop is thrown over the mass to be removed, until it rests on the free ends. One of these is then drawn through this loop so as to rest on it. Both ends are drawn tight so as to constrict the pedicle. They are then tied, the first part of the knot having a double turn.

Bantock knot.—When the needle is withdrawn, one of the free ends is carried around the pedicle, passed through the loop and tied to the other free end on the other side of the pedicle.

Interlacing ligatures.—When the needle is withdrawn the loop is cut, and the two parts are interlaced. One part is tied on one side of the pedicle, the other on the other. In the case of a larger pedicle it is best to employ more than two interlacing structures. For this purpose the needle must

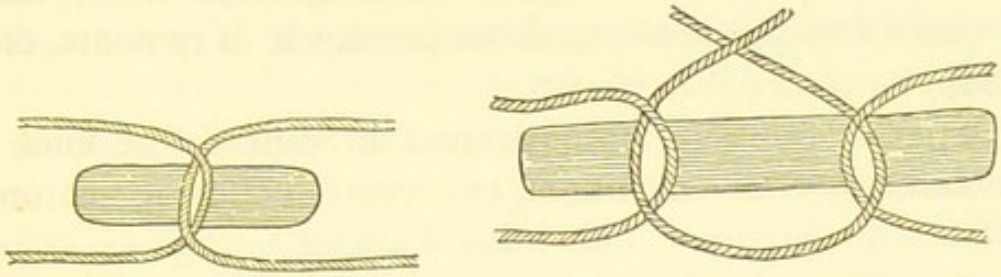


FIG. 78.—Double and triple interlacing sutures.

pierce the pedicle more than once. A simple method of carrying this out may be seen in Fig. 79.

Elastic ligature.—This is practically only applied to the pedicle in case of removal of fibroids, in abdominal hysterectomy, and Cæsarean section. It may be used

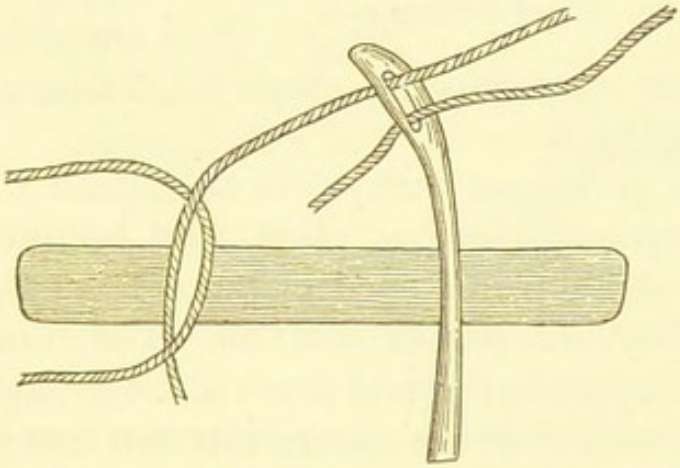


FIG. 79.—Method of passing interlacing sutures.

temporarily, or it may be left in position for days, *e.g.* in extraperitoneal treatment of the stump in abdominal hysterectomy.

The best round, strong rubber band should be used. Different methods are employed for holding the ends after the pedicle is embraced. Both ends may be held in a small

grooved piece of metal or vulcanite. They may be tied with silk, or may be held in a strong pair of forceps close to the pedicle. Pozzi uses a special instrument to tighten and hold the ends.

Forceps.—Ordinary artery forceps are greatly used in various operations. Greig Smith's, Spencer Wells', and Kocher's forceps, with separable locks, are very convenient forms.

Of great value for forcipressure in different abdominal operations are the medium-sized and long forceps of such patterns as Keith's. The Péan-Richelot forceps are of use in controlling the broad ligaments in vaginal extirpation. Other special forms of forceps will be referred to in connection with the operations in which they are used.

Drainage.—Drainage of wounds, not connected with the peritoneum, may be carried out by means of rubber tubes, whose sides are perforated. Antiseptic gauze may also be employed. Sometimes glass tubes may be used.

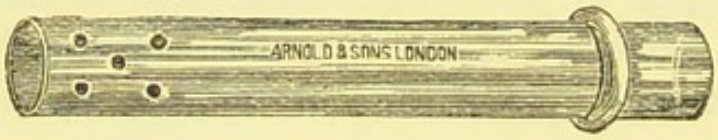


FIG. 80.—Glass drainage-tube.

When the peritoneal cavity is to be drained through the abdominal opening, various plans may be tried. Glass tubes, with small perforations in the sides, may be used. Generally they are passed into the pouch of Douglas through the abdominal wound near the lower angle. When the wound is closed all the sutures are tied except the one immediately above the tube. It is fastened when the tube is withdrawn after six, twelve, twenty-four, or more hours as the case may be. While the tube is in position, any fluid that gathers in it may be withdrawn from time to time by means of a syringe and rubber tubing. By some, antiseptic gauze or lamp-wick is used along with the tube to give constant capillary drainage.

In certain cases of abdominal section a large tampon has

been used by some operators. It is hæmostatic, antiseptic, and allows of drainage. Mikulicz's plan is to make a long sac of iodoform gauze, which is placed in the part of the cavity to be plugged. To the bottom of the sac a long piece of string is previously fastened. It is brought out through the opening of the bag. The sac is then packed with a series of strips of gauze. The order in which the strips are placed in the sac should be marked by strips of

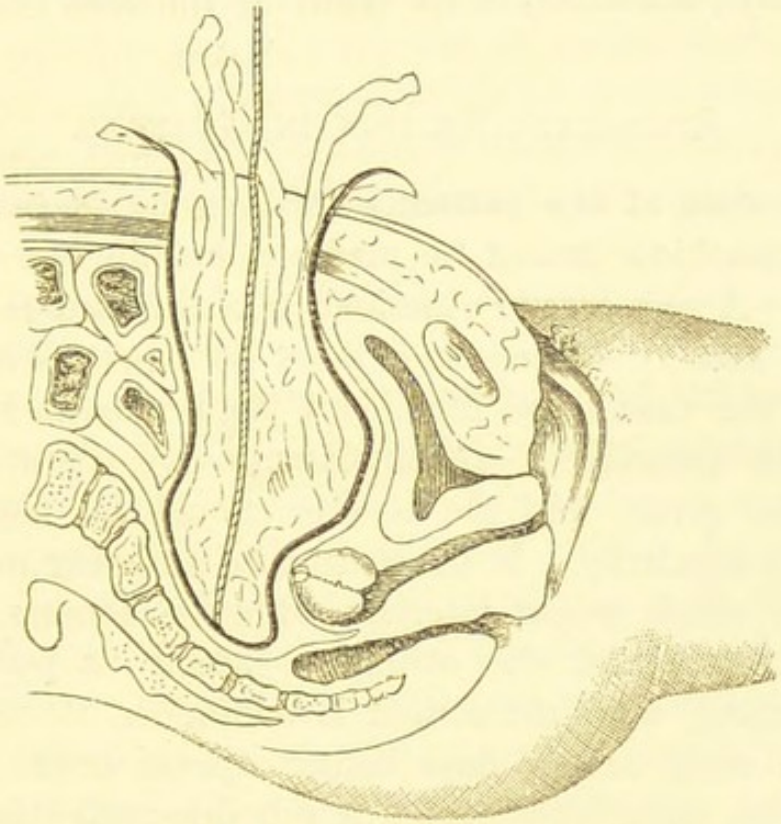


FIG. 81.—Mikulicz's plug.

coloured yarn attached to their outer ends. They should be removed in the reverse order of their introduction. It is an advantage also to place a drainage-tube in the very centre of the mass.

All excess of iodoform should be removed from the gauze beforehand by beating it, in order to lessen the danger of absorption.

The tampon is left in position, according to the amount of oozing. It is impossible to lay down exact rules. Mikulicz states that the gauze packing may be removed

after forty-eight hours, and the sac later. Fresh gauze may be introduced. Sometimes it may be necessary to drain the peritoneum through the vaginal fornix. This may be done by a T-shaped rubber tube. Iodoform gauze may be placed in the vagina, which may be douched from time to time.

Iodoform gauze alone may be used for this purpose. It should be frequently changed, and drainage kept up for several days, according to the nature of the case.

Abdominal Section in General.

Preparation of the patient.—Prior to the operation, her general condition should be made as healthy and quiet as possible. A very careful examination of the various systems must be made. Where the kidneys do not work freely, as may be the case when there is a large tumour, diuretics should be prescribed. Nourishing, easily digested food should be given, and the bowels should be kept open with daily regularity. If the patient be suffering from any condition which might interfere with the success of the case, *e.g.* bronchitis, the operation should be postponed, unless urgent, until the patient is better.

For a week or ten days before operation the patient should rest, lying down for a few hours each day. The last two or three days she should spend entirely in bed. A record should be kept of the temperature and pulse-rate during this period.

A daily antiseptic vaginal douche should be administered. If, in the operation, the uterus is likely to be partly or wholly removed, an iodoform gauze plug may be placed in the vagina after each douche; and on the two days before the operation the douche may be given twice per diem.

In the evening of the last day she should have a thorough washing in warm water. The abdomen and pudenda should be washed with turpentine, warm water, and soft soap.

Then a cloth wrung out of an antiseptic lotion, *e.g.* formalin (1 in 1000), should be placed on the abdomen and enveloped in a waterproof cover. A dose of opening medicine should be given.

Early the next morning an enema should be administered, and when the bowels move, the lower gut should be washed out with warm boracic lotion. The vagina should also be douched with an antiseptic lotion.

The operation should take place in the morning. No breakfast, save a cup of weak tea or water, which may be given early. It is said that if fluids be freely administered there is less danger of troublesome thirst after the operation. In any case, nothing solid is allowed, nor any milk which forms a curd.

Some operators advise that half an hour before the operation the patient should get a dose of brandy by the mouth, and a hypodermic injection of morphine and atropine.

She should wear clean stockings, a clean under-shirt, and a clean night-gown. Just before the anæsthetic is administered the nurse empties the bladder with a catheter. In hospital the patient should then be carried to a room next the operation room, where she is anæsthetised. In private the anæsthetic may be given while she is still in bed.

In the meantime the operating room has been made ready for her reception, the operator, his assistants, and nurses have made their hands and arms aseptic. If the table to be used is the ordinary flat one, it is covered with a clean blanket, on which is placed a waterproof cover and a clean sheet. On the top should be placed a circular rubber pad with a flap reaching over the side of the table.

The patient is now placed on the table, her buttocks resting on the pad. The clothes are then drawn up under her arms and a clean blanket placed over her legs. On each side of her legs should be placed a bottle of hot water, and over the blanket a clean sheet should be placed, which should be fastened around the table. Her arms should

be tied to the table. The abdominal poultice is removed and the hair of the mons veneris shaved; the abdomen is carefully scrubbed with turpentine, water, and green soap, the navel being thoroughly cleaned with chloroform, and, afterwards, washed with potassium permanganate and oxalic acid solutions. The surface is then soaked with a strong antiseptic lotion, *e.g.* formalin or corrosive, 1 in 2000. It is then washed with sterilised salt solution.

Sterilised thin waterproof cloths are now placed above and below the abdominal region, and on each side of it. These are covered by sterilised towels wrung out of a weak antiseptic solution, a sheet of sterilised gauze being placed over the abdomen.

The operator stands on one side of the table, usually the right, and his chief assistant on the other. Another assistant, or nurse, looks after the instruments, which have been laid out in flat dishes containing sterilised salt solution or a weak solution of boracic acid. A nurse attend to the swabs, sponges, and lotions that may be used during the operation. The swabs, sponges, and instruments are carefully counted. A number of artery forceps, a bistoury, and a pair of scissors are placed on the antiseptic towel covering the patient's legs. A swab is given to the chief assistant before the operator makes his incision.

Opening into the peritoneum.—Most operators select the middle line between the pubes and umbilicus. This incision is accompanied with least injury, for no muscle, large nerves, or important vessels are divided. Sometimes an unclosed umbilical vein may be cut, or one or more veins in the extraperitoneal fat. This incision may be employed for most purposes, as it affords equal access to both sides of the pelvis. This is especially valuable in cases where beforehand it is suspected that a bilateral operation may be necessary. If, when this incision is made, it is not sufficient even when lengthened, another incision may be made at right angles to it, in order to give more access to the side.

The chief objection to the mesial incision is that the resulting cicatrix is not apt to be as strong as that following incision elsewhere.

Some operators, therefore, always make the incision to one side of the middle line. If this be vertical, it should divide the inner part of the rectus. Vertical incisions in the outer part of the rectus or outside this muscle, if of any length, are not so desirable, because the nerves which supply the muscle are divided. In the upper region of the abdomen this is apt to be more serious than in the lower portion. If lateral incisions, therefore, are to be made, the large nerves will be protected if the abdominal wall be cut in an oblique or transverse line.

Transverse division of the rectus is not to be feared. Strong tendinous union takes place after suture, and the contraction of the muscle is not interfered with.

The length of the incision to be made depends on the nature of the case. It is a common practice to make a small one at first, about 3 in. in length, and afterwards to enlarge it if necessary.

The incision is made as follows :—Let us suppose that it is a mesial one. The skin and superficial fascia with fat are divided. Bleeding points are caught with forceps, because all bleeding should be checked before the peritoneum is opened. Large vessels may be tied with catgut. Most of the bleeding points are, however, checked by the temporary application of the forceps. The junction of the sheaths of the recti (linea alba) is divided, then the transversalis fascia which is transversely striated. Under this lies the extraperitoneal fat. It varies in thickness. Usually it is scanty when the superficial fat is not abundant. It should be caught up on each side of the middle line by artery forceps held by the operator and his assistant. Deeper and deeper portions should be caught and divided, until at last the peritoneum is incised. These precautions are necessary in order that no damage be done to the bowels

or omentum. The obliterated urachus may be found in the middle line, but it can be pushed aside. It may sometimes be unobliterated for a distance, and may contain calculous deposits, or may communicate with the bladder.

Ordinarily when the slightest hole is made in the peritoneum the bowels fall away from the surface, owing to the inrush of air. When, however, they are adherent to the parietal peritoneum, there is great risk of opening into them. In these cases, if the adhesions cannot be separated, it is necessary to close the opening in the abdominal wall, and it is justifiable to endeavour to make an opening at another part. If the bowel be cut into, it should be closed by catgut sutures (No. o or No. 1), passed through both the serous and muscular coats, the edges being turned in towards the lumen of the bowel.

Sometimes it is difficult to recognise the peritoneum. It may be very thin and the extraperitoneal fat may be mistaken for the omentum. When there is much ascites, it may project and be mistaken for a thin cyst wall. When there are many adhesions below, it may be mistaken for the same structure. If it be very much thickened by inflammation, it may be difficult to distinguish.

As a rule the omentum is above the umbilicus. If below, it can easily be pushed aside unless adherent. If adherent it should be carefully separated from the abdominal wall, and pushed up or to one or other side. Bleeding vessels in it may be ligatured, or portions may be sutured *en masse*. Sometimes it may be necessary to cut through the omentum, tying the vessels.

Bowel adhesions, if recent, may be broken through by means of the finger or swabs. If they are of any length, they may be tied in two places, and divided. Sometimes they are short and strong, and cannot be touched.

If the peritoneum be successfully opened, a finger should be passed in, the bowel pushed aside, while the rest of the peritoneum is cut with a pair of scissors the full length of

the wound. Two or three fingers are then introduced, in order that the diseased part may be palpated. If these are not sufficient, the whole hand should be introduced, the opening being made large enough. In cases where the nature of the internal condition is uncertain, *e.g.* intestinal obstruction, rupture of a tumour, an ectopic gestation sac, etc., it is best to make a large opening at once, 4 or 5 in. in length, in order that there may be no trouble in examining the viscera.

Before the condition can be treated it may be necessary to carry the incision above the umbilicus. In so doing it is best not to divide the navel, but to cut to one side of it. Often, also, the incision is extended downwards nearly to the symphysis. Care should always be taken to prevent the bladder from being injured. If it be cut, the wound should be closed with a continuous catgut suture.

The treatment of the various conditions for which the abdomen is opened will be considered in succeeding chapters.

During all manipulations it is of great importance that the peritoneal cavity should be kept dry, that all fluids, clots, etc., should be prevented, as much as possible, from entering it, by means of swabs, and that the bowels should not be exposed to the air without being covered in a sterilised towel wrung out of warm sterilised salt solution.

If the case is one in which the diseased part has been satisfactorily removed without the necessity of drainage, any small amount of blood or other fluid which has escaped among the intestines should be wiped out with sterilised swabs held in long forceps. These should be passed especially into the pouch of Douglas, care being taken not to disturb the ligatured pedicle. The bowels must not be roughly rubbed during this procedure.

In the great majority of cases irrigation is not necessary. When pus or the contents of a ruptured cyst, or of ruptured bowel, are widely spread in the abdominal cavity, it is well to

wash out the cavity with a sterilised salt solution (0·6 per cent.) at blood heat. The stream should flow *gently* through a rubber tube from half an inch to three-quarters of an inch in diameter. When the cavity is full the hand of the operator should be cautiously moved among the intestines. The stream should not be directed against the diaphragm, nor should the cavity be too much distended. Dyspnœa, asphyxia, or cessation of breathing may take place if caution be not observed. After irrigation careful sponging must be carried out to remove all the fluid. Some experimenters state that it is impossible to clean the cavity thoroughly by means of irrigation, because of the distribution of the foreign material among the coils of intestines; others, that thorough sponging alone is not sufficient. Probably a combination of both methods in bad cases is best.

Clark emphasises the importance of thorough irrigation, on the ground that, even if the foreign matter be not entirely removed, it is more broken up and therefore more easily disintegrated by the leucocytes. Muscatello's experiments have clearly demonstrated that the leucocytes act more rapidly in removing foreign particles when they are small. Moreover, the irrigation distributes the noxious matter and prevents it from remaining in a localised area.

Sometimes a cyst cannot be removed, but must be stitched to the abdominal wound. I will describe the technique in such cases, when they are specially referred to. The method of carrying out drainage is referred to on p. 407.

Closure of the abdominal wound.—Several methods are adopted. A common one is that in which several sutures are passed through the whole thickness of the walls. Before the sutures are passed, a sterilised gauze pad is placed on the intestines under the wound, in order to keep them out of the way of the needles, and to catch any blood from the stitch-holes. At this stage the assistant in charge of the instruments should see that all are in his possession

and that nothing has been left in the abdomen. The nurse in charge of the swabs or sponges should likewise be able to account for all that have been used. None of these should be divided in an operation.

A number of large full-curved needles are threaded with pieces of thoroughly sterilised silk sutures or of silkworm gut, and are passed by means of Martin's needle-holder through the abdominal wall on each side of the wound, the needle passing through the skin about three-eighths of an inch from the edge. Care must be taken that none of the layers shall retract so far as not to be pierced by the needles. They may be pulled towards the middle line by the assistant, if necessary.

The sutures are placed about half an inch from one another. When all are passed, the pad is withdrawn from the abdomen, the edges of the wound brought together, and the sutures tightened. Care must be taken to keep intestine and omentum out of the wound. The assistant then keeps the wound closed while the operator ties the sutures ; each knot should have a double turn on the first part.

All blood should be swabbed out of the wound while it is being tied. The skin edges are next carefully approximated. If there is gaping at any point, catgut may be used to make closure.

The suture ends are cut short, the skin surface is dried and made ready for the dressings.

Another method preferred by many is the following :—The peritoneal edges are brought together by means of a continuous catgut suture. The rest of the wound is closed by a series of sutures passed as already described, including everything but peritoneum. This method is a good one. If suppuration starts in connection with one of the sutures it will not tend to spread to the peritoneum, which has been separately closed.

Another method is recommended by some, namely to close the wound layer by layer by means of catgut. It is said

to lead to a stronger cicatrix. There is no proof of this, however. It takes more time than either of the other methods.

The dressing.—The wound and navel are thickly covered with an antiseptic powder, *e.g.* iodoform, napthalene, or a mixture of both. A thin pad of sterilised gauze, or a prepared pad of wool enclosed in gauze, is placed on the wound. This is covered with a single piece of gauze, larger than the pad. The edges of the gauze are fastened to the wall with antiseptic collodion. In this way the dressing is closely fixed to the wound.

Antiseptic collodion is made as follows :—

Mix,

Absolute alcohol	ʒiii.
Iodoform	ʒvi.

Add,

Ether	ʒiii.

Add,

Pyroxylin until the fluid is syrupy.

Williamson recommends highly, for wounds and dressings, a celloidin mixture, *e.g.*—

Celloidin	2 parts.
Absolute alcohol . . .	15 ,,
Pure ether (sp. gr. 720) .	15 ,,

Over the gauze, pads of dry antiseptic wool are placed. The dressings are held in position by means of a wide abdominal bandage, made of domette or of fine flannel, which has been sterilised; or strips of adhesive plaster may be employed. The patient is then placed in bed, which has been warmed with hot-water bottles.

Drainage of the peritoneum.—It is generally considered advisable to drain, when foreign matters have been present in the peritoneal cavity, *e.g.* pus, blood, contents of the intestinal canal or bladder, cyst contents, when at the closure of the wound there is unchecked capillary oozing

from the same surface, or where the case is one in which after hæmorrhage is to be feared.

In the great majority of cases a glass tube suffices for drainage. I have already described it and the other methods of drainage, *vide* p. 268. The tube is usually placed in the pouch of Douglas, passing between a couple of sutures, close to the lower end of the wound. The outer end of the tube should possess a circular flange, which should not project much beyond the skin.

If the tube be too short, or have no circular flange, it may slip into the abdomen ; if too long, it is apt to be forced inwards upon the viscera. Damage, *e.g.* perforation of the bowel wall, may be caused in this way.

The sutures are all tied, except one next the tube, which is left to be tied when the tube is withdrawn. The skin edges around the tube may be kept from gaping by catgut sutures.

The dressings in such a case are best applied as follows :— A square piece of thin indiarubber sheeting is perforated and fastened to the tube just below the flange. Under it the antiseptic powder and pads are placed. In this way any fluid escaping from the tubes does not soak the dressings next the wound. Over the tube-mouth a pad may be placed, and the whole covered with absorbent wool, and kept in position by means of an abdominal binder. This must not be fastened tightly.

The tube may be continuously drained by sterilised gauze or lamp-wick passed into the tube. Generally it is best to withdraw the fluid by means of a syringe with a rubber tube attached, as often as is necessary.

Sometimes immediately after an operation it may require to be drawn off every ten or fifteen minutes. The intervals should be made as long as possible. When capillary drainage is established, it is apt to be stopped by clots if the discharge is bloody.

If the syringe will not remove them, a sound with cotton-wool on the end may be used.

If the tube be left in position for twenty or thirty hours or more, it tends to become enclosed in peritonitic adhesions. This is sometimes valuable where there has been a tear in the rectum in the removal of a mass from the pouch of Douglas, which has not been well closed during the operation. The fæcal matter and gas escape through the tube-tract without infecting the general peritoneal cavity. This fæcal fistula may last a long time.

When intestine has been wounded, gas or fæcal matter may pass from the tube, and this may be the first intimation that the accident has taken place.

Sometimes air only may escape. This has entered during the operation or has been sucked in during attacks of vomiting.

If the holes in the side of the tube are larger than 1 mm., the omentum or even the bowel may tend to work its way into the lumen. A series of little herniæ may thus form, which, becoming strangulated, may give rise to pain, vomiting, local hæmorrhage, and gangrene. This may occur within the first twenty hours of the operation. To prevent it, the tube should be turned around and moved slightly upwards and downwards each time the fluid is removed.

If the tube should become fixed by the formation of the herniæ, rotation may cause the withdrawal of them. But it may be necessary to pull up the tube, ligature the omentum just outside the tube, and cut off the hernial portion.

The drainage-tube may only be required for a few hours, but it may be needed for several days. It should be removed when the discharge is becoming scanty.

The longer the tube remains in position the greater the risk of an abdominal hernia. The edges of the tube-tract are slow in healing.

The tube should be of strong glass. Otherwise it might be broken during an attack of vomiting.

When it is withdrawn, the suture that was left untied is securely fastened, and the whole wound is freshly dressed.

I have already described the plan of draining the peritoneum by means of a large gauze pack.

Martin and others often drain the peritoneum by means of a T-shaped tube passed through an opening from the pouch of Douglas into the vagina, which is made at the abdominal section. The tube is carried up the vagina and into the peritoneum by means of forceps, the cervix being steadied at the time by an assistant. The vagina and uterine cavity should be made aseptic before this is carried out. The lower end should be surrounded with iodoform gauze, which must be changed from day to day.

Within very recent times the question of drainage in abdominal cases has attracted considerable attention. The views expressed by T. J. Clark of Johns Hopkins Hospital, based upon the study of a large number of cases, are worthy of careful study.

In regard to operative cases, in which there is no primary infection, he emphasises facts which many recognise, namely, that blood within the peritoneal cavity may be absorbed before it coagulates; that after coagulation it may be removed gradually by the action of leucocytes, or may become encapsulated and organised; that the absorptive power of the peritoneum is best marked when the tissues are uninjured, but that, even when considerably injured, free blood may be taken up; that where the peritoneum has been injured, especially if already diseased, there is a special tendency to the pouring out of blood and serum; that freshly effused blood or serum is actively germicidal for some time, and may be able to destroy many organisms.

He shows that in a hundred undrained cases, where there were extensive adhesions, only one was complicated by the formation of suppuration after operation, whereas in a hundred similar cases which were drained it occurred in eight.

The introduction of a gauze drain into a raw oozing cavity may check the bleeding but leads to free serous secretion, which is liable to infection from the skin of the abdominal wall. The danger of infection through a drainage-tract is greater after the drain is removed than immediately after the operation.

When a drain is introduced plastic fibrin forms round about it, causing adhesions to neighbouring peritoneum. If the gauze be removed in this period, great pain is caused, and complications may result, *e.g.* dragging out through the wound of omentum or intestines, hæmorrhage from rupture of a vessel, or separation of a ligature. As the fibrinous covering organises, it becomes less attached to the drain, owing to degeneration of the layer next the drain. From the fifth day this takes place, so that removal of the gauze is more easily carried out after that day.

In removing the drain the organisms which may have entered the outer part of the gauze may be squeezed into the peritoneum, and thus set up infection.

In cases where infectious matter is supposed to exist at the time of operation, *e.g.* pyosalpinx, ovarian abscess, etc., the researches of Miller and others have proved that the great majority of fluid collections are sterile, and Clark shows that the results of treatment in such conditions are very much more satisfactory where no drainage is employed. Drainage is often associated with obstinate constipation, tympanites, nausea and vomiting, owing to the constrained position of the intestines around the drains. Fæcal fistula may also be produced. Sometimes the inflammatory reaction around the drain may cause vesical irritation, cystitis, and dysuria; the bladder may be interfered with in its movements, or a suppurating tract may open into it. Cases in which drainage is employed are more apt to be followed by hernia than those in which no drainage is used. In order to avoid the necessity for drainage, Clark insists upon careful attention being paid to the following points:—

1. Thorough disinfection of the hands of the operator and his assistants.

2. The careful control of hæmorrhage.

3. The avoidance of bruising and injuring of the tissues.

4. The isolation of the general peritoneal cavity during the operation.

5. The sacrifice of as little as possible of the peritoneum.

6. The conservation of bodily heat.

7. The avoidance of rupture of intraperitoneal abscesses.

8. Irrigation of the peritoneal cavity, with normal salt solution after operations, where débris or normal fluids escape into the peritoneal cavity.

9. The retention in the peritoneal cavity of 500 to 1000 cc. of normal salt solution, after operations which have been prolonged, or in which the presence of septic matter has been suspected. This should be associated with the elevation of the foot of the bed for twenty-four hours after the operation, in order that the matter should not collect in one part, namely, in the pelvis, but should be distributed through the peritoneal cavity, so that the forces which are employed in removing the foreign matter may act at the best advantage. For the matter will be broken up in the dissemination, irritating toxins will be diluted, and more leucocytes will be brought into relationship with the foreign bodies.

This postural drainage is only to be regarded as a prophylactic against post-operative peritonitis, and is not to be used after the peritonitis is established. In purulent peritonitis it is of no use, for Pawlowsky has demonstrated that in this condition the lymph channels leading from the peritoneum are choked with microbes and inflammatory products; free drainage through an incision is better in such cases. Where ascites is present it is also best not to employ the postural method, Waterhouse having shown that absorption from the peritoneal cavity is imperfect where that condition exists.

10. The injection of normal salt solution into the cellular tissue beneath the breasts, if symptoms of infection arise after operation.

After-treatment of abdominal sections.—The patient lies at rest on her back. For the first twenty-four or thirty-six hours nothing should be given by the mouth, except where the patient is very young, old, or exhausted. If it be necessary to feed early, it is best to do so by the bowel. With some the rule is to give nothing until flatus is passed by the rectum. If the patient be doing well and be not sick on the evening of the second day, a little milk and hot water, or milk with lime-water, may be given in sips. On the third day, the same may be given in the morning and evening; on the fourth day, milk and water may be given in the morning, weak tea with milk in the afternoon, chicken or beef-jelly, gruel or arrowroot in the evening. During the night one or other of the same articles may be given. On the fifth day, beef-tea, chicken-tea, or milk-pudding may be added; on the sixth day, fish; on the seventh and succeeding two or three days, chicken may be added to the dietary.

There may be nausea after the operation; it may last for twelve, eighteen, or twenty-four hours, or may be more prolonged. If prolonged, the administration of food by the mouth must be postponed.

For the nausea and vomiting, nothing should be given for some hours. Then bismuth and hydrocyanic acid mixture may be tried, sips of champagne, or sodium bicarbonate dissolved in hot water (5 grs. to ℥i.) given in the dose of a couple of tablespoonfuls. Also a mustard leaf over the epigastrium may give relief.

In bad cases sometimes a hypodermic of morphine will check the vomiting. The head should not be much higher than the body in such cases.

In long-continued vomiting, where the patient is weak

and requires food and stimulant, nutrient enemata may be given. The following is a good mixture :—

Peptonised milk . . . ℥i.)
Brandy . . . . ℥i.)
The whites of two eggs ; add a little salt.

Or a mixture of peptonised beef-tea with brandy may be given. If necessary, strophanthus or digitalis may be added to these.

Nutrient suppositories are also used.

Before nutrient enemata are given it is well to wash out the rectum with warm salt solution. No ice should be given. Cold black coffee is often well borne.

As regards the bowels, nothing passes save flatus for some days. If gas tends to collect and cause the patient any annoyance, a rectal tube should be passed to enable the flatus to escape.

If all goes well, on the evening of the third day a saline aperient should be given (earlier if there is much distension and trouble). If there is nausea, however, it is best to produce an evacuation on the morning of the third day (or earlier) by an enema of soap and water (1 pint), to which may be added, if desired, an ounce of Epsom salts, or this may be preceded, an hour before, by warmed olive oil or glycerin (6 oz.).

On succeeding days, cascara by the mouth, or glycerin suppositories by the rectum, may suffice to keep the bowels regular.

After the first opening of the bowels, the patient sometimes feels weak. For this condition a nutrient enema, with brandy, is valuable.

The patient is generally greatly troubled with thirst. She must be encouraged to restrain the desire to drink, and must not be allowed to take fluid by the mouth. She may rinse out the mouth or suck a rag dipped in water, and get relief. Sometimes an enema of warm water may help the patient.

The bladder should not be emptied with a catheter unless absolutely necessary. During the evening after operation, the patient should try to pass water. If she is not able, she should again try during the night. A warm cloth over the vulva may assist her. If she fail, the nurse should draw off the urine under strict antiseptic precautions. This may be done every six hours, if necessary.

Pain is generally felt in the pelvis after sections. It varies greatly in intensity in different cases, is not dependent upon the seriousness of operation, and has a good deal to do with temperament. It generally begins to improve after twenty hours or thereabouts, and passes off, usually, within the next twenty-four hours.

The ordinary cause of pain is constriction of the pedicle, and also of the abdominal wall by the wound sutures. It is aggravated by vomiting. Other pains may be due to stitch abscess, to blood extravasation, to neuralgic conditions in weakly women, and sometimes to peritonitis. It must be remembered that there may be little or no pain with the septic peritonitis following an abdominal section.

For pain nothing should be given, if possible. The patient should be encouraged to fight against it. Sometimes morphine may be required. Where the person has been accustomed to this drug it will probably be of little service.

Restlessness is a common condition. For this the nurse must try to arrange the pillows and bedclothes so as to give the patient more comfort. Sponging of the limbs and chest with warm alcohol, or with warm soap and water, may be tried after the second day, if the patient be not too ill or restless. After each part is sponged it should be dried and covered. There should be no exposure leading to a chill. This may be regularly carried out during convalescence. Excessive restlessness may, however, require a hypodermic injection of morphine or an enema of sodium bromide (ʒi.) or of paraldehyde (ʒii.) in syrup and water.

The pulse, after operation, if the case proceeds well,

is slow and regular. It may be quickened by internal hæmorrhage, peritonitis, and various other conditions, *e.g.* restlessness, temper, nervous temperament, etc.

The temperature, in an ordinary case, usually rises in the evening of the day of operation, and afterwards gradually falls to the normal, where it remains. It may be subnormal where there has been much shock or depression, or where marked internal hæmorrhage has occurred. It may be elevated by various conditions, *e.g.* disturbed stomach, tympanites, nervousness, inflammation, formation of a hæmatoma or hæmatocele, etc. There may be marked rises of the temperature with peritonitis, though in some cases it may be normal or subnormal.

The tongue should in good cases be moist, free from coating, and of normal colour. It may be coated from a disordered stomach, or may be stained light brown from bilious vomiting. In peritonitis it has various appearances. It may be covered with a yellowish coating, or may be rough and dry. Where suppuration is going on to any extent, it may be dry, smooth, and of a bright red colour.

The occurrence of tympanites must be watched for carefully. It causes colic, pain, and distress, and may quicken pulse and breathing, interfering with the action of heart and lungs. It may be due to intestinal disorders or to peritonitis. Distension is very often the earliest indication of peritonitis, and, in such a condition, usually appears on the third day. Tympanites may follow the removal of large tumours, but this form is usually painless. The rectal tube should be used to draw off the flatus, or an enema should be given containing :—

Warm water . .	1 pint.
Warm olive oil . .	2 oz.
Turpentine . .	1 tablespoonful.

A turpentine stupe on the abdomen may also be tried.

The stitches should not be removed from the abdominal

wall until the bowels have been moved. A dose of an aperient should be given on the evening previous to the day of their removal, so that there may be a motion in the morning before the stitches are taken away.

On the morning of this day it is also a convenient time to change the patient's night-dress and the bed-linen, because, after removal of the stitches, it is necessary that she should be kept very quiet. This changing must be carefully carried out.

Ordinarily the stitches may be removed on the ninth day. If a drainage-tube has been employed, so that one stitch is later than the others, all may be removed save this one, or all may be left until the tenth or eleventh day.

Before removing the sutures, the line of the wound and the suture ends are carefully washed in antiseptic lotion. Each stitch is removed by means of a pair of forceps and a pair of scissors. The knot is pulled outwards, the skin depressed a little by the scissors, the suture cut below the skin-level and drawn out of the wall by the forceps which are attached to the knot.

Antiseptic powder is then sprinkled along the line of the incision. This is covered with a narrow piece of wool. Across this are placed strips of perforated adhesive plaster, the abdominal walls being well drawn towards the middle line by an assistant before the plaster is applied.

If no suppuration occur, this dressing may not require to be changed for some time.

By the fifteenth or sixteenth day, the patient may be allowed to sit up somewhat in bed, being propped up with pillows. After two or three days, if all goes well, she may be allowed to sit up in a chair for a little, and, on the following days, to walk a little. Before being allowed up, she should be fitted with an abdominal belt, which should be worn constantly, a light one at night, a strong one by day.

During the fourth week the patient may go home. She must be told to avoid all exertion, to be careful with her

diet, to keep the bowels regular, to avoid coitus for four months, and to wear the belt for a couple of years. After six months she need not wear a night-belt.

Complications after operation.—*Shock.*—After most cases of abdominal section there is some depression, the patient being pale, the pulse small, soft, increased in frequency (sometimes slow). Sometimes shock is a very marked feature. It is generally due to lengthened anæsthesia, hæmorrhage, reduction of temperature, especially from the exposed peritoneum, irritation of the peritoneum during the manipulations, or as a result of pouring large quantities of fluid into the abdomen. The dangerous element in shock is the failure of the heart's action. Death may occur during the first, second, or third day. It is most to be expected in old, weak, or anæmic women.

Hæmorrhage.—Internal hæmorrhage may be due to various causes. The most common causes of severe bleeding are slipping of the pedicle ligature, loosening of it, and retraction or shrinkage of some part of the pedicle. In most cases such a calamity occurs on the first or second day, though it may be later. It may be associated with the straining of vomiting or coughing.

Hæmorrhage also may take place from torn adhesions. In all these cases it is intraperitoneal. Sometimes extraperitoneal bleeding may occur, *e.g.* in the broad ligament. This may sometimes force the ligature from the pedicle, and may burst into the peritoneal cavity. Hæmorrhage may also occur in connection with the abdominal wound when the patient has hæmophilia, leucocythæmia, bad jaundice, or purpura.

If a drainage-tube has been used, the internal hæmorrhage may soon be detected. If not, the symptoms and physical signs indicate the condition. The pulse becomes rapid and thready, the temperature falls, the face gets pale and waxy. Respiration increases. Patient is thirsty, restless, and pants for air. She may faint, may see

everything darkly, or may see dark spots before her eyes. She feels giddy. If the case has a fatal issue she gets collapsed, pupils dilate, pulse gets unrecognisable, temperature falls, and limbs become cold. On bimanual or abdominal examination a boggy, indefinite fulness may be made out—dull on percussion in the flanks. If the blood is extraperitoneal, its circumscribed and unilateral position may be determined.

In all cases, as soon as hæmorrhage is suspected, if no drainage-tube has been used, remove a stitch or two near the lower end of the wound, and pass a tube deeply into the pelvis in order to determine the presence of blood. When hæmorrhage is detected, the abdominal wound should be reopened, and the source of hæmorrhage found.

If the pedicle has slipped, it should be caught up and religatured. If this be impossible, hold the raw edges by forceps, ligature the ovarian, and, if possible, the uterine artery of the bleeding side. The raw edges should then be closed with continuous catgut suture. The blood is then washed out of the peritoneal cavity. Sterilised salt solution should be used, some of it being left in the cavity to be absorbed into the system, thus serving instead of transfusion.

When oozing goes on from adhesions, the drainage-tube being left in the wound, it is well to apply a compress to the abdomen, taking care not to put pressure on the tube. Wool is placed on the abdomen, thick cloths on each side, and an elastic binder over all. A firm vaginal plug may be introduced. In bad cases the abdominal wound must be reopened, and the operator must endeavour to check the bleeding by cautery, ligatures, or pressure. In cases of bleeding from a large raw surface, packing of the cavity with iodoform gauze may be tried.

When the hæmorrhage is extraperitoneal, ice-bags may be applied to the abdomen, and ergot given internally.

In all of these conditions, the general treatment of

hæmorrhage may require to be carried out, *e.g.* stimulants internally or hypodermically, warmth, bandaging of limbs, rectal injection of warm solution of salt (℥i. to Oi.).

Sepsis.—Most of the deaths in the first week are due to sepsis. Some cases, in which the cause is put down as heart-failure, are undoubtedly due to septicæmia. Examination of the blood or of the peritoneum, though there may be no peritonitis, may reveal germs. The septic attack may be acute, and death may be sudden, or a more chronic process may be set up. Peritonitis may or may not be present. It is often widespread.

The septic process often begins on the first day. The temperature rises, but this varies considerably in different cases. There may be rigors. The pulse increases markedly. The worse the case, the more marked the difference between pulse and temperature. Vomiting is often bad. The patient becomes exhausted. The face is peaked and anxious.

When septic peritonitis is present, the symptoms usually develop first on the third day. Tympanites develops, and tenderness on pressure. If the patient feels pains, they are not often severe, and may disappear after a few days. The vomiting may be bad, but may vanish. Pulse gets soft and quick. The temperature varies greatly. Patient is weak. The face is anxious, and the eyes appear sunken with dark rings around them. The intellect is generally quite clear. The tongue gets dry and brownish.

Treatment.—An enema of warm soap-suds (Oss.), turpentine (℥ss.) and castor-oil (℥i.), or sulphate of magnesia (℥i.) should be given, and at intervals of four or five hours a simple turpentine enema should be administered. The rectal tube may be passed at intervals. It is a good sign when flatus passes.

By the mouth, calomel and salines should be given alternately, in order that purging may be produced.

No morphia is to be given, unless the patient be beyond

recovery. Brandy and champagne are to be given by the mouth or in nutrient enemata.

The abdomen is not to be opened, save where there is evidently a collection of pus in it. If there be extra-peritoneal pus, it may be opened through the vagina or elsewhere.

Local inflammation.—A localised peritonitis in the pelvis may take place, probably due to germ infection, often with the irritation of some foreign body, solid or fluid. Adhesions form, and the inflammation does not become general. Also, localised cellulitic inflammations may occur. It must also be remembered that blood collections may break down and suppurate.

When these cases go on to pus formation, the pus tends to burrow, and to escape either into the peritoneal cavity, bowel, bladder, vagina, or through the abdominal wall.

Thrombosis may occur in neighbouring vessels, and pyæmia or embolism may result.

The clinical symptoms are pain, sweating, rigors, rises of temperature, headache, nausea, or vomiting. After a time hectic develops.

These inflammations in their early stages may be treated by purging, blistering, and the hot douche. When pus forms, it may be removed, and the cavity drained, if possible, per vaginam. Inflammation may also occur around the stitches in the abdominal wall. The great cause is imperfect asepsis. The inflammation ends in pus formation—stitch abscess. In such cases the suture affected must be removed, and, if necessary, the openings enlarged so as to allow of free outward drainage and washing-out with antiseptics.

Opening of the abdominal wound.—This may occur before the stitches are removed, if they be not of good material, and if there be any great strain on them, *e.g.* coughing. Generally it occurs after they are removed too early, because of imperfect strapping or because of increased intra-

abdominal pressure. Sepsis in the wound is also a cause of weakening of the wall. The wound must in such cases be closed, the wound and bowels being carefully washed if suppuration be present, and a drainage-tube inserted into the peritoneal cavity.

Intestinal obstruction.—This accident may occur after abdominal section. It may be due to an adhesion of the bowel and pedicle; to the incarceration of a loop of gut between the pedicle and some other part, when the former has been fastened to the abdominal wound; to twisting of the gut during the operation; to the inclusion of gut in the abdominal wound; to the passage of a suture through bowel; to adhesion of bowel and abdominal cicatrix; to constriction by hæmatoma of the broad ligament; to atony of the bowel wall and tympanites; to the same condition in peritonitis; to matting together of the bowels in chronic peritonitis. The obstruction may occur soon after the operation or not for months. The treatment is to do abdominal section and relieve the obstruction.

Tetanus.—This occurs in a certain percentage of cases. According to Olshausen, it takes place in cases in which the clamp has been used, in those in which the pedicle is treated extraperitoneally by means of perforating needles or the wire *serre nœud*, and also in cases where the pedicle is ligatured and treated by the intraperitoneal method. The tetanus is probably related to imperfect ligature of the pedicle, whereby the nerves were not thoroughly compressed, but left in an irritable state.

The treatment is that of tetanus in general. Locally it may be necessary to tighten the constricting clamp, or to remove it, along with the perforating needles. Sometimes excision of part of the end of the stump may be required.

Perforation of bowel.—This may be due to a cut at the time of operation, to a tear made in separating adhesions, to the giving way of a stitch after an operation on the bowel wall. It may follow intestinal obstruction, or may result

from the bursting of pus into the bowel; from the pressure of a drainage-tube, or the irritation of a ligature. It may be due to malignant disease, or may follow opening of the abdomen for tuberculosis, due to the giving way of a tubercular ulcer.

Treatment.—When the gut is wounded in operations, it should be closed with Lembert sutures. In the case of a diseased wall or a large tear, it is best to sew the opening to the edges of the abdominal incision. When the opening occurs in the rectum in the pouch of Douglas, if possible it should be closed with sutures on the peritoneal side. If this cannot be done, a large drainage-tube, passed out of the abdominal wound, may be employed. Little food, no purgatives, and no enemata should be given.

Some use a plug of iodoform gauze for a few days. In addition, a colotomy may be performed, in order to prevent fæces passing down the rectum. When a fæcal fistula forms, it should be dressed carefully. After it has existed for a time its closure should be attempted.

Ventral hernia.—This may result from careless closure of the wound, *i.e.* from not bringing towards the middle line all the elements in the edges of the wound; carelessness on the part of the patient in regard to the wearing of her belt; over-exertion, *e.g.* straining at stool, lifting, coughing, or vomiting. It is more common after hysterectomy than after other forms of abdominal section. The use of the drainage-tube, or suppuration in the wall, tends to lead to a weakening in the wound, which may be followed by hernia.

The treatment is to open the abdomen, excise the old cicatrix, and to close the wound layer by layer.

Parotitis.—This may occur on one or both sides. As a rule it develops from five to seven days after operation. It may be associated with sepsis. There is pain locally and elevation of temperature. The swelling may subside or suppurate.

Vaginal Section or Colpotomy.

Recently several gynecologists, notably Martin of Berlin, have recommended the treatment of various diseased pelvic conditions by means of an opening into the peritoneal cavity made through the anterior fornix of the vagina, instead of one made through the abdominal wall. It is claimed that the operation is a safer one for the woman, and not attended with the after-troubles or dangers associated with abdominal section.

The operations which may be carried out by this method are :—

1. Removal of myomata not larger than a fœtal head.
2. Removal of small ovarian tumours.
3. Ovarian resection and destruction of small cysts.
4. Removal of inflamed tubes and ovaries, pyosalpinx, hydrosalpinx, hæmatosalpinx.
5. Removal of early tubal pregnancy.
6. Vaginal fixation of a retroverted uterus.
7. Breaking of peritonitic adhesions to uterus, except those deep in the pouch of Douglas.

Preparation for the operation.—The patient is prepared in the careful manner already detailed on p. 249. Strict asepsis is aimed at throughout the operation.

The operation.—The patient is placed in the lithotomy position and anæsthetised. The hair of the vulvar region is shaved, and the genital tract, the vulva, and the buttocks are made aseptic. The patient's legs should be covered with long sterilised linen stockings. During the operation irrigation of the wound should be carried out with hot sterilised salt solution.

First, a short broad-bladed spatular speculum is introduced into the vagina to pull back the posterior wall. Orthmann's combined sound and volsella is then used to steady the uterus; the sound enters the uterus, and the volsella grasps the anterior lip of the cervix. If the sound

cannot be passed, an ordinary volsella must be used. The uterus is then pulled downwards and backwards. With another volsella the anterior vaginal wall is held near the urethral orifice. A vertical mesial incision is then made through the anterior vaginal wall, and is carried on to the cervix. On each side of this line the wall is separated from the bladder and cervical musculature. The bladder is then separated from the cervix as far up as the peritoneal reflection.

This layer is caught with forceps and carefully opened. There is usually little hæmorrhage. Bleeding points may be twisted or tied with catgut. When the peritoneal opening is fully made, the pelvis is explored with the fingers. Small adhesions may be broken down with the fingers. Large ones may be ligatured and divided if they are within access. The diseased condition is then attended to. If parts are to be removed—*e.g.* inflamed ovaries—the pedicle is treated exactly as in cases of abdominal section.

Method of closure of the incision.—With Martin's full-curved needle, catgut sutures (No. 3) are passed through the upper part of the vaginal wound, cellular tissue at base of bladder, peritoneum, and anterior wall of the cervix. These are then tied in the vagina. With continuous catgut the rest of the vaginal wound is completely closed. Care must be taken not to injure the ureters. Martin passes the sutures through the anterior wall of the body of the uterus, in order to bring about a vaginal fixation of the uterus. This plan must not be carried out if there is a chance of pregnancy succeeding. There is risk of danger in the labour.

After-treatment.—The patient is kept at rest in bed, the same rules to be observed that are followed in abdominal section. The urine is not to be drawn off unless necessary. Iodoform pessaries may be introduced into the vagina from time to time.

On the fifteenth or sixteenth day usually the patient may

be allowed to sit up. From this time onwards the vagina should be carefully douched daily for two or three weeks with a formalin or sublimate solution (1 in 3000).

In women who do not possess a roomy vagina this operation should not be attempted, *e.g.* in virgins. Some operators prefer to open the peritoneum through the posterior fornix.

CHAPTER X.

AFFECTIONS OF PERITONEUM AND CELLULAR TISSUE—PERITONITIS.

Inflammation of the peritoneum, like inflammation of every other part of the body, is not to be regarded as a specific process working *per se* towards a calamitous end.

It has a beneficent purpose, being nature's method of defending her tissues when injured, of repairing inroads made by the enemy, and of destroying and removing the latter. In the great majority of instances, the inflammatory process is directed against the action of micro-organisms or their deleterious products. Recognising these facts, the aim of the student should be—first, to look carefully into the causation of inflammatory attacks, seeking especially to relate them to the exact mode and origin of the infective processes which have led to them; secondly, in carrying out treatment, to work in the direction of removing from the tissues the irritants already there, and to prevent the entrance of fresh ones from the outside.

In most fatal cases of peritonitis, the chief symptoms are those due to systemic poisoning, death being due to toxic infection rather than to the changes in the peritoneum. It is noteworthy that in these cases there is no constant relationship between the severity of an attack and the local changes in the peritoneum. In some of the worst cases very slight peritoneal changes may occur before death supervenes. This is due to the fact that the virulence of

the poison has affected the whole system before the defensive peritoneal reaction has had time to manifest itself to any extent. Then, again, some of the most favourable cases are those in which extensive alterations have occurred in the peritoneum in its widespread efforts to destroy and eliminate the toxic material. No doubt, in many cases, there are also distinct effects produced, due directly to the inflammatory process itself.

In the pelvis, the sources of infection are many. The most important is *the genital tract*—but the bladder and bowel may also afford entrance to toxic matter. As regards the influence of traumatism, apart from infective processes, we know very little. In the pelvis, it plays a very small part, *per se*, in the production of pelvic inflammation. Its importance consists in the opportunity given for the entrance of germs through the raw or injured surfaces produced by it.

The following points in regard to the peritoneum in general have been pointed out by Treves, and are worthy of notice :—

Its whole surface is probably as great as the skin-area of the body. It has marked powers of absorption, taking up milk, blood, peptones, etc., rapidly. It is said to be able to absorb an amount equal to 3–8 per cent. of the body weight. Septic intoxication occurs more quickly in peritoneal infection than in any other. The peritoneum offers a limited resistance to microbes and their products. It can, however, destroy a certain quantity of these. Its power in this respect varies greatly, being affected by the state of health, age, etc. Then, no doubt, there are individual differences, and also variations according to the part of the peritoneum affected.

That which covers the small intestine is most sensitive to infection and to a rapid spread of inflammation. The parietal peritoneum is less susceptible. The most marked changes are usually found on the visceral and omental

layers. Localised or encysted peritonitis is rare in the area of the small intestine.

The peritoneum is very sensitive, though it does not feel pain as does the skin. There is more or less distress to the unanæsthetised patient on handling it. When the peritoneum is bathed in lymph or pus, the ordinary sensibility is diminished or absent.

Bacteria and their products are the irritants which most acutely affect the peritoneum. Fluids do not gravitate to the pelvis from different parts of the peritoneal cavity with the readiness which might be expected. This is in some way related to the influence of intra-abdominal pressure; though, of course, in some instances adhesions cause the retardation. The frequency with which intestinal contents fail to escape after rupture or perforation of the gut has been noted, and is believed to be due to the effect of intra-abdominal pressure.

It is possible that the peritoneum may acquire some degree of immunity from septic infection. *Ceteris paribus*, abdominal operations in those who have had chronic peritonitis or frequent attacks of a subacute nature are less likely to be followed with bad results than those in whom the peritoneum is normal.

Etiology of peritonitis in general.—1. Infection may spread from the interior of the alimentary tract, in connection with hernia, intestinal obstruction, rupture, perforation, etc. Generally, it is the *Bacterium coli commune* or its products which is associated with this variety.

This organism exists throughout the whole length of the alimentary tract, and is the most numerous of all the microbes there found. If it be taken from the intestine and grown, a culture has no bad effect on the peritoneum of animals.

It seems to get virulent when the bowel wall is injured or diseased or impaired in vitality to any degree, *e.g.* in obstruction of the gut, in diarrhœa, cholera, marked con-

stipation. In such conditions it tends to invade the wall, and to spread into neighbouring tissues.

When a virulent culture is injected into the peritoneum of animals, the effect varies according to the dosage. The peritonitis usually becomes purulent.

2. Infection may enter the peritoneum from sources other than the alimentary tract, *e.g.* from operative procedures, from septic processes in the neighbourhood of the peritoneum, from general septic conditions, etc. The most common germ associated with these forms is the *Streptococcus pyogenes.* Staphylococcus is seldom found alone in peritonitis, but usually with more active cocci. Experiments show that pyogenic cocci are more active if introduced into the peritoneum with a fluid difficult of absorption, or with one which damages the endothelium. The germs may be implanted directly on the peritoneum, or may reach it through lymphatics and blood vessels.

3. Infection may be due to the entrance of certain specific organisms, *e.g.* pneumococcus, tubercle bacillus. It is also associated with gonorrhœa.

The pneumococcus may sometimes set up peritonitis in cases of pneumonia by passing down through the diaphragm, but, in many cases, it may not cause any harm in the peritoneum. As regards the gonococcus, many believe that it does not, *per se*, cause general peritonitis, for experiments seem to show that it does not survive in the peritoneal cavity. It is thought that the inflammation is set up by pyogenic cocci, which have developed in the discharges due to the action of the gonococcus in the lower genital tract (*vide* p. 155).

4. Peritonitis may occur in connection with nephritis, rheumatism, gout, alcoholism, syphilis, etc., in a manner not well understood.

5. It is generally believed that it may result from local irritation apart from specific infection. This is, however, a difficult matter to establish. Certain it is, of course, that

sterilised croton oil and other irritants, if introduced into the peritoneal cavity, will cause peritonitis. But it is not easy in these experiments to eliminate the influence of the microbes in the alimentary canal, or their chemical products, passing through the injured coat of the gut. Jalaguier has shown that sterilised gauze placed in the abdomen may cause no reaction unless it be of a certain size, and that, if large, no symptoms may follow, though in course of time it gets covered with adhesions. Sterilised fæces causes no ill effect in the peritoneum. Freshly filtered fluid from the gut, however, causes peritonitis when placed in the peritoneal cavity.

Bile introduced sometimes causes it, and sometimes does not, varying according to whether it contains germs or not. The *Bacterium coli commune* has been found in bile in inflamed conditions of the duct. Blood alone will not cause peritonitis, but it is a splendid nidus for germs.

I. Acute Peritonitis.

Pathology. — The changes produced vary greatly as regards their nature and quantity.

There is at first increased congestion and redness. This may be uniformly or irregularly distributed, being often most marked where the coils of bowel touch. The surface of the peritoneum usually gets dull, swollen, and softened. The minute changes are subserous œdema; transudation of serum and leucocytes from vessels; proliferation of connective tissue corpuscles; changes in the endothelial cells, and proliferation of some of them; formation of vascular granulations.

Small petechiæ may be present. Fibrinous exudation takes place, with very little serum, in many cases; organisation takes place, and lymph is deposited on the peritoneum, at first soft, afterwards firm. This thickens in regular or irregular masses, and tends to mat together adjacent struc-

tures. As the inflammation advances, it tends to form thickenings and adhesions. This variety is known as *adhesive peritonitis.*

In other cases, there is only a slight degree of fibrinous exudation, the marked feature being pouring out of serum. This may be almost pure like ascitic fluid, or may be mixed with some fibrinous exudation, forming a serofibrinous mass. The more abundant the latter constituent, the more tendency to coagulation does it show. Lymph flakes may be seen floating about, and they may get deposited on the peritoneum. The fluid may remain free or may become encysted. As it gets absorbed, adhesions and thickenings tend to remain. This variety is known as *serous peritonitis.*

In the most extreme cases of acute peritonitis, there is pus formation. The pus may be mixed with serum, or may be thick and white. It may be discoloured, foul-smelling, or mixed with blood in various proportions. The pus generally works its way to the pelvis, but often it remains in other parts where adhesions may help to determine its position. This form is known as *purulent peritonitis.* Sometimes the peritoneal fluid is of a colloid or gelatinous consistence.

Sometimes foul-smelling gas may be found in the peritoneal cavity. When perforation of viscera has occurred, various materials may be got there.

The intestines are distended with gas, their walls being œdematous, softened, and infiltrated. The stomach is often small and contracted. In extensive and severe peritonitis, the abdominal muscles may be softened and somewhat degenerated.

Peritonitis may be more or less general or localised. The three seats in which localised attacks mostly occur are the region of the diaphragm, that of the cæcum (especially its outer side), and the pelvis. It is rare to find the area of the small intestine the seat of these circumscribed

attacks. In these three regions, the type of inflammation is usually healthy, and recovery is most frequent from them, either spontaneously or after operation. These local attacks of peritonitis may cause thickenings and adhesions, collections of serum or pus. Thus abscesses may be formed in the pelvis, iliac fossæ, lesser omental sac, hypochondrium, subphrenic region, etc.

A general peritonitis may succeed the circumscribed form, but not often. Adhesions prevent the spread, or it may remain localised because of some special local peculiarity. Some think that the omentum helps to prevent the spread of inflammation from below upwards, and Mikulicz believes that the transverse colon prevents its extension from above downwards.

Symptoms. — The symptoms of acute peritonitis vary according to the cause, its seat and extent, the condition of the patient, etc.

Local.—Pain is one of the most marked symptoms. It usually begins in one region, and then spreads rapidly, though it may sometimes be at first referred to the region of the solar plexus. It may vary at different spots, being described as hot, cutting, boring, darting, burning, etc. Exacerbations occur from time to time, owing to movements of the bowel. It is aggravated on exertion. The sufferer usually lies on the back with the thighs well flexed. Abdominal breathing is lessened. The abdomen is very sensitive to touch, and becomes rigid. Where perforation of the gut has occurred, the belly wall tends to sink in towards the spine.

As the inflammation extends, the pain, hyperæsthesia, and contraction of the abdominal wall pass away, and the tenseness of the latter is merely due to the distension of the intestines. This change is especially marked when sepsis develops. If septic phenomena occur very early in the case, there may be no hyperæsthesia or pain whatever.

Disturbances occur in the alimentary tract. There is

loss of appetite, thirst, nausea, vomiting. The latter varies in degree in different cases, and sometimes may be absent.

The tongue is furred, often being red and irritable, gradually becoming dry. There is often a disagreeable taste in the mouth, while the breath is offensive. Eructation of gas is common. Constipation is a common feature, mainly owing to paralysis of the bowel, though sometimes diarrhœa is met with. Irregular contractions of the intestine take place in the early stages particularly, causing gurgling sounds. Jaundice is sometimes present. Micturition may at first be frequent, but later there may be retention. The urine is diminished in quantity; sometimes there is suppression.

Hiccough is often present. The respirations often get frequent and shallow. Marked dyspnœa often exists, and the heart's action may be very rapid. The changes in the respiration and circulation are due to the general condition, to the pain from the peritonitis, to action of the inflammation on the diaphragm, and to the pressure of the distended intestines. In some cases they may be aggravated by the development of pleurisy, pneumonia, or pericarditis.

General symptoms.—Rigors may mark the invasion stage of the attack, but they are often absent. The febrile phenomena are very variable, and they are no sure guide to the extent or gravity of the affection. Treves points out that in some cases the temperature moves steadily upwards; in others, steadily downwards; in others, a fairly even line of high fever may be followed; while in others, a normal or subnormal course may be marked. The occurrence of diarrhœa or of a sudden perforation is usually marked by a drop in temperature. Sometimes the temperature may fall only gradually, especially where the bowels continue to keep open. When the bowels cease to act, it tends to rise again after the fall. When the perforation occurs slowly, it may rise at first and then sink. Persistent subnormal

temperature makes the prognosis very bad. It is often found where general sepsis is present. The most marked febrile signs occur with a plastic peritonitis, or where there is a localised pus collection.

Where the peritonitis is due to hernia, the temperature as a rule remains low. Before death in marked septic cases, the temperature usually sinks; though, sometimes, it may rise very high.

When gangrene of the bowel is present, the temperature is usually high. When there is disease in the appendix, it is generally high.

The *pulse* increases in rapidity, usually varying from 120 to 160. It is at first full, and bounding, becoming small, hard, wiry, or thready; sometimes very soft and irregular.

The *face* has an anxious or pained expression, and the features appear sunken and pinched, dark areolæ being around the eyes. There may be a feeling of great prostration and restlessness. There may be more or less cyanosis. Often sleeplessness or headache is complained of; sometimes delirium or stupor. The mind usually remains bright and clear to the end. As death approaches, the extremities get cold, and the skin covered with a clammy sweat.

Physical signs.—The abdomen early becomes rigid, and it may be slightly depressed; in perforation cases, markedly so. Abdominal respiration is slight. The surface is tender to the touch. Later, meteorism develops as the abdominal walls relax. The distension of the abdomen is symmetrical generally, but not always. Sometimes a transverse groove can be made out in the epigastrium. In very muscular persons there may be little enlargement. Intestinal movements are sometimes visible.

On percussion the note is tympanitic, and varies in different parts. If the distension is extreme, the sound is muffled and toneless. The splenic and hepatic dulness are lessened. Small quantities of fluid cannot be made out.

Where there is a considerable collection, dulness may be got on percussion in the dependent parts, varying on change of posture. Where there is encysted fluid, the dulness is unaffected by change in position. Fluctuation may be obtained if there be a sufficient quantity of fluid in the peritoneum. On auscultation, friction sounds may sometimes be heard; also, movements of intestinal contents.

On examination of the chest, the heart is found displaced upwards and to the left, *i.e.* when the abdomen is distended, and there is often dulness at the base of the lungs.

Course and terminations.—The patient may die. Or recovery may gradually take place, where the inflammation has not been too severe or extensive. Sometimes a chronic condition may develop, the temperature remaining high and irregular. Fluid collections may remain, and a condition of pyæmia may develop, or the collection may burst. A condition of wasting may supervene, and death may follow. Extensive adhesions may develop, giving rise to much after-trouble.

Differential diagnosis.—Various conditions may be mistaken for acute peritonitis.

1. There are certain abdominal neuroses which may lead to an error in diagnosis. These may give rise to such symptoms as pain, a rigidity of the walls, sensitiveness to touch, meteorism, vomiting, constipation, diarrhœa.

2. Myalgia, hyperæsthesia, or localised inflammations in the abdominal wall.

3. Colic, the passage of renal and biliary calculi.

4. Extreme tympanites and pain in low febrile conditions, *e.g.* typhoid.

5. Marked enteritis.

6. Extraperitoneal rupture of a tubal pregnancy or of an aneurism; hæmatocele.

7. Acute pleurisy or pneumonia may at first simulate peritonitis.

Prognosis.—The worst forms are those due to perforation and severe septic infection. Very serious are those associated with nephritis. In infancy peritonitis is very fatal. A poor condition of health is very unfavourable. The more localised the affection, the greater is the chance of a favourable issue. Very marked tympanites, bad vomiting, the passage of blood from stomach or bowel, continuous hiccough, high temperature, early collapse, rapid, feeble, and irregular pulse, a comatose condition, are indications which make the prognosis very grave. Complications of the nature of pleurisy, pneumonia, or pericarditis greatly increase the risks.

Treatment.—Complete rest with the knees flexed over a support is necessary. The chest and arms should be covered in a woollen garment.

As little food as possible should be given by the mouth. For the severe thirst, iced milk and soda-water may be employed, but often hot water or hot tea may be preferred. The continued sucking of ice is to be avoided. Sometimes a good draught, even if it be followed by vomiting, relieves thirst for some time. The mouth may be rinsed out from time to time with glycerin and water, or with eau de Cologne and water.

The patient should be fed by small enemata of peptonised beef-tea, or meat-extract, a little brandy being added. These should not be diluted. To add water to the body, separate injections should be given. Irritability of the rectum may be somewhat relieved by occasional flushings with water or weak cocain solutions. When the sphincter relaxes, the enemata must be stopped, but when this occurs the patient is generally beyond hope. When there is diarrhœa, feeding must be tried by the mouth, and very often in such cases it can be carried out.

Saline aperients may be given at the onset of peritoneal inflammation, but they must not be used when general peritonitis is established, especially when a septic condition

is recognised. And, of course, they are not to be administered by the mouth when any intestinal obstruction exists. Enemata may be given in the hope of clearing the lower bowel.

Whenever there is collapse, alcoholic drinks, especially champagne and brandy, must be given by the mouth or by enemata. When the condition is septic, very large quantities must be given, *e.g.* 15 to 20 oz. of brandy in twenty-four hours.

Opium should be used as little as possible. In the early stages it is generally necessary, and may be given as an injection of morphine. Some prefer to administer laudanum by the mouth along with the aperient dose. It may often, at this stage, avert the ill-effects of shock. The indication should be pain, and not mere discomfort and distress. In septic cases it is not necessary.

In advanced cases the hypodermic injection of strychnine often gives the patient much relief.

Calomel, or enemata containing turpentine, sometimes relieves meteorism. But the passage of a long rubber tube per rectum is generally more efficacious.

Nausea and vomiting may often be relieved by champagne, creasote, or by hydrocyanic acid and bismuth. For hiccough, sedatives may be given, mustard applied to the epigastrium, or in bad cases chloroform administered.

Local applications to the abdomen often give great relief. In the early stages, either cold or hot compresses may be employed with turpentine or anodynes. The patient may be allowed the choice. Later, only hot applications are to be used.

Blood-letting by leeches or venesection may be tried at the onset of an attack, if the patient be robust and full-blooded.

Operative measures.—Operative treatment has not yet been established on a satisfactory basis. When suppuration is localised, *e.g.* around the vermiform appendix, in the

pelvis, after injury or perforation, or under the diaphragm, the collection should be opened, stuffed with iodoform gauze for twenty-four hours, and then irrigated daily with an antiseptic lotion, *e.g.* iodoform emulsion. If advisable, gauze may also be used for some days.

The treatment of widely diffused suppurative peritonitis by operation is very unsatisfactory.

The peritoneum is to be opened, and any recognised source, *e.g.* gangrenous bowel, appendicitis, etc., to be attended to. The cavity must then be thoroughly irrigated with warm saline solution, as described on p. 276, and then drained. The most thorough washing may not remove all the pus from the cavity; portions are apt to be caught among folds of bowel.

When there is much plastic peritonitis binding the intestines together it may be necessary to separate adhesions, to get at the source of the infection, or to let out the pus, and bleeding may be started.

It is not wise to do too much in this direction, even to find the source of trouble. When irrigation and drainage are not possible in some of these cases, iodoform should be dusted among the bowels, after the peritoneum has been mopped with gauze-pads.

If the cause be a perforation, it is generally best not to interfere with the adhesions, for they may be in process of closing the opening; all that should be done is to wash out free pus and débris.

II. Chronic Peritonitis.

This is met with localised or diffuse, and occurs in many varying conditions. It may follow an acute attack. It may be associated with the irritation of cirrhosis or carcinoma of the liver, cancer or ulceration of stomach or intestine, old hernias, ascites, tapping of fluid in abdomen. It may spread from localised inflammations, *e.g.* peri-hepatitis. It is said to

follow cold or exposure. It may occur in chronic nephritis, gout, rheumatism, alcoholism, lead-poisoning, etc. It may be due to tubercular or cancerous infection of the peritoneum (*vide* p. 320).

Morbid anatomy.—Great variations are found. There may be thickenings of the peritoneum, adhesions, matting together of viscera; serous, seropurulent, or purulent effusions, usually more or less circumscribed; caseation or calcareous degeneration of inflammatory products may be found, and pigment deposit; distortion, displacement, or obstruction of viscera may be brought about; the intestinal wall may be wasted, though the stomach is oftener thickened.

Symptoms.—These are very varied. If the condition has developed from an acute attack, there is a gradual alteration in the type of the symptoms noticed.

If no acute attack precedes it, the onset is usually very insidious. There may be uneasiness; dull or irregular pains, sometimes somewhat aggravated; constipation, diarrhœa, colic, flatus, vomiting, dyspepsia; there may be increased discomfort or pain on movement, or on palpation of the abdomen. Owing to the pressure of inflammatory thickenings on various parts, various phenomena may supervene, *e.g.* jaundice, ascites, thrombosis, œdema of the legs, albuminuria, etc.

The temperature shows great variations. It may not be elevated at all, or it may be very irregular. There may be gradual weakening and wasting, hectic, increased pulse, dryness of skin. The health of the patient may vary greatly from time to time.

Physical signs.—The abdomen may be enlarged, partly owing to the fluid in the peritoneal cavity, or, partly, to gas in the bowels. The enlargement may be uniform, but it is often irregular. On palpation, there may be tenseness or a uniform doughy feeling; or irregularities may be felt, *e.g.* nodulations. In percussion, free fluid may be recognised, but usually it is found to be localised;

generally, irregular areas of dulness and resonance are distinguishable.

Fluctuation may often be got in fluid collections, and friction-fremitus may occasionally be made out. Change of position, as a rule, causes little alteration in the physical signs.

Treatment.—Rest in bed for a long period is often advisable. Good surroundings, change of air, careful dieting, cod-liver oil, wine, iron, quinine, and other tonics are of great value. The iodide of iron, or potassium, may be given inwardly. Counter-irritants to the abdomen are good, *e.g.* iodine, blisters; the inunction of mercury ointment is valuable. Pressure by means of cotton wool and a bandage should be employed. Collections of serous fluid may be tapped. Purulent gatherings may be treated in the ordinary surgical manner.

III. Acute Pelvic Peritonitis (Pelveo-Peritonitis, Perimetritis).

This is a local peritonitis within the cavity of the pelvis. Much that has been described in connection with general peritonitis may be applied here, but it is necessary to make special reference to the localised affection. All varieties are met with in the pelvis, *e.g.* simple, adhesive, serous, purulent.

Etiology.—The great majority of inflammations in the pelvic peritoneum are due to infection by micro-organisms or their products. The poison may enter by way of the genital tract, by the bowel, or by the bladder. The first of these is the most frequent path, and it is easy to understand why this should be so. The Fallopian tubes communicate directly with the peritoneum; the uterus is continually being subjected to injury in connection with child-birth, and is consequently exposed to infection from the exterior. In tabulating the chief sources of pelvic inflammation we may particularly note the following:—

1. Imperfect precautions to ensure asepsis in performing operations on the genital tract, bladder, and rectum.

2. Abortion and child-birth. Here the infection may spread along the Fallopian tube, or through the tissues, either directly by the lymphatics, or by the blood vessels.

3. Gonorrhœa and latent gonorrhœa in the male are generally regarded as important sources of infection. At present, it is, perhaps, safer to say that pelvic peritonitis is very often associated with these conditions than that it is due to the direct action of the gonococcus. Very probably the infection is often due to pyogenic cocci, which have formed a nidus in the discharges due to the inflammation set up in the lower genital tract (*vide* p. 155).

4. Extension from inflammatory areas, *e.g.* tubes, uterus, ovaries, cellular tissue.

5. It is often associated with new growths, *e.g.* ovarian tumours, fibroids, carcinoma, tubercle; and with swellings, *e.g.* hæmatocele.

6. Severe chills, especially during menstruation, are believed to occasionally cause pelvic peritonitis.

7. Sexual excess is described by some. This must be regarded as very doubtful.

8. Traumatism, *e.g.* the forcing of fluids along the Fallopian tubes by careless irrigation of the uterus.

Symptoms.—The pulse is first rapid, full, bounding; later, small, hard, wiry, or thready; in bad cases, soft and irregular. The temperature rises early, and continues more or less elevated. Often the onset is marked by rigors. Pains develop of a burning, cutting, darting, or boring nature. There is nausea, vomiting, constipation; sometimes diarrhœa. It is rare to find such symptoms as have been described in connection with severe general peritonitis, unless the local condition spreads and becomes diffuse. When pus collections have formed, the symptoms are those of abscess. Pus may tend to open through vagina, bowel, bladder, or through the abdominal wall.

Physical signs.—The abdomen is early rigid. Afterwards it may be distended. Both legs are drawn up. The belly is tender or painful in its lower part. On bimanual examination, the vagina is hot and sensitive. When there is free fluid in the pelvis, an indistinct boggy fulness may be made out. When consolidation has taken place in it, a hard mass like plaster of Paris is felt behind, and at the sides of the cervix; sometimes around it. In other cases, masses of serous fluid may be encysted, and are felt in the middle line pushing the uterus forward; sometimes in front of the uterus, when this organ has been retroverted; sometimes on either side behind the broad ligament.

After an acute attack has passed off, various conditions are found, *e.g.* thickenings, adhesions, displacement of uterus or appendages. There is usually considerable tenderness on examination.

Treatment—*General.*—The patient should be placed at rest in bed. Milk and potash or soda-water, peptonised beef-tea and beef-jelly are to be given by the mouth. Alcoholic stimulants are to be given if the patient is weak; if pus be present, large quantities may be required. Pain is to be counteracted with hypodermics of morphine. Quinine is of use as an antipyretic. Early, castor-oil or saline aperients are of great value.

When convalescent, the patient should be given plenty of nourishing and easily digested food; the bowels should be kept regular. Iron, wine, and other tonics are to be given. The patient should carefully avoid exertion and exposure to cold or damp.

Local.—Cold compresses over the lower abdominal region are valuable in the early stages. But if the patient does not like them, hot fomentations can be applied every two hours. Hot vaginal douches are valuable, but they often distress the patient. Encysted serous fluid, which does not get absorbed, may be tapped, usually through the fornix vaginæ, with aseptic care. Purulent collections must be

opened and treated in the manner described already, either through the vagina or abdominal wall. In the convalescent stage, the patient should wear a flannel binder for months.

IV. Chronic Pelvic Peritonitis.

I have already described the chief changes found, in describing chronic peritonitis in general. In the pelvis, thickenings, adhesions, and displacements of the uterus and appendages are produced. The ureters may sometimes

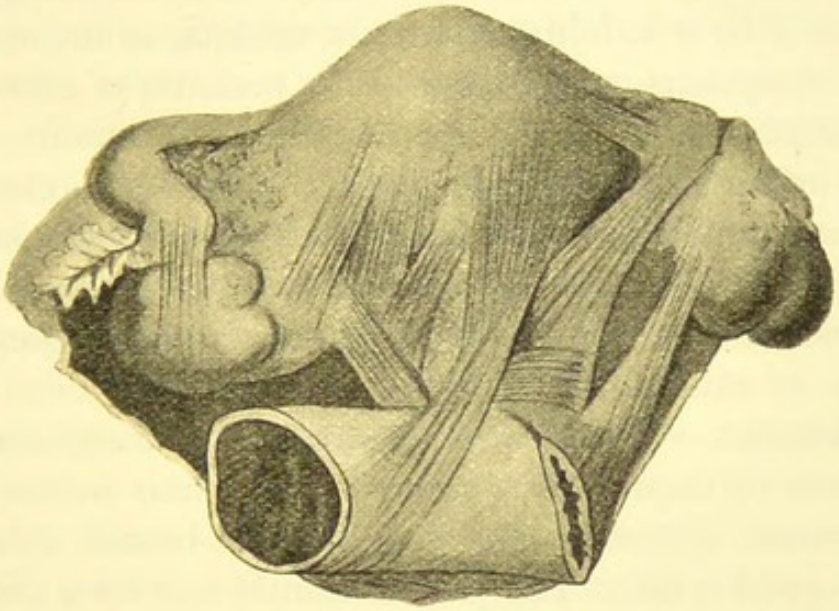


Fig. 82.—Peritonitic adhesions behind the uterus, matting together the tubes and ovaries on both sides, and obliterating the pouch of Douglas.

be constricted. The bladder may be interfered with by adhesions or by effusions. The bowel functions may be affected.

Symptoms.—These vary greatly. Where an acute attack has preceded the chronic trouble there is a history of a gradual change from the acute symptoms. In other cases, the affection begins insidiously and without marked symptoms. Sometimes there may be a history of pain, perhaps beginning in connection with a menstrual period. In some cases there is a history of a slight attack of pain with fever.

Various degrees of pain may be met with—dull, sharp, aching. It is often worse after exertion, at menstruation, during coitus, or at defæcation. There may be menorrhagia, metrorrhagia, or irregular menstruation. Sterility is common. The health of the patient is below par, and she often has various reflex nervous disturbances. In many cases she develops marked neuroses. It is important, therefore, to note that the suffering of which the patient complains may be often very largely neurotic, non-commensurate with the amount of pathological change in the pelvis.

The bladder functions are not often disturbed. But there may be irritability, tenesmus, dysuria, or incontinence. These symptoms may be due to the pressure of effusions, or of a displaced uterus, to the traction of peritonitic bands, or to inflammation in the bladder wall. The circulation and innervation of the gut may be affected and its peristalsis interfered with. Rectal catarrh, constipation, diarrhœa, flatulence are met with. Rarely, ileus results from interference by adhesions.

Treatment.—The general means taken should consist of measures to improve the general health and to strengthen the nervous system. The stomach and bowels should be kept in good order. The patient should rest for a time from hard work. Coitus should be avoided. If the patient is very neurotic, a course of Weir Mitchell treatment is valuable.

Locally, the hot douche, hot hip-baths, vaginal tampons soaked in glycerin or in ichthyol and glycerin, and blistering above Poupart's ligament may be employed. The uterus should be curetted if there be endometritis, and any inflammation about the cervix should be treated.

Schultze and others recommend breaking down of old adhesions by bimanual manipulations under chloroform. This method is dangerous, however, and is not to be advocated.

Recently, anterior or posterior colpotomy has been employed, the adhesions being broken down, or ligatured and

divided after the peritoneum is opened, the uterus being pulled down with forceps to bring the adhesions within reach.

V. Tubercular Peritonitis.

This affection is met with under three different sets of conditions. It may appear as part of a general miliary tuberculosis. It may be a localised development in connection with ulceration of the intestine, beginning in thickenings on the peritoneal surface over the ulcer.

It may be a widespread affection in the peritoneum, of a chronic or subacute nature, often associated with ulceration of the bowel, sometimes with enlargements in the mesenteric glands. Tubercular affection of the Fallopian tubes and uterus may be present. Pulmonary trouble very often exists.

Pathological changes.—These present varied appearances. When acute miliary tuberculosis exists, the peritoneum is studded with tubercles in various stages of development, usually believed to be most numerous in the flanks and on the diaphragm, less marked on the intestines. As the process gets more chronic, adjacent granulation masses tend to blend. There is abundant citron-coloured ascitic fluid produced, sometimes blood-stained, rarely seropurulent. Adhesions are usually slight. In other cases ascitic fluid may be encysted in one or more loculi by means of adhesions.

In another class of cases there is considerable fibroid change, the tuberculous process tending towards improvement. Sometimes this is found as large scattered tubercles, there being no adhesions nor ascites. More commonly there are marked adhesions between the bowels, the omentum being often in a crumpled, irregular mass below the stomach. The mesentery may also be contracted and thickened.

When the tuberculous products break down, different appearances are caused. Sometimes the matted intestines

are covered with a mass of grey or yellow adhesive material with caseous masses; on breaking through it, loculi may be seen, containing clear fluid, caseous matter, chocolate-like fluid or pus. The bowel may be perforated at points by the breaking down of ulcers. Adjacent coils of gut may communicate, or a fistula may discharge at the umbilicus.

Sometimes there may be extensive suppuration, diffused or localised. Occasionally the mesenteric glands are enlarged, but not often in bad cases of peritonitis. They may form a large irregular mass, several large masses, or a series of small isolated swellings.

Intestinal obstruction may result from the adhesions of tubercular peritonitis.

Symptoms and physical signs.—These vary greatly. Sometimes the trouble begins with rigors; sometimes there is fever. Usually, there is dyspepsia, diarrhœa, constipation, and pains in the abdomen. The onset, in the majority of instances, is gradual. The abdomen tends to enlarge, and the patient loses flesh. As the case advances there is an irregular febrile condition, and hectic may develop. There is generally malaise. Often sweating is profuse. There are generally relapses and remissions. There may be meteorism, found in varying degrees. There may be general tympanites, or it may be combined with dulness due to free ascitic fluid. Or areas of resonance may alternate with patches of dulness, the latter being due to fluid collections or to thickened masses of bowel, omentum, or adhesions. The umbilicus is often protruded. On palpation, the abdomen is often tender, over the whole surface or in areas. Enlargements due to affection of the mesenteric glands may be felt.

Differential diagnosis.—Tubercular peritonitis may be mistaken for a variety of conditions, *e.g.* cyst of mesentery or liver; enlargements of kidney; malignant disease in abdominal viscera; perityphlitic abscess; internal hernia; tumours of the abdominal wall; enlarged mesenteric glands

have been diagnosed as floating kidney, enlarged spleen, or as various kinds of tumours.

Treatment.—The general treatment for tubercular disease is to be carried out. Locally, the application of a counter-irritant, *e.g.* tincture of iodine or mercury liniment, is valuable, and also the inunction of ointments of mercury.

Operative measures are to be employed in certain cases. When there is free serous fluid or a large encysted quantity in the abdomen, the latter should be opened, and the fluid removed. The incision should then be closed. Such a procedure is very often followed by cure.

When the fluid is purulent, the peritoneal cavity may be irrigated with warm saline solution, and drained for twenty-four or forty-eight hours with iodoform gauze. If drainage be kept up too long in these cases a sinus is apt to form, or a fæcal fistula, as a result of pressure of the drain on the bowel.

When adhesions and thickenings are prominent, there being little or no fluid, the results of opening the peritoneum are not so satisfactory, though undoubted benefit may result in some cases. In operating, care must be taken not to open the gut. If, owing to adhesions, it be impossible to cut into the peritoneum by one incision, others should be made in the hope of gaining entrance where no adhesions exist.

The latter are usually most marked below the umbilicus. A drainage-tube should not be placed among matted coils of intestine. If many adhesions have been broken through, however, it may be necessary to drain.

Operative procedures should not be carried out when there is acute general miliary tuberculosis or very advanced tubercular disease in other organs of the body.

The following suggestions have been made to explain the method of cure in these operative cases, namely, that it is due to the admission of light or of air; to the removal of the fluid; to the escape of the ptomaines and toxins pro-

duced by the microbes; to modifications of intra-abdominal pressure, leading to an improved circulation and to a more active absorption.

Mere puncture seldom brings about an improvement.

VI. Malignant Peritonitis.

This is not very common, and is generally cancerous. In the great mass of cases it is secondary to malignant disease in the alimentary canal, especially the stomach, liver, pancreas, retroperitoneal glands, female genitals. It may be developed by extension or by secondary deposit. It may spread from one serous surface to another with the formation of adhesions. The chief pelvic causes are malignant disease of the ovaries and rupture of papillomatous cysts.

Peritoneal cancer is most often scirrhous in type, sometimes encephaloid or colloid. The disease is found in diffused nodules or masses, which tend to become umbilicated. The omentum may be drawn up in a mass. There is generally some chronic peritonitis, with more or less effusion, often bloodstained. It may spread to various structures and may interfere with the intestinal tract, narrowing it, or causing ileus. In the colloid form, the viscera may be covered in thick, gelatinous masses.

Symptoms and physical signs.—Great variations are found. They are due to the general decay in health, the interference with various functions, and to associated peritonitis.

In the early stages there are only obscure and indefinite symptoms. Abdominal pains develop, and various disturbances of the alimentary tract. There is ascites and sometimes jaundice. Cachexia develops. Sometimes marked anæmia from loss of blood in the peritoneal cavity. Sometimes there is considerable fever, but generally there is little or no pyrexia, and of an irregular type. There is tenderness

and resistance on palpation. Fluid may easily be made out on percussion. Irregular masses may be felt, and enlargements of groups of glands.

Treatment.—The strength must be kept up and the various symptoms treated. It may be necessary to tap the abdomen from time to time.

VII. New Growths in the Peritoneum.

Tuberculosis and malignant disease have already been described. Hydatids sometimes produce large swellings. Lipomata, myxomata, and myxo-lipomata sometimes develop to a great extent retroperitoneally. Cysts of various kinds are found, *e.g.* dermoids, serous, colloid; some of these are probably due to the breaking down of lipomata and myxomata. Fibromata are rare. Malignant adenomata sometimes develop from remains of the Wolffian body.

Treatment.—Cysts may sometimes be evacuated. Solid tumours may sometimes be removed, if small or somewhat pedunculated. Shepherd has recently reported a successful case of removal of a very large myxo-fibroma from the mesentery, eight feet of small intestine being taken away as well.

PELVIC CELLULITIS (PARAMETRITIS).

Nature.—This is an inflammation, acute or chronic, affecting a portion of the pelvic cellular tissue. The most common seats are the bases of the broad ligaments and the utero-sacral folds. There is usually some associated peritonitis over the seat of the cellulitis, just as in peritonitis there is more or less underlying cellulitis.

Etiology.—The chief cause, probably the only direct cause, is germ infection. It is doubtful if simple injury will be followed by cellulitis. Traumatism, however, plays an important part in the causation of pelvic cellulitis, namely,

by affording an area which allows the germs an entrance ground.

The special conditions with which it is associated are the following :—

1. Abortion, premature and full-time labours, infection entering through the raw or bruised surfaces, produced as a result of imperfect asepsis.

2. Operative measures on the genital tract, bladder, or rectum, in which thorough asepsis is not obtained.

3. Diseased conditions in bladder or rectum, whereby infection of the cellular tissue occurs.

4. Secondary to peritonitis.

5. It is said that it may result from a severe chill during menstruation.

Pathology.—At first there is an exudation. This may become quickly absorbed, or only a portion may be absorbed, the rest remaining as a thickening. This may gradually disappear, followed by shrinkage and cicatrisation. Or pus may form and an abscess be produced. This may burrow in various directions, and may open in the following ways :—

1. Through the bladder, rectum, vagina, or urethra.

2. Through the perineum.

3. Through the abdominal wall.

4. Through the obturator, sacro-sciatic, or saphenous openings.

5. Through the lumbar region near the kidney.

6. Rarely into the peritoneal cavity.

Exudations spread by lymphatics and directly through the tissues. According to König there are lines of cleavage so arranged as that fluid in the upper portion of the broad ligament extends out to the pelvic wall, then along the psoas-iliacus, sinking below the brim. Fluid in the lower and anterior portion passes out to the side pelvic wall laterally, and runs along the round ligament to the abdominal wall, thence by Poupart's ligament to the iliac fossa.

When in the lower and posterior part it burrows around the pouch of Douglas and then follows the course first mentioned above.

When the pus has discharged and healing has taken place, there is more or less contraction and cicatrisation in the cellular tissue.

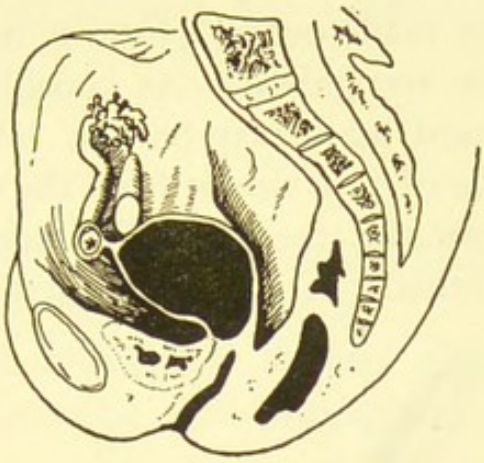


FIG. 83.—Sagittal lateral section of the pelvis, showing a large inflammatory collection in the right broad ligament.

Cellulitis usually leaves more or less marked traces behind it, the most marked of which are displacements. The most common alterations are found in the uterus. This organ may be lateriverted, when the inflammation has taken place in a broad ligament. When it has existed in the utero-sacral ligaments, the lower portion of the organ is fixed and drawn somewhat upward and backward, the fundus bending forward; this condition being known as *pathological anteflexion.*

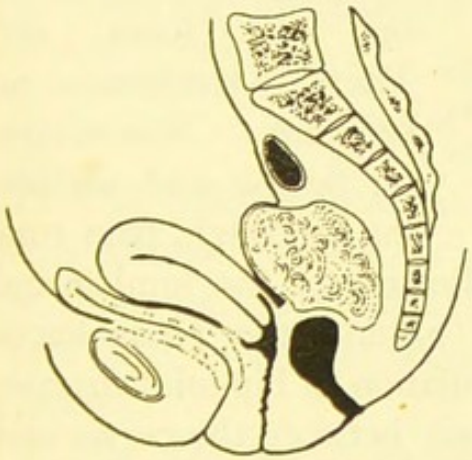


FIG. 84.—Inflammatory exudation in the cellular tissue behind the pouch of Douglas at the side of the rectum.

The ovaries and tubes may be more or less displaced. The bladder may sometimes be altered, and occasionally the rectum may be affected.

Symptoms—(*a*) *In acute cases.*—There is often a rigor at the onset. There is pain in the pelvis and, it may be, in the lower abdominal region. Pulse and temperature are raised. When there is marked exudation the patient may lie with one leg drawn up. There may be constipation, painful defæcation, and dysuria.

In slight cases the patient may complain only of slight uneasiness.

(*b*) *In chronic cases.*—The symptoms are much the same as in chronic pelvic peritonitis (*vide* p. 325).

Physical signs.—In the early stages nothing definite may be made out. A little fulness or tenderness may sometimes be recognised. As consolidation occurs in the effusion, a hard mass may be felt. When in the broad ligament, if it be of any size, it fixes the uterus, and pushes it somewhat towards the opposite side and bulges down the lateral fornix. If the utero-sacral folds are affected, the cervix is felt fixed, and there is a thickened mass on each side behind, most easily felt through the rectum. In other cases the thickening may be felt at the side of the bladder, vagina, or rectum, reaching above Poupart's ligament, in the iliac fossa, etc. There is tenderness on pressure. Sometimes, on flexing and abducting the thigh, pain runs down the leg, owing to the implication of the lumbar and iliac glands and of the tissue around the psoas-iliacus muscle; there may thus be a simulation of hip-joint disease.

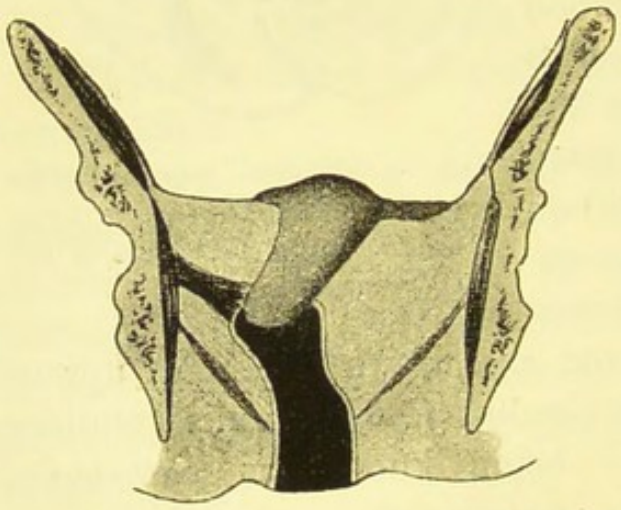


FIG. 85.—Coronal section of pelvis, in which a chronic cellulitis in the right broad ligament is drawing the cervix towards the right side.

It is very rare to find any deposit between the cervix and bladder. When fluid is present it may often be recognised as a cystic mass, but sometimes it may be thought to be solid. Sometimes pus may exist in the centre of thick solid masses, and may be very difficult to make out; it may often be felt as a boggy mass.

In old-standing cases various cicatrices and displace-

ments are found, the uterus being drawn towards the affected side.

Differential diagnosis between pelvic peritonitis and cellulitis. — In some cases this cannot be made out clinically. Between marked types of each the following distinctions may be drawn :—

Pelvic Peritonitis.

1. The inflammation is mainly in the peritoneum, and often not definitely localised in one part of the pelvis.
2. Pain very severe. Marked abdominal tension and tenderness. Coils of intestines may be seen through the wall.
3. A swelling may not be noticed for some days. It is around the uterus generally, and does not bulge down lateral fornices. The uterus is usually never displaced to one side.
4. Nausea ; often bad vomiting.
5. Tympanites in severe cases.
6. Both legs often drawn up.

Pelvic Cellulitis.

1. The cellular tissue is mainly affected, usually in distinctly localised areas.
2. Pain not so severe. It often shoots down one leg. There may be very little tenderness or rigidity in the abdomen.
3. The swelling is easily felt on bimanual examination as a localised mass. Very often the uterus is considerably displaced.
4. Vomiting is not often marked.
5. No tendency to tympanites.
6. Marked tendency to formation of pus, which burrows in definite directions.

Treatment.—Practically the same as in the case of pelvic peritonitis. It is important to precede measures by curetting, if the endometrium be diseased, as it is so often a source of infection.

When the bladder or rectum is diseased it should be treated early.

When pus collections form, they should be opened. The chief sites of these have already been mentioned.

Whenever, in such cases, it is possible to open into these cavities without injuring the ureter, large vessels, viscera, or the peritoneal cavity, the pus should be removed, the opening being made through the skin or vaginal surface.

Sometimes it is sufficient to aspirate the collection when it is small. A large collection should be opened freely.

Whenever there are important structures which might be injured by a knife, a director should be pushed into the abscess after an opening is made through the skin or vaginal mucosa. The opening is then enlarged with dressing forceps. In other cases the abscess may be freely opened with a knife. If a finger can be introduced, any septa or masses preventing free escape of the pus may be broken down.

Drainage should be continued by means of iodoform gauze, or by a rubber tube, after the cavity has been washed out with an antiseptic lotion. The cavity should be washed out once or twice each day. When the opening is made high up in the vagina, it is a good plan to stitch the tube to the edges of the opening for a time.

When it is impossible to open a collection of pus seated close to the rectum by means of the vaginal incision, it should be opened by way of the gut without hesitation, the rectum being carefully cleaned out beforehand. A large opening should be made, vessels being avoided. It should

be washed out three or four times daily, and should be made to close from the bottom. The opening should be kept large by the finger, in order that it may be the last to close. If the sphincters of the anus be paralysed for a few days, the cavity drains best.

When a pus collection has discharged into the vagina, and healing takes place slowly, the opening should be enlarged, and drainage kept up.

If an abscess has opened into the rectum, the opening should be enlarged, and all pockets destroyed.

After opening has taken place into the bladder, an effort should be made to open into the abscess cavity between the bladder and cervix, and to establish drainage.

If this be not possible, it may be necessary to make a vesico-vaginal fistula, and to dilate the opening by which the pus has entered the bladder.

Some large collections of pus in the cellular tissue cannot be opened without the performance of an abdominal section. The peritoneal cavity is opened and the pus is aspirated. The walls of the sac are then stitched to the edges of the abdominal wound. The opening into the sac is next enlarged, the cavity washed out with an antiseptic, and then stuffed with iodoform gauze. In two or three days it is removed, and a smaller quantity introduced.

Sometimes on opening the peritoneum it is found that, owing to the fixation of the pus collection, its deep-seatedness in the pelvis, or its adhesion to intestines, it is impossible to attach its covering to the edges of the abdominal wound. In such a case a careful examination per vaginam should be made, in order to determine the possibility of draining the pus by a vaginal puncture. If this can be done, a T-shaped drainage-tube should be introduced into the abscess cavity by way of the vagina. The abdominal wound is then closed.

When an opening by way of the vagina cannot be made,

the abscess may be opened, carefully cleaned, and drained through the abdominal wound, by Mikulicz's iodoform gauze tampon (*vide* p. 269).

Parametritis Chronica Atrophicans (I. Circumscripta; II. Diffusa).

Freund has given this name to a slow chronic process affecting mainly the fascial and aponeurotic structures, producing changes similar to those found in cirrhotic processes in the liver, kidney, etc.

The circumscribed variety.—The dense bands may be found in relation to bladder, uterus, or rectum. The disease is believed to start in infection from these different structures. As shrinkage occurs, more or less displacement of one or other of them is produced.

The diffuse variety.—This is a rare condition in which a cirrhotic process affects the whole pelvic cellular tissue. As it progresses vessels are compressed, and there is congestion and catarrh of urethra, bladder, uterus, and rectum. The genitals gradually atrophy; menstruation is at first abundant, and afterwards scanty. The cause is not well known. It has been attributed to a weakened condition, produced by excessive child-bearing or suckling.

Symptoms.—These have been described in connection with chronic inflammatory conditions in the pelvis. Neurotic phenomena are usually marked. Menstruation may be excessive at first, and afterwards scanty.

CHAPTER XI.

PELVIC HÆMATOCELE AND HÆMATOMA.

Nature.—These conditions are not diseases *per se*, but are outpourings of blood, resulting from various pathological states. Hæmatocele is an infusion of blood into the peritoneal cavity; hæmatoma, into the extraperitoneal tissues. These conditions are most frequent in parous women, in the most vigorous reproductive period, *i.e.* between 25 and 35.

Etiology.—Rupture of blood vessels may occur in abnormal conditions of the tissues, and of increased blood pressure.

Thus, occasionally an effusion of blood may be brought about during menstruation, usually from a sudden strain, violent exercise, or violent coitus. Sudden chill of the body during a period is said to induce it.

It may take place from a congested ovary, in connection with the rupture of a Graafian follicle. Rupture of an ectopic gestation sac is the most important cause. It may occur from rupture of varicose veins under the peritoneum in different parts of the pelvis. It may be found in connection with the acute exanthemata, purpura, scorbutus, hæmophilia, and certain other rare conditions.

Hæmatocele.

Etiology.—Of all the causes of hæmatocele mentioned above, there can be little doubt that by far the most important is ectopic pregnancy. Lawson Tait has been foremost in urging this view, and he states that the great

majority of cases can be attributed to this condition. The following statistics of other observers do not quite bear out this statement:—

Thus in 66 cases observed by	Veit,	16	only were due to ruptured		
,, 20	,,	Jousset,	9	,,	ectopic gestation.
,, 17	,,	Dubousquet,	5	,,	,,
,, 36	,,	Voison,	9	,,	,,
,, 7	,,	Engelhardt,	1	,,	,,

Thus in 146 cases there were only—40, or 28 per cent.

These statistics are not at all conclusive. The proportion is far too small. In many cases of hæmatocele, occurring in the early weeks of an ectopic pregnancy, the real cause is never suspected or recognised. Moreover, with the most careful physical examination, it may be impossible to determine it. Cullingworth has recently reported an interesting series of twenty cases, in which he performed abdominal section for hæmatocele. In every one the condition was associated with tubal pregnancy. Escape of blood into the peritoneal cavity in ectopic pregnancy may take place in various ways. I have pointed out in my former work, "Ectopic Pregnancy," the conditions which favour the occurrence of this complication. When gestation takes place in a Fallopian tube, after a very early period the musculature of its wall is not able to respond to the rapidly developing ovum as does the normal fruit-holder, the uterus. The normal relations of the muscle become greatly altered, the bundles getting broken and separated, so that as pregnancy advances many portions of the wall are found without any muscle whatever, owing to the marked scattering of fibres which has taken place, and to the accompanying atrophy of the fibres which usually occurs. The main structure in the wall is connective tissue. In this condition of the gestation sac it is as easy to understand how the wall may become stretched, thinned, and ruptured by the pressure of the increasing contents, especially if this be suddenly increased by intratubal hæmorrhage, or by

alterations in intra-abdominal pressure, *e.g.* sudden strains, falls, etc.

The rupture in the wall may be large or small, the rent in the tube being rounded, elongated, or irregular. In some cases that part of the wall to which the placenta is attached may burst, in others the non-placental portion; in the former the bleeding is most severe and the condition most serious. The whole ovum, or only part of it, may escape into the peritoneum; according to Orthmann, in the majority of instances complete expulsion takes place. The hole in the tube may become plugged by the fœtus sticking in it. It is thus easy to understand how so many variations are found in the nature and extent of the rupture, the amount of blood lost, and the danger to the mother. In a large number of cases the condition will be fatal within twenty-four hours, as a result of the pouring out of blood, unless an operation be performed. Thus, Parry found that, out of 113 cases, thirty-nine died within ten hours, eighty-one within twenty-four hours, and ninety-eight within forty-eight hours.

In many cases only a small loss of blood takes place, and this may be followed at successive intervals by more hæmorrhage. The temporary cessations may be due to contractions of the tube or vessel wall, or to plugging of the rent by the fœtal structures. A succession of small losses may prove fatal to the mother after a short time. In some cases blood may accumulate first in the tube, *e.g.* between the wall and the placenta, and afterwards burst into the peritoneal cavity. In another class of cases, where the tube is surrounded with adhesions, the blood may only slowly work its way through them. The earlier in pregnancy the rupture occurs the less will be the immediate danger to the mother, because the vessels are not much enlarged, and the musculature of the tube wall not too much altered to contract on the torn vessels and check hæmorrhage. Also an escaped ovum along with the blood will probably more easily be absorbed in the early than in the late months.

The mother, therefore, during the first and second months, runs somewhat less risk from rupture than during the succeeding months. In the majority of cases of tubal pregnancy rupture occurs during the first four months, but it may also take place during the succeeding months. During the first month it is rare, but has been reported as taking place in the second and third weeks. A large number of cases rupture during the second month.

In ninety-five cases reported by Hennig :—

Rupture during the	1st	month occurred in	5 cases.
,,	2nd	,,	22 ,,
,,	3rd	,,	18 ,,
,,	4th	,,	23 ,,
,,	5th	,,	8 ,,
,,	6th	,,	1 ,,
,,	7th	,,	1 ,,
,,	8th	,,	6 ,,
,,	9th	,,	1 ,,
,,	10th	,,	9 ,,
Beyond the	10th	,,	1 ,,

In Von Schrenk's collected cases rupture occurred—

In the	1st	month in	13 cases.
,,	2nd	,,	67 ,,
,,	3rd	,,	28 ,,
,,	4th	,,	12 ,,

In Schauta's cases.

In the	1st	month in	15 cases.
,,	2nd	,,	29 ,,
,,	3rd	,,	23 ,,
,,	4th	,,	10 ,,

In Mackenrodt's cases :—

In the	1st	month in	6 cases.
,,	2nd	,,	23 ,,
,,	3rd	,,	5 ,,
,,	4th	,,	4 ,,

Another important factor is the patency of the fimbriated end of the tube in the early weeks of pregnancy. This is

found in varying degrees. In a certain number of cases it is completely closed at an early period by perisalpingitis, or by adhesions to neighbouring structures. This may not, however, take place until pregnancy has considerably advanced. Closure may be quickly brought about, or only gradually, so that many variations are found in the degree of patency which exists in different cases. Through this open end blood may escape in small or large quantities, if rupture of a vessel occur, causing hæmorrhage within the tube. Probably the most frequent source of the blood in such cases is the decidua reflexa, though it may also come from the serotina and vera. In my researches in ectopic pregnancy I have pointed out the very delicate nature of the reflexa, its great vascularity, the rapid degenerative processes in it, and the tendency to hæmorrhage in it. Blood is often found escaping from the maternal sinuses of the reflexa into the surrounding decidual tissue; and it may burst through the reflexa, either on its inner side, coming into relation with fœtal structures, or on its outer side, forming a blood mass in the tube outside the ovum. On its inner surface a greater or less area forms, along with the serotina, the side for the attachment of the permanent placenta, the rest of it being related to the temporary *chorion læve*. These relationships afford an explanation for the almost constant occurrence of blood effusions in the placenta or membranes of a tubal pregnancy.

It is highly probable that this origin of hæmatocele is much more frequent than has been thought. It is, indeed, remarkable that in Cullingworth's twenty cases the blood was found escaping from the open end of the unruptured tube. In the majority of instances, the escape had taken place very slowly, the blood trickling out gradually, thus allowing progressive clotting and encapsulation to take place; very rarely does the blood escape so rapidly from the open end as to lead to a diffusion of free blood throughout the general peritoneal cavity. This author believes, and I agree with

him, that the majority of the favourable cases of hæmatocele are those in which the escape of blood has taken place by the open end of the tube in very early tubal pregnancy.

The blood which escapes through the fimbriated extremity may be accompanied with part or whole of the gestation products—the so-called "tubal abortion." The abortion is most apt to occur before the *ostium abdominale* is closed, *i.e.* during the first two months, in most cases, but it may take place if the ostium be closed with recently formed weak adhesions.

In thirty-two cases collected by Mackenrodt—

It occurred during the	1st	month in	8	cases.
,,	2nd	,,	19	,,
,,	3rd	,,	4	,,
,,	4th	,,	1	,,

In twenty-nine cases occurring in A. Martin's hospital, reported by Orthmann—

It occurred during the	1st	month in	13	cases.
,,	2nd	,,	10	,,
,,	3rd	,,	4	,,
,,	4th	,,	2	,,

The expulsion probably takes place as a result of the contractions of the muscular part of the tube wall, the tubal contents moving in the direction of least resistance. It can most easily take place when the ovum is primarily situated in the outer part of the tube; but it is to be remembered that the ovum may be moved some distance along the tube. In most cases, according to Orthmann, the ovum is completely expelled.

The results of tubal abortion, as far as the woman is concerned, are very variable. A large quantity of blood may be poured out quickly in the peritoneal cavity, endangering her life, and death may be immediate or delayed. A large localised hæmatocele may be formed, or a small one in some cases. As regards the ovum, various

changes may take place; if pregnancy be early, it may be easily absorbed when it escapes into the peritoneal cavity. In many of these cases extravasations may be found in the fœtal envelopes; these hæmorrhages leading to the death of the ovum, and forming the so-called "mole," lead to the abortion.

In nineteen cases in which Cullingworth found tubal mole, with hæmorrhage from the free end of the tube, pelvic hæmatocele resulted in seventeen cases, and a free effusion in the peritoneal cavity.

In nine cases in which rupture of the tube occurred, free intrapelvic effusion occurred in seven cases, pelvic hæmatocele in one, and hæmatoma of the broad ligament in one.

After the early months, when the placenta is a well-formed structure, partial or total escape of it into the peritoneal cavity, with or without the fœtus, is probably always fatal to the woman unless operation be carried out. When the fœtus alone passes into the peritoneal cavity, its fate varies. If it be young, it may be gradually disintegrated and absorbed by the peritoneum. Older fœtuses may be partly absorbed, or may, with or without partial absorption, become encapsuled by peritonitis; this may be followed by death or suppuration, or the fœtus may become shrivelled, and be turned into adipocere or a lithopædion.

In some cases, as Orthmann has pointed out, the ovum may escape without any blood, though blood-clot may be found in the tube. He also states that such a combination is never found when the ovum escapes through a rupture of the tube wall; in such a case, blood is always found in the peritoneal cavity.

While Orthmann's observations are quite correct, it is probable that, in the majority of cases in which abortion occurs by way of the outer end of the tube, a little blood may escape along with the ovum; but that it is so small in amount as to be rapidly absorbed by the peritoneum.

In some cases a hæmatosalpinx may be formed along with the hæmatocele; and, according to Werth, the outer

end of the tube may become closed after the escape of blood, so that the hæmatocele and hæmatosalpinx become distinct from one another.

A view long held as to the origin of many cases of hæmatocele is that of Bernutz, who regarded them as due to a reflux of menstrual blood from the uterus.

Many now believe, among whom Bland Sutton is foremost, that the cases of this supposed origin are mainly those in which tubal abortion has occurred.

The supposed menstruation is the bleeding which may take place from the altered mucosa of the uterus in ectopic pregnancy. As there is only a slight escape from the uterus in such cases, it is easily understood how the belief has been readily accepted that the blood has regurgitated through the Fallopian tubes.

In cases where the hæmatocele forms without any external bleeding, the opinion has been often expressed that the hæmatocele is due to a reflux of blood from the tube apart from the influence of an ectopic gestation.

All such opinions must be taken with caution. Cases must be examined with great care to ascertain the existence of ectopic gestation, and at the time of operation or post-mortem to make out the real source of the hæmorrhage; above all, a microscopic examination of the tube and clots should be made to decide as to the presence or absence of fœtal structures.

A rare cause of hæmatocele is the rupture of a tumour, *e.g.* an ovarian cyst in which hæmorrhage has taken place.

Gardner has described two interesting cases, in one of which the hæmatocele was associated with adeno-carcinoma of the ovary, and in the other, with tuberculosis of a Fallopian tube, which had become distended with blood and had ruptured.

Pathology.—Sometimes the patient may die from the amount of blood poured out. Then only fluid blood is

found in the peritoneal cavity. In less severe cases the following conditions are found :—

The blood extends from the pelvis upwards for varying distances. It may surround the uterus, push it forwards, backwards, or to one side. It becomes gradually clotted, forming a dark-red mass. Fibrin gradually spreads throughout it, and it becomes more organised, solid, and paler in colour. (Many of the red blood corpuscles are probably absorbed through the peritoneum early after rupture.) An inflammatory reaction usually occurs around the mass, and there is some serous effusion into the peritoneal cavity. The bowels get matted together to form a roof over the blood mass. Sometimes only the outer portion of the blood is solid, the central part consisting of one or more cavities containing altered blood, of a dark, tarry nature. Or solidification may occur irregularly.

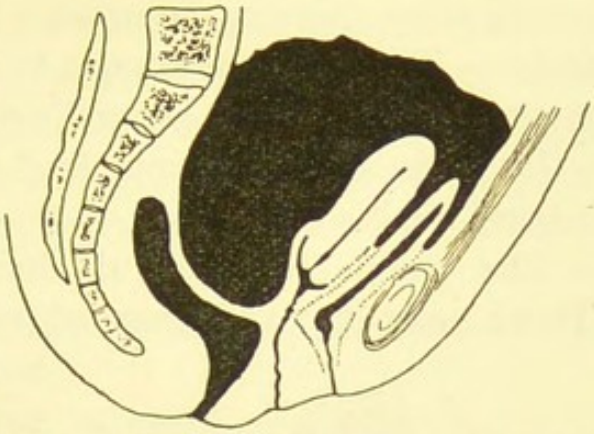


FIG. 86. — Hæmatocele in which the uterus lies anterior, close to the abdominal wall.

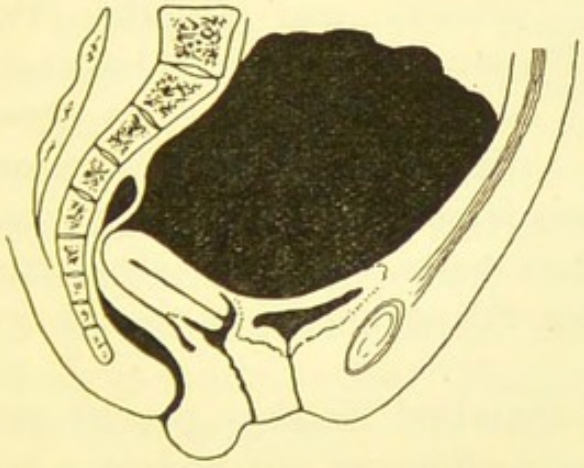


FIG. 87.—Hæmatocele under which the uterus lies retroverted.

Course. — Many cases gradually become cured by gradual absorption. Sometimes considerable thickenings may remain for a long time. In some cases suppuration occurs, and a pelvic abscess is formed which may tend to burst in a variety of ways.

Sometimes the mass increases at menstrual periods, owing to increased hæmorrhage or inflammation.

Symptoms.—These vary according to the rapidity with which the blood is poured out, and to the quantity.

In a well-marked case, there is sudden pain, accompanied, often, with a feeling of fear; pallor, prostration, collapse; perspiration, nausea, vomiting. The pulse may become feeble. There is menorrhagia in some cases; sometimes the menstrual flow ceases, generally reappearing after a few days.

In some cases anæmia and amenorrhœa may last for a considerable time.

The pains are often rhythmical; sometimes colicky. There may be a feeling of weight in the pelvis; also rectal and vesical tenesmus; sometimes retention of urine. There is apt to be a recrudescence of pain at succeeding menstrual periods.

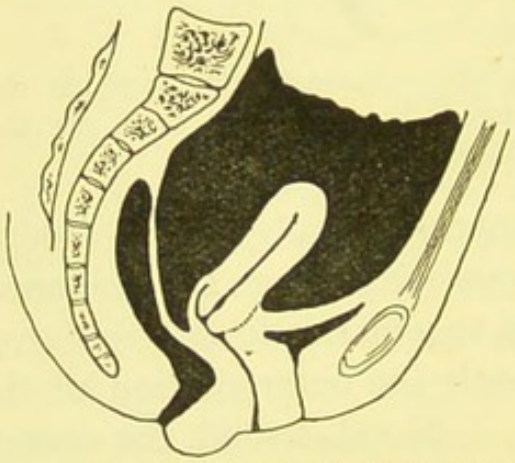


FIG. 88.—Hæmatocele in which the uterus is embedded in the centre of the mass.

When inflammatory reaction occurs the temperature and pulse rise.

As the mass gradually shrinks and absorbs, the patient is more or less comfortable, though often some degree of pelvic discomfort or pain is experienced. There is generally a tendency to constipation; sometimes diarrhœa and passage of bloody mucus.

When suppuration occurs, the symptoms of abscess are marked.

Physical signs.—When abundant blood is poured out, signs of free fluid in the peritoneum are present. Per vaginam a boggy feeling is got through the fornix. As coagulation occurs the mass may be made out. At first it is difficult to feel this through the abdomen, owing to the tenseness and tenderness of its wall. Afterwards it may be made out bimanually as a firm elastic mass, filling the pelvis and reaching up, it may be, above the umbilicus. The

lower surface of the mass is somewhat concave. The uterus may be felt in front of the mass against the symphysis; behind, laterally displaced; or it may not be found at all, being in the midst of the blood. On percussion over the abdomen there is dulness over the palpable portion. It may be more on the right side in some cases, and in others more on the left. As the tumour gets older it becomes harder, and furrows often develop on it. Its consistence may be felt to be different at different parts.

In some cases there may be slight distension of the intestines above the mass.

Differential diagnosis.—1. Ectopic pregnancy.

2. Pelvic peritonitis or cellulitis with effusion.

3. Myoma uteri; myoma with peritonitis or cellulitis; myoma with torsion of pedicle.

4. Ovarian tumour; tumour with peritonitis; tumour with twisted pedicle.

5. Posterior displacement of gravid or non-gravid uterus.

6. Hæmatosalpinx.

7. Retained menstrual blood in atresia of vagina or cervix, or in the horn of a malformed uterus.

Treatment.—The patient must be put to rest in bed. At first ice-bags should be placed on the abdomen, and ergotine given hypodermically. If there be collapse, brandy, ether, or strychnine should be administered; and, if necessary, saline solution should be injected subcutaneously or into the veins. The diet should be low and simple, *e.g.* milk, beef-jelly.

Sometimes morphia may be necessary on account of the pain.

As the case goes on the cold applications are to be continued, and the ergot may be given by the mouth. The bowels should be kept regular. More nourishing diet and tonics are to be administered.

Local inunction of the abdomen and vagina with iodine,

iodide of potassium, etc., has been employed, but with no very distinct benefit.

Surgical measures.—The exact position of surgical procedure in recent cases of hæmatocele has not been definitely fixed. The reason of this is our uncertainty in regard to all the causes which may give rise to the condition. Within recent years recognition of the importance of rupture of an ectopic pregnancy as a cause has led to early active interference. It is extremely likely that, in the future, similar measures will be adopted in all cases of intraperitoneal hæmorrhage, whether the cause be known to be ruptured ectopic gestation or not, unless it be of such a nature as to preclude the possibility of remedial surgical interference, *e.g.* rupture of a large aneurism.

Cullingworth thinks it may be safe to withhold operative measures when the ectopic pregnancy is in the very early weeks.

The course to be taken is the following:—The peritoneal cavity is opened, and the bleeding point found and controlled. If the case be one of ectopic gestation, the procedure varies, according to the condition found on examination. If the patient be much collapsed, it is well to transfuse blood, or to give an intravenous or subcutaneous injection of saline solution, in order to improve her for the operation. Hypodermic stimulant injections may also be needed.

After opening the abdomen, the first step is to find the rupture and to check bleeding from it with forceps or ligatures. If the tear be large or irregular, it may be impossible to do this quickly; or in carrying out the procedure the tear may be made worse, owing to the thinness of the sac. In these circumstances the infundibulo-pelvic ligament should be clamped with a pair of forceps, so as to secure the ovarian artery, and no time should be lost in ligaturing the broad ligament and removing tube and ovary.

In cases in which abdominal section is carried out some

time after the first escape of blood, the operation may be considerably complicated by adhesions due to peritonitis.

If the case be one in which the hæmatocele is due to the secondary rupture of a broad ligament, into which a tubal pregnancy has, first of all, burst, the whole gestation sac should, if possible, be removed. If this cannot be done, the ovarian artery should be ligatured, and the rent in the sac, if near the abdominal wall, stitched to the edges of the incision in the latter. If the rent be distant from the abdominal wall, it should be closed with catgut. Then the sac should be stitched to the edge of the abdominal incision, and a new opening made in it through which iodoform can be introduced; the sac thereafter gradually contracts and closes. Should there be a rupture of the broad ligament, the bleeding vessels must be thoroughly secured with strong catgut ligatures. If the abdominal viscera be ruptured, the treatment should be carried out as recommended in surgical treatises. In all cases the blood is to be thoroughly removed from the peritoneal cavity, which should be irrigated with salt solution, some of which may be left to be absorbed by the peritoneum, to make up for the loss of blood. In some cases drainage may be carried out, especially where matter other than blood has entered the peritoneal cavity, where there is difficulty in removing all the blood, or where there is some fear that the fluid is not perfectly aseptic.

Hæmatocele of some duration in which suppuration has occurred.—The treatment is to open into the mass, remove the pus, break down the clot, wash out the cavity with an antiseptic, and drain it freely. The place of opening in such a case must depend on circumstances. The operator must be guided by the position and extent of the pus, by the direction in which it is tending to point, by the relationship of the intestines, and by the necessity of selecting the best tract for drainage.

There can be no doubt that the vaginal opening is the

best when most of the blood mass is broken down and can be removed; when the mass is of small size it affords the best means of drainage. Some, however, prefer in these cases to make the opening in the abdominal wall. It is probably best to remove the fluid by an abdominal opening and to drain afterwards by a vaginal opening, the former being closed.

When the blood mass is large and not much broken down the incision should be in the abdominal wall, if possible directly over the pus collection. As much of the mass as will easily come away should be removed and the cavity packed with iodoform gauze. In all these cases care must be taken not to injure the intestines. They are generally matted together to form the upper boundary of the hæmatocele, which is thus shut off from the rest of the peritoneal cavity.

Hæmatoma.

Hæmorrhage into the extraperitoneal cellular tissues of the pelvis is due to the same causes which produce hæmatocele. The blood goes through the same changes as those already described.

Symptoms.—These are somewhat similar to those in hæmatocele, only *much less severe.* There is rarely any rise of the temperature following the hæmorrhage.

Physical signs.—When the effusion has taken place in a broad ligament, the uterus is pushed towards the opposite side of the pelvis, and the fornix on the corresponding side is pushed downwards.

Through the abdominal wall the upper surface may be very clearly defined, and, sometimes, the appendages can be distinguished.

Sometimes the blood extends all round the uterus, and then there is a bulging down of the whole vaginal fornix. In some cases the peri-rectal tissue may be the seat of

the hæmorrhage, and a mass may be found which is lateral to the gut or which presses forward in front of it, displacing the uterus. Sometimes a hæmatoma ruptures into the peritoneal cavity.

Treatment.—The general treatment is the same as for hæmatocele.

As regards surgical measures, no interference is necessary save under certain conditions, when the hæmatoma is due to the rupture of a tubal pregnancy into the broad ligament, the fœtus not being destroyed.

When a hæmatoma ruptures into the peritoneal cavity, giving rise to a hæmatocele, it is probably best to open into the peritoneal cavity, from which all blood is washed out, to stitch the edges of the ruptured sac to the abdominal wound, or, if this be not possible, to close the rent with continuous catgut. The ovarian artery should then be ligatured in the outer part of the broad ligament on the bleeding side, and, if possible, the uterine artery also. The top of the blood sac should then be carefully sutured to the abdominal wound. The sac should be opened, the blood clot removed, and antiseptic gauze packed in its place. This should be changed and lessened in amount every few days.

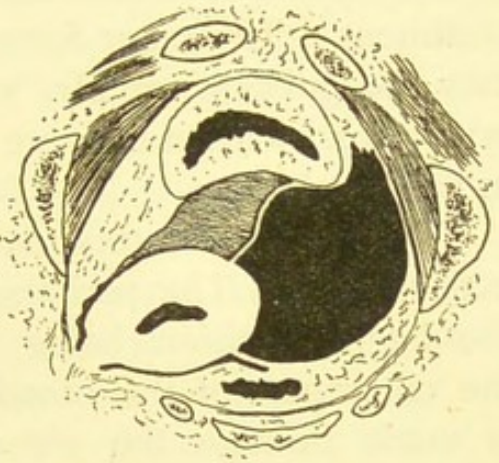


FIG. 89.—Hæmatoma of the right broad ligament. The transverse section of the pelvis shows how the uterus is displaced by the blood.

When suppuration occurs in a hæmatoma the condition is treated as a pelvic abscess.

Other Affections of the Pelvic Connective Tissues.

Cysts of the broad ligament.—Besides blood and inflammatory effusions, parovarian, hydatid, and other cystic conditions are found in the broad ligament. These will be considered along with cysts of the ovary.

Solid tumours of the broad ligament. — These are fibroma, fibromyoma, lipoma, phleboliths, carcinoma, sarcoma, tubercle.

The latter three conditions are practically beyond surgical treatment. The other forms are only to be removed when they are growing rapidly, when they are causing pressure symptoms, or when they are apt to be a cause of obstruction in future labours.

The most satisfactory method of operation is by abdominal section. The peritoneum is opened, in most cases the lateral incision being used. The ovarian artery in the outer part of the broad ligament is tied. An incision is made through the anterior peritoneal covering of the tumour, *i.e.* the layer of the broad ligament. The tumour is shelled out by means of the hand, and removed. If there is much bleeding from the interior of the sac, the uterine artery on the same side is ligatured.

The sac may be treated in either of two ways, of which I recommend the first.

The two layers are brought together from below upwards by means of a continuous catgut suture. When this is done, the broad ligament appears on the side occupied by the tumour, as a thickened crumpled mass at the side of the uterus. Or the edges of the sac may be stitched to the abdominal wound, packed with antiseptic gauze, and thus drained.

Solid tumours of the round ligament.—Fibroma, fibromyoma, fibromyxoma, and sarcoma may occur within

the peritoneal cavity, in the inguinal canal, in the labia majora.

The latter are the most common. The extraperitoneal forms may be removed by external incisions in the groin, unless too great extension into the neighbouring pelvic connective tissue has taken place. The intraperitoneal forms may be removed, unless they have spread too far, by means of an abdominal incision.

Retroperitoneal tumours in the pelvis or lumbar regions.—These may sometimes be removed by abdominal section if they are not too large or malignant. The peritoneal covering should be incised and the tumour shelled out, care being taken to avoid injuring important nerves, vessels, or the ureter. Bleeding points should be tied, the peritoneal flaps, which covered the tumour, being brought together, save at the lowest point. Drainage of the peritoneal cavity should be kept up for a day or two.

Tumours in the pelvic connective tissue, elsewhere than in the broad and round ligaments.—Dermoid cysts, fibroma, fibromyoma, and sarcoma may be found, *e.g.* in the recto-vaginal septum, at the side of the rectum, etc.

In some cases these can be removed by incisions made externally.

Hydrocele of the round ligament.—This is a collection of fluid in the canal of Nuck—a tube of peritoneum extending into the labium majus. It may communicate with the peritoneal cavity or be shut off at the internal inguinal ring. It must be diagnosed from ovary prolapsed into the inguinal canal and from inguinal hernia.

When it exists as an encysted hydrocele there is an oval translucent swelling in the inguinal canal. It cannot be pressed into the abdomen, is not tender, and causes no symptoms.

When in the labium majus, the latter is distended with a fluctuating translucent tumour, which cannot be returned into the abdomen.

Treatment.—The most satisfactory treatment is to cut down upon the cyst and dissect it out, closing the wound with continuous catgut suture.

If the cyst communicate by an unobliterated passage with the peritoneum by means of the inguinal canal, it is well, after dissecting out the sac, to place a ligature immediately above it in order to close the passage in the inguinal canal. The wound is then to be closed with continuous catgut.

CHAPTER XII.

AFFECTIONS OF THE FALLOPIAN TUBES.

Anomalies of structure.—Sometimes the tubes are abnormally long or abnormally short; sometimes of unequal length. The outer end varies greatly in shape, in size, in the number and development of the fimbriæ. Sometimes the fimbriæ are wanting. In some cases there are accessory fimbriæ; these may be without or with an accessory ostium, which communicates with the lumen of the tube. Occasionally two accessory ostia are found.

Anomalies of position.—Various displacements are found, either of congenital origin, or due to acquired causes. The latter are associated with inflammatory changes, malpositions of ovaries and uterus, tumours and swellings of various kinds.

Stricture and occlusion.—These may be congenital. Most commonly they are due to a tumour in or outside the tube or to inflammatory changes. The stricture may occur at the outer, inner, or middle portion. They are important in relation to the causation of sterility and to the accumulation of fluid in the tubes.

Inflammation of the Tubes—Salpingitis.

Etiology.—1. Microbial infection from the genital tract, especially following abortion and labour; a most frequent cause.

2. Infection associated with latent gonorrhœa in the

male; a common cause. In cases in which the gonococcus is absent, the infection is due to septic cocci which have developed in the discharges. Acute gonorrhœa may also give rise to salpingitis.

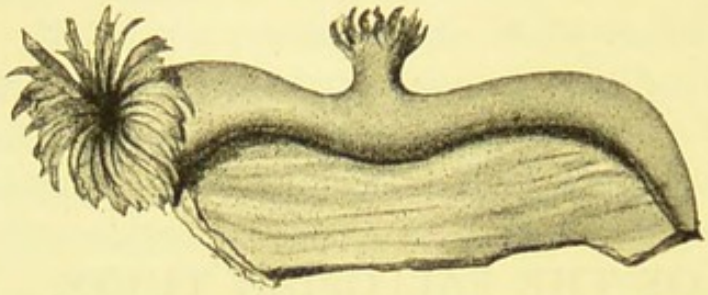


FIG. 90.—Fallopian tube, with accessory ostium.

3. Spread of inflammation from neighbouring parts.

4. Severe chills, excessive coitus, or excessive exercise during or near menstruation are said to cause salpingitis sometimes.

5. Acute exanthemata.

6. Tuberculosis; actinomycosis.

Pathology.—The most important changes occur in the mucosa, but all parts of the wall are usually affected at the same time.

When the peritoneum covering the tube is affected it may be a localised inflammation or part of a wider affection.

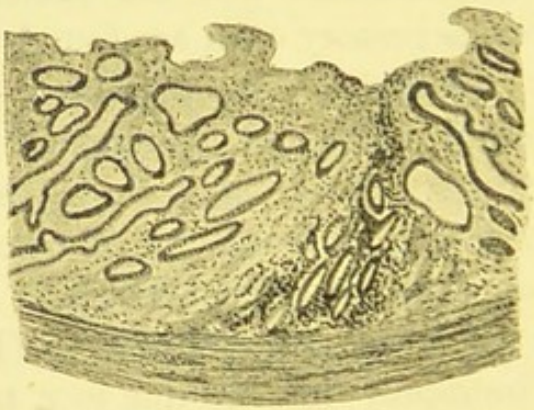


FIG. 91.—Salpingitis. The mucous fringes have become fused together, so that the spaces between them have been largely obliterated. Next the lumen of the tube the lining epithelium is mostly degenerated.

It leads to bending, stricture, displacement, or to adhesion of the tube to surrounding parts. Very often the inflammation spreads to the ovary. It may close the outer end by matting the fimbriæ together. When the muscular portion of the wall is affected, it becomes thicker and hard, owing to the small-celled infiltration in it; when pus is present, small loculi may be formed throughout it.

When the mucosa is affected various changes are pro-

duced. Infiltration and effusion take place into the delicate fimbriæ and into the thin layer of submucous tissue. There is congestion of the vessels. Small hæmorrhages are sometimes found. There is increased mucous secretion into the lumen, and it may contain leucocytes, shed epithelial cells intact or breaking down, and, sometimes, red blood corpuscles. The epithelial lining is lost in some parts, degenerated in others, and adhesions may occur between neighbouring plicæ.

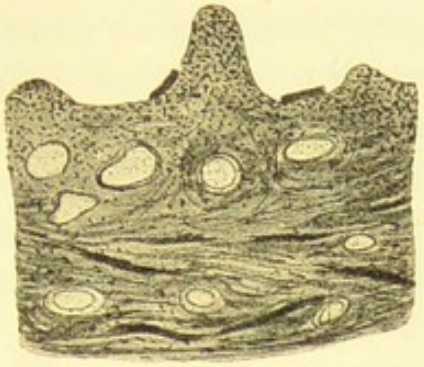


FIG. 92.—Pyosalpinx. The mucous fringes are obliterated, the lining epithelium destroyed, and the muscular part of the wall greatly altered by chronic inflammatory changes.

Sometimes the fringes may enlarge and vegetations may form in connection with them. These appear like polypi, on transverse section. The inflammation may go on to pus formation.

As a result of adhesions of the mucosa, occlusion of the tube may be brought about in one or more places. If fluid continues to be poured into the lumen, the tube gets distended and the condition of hydro- or pyosalpinx is produced.

In the cases in which a slow chronic interstitial change is the main one the tube may become very hard and somewhat thickened. In advanced stages an atrophy is sometimes produced as absorption occurs. The lumen may be obliterated partly or wholly by adhesion of the walls, and unobliterated portions may give rise to small cysts.

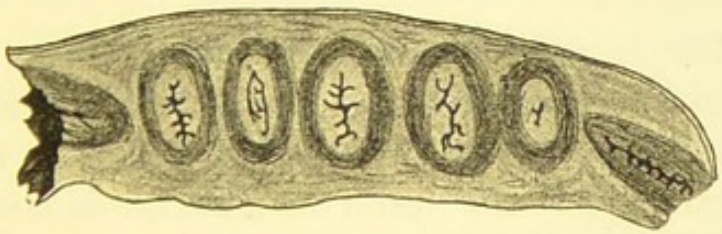


FIG. 93.—Contorted Fallopian tube, with marked perisalpingitic thickening.

HYDROSALPINX.—This is the distended condition of the

tube, as a result of inflammatory serous fluid poured into the lumen, the outer and inner ends having been closed. In some cases it is the advanced stage of a pyosalpinx. The tube becomes enlarged and elongated, tortuous, and pear-shaped, with constrictions. It rarely gets larger than a small pear, though it may be larger. The outer surface is smooth, whitish blue in colour; the walls are thin and translucent. There are often thin adhesions present. The fluid is citron-coloured; sometimes it contains flakes of lymph or a little blood. The cavity has usually one compartment, but may have more than one. The condition may exist on both sides. In some cases the uterine end of the tube may not be completely closed, but only stenosed, so that fluid may escape into the uterus; this condition is termed "hydrops tubæ profluens." The mucosa becomes very thin as the tube distends. The fimbriæ get gradually obliterated, and may be found only as low ridges. The muscular coat also atrophies. Sometimes the distended tube has a narrow pedicle, owing to rotation.

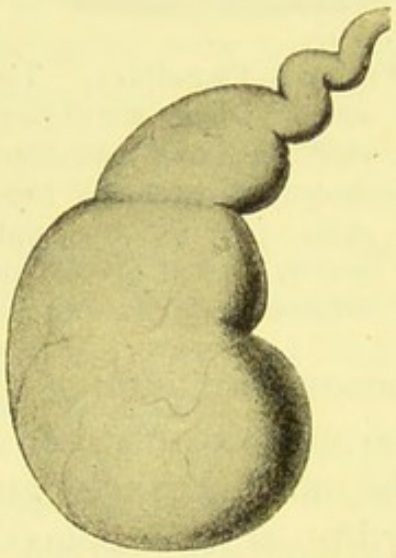


FIG. 94.—Pyosalpinx.

PYOSALPINX.—This is a distension of the tube as a result of purulent salpingitis. The distension may be uniform, but generally the wall is somewhat constricted in parts. It may be produced quickly, as the result of an acute inflammation or as a chronic condition. Sometimes a hydrosalpinx may become purulent. The least alteration is found near the uterus. In extreme cases the enlargement of the tube may reach the size of a child's head. It may reach into the abdomen. The wall is bluish white and varies in thickness at different points. Adhesions are found attached to various structures. The lumen may be single or partly

divided into compartments. The mucosal fringes are more or less obliterated, and the surface has the ordinary appearance of an abscess cavity. The pus is generally thick and yellow. In old cases it may become a thin fluid with masses of lymph and pus floating in it. It has a fœtid odour when the sac is adherent to the bowel. On microscopic examination, the wall is found to be lined with mucosa altered by inflammation. The lining epithelium is mainly absent, but may be found somewhat altered, especially in depressions in the mucosa.

The fimbriated end is rarely free. Generally the fimbriæ are matted together, or adherent to the ovary, or to some part of the peritoneum.

When both tubes are affected, the left is usually larger than the right.

The muscular part of the wall thins as distension occurs, but thickenings may be brought about by inflammatory infiltration. A pyosalpinx may rupture into the peritoneal cavity, setting up severe peritonitis. It may also open into the rectum, especially when on the left side. Sometimes it may open into the bladder or vagina, or through the abdominal wall. It may also burst among surrounding adhesions and be prevented from extending.

It has been noted that pyo- and hydrosalpinx occur in a certain percentage of cases of carcinoma uteri.

Bacteriological examination of diseased tubes shows that sometimes the gonococcus alone is present, but more usually with streptococci or staphylococci. In other cases the latter only are found. Rarely the pneumococcus or *Bacterium coli commune* has been detected. In many cases of distended tubes the fluid is sterile.

Sometimes the ovary is infected from the tube, and an abscess formed in it which communicates with the pyosalpinx, forming the condition of *tubo-ovarian abscess*. The communication may take place by the outer ostium of the tube, or this may be closed and a new opening made. The

tubo-ovarian abscess may burst into the peritoneum or may open into the rectum. In the latter case it is usually the ovary which makes the communication.

Symptoms.—It is impossible to present a clear account of the symptomatology of salpingitis, especially in relation to the different varieties. In acute cases, and very often in chronic cases, there are inflammatory changes in the neighbouring ovary, uterus, peritoneum, or connective tissue, so that there is difficulty in assigning to each part its proper share of symptoms. Pain is felt in the side affected. At first it may be intermittent, afterwards constant. It is aggravated at menstruation, and often on coitus; there is

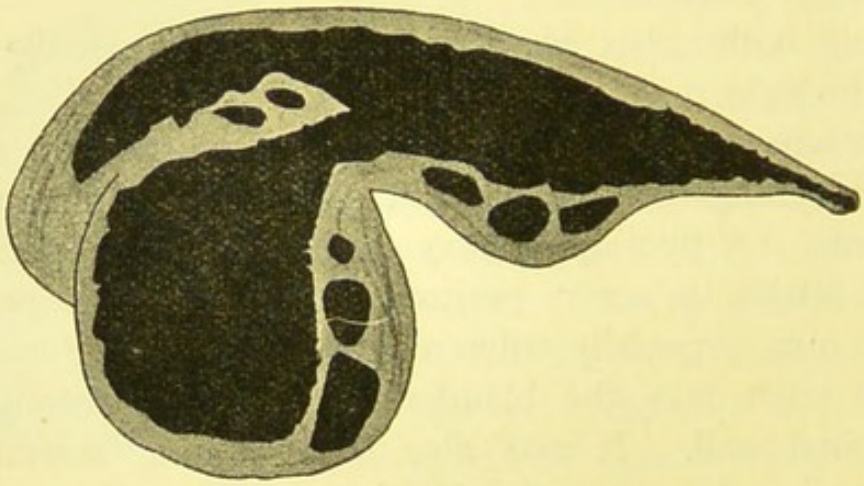


FIG. 95.—Tubo-ovarian abscess.

menorrhagia and often metrorrhagia; when the disease is bad and bilateral, sterility; in pyosalpinx cases drops of pus may find their way through the tube wall from time to time, causing sharp attacks of pain and localised peritonitis. Defæcation is often painful.

When large distensions of the tubes are formed, there are often very few symptoms. There may be a period of improvement after a stage of activity. It is possible that this may be due to the sterilisation of the tube contents, whereby the fluid loses its virulence. Symptoms may, however, be caused by pressure of distended tubes against bowel or bladder, especially when fixed with adhesions.

Some cases of hydrosalpinx may exist for years without causing symptoms.

In the case of hydrops profluens there may be an occasional discharge of fluid into the uterus and through the vagina.

In many of these cases reflex pains are established, and various neurotic phenomena may become marked.

When a distended tube ruptures into the peritoneal cavity, severe acute general peritonitis may be set up. In some cases this does not occur, owing to the sterile nature of the contents. When rupture occurs into the rectum the symptoms generally improve.

Physical signs.—Where there is considerable surrounding peritonitis, and the tube is not much enlarged, it is usually impossible to distinguish the tube from neighbouring structures.

When the tube is thickened, it may be palpated on bimanual examination, the patient complaining of pain. When the ovary is affected, it may be difficult to distinguish it from the tube, both being blended by adhesions.

When the tube is much distended, it may sometimes be palpated through the lower abdominal wall. Generally it is best made out on bimanual examination, at the side of the uterus, behind it, or sometimes in front of it. There is usually tenderness felt by the patient. The examination is often best made by the abdomino-rectal method. The most satisfactory exploration is obtained when anæsthesia is employed.

Treatment.—In the early acute stages rest in bed is necessary. The remedial methods to be employed are much the same as described in connection with pelvic peritonitis. In the chronic stages the hot douche, hip-baths, and blisters in the iliac regions are valuable. Bromide and iodide of potassium are recommended by many. Courses of baths at various watering-places are sometimes of value.

It is of the greatest importance to attend to the patient's general condition and, especially, to combat neurotic complications. Sometimes the Weir Mitchell treatment gives great benefit. In some cases operative procedures are necessary. In non-cystic salpingitis it is often advisable to remove the affected part, along with the corresponding ovary. This operation must not be too quickly decided upon, and a thorough investigation should be made to determine how much of the patient's suffering is actually due to the disease and how much to neurosis.

It has been noted in a good many cases that the patient is no better after the operation. Here undoubtedly the pain is largely a neurotic element. The operation is carried out as follows :—

(*a*) *By abdominal section.*—The general technique has already been described (p. 270). The abdominal incision is made, 3 or 4 in. in length, between the umbilicus and pubes, in the middle line or slightly to one side. The operator then introduces a couple of fingers, finds the fundus uteri, passes them outwards on each side to examine the condition of the appendages.

If no adhesions exist, the diseased tube and ovary are raised to the abdominal incision. If slight adhesions are attached to the appendages, they may easily be broken down with the fingers. When abundant or strong adhesions exist, there is danger of tearing some structure to which they are attached, *e.g.* bowel, if the operator attempt to break them forcibly without first exposing the parts so that they are visible. In such a case the abdominal incision should be enlarged, and an assistant should carefully move the bowels aside from the region of the broad ligament, while the operator divides the adhesions with the fingers, with a knife handle, with the end of closed forceps, or with scissors. If any bands are long enough to allow a catgut ligature to be applied, they should be ligatured and cut.

Sometimes it may be impossible to get at the parts with-

out enlarging the abdominal incision and turning out the intestines. Great care should be taken in doing this. They should not be pinched nor pressed upon in any way. They should not be allowed to get cool or to dry. It is best to cover them carefully in towels wrung out of hot sterilised salt solution. An assistant should attend to the renewal of these as long as the intestines are outside the peritoneal cavity.

In this way access to the pelvis is easily obtained. If illumination be required, light from the window may be reflected into the abdomen by means of a mirror held by an assistant, or an electric lamp may be employed. In the separation of adhesions care must be taken not to injure bladder, ureter, bowel, or any large vessel.

When the appendages on both sides require to be removed, and if bad adhesions exist bilaterally, it is best to break them down on both sides preliminary to removing the appendages. This is safer than to remove them on one side and then to break down the adhesions and remove the appendages on the other side, because when the latter method is adopted there is always danger of loosening the first applied ligature by the manipulations necessary to free the tube and ovary on the opposite side.

In some cases the adhesions may be so numerous and dense that it is impossible to free the appendages so as to remove them. In other cases, only partial separation can be carried out, so that removal of but part of the appendages can be effected.

When the tube and ovary can be made free from adhesions, they are raised towards the abdominal incision. The broad ligament is then pierced below the ovary with a pedicle needle, carrying a silk or No. 4 catgut ligature, about 2 ft. in length, the eye of the needle being placed at the middle of the ligature. In piercing the broad ligament, no vessel should be injured. The needle is then withdrawn. In the great majority of cases, the Staffordshire knot may

be used to secure the pedicle (*vide* p. 266). If the pedicle be thick or tense, interlacing sutures should be employed (*vide* p. 267). Before tightening the ligature, the tube should be well lifted up, in order that as much of it as possible may be embraced. After the knot is made, a pair of forceps is applied to each side of the pedicle, about $\frac{3}{8}$ in. outside the ligature. An assistant then holds an absorbent pad under the forceps, and keeps the intestines and abdominal walls aside, while the operator cuts across the pedicle outside the attached forceps. The stump is carefully sponged. If there be no bleeding, the ends of the ligature are cut away, the forceps are removed, and the stump sinks into the pelvis.

If, after cutting through the pedicle, there be bleeding, or if the operator be in doubt as to the security of the ligature, two ends are again passed around the pedicle under the forceps, and tied, before being cut short.

If the appendages on the opposite side are to be removed, they are treated in the same manner. If any bleeding has occurred from separation of adhesions, the pelvis is sponged carefully with hot pads. Sometimes irrigation with hot sterilised salt solution may be required. After-drainage may be necessary if there be continued oozing. The abdomen is closed, as described on p. 276.

(*b*) *By anterior colpotomy.*—Recently this operation has been recommended in place of abdominal section. The operation is performed as described on p. 295. When the peritoneum is opened, the appendages are examined, freed from adhesions, and removed, the pedicle being ligatured exactly as when abdominal section is performed.

(*c*) *By posterior colpotomy.*—The removal may be sometimes more easily carried out by this method.

When there are cystic conditions of the tube, *e.g.* pyosalpinx, tubo-ovarian abscess, etc., removal of the diseased parts should be carried out.

(*a*) *By abdominal section.*—On opening the abdomen the

state of both appendages is examined. If both are adherent, and if the adhesions can be broken down easily, this should be carried out before one tube is removed. The greatest care must be exercised in separating adhesions. For such cases, too small an abdominal incision should not be used. Plenty of room and free access are necessary. If, on examination, it is found that the adhesions cannot be broken without great danger of rupturing the cyst, the contents should be removed by means of an aspirator, care being taken that no drops of fluid escape into the peritoneal cavity. As soon as the aspirator is removed, the opening is closed with forceps, the tube drawn up into the abdominal opening, and adhesions separated.

Whether the tube be emptied or not before removal, the pedicle is secured just as it is when non-cystic diseased tubes are removed. After the sac is cut away, if the case be one of pyosalpinx, it is important to cauterise the stump of the tube outside the pedicle. This may be done with a galvano-cautery or with carbolic acid.

In cases where the cystic tube cannot be removed on account of adhesions, either of the following plans may be adopted :—

First, if the tube be fixed low down in the pelvis, behind the uterus, so that it may be opened through the vagina, the abdominal wound should be closed. After this is thoroughly healed, the cyst may be opened through the posterior fornix and drained. Vaginal antiseptic douches should be continued until the sac closes.

Second, if the tube be fixed high, so that the abdominal wall can be brought near it, the cyst should be aspirated, then stitched to the peritoneal edges of part of the abdominal wound, a portion of the cyst wall being drawn into the wound if possible. The rest of the wound should be then closed. The opening into the cyst is enlarged, iodoform or naphthalene powder introduced, and drainage continued by means of iodoform gauze or a glass tube. The

cyst cavity should be washed out each day with a solution of formalin (1 in 3000). The cavity gradually diminishes in size. A sinus may remain for a long time.

(*b*) *By anterior colpotomy.*—Some operators employ this method, but it is best to try it only when the tubes are not much distended. They may be got out without aspiration, though sometimes this may be necessary.

(*c*) *By posterior colpotomy.*—This method may be adopted when the distended tube lies in the pouch of Douglas.

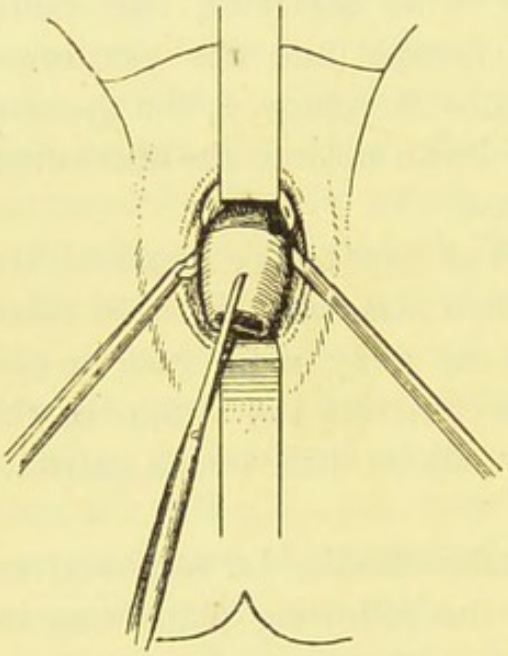


FIG. 96.—Vaginal extirpation of the uterus. This figure represents the circular flap of mucosa covering the vaginal portion of the cervix pushed up, and forceps applied to the uterine artery of each side.—DUNN.

Treatment of various diseased conditions of the appendages by vaginal hysterectomy and removal of the diseased portions.—In recent years this operation has come into favour in many quarters. Landau, one of the chief advocates of this method, sums up the indications for the operation as follows:—

Where there is bilateral disease, with the formation of pus sacs, with or without fistulous openings, intra- or extraperitoneal abscesses, the operation should be carried out; the object being to remove as much as possible the walls of the abscesses per vaginam.

In some cases, where the extent of the disease, or the possibility of entirely removing it, cannot be made out by bimanual examination, it may be necessary, first of all, to perform an abdominal section. In such cases, owing to the adhesion or high position of the tubes, it may be necessary to free them before going on with the vaginal

operation; or in some cases it may be advisable to remove the tubes by the abdominal incision. In all these cases, however, the uterus must be extirpated by the vaginal method.

When it is probable, though not certain, that the complete extirpation of all the diseased tissues is possible by way of the vagina, the removal should be begun from below; if necessary, an abdominal opening may be made to aid the completion of the operation.

In some cases this operation may be carried out according to the plan already described. Or it may be performed by the use of forceps and *morcellement*. Recently, Richelot's and Doyen's methods have come into favour. These are exceedingly valuable and rapid procedures.

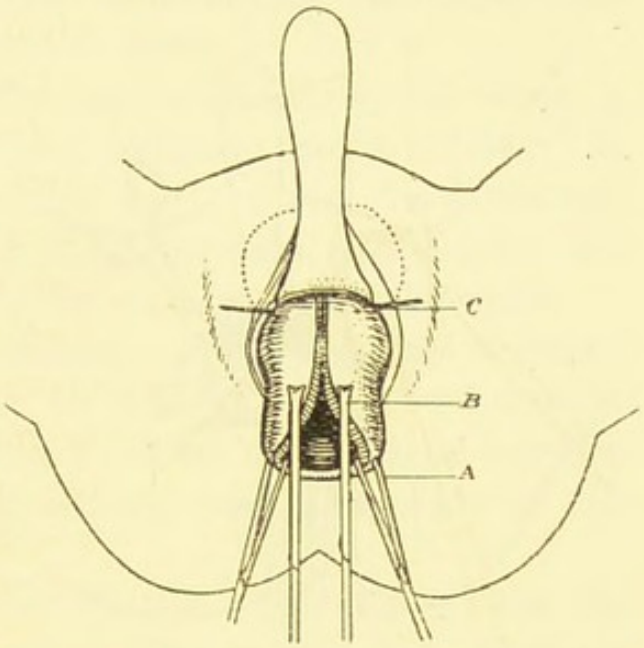


FIG. 97.—Vaginal extirpation of the uterus. This figure represents the uterus being grasped with forceps, and split in the middle line.—DUNN.

A. B. Forceps.
C. Opening into the peritoneal cavity.

Richelot-Doyen operation.—The patient is prepared as described on p. 249, and is placed in the lithotomy position. The uterus is curetted and then drawn down. An incision is made through the mucous membrane surrounding the cervix close to the fornix vaginæ. The tissues are then pushed up with the fingers until the uterine arteries are felt. These are grasped in forceps, their points being directed towards the uterus, in order not to catch the ureters, and the arteries are then divided between the forceps and uterus. The separation of the tissues is then continued upward, and the peritoneum

opened in front and behind. The bladder is kept out of the way with an anterior retractor. By splitting the anterior wall of the uterus from below upwards, forceps can be applied to the cut edges, and it can be thus more firmly held and manipulated.

As the uterus is pulled down its fundus should be anteverted, until the fundus and upper edge of the broad ligament is reached. A pair of forceps is then directed from above, downwards, so as to clamp the upper part of the broad ligament. This pair should overlap the pair already placed in position. The uterus may then be cut free on that side, pulled down, and forceps placed on the upper part of the broad ligament of the opposite side; the organ may then be completely cut away.

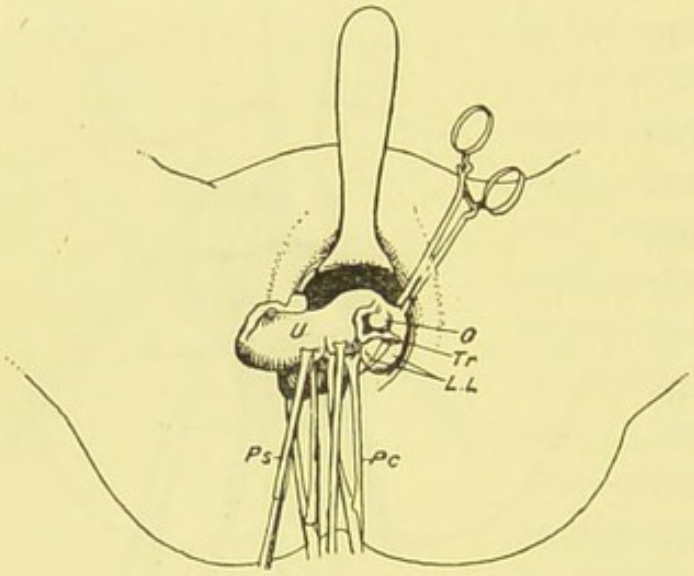


FIG. 98.—Vaginal extirpation of uterus. This diagram represents the clamp being placed on the upper part of the broad ligament.—DUNN.

U. Uterus.
O. Ovary.
Tr. Fallopian tube.
Pc. First pair of volsellæ.
L.L. Broad ligament.
Ps. Second pair of volsellæ.

The posterior vaginal wall often bleeds freely. The peritoneal and vaginal edges should be brought together with small forceps, and the hæmorrhage stopped. The edges of the broad ligament should then be examined, and forceps placed on each bleeding point, or a pair of long-bladed forceps should be placed close to those already in position. In all cases where it is possible, the appendages should be removed with the uterus.

Complications.—Sometimes the uterus is too large to allow the fundus to be anteverted. In such a case the cervix may be amputated. If this is not sufficient, both walls may be split vertically in the middle line, the edges being held with forceps. Then each half may be pulled down, and the ligaments successively clamped. If the ovaries cannot be drawn downward, so that the clamp may be placed outside them, they must be left, the broad ligament being clamped internal to them.

After-treatment.—If drainage is necessary, *e.g.* where a purulent mass is opened into, iodoform gauze is used. It is placed between the forceps, just entering the peritoneal cavity. The vagina is packed between and around the forceps, in order that the latter may not injure the walls.

The bladder is then drained. Antiseptic wool is placed over the vulva, and kept in position with a T-bandage. The patient is placed in bed, a bolster being placed between her thighs, so as to support the projecting ends of the forceps.

The forceps are removed in forty-eight hours. On the third day an enema is given. The vagina and vulva are dressed daily. In three weeks the patient may begin to sit up in bed.

Hæmorrhage into the Tubes.

Small hæmorrhages may take place in acute febrile conditions, *e.g.* typhus, in purpura, in heart, renal, and hepatic diseases. These are of no practical importance.

Hæmatosalpinx.—**Etiology.**—Distension of the tube with blood may take place as a result of atresia in the uterus or vagina. It is believed by many to be a reflux from the uterus of the menstrual discharge. The nearer the tube the atresia, the sooner is the hæmatosalpinx formed. In hymeneal atresia the condition is rarely observed (Bandl). Some think that the blood is derived from the congested

mucosa of the tubes. In these cases the tubes are usually unequally distended, sometimes only one is affected.

Against the reflux theory is the fact, that often the inner end of the tube may be completely closed off from the uterine cavity.

Hæmatosalpinx may develop in connection with the rudimentary horn of a malformed uterus, or in the case of a bicornuate uterus where atresia exists on one side. It often forms in connection with a tubal pregnancy.

Pathology.—Small amounts of blood may be absorbed. If the tube distends, the wall gets thinner, though it may be thickened in places by inflammatory changes, which usually take place on the outside, leading to adhesions. The blood remains fluid for a long time, probably owing to its mixture with the tubal secretion. After a time it is a dirty brown fluid. Rupture may take place into the peritoneal cavity, or into structures with which it is adherent. Rarely gangrene of the sac or suppuration of the contents takes place.

In the cases in which tubal pregnancy is the cause the ovum may be entirely broken up and diffused through the blood, or it may be partly or entirely detached and become incorporated with the blood mass to form a mole. The amount of blood extravasated varies in these cases. Often there is a tendency for the mass to increase, owing to fresh hæmorrhages succeeding the primary loss. Sometimes the blood may be limited to the decidua and chorion, and may be so great as to compress and almost close the amniotic cavity, the fœtus being partly or entirely destroyed.

In the early stages of these changes the ovum looks like a fresh blood clot, and unless the specimen be studied with care, the distinctive gestation tissues, *e.g.* amnion, chorionic villi, and decidua, may not be recognised. Later, the mass becomes paler and firmer, undergoing the ordinary changes of blood clot. They tend gradually to shrink in size, but may remain as small hard masses for long periods. Suppuration

may sometimes follow. It is important to note that in a certain number of these cases, where the clinical evidence points strongly to ectopic pregnancy, the most thorough examination of the tubal contents may fail to reveal corroborative evidence.

Diagnosis.—There is nothing distinctive in the symptomatology of hæmatosalpinx, it is so often associated with other conditions. The physical examination gives the same results as in the case of pyo- and hydrosalpinx. The enlargement is the same as these.

Treatment.—The same as for hydro- and pyosalpinx.

Tuberculosis of the Tubes.

This has been well described by Whitridge Williams. The tubes are the most frequent seat of tuberculosis of the genitals, according to this author; it is generally associated, however, with similar disease in the uterus or ovaries, or in both. Often the peritoneum is also involved.

Tubal tuberculosis is mostly secondary to disease elsewhere, though generally primary as far as the genitals are concerned. Sometimes it may be primary as regards the whole body.

The disease is met with in the miliary, the chronic diffuse, and the chronic fibroid forms.

The appearances presented by the tubes vary greatly. In marked cases the tubes are enlarged, the outer end usually being occluded; tubercles are on the surface, and there are adhesions to surrounding structures. The lumen contains yellow caseous matter, sometimes thick, sometimes fluid-like, sometimes partly calcified. In old cases the inner surface is raw and ragged, and studded with tubercles. Rarely the muscular part of the wall is affected. The wall is usually thickened by inflammatory hypertrophy. The tubes are often sausage-shaped, and may fall behind the uterus. They may be very firm to the touch, or may be somewhat cystic.

In slighter cases the tubes may not be much thickened, and the tubercles may not be numerous. These are most numerous towards the outer end of the tube, especially where there is phthisis or a peritoneal affection.

Sometimes there is a single nodular enlargement, formed of several tubercles. Sometimes the tubercular trouble may be so slight that it may be missed on ordinary microscopic examination. Sometimes there may be a condition of tubo-ovarian abscess.

In the cases in which the disease is primary in the tubes, it may be found localised there; and though there be surrounding peritonitis, this may be non-tubercular.

Diagnosis.—There is no distinct method by which the condition can be definitely diagnosed. The symptoms may be masked by those due to tuberculosis elsewhere. Or they may be simply those of pelvic inflammation,

Treatment.—*Prophylactic.*—As tubercle bacilli may enter by the vagina, physicians and nurses should make digital examinations in the most cleanly fashion.

Women should not sleep near a source of tubercular infection, and should avoid coitus with diseased men.

General.—If the case be one of widespread tuberculosis, the treatment is directed towards the general condition.

Operative.—If the tubes are diagnosed they should be removed, provided there is no disease elsewhere, or if there is only a slightly marked degree in the lungs. If, on opening the abdomen, the peritoneum be widely affected, the tubes should be removed. Where the uterus is affected, along with the tubes and ovaries, it is doubtful if Hegar's suggestion of removal of all these parts should be undertaken. Possibly most will prefer to remove the tubes and ovaries and to curette the uterus, applying iodoform to its cavity.

In the above operations, the ovaries are to be taken away with the tubes.

Actinomycosis of the Tubes.

This may be primary and due to infection from without, or may be secondary to the affection elsewhere. The tube becomes enlarged and adherent to surrounding structures. Nodules of the growth are found in the wall, and the lumen of the tube gets distended with pus. Secondary abscesses may result from the tubal condition.

New Growths of the Tubes.

Carcinoma.—This is sometimes primary. It arises in the mucosa, and may be of the papillomatous or adenomatous type. It is mostly found on one side. The ovary is sometimes affected as well. It may lead to closure of the outer end of the tube. Inflammatory changes may be present. In fourteen cases, only one was below the age of 40. The rest varied from 43 to 60 (Sänger and Barth).

Secondary infection may be due to direct spread from ovary or uterus. It may appear in the mucosa or in the outer part of the wall first, and may be papillary, adenomatous, medullary, or scirrhous in type.

The cancerous masses may be found in nodules, or diffused.

Diagnosis.—At first the symptoms may in no way be distinguishable from those of salpingitis. Later, ascites usually develops and cachexia.

Sarcoma.—This is very rare indeed as a primary condition. It may form a diffuse mass or a series of projections in the tube. Sometimes the epithelial elements may show changes, so that a kind of carcino-sarcoma is produced. Sometimes sarcoma may spread from the uterus along the tubes.

Papilloma is sometimes found, non-malignant. It may be cystic.

Myoma, fibroma, and **lipoma** are very rare.

Simple cysts and cystic myomata may develop under the peritoneal covering, and are probably derived from Wolffian remains. Cysts are also found at the fimbriated end, and, rarely, fibromyxoma.

Dermoid cysts of the tube wall are extremely uncommon.

Polypi of the tube may be formed by carcinomatous, sarcomatous, or papillomatous growths; by inflammatory changes; as a result of decidual changes; hæmorrhage into a limited portion of the mucosa.

Treatment.—When new growths of the tube are of such a size or nature as to cause trouble, the tube should be removed either by abdominal or vaginal section.

Differential Diagnosis of Tubal Enlargements.

1. Broad ligament tumours.
2. Ovarian swellings.
3. Tubal or cornual pregnancy.
4. Inflammatory or hæmorrhagic effusions in the pelvic peritoneum or cellular tissue.
5. Retroflexion of the uterus.
6. Subperitoneal uterine fibroid.
7. Retained blood in a malformed uterus.
8. Fæcal masses in the rectum.
9. Cancer of the sigmoid flexure.
10. Burrowing perityphlitic abscess.
11. Kidney displaced into the pelvis.

CHAPTER XIII.

AFFECTIONS OF THE OVARIES.

Anomalies.

Sometimes both ovaries are congenitally absent; this is associated with defective development in the uterus. Sometimes one ovary may be wanting; the corresponding tube is usually absent, and sometimes the corresponding half of the uterus; occasionally the kidney on the same side is wanting.

The ovaries may vary considerably in size, sometimes being very small. In some cases the ovary is divided by a deep fissure, so that one part is almost isolated.

These fissures may be congenital, or they may be caused by inflammation.

Supernumerary ovaries have long been described, but the work of Bland Sutton seems to show that they probably fall under the above category, and that there is no proof that accessory ovaries apart from the main gland exist. He thinks that small fibroids in the broad ligament may have been wrongly described as such.

Hernia of the Ovary.

The ovary alone, or with the tube, omentum, uterus, or intestine, may occupy a hernial sac.

In the inguinal canal.—This is the most frequent variety, but it is a rare occurrence.

According to some, it is doubtful if reported congenital cases are of the nature described; in these instances it is thought likely that the female is possessed of testes which have entered the inguinal canal.

An acquired hernia may occur at any age. Strangulation may occur, and symptoms produced like those in conditions of strangulated epiploceles or enteroceles. Possibly the symptoms may be produced by twisting of the pedicle. Apart from strangulation, there may be distress or pain in the inguinal region, worse at menstrual periods, and sensitive on pressure. The ovary usually becomes adherent.

As to treatment, nothing may be needed; a protecting cap may be worn, or the ovary may be taken away if the pain is troublesome.

Obturator and abdominal herniæ are sometimes found.

Prolapse of the Ovary.

The ovary may be variously displaced.

Etiology.—A considerable proportion of cases develop after labour, when the conditions are favourable, the ovaries having been enlarged and their ligaments softened. A sudden fall or jump, or the lifting of heavy masses, may cause the ovaries to descend. Retroversion drags them down. When enlarged from any cause they tend to sink.

Inflammatory adhesions may contract and drag them down, or enlarged tubes which fall down may displace them.

They may be found in the following situations:—

1. In the pouch of Douglas.
2. Behind the lower part of the broad ligaments.
3. In the utero-vesical pouch.
4. In the cup-shaped depression of an inverted uterus.

The last two are very uncommon.

Diagnosis.—There is pain in the pelvis, increased on coitus and defæcation. There is often much disturbance of health and neurotic complications. On examining the pelvis the ovaries are felt exquisitely tender. The symptoms are aggravated when inflammation is present.

Treatment.—Hot douches, glycerin tampons, and blisters in the iliac regions should be tried. The bowels should be regulated. If the uterus be retroverted, it should be replaced if possible, and kept in position with a Hodge or Albert Smith pessary; if these give rise to pain, a ring may be worn for a time.

When no improvement results from these measures, especially where there is ovaritis or adhesions, the question of removal by abdominal or vaginal section must be carefully considered..

Sänger has recently recommended an operation for restoring the appendages to their normal level. He stitches the uterus to the anterior abdominal wall, and sutures the mesosalpinx to the side wall of the pelvis near the brim level.

Inflammation.

Ovaritis, Oöphoritis.—Inflammation of the ovary is very generally associated with salpingitis. It may be acute or chronic.

Etiology.—The causes are practically the same as described in connection with salpingitis. It is important to note that the commonest cause is micro-organismal infection. Ovaritis may also be caused by arsenic and phosphorus poisoning. It may be secondary to parotitis, usually developing as the attack of mumps subsides; sometimes the pelvic trouble may precede the other.

Pathology.—The inflammation may particularly affect the follicles or the stroma. Generally, in acute cases, the former are markedly affected. The ovary enlarges; the Graafian

follicles swell, their contents becoming cloudy; the cells of the membrana granulosa and discus becoming degenerated, the ovum breaking down and the zona pellucida getting swollen and folded. On the surface the germ epithelium may break down.

There is congestion of the vessels. Exudation takes place in the stroma; small ecchymoses may form. Pus may develop in one or more centres, and may go on to form a true abscess of the ovary.

In advanced cases the ovaries may become smaller, irregular, and cirrhotic. The follicles are destroyed or filled with turbid, thick, or bloody fluid.

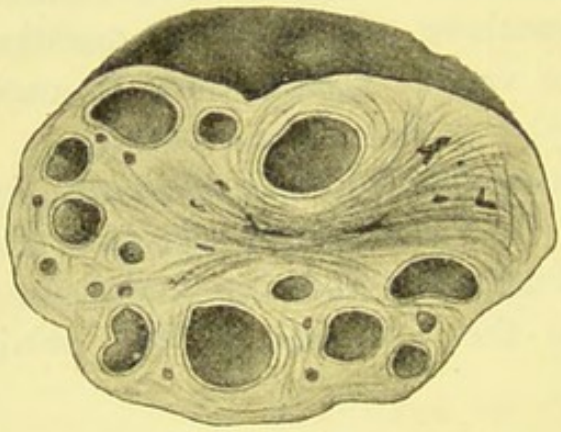


FIG. 99.—Chronic ovaritis, with small cyst-like distensions of Graafian follicles.

An *ovarian abscess* may reach the size of an egg, or more rarely may reach the size of a child's head. It may rupture spontaneously into the intestine, bladder, vagina, or through the abdominal wall, and improvement in symptoms follows this occurrence. Rarely, it may rupture into the peritoneal cavity. Sometimes an ovarian abscess may communicate with a purulent tube (*vide* p. 351).

Periovaritis may be primary or secondary to ovaritis, or associated with it. Adhesions are formed over the ovary, sometimes as strings or bands which may connect it with the broad ligaments, tubes, or pouch of Douglas; rarely with the uterus or intestines. Sometimes, thick capsules may be formed around the ovary. As a result of traction on a small band of adhesion the ovary may be deeply fissured.

Diagnosis.—The symptoms in acute ovaritis are practically the same as in acute localised peritonitis. There is sharp pain in the region of the ovary, which radiates. On examina-

tion, the ovaries are very painful to the touch, and may be felt to be somewhat enlarged.

In chronic ovaritis the symptoms are much the same as in chronic salpingitis. There is the same tendency to the development of ill-health and of neurotic manifestations. Sterility is often the result of double ovaritis. There is generally menorrhagia, often metrorrhagia, sometimes scanty menstruation. The dysmenorrhœa may last through a whole period, but is most marked during the first two or three days.

In cases of abscess, there are usually the ordinary symptoms of this condition.

On physical examination, one side is usually worse than the other. The affected part is tender. It may be felt somewhat enlarged and irregular; or small, irregular, and hard.

Treatment.—The same as in the case of salpingitis. In severe cases operative measures must be carried out, but the greatest care should be taken to ascertain that the need exists, and that the patient's sufferings are not mainly neurotic.

The operative treatment of inflamed ovaries is of three varieties:—

1. Puncture and destruction of small cysts formed in certain cases.
2. Resection of a diseased part.
3. Complete removal.

Puncture.—Anterior colpotomy or abdominal section is performed, the ovary is freed from adhesions, and the small cysts which are present are punctured, and destroyed by means of a galvano-cautery.

Resection.—Anterior colpotomy or abdominal section is performed, and the diseased part of the ovary is cut out. The raw surfaces are then brought together by means of fine catgut sutures (No. 1).

Probably in all cases in which puncture or resection is to

be carried out, the vaginal incision should be employed, unless the vagina be too small.

Removal.—When an inflamed ovary requires removal, the tube is taken away with it, since inflammation is so commonly present in it also. This operation is termed salpingo-oöphorectomy. I have already described it in connection with salpingitis (p. 354). It is carried out either by means of abdominal or vaginal section.

Tumours of the Ovary.

Cystoma.—*Modes of origin.*—The sources of the various cysts which are found in the ovary are generally given as follows :—

1. Distension of Graafian follicles. The small simple cysts arise in this manner.
2. Degeneration of young undeveloped follicles. Most multilocular cysts are believed to arise in this manner.
3. Development of remains of the Wolffian body in the hilum of the ovary. The papillomatous cysts arise in this way.
4. Colloid degeneration of ovarian stroma.
5. Certain embryonic cellular rods, in the cortical layer, probably derived from the germinal epithelium ; some believe them to be degenerated blood vessels.
6. Malignant disease.
7. Of dermoid nature.

Varieties Considered in Detail.

Simple cysts.—The commonest of these is the small *hydrops folliculorum*, due to the distension of Graafian follicles. Several may be found in the same ovary, and they are often associated with inflammatory changes in the ovary. These cysts may be small, or may project from the surface. The contents are usually thin, serous, and

light-coloured, sometimes brownish. The cyst is lined with cells derived from the membrana granulosa. Sometimes the ovary is permeated with these cysts, the stroma being gradually obliterated.

Rarely a single cyst may develop as large as an egg, an orange, or a head. Sometimes the same ovary may be the seat of two or three large cysts, or both ovaries may show the change. They are independent of one another, and one does not grow from the other, as in the case of the multilocular cyst. Sometimes the walls between these may break down. The walls of these are generally thinner than in proliferating cystoma. They are composed of fibrous tissue, and are lined with low cylindrical epithelium. The cyst contains thin serous fluid, with a sp. gr. of 1005 to 1020. Rarely blood or pus is found in it.

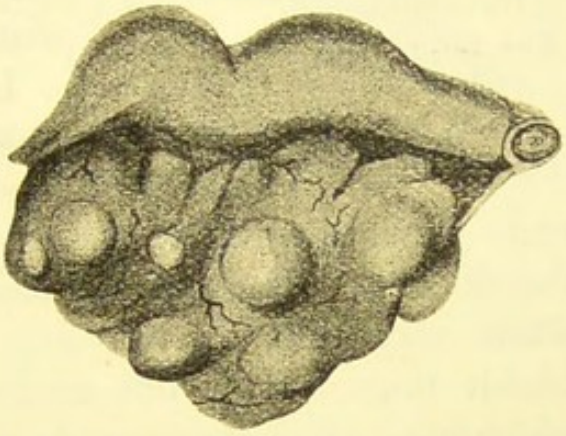


FIG. 100. — Hydrops folliculorum. The ovary is somewhat altered by inflammation, and contains several enlarged follicles.

The causes of the dilatation in these cases is not known. Possibly, sometimes the corpus luteum may be the starting-point of a cyst. Ordinarily these small cysts have no significance. Large ones require to be removed.

Proliferating multilocular cystoma.—These vary greatly in size and structure. They have been known to reach a weight of 100 kilos. The tumour is made up of numerous cysts. The smaller the tumour the more alike in size are the cysts. As it grows, one cyst is apt to develop more rapidly than the rest, especially one situated anteriorly; sometimes two or more cysts reach a large size. In some large tumours no special enlargement occurs, all the cavities remaining small, a section of the mass resembling a honeycomb.

When large and small cysts exist, the latter are found in the walls of the former. They may form projections on the outside or inside; they may sometimes rapidly develop, and tend to obliterate large cavities.

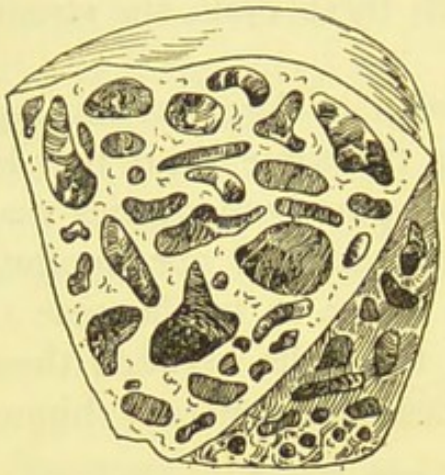


FIG. 101.—Section of an ovarian cyst, in which the cavities are small, and filled with thick colloid material.

Sometimes several cavities may be joined into one, by obliteration of intervening septa. It is by this process that the very large cavities are produced. Occasionally a unilocular cyst may be brought about in this manner.

Large tumours are usually more elastic than small ones. The walls of the individual cysts vary greatly in thickness. The outer wall is usually the thickest. It is of a dulled whitish-grey appearance; when very thin, it has a bluish tinge. It is not so glistening as a peritoneal surface.

These tumours are pedi-culated, the pedicle being composed of broad ligament, Fallopian tube, and ovarian ligament.

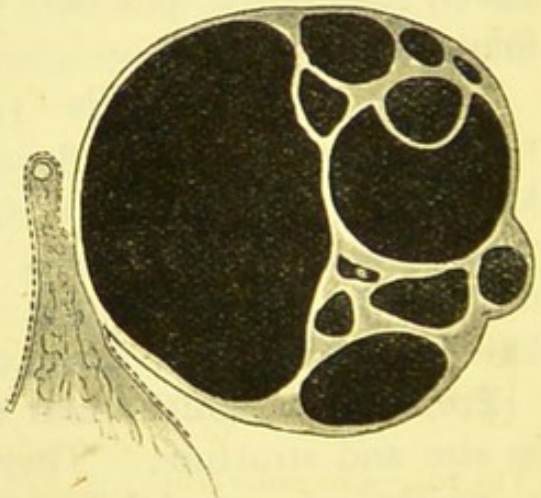


FIG. 102.—A small ordinary multi-locular cystic ovarian tumour. The relation to the broad liga-ment is shown.

Structure.—The outer sur-face is covered with low cubical or flattened epithe-lium, the remains of the germinal epithelium. The main mass of the wall is fibrous, and may be arranged in one, two, or three layers. Near the pedicle smooth muscular fibres are found. The inner wall of the cysts is covered with columnar or cubical

epithelium, usually arranged in a single layer; sometimes these cells are very large and translucent on account of the mucus they contain.

Sometimes solid masses may be found in the walls, projecting into the cavities. These are generally thickenings of the stroma, and may be myxomatous or fibrosarcomatous. Sometimes the proliferating cystoma is associated with the papillomatous growth next to be described.

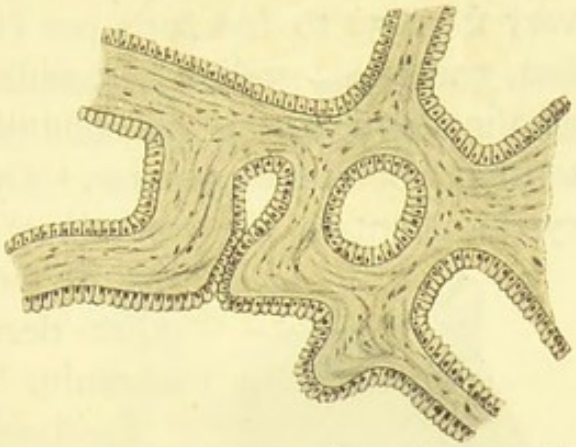


FIG. 103.—Section through a small portion of a multilocular ovarian cyst.

Certain changes may occur in the walls. Calcification takes place sometimes as a deposition in the form of granules or plates. It is the more apt to occur as the nutrition of the tumour is affected, *e.g.* after torsion. Sometimes it may occur in the epithelium or in the cyst contents.

Fatty degeneration is common, especially in the epithelium lining the cysts; it may also occur in the walls, especially in the septa. This change is favoured by impaired nutrition. Atheromatous changes may be also found, and infarcts sometimes occur.

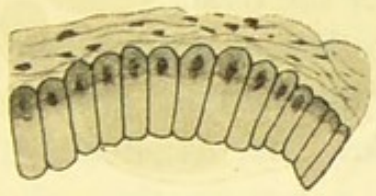


FIG. 104.—Columnar cells lining wall of ovarian cyst.

The contents of these tumours vary considerably. They are generally viscid, ropy, glairy, gelatinous, or colloid. The specific gravity varies from 1010 to 1013. Often as the cysts grow very large their fluid becomes thinner. The gelatinous masses in the smaller cysts are often very tough and are removed with difficulty from the wall. Sometimes the partitions between a number of these small masses may degenerate, and large portions of the gelatinous substance

may show the remains of these as whitish lines running through it. Sometimes altered blood may be mixed with the contents; in certain conditions pus may be present also.

The chemical reaction is neutral or alkaline. The solids vary from 50 to 100 parts per 1000, and consist of proteids, fats, and salts; sodium chloride is the most abundant salt; alkaline and earthy phosphates are also found. Cholesterin is sometimes present. Other salts, *e.g.* leucine, urea, cystin, allantoin, are sometimes found. The proteids consist of metalbumin, paralbumin, and other derivatives, probably, of true albumin. Mucin is also present.

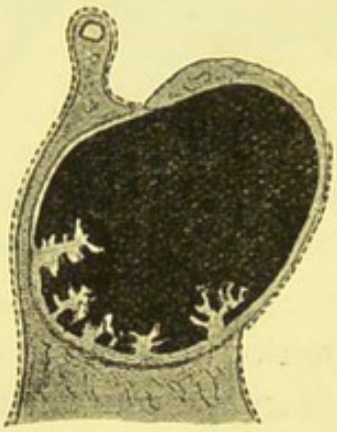


FIG. 105. — Papillomatous cyst, growing from the hilum of ovary, and extending into the broad ligament.

Epithelial cells, more or less degenerated, may be found in the fluid; granular masses, blood corpuscles, granules of pigment, leucocytes, pus cells, cholesterin. There are no pathognomic cells.

Papillomatous cysts.—These are often bilateral, and do not generally reach the size of ordinary multilocular cysts. They are generally developed from the hilum of the ovary.

The number of cavities is small; there is often only one. On the inner wall are papillomatous growths, arranged as densely massed nodules, or as detached branching nodules, from the size of a pea to that of a nut, rising from a pedicle. They vary in colour from white to red; sometimes they are hard from calcareous deposition.

The larger a cyst, the smaller the proportion of papillomatous growths it is apt to contain. Some small cysts may be entirely filled with them. Usually a bit of the ovary is found in the outer wall of the tumour.

The tumours tend to grow between the layers of the

broad ligaments, and therefore to be covered with peritoneum. The uterus is displaced by the growth, which may develop under the peritoneum of the pelvic floor, or in the mesentery of the sigmoid flexure or intestines. It may also come into direct relationship with the bladder or abdominal wall.

In cases in which the tumour does not grow extraperitoneally, it is pedunculated like the ordinary cyst. The main mass of the wall is fibrous tissue. The epithelial

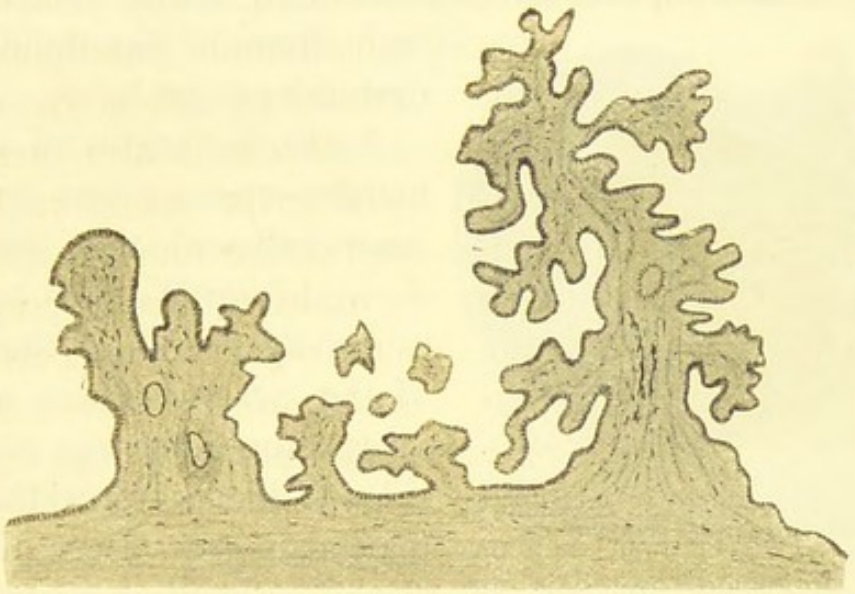


FIG. 106.—Section through projections on wall of papillomatous cyst growing in hilum of ovary.

lining is chiefly cylindrical, and for the most part ciliated; the cells vary greatly in height, in many parts being cubical. The papillomata are usually covered with the cylindrical cells.

The stroma of the projections is delicate connective tissue. They are vascular, and bleed easily. Calcareous concretions are apt to develop in the stroma of the wall and in the papillæ. As the papillomata grow they may perforate the walls of their cysts, and extend into neighbouring cavities. They may perforate the outside wall and fasten the tumour to surrounding parts, *e.g.* pelvic floor, uterus, rectum, bladder. When rupture occurs into the

peritoneum, dissemination may take place quickly, the growths continuing and growing into other organs. Hydroperitoneum accompanies the development of these secondary masses.

The pouch of Douglas, the omentum, and mesentery are most abundantly covered with the growths after rupture.

These tumours usually contain opaque, dirty yellowish, serous fluids, not ropy nor colloid. Free portions of the growths may be found in the fluid.

Sometimes papillomatous characters may be found along with those of the proliferating cystoma proper.

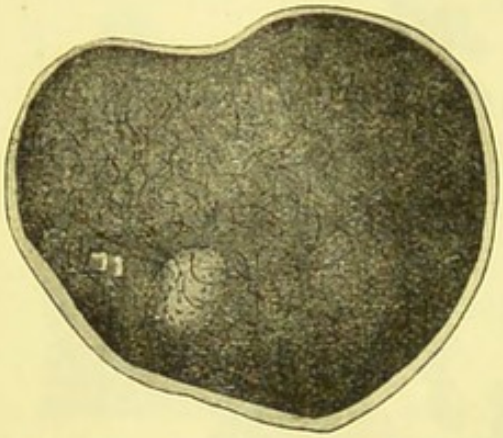


FIG. 107.—Cavity of a dermoid cyst. Two teeth, a mamma-like projection, and hair are attached to the wall.

As to the origin of papillomatous cysts, it has generally been believed that they are derived from Wolffian remains, especially found in the hilum of the ovary. There is good reason for believing, as Whitridge Williams states, that they may also grow from the germinal epithelium, and from Graafian follicles. Williams thinks that sometimes they may arise from the fimbriæ of the tube, which become adherent to the ovary.

Dermoid cysts.—These are the cysts in which certain of the elements of the integument predominate, *e.g.* sebaceous and sweat glands, nail, mammæ, nipples, hair, teeth, etc. Mucous membrane elements are also found in some. They may grow to be as large as an adult head, but ordinarily they are met with smaller than this. As a rule they are unilateral, but they may be found in both ovaries. They are almost always unilocular, but two may be found in one ovary. The walls are often thick, but may be thin. The inner surface may be smooth in large part, with projecting skin-like portions, on which hair grows; it consists of

stratified squamous epithelium. In some cases it has the structure of a mucous membrane, being lined with columnar epithelium and mucous glands.

Bones and teeth are not constant constituents. The former are situated in the connective tissue of the wall; sometimes pieces of bone are connected by joints. The teeth are in the connective tissue, but may project into the cavity; they may be fixed in bony plates. The crowns usually slope towards the median plane of the body. Occasionally a milk-tooth may be found in course of absorption, another growing beneath it. Grey matter of the central nervous system has been found; rarely, medullated nerves. Sometimes nerves can be traced from the grey matter to bone and other tissues.

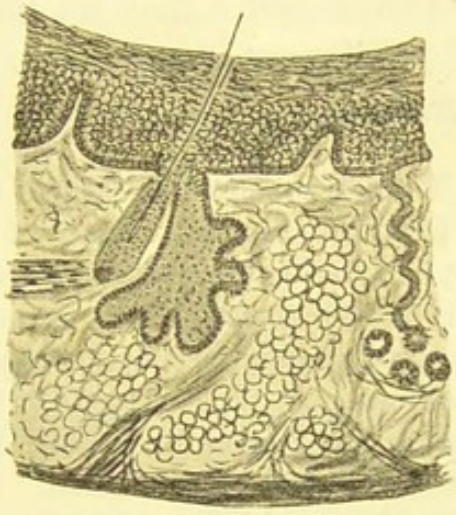


FIG. 108.—Section through wall of a dermoid cyst. The skin-like character of the inner wall is shown.

Nail is very rarely found. Hair is often found of great length. It may be white in elderly people. It tends to be shed and to lie in the cavity.

The sebaceous glands may give rise to wens, and "horns" may grow from them. Nipple-like projections are occasionally found, sometimes surrounded with an areola. Rarely these may be associated with small mammæ, which may produce colostrum. Bland Sutton has found a thyroid gland; Virchow has described smooth muscular fibres.

The dermoid usually contains a thick oily material, containing fat, epidermic cells, hairs, and sometimes cholesterin. On removal from the body the fat hardens. In it are sometimes found "epithelial pearls," formed of shed masses of concentrically arranged epithelial cells.

When mucous membrane lines a cyst, it may secrete

mucus. Some dermoids may contain no fluid. There may be retention cysts derived from the sweat glands.

Sometimes colloid degeneration is found in the stroma of a dermoid.

A dermoid and a proliferating cystoma may coexist in the same ovary. It may be associated with a malignant growth. If a dermoid ruptures, there may result epidermal implantation on different parts of the peritoneum. It is generally believed there is some special tendency to malignancy in dermoids, but this has not been definitely established.

Doran states that he has frequently observed the growth of malignant tumours in the abdomen after removal of dermoids.

Theories as to the origin of dermoids.—Some believe that early in fœtal life, certain portions of the fœtal layers, epecially the epiblast, get included in the developing ovary. While the main part is epiblastic, it is likely that mesoblastic elements are also included, helping to explain the development of bone and muscle.

Others, *e.g.* Waldeyer, think that the epithelial elements in the ovary may in these cases have some special formative power, producing elements other than epithelium. (As Olshausen points out, if this be the case, the production of such a varied assortment of elements might deserve the name of a "parthenogenetic development.")

Bland Sutton thinks that "the epithelium of the ovarian follicle is the source of all the structures found in ovarian dermoids." He makes a sharp distinction between dermoids and teratomata, the latter being due to suppressed teratomata.

Olshausen, on the other hand, thinks that the development of teratomata in the ovary is due to fœtal inclusion, and that there is no practical genetic distinction between ovarian dermoids and teratomata.

It is important to note that an old tubal pregnancy which had undergone lithopædion formation, and with which the ovary has been closely blended, has often been wrongly described as either a teratoma or a dermoid.

Bland Sutton has pointed out that "in women *dermoids have never been found growing primarily from any abdominal viscus, save the ovary.*"

Development and growth of dermoids.—They are the most frequent tumours in the abdomen before puberty, and

may be met with in early childhood. The majority are only recognised, however, after puberty. They may be found in very old age. They usually grow very slightly in the course of years. At puberty the most rapid increase occurs in them. Sometimes the genitals are imperfectly developed in the case of a dermoid of the ovary, but occasionally premature development is marked.

Peritonitis is very prone to occur around dermoids, and torsion of the pedicle is common. Suppuration, gangrene, and rupture of the wall may take place.

In many cases only slight pressure disturbances are produced. Marked enlargement may be due to colloid degeneration, to retention cysts, or to the growth of an accompanying proliferating cystoma.

Broad Ligament Cysts.[1]

Parovarian cysts.—Certain small cysts, rarely larger than a pea, may develop with the short tubules external to the ovary, known as Kobelt's tubes; these are of no importance. They must be distinguished, however, from the hydatid of Morgagni (*vide* p. 15).

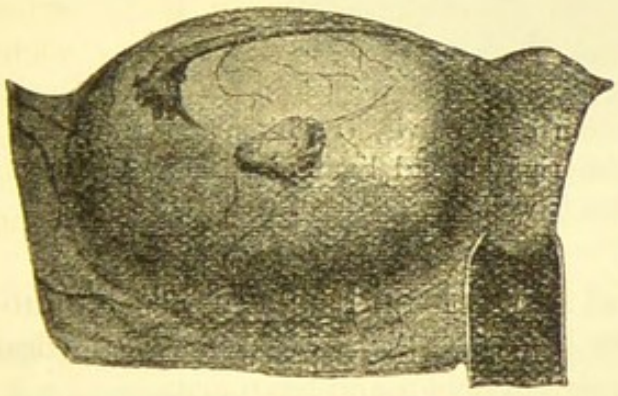


Fig. 109.—Parovarian cyst of left broad ligament. Ovary and tube are seen on the wall of the cyst.

The important cysts are formed from the tubules of the organ of Rosenmüller, between Gartner's duct and the hilum of the ovary. These cysts are almost always unilocular. Only one cyst may exist, which grows to a considerable size, sometimes reaching into the abdomen; or two or three small ones may exist side by side.

[1] These are conveniently studied here.

Small cysts are translucent; in large ones the walls thicken somewhat, though it always remains a thin membrane. The peritoneal covering is somewhat movable on the surface, and in life is seen to contain numerous vessels. It can usually be stripped off the tumour with ease. The main thickness of the wall is fibrous tissue. The lining in small cysts consists of columnar epithelium ciliated in parts. In large cysts the epithelium is compressed, and may be cubical or flattened; it may be found in more than one layer. No papillary projections grow on the wall.

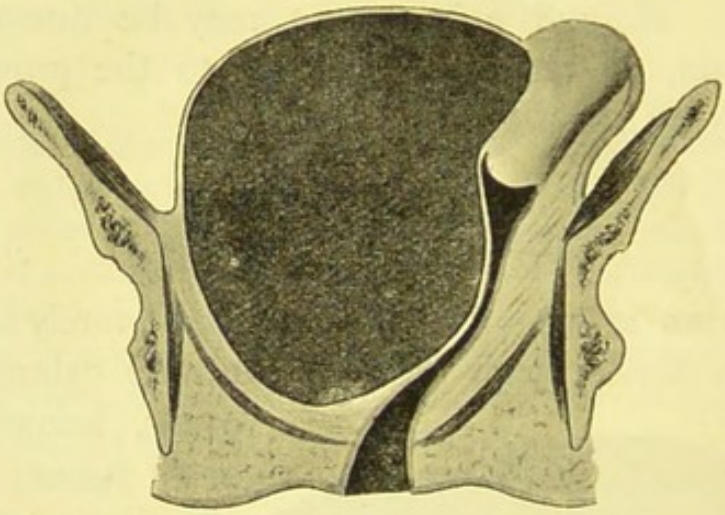


FIG. 110.—Coronal section of a pelvis, containing a large parovarian cyst of the right broad ligament. The displacement of the uterus is well seen.

The fluid is thin and limpid and alkaline. Specific gravity 1002 to 1008. It contains little proteid matter, but occasionally there is paralbumin. In large cysts the fluid may be turbid, and may contain cholesterin. Sometimes a fluid of high specific gravity may be found.

These cysts are usually non-pedunculated, but a pedicle may form, owing to the bulging of the tumour in one direction.

As the cyst grows, the Fallopian tube is stretched over it and elongated, its walls being thinned. The ovary is drawn towards it, and may be closely applied to it; it may become

greatly stretched or flattened, appearing as a mere thickened portion of the cyst wall.

As the cyst develops, it burrows beneath the peritoneum and may pass beneath the pouch of Douglas to the opposite side, and may reach rectum, cæcum, or colon. It may lie in contact with bladder, uterus, and pelvic floor. Thus these various structures may be considerably displaced.

The cyst grows slowly, and may be stationary for years,

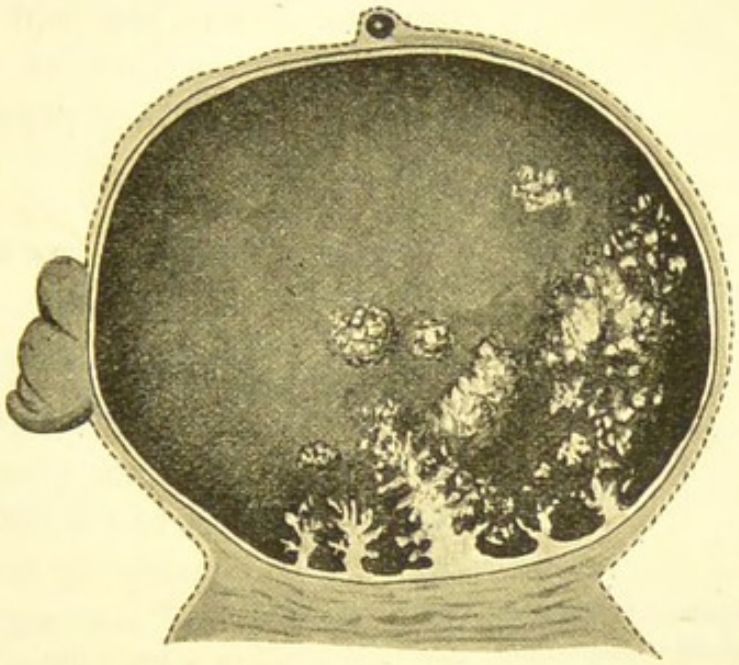


FIG. 111.—Section through a papillomatous cyst of the broad ligament. The tumour has widely separated the layers of the ligament. The ovary and tube are seen.

giving no trouble. It tends to rupture spontaneously, the fluid being quickly absorbed.

The process of refilling occurs slowly after rupture or puncture, *e.g.* months or years may elapse. Adhesions are not often met with. Torsion is rare.

Time of occurrence.—These cysts are very rare before puberty. A considerable proportion are met with in the years following puberty, but they may be found as late as the age of 60.

Papillomatous cysts.—These are unilocular, and contain

on their inner surface papillary projections, similar to those described in papillomatous cysts of the ovary.

They develop extraperitoneally, as has been described in the case of parovarian cysts. Their significance is the same as that of papillomatous cysts of the ovary.

They originate from remains of the Wolffian body within the broad ligament. Bland Sutton thinks that some of them may arise from remains of Gartner's duct.

There is one variety in which the warts are very hard, differing from the soft vascular papillary projections so characteristic of the common papillomatous cyst.

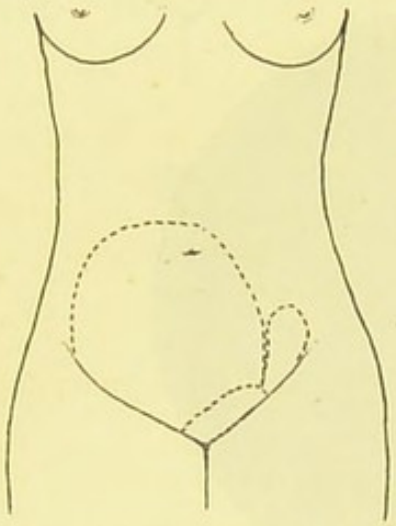


FIG. 112. — Outline of a broad ligament cyst of the right side displacing uterus and bladder.

VARIOUS CHANGES IN OVARIAN CYSTS.

Torsion.—Rotation of the cyst may occur, causing a twist in the pedicle. This takes place in varying degrees, *e.g.* half a turn may be found, or as many as five or six. The causes are not well known. They are said to be—the influence of a growing pregnant uterus; emptying of the pregnant uterus; sudden alterations of intra-abdominal pressure, *e.g.* lifting, unequal growth of the tumour, movements resulting from a physical examination.

Predisposing factors are ascites, and a long pedicle. Dermoids are especially liable to torsion. Torsion interferes with the nutrition of the tumour, and various results may follow.

Œdema of the pedicle and tumour occurs, marked venous engorgement, hæmorrhage into the cyst wall or cavities, which may cause great anæmia or death; peritonitis, leading to adhesions with surrounding structures; in some

cases, gangrene of the cyst. Gangrene is probably due to the entrance of micro-organisms from adherent bowel.

Where gangrene does not occur, the tumour may shrink in size. Sometimes the pedicle may be completely divided. The veins thrombose, and the tissues become brittle and tend to be easily severed. The tumour may continue to be nourished by means of the circulation carried on through the adhesions; it is doubtful if it can increase much in size in this condition.

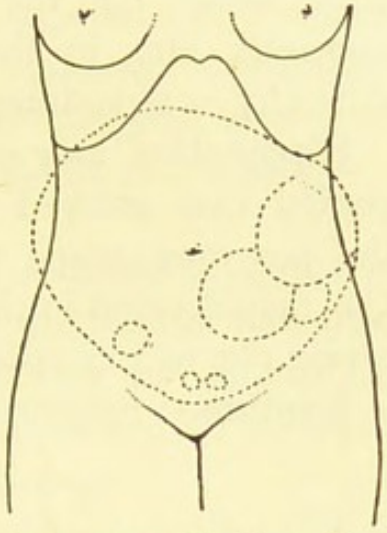


FIG. 113.—Outline of a large ovarian cyst. The irregularities due to small projections of the wall are shown.

The tumours which have been most frequently described as undergoing this change are dermoids.

Sometimes the intestine may be obstructed by a twisting tumour.

Inflammation.—Adhesions are comparatively common in ovarian tumours. This is probably due to micro-organismal infection through the Fallopian tube, vermiform appendix, or bowel. Tapping was a frequent source in the pre-antiseptic days. Adhesions may take place between the tumour and the parietal or the visceral peritoneum. The larger the cyst the more likely there are to be adhesions. Those on the anterior wall are the most frequent and extensive, owing to the more constant pressure there. Next in frequence are omental adhesions, then intestinal, then vesical, uterine, etc. The condition of the case is thereby rendered much worse as regards operative

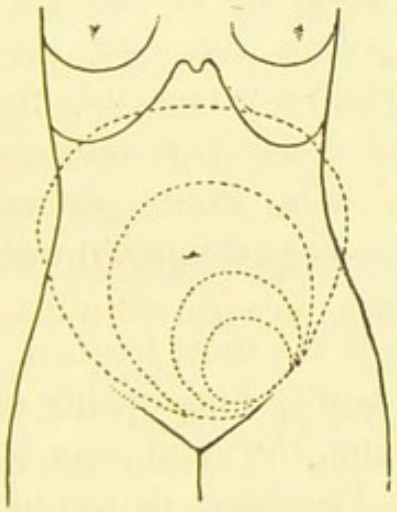


FIG. 114.—Outline showing the gradual increase in size of an ovarian cyst.

treatment. There may be great risk of tearing through a large vessel, *e.g.* the iliac, through the ureter, vermiform appendix, etc., in the removal, while there may be great difficulty in separating bowels from the wall.

Suppuration may occur in some cases. This is accompanied with marked formation of adhesions. Sometimes the pus may escape to the exterior by one or other route. Gas may develop in the cyst in connection with suppuration, giving rise to a tympanitic note on percussion.

Rupture.—Rupture of an ovarian cyst may occasionally occur. The causes vary. The wall may grow very thin at one place and gradually burst; or the thinness may be due to the development of secondary cysts in the main wall. In such cases there may be several points of perforation. Hæmorrhage in the wall or in the cyst may lead to rupture. Thrombosis of vessels may occur, followed by fatty degeneration and softening, or gangrene of the wall. Suppuration within the cyst may cause it. In papillomatous cysts the papillary growths may perforate the wall. Blows, falls, injury during labour or physical examination may cause rupture.

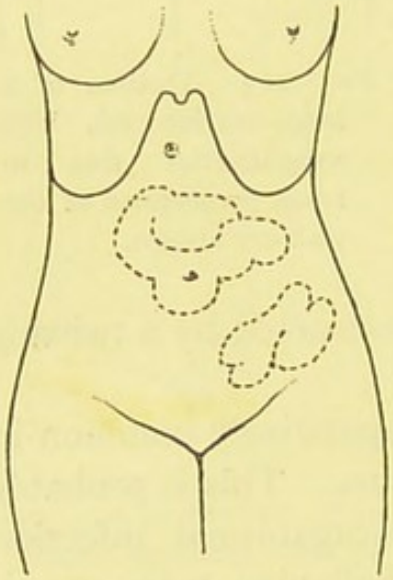


FIG. 115.—Outline showing irregular swelling in abdomen, due to fæcal accumulation.

Rupture into the peritoneal cavity is the most frequent; the results of this depend on the quantity and quality of the fluid. In some cases, after rupture, the fluid may be absorbed and the rent close again. The least dangerous fluid is that in the unilocular cysts. In other cases the contents are difficult of absorption, and may remain for quite a time in the peritoneum without leading to changes. If, however, the colloid matter be mixed with blood, pus, or the contents of a dermoid, peritonitis is apt to be set up,

and this may prove fatal. If much fluid escapes, the tumour diminishes in size and shape, and becomes flaccid in part. After papillomatous cysts rupture, secondary papillary developments generally take place in the peritoneum. Fluid is also increased in the latter—hydro-peritoneum.

When the fluid is gelatinous or colloid, small masses of it often become attached to the peritoneum, which becomes congested and roughened. This may lead to crepitus on palpation. These have been wrongly described as *myxoma peritonei.* They are really pseudo-myxomata.

Perforation into the intestines may occur, most frequently into the rectum. This may lead to improvement in some cases ; but, sometimes, infective inflammation or gangrene may be set up. Rupture into the stomach or small intestine is rare.

It may also take place through the bladder, vagina, abdominal wall, or Fallopian tube.

Hæmorrhage in the cysts.—Sometimes this may be due to rupture of a vessel in connection with the increase in size of a cyst. It may occur after puncture. In papillomatous cysts spontaneous hæmorrhage may take place. The most common cause is torsion of the pedicle. Generally it is slow and gradual, but it may be sudden and extensive.

Suppuration and gangrene.—These may follow puncture, torsion of the pedicle, communication with the bowel. After labour they may take place, an important factor in their causation being the damage sustained to the cyst wall by the pressure it has borne.

Symptoms Associated with Ovarian and Broad Ligament Cysts.

By far the greater number develop slowly, producing no symptoms until considerably advanced, the cysts reaching

above the umbilicus, it may be; often the patient only discovers the mass accidentally. One of the commonest early symptoms is vesical tenesmus, constipation, or pain on defæcation. Sometimes pains in the pelvis or abdomen are first noted. There may be nervous phenomena, *e.g.* syncope. Generally the patient only begins to feel ill when the stomach functions are altered.

Dyspeptic symptoms gradually develop, and nutrition suffers. The patient loses strength. Abdominal pains may develop from peritonitis. Œdema of the lower part of the body may supervene, and death may occur from exhaustion.

Sometimes symptoms may develop early, when the tumour is small and in the pelvis; such as pelvic pains and difficulty of micturition and defæcation. These pass away if the tumour rises out of the pelvis. Attacks of pain are produced also when the tumour is small, as a result of peritonitis or torsion.

It is best to consider the symptoms, as Olshausen does, according to the following plan :—

Symptoms produced by ovarian disease per se.—These mainly refer to menstruation. As a rule it is not much interfered with. But all forms of disturbance are found in the course of the disease. Dysmenorrhœa is very rare. Early menorrhagia is somewhat frequent, and, with metrorrhagia, is found especially in double broad ligament cysts, probably due to interference with the pelvic circulation. As a result of this loss of blood considerable anæmia may follow.

Amenorrhœa is often found. If the patient's health be good, this may be due to bilateral cysts of the ovaries, malignant disease, pregnancy. But often it may be due to a poor general condition of health.

Sterility may result from ovarian tumours, though pregnancy may take place with a large cyst or even with bilateral ones. It is important to note that these tumours

may cause certain signs of pregnancy, *e.g.* mammary areola, enlargement and pains in the breasts, secretion of colostrum.

Symptoms due to pressure of the cysts.—Small tumours impacted in the pelvis cause pelvic pains, difficulty in micturition and defæcation. These are aggravated if inflammation supervenes.

Large tumours growing into the abdomen may also drag on the bladder and cause tenesmus; this may also produce dragging pains. Digestion is interfered with, as the stomach and intestines are pressed on, though alterations may not be marked for a considerable time. In extreme cases the diaphragm is pressed upwards and breathing is interfered with. The heart may also be displaced upwards, and palpitation produced.

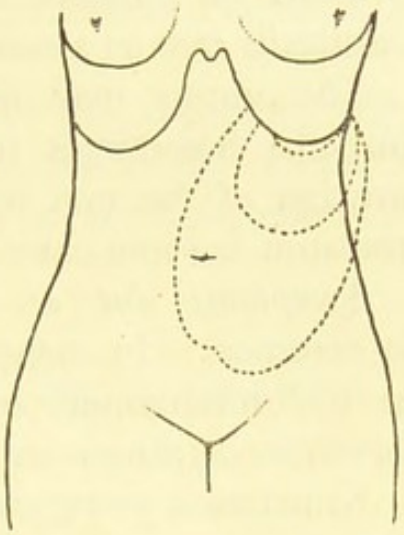


FIG. 116.—Outline showing the gradual increase in size of a splenic tumour.

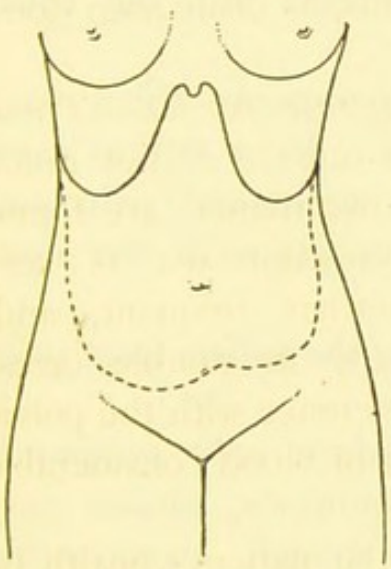


FIG. 117.—Outline of a liver greatly enlarged with malignant disease.

The renal veins may be pressed on, and albuminuria caused. The ureters may be pressed on, leading to their dilatation and to hydronephrosis. This may lead to suppression of urine.

In many cases of large cysts it has been noted that small amounts of concentrated urine are passed, depositing mixed urates on standing.

Cystitis may be caused by ovarian cysts, and when septic may lead to kidney infection. In patients dying with large ovarian tumours, or dying after ovariotomies, it has been remarked that kidney disease is very often present.

Hæmorrhoids, varix, and œdema of the lower limbs, as a result of pressure on abdominal veins, is not frequent. Ascites is rare as a result of mere pressure.

The uterus may be pressed upon and somewhat displaced. Sometimes it may be dragged upwards by the traction of the cyst on the bladder. It may be made to prolapse in some cases. Umbilical hernia may result.

Symptoms due to complicating conditions.—Peritonitis is common. In many cases no symptoms are produced in the development of even marked adhesions. It may, however, be associated with pains.

Sometimes, owing to pressure or to adhesions, the bowel functions are disturbed, irritation and diarrhœa being caused.

Hæmorrhage into the cyst may cause no symptoms in cases where it is slow and scanty. Sometimes it may produce acute anæmia, collapse, quick feeble pulse, and may lead to death.

Suppuration or gangrene is associated with the usual symptoms of septic infection.

Torsion of the pedicle produces symptoms which vary according to acuteness of the attack. In a typical case, suddenly produced, there is sharp abdominal pain and shock; if marked hæmorrhage takes place in the cyst, additional symptoms are present.

If the patient gets over the attack, she suffers from poor health, peritonitis being present.

Slowly produced torsion may produce only symptoms of chronic peritonitis. Sometimes, however, torsion may exist with no inflammation, even though considerable hæmorrhage occur in the cyst.

Rupture of the cyst may be followed in some cases by no symptoms when innocuous fluid escapes into the peritoneal cavity.

When harmful fluids suddenly escape, there may be collapse, shock, or symptoms of acute peritonitis. In other

cases, especially where rupture occurs slowly, peritonitis may only gradually be developed. Often, marked diuresis and diaphoresis take place.

When rupture has taken place into the intestines, the cyst contents are passed by the rectum, and violent diarrhœa may be set up. When the bladder is opened into, tenesmus and dysuria are marked.

Physical Signs in Ovarian and Broad Ligament Cysts.

I. OVARIAN CYSTS.

(*a*) **Entirely within the Pelvis.**

1. *Lateral to the Uterus.*

Physical signs.—Bimanually, a rounded, firm mass is felt at the side of the uterus, movable unless fixed by adhesions. If very small, it may be at the normal level of the ovary; if larger, on a lower plane, usually behind the broad ligament, rarely in front of it. These small cysts rarely feel elastic or give fluctuation.

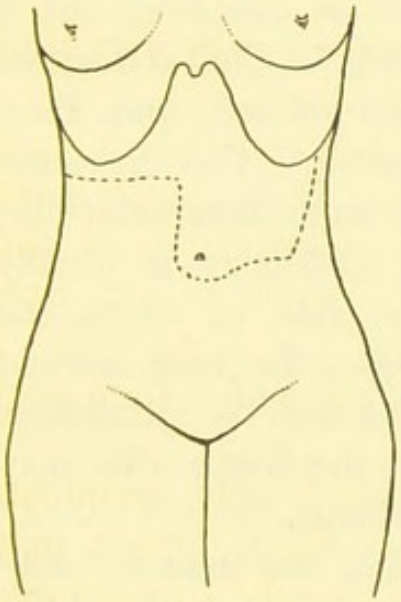


FIG. 118.—Outline of an enlargement of the left lobe of the liver, due to malignant disease.

2. *Behind the Uterus.*

Physical signs.—Bimanually, a rounded, firm mass is felt in the pouch of Douglas, pushing the uterus to the front; if it be not impacted nor adherent it may be moved freely. Sometimes it may feel quite solid, especially in the case of dermoids. The connection of the pedicle with the uterus may be made out, especially by rectal examination, or on pulling down the uterus with forceps. Some-

times it is necessary to pass a sound to distinguish the uterus clearly.

These small ovarian cystomata in the pelvis must be distinguished from—

1. Encysted peritonitic effusions.
2. Cellulitic deposits.
3. Hæmatocele and hæmatoma.
4. Broad ligament cysts.
5. Hydro-, hæmato-, and pyosalpinx.
6. Ectopic gestation.
7. Fibroid and fibrocystic tumours of the uterus.
8. Retroversion of the gravid uterus.
9. Solid ovarian tumours.

(*b*) When the Cyst is Large and Abdominal.

On inspection, the abdomen is larger than normal. The distension may be especially marked on one side, but it is often uniform. The abdominal veins are often dilated, and lineæ albicantes present. The measurement from the anterior-superior iliac spine to the umbilicus is usually greater on the side to which the tumour belongs. In very marked cases the abdomen is pendulous and smooth; the lower ribs may be curved outwards.

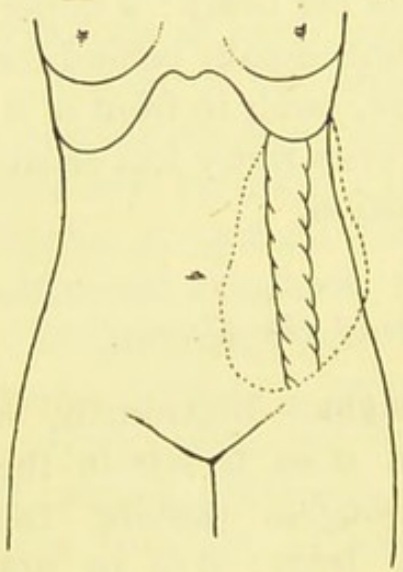


FIG. 119. — Outline of a left renal tumour, with the descending colon in front of it.

On palpation, the tumour may be defined above and at the sides, except when very large, or the abdominal wall too thick or tense. It is felt to be more or less spherical, but irregularities may develop as secondary cysts become marked. The resistance is elastic in parts, or over the whole tumour, and fluctuation may be

obtained, except in cases where the cyst contains numerous small cavities or thick fluid; or where the abdominal walls are thick. Sometimes, in a lax condition of the abdomen, the hand may be passed around a considerable part of the tumour. On bimanual examination, the uterus can usually be made out distinct from the tumour (unless adhesions exist), separately movable, displaced and attached by means of the pedicle at one corner.

The uterus is generally anterior to the cyst. It is often elevated, and is usually on one or other side of the middle line. It may be elongated by traction. In some cases it is not raised up. It may be found retroverted, laterierted, or prolapsed. Its mobility is the more interfered with the larger the cyst.

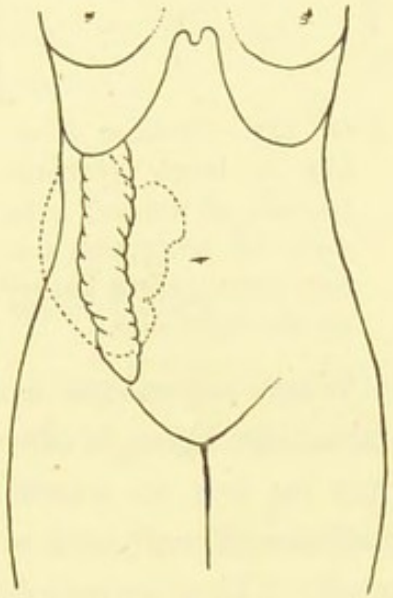


FIG. 120.—Outline of a right renal tumour, with the ascending colon in front of it.

The vagina is elongated if the uterus is dragged upwards.

Fluctuation may be often felt bimanually. It is important to note that no variations in the consistence of the cyst wall take place from time to time.

On percussion, various signs are obtained. If the patient be in the dorsal position, in the case of a not too large cyst, there is dulness over the tumour, and it is surrounded above and laterally by a resonant note due to intestines; the latter varies, of course, according to the presence of fæces in the bowel, and it may be altered, especially, at the sides, by fluid in the peritoneal cavity.

On changing the position of the patient, the percussion results are found to be the same, though there may be variation if the tumour is not very large and very movable.

In cases of the largest cysts, the intestines are so pushed

back that they only give a note in the loins. The transverse colon and stomach do not reach the abdominal wall. The hepatic dulness disappears anteriorly as far round as the axilla. The diaphragm is pushed up, and may reach as high as the second rib on the right side. The lungs and heart are markedly displaced upward. Splenic dulness is lost.

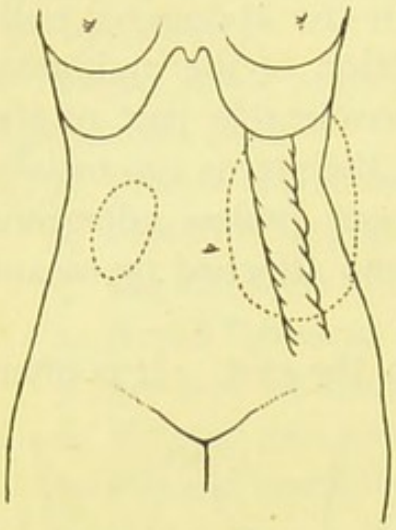


FIG. 121.—Outline showing a large hydronephrosis of the left side, and the projection due to a suppurating kidney on the right side.

On auscultation, no bruit is heard, as in the case of a fibroid or a pregnant uterus. Friction or creaking may be heard when there are peritonitic thickenings, or when colloid matter escapes from the cyst, or from one cyst cavity to another.

When adhesions are present, there may be tenderness on palpation, though often this is absent. Sometimes the cyst may be felt to move only with the abdominal wall, and not independent of it. The intestines may be adherent in front of it, giving a tympanitic note. In a large number of cases it is impossible to diagnose adhesions.

When rupture occurs, and a considerable quantity of fluid escapes, the tumour may have been found to diminish in size, to change in shape, and to show flaccidity. Free fluid may sometimes be detected in the peritoneal cavity.

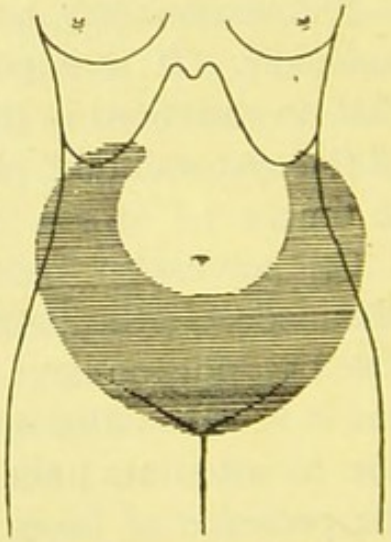


FIG. 122.—Outline showing free ascitic fluid in the abdomen when the patient lies on her back.

Differential diagnosis of large ovarian cysts.—There are many abdominal and pelvic swellings, which it may be difficult to distinguish

from these large cysts. The most important are as follows :—

1. Fluid in the peritoneal cavity free or encysted.
2. Fibroids and fibrocystic tumours of the uterus.
3. Distended bladder.
4. Obesity.
5. Phantom tumour.
6. Pregnancy ; hydramnios.
7. Hæmatoma ; hæmatocele.
8. Ectopic pregnancy.
9. Omental, mesenteric, and retroperitoneal tumour.
10. Renal, splenic, and hepatic enlargements.
11. Fæcal accumulation.
12. Hydatid cysts.

(*c*) When there is a Cyst in each Ovary.

This condition can only be exactly diagnosed when the tumours are not too large, or not too close together ; also, it is easier when they are unequal in size.

Where two large cysts are close together, the sulcus between them may be mistaken for the depression between two parts of the same cyst, and *vice versâ*.

If the cysts are not very large and not adherent, independent movements can be got in them. Sometimes they may become firmly joined, and communication may open between them.

II. BROAD LIGAMENT CYSTS.

Small ones may be felt bimanually. Large ones are recognised as fixed in position (very rarely they may become pedunculated). They are close to the uterus, which is felt displaced in most cases upward, forward, and to one side. The bladder and bowel may also be displaced. The tumour may thus have a tympanitic note

over it. Per vaginam the cyst may be felt low in the pelvis.

In the case of the parovarian cyst, the wall is felt to be thin and flaccid, and fluctuation easily obtained. It is of very slow growth usually. In some cases, owing to the flaccidity of the cyst, it may be entirely missed when a bimanual examination is made.

Broad ligament cysts are usually less round and circumscribed than are ovarian. They are not elastic in feeling when small.

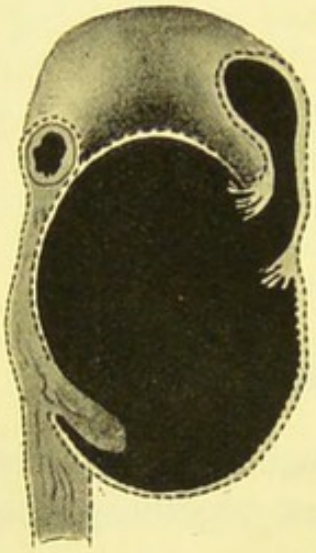


FIG. 123. — Ovarian hydrocele, due to distension of ovarian sac of peritoneum. The relations of tube and ovary are seen.

Sometimes, in the papillomatous cysts, the papillary growths may be felt bimanually; if perforation of the wall occurs, these may be more readily recognised, and the accompanying ascites made out.

OVARIAN HYDROCELE.

This term has been given by Bland Sutton to a sac containing thin fluid found occasionally on the posterior layer of the broad ligament. The outer end of the Fallopian tube, which is elongated and somewhat dilated usually, communicates with the sac. In small cysts the ovary projects on the floor of the sac; in large ones it is spread out and blended with the sac wall, often being unrecognisable as a distinct structure.

The condition is due to the distension of a fold of peritoneum, which occasionally surrounds the ovary—the so-called "ovarian sac." This sac, in certain mammals, exists normally as a covering to the ovary, *e.g.* hyæna, rat, mouse, mare, guinea-pig. In others, *e.g.* porcupine, baboon, the sac is only partly formed. Cases of ovarian hydrocele are sometimes found in some of these mammals.

The hydrocele may empty itself from time to time through

the tube and uterus. Sometimes the contents become purulent.

Solid Tumours of the Ovary.

Fibroma.—Fibroma of the ovary is rare. It may occur on one or on both sides. It forms a hard, smooth, or nodular mass, and may be found at one special part of the ovary, or may obliterate the whole organ.

Fibromyoma.—This tumour is sometimes met with. It may have the appearance of a uterine fibromyoma; but in some cases it is difficult to distinguish from a fibro-sarcoma.

Sarcoma.—The spindle-cell form is more frequent than the round-cell variety. It may occur in infancy or in adult life. On microscopic examination various appearances are found. Sometimes there may be a resemblance to carcinoma; possibly, as Bland Sutton suggests, in some cases the entangling of the Graafian follicle in the sarcomatous tissue may account for this appearance.

These tumours grow rapidly, and may produce metastases, especially in the peritoneum, intestines, stomach, and pleura. Ascites usually develops. Cystic changes may occur in the tumour as a result of fatty degeneration, mucoid change, or hæmorrhage.

The tumours are rounded masses, with a fairly regular surface, or they may be nodular. They may occur bilaterally. Adhesions are often present.

Carcinoma.—This neoplasm may occur primarily or secondarily in the ovary. The scirrhous, encephaloid, colloid, and papillary varieties may be met with.

Primary cancer is especially apt to occur along with ovarian papillomatous cysts; also with ordinary cysts and dermoids. It may be bilateral. It grows rapidly and tends to produce ascites; secondary deposits are most frequent in the retroperitoneal glands, peritoneum, stomach, intestines, and liver.

Secondary cancer of the ovary may follow the disease in other parts, *e.g.* uterus, mammæ, pylorus.

Papilloma of the ovary.—Occasionally the ovary may present papillomatous growths from the surface, exactly resembling those found in papillomatous cysts. They may be found without any cystic changes in the ovary. Williams believes that they are always derived from the germinal epithelium. They may extend to surrounding peritoneum, and small portions may be implanted.

Tuberculosis of the ovary.—This is not so frequent as in the case of the tubes and uterus. It usually occurs along with tuberculosis of the tubes or uterus, or both, with tubercular peritonitis. Sometimes, in phthisical women, the ovaries may be the only part of the genital tract affected. It is met with in the miliary form, in caseating masses, along with abscess formation.

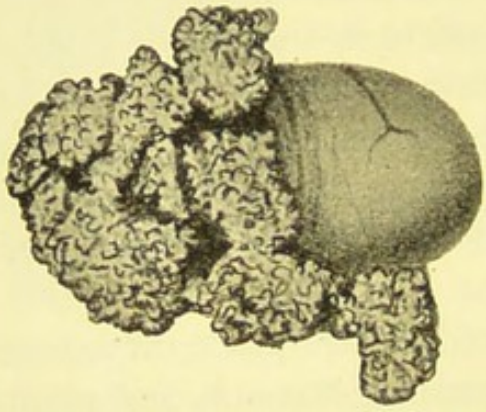


FIG. 124.—Superficial papilloma of ovary.

Tuberculosis may attack ovarian cysts.

Coexistence of pregnancy and ovarian tumours.—Pregnancy may be found along with all varieties of ovarian tumour, unilateral or bilateral. Spiegelberg and Olshausen think that they often grow rapidly during pregnancy. The tumour may lie in the pelvis or in the abdomen. If in the pelvis, it usually lies in the pouch of Douglas; in the abdomen, it generally lies lateral to the uterus and somewhat in front. The earlier the gestation and the smaller the tumour, the more easily can the uterus and tumour be distinguished by palpation.

In advanced pregnancy this is generally impossible. Sometimes the abdomen may be enormously distended in advanced pregnancy; or where pregnancy occurs with a large tumour, the tension of the wall may be great.

The patient is apt to suffer more than in ordinary pregnancy, *e.g.* from varicose veins, œdema of legs. Abortion is apt to occur in certain cases. Labour may be seriously interfered with.

After emptying the uterus, torsion, rupture, or suppuration may sometimes occur.

Treatment.—The only available treatment for tumours of the ovary is removal. This is to be carried out as follows :—

Hydrops folliculorum.—If this condition require operative treatment, either puncture and destruction of the small distended follicles may be carried out, or removal of the whole ovary, by means either of anterior colpotomy or abdominal section. The procedure is the same as in a salpingo-oöphorectomy.

Proliferating ovarian cyst.—The operation for the removal of an ovarian tumour has long been known by the name of ovariotomy.

The nature of the procedure and the difficulty of manipulation vary according to the size and condition of the tumour, adhesions, condition of the patient's health, etc. For many years an abdominal incision has been employed for all varieties of cyst. Recently, Martin and others have advocated the advantage of anterior colpotomy for certain cases.

Small cysts not larger than two fists.—These may be removed by abdominal section, or by anterior colpotomy. If there are many adhesions which can be diagnosed, the former of these methods alone should be employed.

When the incision is made into the peritoneal cavity, the cyst, if very small, is removed along with the corresponding tube, just as in the case of a salpingo-oöphorectomy, preliminary evacuation of the cyst not being necessary.

Where the cyst is too large to remove in this way, it is aspirated before the pedicle is secured.

Large ovarian cysts.—These should only be removed by

abdominal section. The abdomen is opened, as already described. The incision, to begin with, should be long enough to admit the hand.

In most cases the whitish surface of the cyst is seen next the abdominal wall. Its relation to the breathing should be watched for a moment. If it moves freely with respiration, no extensive adhesions to the parietes are present. The fingers of one hand are then introduced and carried all over the tumour to make out its relations and the presence of adhesions.

If only a few parietal adhesions exist, they are broken with the fingers. If extensive, they are attended to after

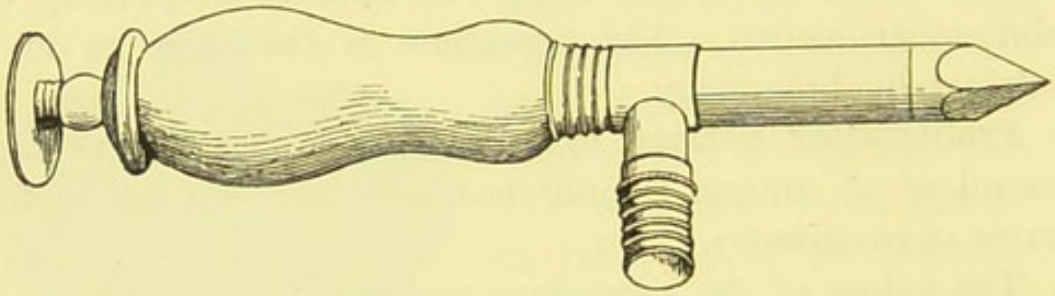


FIG. 125.—Trocar.

evacuation of the sac. Omental and intestinal adhesions are also left until after this is carried out.

Evacuation of cyst.—In order to reduce the size of the tumour, the cystic contents must be removed (save when they are purulent or gangrenous; in such cases the tumour should be removed *en masse*).

Before puncture an assistant should steadily compress the patient's flanks with the palms of his hands, and should continue in this position as long as fluid flows from the tumour.

The largest cyst near the abdominal incision is chosen for puncture. Various trocars are used. The simplest method is to pierce the cyst wall with a bistoury. As the assistant presses in the flanks, a thin stream of fluid (except when it is thick) flows steadily out as a jet, and is caught in sterilised basins.

If the bistoury be not used, puncture may be made with a simple trocar and cannula, attached to a rubber tube. The latter hangs over the edge of the table and drains the cyst by syphon action. Large complicated trocars are not necessary; they are difficult to keep clean.

If the puncture of one cyst is not sufficient to reduce the size of the tumour, so that it can be removed, other cysts should be opened from the interior of the one already punctured. This may be done with a finger, knife, scissors, or trocar.

In some cases, on account of the colloid nature of the fluid or the presence of fibrinous clots, nothing escapes in the tube. This happens also when the tumour walls rupture owing to their brittleness, or because the cyst is so numerously subdivided. In these conditions either the cyst should be removed *en bloc*, through a large abdominal incision, or, if too large for this, it should be opened so that the hand can be introduced to remove the contents and to break down the septa.

If the cyst contents are gangrenous or purulent, the tumour should be removed *en masse*. If, only after an opening has been made, the dangerous character of the contents has been found out, the opening should be closed with forceps and the tumour removed from the abdomen through an enlarged incision.

Usually only slight hæmorrhage results from the breaking down of the cyst interior. Sometimes, however, marked bleeding occurs. When this happens the pedicle should be temporarily constricted with forceps until the cyst is removed from the cavity, and the ligatures are ready to be applied.

Treatment of adhesions.—After the evacuation of the cyst contents, the edges of the opening are grasped in strong forceps and the tumour is drawn outwards in order that adhesions may be severed. Parietal adhesions may be broken through with the finger tips; when they are

very tough and tendinous, they may require to be cut through.

When there is a circumscribed patch of dense adhesion, the corresponding part of the cyst wall may require to be cut from the rest of the sac; in such a case, the lining secreting portion should be entirely dissected off.

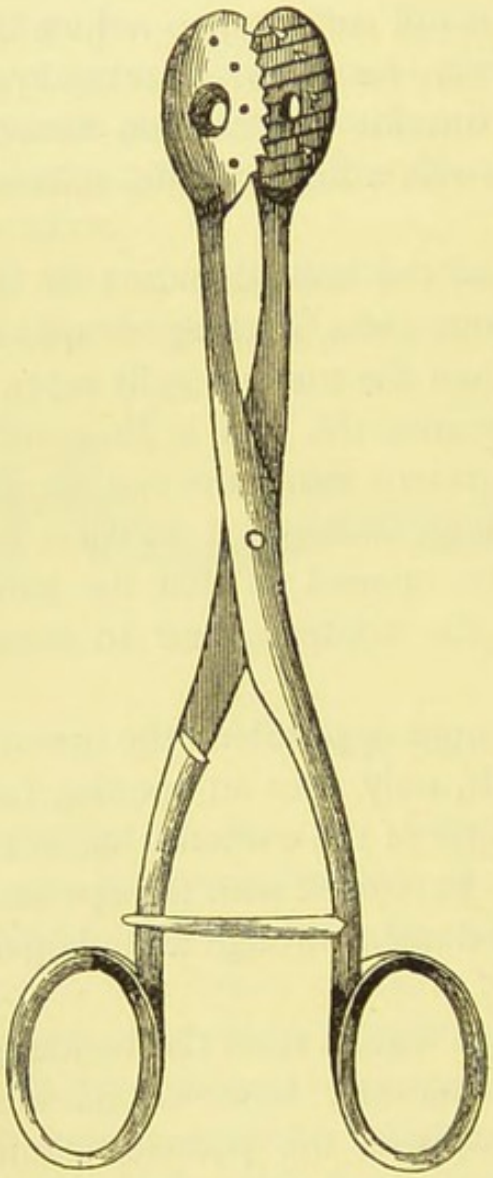


FIG. 126.—Nélaton's forceps, used in drawing out the cyst.

When oozing takes place from torn adhesions it may be checked by pressure of a hot sponge. Any points that bleed particularly freely may be tied or burned with a cautery. It may be necessary to pass the catgut through the tissue by means of a needle.

Parietal adhesions over the front of the tumour may make it difficult to know where the peritoneum is, during the opening of the abdomen. In attempting to strip off adhesions one may at the same time remove the parietal peritoneum. After evacuating the cyst the distinction can usually be made, and proper separation of the adhesions carried out.

Omental adhesions are next in frequency after parietal adhesions. Usually the omentum lies above the umbilicus. If it should lie in front of the tumour below the umbilicus, so as to interfere with the opening into the cyst, the incision should be prolonged downwards in order that the omentum

may not be wounded. Sometimes, however, it reaches to the symphysis.

It should be separated from the parietes, and an endeavour should be made to get to one side of it in order to puncture the cyst. If a piece of the omentum which is in the way can be conveniently ligatured and divided, this may be done. If there is no other method, it may be necessary to puncture the omentum in order to enter the cyst.

In drawing out the tumour the omental adhesions are gradually torn through. This is best brought about by rubbing them off with a dry sponge or gauze pad. Firm bands may require to be torn through with a pair of forceps or with the fingers. Bleeding vessels in the omentum may be ligatured with catgut, but if, when the omentum is freed, any extensive oozing surface should remain, strong catgut (No. 3) ligatures should be tied around it, and the oozing part cut away.

Adhesions to mesentery and intestine are not very common. They are usually found on the back and sides of the cyst. If the adhesions are short, they should be torn through by being rubbed off the cyst with a sponge, or cut with a knife. If they are long, the bands may be ligatured and cut. If the adhesions are very firm and short, it may be necessary to dissect a portion of the outer wall of the cyst to which they are attached, leaving it in continuity with the bowel or mesentery, care being taken that no part of the inner secreting surface is left.

When intestine is adherent to the pedicle it may not be easily recognised. Or, when the pedicle is very broad and there are no adhesions, the operator may think that the bowel is adherent. When any extent of peritoneum has been torn from the bowel, the rawed surface should be covered with neighbouring peritoneum by means of fine catgut (No. 0) and small needles.

Mesenteric adhesions should be separated and then ligatured, or *vice versâ*.

If the vermiform appendix be adherent, the adhesions should be torn through. If this be very difficult, it may be necessary to remove it.

Splenic and hepatic adhesions must be divided with the greatest care.

Uterine adhesions are mostly found in cysts which lie in the pouch of Douglas and are adherent to it.

Bladder adhesions must be carefully dealt with. Sometimes the attached bladder may be mistaken for part of the cyst, and there is danger of cutting into it or removing it. This mistake is most apt to occur when the bladder is markedly displaced upwards. When the adhesions are divided, bleeding points should be ligatured.

Adhesions to the pelvic floor may be difficult to separate. Sometimes it is quite impossible. There is danger of tearing into a large vessel, the ureter, the bowel, or the vagina. Bleeding points on the tumour may be held with forceps or with ligatures, until the pedicle is tied.

Treatment of the pedicle.—The pedicle consists of the tube, broad, ovarian, and infundibulo-pelvic ligaments. It varies greatly in length and width in different cases.

In cases of torsion it may be very brittle, the vessels being closed by thrombi. Sometimes the pedicle is double as a result of atrophy of a mesial portion.

Sometimes the appendages of the opposite side may be adherent to the cyst, thus making it difficult at first to say to which side the tumour belongs. Intestines may become adherent to the pedicle, and should be separated.

Sometimes no pedicle is found in cases where torsion has occurred, the original pedicle having been thereby divided. The tumour thereafter thrives by means of the adhesions which have formed. If the tumour has developed between the layers of the broad ligament, or if it has grown behind the ligament and become attached to it, no pedicle exists. The treatment of these conditions will be considered later (*vide* p. 406).

The pedicle is secured by means of ligatures. To pass them, the cyst should be drawn outside the abdominal incision and held by an assistant.

If very large, the mass of it may be cut away, large forceps securing the basal portion. This facilitates the application of the ligatures.

Strong chromic or juniper catgut (No. 4) or twisted silk ligatures may be used. They are passed with the special pedicle needle, care being taken not to pierce a vessel. If the pedicle be small, the Staffordshire knot may be used. If it be large, or if it be short, two interlacing ligatures may be used.

If it be very broad, three or more interlacing ligatures may be necessary. These have been described on p. 267. The pedicle is next grasped on each side with forceps, and the tumour cut away outside them. The stump is then carefully sponged. If there be any bleeding from it, the ends of a ligature are passed around the pedicle and tied firmly. The ligature ends are next cut short and the forceps are removed.

Ovarian cysts which have developed within the broad ligament.—These are mainly papillomatous. Sometimes this extraperitoneal development may be slight. In such a case, after the evacuation of the contents of the cyst, the pedicle may be secured by a series of interlacing ligatures passed under the cyst from the uterus to the infundibulo-pelvic ligament. In a more marked case, after evacuation of the intraperitoneal portion of the cyst, the peritoneum covering the extraperitoneal part is divided around its attachment, and the tumour is enucleated.

In the most marked cases, the whole tumour lies under the peritoneum. As it grows it may come into relation with various structures of the pelvis, *e.g.* rectum, bladder, uterus, etc., and marked displacement of these may occur as well as firm adhesion to them.

In these cases, before enucleation is attempted, the

ovarian vessels should be controlled in the infundibulo-pelvic ligament by means of a strong catgut suture passed with a needle. After evacuation of the cyst contents, its walls are pulled outwards by means of forceps, and its peritoneal covering is incised on the upper surface if the tumour be a pelvic one. If the cyst extend above the pelvis the peritoneum is cut around the swelling near its base. The tumour is then rapidly enucleated by means of the fingers; in some cases, by knife or scissors. Where there is firm attachment to a delicate structure—*e.g.* bowel—it may be necessary to leave behind a bit of the outer portion of the cyst wall. None of the lining membrane should be left. It should be pulled or scraped away. Care must be taken not to injure the ureter or any large vessel. The ureter is white in colour; it may be distended somewhat in these cases.

There may be a good deal of bleeding as enucleation proceeds, but the preliminary ligature of the ovarian vessels tends to diminish this. The inner part of the tube and broad ligament may be ligatured close to the uterus at an early stage with advantage. The ureters must not be caught.

As vessels are torn through they must be caught with forceps and tied. Sometimes ligatures cannot be passed. The galvano-cautery may be used, or the pressure of a hot swab.

When the tumour is entirely removed, the peritoneal sac should be closed by continuous catgut suture. It then lies in a crumpled mass at the side of the uterus.

Sometimes when the uterus is too firmly attached to the tumour, its removal may be necessary.

When the cyst develops in the folds of the mesentery, its separation may be accompanied with much bleeding. Ligatures must be carefully used, because too wide portions must not be constricted lest the nutrition of the gut should be interfered with.

When the cyst grows up behind the peritoneum in the

front of the pelvis and abdomen, the abdominal incision may not enter the peritoneal cavity at all. Usually, however, in such a case, it is opened into before the cyst can be entirely enucleated. If the cyst can be removed, the remaining cavity should be stuffed with gauze and allowed to close gradually, being shut off from the peritoneal cavity.

Double extraperitoneal cysts.—These may be treated by a double procedure similar to that just described. Sometimes it is impossible to separate the uterus from the cysts, and its removal, along with that of the tumours, is necessary.

Incomplete operations.—Both in the case of extraperitoneal and of intraperitoneal cysts which become very adherent to the pouch of Douglas, it may be impossible to remove the entire tumour.

In such cases, the inner lining—the secreting surface—should be torn or scraped off, oozing of blood from the rest of the wall being checked as much as possible.

If the remnant be a small one, it may be left *in situ*. If it be large, its edges should be stitched to the edge of the lower part of the abdominal incision, the cavity being drained with iodoform gauze, and allowed to close gradually.

In the case of the extraperitoneal cyst, an opening may be made into the vagina, drainage being carried out by means of a T-shaped rubber tube and by iodoform gauze. In such a case, the first incision into the sac is carefully closed before the abdominal wound is stitched.

Dermoid cysts of the ovary.—These should be removed *en masse*. Evacuation should not be attempted because of the risk of escape of its contents into the peritoneal cavity. The pedicle is secured just as in the case of simple cysts.

Solid ovarian tumours.—When these can be removed, whether simple or malignant, the procedure is the same as in the case of an ovarian cyst, save as regards the reduction of the size of the tumour.

Removal of a malignant growth need not be attempted when the diseased ovary is adherent to surrounding parts and infiltrating them, or when growths exist elsewhere.

Ovarian cyst complicating pregnancy.—In such a case the cyst should be removed by abdominal section, save when it is very small. The procedure is the same as in the non-pregnant state. Care should be taken to disturb the uterus as little as possible, not to puncture it, and not to mistake it for a cyst.

After the operation, the patient must be kept under the influence of morphine.

Adhesive plaster should be worn over the wound throughout pregnancy, as well as a carefully adjusted belt.

Parovarian and other circumscribed broad ligament tumours.—These are removed by abdominal section in the manner in which extraperitoneal ovarian tumours are taken away.

Minor Conditions in the Ovary.

The corpus luteum is liable to form a small cyst; it may become a small, hard, fibrous body, sometimes pedunculated, or may calcify. Sometimes excessive hæmorrhage may occur in a follicle after its rupture. This may extend beyond the follicle and distend the stroma. The ovary may enlarge to the size of an egg or an orange. Hard concretions are sometimes found in the ovary, probably formed of old coagulated proteids derived from blood clot.

CHAPTER XIV.

AFFECTIONS OF THE UTERUS.

Malformations.

Complete absence of the uterus.—This is a very rare condition. The bladder and rectum touch. The tubes are absent, rudimentary, or represented by solid rods. The ovaries are absent, rudimentary, or of normal size. Complete absence of uterus, tubes, and ovaries have mostly been

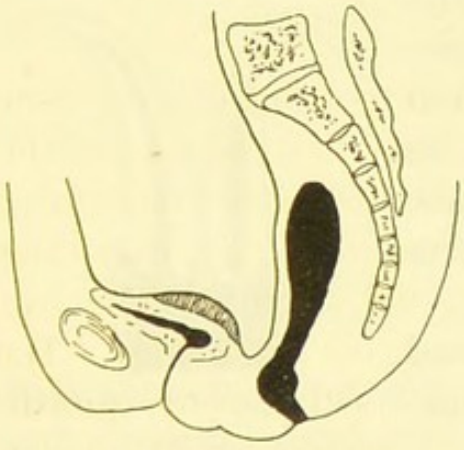


Fig. 127.—Rudimentary uterus. It is seen as a small projection on the bladder.

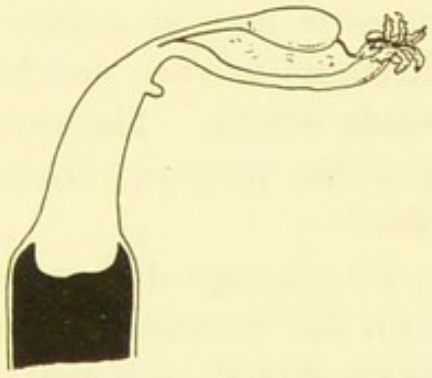


Fig. 128.—Uterus unicornis.

described in monstrosities. Sometimes signs of hermaphroditism exist.

Rudimentary uterus.—This is found in various conditions. It may be a mere thickening on the posterior bladder wall, or a band continuous with the Fallopian tubes and round ligaments. Sometimes there is a distinct

median lump ending in the vagina; in some cases this may resemble a cervix. The uterus may sometimes be represented by two vertical ridges. The vagina may be absent or small; the outer genitals may be normal, small, or maldeveloped.

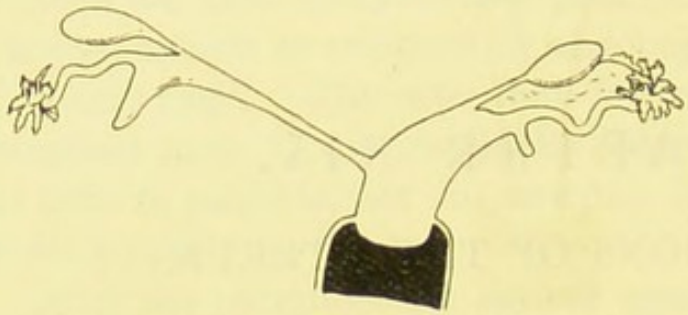


FIG. 129.—Uterus unicornis, with right rudimentary cornu attached.

Uterus bipartitus. — The cervix may be well developed and connected with distinct cornua, solid or hollow. The ovaries may be normal, absent, or atrophied. The vagina is often malformed.

Uterus unicornis. — In this form, only one cornu is developed; it is directed from the cervix upwards and towards one side. The other cornu is absent or rudimentary. The rudimentary horn may be a mere solid band. Sometimes it may be hollow for a short distance or be perforated in its whole length. The ovary and tube may be normal, absent, or atrophied.

To distinguish between tube and horn the insertion of the round ligaments should be noted.

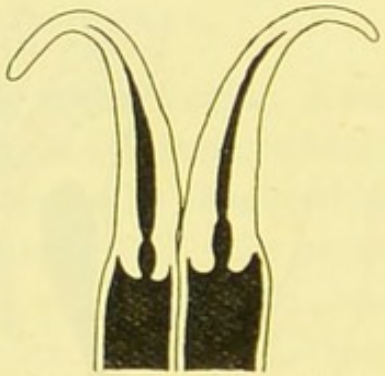


FIG. 130.—Uterus didelphys.

Uterus didelphys.—This condition is rare. In it the two common halves of the entire uterus remain distinct, the cervical portions being close together. The vagina is absent, single, or double.

Uterus bicornis.—In this condition the uterus is more or less divided into two parts, by means of an external depression. The separation rarely extends through the cervix, though the latter may often, in these cases, be divided by an internal vertical septum. There is found

quite a range of variation in shape, from a mere depres-

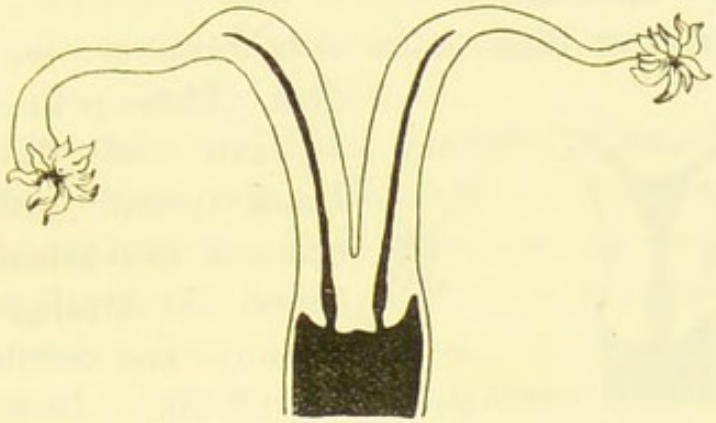


FIG. 131.—Uterus bicornis bicollis.

sion at the fundus to a deep division extending into the cervix.

Uterus septus.—Here the uterus has the normal external

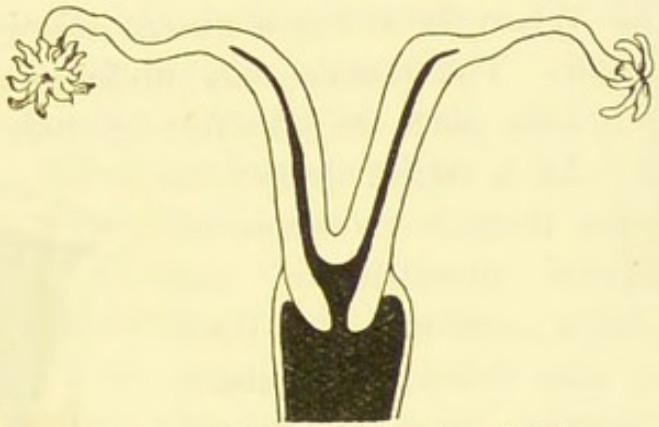


FIG. 132.—Uterus bicornis unicollis.

appearance, but inwardly a median septum, which may reach from the fundus to the os externum, or not so far down.

IMPERFECT DEVELOPMENT OF THE UTERUS.

Uterus infantilis.—In this condition the uterus has the fœtal characteristic, namely, shortness of the body relative to that of the cervix; the latter may be two or three times the size of the former.

Atrophied uterus.—This is a condition of uterus some-

times found in the adult, in which the organ has the adult shape, but is undersized.

The causes of these latter conditions are not very evident. There is in some cases a fault of development. Local pelvic inflammatory changes may sometimes be a factor. In dwarfs and cretins the imperfect development is often found. In early tuberculosis also, in chlorosis and low health from other important causes, certain conditions of the nervous system, *e.g.* hysteria, epilepsy, are said to be causes.

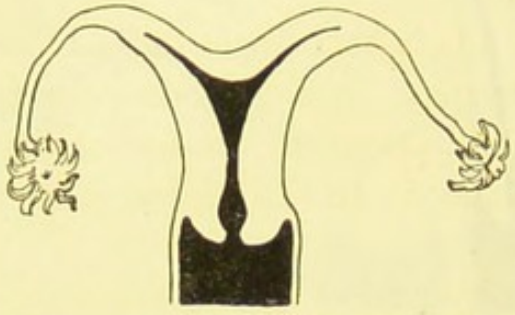


FIG. 133.—Uterus bicornis. The upper part of the body is divided.

Diagnosis.—When the uterus is absent, there is, of course, no menstruation. The female may undergo all the other changes which take place at puberty, *e.g.* hair and breasts may develop. In a rudimentary condition of uterus there is no menstruation. Vicarious menstruation has sometimes been reported in these cases. They may develop at puberty like other women, save as regards menstruation.

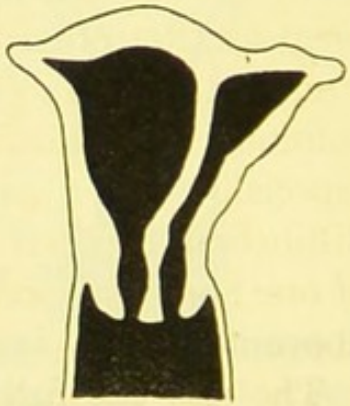


FIG. 134.—Septate uterus in which one half is more developed than the other.

The vagina is often rudimentary. On examining the pelvis in these cases, it is good to pass a sound into the bladder; the rectal finger feels it readily when the uterus is absent or rudimentary. It is important to make an abdomino-rectal examination under anæsthesia. When the unicornuate uterus exists, the well-developed horn may perform all the functions of the normal uterus. If the rudimentary horn be pervious for a distance, accumulation of menstrual blood may take place in it, though sometimes

no menstruation takes place on the malformed side in such a case. It has occasionally happened that no menstruation takes place from the developed horn, blood accumulation occurring in the other (P. Müller).

The distended horn is felt as an elastic or firm mass, often sensitive to examination. It may be very adherent to surrounding structures. It is important to remember that a pregnancy may also take place in it, leading to a very serious condition.

In the case of uterus didelphys, there are no symptoms unless the vagina be absent or atresic, or one horn be closed. On physical examination, two separate cervices or separate cervical openings are felt. A sound may be passed into each horn, and the condition determined by abdomino-rectal exploration. In uterus bicornis there are no distinguishing symptoms; menstruation is often normal, but may be irregular. When one horn becomes pregnant, the other usually stops menstruating, though in some cases it may continue. On bimanual examination, especially under an anæsthetic, the distinction between the horns can be made out. Atresia of one horn may occur, leading to an accumulation of blood above it.

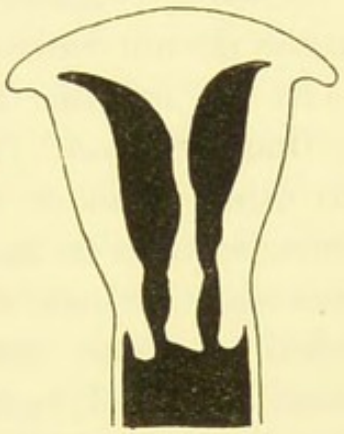


FIG. 135.—Septate uterus.

The sac gradually pushes the open horn towards the opposite side of the pelvis, and forces down the dilated cervix and vaginal vault. Bimanually the mass is felt elastic or firm. The unclosed os is crescentic, and is stretched over the lower end of the tumour, when the atresia is cervical; it is felt at one side of the fornix, and a sound may be passed into it.

P. Müller points out that there is no record of a pregnancy in the closed horn in such a case, though it may occur in the rudimentary horn of a unicornuate uterus.

Sometimes a vaginal septum of greater or less extent may exist with the bicornuate uterus, and may cause a suspicion of the latter condition.

Uterus septus is usually recognised only when the examining finger feels the septum in the cervix. When the septum does not extend down so far, the condition may never be found out.

Menstruation proceeds as normally. Blackwood reports an interesting case where the flow took place, month by month, alternately from one side and the other.

Atresia of one-half may occur, followed by distension with blood.

When a complete septum exists, sounds passed into both halves do not touch.

In the infantile and atrophied uterus, there is generally no menstruation. This may continue throughout life with no other signs or symptoms. Often, however, there are periodic pains in the pelvis, with a flow of mucus from the genitals. Periodic disturbances of other organs have been noted in some cases, *e.g.* stomach disorder, palpitation, pains in breasts, head, etc. Vicarious bleedings have been described, though rarely. Neurotic disturbances are apt to develop in these cases. Sometimes there may be a very scanty or irregular menstruation in these cases. Sterility generally marks the condition, but pregnancy may occur.

Bimanually the smallness of the uterus may be made out, especially if the sound be passed into its lumen at the same time.

When in any of these conditions there is accumulation of menstrual blood on one side, pains occur on that side, and in many cases continue for longer and longer periods after the menstrual flow, until it may become more or less continuous. The mass may cause pressure effects. Peritonitis often takes place outside it. It may rupture into the abdomen, vagina, the neighbouring horn, the bladder, or the bowel. Suppuration may occur in it.

Differential diagnosis.—The unicornuate uterus must be distinguished from the infantile, atrophied, and rudimentary uterus. The rudimentary cornu may be mistaken for a small fibroid; when distended, it may be mistaken for a tubal, ovarian, or broad ligament swelling. A bicornuate uterus, with one horn closed and distended, may be diagnosed as a normal uterus associated with a fibroid, ectopic pregnancy, or some other pelvic swelling. This may be the case with a septate uterus, or with the uterus didelphys.

Treatment.—In the unicornuate uterus with a rudimentary horn, treatment is necessary, when accumulation of blood occurs in the latter. If this takes place slowly, and causes no serious disturbance, the case may simply be watched.

If rapid accumulation occurs threatening rupture, or if peritonitis develops, operation is necessary. Abdominal section should be performed, and the mass removed. If it cannot be taken away, it should be emptied and stitched into the edges of the abdominal incision. If pregnancy takes place in this horn, removal is also necessary. It may also be justifiable always to remove the opposite ovary at the same time. In the bicornuate uterus, when distension of one-half occurs above an atresic portion, the collection must be opened per vaginam. If, however, the Fallopian tube on the same side is much distended, it is probably best to perform an abdominal section first of all, and either to remove both distended tube and cornu, or to remove the tubal portion, and, at a later date, to open the cornu from the vagina.

In a septate uterus, where distension of an atresic half has occurred, an opening must be made by way of the cervix. If the corresponding tube is much distended, a preliminary abdominal section for its removal must be carried out.

In cases of deficient development of the uterus, good feeding and tonics may sometimes do good.

Atresia of the cervix.—This may be due to acquired causes (*vide* p. 436). It may also be congenital. It may be found in the single uterus, when the whole cervix may be atresic, or when there may be a septum at the os externum or os internum. Mucus may collect in the uterus before puberty, but generally the condition is only made out after menstruation begins, owing to the accumulation of menstrual blood. (For the results of accumulation, *vide* "Atresia of the Vagina").

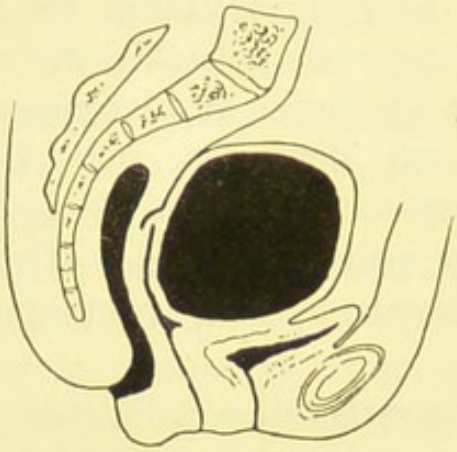


FIG. 136.—Atresia of the cervix. The uterus is completely distended with blood.

Atresia may also affect one or both horns of a bicornuate uterus, or a unicornuate uterus. I have already referred to its occurrence with a rudimentary horn.

Treatment.—*Vide* "Atresia of the Vagina."

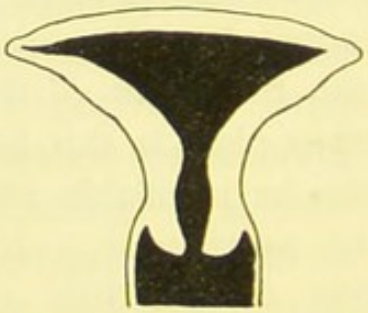


FIG. 137.—Uterus incudiformis. The bicornuate uterus has the shape of an anvil.

Abnormal communications of the uterus.—There may sometimes be found an opening into the rectum or bladder, or into both. Vaginal atresia may be present. Impregnation has taken place either by way of the rectum or urethra. These conditions are remains of the cloacal state.

Doran has reported a bipartite uterus opening on one side to the outer surface of the body. The uterus may also sometimes communicate with the ascending colon.

Minor Malformations.

The uterus may sometimes be obliquely shaped, owing to the imperfect development of the organ. The condition might be mistaken for a unicornuate uterus.

Sometimes the uterine fundus is straight, giving the name of anvil-shaped (*uterus incudiformis* or *biangularis*) to the organ.

Sometimes the vaginal portion of the cervix may be small or rudimentary (*uterus parvicollis* or *acollis*).

The *uterus biforis* is the condition in which a median partition divides the os externum into two parts (as in the ant-eater).

Abnormal folding of the cervix.—Sometimes a flaplike circular projection may be found inside the cervix (like that normally found in the sheep), forming a second os externum. It may be mistaken for a polypus, and may give rise to hæmorrhage. It may obstruct labour, and should be removed when recognised.

Premature development of the uterus.—The uterus may develop in early life into the adult form, with or without accompanying changes in the rest of the genital tract, and with one or more of the general changes met with at puberty, associated with the development of secondary sexual characters.

Inflammation of the Uterus.

The uterus is the commonest seat of inflammation in women, especially in those who have borne children. This is to be associated with the marked disturbances to which the organ is subjected in relation to labour, and to its free communication with the exterior, whereby microbial infection is made easy. It is impossible to give to traumatism and other physical factors and to germ activity their proper proportional values as factors in the causation of inflamma-

tion in the uterus. There can be little doubt, however, that in the majority of instances, the great cause is micro-organismal infection, entrance being gained through an injured or rawed surface. The divisions under which this subject is considered are arranged on the basis of the predominant tissue affected. But it is to be remembered that no hard-and-fast line of distinction really exists. Thus while endocervicitis is studied by itself, it must not be forgotten that there may be an accompanying inflammation in the endometrium above the cervix, or in the muscular part of the wall. Also, in considering chronic metritis, while attention may be mainly fixed on the changes in the muscular thicknesses of the wall, it is to be noted that the mucosa or the peritoneal covering, or both, may also be inflamed.

As regards the etiology of the various forms of inflammation, it is probably best to establish the following classification :—

Acute Inflammations.

These are due to the following conditions :—

1. Septic infection in the puerperium.
2. Septic infection in operative procedures.
3. Gonorrhœa.
4. Extension from neighbouring acute inflammation, *e.g.* peritonitis.
5. Acute specific febrile conditions, *e.g.* typhus.
6. Excessive coitus and cold at a menstrual period are believed to cause the condition sometimes.

Chronic Inflammations.

1. Following on an acute attack.
2. Infection after delivery, especially after imperfect emptying of the uterus, and after lacerations.
3. Faulty asepsis in operative measures on the genital tract.

4. Extension of inflammation from neighbouring structures.
5. Gonorrhœa.
6. Associated with the presence of uterine tumours.
7. Associated with too frequent child-bearing, non-lactation, too early rising after delivery.
8. Associated with retroversion.
9. Excessive coitus is said to be a cause.
10. Tuberculosis.

Varieties Studied in Detail.

I. INFLAMMATION OF THE MUCOSA.

CERVICAL MUCOSA.

Acute Inflammation.

Acute endocervicitis is found with general acute inflammation in the uterus, and will be considered under "Acute Metritis."

Chronic Inflammation (Chronic Cervical Catarrh, Cervical Endometritis, Endocervicitis).

This form is especially due to infection following lacerations of the cervix, and to spread from inflammation in the endometrium of the corpus uteri. It is also found as a result of gonorrhœa, and in retroversion of the uterus.

Pathology.—The inflammatory process affects all parts of the mucosa, chiefly the glands and epithelium.

Hyperplasia and increased folding of the mucosa take place, and extension below the os externum occurs, the stratified epithelium around the latter being displaced. The glands also increase and extend downwards in the cervix; their outlets may get closed, giving rise to retention cysts—Nabothian follicles. One of these may grow beyond the surface and become a polypus. Sometimes this projection

may contain more than one small cyst. In some cases a Nabothian follicle bursts through the surface, forming a moist surface which tends to proliferate. When the disease is extensive, the lower part of the cervix may become converted into a mass of cysts. The connective tissue elements are increased as the inflammation proceeds, and the cervix may be greatly thickened and sometimes elongated.

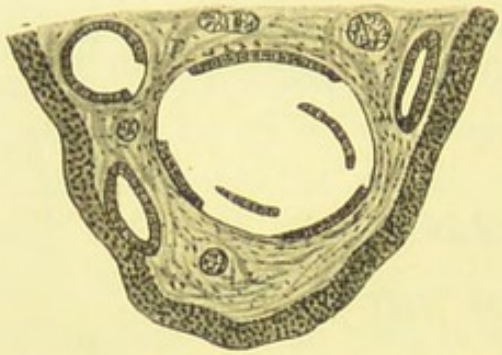


FIG. 138.—Small bit of vaginal portion of cervix with a large Nabothian follicle.

On microscopic examination, the patches of inflamed cervical mucosa present the following appearances:—

1. The folds and recesses may be long and narrow—the papillary variety.

2. They may be short, the recesses being often broad and irregular, formed by the bursting of retention cysts. In both forms the covering epithelium is a single layer of columnar cells smaller than those of the normal mucosa.

In rare forms of inflammation the superficial epithelium may be destroyed, forming a true ulcerated surface.

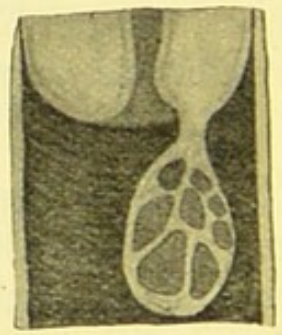


FIG. 139.—Small multilocular polypus growing from vaginal portion of cervix.

Physical signs.—On physical examination various conditions may be found. In a nullipara, if the disease is at all marked, and has extended outside the os externum, the margins of the latter feel soft and velvety; in a multipara, in addition, the cervix and os are enlarged, and there are evidences of laceration. Shotlike nodules or larger masses, retention cysts, may be felt with the finger. In some cases a cyst may be felt as a hard, raised area on the surface (like early cancer), or as a polypoidal projection. Occasionally the velvety area bleeds slightly on

being pressed with the finger-nail. A good deal of mucus may be felt about the os.

On examining the cervix with a speculum, the enlargement of the cervix is noted. The inflamed or catarrhal patches appear as bright red, granular, secreting surfaces.[1] These areas of mucosa become soft and spongy.

Symptoms. — There is marked leucorrhœal discharge, mucous, thick, creamy, or variously coloured, with no offensive odour usually. It may sometimes be tinged with blood.

There is usually pelvic distress, *e.g.* vague dragging pains, or back and loin pains. These are aggravated on exercise.

Menorrhagia is found in some cases, probably mainly depending upon the amount of involvement of the mucosa of the corpus uteri. Irregularity of menstruation is often found. As the patient gets more and more run down, some degree of amenorrhœa may be found.

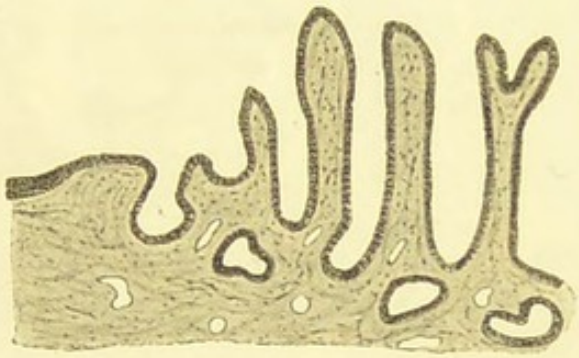


FIG. 140.—Endocervicitis. Section through papillary form of catarrhal patch.

The disease tends to prevent conception.

In many cases, the patient gradually loses health, gets unfit for her duties, and may become neurasthenic. These changes are more frequent, however, when the uterus is widely affected.

Differential diagnosis.—The condition must be diagnosed from mere vaginal or vulvar leucorrhœa.

Endometritis may cause similar symptoms, but in the latter condition none of the physical signs relative to the cervix may be present.

Early malignant disease of the cervix may stimulate endocervicitis, *i.e.* in the hard feeling in the latter condition,

[1] These patches have also been known by the terms "erosion," "ectropium." For a long time they were wrongly thought to be ulcers.

due to Nabothian follicles. At a later stage the profuse discharge might be mistaken for the leucorrhœa of endocervicitis; it is, however, often disagreeable in odour, and mixed with more or less blood.

Simple laceration of the cervix may sometimes be wrongly diagnosed as endocervicitis. This is apt to be the case if it be examined with a tubular or valvular speculum. The os may appear gaping, and a red velvety area be seen, resembling the catarrhal patch; this is merely the normal mucosa, exposed by the separation of the edges of the tear in the cervix. If, in such a case, the edges be brought

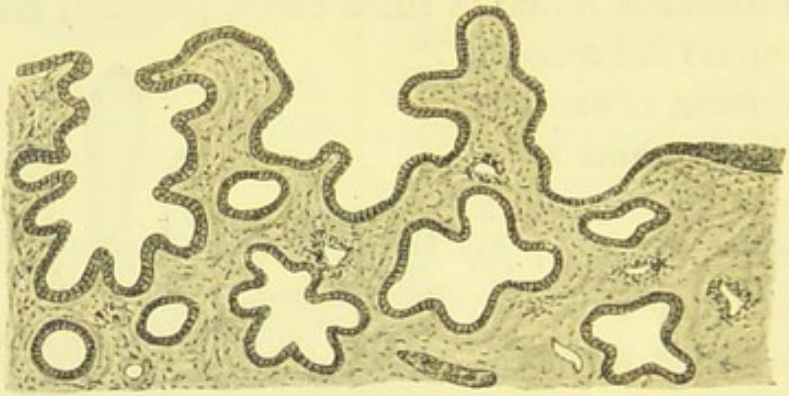


FIG. 141.—Endocervicitis. Section through follicular form of catarrhal patch.

together by volsellæ, the redness disappears, whereas in a true catarrhal patch it cannot be made to disappear in this way.

MUCOSA OF CORPUS UTERI.

Acute Inflammation (Acute Endometritis).

This inflammation is usually part of one affecting the whole uterus, and will be considered along with "acute metritis."

Chronic Inflammation (Chronic Endometritis).

Pathology.—The inflammatory changes affect the glands, the lining epithelium and the interglandular tissue. Accord-

ing to the predominance of the tissue affected, the varieties are denominated. Thus, Ruge makes the division as follows :—

Glandular.
Interstitial.
Mixed.

In the glandular variety, there is both a hypertrophy and hyperplasia of the glands, the latter taking place mainly by lateral outgrowths of old glands; it is doubtful if new ones grow inwards from the surface epithelium, as some state.

Many of the glands have, on longitudinal section, a serrated appearance.

In the interstitial variety, the interglandular connective tissue elements are most affected.

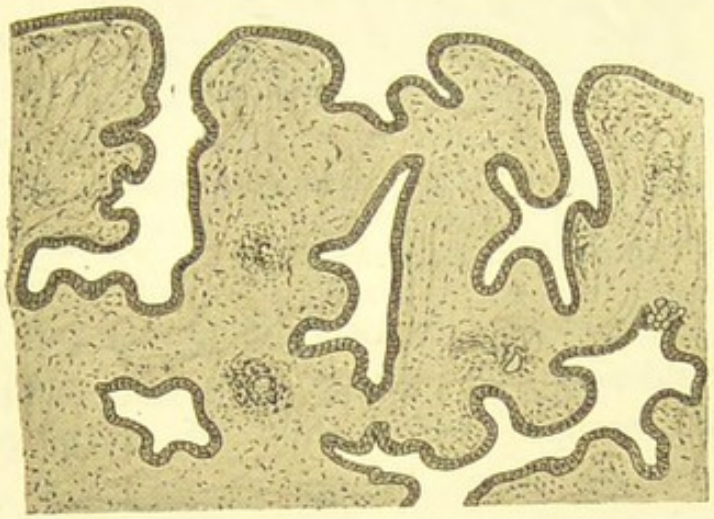


FIG. 142.—Glandular endometritis.

The ordinary chronic changes in inflammation are found, the tendency to the formation of spindle-shaped cells and dense tissue being prominent. The glands may become pressed upon and obliterated. Sometimes small retention cysts are formed. These may sometimes cause projections of the surface.

In mixed forms, the above changes are found in various proportions.

In old-standing endometritis the mucosa gets atrophied and gradually destroyed, being replaced by firm connective tissue.

Opposite sides of the lumen may blend, sometimes causing complete atresia. These changes may sometimes be seen in the senile uterus, in which accumulation of mucus or blood may take place above the atresia.

Occasionally inflammation in the mucosa leads to a destruction of the lining epithelium, and to the formation of projections of granulation tissue—the so-called villous or papillary endometritis. These may give rise to small polypi.

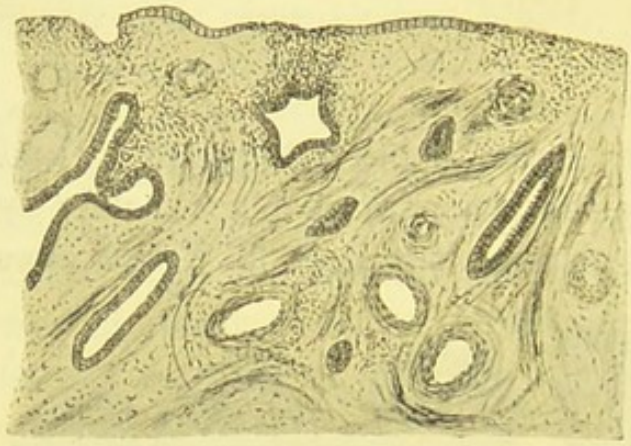


FIG. 143.—Chronic interstitial endometritis. The mucosa is greatly altered from the normal.

In some cases of endometritis there is a special tendency to marked congestion, and dilatation of the blood vessels.

This variety is known as *hæmorrhagic endometritis* or *endometritis fungosa*.

It may be extremely difficult to say which one of these conditions is present in most cases of the affection. Microscopic examination of scrapings is important in enabling one to arrive at a conclusion.

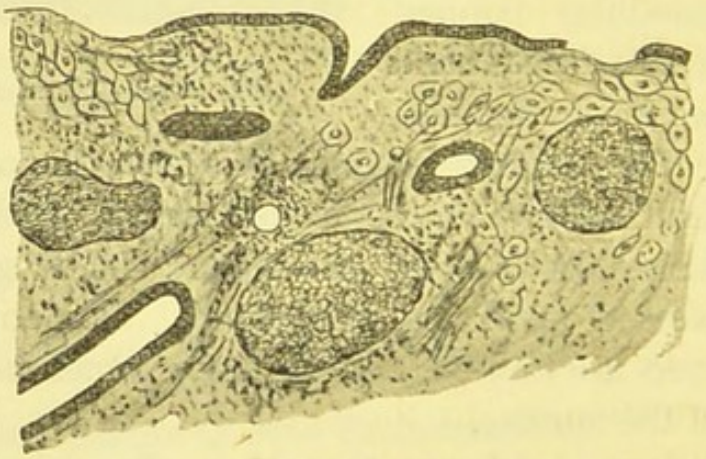


FIG. 144.—Endometritis following an abortion. Large decidual cells are seen.

When endometritis occurs soon after the pregnant uterus is emptied, especially after an abortion, the connective tissue cells tend to be of large size—the decidual type, for some time. This is more apt to be pronounced if the uterus has not been thoroughly emptied.

Physical signs.—The uterus is enlarged considerably, usually, if there be much associated metritis.

It may not be easy to make out slight degrees of enlarge-

ment by the bimanual; this can be determined by the passage of the sound. On introducing this instrument, slight bleeding may result; there may be tenderness, and irregularities may be felt. In many cases, however, none of these signs are present.

Endocervicitis may often be present, or other conditions, *e.g.* cellulitis, local peritonitis.

Differential diagnosis.—The hæmorrhagic type may be mistaken for sarcoma, or carcinoma of the uterus. It may be difficult to say which of these conditions is present without the most careful examination of scrapings.

Symptoms.—Increased menstruation is the most common symptom. This is especially marked in the hæmorrhagic type, and, as a result, the patient may get very anæmic, weakened, and sometimes cachectic-looking. There may be increase both in the duration and quantity, and in some cases there may be loss of blood between times. When the patient has got much run down, the menstruation may become scanty.

Leucorrhœa is very common. The discharge is not usually so gelatinous as that produced by the cervix. It is more serous or seropurulent, and may be somewhat blood-tinged.

Dysmenorrhœa is frequently present. In some cases this is undoubtedly due to associated inflammatory conditions, *e.g.* metritis, salpingitis, etc., but in many cases I believe it to be due to abnormal clotting of blood *in utero*, fibrin-formation, or to the shedding of abnormally large bits of mucosa, as a result of the inflammatory changes; these masses interfere with the free escape of the menstrual blood and cause reflex contractions of the uterus (*vide* "Dysmenorrhœa," p. 127).

Weakness and pains in the back and pelvis are common. A feeling of general weakness and incapacity for work, anæmia, various nervous derangements, and digestive disorders are found in well-pronounced cases.

Sterility may result, or if pregnancy should take place there is a tendency to abortion.

II. INFLAMMATION OF THE WHOLE UTERINE WALL.

Acute Metritis.

Pathology.—In acute inflammation the uterus becomes enlarged, softened, and, it may be, of doughy consistence. The walls are deeply congested in all parts, and blood extravasations may be seen in parts.

Inflammatory products are exuded among the muscular bundles, and in the mucosa. If pus formation has taken place, small foci are noticed throughout the wall. The muscle is softened, and often pulpy. The peritoneal surface is also inflamed.

FIG. 145.—Septic infection following abortion. Many chains of streptococci are seen in the remains of the mucosa of the uterus.

Acute metritis may lead to a chronic inflammatory condition, in which thickening and hardening of the connective tissue elements prevail; or, a chronic purulent condition may be left, abscesses being present in the uterine wall, and, sometimes, in the adjacent parametrium, tubes, and ovaries. Rarely, abscess of the wall may perforate into vagina, bladder, intestines, or abdominal walls.

Sometimes rapid resolution and recovery may occur. At times death occurs from the virulence of the infection causing the inflammation.

Physical signs.—There is tenderness on bimanual examination of the pelvis, and there may be great pain. The abdominal walls may be very tense and resistant—varying according to the amount of peritonitis. There is much heat in the pelvis, and often free leucorrhœal discharge. In puerperal cases, the lochial discharge usually diminishes

with the development of an acute attack. The uterus is felt enlarged and softened. The usual signs of peritonitis may be present also.

Symptoms.—These are in general those of acute local peritonitis. There is, locally, a feeling of heat and fulness; pains are felt in the pelvis, aggravated by movement, micturition, and defæcation. There is vesical and rectal tenesmus.

Menstruation is usually suppressed or diminished, sometimes increased.

Chronic Metritis.

Pathology.—This condition may follow an acute inflammatory attack, but more frequently it begins slowly. When it follows an acute process, or begins as a subinvolution after the delivery, the uterus is at first enlarged, softened, and congested. Later it becomes gradually indurated and pale. The enlargement is uniform. The peritoneum may or may not form adhesions.

On microscopic examination, in the early stage, the vessels are found congested, and many leucocytes and proliferating connective tissue corpuscles are found between the muscular bundles. Later on, the blood vessels are contracted and their walls thickened, the lymphatics often dilated. There is an increased quantity of dense fibrous tissue between the muscular bundles. The latter gradually tend to become compressed and destroyed.

In the endometrium the various chronic inflammatory changes described may be in process. The peritoneum may be found thickened or adherent.

Physical signs.—In the early stage the uterus is felt bimanually to be uniformly enlarged and somewhat softer than normal. In the later stages it is felt enlarged and hard. It may be movable, fixed, or displaced. On passing the sound, its cavity is found to be enlarged.

Differential diagnosis.—It is often difficult to establish a diagnosis between metritis, early pregnancy, metritis in an early pregnant uterus, and a uterus enlarged as a result of a small fibromyoma.

Symptoms.—Menstruation is altered in various ways, mainly depending upon the condition of the endometrium. Menorrhagia and metrorrhagia are very frequent. The discharges of blood may be very irregular in some cases. When the patient is much run down, there may be some degree of amenorrhœa. Dysmenorrhœa is often present. There is a tendency to abortion. In marked cases sterility is the rule, though in many cases this may be due to coexisting inflammatory changes in the ovaries or tubes. There is a feeling of weakness, dragging, or heaviness in the back, pelvis, or loins, and pains are often felt. There may be pain on defæcation and micturition.

There are usually more or less marked reflex and sympathetic disturbances, and various neuroses may be established.

Treatment of Uterine Inflammations.

In Acute Cases.

The treatment of acute inflammation of the whole uterus is practically that of an acute pelvic peritonitis.

If there be any local cause of septic infection, *e.g.* remains of placenta which have undergone decomposition *in utero*, the cavity of the uterus should be thoroughly curetted and washed out regularly with an antiseptic lotion.

Several have advocated extirpation of the uterus in acute septic, *e.g.* puerperal cases; the operation is a very severe one under the circumstances, and it is doubtful if it should be employed. If the treatment of septicæmia by anti-streptococcus serum turns out to be reliable and successful, it is likely that such extreme operative measures will never come under consideration.

In Chronic Cases.

The treatment of chronic uterine inflammation is most difficult and unsatisfactory. It can only be satisfactorily accomplished when the patient submits herself to the most diligent carrying out of the measures recommended. Spasmodic or unsystematic efforts are bound to end only in disappointment both to patient and physician.

General Measures.—It is of the greatest importance to attend to the general health of the patient. The diet should be regulated so that the stomach and bowels perform their functions well. Constipation is to be avoided. Various mineral waters are used for laxative purposes, *e.g.* Villacabras, Rubinat, Birmenstorf, Hunyadi Janos, Friedrichshall. If the patient be run down, it may be necessary to stop her from engaging in her ordinary activities. Often it is best to send her away from home for a complete change. Patients often improve considerably at watering-places, where they are under changed conditions and on strict regimen. Sometimes it is advisable to make the patient rest on the flat of her back, with the lower part of her body elevated, for a couple of hours in the afternoon. She must not be allowed to become too inactive, however, and should be encouraged to take regular open-air exercise of a gentle nature, while indoor practice with dumb-bells or Indian clubs should be enjoined.

At menstrual periods the patient should take an extra amount of rest. Coitus is to be avoided as much as possible.

Certain drugs may be necessary in some cases, mainly of a tonic nature, *e.g.* iron, arsenic, cod-liver oil, strychnine. Potassium or sodium iodide is recommended strongly by some authorities to bring about a reduction in size of the uterus, but it acts very slowly in this way, if local pelvic measures

be not employed; it may be especially valuable where there is a rheumatic taint, but it is not to be used if the patient be much depressed or debilitated. Sodium or potassium bromide is often used along with the iodide, where there is much pain or nervous irritability. It is important, however, to avoid the indiscriminate use of this drug, and it should be withheld in all cases where there is a considerable neurotic complication.

Various of the medicinal waters are of value in many cases, *e.g.* the sulphated alkaline waters of Franzenbad, the muriated waters of Kreuznach, Woodhall Spa, Kissingen, Reichenhall, the muriated alkaline waters of Ems, Royat, etc. Iron waters are given at Spa, Schwalbach, Pyrmont, and elsewhere.

When there is menorrhagia or metrorrhagia, ergot may be given for some weeks, being increased at the menstrual periods.

In every instance the patient should be encouraged and strengthened in every way; she should be made to take her mind off her local condition. If she be very neurotic, strict disciplinary measures may be necessary, and, in some cases, it is advisable to put her under the Weir Mitchell treatment.

Believing that the great majority of these chronic inflammations are due to residual infection of microbial origin, we must use measures to promote nature's method of getting rid of the irritant, mainly by the activity of the blood and lymph circulation, and of leucocytes.

Local Measures.—It is important, therefore, to aim at relief of congestion and stimulation of the circulation. Where the uterus is somewhat enlarged and tends to drag down or prolapse, a Hodge or ring pessary may be introduced to support the uterus as a whole for a time. This is especially necessary if the uterus be displaced.

Vaginal douching is of great value when thoroughly carried out (*vide* p. 216). The water may be either cold or

hot. Most patients prefer the latter, the temperature being about 110° F.

When there is slight endometritis and endocervicitis it is well to finish the douche with an astringent lotion, *e.g.* sulphate of copper or alum (℥ii. to a pint) solution, or corrosive sublimate (1 to 6000), solution.

Hot hip-baths of salt water given at night from time to time are serviceable. They are often valuable in diminishing pelvic pain, especially before menstruation. If the patient is debilitated, it is not well to employ them.

A *cold hip-bath* in the morning is a valuable stimulus to the circulation. Vaginal tampons soaked in glycerin or in ichthyol glycerin (1 in 10–20), placed in the vagina against the cervix, at bed-time, may relieve congestion considerably by causing a free flow of watery discharge from the uterus. These may be introduced every few nights.

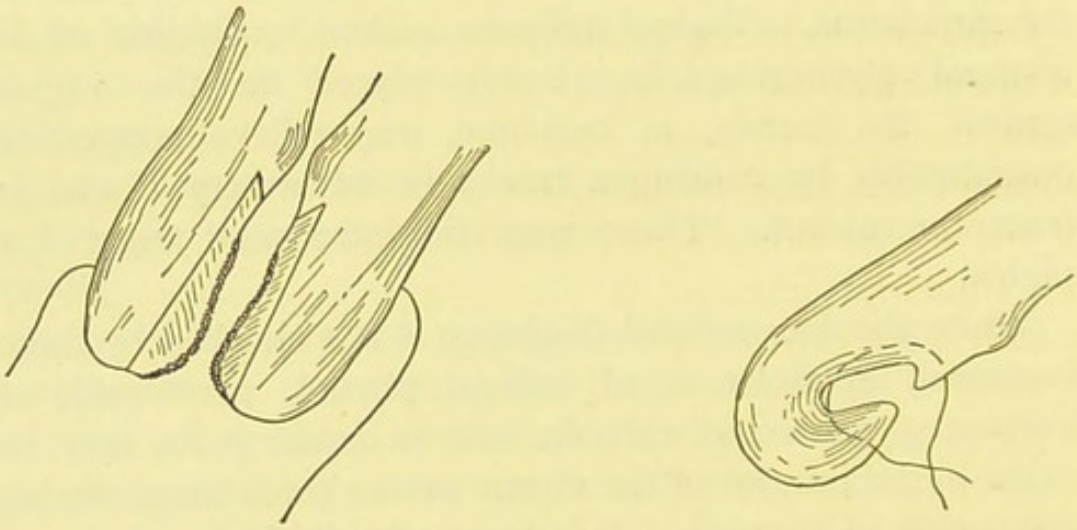
When the leucorrhœal discharge is not checked by these measures, applications of iodised phenol, perchloride of iron, or glycerin and carbolic acid in equal parts, may be made in the interior of the uterus two or three times during the course of a month. It is best to begin during the week after menstruation. If an application be made too near the onset, it is apt to bring on the flow prematurely.

Counter-irritation by means of blisters over the iliac regions is often beneficial.

In many cases it is more expeditious to curette the uterus thoroughly. The importance of thorough removal of possible sources of infection in inflammations of the uterus cannot be too strongly urged. If a diseased mucosa be left as a constant source of irritation, progress will be very slow. Where slight endocervicitis exists, with the formation of a catarrhal patch, the diseased surface should be scraped away, the Nabothian follicles emptied, and iodised phenol applied. Each day afterwards the vagina should be douched with an astringent antiseptic douche. In bad

cases, where the cervical mucosa is much diseased, curetting should be followed by an operation for the removal of the diseased part. This is best carried out by Schroeder's method, as follows :—

The cervix is drawn down and steadied with a volsella. It is then divided as high as the fornix into an anterior and posterior half. A transverse incision is then made across the mucosa of the latter above the disease, and another is carried up from the extremity of the lip to meet the first one. In this way a strip of diseased mucosa is entirely



1. 2.

FIG. 146.—Operation for removal of diseased mucosa in endocervicitis.—SCHROEDER.

1. The lines of incision are shown. 2. Passage of sutures.

removed. The rawed lip is then bent upwards on itself, the lower part being approximated to the intact mucosa, and three or four stitches applied.

The anterior lip is treated in the same way. The sides of the first incision are then secured with a stitch or two, and the after-treatment is the same as in the case of curetting.

In bad hæmorrhagic endometritis cases, it is good, after curetting, to pack the uterine cavity with iodoform gauze for twenty-four hours, and then to introduce another piece for the same period.

After these operations the patient should be in bed for at least eight days. At the following menstrual period there is apt to be an excessive discharge of blood, and it is advisable for the patient to rest a good deal and to take ergot inwardly.

In extreme cases of metritis, where the uterus is much enlarged, in addition to curetting the mucosa it is advisable to amputate one or both lips of the cervix by the method described on p. 438. This has been especially advocated by Martin of Berlin as a means of stimulating involution changes in the uterus.

Galvanic electricity is also valuable in reducing the size of the uterus (*vide* p. 241).

In cases where acute metritis has been followed by a purulent condition in different parts of the wall, extirpation of the uterus along with the tubes and ovaries, which may be similarly affected, is justifiable. The operation is usually best carried out by the clamp-method.

Stenosis of the Cervical Canal.

Narrowing of the cervical canal may be found at the os externum, the os internum, at both of these spots, or in the whole length of the canal. Most frequently the first two varieties are found. The condition may be a congenital one, and in these cases it may be found with defective development of the uterus, or with an elongated cervix. It may be due also to contracture after labour, after operations on the cervix, *e.g.* amputation, to frequent application of strong caustics; it may sometimes follow inflammatory changes in the cervix. The irritation of a pessary has been known to lead to it. It may be a natural change in advancing age.

Symptoms.—Dysmenorrhœa may be caused. Normally, during menstruation, some dilatation of the cervical canal takes place. If this be prevented it is possible that the

obstruction to the menstrual outflow may lead to the development of pains.

In many of these cases the pains are due to associated conditions, *e.g.* clotting of the blood *in utero*, fibrin-formation, the shedding of abnormally large bits of uterine mucosa as a result of endometritis, inflammatory changes in the uterine wall.

Often the pains are due to a neurotic condition. (For a full consideration of dysmenorrhœa in relation to stenosis of the cervix, *vide* p. 125.)

Sterility may also be common in these cases, but probably, in many instances, it is not the stenosis but some associated condition, *e.g.* inflammation, which is the cause. Neurotic complications are often present.

Physical examination.—The condition of the cervix may sometimes be distinguished by the finger when the os externum is affected. It is usually necessary to use the sound. This may be passed with great difficulty, or it may be impossible. Sometimes the cervical canal may become distended with mucus when the stenosis is at the os externum.

It is important to note that the sound may be obstructed by a uterine flexion, a fold of the mucosa, a polypus, or by a reflex contraction of the muscle around the os internum.

Treatment.—When there is a stenosis of the cervical canal, some method of permanently enlarging it should be adopted. This treatment should always be associated with energetic measures to improve other diseased conditions which may be present. Generally it is well to curette the uterus where there are inflammatory changes in its wall.

The following are the various operative measures to be recommended :—

Instrumental dilatation.—The patient is prepared for operation as described on p. 205. She is placed in the

lithotomy position and anæsthetised. The cervix is pulled down by means of a volsella. The size of the canal is estimated by the sound, and a series of Hegar's dilators are passed into the cervical canal until the stenosed portion is well stretched. Along with these a metal dilator, *e.g.* Sims', may be used.

Incision.—It is generally best to divide the stenosed portion as well as to dilate it. In the case of a small external os, this may be carried out with a pair of scissors or an ordinary bistoury, the cervix being pulled down with a volsella.

The posterior lip may be divided in the middle line, or the cervix may be divided on each side. The depth of the incision is about three-eighths of an inch.

In the case of stenosis of the whole canal or of the internal os, after dilatation a narrow, sharp-pointed bistoury is passed up the canal, and the wall at the internal os incised first on one side and then on the other. If the whole cervical canal is narrowed, each of these incisions can be extended down through the whole length of the cervix. The incision extends through the whole thickness of the mucosa and into the muscle.

The after-treatment in these cases is important. The rawed surfaces should be swabbed with iodised phenol or liquor ferri perchlor. fort., and they should be kept apart by a small glass tube, or by a plug of iodoform gauze. These should be changed every two days for eight days. Afterwards, for ten days, the os should be kept open by means of Hegar's dilators or the finger.

Excision.—In cases of stenosis of the external os, this operation is preferred by some.

The cervix is pulled down with a volsella, and is split on each side for half an inch. Out of each of these portions a wedge-shaped piece is cut with a sharp bistoury. The raw surfaces in each lip are then closed by catgut sutures, the edge of the cervical mucosa being joined to that of the

vaginal portion. The lateral incisions are then closed. At the end of the operation, instead of the small os externum there is left a large gaping one.

After these operations, it is a good thing to pass a dilator or sound into the uterus prior to three or four menstrual periods. Neurotic complications must be carefully attended to.

Atresia of the Cervix.

This may be congenital or acquired. The former of these is considered on p. 416.

Acquired atresia may follow cicatrisation after injury in labour, cauterisation of the cervix, amputation, ulceration; it may be found in the senile uterus; with tumours of the cervix; as a result of the irritation of a pessary; sometimes in prolapsus uteri.

If the patient has not passed the menopause, distension of the uterus or tubes, or of both, may result. Sometimes this may become infected, and a collection of pus may follow; occasionally it may contain gas. In women, after the menopause, a pus collection may rarely be found in the uterus.

Treatment.—An opening must be made in the cervix. The incision is made by means of a sharp bistoury, the cervix being steadied by means of a volsella. A small circular portion may be cut out, and the raw surfaces swabbed with perchloride of iron. The after-treatment is important. A glass tube should be worn for a few weeks, in order to prevent the part from closing.

Hypertrophy of the Cervix.

Hypertrophy of the uterus is found in two forms, namely, general increase in size, especially transversely, due to inflammation, and hypertrophic elongation. The latter will

alone be considered under this heading. The following forms are met with:—

Hypertrophic elongation of the vaginal portion.—In this condition the portion of the cervix within the vagina is elongated; in some cases it may extend beyond the vulva. There is practically no transverse increase. This condition is probably congenital in origin.

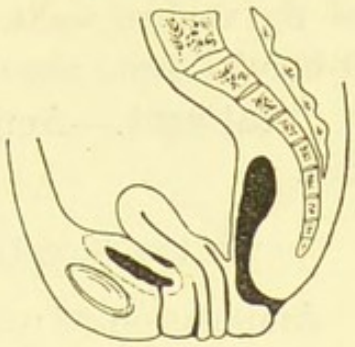


FIG. 147.—Hypertrophic elongation of vaginal portion of cervix.

Physical signs.—On bimanual examination the fundus uteri is found at its normal height. The fornix vaginæ is normal. The uterus is elongated, that part of it above the vagina being of normal size and shape.

Hypertrophy of the supravaginal portion.—This condition may be primary, though generally it is secondary to prolapsus uteri.

Physical signs.—On bimanual examination the uterus is felt elongated. As the hypertrophy increases, both fornices tend to become obliterated. It is impossible to say whether the body of the uterus may not be involved in these cases, because it is impossible to know clinically where the os internum is situated. There may be stenosis of the cervix. In an advanced case the bladder is greatly lowered, as well as the pouch of Douglas.

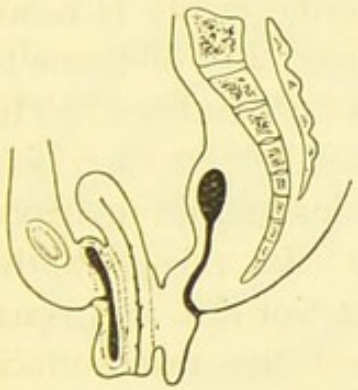


FIG. 148.—Hypertrophic elongation of supravaginal portion of cervix.

Hypertrophy of the intermediate portion.—Sometimes the hypertrophy may mainly affect the intermediate portion of the cervix. As it increases, the anterior fornix tends to become obliterated, the posterior remaining. The bladder becomes lowered.

Symptoms.—In slight cases there may be no symptoms.

In other cases there may be dysmenorrhœa and sterility. In marked cases there may be a feeling of dragging or bearing-down, discomfort, or pain. There may be micturition and defæcation troubles, and trouble on walking. Leucorrhœa may be excessive, and may result from irritation of the vaginal walls. If the cervix projects from the vulva it may become ulcerated.

Treatment.—Amputation of the cervix must be carried out.

Hypertrophic Elongation of the Cervix.

Amputation of part of the cervix is performed. Either of two methods may be employed.

1. **Flap amputation,** by removal of wedge-shaped portions from anterior and posterior lips.

The patient is placed in the lithotomy position. A short, wide, spatular speculum is placed posteriorly in the vagina. The cervix is pulled down with a volsella. The length of the uterine cavity is measured, so that the amount of tissue to be removed may be estimated. The cervix is then divided on each side as high as is desired, it may be ¾ in. or more. In this way the anterior and posterior lips are separated.

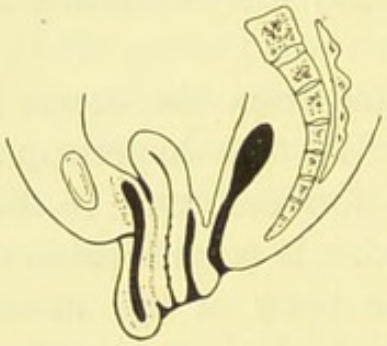


Fig. 149.—Hypertrophic elongation of intermediate portion of cervix.

The posterior lip is then held in the middle line at its lowest point by a volsella, the anterior lip being held out of the way by an assistant. With a bistoury a transverse cut is made across the posterior lip some distance below the upper limit of the lateral incisions. The edge of the bistoury cuts inwards and upwards. A second transverse incision, beginning on the lower part of the lip outside the os externum, extends upwards to meet the first transverse cut. In this way a wedge-shaped piece of tissue is removed.

The raw surfaces in the lip are then brought together, the mucosa of the cervical canal being approximated to that of the vaginal portion of the cervix. For this a series of interrupted catgut sutures are used, or a continuous suture may suffice.

A corresponding wedge-shaped portion is then removed from the anterior lip, and the raw surface closed. The anterior and posterior lips are then brought together by means of a catgut suture passed on each side. The sutures are then cut short.

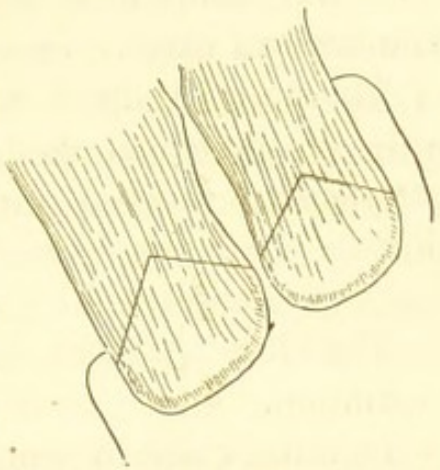


FIG. 150.—Flap amputation of cervix.—MARTIN.

During the operation bleeding is checked by means of the hot douche which is used to irrigate the parts. Any marked vessel may be twisted or secured with catgut.

A vaginal plug of iodoform gauze is placed in the vagina, and the patient is put to bed. After twenty-four hours the plug is removed, and an antiseptic warm douche is given. This is repeated daily. By the tenth day the patient may sit up.

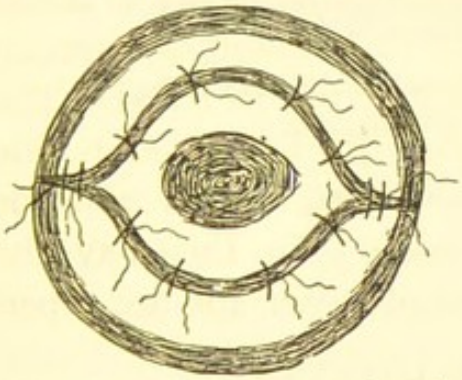


FIG. 151.—Appearance of cervix immediately after flap amputation.

2. **Circular amputation.**—The cervix is pulled down with a volsella attached close to the os externum. With a bistoury a circular incision is made through the mucous membrane, covering the vaginal portion of the cervix just where the outer surface turns inwards towards the os externum. The mucous membrane is stripped upward above this incision by means of the thumb-nail and knife, leaving bare the musculature of the uterus. The upper limit is decided by the amount to be amputated. The cervix is then divided into an anterior and a posterior part

as high as the line of amputation. The posterior lip is then cut across somewhat obliquely, so as to leave a thin flap next the cavity. The stripped-up mucosa is then turned over the stump, and its edge stitched to the thin flap next the cervical canal. Separate catgut sutures are used.

The anterior lip is treated in the same way. On each side of the canal the gaping redundant portions of the stripped-up mucosa should be closed by catgut sutures. Finally the cervical canal should be examined to see that it has not been closed by sutures nor made too small.

The after-treatment is the same as described for the last operation.

In those cases in which the relations of the bladder and

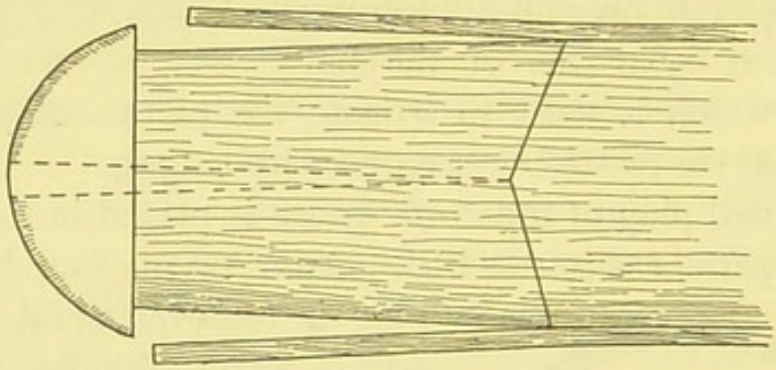


FIG. 152.—Diagram to show the method of amputating the cervix by the circular method.

pouch of Douglas are altered, care must be taken not to open into them in operating.

ATROPHY OF THE UTERUS.

This condition is found—

1. As a congenital condition (*vide* p. 411).

2. Associated with certain debilitating conditions, *e.g.* chlorosis, tuberculosis, syphilis, diabetes, Bright's disease, morphinism, etc.

3. After the menopause.

4. After delivery, as a result of superinvolution. Here great loss of blood or over-lactation may lead to the con-

dition; or, perhaps, pelvic inflammation causing destruction of the ovaries or interfering gradually with the nutrition of the uterus.

5. Sometimes it follows amputation of the cervix.

Pathology.—The uterus is reduced in size. The cavity may be under 2 in. in length. The walls may be very thin and flaccid, or tough and fibrous. The ovaries may or may not be atrophied.

Diagnosis.—The chief feature is amenorrhœa. There may be associated pelvic pains due to accompanying inflammatory conditions or to neurosis. There may be a poor condition of health and reflex neurotic phenomena.

On physical examination, the uterus is found to be small. This is also made out by means of the sound, which must be used with great care. The condition must be distinguished from malformations of the uterus.

Treatment.—Treatment is unsatisfactory. The general health must be improved and tonics administered, *e.g.* iron, strychnine. Locally, hot douches may be used. The uterus may be stimulated by the frequent passage of a sound.

Laceration of the Cervix.

Pathology.—Lacerations result from labour, especially from a tedious or precipitate labour, or from operative procedures on the uterus. The former are by far the most common cause. They may occur at an early abortion, as well as at a labour in the late period of pregnancy. Lacerations may be found in all parts of the cervix. Most commonly the left anterior portion is torn (to be associated with the most common position of the head in labour, namely, to the front and left side). Very frequent is a double laceration, one in front and on the left, the other behind and on the right. Sometimes the presence of several tears may give a stellate appearance to the cervix. All degrees of laceration

may be found, from a slight notch to a deep fissure extending into the fornix.

Results of laceration.—Inflammation of the mucosa of the cervix, substance of cervix, broad or utero-sacral ligament and subinvolution may follow the lesion. It is thus evident that a variety of conditions may be met with.

It is probable that the condition *per se* is of no significance. Inasmuch, however, as it affords a raw surface for germ activity and absorption, it is to be regarded as furnishing an important area for the infection of the pelvis.

Symptoms.—*Per se* laceration gives rise to no symptom, save to hæmorrhage when the lesion occurs.

The many symptoms which are found are probably entirely due to the secondary results of infection, *i.e.* cellulitis, uterine inflammation, compression of nerves by cicatrisation following inflammation, etc. They are very varied, *e.g.* menorrhagia, metrorrhagia, leucorrhœa, pelvic pains and aches, reflex and neurotic disturbances.

Emmet attaches great importance to the presence of cicatricial tissue in the angle of the tear as a source of pain and of nervous disorders.

Diagnosis.—On bimanual examination the laceration may be felt. If the laceration be large or double and the mucosa everted, the fingers may not so easily detect the condition. Through a speculum the exposed mucosa is visible. If there be no catarrhal patch, the red area can be made to disappear if the torn edges of the cervix be brought together by means of volsellæ. Where catarrh exists the red area cannot thus be made to disappear entirely. When inflammatory changes have resulted from the laceration, the various signs due to them may be made out on physical examination.

Treatment.—All marked lacerations should be repaired at the time of their occurrence. Slight ones may be left alone, but the raw surfaces should be kept aseptic until they are healed, in order to prevent infection.

In old-standing cases the most important treatment is that which is directed towards the cure of the sequelæ of laceration (*vide* "Treatment of Uterine Inflammation and Cellulitis").

Repair of the laceration is rarely needed. It should be carried out when there is much exposure of the cervical mucosa.

The operative procedures are carried out as follows:—

(*a*) *Where the tear does not extend into the fornix.*—A spatular speculum is introduced into the vagina for the purpose of pulling back the posterior wall. If there be endometritis, the uterus should be curetted and iodised phenol should be applied to the endometrium. The cervix is then pulled down, the edges of the tear are pared, care being taken to raw the apex well. A bistoury or pair of scissors is used. The rawed surfaces are then brought together by a series of catgut sutures. The cervical canal should not be made too small.

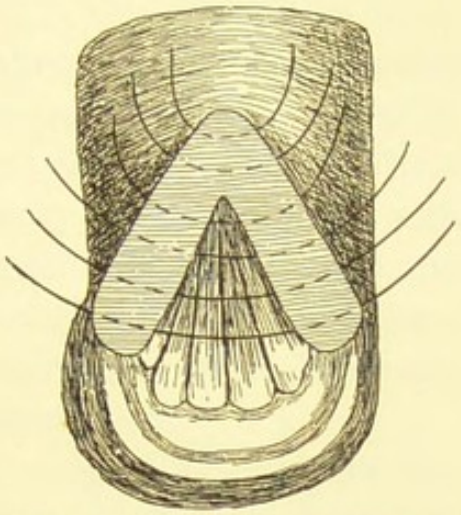


FIG. 153.—Emmet's operation for repair of laceration of the cervix. The diagram shows the rawing of the edges of the tear, and the method of passing the sutures.

An iodoform gauze plug is placed in the vagina for twenty-four hours. The after-treatment is the same as described for the last operation.

(*b*) *When the tear extends into the fornix, displacement of the uterus having resulted from the cicatrisation.*—A broad spatular speculum is placed against the posterior wall. The uterus is curetted if there be endometritis. The cervix is pulled with a volsella towards the sound side. A curved incision is made in the affected fornix close to the cervix, and following its curve, some of the cicatricial bands being cut through. As the cervix is pulled, the incision gapes,

and its walls are brought together by sutures passed from before backwards, so that the resulting line of incision remains transverse.

In cases where there is considerable hypertrophy of the cervix or of the whole uterus, or where marked endocervicitis exists, it is best to curette the uterus, and to amputate the cervix by the flap method, instead of attempting to repair the laceration.

CHAPTER XV.

DISPLACEMENTS OF THE UTERUS.

UNDER this heading are considered alterations in the shape and relation of the uterus in terms of version, flexion, and position.

Normally the uterus is anteposed, *i.e.* placed as a whole in the anterior half of the pelvic cavity; anteverted, *i.e.* with its long axis so directed that the fundus looks towards the front; and anteflexed, *i.e.* with a slight bend in the long axis of the uterus, the concavity being anterior. Normally there may be a slight degree of lateriversion.

Occasionally we find a case of congenital retroposition, *i.e.* the uterus as a whole is well back in the sacral hollow, and anteflexed. More often this condition is the result of a posterior adhesive perimetritis.

I have already fully described the mobility in the uterus, and the range of movement through which it is continually passing. These must be kept in mind in the study of displacements.

According to the ordinary descriptions, attention is drawn to the four following forms of displacement:—

Anteversion.
Anteflexion.
Retroversion.
Retroflexion.

ANTEVERSION.

It is absurd to refer to this as a special topic. *Per se* it has absolutely no clinical importance, though for a long

time this term has been used to describe a supposed special diseased state of the uterus.

In this condition the uterus is enlarged, and the long axis of the uterus more or less straightened, owing to the diminution of the normal slight anteflexion. The symptoms were related to this altered condition of the uterine axis. Such views must now be considered as absolutely untenable. They are incorrect.

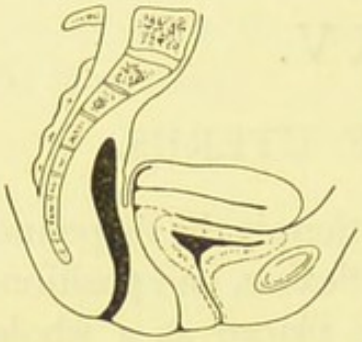


FIG. 154.—Metritis. The so-called "anteversion" of the uterus is shown.

There is no special disease of anteversion. Nor does anteversion produce any symptoms. Anteversion is but one of the results of the thickening of the uterus, due to chronic metritis. Even in normal states the uterus may often be found with very little flexion. The treatment of anteversion is the treatment of metritis. Special anteversion pessaries, such as Gehrung's, Thomas', and Graily Hewitt's, were introduced when incorrect ideas as to the pathology of the condition prevailed. They were meant to lie in the vagina, and by means of a projecting portion to press through the anterior fornix against the uterus, whose wall would thereby become bent over it. It was also believed that the pressure of the body would thus be taken off the bladder.

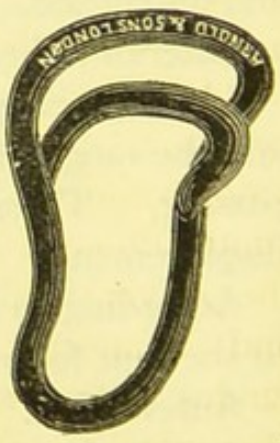


FIG. 155.—Thomas' anteversion pessary.

Now we know that no special influence can be brought to bear on the corpus uteri through the anterior fornix by such instruments. Even if a slight flexion were produced (probably it could not be brought about), the relation of the uterus to the bladder, and to the rest of the pelvic floor, would remain the same, as far as intra-abdominal pressure is concerned.

Such instruments must be abandoned. As I have already

stated, the treatment is that of metritis. Sometimes in this condition it may be helpful to support the uterus for a time in order to relieve congestion where it is much enlarged, and tends to drag down. This support may be given by the use of vaginal glycerin plugs, which help to relieve the congestion, as well, in another way.

But a ring or Hodge pessary may be used for this purpose —without any reference, however, to the so-called anteverted condition of the uterus.

ANTEFLEXION.

This term is used to refer to an exaggeration of the normal flexion on the uterus. It is impossible to say what is a pathological angle of flexion. All degrees may be found in conditions of perfect health. In some cases the most extreme anteflexion may be a congenital condition, the uterus being often undersized and having a long conical cervix.

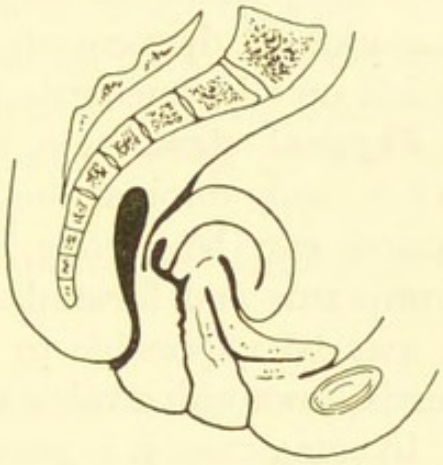


FIG. 156.—Pathological anteflexion of the uterus. The cervix is drawn back by posterior perimetritis and utero-sacral cellulitis.

Acquired anteflexion is mostly due to a posterior or utero-sacral cellulitis, sometimes to a posterior perimetritis. Owing to the contraction of the inflamed bands the cervix is drawn backwards and somewhat upwards, the fundus being lowered. Intra-abdominal pressure tends to press it continually downwards, increasing the anterior flexion on the uterus. Usually in these cases there is some degree of inflammation in the uterine wall, which may lead to a fixation of the organ with the extreme degree of anteflexion. The point of flexion is usually at the isthmus; sometimes it is higher.

This condition is more common in nulliparous than in multiparous women (*vide* "Pelvic Cellulitis").

Symptoms.—In many cases in which there is an abnormal degree of flexion in the uterus there are no symptoms. It is probably only to pathological accompaniments of the anteflexion that we must look for the distressing symptoms which are found in other cases. These are inflammation in the uterine wall, in the peritoneum or cellular tissue behind the uterus, or in the appendages; or to an associated marked stenosis of the cervical canal. The common symptoms in these cases are leucorrhœa, sterility, dysmenorrhœa, dyspareunia. Menorrhagia, irregular menstruation, or some degree of amenorrhœa may be present. There may be frequency of micturition or pain on defæcation. There may be reflex pains, *e.g.* under the left breast. Neurotic phenomena may develop. (An explanation of the causation of dysmenorrhœa in these cases is given in the article on "Dysmenorrhœa," p. 129.)

Physical signs.—On bimanual examination the fundus is felt easily through the anterior fornix, and the angle of flexion can be readily distinguished. The cervix looks downwards and forwards. So marked is the flexion that it may be impossible to pass a sound without pulling the cervix down with a volsella.

In some cases it is possible to straighten the uterine axis between the fingers, but oftentimes this cannot be done, so rigid is the wall; and attempts may cause the patient pain.

The condition of utero-sacral cellulitis or posterior peritonitis may be made out best by a finger passed into the rectum.

Differential diagnosis.—The condition is apt to be mistaken for—

A small myoma in the anterior uterine wall.

A cellulitic deposit between the cervix and bladder.

A tumour of the bladder wall or a vesical calculus.

In the first of these conditions the use of a sound along

with the bimanual examination establishes the nature of the case. The latter two conditions are rare.

Treatment.—The treatment of anteflexion is really that of the various associated inflammatory conditions. Schultze has pointed out how often cases improve as the inflammatory products are absorbed, even though the flexion of the uterus may remain the same.

For a long time uterine stem pessaries have been used for the purpose of straightening the uterus. Their use is based upon a wrong understanding of the pathology, and they are dangerous because of the injury they may cause to the uterine mucosa, and because they may lead to septic infection. All forms of this instrument should be abolished, whether simple firm stems like Amann's, soft rubber stems like Greenhalgh's, or firm stems combined with vaginal pessaries like Beigel's.

In cases in which the uterus is much enlarged from inflammation, support of the organ for a time by means of vaginal plugs, Hodge or ring pessaries, may be beneficial. Their use has, however, nothing whatever to do with the presence or absence of anteflexion.

Where stenosis of the cervix exists, dilatation should be carried out.

Retroversion and Retroflexion.

Retroversion is the condition in which the long axis of the uterus is directed so that the fundus looks towards the back. Retroflexion is the condition in which the uterus is bent, so that the concavity is directed towards the back; it is more commonly met with than the former.

As retroflexion is practically only found in a retroverted uterus the two conditions may be considered together.[1]

Etiology.—Temporary retroversion is brought about when the bladder is over-distended.

Permanent retroversion and retroflexion occur in the following conditions:—

[1] *Vide* p. 27.

1. They may be congenital, the former being more common than retroflexion.

2. They may occur in the puerperium.

The frequent occurrence of these displacements in this period is due to the weight of the uterus causing the fundus to gravitate towards the sacrum, when the patient lies in the dorsal position, the ligaments being in a lax state. Usually the condition is only a temporary one, the organ returning to the normal position as involution proceeds.

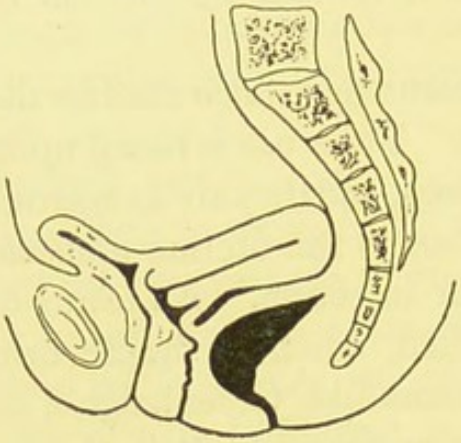


FIG. 157.—Retroversion of the uterus.

If, however, metritis develops in the puerperium, if the patient rises too soon or goes to work too early, a permanent displacement may be established.

3. They may be produced by posterior adhesions due to peritonitis.

4. They may be caused by a small fibroid in the upper part of the posterior wall of the uterus.

5. They may be caused by a sudden strain or fall.

6. They may be caused by cicatrisation in the anterior vaginal wall.

7. Retroversion is usually one of the stages in the development of a prolapsus uteri.

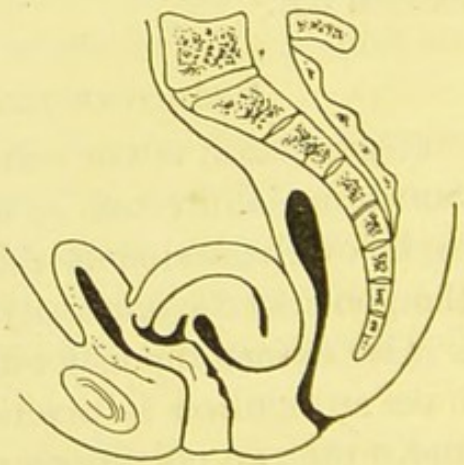


FIG. 158.—Retroflexion of the uterus.

Anatomical changes. — In pure retroversion the fundus lies in the hollow of the sacrum. The os is directed forwards. The cervix presses against the bladder, and may be close to the pubes if the uterus be much enlarged by metritis.

In retroflexion the fundus lies in the pouch of Douglas varying in level according to the acuteness of the angle of flexion, and to the extent to which the uterus as a whole is prolapsed.

According to many authorities the posterior wall is somewhat thinned at the angle of flexion, though in a congenital case Ruge found the anterior wall atrophied at this point.

The whole organ is usually congested and somewhat enlarged. Metritis is very often present in it. In some cases, however, these conditions do not exist.

The os externum looks forwards and downwards, sometimes forwards only, sometimes downwards. It may, therefore, in some cases be found close to the pubes.

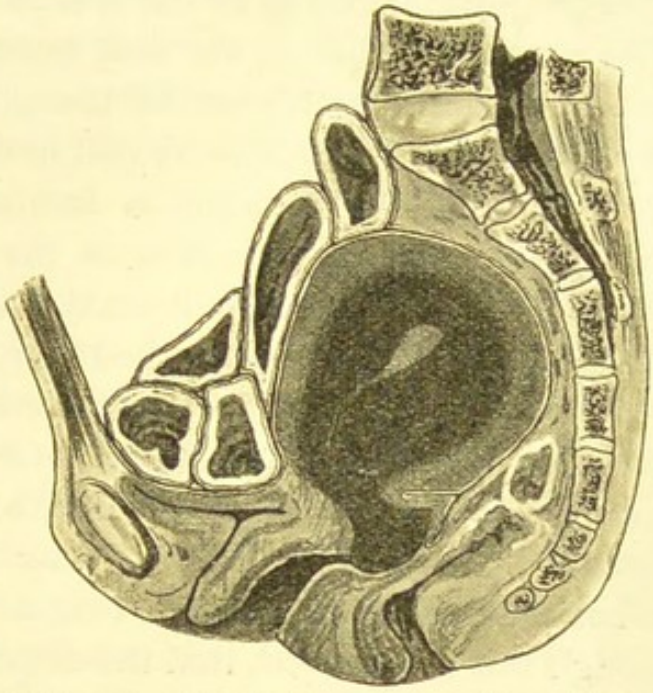


FIG. 159.—Vertical mesial section of the pelvis of a woman who died on the fifteenth day of the puerperium. The uterus is retroflexed.

As a result of these posterior displacements, the *ovaries and tubes* are dragged downwards, often to an unequal extent. Sometimes they may lie below the uterus in the pouch of Douglas.

The *bladder* may not be altered in position, but sometimes it is tilted somewhat forwards. Intestines lie on it, and on the anterior surface of the uterus.

The *ureters* may be compressed or bent, leading to dilatation. This may lead to changes in the kidneys.

The *rectum* may be considerably pressed upon.

The *utero-sacral* ligaments get stretched. The broad ligaments are bent on themselves.

Various inflammatory changes may be found associated with these displacements, *e.g.* metritis, endometritis, endocervicitis, ovaritis, salpingitis, peritonitis. Owing to the formation of adhesions, the displaced uterus may be more or less fixed.

In most cases these inflammations are independent of the displacement. Whether the latter condition can aggravate these inflammatory processes is doubted by many. According to others, it can in a marked retroflexion, owing to the sluggishness of the uterine circulation, and to congestion as a result of the bending of the vessels in the broad ligament. The venous network is so rich, however, that it is difficult to understand how this can be brought about. At any rate, the clinical fact is established, that in these posterior displacements profuse menstruation is common; and even though we attribute this phenomenon to the inflammatory changes in the uterus, it must be admitted that they are in some way affected, especially by a marked retroflexion. There is no proof, however, that a simple posterior displacement, unaccompanied by inflammation, is necessarily followed by this complication. Indeed, it is hard to understand why this should be so, if we believe that practically all uterine inflammations are of infective origin. It may be suggested, though it is not proved, that the displacement may somehow alter the state of the uterus, so as to render it more liable to infection by microbial action.

Physical signs.—On bimanual examination the retroverted uterus is felt, the body being made out through the posterior fornix. Per rectum the fundus may usually be easily felt. In retroflexion the rounded body is felt in the pouch of Douglas, an angle being made out between it and the cervix. When one is moved the other usually moves also, unless fixed by adhesions. In both conditions the fingers may meet in front of the cervix, the uterine body not being found in its normal position. Sometimes, to feel the fundus easily, it may be necessary to pull down the cervix

with a volsella. On passing a sound, its concavity looks to the back. It is important to note that this instrument is only used as a confirmatory test. It is never to be employed at first to determine the existence of a displacement.

Students must be particular not to trust to the mere vaginal examination, for the position of the cervix is no sure indication of the relations of the corpus uteri.

Symptoms.—In some cases no symptoms whatever are found. Often one or more of the following symptoms may be associated with these posterior displacements: a bearing-down feeling, weakness or pain in the back; weakness or pains in the lower limbs; constipation, with or without tenesmus; frequency or difficulty in micturition; menorrhagia, dysmenorrhœa, leucorrhœa, tendency to abortion, sterility. Reflex and neurotic phenomena are often found.

There is some difference of opinion as to the part played by a backward displacement of the uterus in the causation of symptoms, which are so often found accompanying the condition. Some hold that retroversion *per se* does not produce troublesome symptoms; they state that normally the uterus is constantly changing its position, according to changes in the condition of bladder and bowel, and that it may, when turned to the back, trouble the woman as little as when turned to the front. They state that the symptoms which are so often found along with retroversion —*e.g.* pain and weakness in the back, menorrhagia, etc.—are due to accompanying pathological conditions, namely, inflammations outside the uterus, inflammations in the uterus itself, subinvolution, or some prolapse of the organ.

In favour of these opinions may be mentioned the fact that cases are found in which, along with a retroverted uterus, no symptoms whatever are found. Moreover, the forward position of the uterus, as a whole, does not seem necessary to health, because, in certain cases, retroposition of the uterus may exist along with perfect health.

Other authorities hold that the backward displacement *per se* may lead to bad symptoms.

I have already (p. 452) referred somewhat to the relation of posterior displacements to the various conditions often associated with them, and it is needless further to consider the different views which are held. I would point out, however, that the above symptoms are those which we find with the various inflammatory conditions which occur in the pelvis. No doubt influence of retro-displacements *per se*, in causing symptoms, has been greatly exaggerated.

Differential diagnosis.—The following conditions must be diagnosed from retro-displacements :—

1. Masses of fæces in the rectum.
2. Utero-sacro cellulitis ; peri-rectal deposits.
3. Deposits in the pouch of Douglas, *e.g.* hæmatocele ; peritonitis.
4. Prolapsed ovarian or tubal swellings.
5. Myoma of posterior uterine wall.

Treatment.—It is of the utmost importance to treat inflammatory conditions associated with the displacement. In some cases it is well to replace the uterus, and to introduce a vaginal pessary. The following varieties of conditions are met with :—

1. Retroversion accompanied with fixation by means of peritonitic adhesions.

In such cases the uterus cannot be replaced, *i.e.* turned to the front. Pessary treatment is of no avail. The case must be treated by douches, baths, electricity, glycerin plugs. Stretching of adhesions by means of massage or by means of vaginal dilators—*e.g.* Bozeman's—is recommended by some. (Other recommendations as regards operative interference I will consider afterwards, *vide* p. 458.)

2. Retroversion of a freely movable uterus, not enlarged, unaccompanied by pelvic trouble.

In such cases there seems to be no necessity, as a rule, for the replacement of the uterus and the introduction of a

pessary. When, however, women in such a condition are liable to the strain of heavy lifting, or to chronic bronchitis, it may be considered advisable to use a pessary for the purpose of keeping the uterus anteverted. For undoubtedly the uterus may, when retroverted, show a greater tendency towards prolapsus under the influence of increased intra-abdominal pressure than when it is anteverted. In these cases the Hodge or Albert Smith pessary does well.

3. Retroversion of the freely movable puerperal uterus, unaccompanied by pelvic troubles.

It is now recognised that normally, in many women, during the involution of the uterus in the early weeks after labour, the uterus may be turned to the back.

When, in such cases, good health exists, no pessary treatment is necessary, unless it is known that the patient has suffered previous to her pregnancy, in early pregnancy, or unless she is subject to strains which increase the intra-abdominal pressure.

The Hodge or Albert Smith pessary may be used in these cases.

4. Retroversion of the movable pregnant uterus in the early months. In every case the uterus should be replaced, and a pessary worn until the pregnancy has well entered the fourth month, *i.e.* until all danger of an incarceration in the pelvis is past.

The Hodge or Albert Smith pessary may be used.

5. Retroversion of a movable uterus, where pelvic symptoms are present, but where the ovaries are not prolapsed into the pouch of Douglas, nor any special tenderness exists in the perimetric or parametric tissues.

In such a case the uterus should be replaced, and a Hodge or Albert Smith pessary introduced.

6. Retroversion of a movable uterus where pelvic symptoms are present, and where one or both of the ovaries are prolapsed into the pouch of Douglas.

These are generally very troublesome cases to deal with.

If the ovaries be inflamed as well as prolapsed, no pessaries should be used until glycerin plugs and the vaginal douche have been used. After the uterus is replaced it is often a matter of difficulty to select a pessary. In a certain number of cases owing to the sensitiveness of the ovaries no form of instrument can be worn. In other cases a Hodge or Albert Smith pessary acts well and causes no pain even though the ovaries remain prolapsed. A Thomas pessary with a thick soft rubber upper end may often be more suitable than entirely hard instruments, or a soft rubber ring pessary may often be borne when no hard instrument can be tolerated. In all cases where the ovaries are noticeably tender or inflamed, it is best, after the use of the douche and plugs, to use a ring pessary for a time before trying one of the hard instruments. Though the ring may not keep the uterus to the front, merely acting as a general support to the uterus, it has a beneficial influence in allowing congestion of the uterus to be relieved.

In some cases of prolapse of one ovary only, benefit may be obtained from the use of a hard instrument, in which the upper angle on one side is absent to ensure non-pressure on the ovary, while the pessary is in position.

7. Retroversion of a movable uterus, accompanied by pelvic symptoms, where old posterior perimetritis or some remains of cellulitis are present.

These cases are also very troublesome. The line of treatment as regards pessaries is the same as that laid down in the last section.

Retroflexion of the uterus.—All that has been said regarding the use of pessaries in the treatment of retroversion may be stated with regard to retroflexion. Practically, wherever retroflexion exists retroversion is present, and the employment of pessaries like Hodge's and Albert Smith's, after the replacement of the uterus, is related primarily to the posterior version, not to the flexion. Disappearance of

the flexion depends on the consistence of the uterus and its relation to the intra-abdominal pressure.

In some cases, after a pessary has been worn for some months, the uterus shows no tendency to return to the displaced position. In other cases, the instrument must be continually worn to keep the uterus to the front.

METHODS OF REPLACING THE UTERUS.

1. **By the abdomino-recto-vaginal bimanual examination.**—Sometimes this may be employed satisfactorily, when

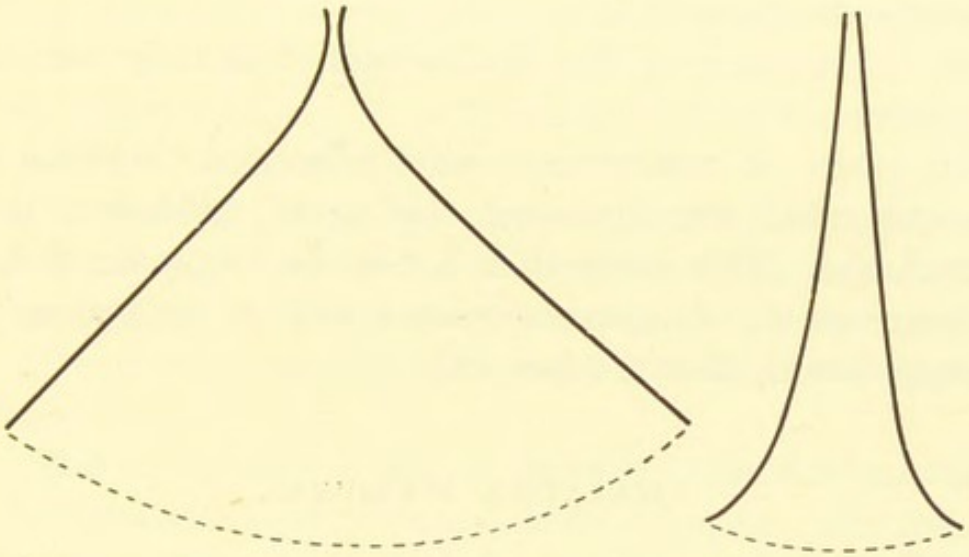


FIG. 160.—Diagram showing right and wrong methods of rotating the sound.—After HART and BARBOUR.

1. Right method, long rotation of handle. 2. Wrong method.

the patient lies in the dorsal position, the abdominal walls being thin and lax. Or it may be done with the patient in the Sims' position.

2. **By the genu-pectoral posture.**—The patient is placed in this position, and the vagina opened to allow air to enter. The displaced uterus tends to fall towards the sacrum, and if the cervix be tilted towards the sacrum by a finger passed into the vagina, the fundus may pass downwards and forwards to the front. Sometimes it is necessary to use recto-vaginal manipulations to cause the fundus to move from the

back. (In carrying out this procedure the patient's clothes must be loose.)

Sometimes it is advantageous to pull down the cervix with a volsella.

3. **With the sound.**—Having made out the position of the uterus and the absence of adhesions, the sound is passed as described on p. 199, the patient lying on her left side with her legs drawn up. The handle is then carried upward towards the patient's right buttock, and forward and downward with a long sweep until it lies over the symphysis. The handle is then slowly and gradually carried back towards the perineum.

By this manœuvre, the fundus uteri is readily carried to the front.

In cases of retroversion with adhesions, Schultze has recommended the bimanual tearing of adhesions, under anæsthesia. This method is not to be recommended, on account of the dangers associated with it, *e.g.* tearing into vessels, bowel, dilated tubes, etc.

Operative Measures.

Within recent years there has been an enormous amount of ingenuity displayed in devising operations for the purpose of replacing the uterus, and keeping it permanently to the front. Too strong a protest cannot be urged against the wholesale manner in which these procedures have been carried out. It must be clearly understood that the indication for operative interference is not to be the mere fact *that the fundus uteri is turned towards the back.* I hold that the great majority of cases can be satisfactorily treated by measures taken to check the very inflammatory processes which may be found, and by the judicious use of pessaries.

If we believe that the displacement *per se* does not cause the symptoms, it is surely bad logic to make the replacement of the uterus the main element in our therapeutic

procedures. Moreover, it is surely *contra naturam* to turn the uterus to the front, and *to fix it there.*

Then, these operations have been recklessly carried out without regard to the effect on after-pregnancies. We are just now beginning to gather facts regarding their influence in causing miscarriage, and in introducing difficulties into labour.

At the present time, therefore, it is impossible accurately to lay down the indications for operative treatment in cases of retro-displacements.

If the patient has no symptoms, certainly there is no necessity for operative measures. All the simpler measures must be first of all carefully employed.

Only a few cases are left in which little or no improvement may be gained by these means.

This residuum must be carefully studied to eliminate neurotic complications and disease in the appendages.

There exists, then, only a small number of cases in which operative measures should be carried out. The following are on their trial :—

1. **Shortening the round ligaments (Alquié-Alexander-Adams operation).**—Various methods are used. The following by Edebohls may be employed.

An incision of 2 in. long is made through skin, fat, and aponeurosis of the external oblique muscle, from the pubic spine upward and outward, parallel with the inguinal canal, exposing the canal from the external to the internal ring, as well as the internal oblique muscle and round ligament. The ligament is more or less concealed, according to the greater or less development of the internal oblique. Sometimes it is found with difficulty, or not at all. The ligament is then freed from its attachments in the canal and drawn outwards, the investing peritoneum of the broad ligaments being stripped backward.

A deep continuous catgut suture is then passed, embracing the internal oblique, transversalis, Poupart's ligament, and

transfixing the round ligament; the uppermost loop fastens the margins of the internal ring. A superficial continuous suture is then passed through the aponeurosis of the external oblique to restore the anterior wall of the canal, the excess of round ligament outside the external ring having been cut away; the lower end of the ligament is transfixed by the lower part of the latter suture. Then the skin and fat are closed by a superficial suture.

Complications due to adhesions. — According to some operators it is unwise to attempt this operation when pelvic adhesions exist. According to Edebohls and others the adhesions may be first of all broken down, either by means of a colpotomy, a median cœliotomy, or an incision through the peritoneum at the internal ring.

After-treatment.—The wound is dressed in the ordinary manner. The patient is kept in bed for a month, a Hodge or Albert Smith pessary being worn during this time and after she rises for a few months, in order to support the uterus while healing and consolidation take place.

Value of this operation.—According to Pozzi, the greatest benefit is obtained in old cases where there is some prolapse, and where there has been such extensive injury of the pelvic floor as to render local repair measures impossible (such cases are extremely few—J. C. W.); also in cases where the ovaries are prolapsed, thus preventing a pessary from being worn.

2. **Ventro - fixation (gastro - hysteropexia).** — Various methods have been employed. That of Kelly, who introduced the operation, may be recommended.

The patient is placed in the dorsal position, with hips elevated. The abdominal cavity is opened by the median incision ($1\frac{1}{2}$ to 2 in. long) above the symphysis. Two fingers are introduced, and the fundus of the uterus raised to the incision. A silk suture is then passed through the cut edges of the peritoneum and posterior surface of the corpus uteri, about $\frac{1}{2}$ or $\frac{3}{4}$ in. from the lower end of the

incision. This is firmly tied. Another is passed higher up, passing through the posterior uterine wall, about $\frac{1}{4}$ in. below the other, and firmly tied.

The peritoneal edges are then closed with catgut, and the rest of the incision sutured.

Sometimes in this operation it may be difficult to raise the fundus. Usually it is best to support it by two fingers placed against the symphysis, while the first suture is being passed. If this cannot be done, an elevator may be used to hold up the fundus.

After-treatment.—The patient is kept in bed for three weeks. Afterwards she must take only gentle exercise for weeks, and should do no heavy work for six months. The bowels and bladder should be emptied with strict regularity.

Value of this operation.—Kelly has had no hernia after this operation, nor any serious trouble with the bladder.

Very few relapses occurred. He followed the history of fourteen cases in which labour took place at a later period, and found trouble due to the adhesions of the uterus only in one. In most cases the uterus does not remain close to the abdominal wall, but is suspended from it by two or more adhesions, so that the organ has a certain range of movement. It might be expected that these would be a source of danger to the bowel.

Where there is a torn perineum and some degree of prolapsus, it is best to follow the suspensory operation by one for the repair of the damaged parts. If this be not done, the suspensory operation alone, according to Kelly, is of no use, as relapse will occur.

3. **Vesico-fixation and ventro-vesico-fixation.** — Werth recommends these instead of simple ventro-fixation, because, after the latter operation, a space is left between uterus and bladder in which bowel may be incarcerated. Such a risk, he says, does not exist if the anterior surface of the uterus be stitched to the bladder, or if this, as well as ventro-fixation be performed.

4. **Vaginal fixation.**—Instead of the peritoneal cavity being opened, the anterior vaginal wall is divided in its upper three-fourths. The base of the bladder is separated from it and from the cervix. The peritoneal reflection from bladder to uterus is stripped upwards as high as possible, the cervix being pulled downwards with a volsella. The cervix is then pushed well back and catgut sutures (No. 3) passed through the edges of the vaginal incision, the cellular tissue between cervix and bladder, and the surface of the uterus below the peritoneum.

The remaining united edges of the vaginal wound are then closed with continuous catgut.

Vesico-fixation, ventro-vesico-fixation and vaginal-fixation are not to be employed, if the patient runs any risk of falling pregnant after the operation. The uterus is kept to the front certainly, but the danger of miscarriage and the risks of great difficulties in labour are too serious to warrant the employment of the operation in the reproductive era of a woman's life.

5. **Pryor's operation.**—This method is on its trial; recently its originator has reported two cases where it was followed by normal pregnancy and labour.

The pouch of Douglas is opened per vaginam. Adhesions in it are broken up with the fingers. An iodoform gauze pad is placed in the pelvis behind the cervix, and the patient put in the Trendelenburg position. The intestines gravitate towards the diaphragm, and a second pad is placed in the pelvis. The table is then placed horizontally. The pads are withdrawn, and a wad of gauze placed in the vaginal opening, reaching just within the incision. The uterus is now anteverted by bimanual manipulation.

After-treatment.—The gauze is removed in seven or ten days, and replaced, the patient being chloroformed. This is changed in a week, and again in five days. The vagina is packed all the time.

By this operation a dense mass of lymph is produced

behind the cervix, which, on organisation and contraction, pulls it towards the back, the fundus being left freely movable.

Retroposition of the Uterus.

This condition may be congenital. Tumours may sometimes press the uterus backward as a whole. It may be due to inflammatory adhesions behind the uterus, and may follow a retro-uterine hæmatocele.

There may be no symptoms, or symptoms may be caused by the inflammatory conditions, and by the backward traction on the bladder. The condition is treated as is retroversion.

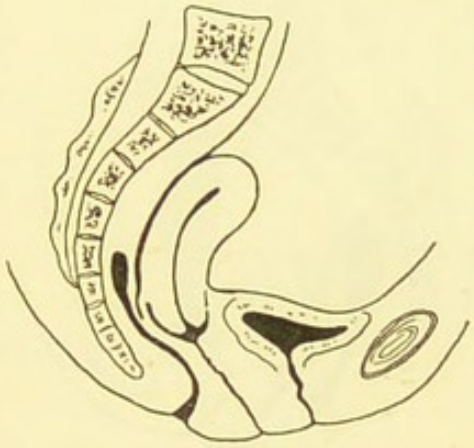


Fig. 161.—Retroposition of the uterus.

Inversion of the Uterus.

This is the condition in which the organ is turned in upon itself, the inverting portion extending downwards towards or through the cervix.

Etiology.—Inversion occurs under two conditions—(1) In the puerperal state; (2) associated with the growth of a tumour in the uterine wall.

1. Inversion is caused in the puerperium in the following ways:—

(*a*) Traction on the cord, the uterus being non-retracted and uncontracted.

(*b*) Sometimes it appears that that part of the wall to which the placenta is attached is somewhat paralysed, and unable to retract and contract like the rest of the wall. As contractions take place in the surrounding musculature, the placental portion, being inert, may be depressed towards the cavity of the uterus, intra-abdominal pressure then continu-

ing to aid the further inversion of the part. This process is usually brought about slowly.

2. In the case of tumour growth, *e.g.* malignant infiltration of the upper part of the corpus uteri, inversion may be brought about as a result of the weakening of that portion which is affected, and which becomes pressed in towards the cavity. The same thing may be produced by a tumour becoming polypoidal in the cavity, *e.g.* fibromyoma.

Pathology.—In the suddenly produced inversion of the puerperium, the inverted portion may lie in the vagina or partly protrude through the vulva. It may be smooth, covered by the placenta and membranes, or raw, red, soft, and bleeding.

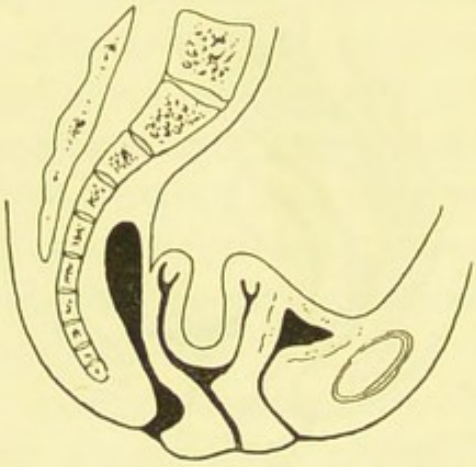


FIG. 162.—Partial inversion of the uterus.

In the more slowly produced condition, various stages are found. A cup-shaped depression is formed on the peritoneal surface where the inversion takes place. In old cases the mouth of the cup usually becomes a slit.

The inverting portion, generally the fundus, may extend as far as the cervix, or through it. The cervix may be loosely felt around the inverting mass, or may form a tight constriction. Sometimes the cervix may be partly inverted, but its complete inversion never occurs. The vagina may become inverted. When the inverted uterus lies in the vagina, it may look like a fibroid polypus; but it is, in the early stages, of a deeper red, and softer, and bleeds easily when handled. The mucosa may become much inflamed, and may ulcerate or become gangrenous; in some cases it may take on the characters of the vaginal epithelial covering, losing its glands, and becoming hard.

The ovaries and tubes, and even intestines, may lie in the cup-shaped depression on the peritoneal surface. In

old cases they are usually withdrawn. Adhesions rarely form between the peritoneal edges of the depression, which may get very contracted.

If there be prolapse of the uterus as well as inversion, the bladder is dragged downwards.

Symptoms.—In the suddenly produced cases, the patient feels as if something had given way; there may be severe pain, hæmorrhage, collapse, retention of urine. Septicæmia may result.

In chronic inversion there is menorrhagia, metrorrhagia, leucorrhœa, bearing-down, and other pains in the pelvis. The patient may become run down and anæmic. Reflex and neurotic symptoms may develop.

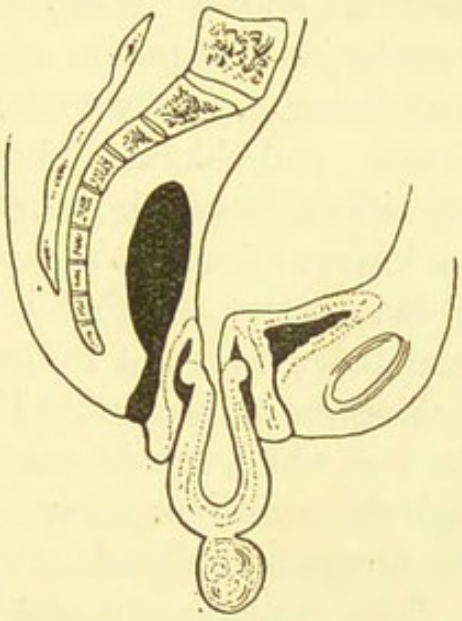


FIG. 163.—Complete inversion of the uterus. The latter has a fibroid tumour attached at the fundus.

Diagnosis. — Bimanually, in advanced cases, a mass is felt in the vagina, with the characters already described. It is somewhat moulded by the vaginal walls. The rim of the cervix can usually be distinguished, and the finger may be passed up around the inverting portion for a distance in some cases. Sometimes this is impossible, owing to the contraction of the cervix, or to adhesions between it and the inverting mass. If the inversion has not passed the cervix, the finger may be passed into the cavity and distinguish the condition. The outer hand feels the cup-shaped depression through the abdomen, and recognises that the fundus is absent.

The condition must be diagnosed from—

1. Intra-uterine polypus.
2. Polypus extending into vagina.

3. Polypus with inversion.
4. Prolapsus uteri.
5. Inversion with prolapsus uteri.

Results.—Sometimes spontaneous cure may result. The patient may die sometimes in acute cases from shock, hæmorrhage, etc. A chronic condition of ill-health may develop. Sometimes, in old chronic cases, patients may not complain much.

Treatment.—Recent.—If a case be seen soon after inversion has occurred, it may be possible to undo the inversion and to replace the uterus at once. The patient, anæsthetised, is put in the lithotomy position, the genital tract being carefully washed with antiseptic solution. The rectum and bladder should be emptied, and bimanual reposition should be attempted. One hand is placed on the lower abdominal region, while the other grasps the mass of the uterus, pushing it up and undoing the inversion. Sometimes it is best to dimple inwards one part of the wall, making the rest follow. If there be a tumour attached to the wall which can be removed, its base should be ligatured, and the mass cut away. It may be safest to do this when the uterus is replaced.

After replacement the uterus is douched with a hot antiseptic solution. The cavity is then packed with iodoform gauze, as well as the vagina, and the patient put to bed.

After-treatment.—In two days the plug is removed, a daily hot uterine douche is given, ergot being administered by the mouth. The patient lies in bed, according to the nature of the condition. If it is a puerperal case, for twelve or fourteen days; if not, about eight days. If a tumour has been removed, for two or three weeks.

Chronic.—Previous to the attempt to replace the uterus the patient should be kept at rest in bed for a few days, the bowels being moved regularly. If the inverted uterus does not extend outside the vulva, a Barnes bag should be

distended in the vagina each day. This may cause the uterus to be replaced. But if not, it causes the vagina to be stretched so that there is more room for the manipulations required. The night before the operation a dose of opening medicine should be administered, and the next morning an enema should be given, the rectum being afterwards washed out with boracic lotion. Morphine should be given. The patient is anæsthetised and placed in the lithotomy position. The vagina is well lubricated with antiseptic vaseline, and the bimanual manipulations already described are attempted. Sometimes, by pressing a forefinger into the rectum, the uterus may be steadied and counter-pressure may be made. Some, in addition, advise passage of the other forefinger into the bladder.

When the hand gets tired of pressing up the fundus, continuous pressure may be exerted on it by means of a cup and stem attached to a spiral, which is pressed against the operator's chest. It may be necessary to pull the cervix down with a volsella, and sometimes incisions into it are necessary.

If partial reposition can only be obtained at one sitting, the patient should be put to bed, a Barnes bag being placed in the vagina. Opium should be given.

When manual manipulations fail to replace the uterus, continuous slight elastic pressure may be kept up by means of a cup and curved stem attached to elastic bands, which are fastened to an abdominal belt. A pad soaked in antiseptic vaseline is placed in the cup, which is made to press against the inverted fundus, in the line of the axis of the uterus. Counter-pressure is kept up by means of a pad placed above the pubes, and held in position with an abdominal band.

If all methods fail to bring about replacement, the question of removal of the uterus must be considered. If malignant disease, bad ulceration, or gangrene exists in the wall, amputation or extirpation should be performed. In

either case, the most thorough disinfection of the uterus and vagina should be made.

Amputation.—The patient is placed in the lithotomy position. The inverted fundus is steadied with a volsella. Carefully determine the natural neck of the inverted portion. Pierce the neck with a pedicle needle carrying a strong double silk ligature. Withdraw the needle. Divide the ligature into two equal parts. Interlace them and embrace the neck, tying the ligatures on each side.

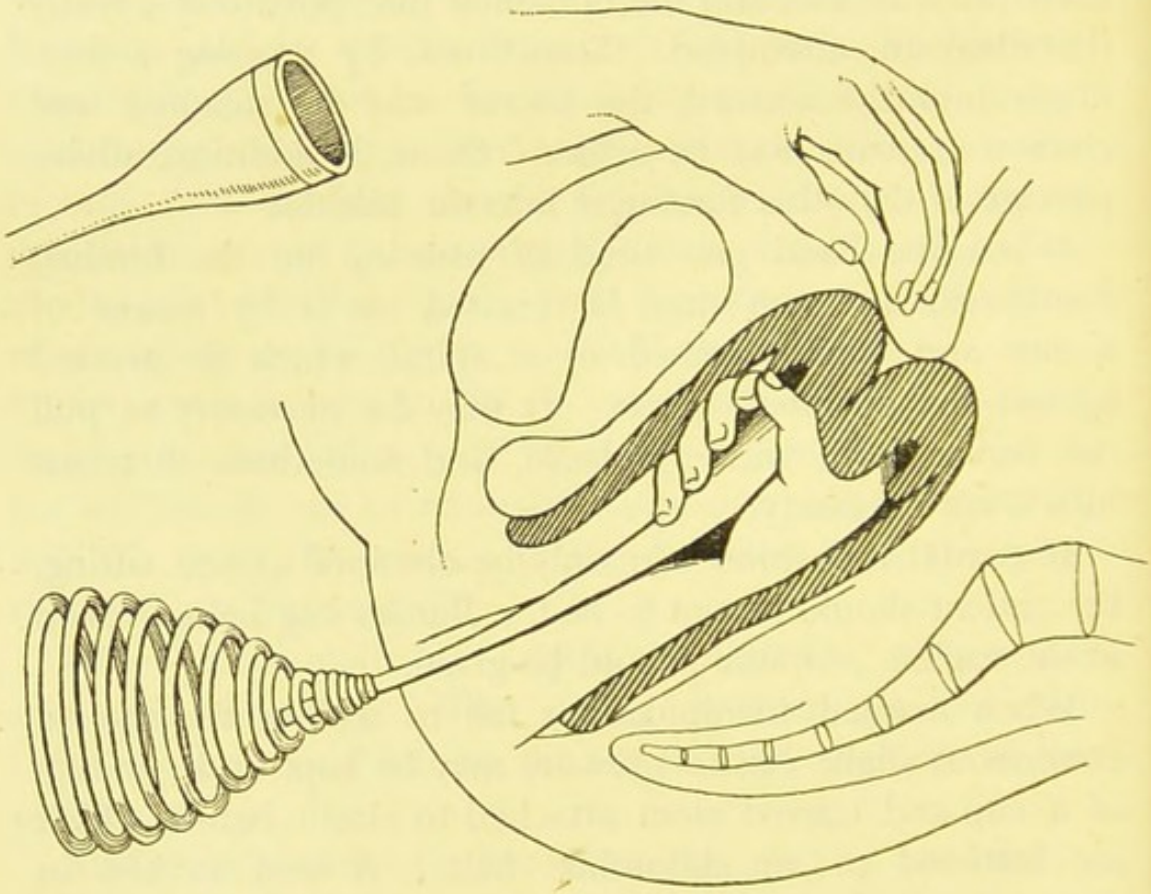


FIG. 164.—Replacement of inverted uterus by the aid of White's repositor—THOMAS.

Then grasp the neck three-eighths of an inch below the ligatures with two pairs of forceps, and cut off the uterus below them. If there be any bleeding from the stump, tie the neck again with one of the ligatures already passed. Then cut short the ligatures, remove the forceps, and place an iodoform gauze plug in the vagina. This is removed

in two days, and an antiseptic douche is afterwards given daily. There is some risk that the stump may spring back into the pelvis and the wound burst open.

Extirpation.—This should undoubtedly be performed if sloughing, gangrene, or malignant disease exists in the uterus.

CHAPTER XVI.

FIBROMYOMA UTERI.

Myoma Uteri—Fibroid Tumour.

Pathology.—These tumours are composed of non-striped muscle and fibrous tissue. They are much more frequent in the corpus uteri than in the cervix, and are more common in the posterior wall. According to one authority, one-fifth of all women over 35 have these tumours. They vary in number. There may be only one, or they may be very numerous. They may grow to a great size—even weighing as much as 140 lbs.

The fibrous and muscular elements vary greatly in their proportions in different cases. Where the muscle is greatly in excess, the tumour is of a somewhat soft consistence, flesh-coloured, and usually without a very distinct complete capsule; this form is known as *soft myoma*, and is not common. It is usually single.

The common fibromyoma is firm, pinkish grey in colour, and is usually multiple. There is a distinct covering of loose connective tissue, which, with the surrounding muscular wall, forms a capsule. The tumour may be completely surrounded by this connective tissue, or at one point its substance may be continuous with the uterine wall, or it may be connected by several bands. The capsule is very vascular.

On section, the surface has a smooth shiny white appearance; often it bulges out irregularly after being cut. Many

intercrossing bands of fibres are visible, and often the muscular bands are arranged in whorls, surrounded with connective tissue—an appearance which has been compared to an arrangement of cotton-balls. Usually the tumour contains few vessels. In some cases the capillaries are dilated throughout it, giving rise to an angiomatous appearance—the "teleangiectatic myoma" or "myoma cavernosum."

FIG. 165.—Section through a small fibromyoma, showing the "cotton-ball" appearance of the cut surface of the tumour.

In the capsule the large veins often tend to gape on being cut, because of their attachment to surrounding muscular tissue.

The pedicles of pedunculated tumours may contain large arteries. These tend to contract and retract when cut across.

Nerves pass into the tumour; their endings have been found in the muscular fibres.

On microscopic section, the muscle cells are fusiform in shape, with elongated rod-shaped nuclei; on transverse section, a number present a kind of mosaic-like appearance, which might be mistaken for a collection of round, nucleated cells. Between the muscle bundles, connective tissue, poor in cells, is arranged; in some cases it is found in bundles.

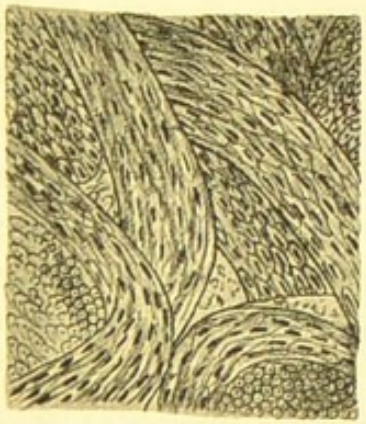


Fig. 166.—Section through a portion of a myoma.

Fibromyomata grow slowly; the more abundant the muscle the more rapid the growth; a soft myoma develops most quickly. Progress is hastened by pregnancy. In the puerperium they usually diminish in size again, and sometimes shrink up entirely. After the climacteric, which

is usually delayed in fibromyoma, their growth stops, and shrinkage occurs; rarely does growth continue after this period.

Sometimes they may grow into neighbouring viscera, by bringing about atrophy of their walls.

Certain changes may take place in these tumours:—

1. **Softening may occur,** and may be due to œdema, or to myxomatous degeneration. Fatty degeneration is also said to occur, but it is extremely rare.

2. **Hardening usually occurs after the menopause.**—It is due to the contraction and fibrous change in the intermuscular connective tissue elements and to gradual disappearance of the muscle.

3. **Calcification occasionally occurs,** due to deposits of salts of lime, generally in the centre of the tumour, sometimes in the outer layers. A calcified tumour is termed a "womb-stone."

4. **Inflammation; suppuration; gangrene.**—These processes may follow an operation on the uterus; they may follow constriction of the vessels in the neck of a tumour as it is being spontaneously enucleated; they may follow infection from an ulceration of the covering of submucous polypoidal fibroid; they may follow torsion of a subperitoneal pedunculated tumour.

General septic poisoning may result, and the pus may spread to surrounding tissues. A suppurating fibroid may discharge itself through the uterine cavity, may perforate the peritoneal surface of the uterus, or may open into the bladder or bowel.

5. **Sarcomatous change may occur in a fibroid.**—Rarely it is believed that carcinomatous changes may occur also (this may possibly start from the mucosa or from remains of the Wolffian body, according to Freund and Recklinghausen).

Changes in the uterus.—In the great majority of fibroids there is a hyperplasia of the mucosa, considered by many to be due to endometritis. Inflammatory changes are

certainly often found in it. This may be interstitial, glandular, or mixed; sometimes it is of the hæmorrhagic type. According to Wyder, the nearer the tumour is to the mucosa the more the inflammatory changes are apt to occur in the interglandular portion of the mucosa.

The uterus is enlarged as a whole. Its position may be greatly altered. It may be drawn upward, pushed downward to one side, or twisted on itself; it may become inverted by a submucous fibroid.

Changes in other organs.—Sometimes inflammatory changes are produced in the kidneys; occasionally the uterus may be pressed on, leading to their dilatation, along with hydronephrosis, pyelitis, or pyelonephritis. Heart lesions are sometimes found, *e.g.* hypertrophy, with or without dilatation, or with degeneration of cardiac muscle; these may be due to a renal lesion in some cases.

Hæmatosalpinx is sometimes found, and in the ovaries considerable changes are often seen.

Varieties of Tumour.

It is convenient clinically to divide these tumours into the subperitoneal, the interstitial, and the submucous. In the beginning all are interstitial.

I. In the Corpus Uteri.

Subperitoneal.—These are tumours which grow outwards toward the peritoneum. They tend to become pedunculated. The pedicle may vary greatly in length and thickness; consequently the tumours vary in their range of movement. If a tumour grows upwards, having a short pedicle, it tends to pull up the uterus, elongating it; sometimes the uterus may be almost or completely torn across by this gradual traction.

In some cases the tumour may lie in the pelvis from the beginning, or may gradually fall down as its pedicle elon-

gates; it may become impacted, incarcerated, or adherent. Sometimes a subperitoneal tumour may grow into the broad ligament.

Adhesions may take place owing to peritonitis, and ascitic fluid may be produced. Adhesions are most frequent to great omentum and intestine; sometimes a loop of gut may be very intimately fused with the tumour wall. These adhesions may lead to increased growth in the tumour. Sometimes a thin pedicle may be broken through, *e.g.* in pregnancy or labour, or as a result of torsion. After such a separation it usually gets nourishment through its adhesions. In many of these tumours, there are few vessels in the pedicle; they tend to form very slowly, and often become very hard and shrink or calcify.

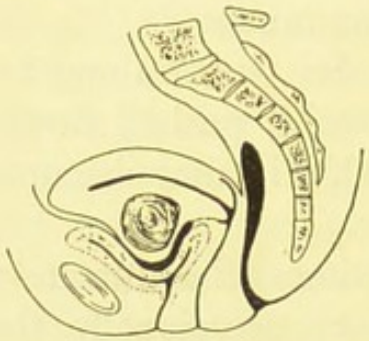


FIG. 167.—Small fibroid of anterior wall of uterus, pressing on bladder.

Torsion of the pedicle may sometimes occur, leading to œdema and congestion in the tumour, and to peritonitis over it. Thrombosis occurs in the vessels of the pedicle, and it may become broken across. Suppuration or gangrene may follow in some cases.

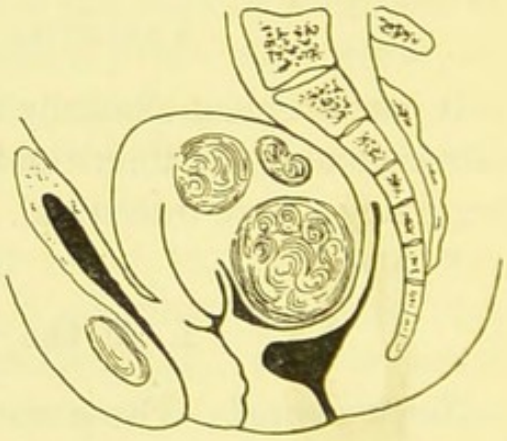


FIG. 168.—Retroflexed uterus with interstitial fibroids.

Interstitial.—These are the tumours which, as they grow, cause the uterine wall to expand equally around them. Many may be found in the wall. As they grow they push the peritoneum outwards and the mucosa inwards, so that sometimes it may be difficult to distinguish them from subserous and submucous forms. It is best to denominate as interstitial those in which the capsule is of equal thickness all round. As they

grow, they tend markedly to bring about a hypertrophy of the uterus. Often at one point the wall may be thinned either on the peritoneal or the mucosal side.

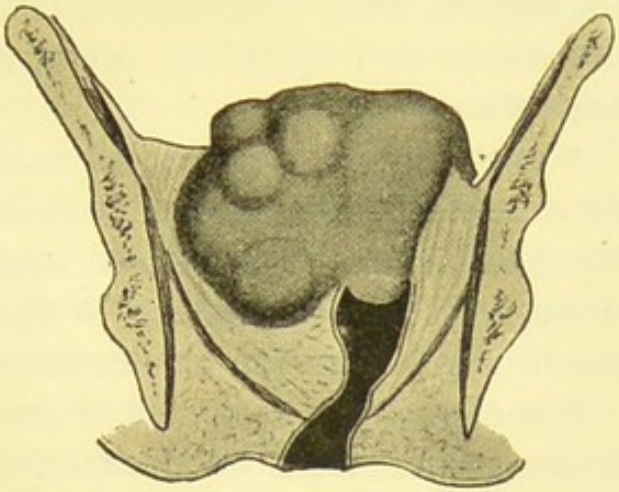


FIG. 169.—Coronal section of pelvis in which a fibromyoma of the uterus is growing into the right broad ligament.

Where there is one large intramural fibroid, the whole uterus is somewhat rounded. When there are several, it is irregular. The uterus may be displaced in various directions; sometimes it may be flexed. It may grow downwards into the pouch of Douglas, or into the cervix and vagina, or it may gradually fill up the pelvis.

In some cases the tumour may grow outwards into the broad ligament.

Submucous.—These are the tumours which tend to project especially into the uterine cavity. Great variations are found in their size and in the size of the pedicle; the latter may be short or long, or nothing worthy the name may exist. They are covered with uterine mucosa, and a thin layer of musculature which helps to form a capsule; this may be very thin at points. Sometimes no muscular covering may exist.

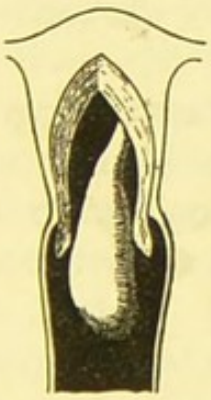


FIG. 170.—Fibroid polypus of the uterus extending into the vagina.

In the early stages, the mucosa covering it is hypertrophied, as in the rest of the cavity; as the tumour increases it usually atrophies.

Uterine action tends to force the tumour more and more down. This is often most marked during the engorgement due to menstruation. The tumour, being congested and

enlarged, stimulates the uterine musculature to increased contractions. A pedunculated submucous tumour is usually rounded or oval. Sometimes, owing to the constriction of the cervix as it is driven down, it may be shaped like an hour-glass.

Sometimes the capsule and mucosa covering the tumour may be broken or gradually thinned, so that spontaneous enucleation may follow. It may also ulcerate through. Adhesions may take place to the wall of the uterus as a result of inflammation or ulceration.

Sometimes in the course of enucleation the pedicle may become constricted by the contraction of the musculature of the capsule around it, and suppuration or gangrene may follow. This may also follow infection from ulceration or from operative procedures.

II. In the Cervix.

Fibroids rarely occur in this situation. They may develop in any position in the cervix. If in the lower part, they may give the cervix a rounded or elongated shape, or may become polypoidal. They may project into the cervical canal or into the vagina.

When they develop in the upper part they may grow under the pouch of Douglas, between the bladder and uterus, or into the broad ligaments. Various structures may in this way be displaced, and the pelvis may become greatly filled up.

Etiology.—The exact origin of fibromyoma is not known. Klebs and others believe they take their origin from the walls of blood vessels. Kleinwächter thinks they spring from degenerated capillaries. According to Cohnheim's theory, they arise from embryonic residues not used in the normal development and growth of the uterus. They are related to the period of sexual activity, and are practically not known to develop before puberty or after the menopause.

They occur with special frequency among the African races.

Symptoms. — Hæmorrhage from the uterus is a very marked symptom in many cases. It occurs as menorrhagia or metrorrhagia, and usually develops gradually, not suddenly, as in carcinoma. This symptom is found with tumours in the region of the mucosa, which is generally altered by interstitial endometritis in such cases. The worst bleeding occurs when submucous tumours become polypoidal. Sometimes hæmorrhage is due to ulceration of the mucosa over the tumour. Rarely rupture of veins in the capsule causes it; it may be sudden and fatal. Death from hæmorrhage is, however, very rare.

With subperitoneal fibroids there are not necessarily any hæmorrhagic symptoms, but they may sometimes be found.

Leucorrhœa is present in many cases, but it is not distinctive. Probably it is most marked where the endometritis is of the glandular type. It is often irregular. Just before and after menstruation, there is usually a profuse mucous discharge. The discharge is foul smelling when ulceration or gangrene occurs.

Pains are common. They may be only of a heavy dragging nature, with reflex abdominal and lumbar distress. In many cases these are felt first at menstrual periods.

With subperitoneal fibroids, there may be pain due to peritonitis, to torsion, to their large size, to their falling into the pelvis and there causing pressure or being impacted.

Dysmenorrhœa may be very intense. The pains may be like those of labour in the case of submucous polypi, owing to the efforts of the uterus to expel the tumour congested by the menstrual period. They may also be very intense if an interstitial or a prolapsed peritoneal tumour fills the pelvis; the suffering is due to the swelling which the tumour undergoes. In many cases there are pains in the legs.

Pressure symptoms are common.—The bladder may be

interfered with, causing dysuria, difficulty in micturition, or retention. In some instances these may only develop at menstrual periods.

A small fibroid of the anterior uterine wall may cause symptoms of cystitis. Sometimes the neck of the bladder may be pressed on, causing chronic over-distension of the bladder. In a few cases actual cystitis may develop in connection with an imperfect emptying of the bladder.

Compression of the ureters may lead to hydronephrosis, pyelonephritis, or pyelitis.

Diseased conditions of the kidney seem to account for a considerable proportion of deaths after operation in myoma uteri.

Pressure on the rectum may lead to constipation, which may be very troublesome; to obstruction; occasionally to diarrhœa. Pressure on veins may cause hæmorrhoids or varicose veins in the legs. Pressure on nerves, besides causing pains, may bring about weakness and numbness in the lower limbs.

The heart may be secondarily affected when the tumour is of any size,—due to increased blood pressure,—and weakness may result, though there may be no very definitive symptoms.

Sterility is common as a result of these tumours. If pregnancy takes place, abortion or premature labour may result. If the case go on to full time, there may be difficulty in delivery, and danger in the third stage.

Progress of the disease.—Interstitial fibroids are believed sometimes to disappear by involution and absorption. A few cases have been recorded, the majority of which have been met with in the puerperium; the rest at the menopause.

The usual change at the menopause is a mere diminution in size, the tumour becoming harder.

A subperitoneal fibroid may become separated from the uterus, and may grow in connection with other structures.

A submucous tumour may be expelled as a polypus, or may be spontaneously enucleated from its capsule, or may be discharged as a result of suppuration or gangrene. Sometimes a suppurating tumour may burrow into surrounding parts, open into the peritoneum, vagina, or viscera.

Death from fibromyoma may be due to sudden great loss of blood; to peritonitis, with or without torsion of the pedicle; to uræmia; to suppuration or gangrene; to long-continued loss of blood and exhaustion, probably aided in some cases where there is much constipation by a condition of copræmia.

Physical signs—When the tumour is small.—Small submucous tumours which are pedunculated may be felt when the cervix is dilated so as to admit a finger. When they project through the cervix, they are red in colour while covered with uterine mucosa. When the mucosa has disappeared, they are usually pale in colour. When covered with mucosa, they are sensitive to pain; when uncovered, they are not sensitive. Sometimes such a tumour, bulging through the cervix, may be in a condition of ulceration or gangrene, rendering the diagnosis difficult from malignant disease.

The whole uterus is increased in size with these tumours.

Small submucous tumours non-pedunculated may be difficult to diagnose. The uterus is increased in size and rounded. The swelling of the tumour may be felt bimanually. On dilating the cervix, the exploring finger may feel the elevation, covered with soft mucosa, interfering with the lumen of the uterus.

Small interstitial tumours may be easily missed. Some enlargement of the uterus may be felt, and the nodule or nodules may or may not be felt according to their size. The higher in the uterus they are, the more apt are they to be missed. When low in the uterus, they may bulge down the cervix, and be mistaken for inversion.

These various submucous and interstitial fibroids must be diagnosed from the following:—

Inversion of the uterus.

Chronic metritis.

Early pregnancy.

Anteflexion and retroflexion.

Endometritis.

Malignant disease of the uterus.

Small subperitoneal tumours are felt on careful bimanual examination attached to the uterus. The uterus is not necessarily large.

They must be diagnosed from—

Swellings of the ovary and tube.

Swellings in the broad ligament.

Floating kidney.

A cervical fibroid may be felt as a polypus projecting from the cervix, smooth and elastic. Close to it may be felt the os. The opposite lip may be somewhat thinned. Sometimes they may grow as polypi into the canal of the cervix. When they develop in the upper portion of the cervix, they may be felt developing extraperitoneally in one or more directions.

The large polypoidal forms must be distinguished from polypi of the interior of the uterus, and inversion of the uterus. Those growing from the upper part of the cervix, and extending into surrounding tissues, may be mistaken for sarcoma.

When the tumour is large.—A large mass is found, regularly or irregularly rounded or very irregular in outline. It can be distinctly defined usually. If the tumour be subperitoneal, its connection with the uterus may be made out with the uterus, though this may be impossible; it may be felt elongated and elevated. The sound may be passed to an abnormal length. These tumours vary in their range of movement according to their size, the length of their pedicle, and the adhesions which the tumour possesses. The uterus is displaced in various ways.

When the tumour is interstitial, the uterus becomes part of the mass. When it grows into the broad ligament, it has the relations of a broad ligament tumour (*vide* p. 382).

A soft myoma may on palpation give the feeling of a cystic tumour.

The percussion note over the tumour is dull, unless it be covered with intestines. There is usually resonance in the flanks unless the colon contains fæces, unless there be ascitic fluid in the abdomen, or unless there be a mass of the tumour growing into the region of the loins (or some other mass). On changing the position of the patient, the percussion signs do not alter, unless there is a movable subperitoneal tumour or ascites along with the tumour.

A uterine souffle is generally heard over the broad ligaments, and may be distinguished for a short distance on the tumour. In very vascular fibroids, it may be heard over the great mass of the tumour in rare cases; occasionally a thrill can be felt.

The uterine cavity is enlarged. In some cases, owing to the displacement of the organ, it is impossible to pass a metal sound into it; a gum-elastic catheter or bougie may often be introduced where the ordinary sound fails.

Differential diagnosis of large tumours—

1. From advanced utero-gestation.
2. From ovarian and broad ligament, cystic and solid tumours.
3. Ectopic gestation.
4. Hæmatoma and hæmatocele.
5. Inflammatory diffusions and deposits.
6. Cystic uterine tumours.

Treatment—Medical.—If the tumour be growing at a rapid rate, it is best to give the patient a low diet, avoiding stimulants. When much discomfort or pain is complained of, she should give up a portion of her work, and should

rest for two or three hours per diem, and at the menstrual period should rest almost entirely.

Very often when tumours of not too great size cause dragging and bearing-down pains, a Hodge or ring pessary may give relief by supporting the uterus; a binder may give support when the tumour is large.

When a tumour tends to grow in the pelvis, it should be pushed above the brim from time to time, so that it may not become impacted.

Patients often improve considerably by courses of treatment at baths, *e.g.* the muriated baths of Kreuznach, those like the Salies-de-Béarn waters, which contain bromides or iodides.

Ergot in its various forms is a valuable drug. It may be given by the mouth or hypodermically. It tends to check bleeding, and often prevents the increase of the tumour by the contraction of blood vessels which it brings about. It is said that it aids in the expulsion of a pedunculated submucous tumour.

Excessive dosage may produce cramps in the limbs, fever, vomiting; it is also stated that it may have some influence in causing suppuration or gangrene in the tumour. Hydrastis canadensis is also used as a hæmostatic by many physicians. It may be given in twenty- to thirty-drop doses three or four times a day.

Bromide of potassium was used by Sir J. Y. Simpson, who thought that it could check the growth and diminish the size of fibroids. Probably it has only a sedative action against pain. Arsenic and iron may often be necessary as tonics.

Electrical.—Galvanic electricity has been largely employed in the treatment of fibroids. The extravagant claims made by its advocates on its first introduction must be abandoned. It does not cause disappearance of tumours, but only relieves symptoms for a greater or less extent of time.

Cases in which disappearance after its use has been noted have probably not been fibroids at all, but inflammatory or blood deposits.

The details as to treatment are discussed elsewhere.

Surgical.—Curettage.—Often the hæmorrhagic loss from the uterus may be checked for a time by curetting the uterus, and employing a styptic like perchloride of iron. It should only be tried when the whole cavity can be explored.

Dilatation of the cervix.—This procedure may cause relief of pain, and be followed by less hæmorrhage in some cases. It may be tried on cases near the menopause, where a serious operation is not desired.

Ligation of the uterine arteries.—This operation is recommended by Martin of Chicago, Goelet, and others, as a simple means of improving symptoms, of checking rapid growth, and of leading in some cases to a diminution in the size of the tumour. The operation is performed per vaginam. It is best to apply a couple of ligatures on each side. Care must be taken not to injure the ureters. Sometimes it is only possible to apply the ligature on one side.

Major Operative Procedures.

Fibromyoma of the uterus.—Subperitoneal tumours. —Subperitoneal pedunculated fibroids require treatment when they cause pressure symptoms, or are apt to become incarcerated in the pelvis, or when they grow into the broad ligament. Sometimes, in the course of an operation for some other cause, *e.g.* salpingo-ovaritis, they may be removed. These tumours should be removed by abdominal section.

If the growth possess a small pedicle, it is ligatured by the Staffordshire knot or by interlacing sutures, the tumour being cut away outside the ligature. If the pedicle be a thick one, three or more interlacing sutures should be employed. Before passing the needle through a thick

pedicle, it is best to place a temporary elastic ligature around the uterus as low as possible. This is taken off after the tumour is cut away. If there be any oozing through the stitches, a few deep catgut sutures are passed and tied.

When the intestine is attached by adhesions to the tumour, they should be removed in the ordinary manner, if slight. If they are firm and extensive, the superficial layer of the fibroid should be dissected off and left on the bowel, the raw surface being closed by continuous catgut sutures.

INTERSTITIAL TUMOURS. — (*a*) **Single and of moderate size.**—Such growths may give rise to symptoms, *e.g.* pain, for which operative treatment may be deemed necessary.

Sometimes symptoms may be checked by ligature of the uterine artery on each side. This is done with a full-curved needle and a Martin's needle-holder.

A circular incision is made through the mucosa covering the vaginal portion of the cervix, and the flap is stripped upwards, as in the operation for circular amputation of the cervix. When the level of the uterine arteries is reached, the vessels are secured with catgut sutures. The stripped-up flaps are then pulled down and stitched in their former position.

If the patient be not near the menopause, the following operation is recommended by many authorities.

Enucleation by abdominal section.—Before the operation, the vagina and uterine cavity should be made aseptic. After the abdomen is opened, the uterus is drawn up and surrounded with hot gauze pads. An elastic ligature is placed temporarily around the cervix and broad ligaments.

The capsule of the tumour is incised, and the growth enucleated, care being taken not to open into the uterine cavity.

The cavity is then closed either by continuous catgut suture or by a series of interrupted sutures passing under the whole extent of the wound.

If the uterine cavity be opened into, the mucous membrane should be stitched together with catgut, and the rest of the wound closed as described.

If a large opening be made, an iodoform gauze strip should be passed down through the cervix to act as a drain, while as much of the wound as possible should be closed.

Sometimes a very large opening may be made. If the closure of the wall be difficult, the question of extirpating or amputating the uterus may arise.

Removal of appendages.—If, however, the patient be near the menopause, the best operation to perform is salpingo-oöphorectomy, or removal of the appendages. This is performed by abdominal section. Anterior colpotomy is recommended by some, for this purpose, when the tumour is of small size.

The method of removing the appendages is the same as in the case of their removal for inflammatory disease. Care must be taken to remove the whole tube, and to secure as much of the broad ligament in the pedicle as possible. If it is not possible to take in a large portion of the ligament, it is well to secure the ovarian artery by a special ligature around the infundibulo-pelvic ligament.

(*b*) **Single, large, or multiple small fibroids.** — Various operations are performed when these conditions cause distressing symptoms—

1. *Removal of the appendages.*—This method has just been described.

2. *Amputation of the uterus*, or supravaginal hysterectomy.

(*a*) *By the intraperitoneal method.* — Beforehand, the vagina and uterine cavity are made aseptic.

The abdomen is opened in the middle line. In cutting towards the symphysis, care must be taken not to wound the bladder, which may be displaced upwards. If there are any cystic portions, whose puncture will allow of a diminution in size of the tumour, they should be emptied, if accessible. The abdominal opening must be large enough

to allow the tumour to be lifted out. If necessary, the opening may be enlarged by an incision at right angles to the first one. The relations of the bladder must now be studied, a male sound being passed into it. It is best in such cases that the patient should not empty the bladder before operation, in order that its position may be better defined on opening the abdomen.

If it is very high, it may require to be separated somewhat from the tumour.

Adhesions to the tumour are separated.

The broad ligaments must now be ligatured, first on one side and then on the other, in order to secure the vessels.

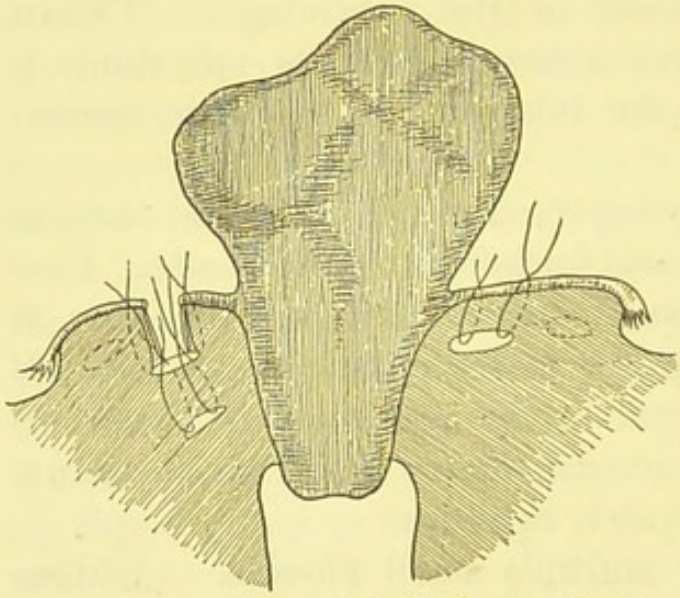


FIG. 171. — Supravaginal hysterectomy. Method of ligaturing broad ligaments.

If the tumour mass be not too great, this may be accomplished while the parts are in the abdomen. If the mass be large, it is best lifted out of the abdomen. The bowels should at this stage be prevented from being exposed to the air. If necessary, aseptic warm pads may be placed over them.

The ligatures are applied from above downwards, first on one side and then on the other. No 4 catgut may be used, or strong pedicle silk. Each is passed double by means of a pedicle needle. The needle is first passed below the ovarian artery in the outer part of the broad ligament, care being taken not to penetrate a vein.

The needle is removed, and the ligature is divided. The halves are then pulled apart for about half an inch or more, a transverse split being made in the ligament.

The outer ligature is next tied outside the ovary and tube, the inner one being tied internal to the ovary. The ligament is then divided between the ligatures almost as far down as the slit. The needle is again passed through the ligament at a lower level, but closer to the uterus, in order to avoid the ureter, and the same procedure carried out. The needle may be passed again if necessary, in order to secure the uterine arteries thoroughly. The ligament is thus divided as low down as the cervix.

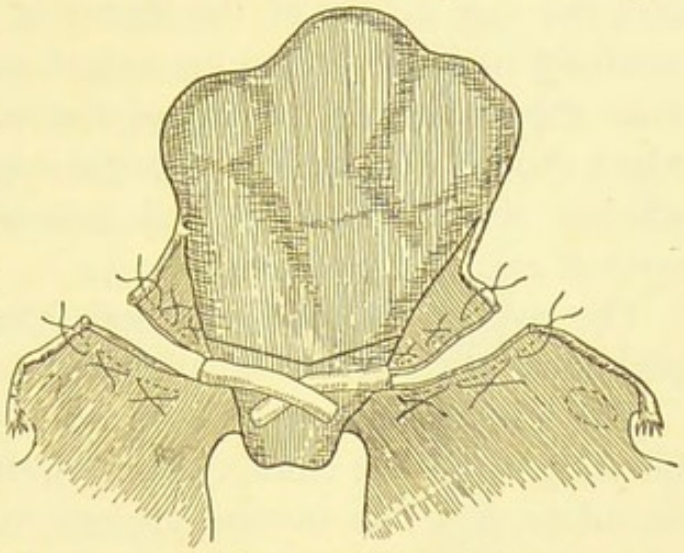


FIG. 172. — Supravaginal hysterectomy. Application of elastic ligature. Line of incision above ligature is shown.

An elastic ligature is then fastened around the cervix tightly, the ends being held in a piece of grooved vulcanite or a pair of strong forceps.

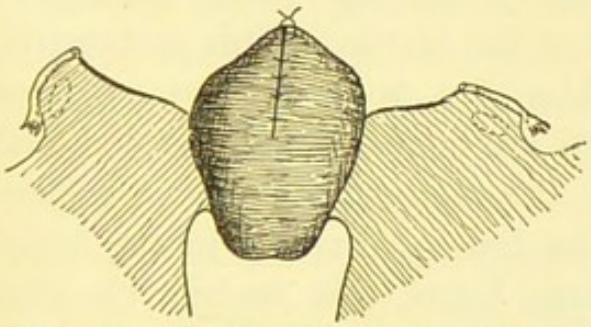


FIG. 173.—Supravaginal hysterectomy. The diagram shows the stump of the uterus left at close of operation.

A circular incision is then made at least 3 cm. from the ligature through the peritoneum covering the uterus - tumour mass.

It is stripped downwards for a little, and then the rest of the mass is cut circularly, the knife blade being directed downwards somewhat. The tumour is then removed. The stump now remains to be secured, the raw surface being funnel-shaped. The cervical canal must be thoroughly cauterised with the Paquelin cautery or with strong carbolic acid.

A series of interrupted catgut sutures are first passed through the whole thickness of the wound. Before they are tied, the raw surface of the stump is closed by means of a carefully applied continuous catgut suture passed in stages from the bottom to the top of the wound. The peritoneal edges should be carefully brought together. The separate stitches should then be tied somewhat obliquely to the vertical axis of the stump.

The wound should be closed from side to side, *i.e.* the peritoneal edge should lie antero-posteriorly.

The elastic ligature is now removed. If there is any bleeding from the stump, either of the following plans may be adopted. The uterine arteries may be further secured on each side by means of a needle and catgut ligature; the collateral circulation will be sufficient to supply the stump. Or the stump may be pierced and ligatured in two halves by interlacing sutures.

Several variations are found in the method of carrying out this operation. Thus Gardner and others first ligature the broad ligaments from the infundibulo-pelvic borders to the edge of the upper part of the uterus. This secures the ovarian arteries, and enables the appendages to be cut away. The round ligaments are ligatured and divided, and an incision made around the uterus, dividing the peritoneum on a level with the line of division in the broad ligaments. The peritoneum below this incision is then stripped down. When the uterine arteries are reached, they are ligatured. The tumour is then cut away at the desired level, and the stump is closed in by interrupted and continuous catgut sutures. No elastic ligature is used in this modification.

After careful cleansing of the peritoneum, the abdomen is closed.

Note.—This operation may be a prolonged one, and there may be much shock. There is danger of after-hæmorrhage, sloughing of the stump, and sepsis.

(*b*) *By the extraperitoneal method.*—The broad ligaments are secured and divided, as already described. The elastic ligature is then passed twice around the uterus, and secured. Forceps are attached to the stump outside the ligature, and the tumour mass is cut away about two finger-breadths above the ligature. If any small fibroids are seen in the raw end of the stump, they are removed. Any vessels noticed may be tied. The peritoneal cavity is then cleansed.

The elastic ligature should be placed so as to act as a permanent ligature. If it has been placed too far down on the uterus, another may be applied outside it, the first one being removed.

If there be no special catch for holding the ends of the elastic ligature, they may be secured with strong silk ligature.

Some operators tie the pedicle with silk outside the elastic band. Instead of the elastic ligature, Koeberlé's serre-nœud may be used.

The peritoneum below the elastic ligature should next be carefully stitched to the peritoneal edges of the lower angle of the wound.

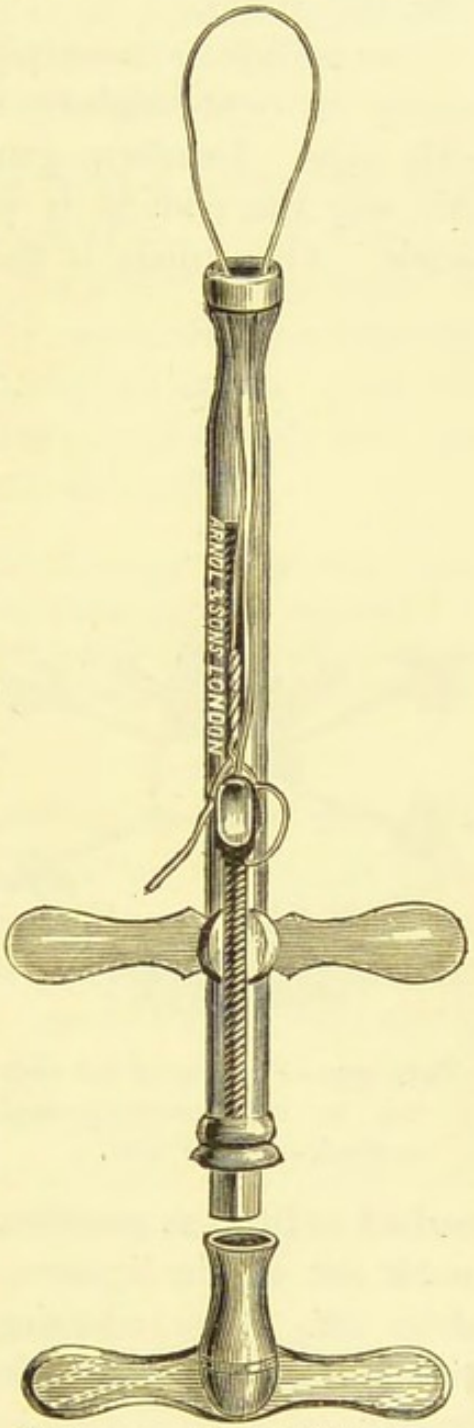


FIG. 174.—Koeberlé's serre-nœud.

The remainder of the peritoneal edges of the wound should now be closed with continuous catgut suture. Then the muscular and facial layers are brought together in the

same way; not, however, within an inch of the stump. The skin edges are then brought together to within an inch from the stump.

The pedicle is next pierced by two strong pins, placed nearly at right angles; the sharp ends must be fitted with caps. Iodoform gauze is placed beneath them. In this way the pedicle is prevented from sinking into the pelvis. The stump is then neatly trimmed, the mucosal and the raw surface being cauterised with a Paquelin cautery.

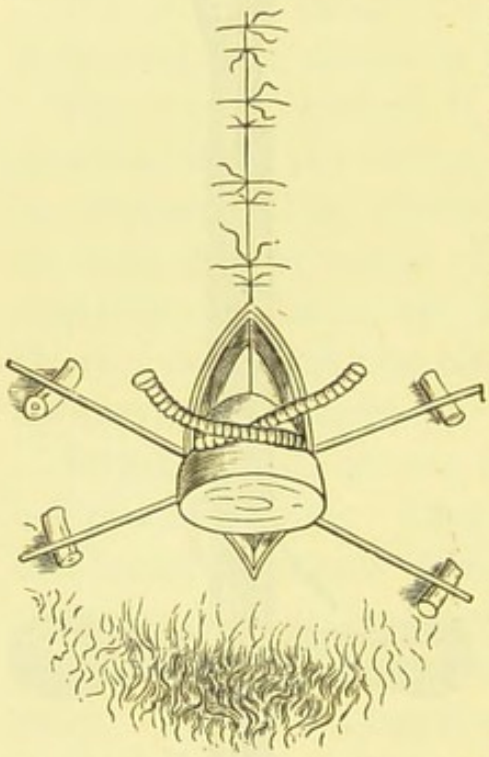


FIG. 175.—Fixation of the pedicle in the extraperitoneal method.—After POZZI.

In the cavity surrounding the stump, naphthalene powder or naphthalene mixed with salicylic acid powder or iodoform is sprinkled, and it is filled with iodoform gauze. The pedicle is covered with the same powder, the usual dressings are then placed on the abdomen, and the patient is put to bed.

After-treatment.—In eight or nine days the dressing is changed, though sometimes it is necessary to do so beforehand. It is best that the wound should be disturbed as little as possible. Between the second and third week the elastic ligature, the stump, and the pins usually drop off. The resulting cavity lined with granulation tissue is dressed with iodoform gauze-packing from day to day.

Otherwise, the after-treatment is the same as after an ovariotomy. The patient should not rise until the cavity has begun to fill up.

Note.—This method, it is evident, can only be adopted when a sufficiently long pedicle can be obtained. It is associated with risk of

sepsis from sloughing of the stump. Sometimes the pedicle retracts, and the peritoneum is opened. The resulting scar is a weak one. An abdomino-cervical fistula may remain. If the appendages be left behind, hæmorrhage may occur from the wound at menstrual periods.

In favour of this operation is the rapidity with which it can be performed as compared with the intraperitoneal method.

Wölfler modification.—This operation is carried out as in the case of an intraperitoneal amputation. The stump is then brought to the lower part of the abdominal incision, to the edges of which it is stitched by means of sutures passed through the thickness of the abdominal walls. The abdominal wound is then closed, save immediately over the stump. The opening left is packed with gauze.

Note.—This operation possesses the advantage of the other extraperitoneal method, without the risks attendant upon the separation of the pedicle. Adhesion soon takes place between the stump and the abdominal wall, the opening above the stump gradually closing by granulation tissue.

(*c*) *Panhysterectomy.*—It is believed by many that complete removal of the uterus, along with the tumour, is a less dangerous operation than amputation. As yet it is impossible to decide regarding this point. It has been very successfully employed by some operators, *e.g.* Martin of Birmingham, and will undoubtedly occupy an important place in the future treatment of fibroids.

The patient is prepared as has already been described. After the incision is made in the abdomen, and the tumour lifted out, the broad ligaments are secured and divided as low as the cervix, in the manner described on p. 486. The reflection of the peritoneum to the cervix is then divided transversely, and the bladder separated as far as the vaginal wall.

An assistant then passes a sound up the vagina, and presses in the anterior fornix, in order to furnish a guide to the operator, who cuts upon it, and then divides the whole anterior fornix transversely.

The lowermost portion of the broad ligament is then ligatured, the needle being passed just above the vaginal surface. Care must be taken not to embrace the ureter. It may sometimes be recognised by its white colour. The broad ligaments are then cut through, and the posterior fornix is divided close to the uterus.

The tumour mass is then removed. The peritoneum and vaginal mucosa should next be approximated all round the opening in the vagina, by means of continuous catgut suture. The pelvis is then cleaned, and the ends of the lower ligatures, if of silk, brought into the vagina. When catgut is used, the ends are cut short. A round mass of iodoform gauze is fitted into the opening, its ends passing into the vagina to act as a drain. The abdomen is then closed, and the patient placed in bed.

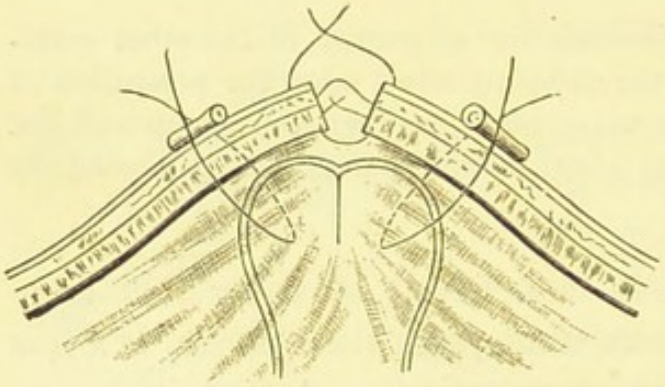


FIG. 176.—Fixation of the pedicle by Wölfler's method.—After POZZI.

After-treatment.—This is much the same as after intraperitoneal amputation. The urine should be drawn off every six hours for five days. The iodoform gauze should be removed on the second or third day, and a fresh vaginal plug introduced. After ten or twelve days, vaginal antiseptic douches may be carefully given with a large double catheter.

Intraligamentous fibroids. — These are fibroids which generally grow from the cervix or lower part of the body of the uterus, and extend into the extraperitoneal connective tissue. They may grow into the mesorectum, or displace the bladder in some cases. Most extend laterally into the broad ligament. In these cases, removal is often very difficult owing to the immobility of

the mass, the absence of a pedicle, and the relationship to viscera.

Small tumours may be removed easily. Large ones often cannot be removed. When removal is impossible, the appendages should be taken away, and the broad ligament on the side opposite the tumour should be ligatured and divided.

If extirpation of the mass be attempted, the ovarian artery in the outer part of the broad ligament should be ligatured. If possible, the uterine artery on the same side should be secured.

A long incision should be made through the ligamentous covering of the tumour, which should then be drawn upwards with a strong volsella, while with the fingers and a spatula it should be shelled out. Bleeding vessels are caught with forceps. The ureter must be avoided.

If there is a small pedicle attached to the uterus, it may be ligatured with interlacing silk sutures. If it be impossible to carry this out, the whole uterus should be extirpated. If, also, after the removal of the tumour, the arrest of bleeding is difficult, the operator should also proceed to the removal of the whole uterus.

After removal of the tumour, if extirpation of the uterus be not necessary, the next step is to treat the bed of the tumour. The raw surfaces should be brought together by continuous catgut suture.

The pelvis is then carefully sponged. If there be any oozing, drainage is carried out by means of a glass tube through the abdominal wound.

Another method is to make an opening from the cavity occupied by the tumour into the vagina, to place gauze in the sac, the ends being passed into the vagina. The incision that was made into the peritoneal covering of the tumour is then closed, and the abdominal wound stitched. The gauze is removed in a few days per vaginam, and daily antiseptic douches are given afterwards by means of a double catheter.

Submucous fibroids of the body.—(*a*) *Pediculated.*—In the great majority of cases, removal by way of the vagina is to be performed. The patient is placed in the lithotomy position. The genital tract is made aseptic. When the polypus does not project through the os externum, or only slightly through, dilatation of the cervical canal should be carried out in the first place. This may be done with a sponge-tent the night before the operation, and with Hegar's dilators at the operation. When, in this manner, sufficient room cannot be obtained for the securing of the pedicle, the following procedure should be adopted:—The cervix should be steadied with a volsella, and the junction of the anterior vaginal wall and cervix divided transversely, the bladder being stripped upwards as far as the os internum. The anterior lip of the cervix is then divided in its whole length, bleeding points being held with forceps. In this way room is obtained.

Various methods of treating the pedicle are adopted. If small, the tumour may be held with forceps, and twisted off. Or, if large, twisting may be combined with snipping of the pedicle with scissors. The pedicle should not be divided close to the uterine wall.

Some operators prefer to transfix the pedicle and secure it by means of strong pedicle silk, the tumour being cut away below it.

Others prefer to cut slowly through the pedicle with the serre-nœud or the écraseur. Sometimes the nail-curette is of use.

When the tumour lies in the vaginal canal, the procedure varies in different cases. If the tumour be small, it may be pulled down easily along with the cervix, and the pedicle may be divided, as described above, inside the cervix. If the tumour be large, it is necessary to reduce it in size before the pedicle can be reached.

This is best done by cutting circularly through the capsule, shelling the tumour out as far up as possible, and then

cutting away portion after portion of the tumour, bleeding being checked by means of forceps. When the pedicle is reached it may be ligatured, and divided with the écraseur or with scissors. To pull down the tumour, large strong forceps are required.

Sometimes, to gain access to the vagina, it may be necessary temporarily to divide the perineum on each side.

If the cervix should have been opened, its edges should be closed, and the incision into the anterior fornix stitched.

After the removal of every tumour, the uterine cavity should be thoroughly cleansed, and it should be packed with iodoform gauze, along with the vagina. This can be removed on the third day, and antiseptic douches given daily afterwards. After a week or ten days, it is well to curette the whole uterus, so as to remove the general mucosa, which is more or less diseased, in order to stimulate the uterus to involution. Some operators, however, prefer to perform curettage at the time of removal of the tumour.

(*b*) *Non-pediculated.*—When the fibroid is not pediculated, its removal is much more difficult. If very large, the treatment should be abdominal removal of the appendages, or panhysterectomy, *i.e.* if the symptoms demand operative interference.

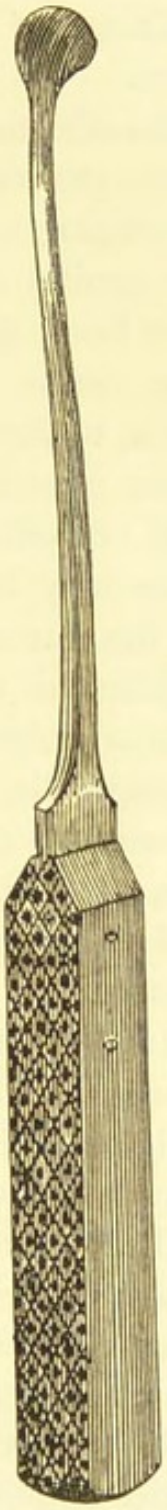


FIG. 177.—A. R. Simpson's nail-curette.

Ligature of the uterine arteries may alone be tried in some cases. Symptoms may be checked,

and the growth of the tumour retarded for a time by this procedure.

Curetting may cause improvement in some hæmorrhagic cases.

Small tumours. — Where the tumour is small or of moderate size, its removal may be undertaken by way of the vagina. The patient is placed in the lithotomy position, the genital tract being made aseptic. The vagina should have been stretched for several days by means of packing. The cervix should be dilated. In order to gain more room, it should be divided, as described on p. 494, and again closed when the operation is ended.

If bleeding be feared, the uterine arteries of both sides may be ligatured by means of a full-curved needle. If the tumour be smaller than a closed fist, it may be enucleated *in toto*. The most prominent portion is held with a volsella. An incision as long as possible is made through the capsule along the line of junction of the prominent part of the tumour with the uterine wall. The tumour is then shelled out of the capsule with the fingers and a spatula, the mass being gradually drawn out with forceps.

It may be necessary to cut some of the adhesions with scissors. The tumour may be gradually twisted as it is withdrawn. If it is rather large to pull down *en masse*, it may be divided.

The bed of the tumour has now to be attended to. All loose shreds of tissue are removed, a hot uterine douche is given, and the raw cavity plugged with iodoform gauze, which is prolonged into the vagina.

If the cervix has been divided, it is now closed, and the patient put to bed. Ergot is administered daily. On the fourth day the plug is removed, and antiseptic douches are given daily. If there should be any fresh bleeding, plugging can again be carried out.

Note.—The dangers of this operation are perforation of the uterus,

inversion of the uterus, hæmorrhage, incomplete removal of the tumour, septicæmia.

Large tumours.—Removal of the mass bit by bit (*morcellement*) is employed by some operators.

The patient is prepared as for the other operations. The cervix is first dilated somewhat.

The junction of the vaginal mucosa to the cervix should

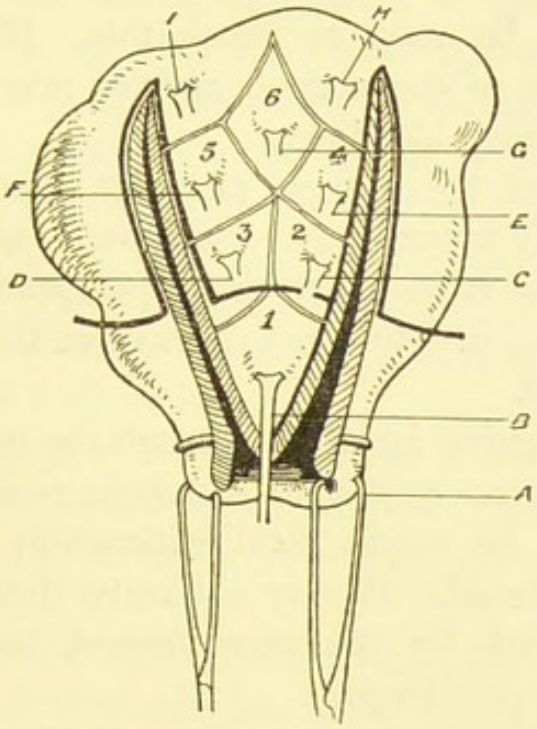


FIG. 178—Morcellement. This diagram shows Richelot's method.—DUNN.

A. Volsella first applied to uterus.
B to I. Successive positions of volsella.
1 to 6. Successive portions removed from anterior wall of uterus.

be circularly incised, and carefully stripped up as far as possible. The cervix is then incised on each side, so as to form an anterior and a posterior flap. Or it may be divided, so as to form two lateral flaps. The incision should reach up to the tumour. These flaps should be held in strong forceps, separated and pulled downwards.

The prominent part of the tumour is then grasped with strong toothed forceps. With retractors the cervix and

vagina are opened as much as possible. An incision is then made in the tumour at right angles to its longest axis. One edge is grasped by forceps, and the piece of tumour cut away with scissors or knife below them. Before the portion is removed, a grasp is taken above it with another pair of forceps.

Usually the operation is not attended with much hæmorrhage. What there is comes chiefly from the divided cervix. Forceps should be used to check this. If possible, preliminary ligature of the uterine arteries may be employed in order to diminish bleeding.

The removal of the tumour, piece by piece, is continued until it is entirely taken away. Sometimes when the lower part of the mass is removed, the upper portion may come away by twisting it. In some cases more than one tumour may be removed.

If a small opening be made through the uterine wall into the peritoneum, no particular measures need be adopted. If a large one be made, total extirpation of the uterus should be performed. If very extensive destruction of the uterus be caused by the *morcellement*, total extirpation should also be performed.

After the removal of the tumour, all bleeding points in the raw bed should be seized with long forceps. The cavity should be cleaned with an antiseptic douche, and between the forceps an iodoform gauze plug should be placed in the uterus.

After-treatment.—The patient is kept at rest and the vagina is douched daily. In thirty-six or forty-eight hours the forceps and gauze are removed, the uterus being washed out. Ergot is given regularly.

Note.—This operation should only be attempted when there is a definite submucous tumour. The risks of cutting into the peritoneum, of hæmorrhage, sepsis, and shock from prolongation of the operation, are great.

It is impossible, as yet, to say whether this operation is

safer or more dangerous than abdominal enucleation or hysterectomy.

FIBROIDS OF THE VAGINAL PORTION OF THE CERVIX.—(*a*) *Pediculated.*—These are removed in a manner similar to that employed in the case of pediculated fibroids of the body by way of the vagina.

(*b*) *Interstitial.*—These are they which cause a large swelling in the cervix, and tend to grow towards neighbouring parts, *e.g.* into the broad ligament.

If not too large, the covering should be divided, and enucleation or *morcellement* should be carried out.

Sometimes one has to be satisfied with removing a part of the tumour, the capsule being sewn over the cut end.

In some cases the part left may be gradually pushed downwards by uterine action, so that it can be removed by a second operation.

When a tumour is removed, the resulting cavity may be closed by continuous catgut suture or packed with gauze.

Care should be taken to avoid injuring the bladder or ureter.

DEATH AFTER ABDOMINAL HYSTERECTOMY.—Death after this severe operation may be due to loss of blood, which may occur at the operation or after it. The secondary hæmorrhage may occur intraperitoneally or extraperitoneally.

It may be due to shock, which may be caused by loss of blood, or to exposure and handling of intestines. No doubt, many cases of so-called shock are really due to ligation of the ureters, reflex interference with the function of the kidneys, prolonged use of the anæsthetic, heart degeneration.

Prolonged use of ergot, bromides, and iodides before operation, may depress the patient so that it may affect her seriously.

Embolism may sometimes cause death; sometimes intestinal obstruction may lead to it. Sepsis is a very important cause.

Cystic Tumours of the Uterus.

The following varieties of cystic tumours are met with :—

Cystic fibromyoma or fibrocystic tumours.—These are fibromyomata, in which collections of fluids have formed. In some cases, myxomatous or colloid degeneration of the connective tissue between the muscular bundles is the starting-point of the condition, or an œdematous infiltration; there are no distinct walls in the cysts formed, as they are formed simply as lacunæ in the tissue of the tumour itself.

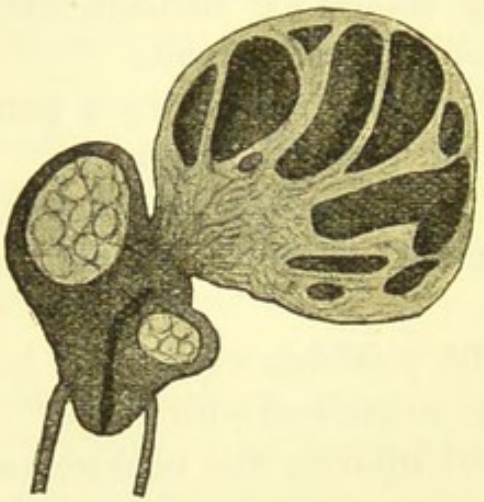


Fig. 179.—Ordinary cystic form of a fibromyomatous uterus.

In other cases cysts may be formed as the result of dilatations of lymphatics, the so-called *fibromyoma lymphangiectodes*. The cysts are usually lined with endothelium, though this may not be easily distinguished in large ones. The fluid coagulates spontaneously on exposure to air. Sometimes there may be, as well, a condition of dilatation of blood capillaries—*fibromyoma telangiectodes*.

Sarcomatous degeneration may sometimes produce a cystic condition. Hæmorrhages may take place into cysts in all the above-mentioned varieties, causing them to increase in size. Rupture into the uterine cavity may sometimes take place.

If the cervix be obliterated, as is sometimes the case in women after the menopause, the cavity of the uterus may be gradually distended, forming a large blood collection.

The great majority of these cystic conditions are found in subperitoneal fibroids. They may grow rather quickly, and form masses of very large size.

Cystic adenomyoma.—These are fibromyomata in which cysts are found lined with cylindrical epithelium. They have been chiefly described by von Recklinghausen and Freund. They occur at the junction of the tube and uterus. (Similar growths are found in connection with the tube alone.) They develop in the muscular part of the wall, and may extend outwards to the peritoneum or into the broad ligament; they may thus infiltrate surrounding tissues diffusely, thus differing from pure fibromyomata.

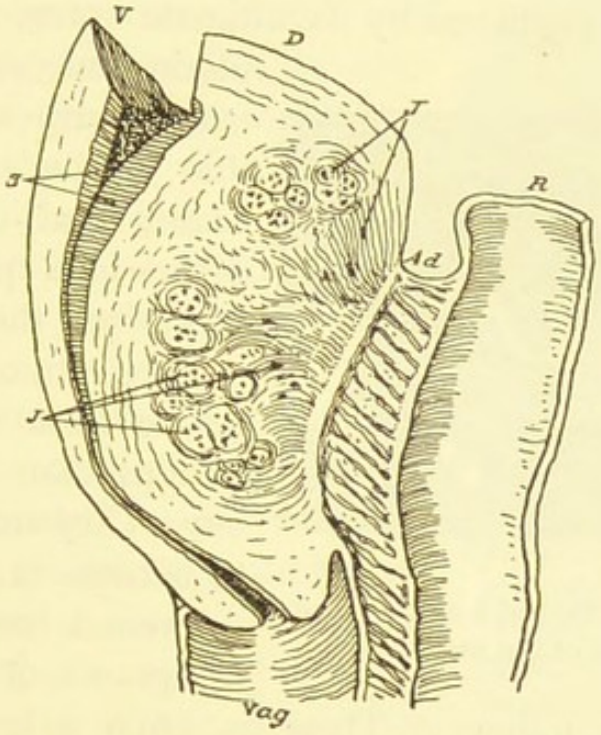


FIG. 180.—Cystic adenomyoma.—VON RECKLINGHAUSEN.

V. Anterior uterine wall.
D. Posterior uterine wall.
J. Collection of small gland-like spaces in the tumour.
R. Rectum.
Ad. Adhesions.
S. Mucous membrane of uterus.
Vag. Vagina.

They tend to form adhesions. Von Recklinghausen classifies the tumours as follows:—

1. Hard masses in which the adenomatous development is scanty.

2. Those in which many small cysts are discoverable by the microscope.

3. Soft masses in which cysts of various sizes exist, which can be seen by the naked eye.

4. Very soft teleangiectatic growths in which adenomatous tissue is present, but few or no cysts.

He believes that these growths are developed from relics of the Wolffian bodies which have remained in the uterine wall.

He also describes a rare form of cystic adenomyoma, which is distinguished by its intimate connection with the uterine mucosa. Its adenomatous structure resembles that of the mucous membrane, and a number of depressions pass from the latter into the tumour.

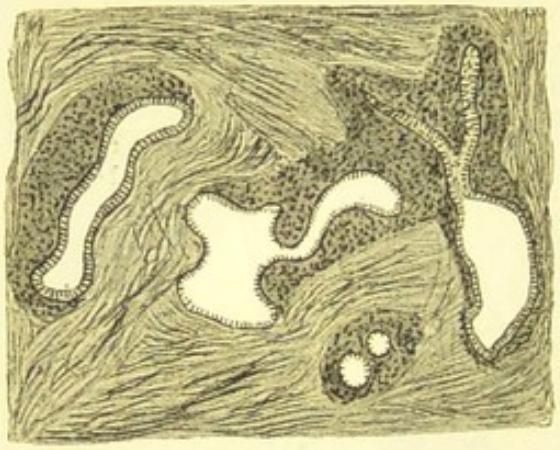


FIG. 181.—Section of a cystic adenomyoma of the uterus.

These tumours are less apt to form peritoneal adhesions than the other variety. They are apt, however, to become carcinomatous.

Freund has arranged the symptoms of cysto-adenomyomata as follows:—There is often a history of poor health in childhood. Menstruation appears late. Menorrhagia and dysmenorrhœa are very constant. Sterility is common. The general health gradually fails. The external genitals and vagina are usually undersized.

Blood cyst of the uterine wall.—In 1895 I described an interesting case in which a large unilocular blood cyst developed from the wall of the uterus, three years after the menopause. The patient in whom it occurred first noticed the swelling about a month after she had strained herself severely, pelvic pains being set up. In five months' time, great distension of the belly was caused.

The cyst wall was deeply congested, contrasting with the pale uterus. It had elongated the fundus into a kind of pedicle.

The cyst wall varied in structure. The fibrous tissue predominated over the muscular, and in many places was dense and sclerosed; in many places the muscle was atrophied. Throughout the wall many dilated capillaries were found. The cavity contained blood, granular débris, flakes of fibrin, and a few cholesterin crystals. In the elongated fundus, which was largely composed of connective tissue and atrophying muscular bundles, a collection of cavities containing blood was found, about the size of a walnut; it resembled an angioma, and seemed to consist of dilated capillaries. No sign of a myoma was seen anywhere in the wall.

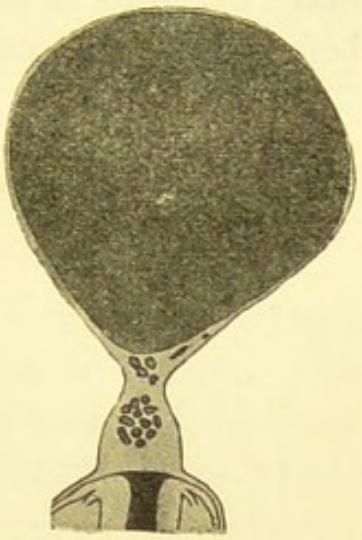


FIG. 182.—Large blood cyst of the uterus. The fundus uteri is elongated, and contains a mass of distended blood spaces.

I believe that this tumour arose from an angiomatous condition of the fundus, the sudden strain which the woman made leading to a rupture of the wall of one of the blood spaces, and to a gradual accumulation of blood, slowly poured out, forming a large blood cyst.

Diagnosis of these various cystic conditions.—The symptoms are much the same as in the case of fibroids, except that usually they develop more quickly. As most are subperitoneal, there may often be no menstruation disturbances. On physical examination, the conditions found in fibroids are present, except that in addition cystic characters are made out. But, as I have already said, a soft myoma may simulate a cyst in character. Cystic fibroids are more apt to become gangrenous, and to develop thrombosis, than solid tumours.

Differential diagnosis of cystic tumours :—

1. From soft myoma.
2. From ovarian tumours.
3. From a fibroid with pregnancy.

Treatment.—In these cases the procedure varies, according to the extent of the cystic formation. If there be one pediculated cyst, it is removed just as is a subperitoneal fibroid. If the cystic disease is extensive, amputation of the uterus or panhysterectomy should be performed. To make the mass as small as possible the cysts may be tapped before removal is carried out.

CHAPTER XVII.

CARCINOMA UTERI.

PRIMARY carcinoma may develop either in the body or in the cervix uteri. In about 98 per cent. of cases, the latter is the seat of the disease.

CARCINOMA CERVICIS UTERI.

Etiology.—In women the cervix uteri is the most frequent seat of cancer; the breast comes next in order. The majority of cases of carcinoma uteri are met with between 40 and 50. The following table of Gusserow, in which 3471 cases are analysed, is interesting:—

Carcinoma uteri developed at the age of—

17 years	in	1 case	40–50 years	in	1196 cases
19 ,,		1 ,,	50–60 ,,		856 ,,
20–30 ,,		114 ,,	60–70 ,,		340 ,,
30–40 ,,		770 ,,	Above 70 ,,		193 ,,

The disease has been reported earlier even than 17; in a case of Ganghoffer at 9.

Hereditary predisposition is believed to play some part in its production. It seems to be more common among the poor and unhealthy than among the well-to-do and strong.

Race is a factor to be considered. The disease is rare among black women. Lacerations and inflammations are predisposing causes; consequently it is mainly found in married women.

Pathology.—It is impossible to speak with accuracy regarding the various modes of origin of cancer, or to establish a satisfactory classification of them as they occur in the uterus. It is probable that all forms arise solely from epithelium. They may, therefore, be divided into those which originate from *cylindrical*, and those starting from *squamous* epithelium. The former are the most frequent. As to the portion of the cervix in which the disease most commonly begins, Hofmeier states that of 422 cases, 236 began in the portio, and 186 higher up in the cervix.

Of the cylindrical-cell cancers, those of the medullary type are more common than those of scirrhous type.

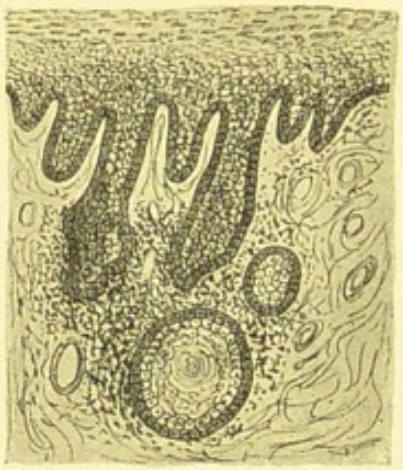


FIG. 183.—Early epithelioma of vaginal portion of cervix. A cell nest is seen, surrounded by small cell infiltration.

As regards the squamous-celled variety, the origin is in almost all cases the covering of the portio vaginalis; very rarely it may grow from the interior of the cervix, or, as we shall see later, from the mucosa of the corpus uteri. I have already pointed out that papilloma covered with squamous epithelium may spring from the mucosa internal to the os externum, and it is possible in these cases that there may be an abnormal covering of the lower part of the cervical lining with squamous epithelium.

It is difficult to draw a distinction between the simple and malignant growths. Transition forms may sometimes be seen in the same growth. Thus the papilloma may be for a time simple and then may take on an epitheliomatous character. So, also, transition forms may be seen between an adenomatous growth in the mucosa and the distinct cylindrical-celled cancer. Thus in the latter may be seen gland-like spaces lined with a single layer of cells, others

lined with two or more layers, and others in which there is no lumen whatever. Sometimes, small masses of epithelium project into the lumen. The cancerous cells next the connective tissue are usually cylindrical and perpendicular to the surface; those more internal are of irregular shape and sizes, the central ones being easily detached. The cells multiply chiefly by indirect nuclear division, like the normal cells. The nuclei are larger, more abundant in chromatin, and more often originate karyokinetic figures than the normal cells. Asymmetrical and multipolar mitoses have been described by several as taking place exceptionally frequently in the cancer cells. Often more than one nucleus is present, and their chromatin tends to be shed into the surrounding protoplasm before division (Roger Williams).

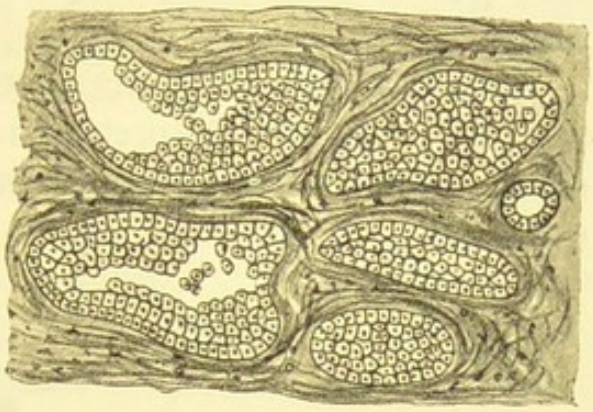


FIG. 184.—Carcinoma cervicis. Medullary form.

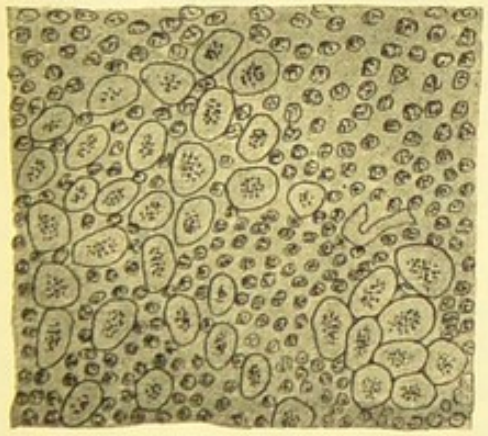


FIG. 185.—Carcinoma cervicis uteri. The cancerous cells are seen extending irregularly among the tissues of the wall, not being in well-defined groups.

These appearances indicate marked reproductive activity. The cancer cells may undergo mucoid, caseous, fatty, or calcareous degeneration; colloid changes or pigmentary changes are rare.

Leucocytes may wander between the cells and may enter them.

In some cases of rapidly growing carcinoma, the epithelial

cell masses may spread out irregularly into the tissues as is sometimes the case in rapid mammary cancer.

The connective tissue stroma of the new growth is cellular mainly; in some cases it is partly or wholly myxomatous in nature.

In examining specimens microscopically, it is important to avoid errors of interpretation. Thus oblique sections of normal glands must not be regarded as cancerous alveoli; this mistake is especially apt to be made if the fundus of

FIG. 186.—Carcinoma cervicis. The cervix is being excavated internal to the os externum.

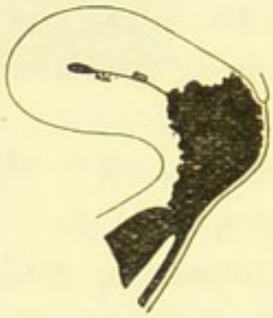


FIG. 187.—Carcinoma cervicis. The disease has partly destroyed the cervix, and has spread to the vaginal walls. A vesico-vaginal fistula has been formed.

FIG. 188.—Carcinoma cervicis. Cauliflower-like growth of vaginal portion of cervix.

the gland be cut across. Serial sections alone can decide regarding such points as these. The arrangement of the cells is important—regular and orderly in normal conditions, irregular in shape, size, and arrangement in cancer. In the latter, also, it is important to note the frequency of mitoses. The small round-cell infiltration of the stroma resembles, greatly, inflammatory tissue. Moreover, in inflammatory conditions, the glands may be compressed so that the lumina are destroyed, and the epithelium compressed and

flattened, so that there may be a strong resemblance to the projections of early rapidly growing cancer.

Note.—Plimmer emphasises the importance of the use of congo-red (1 per cent. aqueous solution) as a cell-substance stain, best employed with hæmatoxylin as a nuclear stain. Normal gland epithelium is stained strongly red ; cancer cells remain almost unstained.

Clinically, cancer may be observed to start in the cervix as follows :—

1. As a fungating epitheliomatous growth from the vaginal surface. This usually spreads out to the fornices, may eat deeply into the cellular tissue, and may sometimes spread up the cervical canal.

2. As one or more nodules, superficially or deeply placed in the mucosa lining the canal, or bulging outwards toward the vaginal surface of the cervix. As growth takes place, ulceration of the mucosa lining the canal or covering the vaginal portion over it occurs, and infiltration of surrounding tissues. It may spread to the corpus uteri. Sometimes, in cervical cancer, nodules of the disease may be found in the body, though there is no direct continuation of the growth. This may possibly take place through lymphatic transmission. Seelig states that the lymphatic communication between body and cervix is much freer in the muscular part of the wall than in the mucosa, on account of the larger size of the lymphatics. Possibly in some of these cases the upper growth may be primary, that in the cervix being due to direct implantation of a portion of the tumour.

3. As an infiltration which tends to spread superficially around the mucosa of the canal eroding it. This may take place to a considerable extent, while the vaginal portion of the cervix and the os externum appear from below to be perfectly normal. This form tends to spread early to the corpus uteri, then to the parametric tissues ; last of all, or not at all, to the vagina.

Extension.—The growth spreads by the lymphatics, or by a continuous chain of infiltration of the connective tissue.

The broad and utero-sacral ligaments may become affected. The ureters are often involved by pressure or by spread of the disease to their walls; as a consequence, dilatation, hydronephrosis, and atrophy of the kidney substance result.

It may spread to the wall of the bladder, causing first a vesical catarrh; then portions may slough, so that perforation may be brought about. Then inflammation may spread to the ureter and kidney; in the latter, interstitial nephritis, pyelitis, or pyelonephritis may result. Sometimes only dilatation of the ureters and hydronephrosis are produced. It appears that cardiac hypertrophy attends renal lesion in cancer very rarely—probably where the disease is of rapid development (Letulle).

Rarely does the cancer extend backwards and attack or open the rectum. Sometimes both bladder and rectum may be opened, so that the vagina may be converted into a kind of cloaca.

Perforation of the peritoneum is rare, because, as the cancer spreads towards it, inflammation is set up, thickenings and adhesions being formed.

The mucosa of the uterus not directly affected is often in a state of hyperplastic endometritis, and it may sometimes show a tendency to malignancy (according to Abel, in the direction of sarcomatous change, in some cases).

Metastases may develop in liver, kidney, stomach, lungs, etc. The hypogastric, iliac, sacral, and lumbar glands may be involved; the inguinal also in some cases, even where there is no vaginal affection. This is due to a communication which exists between the hypogastric and inguinal glands, by means of the gland of Guérin; also to that which exists between the uterine lymphatics and the groin by way of the round ligament. Troiser has pointed out how prone are the left subclavicular glands to become affected. When there is a bad ulcerating surface, from which septic

matter is absorbed, the liver tends to undergo fatty degeneration.

Local symptoms.—The disease is usually quite insidious at first. It may be considerably advanced before the patient notices that anything is wrong.

Hæmorrhage is generally the first noted symptom. It may be a mere trace noticed after coitus, defæcation, or some other form of exertion. In these cases probably the blood comes from the hypertrophied mucosa near the tumour. Sometimes it arises from ulceration. Sometimes the menstrual period is noticed to be rather profuse. Metrorrhagia may develop. In the late stages of the disease, hæmorrhage is not prominent, unless a large vessel should be ulcerated through.

Leucorrhœa is a prominent feature usually. At first this has the ordinary characters found in connection with endometritis. In the papillary form there is an early profuse watery discharge.

When ulceration has occurred, and the cancer has begun to break down, the characteristic discharge with its foul smell is produced. It is variously coloured, being yellowish white, brown, green, or bloody. It is made up of serum, mucus, broken-down tissue in a state of necrosis or fatty degeneration, pus cells, more or less blood, colonies of micro-organisms.

Pain is often present in cancer; in some cases it is hardly ever noticeable throughout the whole progress of the disease. It rarely occurs in the first stage, but rather later, when infiltration of the uterine wall and of the parametric tissue is taking place. When branches of the sacral plexus are involved, the pain may be very intense. It is often improved when much breaking down of the growth occurs.

The pain varies in character; it may be felt in the lumbar regions, in the pelvis, and shooting down the legs. It is dull and gnawing, or sharp and cutting. Sometimes the pains met with are mainly due to peritonitis, when there is

usually rigidity of the abdomen and tenderness on palpation. Various reflex and sympathetic pains are often found, *e.g.* in the mammæ. White swelling may be found in the lower limbs.

General symptoms.—In the early stages the patient may show no sign of ill-health. Gradually reflex phenomena appear, *e.g.* disturbance in the digestive tract; and as the disease advances, anorexia, constipation, meteorism, etc., become marked.

The patient gets weaker and loses flesh. Then the so-called "cancerous cachexia" develops. The skin gets yellow, probably due to copræmia, and it is also usually harsh and dry. There may be cystitis and micturition troubles or difficulty on defæcation. If fistulæ are present, the discharges pass per vaginam. Staining and itchiness of the vulva may be produced by the discharges.

In some cases there are periodical attacks of subacute uræmia. As the disease progresses this tends to become chronic, and the patient becomes dulled in intelligence and sensibility. Towards the end, a semicomatose condition often develops, during which no pain may be felt.

Death may occur quietly during one of these attacks. Uræmia with convulsions is not often met with. Death from peritonitis or perforation is rare. The latter and embolism may cause sudden death. Often death may be alone due to the general blood poisoning. Sometimes death occurs from hæmorrhage, sometimes as a result of venous thrombosis.

Physical signs.—In the very early stages the disease is seldom made out, simply because patients rarely come to the physician (owing to the absence of symptoms) before the affection has advanced somewhat.

When cases are seen, either a hardness may be felt on the vaginal portion of the cervix or inside the os externum; it is sometimes felt raised above the surface, an ulcerated surface may be felt, or a cauliflower growth distinguished.

On examination through the speculum, these conditions may be seen. Stratz states that the non-ulcerated cancer is very yellow and brightly granular.

In the late stages the diagnosis is usually easier. The hardness of the growth and infiltrations is felt. The fingers have a very bad odour from the discharge.

In cases where the cervical mucosa is being eroded, the os externum may, on vaginal examination, appear normal. On dilating it, however, the excavation within is recognised. Rectal examination is very important, especially in determining whether or not the uterus is fixed, and to what extent the disease has spread beyond the organ. There is no means of knowing definitely whether the latter change has occurred.

Ordinarily it is taught that if no hard infiltration is felt external to the uterus, and if it be freely movable, the disease has not spread beyond the uterus. This is, however, fallacious. There may be a delicate lymphatic infection, not marked enough to fix the uterus, or to be felt by the finger. (Old cellulitis or peritonitis must not be diagnosed as infiltration.) There is usually some bleeding after examination.

In forming an opinion it is important to cut out a piece of the tissue for careful microscopic examination.

Differential diagnosis.—Carcinoma cervicis must be distinguished from the following :—

1. Hypertrophy of the cervix.
2. Endocervicitis with catarrhal patches on the vaginal portion, and Nabothian follicles.
3. Cervical polypus.
4. Ulcerating or sloughing fibroid polypus.
5. Syphilitic ulceration and condyloma of cervix.
6. Retained bits of placenta and membranes, especially if decomposition has taken place in them.
7. Sarcoma, fibroid or papilloma of cervix.
8. Diphtheritic patch.
9. Lupoid ulceration.

Prognosis.—The average duration of the disease is one to two years. It may be less or more. Early in life the disease usually advances more rapidly than it does in later years *e.g.* at the menopause.

The scirrhus and the epithelioma have a longer duration than the encephaloid. The scirrhus may last for several years in some cases.

Treatment.—The only means of radical cure is by removal of the disease. This can only be done when the disease is limited to the cervix.

When the disease has not spread beyond the cervix, two operations are employed for its removal, namely, high amputation of the cervix above the limit of the cancer, and total vaginal extirpation of the uterus. Both of these methods have been followed with success, but the tendency at present is to limit the former of them to a very small number of cases, *e.g.* those in which it is definitely certain that the disease is very early, strictly limited, and capable of being removed by a high amputation. In all other conditions, and especially in cases of doubt as to the extent of the disease, extirpation of the uterus should be performed.

High amputation.—The circular method is employed, the operation being carried out as already described.

Vaginal extirpation.—This can only be carried out when the vagina is not too small. If more room be desired in any case, the vagina should be distended with Barnes bags two or three days previous to operation. Sometimes during the operation it is well to divide the perineum on each side of the middle line in order to obtain more room. These wounds can be closed at the end of the operation.

The patient is prepared for the operation as described on p. 249. Great care must be taken to destroy all sources of septic infection by antiseptic douchings and packings with gauze. The patient is placed in the lithotomy position, the bladder and rectum being empty. The vagina is stretched by means of short anterior and posterior spatular specula,

and lateral retractors. The cervix is drawn downwards and forwards, and held with a volsella by an assistant.

The surface of the diseased portion should be carefully cleansed of all discharge, and should be thoroughly swabbed with turpentine, and then with a solution of zinc chloride. Any portion which is breaking down, or is apt to be broken down during the operation, should be removed with a curette, the raw surface being burned with a galvano-cautery, or touched with a strong solution of perchloride of iron.

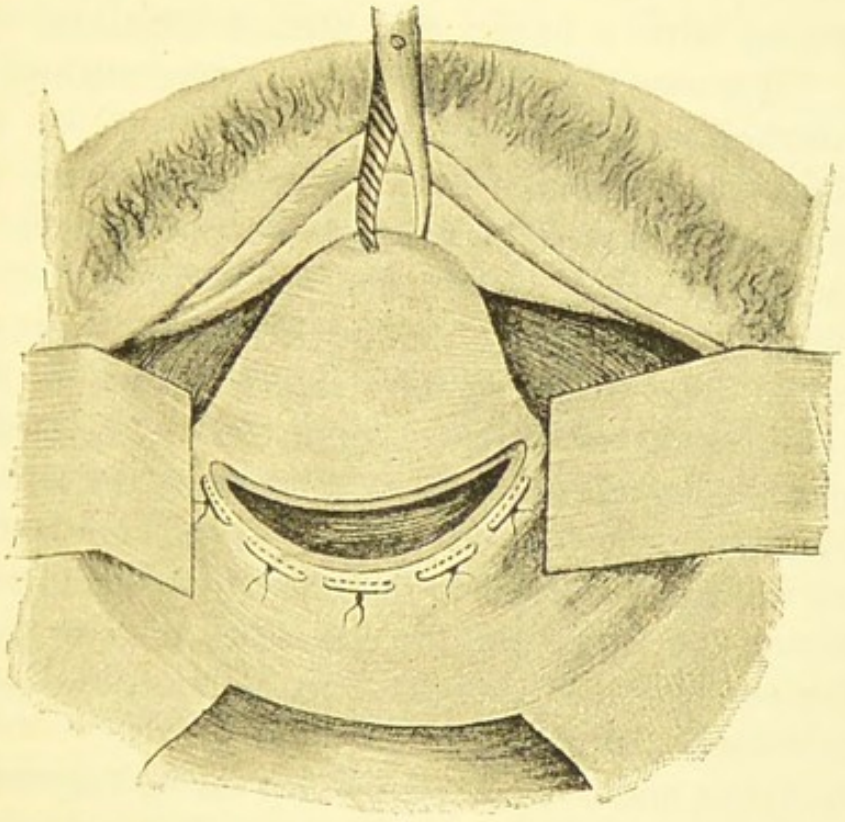


FIG. 189.—First stage in the operation of vaginal extirpation of the uterus. Opening into the pouch of Douglas.—A. MARTIN.

The pouch of Douglas is then opened by a transverse incision through the junction of the posterior vaginal wall and cervix. Bleeding points on the uterus are tied. It is checked on the vaginal flap by means of a continuous suture, which brings together the edges of the peritoneum and vaginal mucosa.

The utero-vesical pouch is then opened, the cervix being pulled downwards and towards the back. A transverse incision is made through the junction of the anterior wall and cervix as deep as the uterine musculature. The bladder is then stripped upwards from the cervix, and the utero-vesical layer of peritoneum is cut across transversely. Then the cut edge is united to the edge of the anterior vaginal wall by catgut suture, thus covering the back of the bladder. The broad ligaments now remain to be secured and divided. At this stage the pelvis should be explored with a finger, and uterine adhesions broken down. To secure the ligaments the ligature method or the clamp method may be used.

(*a*) **Ligature method.**—Strong silk ligatures are passed by means of a curved pedicle needle through the broad ligament on each side, a short distance out from the uterus, the forefinger being passed into the peritoneal cavity to guide the needle. The lowest ligature should secure the uterine artery, and should not embrace the ureter. The higher the passing of the ligatures in the broad ligament, the farther out from the uterus these may be placed. As each one is tied, the ligament is divided internal to the knot by means of scissors.

If, during the operation, the intestines tend to prolapse and interfere with the manipulations, they may be kept up by an iodoform gauze pad placed in the pelvis.

If the tubes and ovaries come down easily, they may also be removed, but it does not matter if they be partly left behind. When the uterus is removed the pelvic cavity may be washed out. Ligature ends are then brought down into the vagina, those of each side being tied in a bundle. Some operators use catgut ligatures (No. 4). In such a case the ends may be cut short. They should not reach so far as the vulva.

If a very wide opening remain in the vaginal roof, it can be made smaller by means of a catgut suture. But there is no necessity for closing it entirely. A plug of iodoform

gauze should be carefully placed against the fornix. If there has been oozing in the pelvis, a portion of gauze should be passed through the opening to act as a pelvic drain.

After-treatment.—The patient lies in bed, and is treated generally as after an abdominal section. The urine is drawn off every six hours for five days, and thereafter the patient passes water at regular intervals. On the day following the operation the gauze plug should be removed from the vagina if there has been much oozing from the pelvis. If there has been only a little discharge, it should not be taken away until the third day. Thereafter the vagina should be douched daily with a double catheter, a solution of formalin (1 in 4000) being used. After each douche an iodoform pessary should be passed into the vagina.

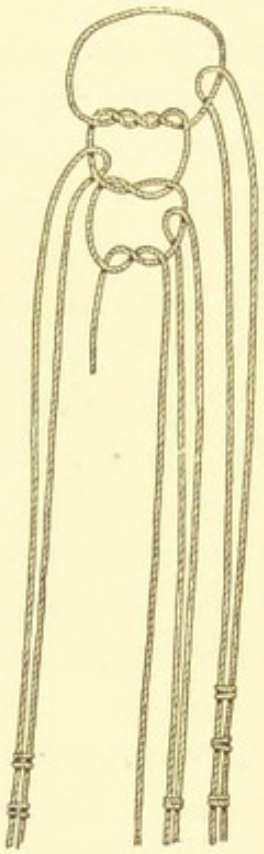


FIG. 190.—Grad ligature.

Between the second and third weeks the ligatures usually begin to drop off. Sometimes undue retention of a ligature is associated with rises in temperature. If they are not all away by the eighteenth or twentieth day, the patient should be placed in the lithotomy position, and they should be carefully removed.

Grad has recently introduced a method whereby the silk ligatures may be easily removed. Traction-strings are included in each knot of the ligatures, as figured in the diagram, the strings being marked by the number of knots put upon them. The mass of strings and ligatures are left in the vagina.

The removal of the ligatures may be carried out on the fourth or fifth day, or on the third, fourth, and fifth days. The patient is placed in the lithotomy position, and the ends of the ligatures and traction-strings carefully distinguished.

Traction-string No. 1 is then gradually pulled on, each half alternately until it comes away, indicating that knot No. 1 is untied. The same manœuvres are carried out with the other traction-strings until the whole ligature is left untied. It may then be pulled away. Catgut sutures, as a rule, give no trouble.

(*b*) **Clamp method.**—The clamp used is a pair of long forceps, with a separable lock. At the handles there is a catch, with which they can be held together. When the anterior and posterior peritoneal pouches are opened, the forceps are placed on the broad ligaments, embracing their whole extent, and the uterus is cut away internal to them. When it is impossible to secure the ligament by one clamp on each side, the lower half of the ligament is clamped on each side, the corresponding part of the uterus being cut free. The uterus can then be pulled down, so as to allow of the application of forceps to the rest of the ligament. The whole uterus is then removed. The handles of the forceps are tied, to prevent them from opening. A plug of iodoform gauze is placed in the fornix, and the handles of the forceps are kept from pressing unduly against the vaginal walls by gauze pads. The patient is then placed in bed.

After-treatment.—In general the same as that just described. The forceps are carefully removed from thirty to forty hours after the operation, and an iodoform gauze plug is placed in the vagina. After three weeks the patient should rise.

The clamp operation is more quickly carried out than the ligature method. It is held to be more convenient when perimetritis or parametritis makes it difficult to draw the uterus down.

The dangers connected with vaginal extirpation are after-hæmorrhage, sepsis, injury to bladder, ureter, or intestine.

The Richelot-Doyen method (*vide* p. 359) may also be employed, but only when the operator can be sure that the

splitting of the uterus will not lead to the detachment of cancerous nodules, which might give rise to a fresh infection.

Abdominal hysterectomy.—If, on account of the size of the vagina, the vaginal method be impossible, the abdominal method should be employed. It is very rarely required. The method is described in connection with myoma uteri.

From statistics it is impossible to decide whether in a

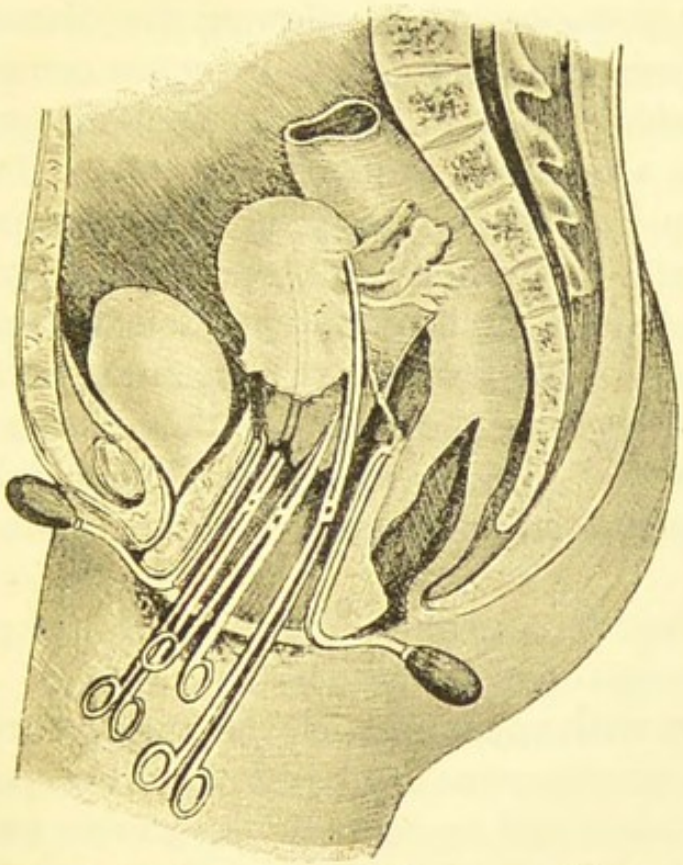


FIG. 191.—Vaginal extirpation of the uterus. Clamp method. Application of clamps to broad ligaments.—PEAN.

strictly localised cancer of the cervix the high amputation or total extirpation is to be preferred. The present tendency is in favour of the latter. Certainly there should be no hesitation to employ the more extensive operation when the disease is situated in the upper part of the cervix, or is excavating the cervical mucosa.

In deciding on the operation, the condition of the urine

should be carefully examined. If there is much solid matter in it, operation must be postponed or put off altogether, owing to the great risk of uræmia and shock.

Where there is any imperfect secretion the patient should be placed on milk for some days before operation, and should be kept on this diet for some time afterwards.

Cancer of the Cervix too Advanced for Complete Removal.

In many cases, instead of allowing the disease to follow its own course, it is advisable to carry out certain measures of a palliative nature, in order to keep the patient in as comfortable a condition as possible.

For sharp hæmorrhage, plugging of the vagina for two or three days with iodoform gauze is the best remedy. To keep down the offensive discharge various douches may be used, *e.g.* solution of potassium permanganate, corrosive sublimate, iodic hydrarg., etc. After the douche a mixture of equal parts of glycerin and olive-oil should be injected into the vagina, and the vulva lubricated with the same mixture.

To destroy the superficial portions of the growth, the following means may be used:—

Curettage with application of the cautery or caustic.—The carcinomatous tissue is scraped out with a spoon curette, care being taken not to perforate the uterine wall. Bleeding is checked by the application of an iodoform gauze plug to the scraped surface for a few minutes. When it is removed the ball-point of Paquelin's cautery is applied at a dull red heat.

An iodoform gauze plug is then placed in the cavity and in the vagina for two days. Afterwards a daily antiseptic douche is used.

Instead of the cautery, pledgets of wool soaked in a 50 per cent. solution of zinc chloride may be placed against the raw surface. These are covered with a dry piece of

wool, and below, a plug of iodoform gauze, soaked in a saturated solution of sodium bicarbonate, is placed.

After eight or nine days the plugs are removed, and the surface of the cancer comes away as a slough. Iodoform gauze is then packed in the cavity for a couple of days, and is followed afterwards by antiseptic douches.

Amputation of as much of the cervix as possible.—This may be carried out by the methods already described (p. 438).

The écraseur or galvano-caustic wire may also be used for this purpose. The patient is placed in the lithotomy position, the vagina opened with specula, the cervix held with a volsella, and the chain or wire is then placed around it. The amputation should proceed very slowly. If there is bleeding afterwards, the points should be touched with the Paquelin cautery, and an iodoform gauze plug placed in the vagina for five or six days.

General measures.—Pain must be relieved with morphine; if trional be used with this drug, small quantities will often suffice. Phenacetin or codein in powder is also most satisfactory.

The digestion should be carefully looked after and the bowels kept regular. A diet containing vegetables and fruit, *e.g.* prunes, roast apples, etc., is valuable; laxatives may, however, be required. Usually a daily enema containing an ounce of glycerin acts satisfactorily.

The patient should sleep in a well-ventilated room, should be placed in cheerful surroundings, and be free from worries and cares.

In bed a piece of thin waterproof sheeting tied around the body keeps down the bad odour, and in the day a petticoat of similar material should be worn. Sexual intercourse should be abandoned. The skin around the vulva is to be protected by vaselin, olive-oil, and glycerin, or olive-oil and lime-water.

Carcinoma Corporis Uteri.

Pathology.—Cancer of the body occurs in less than 2 per cent. of all cases. It is more frequent in nulliparæ than carcinoma cervicis, and tends to occur rather later in life than cancer of the cervix.

The disease begins superficially or deeply in the mucosa. Epithelioma, malignant adenoma, adeno-carcinoma, and pure carcinoma are found, the latter being of the scirrhous or medullary type.

In the malignant adenoma there is an atypical proliferation of the glands; they become folded up irregularly; the intervening connective tissue may be very scant, and the gland spaces may touch at points. They are lined with a single layer of columnar epithelium.

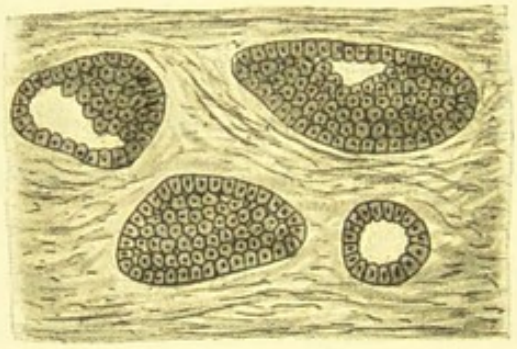


Fig. 192.—Carcinoma of body of uterus. Simple gland spaces, spaces in which the epithelium is proliferating, and another completely filled with carcinomatous cells, are shown.

In the adeno-carcinoma, parts may show the structure of the malignant adenoma, and parts that of the ordinary cancer where the loculi are filled with epithelial cells.

These growths form swellings in the wall. When near the cavity, the mucosa may ulcerate over them. Gradually the uterus becomes excavated. Adhesions may form with adjacent structures, and secondary deposits develop in the peritoneum, ovaries, tubes, vagina, etc.

The epithelioma may grow diffusely through the whole cavity, or as an isolated fungoid growth, which may become polypoidal.

Metastatic nodules may form in different parts of the uterine wall. These tumours are covered with layers of polyhedral cells; very rarely pavement epithelium is found

like that in an ordinary epithelioma. The mucosa of the body gets thinned.

When the disease develops in the puerperium it runs a rapid course.

Symptoms.—These are much the same as in cancer of the cervix. Pain is a more early symptom as a rule. Often it occurs in very severe paroxysms, probably due to infiltration of the dense wall in various directions, or sometimes to the accumulation of secretion in the cavity, the uterus endeavouring to expel it. Hæmorrhage also usually occurs early.

Physical signs.—Bimanually, the uterus is felt to be enlarged and movable, unless fixed by adhesions. The cervix may be closed, but it is often softened and somewhat dilated. On exploring the cavity with a finger, the irregularities, hard masses, and fungosities may be felt. These may be detected with a sound, but the instrument must be used most cautiously.

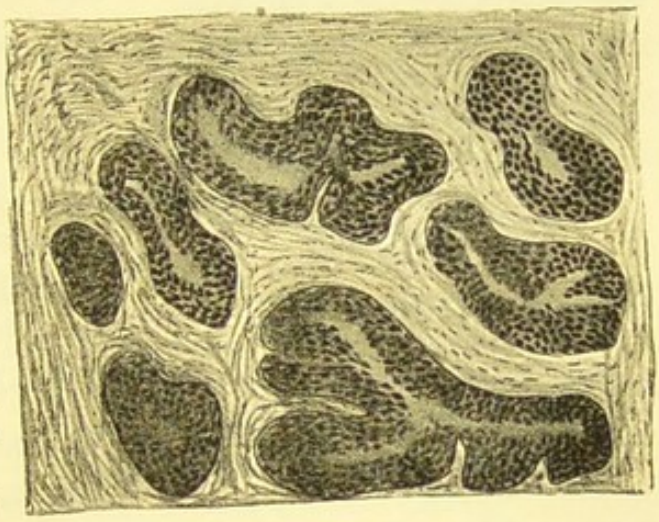


FIG. 193.—Carcinoma of the body of the uterus. Large spaces are shown nearly filled with carcinomatous cells.

It may be necessary to curette the cavity and to examine the fragments microscopically. It may be difficult to decide between a hyperplastic endometritis and an adenoma. Several portions should be examined.

Sometimes it may be impossible to decide as to the nature of the case, and, in such a case, it may be necessary to recommend extirpation of the uterus when the diagnosis of cancer is only a probable one.

The **differential diagnosis** lies between—

1. Hæmorrhagic endometritis.
2. Simple adenoma (hyperplastic glandular endometritis of some authors).
3. Retained bits of placenta or membranes.
4. Sloughing polypus.
5. Sarcoma of the body.

Treatment.—If the disease be diagnosed early, before spread and fixation of the uterus to neighbouring structures have taken place, total extirpation of the uterus through the vagina should be undertaken. If the size of the vagina will not allow this to be carried out, abdominal hysterectomy should be performed. In either case the appendages should be removed, lest they be affected.

FIG. 194.—Section through a fragment curetted from the uterus, after an incomplete abortion. Decidual cells, glands, and effused blood corpuscles are shown.

When the disease is too far advanced for extirpation, palliative measures only can be adopted. These are much the same as in the case of irremovable cancer of the cervix, *e.g.* antiseptic douches, packing of the vagina, curetting of the interior of the uterus, and application of styptics and antiseptics from time to time.

AFTER RESULTS OF VAGINAL HYSTERECTOMY FOR CARCINOMA UTERI.

Among the most valuable of recent papers on this subject special reference may be made to that of Leopold, who furnishes statistics regarding 194 cases. Of these, ten died soon after operation; eleven died of other diseases; fifty died of recurrence of the disease (at the time of the publication of the statistics), or 37·5 per cent.

The time, after operation of the fifty cases, at which death occurred, was as follows :—

In 3 at 3, 4 and 5 months respectively.
,, 3 at 6 months.
,, 2 ,, 7 ,,
,, 2 ,, 8 ,,
,, 4 ,, 9 ,,
,, 3 ,, 10 ,,
,, 21 from 12 to 24 months.
,, 4 during the third year.
,, 5 ,, ,, fourth ,,
,, 1 ,, ,, fifth ,,
,, 2 ,, ,, sixth ,,

The average duration of life was, therefore, in these cases 19.7 months.

Of the ninety patients living, seventy-four had remained free of recurrence. Of the whole 140 cases, therefore, which survived operation and did not die of other diseases, the following table gives their history :—

Died of recurrent disease,	50 = 35.7 per cent.	Recurrence in 47.1 per cent.
Living with recurrence,	16 = 11.4 ,, ,,	
Living and healthy,	74 = 52.9 ,, ,,	
	140 = 100 ,, ,,	

Excluding all cases operated on within two years, 123 may be considered. Of these, nine died from operation, nine from other diseases, and one could not be traced. Of the remaining 104,

46 died of a recurrence = 44.2 per cent.
58 lived . . . = 55.8 ,, ,,

The length of time of the patients after operation is as follows :—

Of 104 operated on,	there lived longer than	2 years	58 = 55.7	per cent.
,, 84	,,	,, 3 ,,	45 = 53.5	,,
,, 61	,,	,, 4 ,,	38 = 62.3	,,
,, 47	,,	,, 5 ,,	29 = 61.7	,,
,, 33	,,	,, 6 ,,	22 = 66.6	,,
,, 21	,,	,, 7 ,,	16 = 76.1	,,
,, 8	,,	,, 8 ,,	6 = 75.0	,,

Of these 104, there was recurrence in seven, and the length of time between operation and return was as follows:

In 1 over 8 years.	In 1 about 5.9 years.
,, 1 about 7 ,,	,, 1 ,, 4.4 ,,
,, 1 ,, 6.5 ,,	,, 1 ,, 4.2 ,,

In 1 about 2.6 years.

Leopold also gives statistics regarding the cases in which operation was carried out when the uterus was freely movable, and when it was not. In the former there was a return in 23.7 per cent.; in the latter in 66.1 per cent.

Leopold believes that in some cases the patient may become infected by cancerous tissue coming into contact with the wound, and he urges that this should be avoided.

Sarcoma Uteri.

I. Of the Corpus Uteri.

Pathology.—Sarcoma occurs in two forms—

1. Diffuse.
2. Circumscribed.

The *diffuse* form is found mostly in young women. It is composed of round or oval cells, and forms villous or irregular swellings of the mucosa, soft and brain-like in consistence. Polypoidal masses may sometimes extend into the vagina. It may ulcerate and break down very quickly. After removal it tends to return very quickly.

The *circumscribed* form may arise in the mucosa or in the connective tissue of the muscular part of the wall. In the former case it may be composed of round, oval, and spindle cells, and may cause a marked swelling of the mucosa which may become polypoidal. In the latter case it exists as localised firm nodules, composed of round, oval, or spindle-shaped cells; often the fibro-sarcomatous type is found. It is stated by some that probably all these circumscribed sarcomata arise in fibroids; whether this be

true or not, it is certain that submucous, interstitial, and subperitoneal tumours may become sarcomatous.

Ordinary sarcoma may be somewhat transformed into myxosarcoma, and other forms. Sarcoma is believed by some to be found rather frequently along with carcinoma or adenoma.

The disease may extend along the Fallopian tubes or through to the peritoneum. Secondary nodules may develop in the vagina, lungs, liver, vertebræ, peritoneum, etc. It may cause inversion of the uterus.

Age at which sarcoma uteri develops.—The following

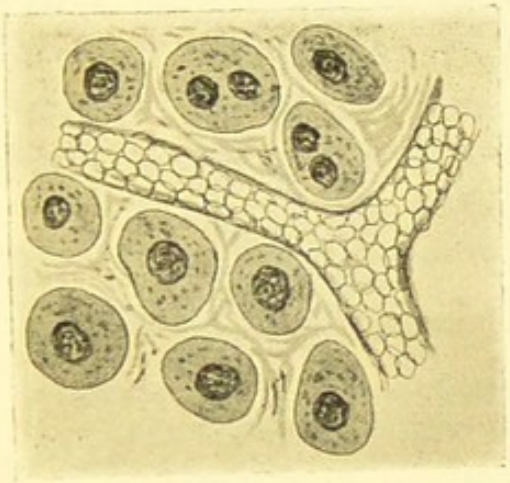


FIG. 195.—Large round-cell sarcoma of body of uterus.

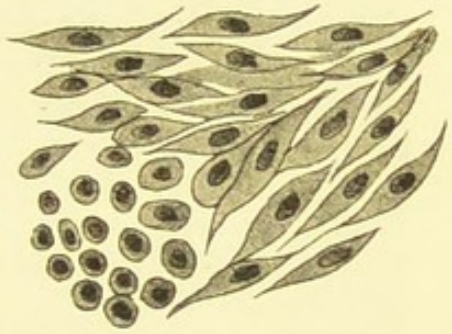


FIG. 196.—Spindle-cell sarcoma of body of uterus.

interesting table has been prepared by Gusserow. In a series of cases collected by him it occurred—

Before 20 in 4 cases.	From 40–48 in 28 cases.
From 20–30 ,, 5 ,,	,, 50–60 ,, 18 ,,
,, 30–39 ,, 15 ,,	Above 60 ,, 3 ,,

Symptoms.—Menorrhagia and metrorrhagia, watery or leucorrhœal discharge, and sometimes pain, are the earliest symptoms.

After ulceration occurs, the bleeding becomes more continuous; the discharge contains considerable débris, and is fœtid. The pain may be in some cases very intense;

probably in the cases where fibrosarcoma is developing in the substance of the wall. In other cases there is no pain, or it is only very slight; probably in those in which the soft sarcoma grows from the mucosa. The patient gradually loses strength and develops a cachectic look.

Physical signs.—On bimanual examination the uterus is found to be enlarged. Soft, pliable, polypoidal masses may sometimes be felt projecting through the cervix. If the cervix be dilated sufficiently to admit the finger, the irregularities in the cavity may be distinguished. Bleeding is usually easily caused. Fixation of the uterus may be

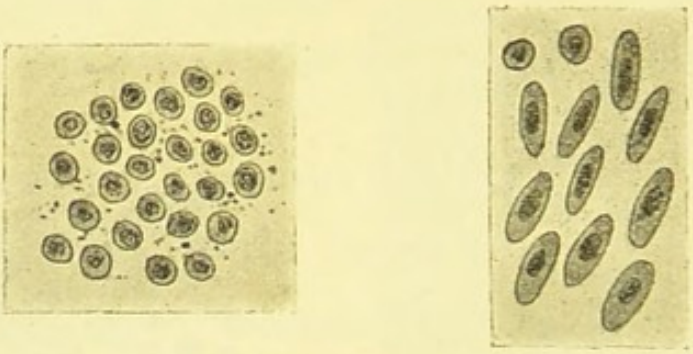


FIG. 197.—Sarcoma of body of uterus, containing small round and oat-like cells.

made out, or extension along the tubes, in the broad ligaments, or elsewhere.

The sound is to be used very cautiously. Scrapings should be made and carefully examined.

Differential diagnosis:—

1. From hæmorrhagic endometritis.
2. From fibroids; sloughing fibroids.
3. From carcinoma corporis.
4. Simple adenoma.
5. Retained bits of placenta or membranes.

Prognosis.—The prognosis is most grave in the rapidly growing forms. In the slow-growing fibrosarcoma, the disease may continue for years, the average period being, according to some, three years. It may last, however, for

six or eight years. Recurrence after curetting varies greatly in different cases.

Treatment.—Total extirpation of the uterus is the only means of radical cure. If this be impossible, palliative measures similar to those used in cancer of the uterus must be employed.

II. Of the Cervix Uteri.

Sarcoma of the cervix is very rare. It may grow as a mass in the substance of the wall, or may project as a polypus into the vagina. A papillary form is sometimes met with, and sometimes this polypoidal form looks like a hydatid mole, owing to the occurrence of œdema in different parts of it. Myxo-sarcoma or myxo-adeno-sarcoma may be found, and myxochondroma may sometimes occur.

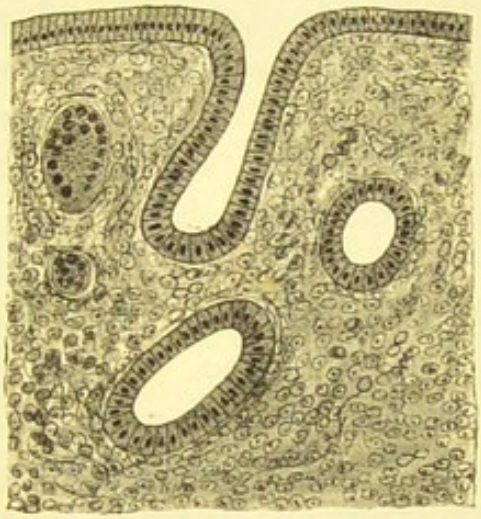


FIG. 198.—Tubercular endometritis. Two giant cells are shown.

TUBERCULOSIS OF THE UTERUS.

Tuberculosis in the uterus is generally secondary to the affection in other parts of the body, *e.g.* phthisis. Very rarely is it primary. In most cases only the corpus uteri is involved. The disease begins in the endometrium, most commonly at the fundus, and afterwards extends. We may find it in the miliary stage, with or without ulceration, in the caseous form, and in the chronic fibroid condition. Owing to obstruction in the cervix the uterus may distend, forming a pyometra.

Tuberculosis of the cervix is rare.

Kiwisch believes that the puerperium is a predisposing cause for uterine tuberculosis.

Deciduoma Malignum.

In 1888 Sänger of Leipzig introduced this term to apply to two cases in which, after abortion, soft, spongy tumours developed in the uterus, with metastases in the lungs, ribs, and other parts, and which were believed by him to belong to the sarcoma group. Since that time a considerable number of cases have been described. Owing to the varying nature of the accounts, there is the greatest confusion as to the nature and origin of the growth. At the present time the views which exist may be stated as follows :—

Relationship to pregnancy. — These cases have been described as occurring within a few days, weeks, or months after full-time labour, abortion, hydatid mole, ectopic gestation. A large proportion have been described in relation to hydatid mole. It is possible that in some cases the primary growth may begin to grow before the pregnancy is ended. The condition has been found at all periods of the sexual life, the largest proportion occurring between the ages of 20 and 30.

Clinical features.—Hæmorrhage from the uterus is usually the first and most marked symptom ; it occurs irregularly. The uterus is enlarged by the soft growth of the mucosa, which may affect the thickness of the whole wall. After curetting of the mass, rapid return is usual. The rapid development of metastases is a prominent feature. They are most frequent in the lungs, common in the vagina, and may occur in other parts, *e.g.* ribs, iliac fossa. The disease progresses rapidly, and death usually takes place within six months of the appearance of symptoms.

Pathology.—There is the greatest discordance of opinion as to the pathology of this condition. By some the growth has been described as carcinoma, by others as sarcoma, and by others as a mixture of carcinoma and sarcoma.

As to the starting-point, some cases are described as maternal in origin, either from epithelial connective tissue,

or muscular elements; others are described as fœtal, either from the epithelium or connective tissue of the chorionic villi, or from both; and others are described as a mixture of fœtal and maternal elements.

From a careful examination of the literature, it appears that the following groups may be arranged:—

1. Those in which the primary growth and metastases are composed of cells of sarcomatous, carcinomatous, or mixed sarcomatous and carcinomatous types.

2. Those in which the structure is that found in Group 1, along with syncytium—irregularly-shaped masses of nucleated plasmodial structure.

3. Those in which the structure is that found in Group 2, along with structures resembling placental villi.

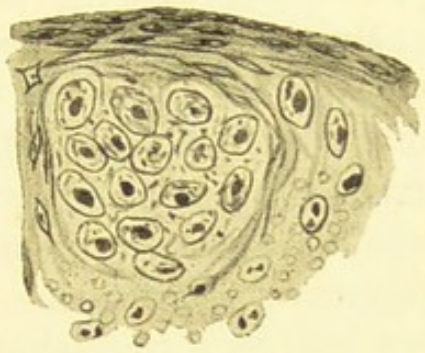


FIG. 199.—Sarcoma of corpus uteri. The cells in this section are arranged in a group somewhat resembling a cancer group.

In regard to *Group* 1, nothing much need be said, save to point out that the difficulty of deciding sometimes as to the carcinomatous or sarcinomatous nature of some malignant uterine growths is a much older one than the discovery of deciduoma malignum, and has been pointed out in connection with the uterus, apart from the influence of pregnancy, as well as in connection with it. Virchow, Hegar, Gusserow, Klebs, and others have referred to this point. The latter author was so impressed with the tendency of these growths to occur together in the corpus uteri, and found the histological differentiation of them so difficult, that he proposed to call them by the term *carcinosarcoma*. The difficulty of establishing their histological nature will be increased by the complication of the influence of pregnancy.

Should the growth occur soon after delivery, the remains of decidual cells and of glandular elements may present appearances exceedingly hard to interpret correctly; more-

over, it is to be remembered that normally the range of variation in the structure of the mucosa in pregnancy and after delivery is considerable (*vide* my articles on "The Changes in the Uterine Mucosa during Pregnancy, and in the attached Fœtal Structures," *Am. Journ. Obst.*, New York, 1897).

The chief feature of these tumours is the large type of the cells which compose them. Now, it is to be noted that everywhere else in the body rapidly growing sarcoma is of the small-cell variety. When sarcomata develop in the uterus of a woman who has not been pregnant, or in whom pregnancy has not taken place for a long time, there is no tendency to the formation of large cells. It is evident, then, that this is a characteristic related to pregnancy, and the explanation is probably as follows:—The genetic influence which is due to fertilisation, and which in the beginning of pregnancy leads to the formation of a decidua, is probably not lost for a considerable while after pregnancy, and may be so excited by the irritation of a new growth that the connective tissue elements multiply and take on that development to which they are physiologically peculiarly disposed, namely, the formation of cells of large size. This will probably be all the more noticeable when the new growth is one developing in connection with the connective tissue elements.

The occurrence of large connective tissue cells in the uterine mucosa has not been noted where the influence of a past pregnancy does not come into play. Thus in Overlach's phosphorus poisoning case, and in Ruge's endometritis case, where large cells were found, the influence of a past abortion could not be excluded. Such cases prove that the genetic influence may extend for many weeks after labour; and we already know that it may act at a distance, because decidual formation may take place in the uterus when fertilisation occurs in one tube, or it may occur in the opposite tube (*vide* my book "Ectopic Pregnancy").

It is not, therefore, remarkable that sarcomatous changes in a uterine mucosa, which has recently been submitted to the influence of pregnancy, may be marked by the formation of cells of a large or decidual type; and it seems to me unnecessary to apply the term "deciduoma malignum" to this group. As regards the rapidity of growth, it has long been known that this is a special characteristic of malignant growths of the uterus developing in the puerperium—very possibly related to the weakened condition of the woman in association with the profound changes which have occurred in the body metabolism.

FIG. 200. — Deciduoma malignum. Syncytial masses and sarcoma-like cells are shown.— Drawn from a specimen kindly given me by Professor SPENCER, University College, London.

Group 2.—In this group, of which the case published by Whitridge Williams in 1895 may be taken as a type, besides the large, malignant, decidua-like cells which compose the great part of the tumour, there are masses of syncytium, varying in size and shape, often found in bands, composed of granular, nucleated protoplasm —plasmodial in appearance, and vacuolated in different parts. Sometimes the masses may be found burrowing through the walls of venous sinuses.

This structure is also found in the metastatic growths, where it may be more abundant and in more varied shapes than in the primary growth. Some of the masses exactly resemble sections of the early epiblastic buds found growing from the chorion in pregnancy.

In the midst of the cells of the tumour blood is found, though often no distinct vessels can be made out.

Regarding these growths there is very great dispute, especially with regard to the syncytium. Some regard them

as sarcomata or carcinosarcomata of maternal origin. Kanthack and others regard them mainly as sarcomatous developments of the connective tissue of the mucosa, the syncytial masses being due to degeneration in the sarcomatous cells. Those who oppose this view state that the syncytium is too abundant and too distinct a formation to be accounted for in this way, and that no such marked appearances are ever seen in sarcoma occurring elsewhere in the body.

Others believe that these tumours are entirely of fœtal origin, the decidua-like cells being derived either by sarcomatous changes in the mesoblastic portion of the villi or by proliferation of the deep layer (Langhans') of the epiblastic covering of the villi, the syncytium being derived from the superficial layer of the epiblast, which is a syncytial structure. Another view is to the effect that the tumours are made up of a mixture derived both from fœtal and maternal sources.

The important feature of the tumours of this group are the syncytial masses. All observers are agreed upon their great resemblance to the syncytium normally found in the uterus in pregnancy. If it can be established that their formation is not due to degenerative processes in the sarcoma, but that they are identical with the syncytium of pregnancy, then it will be necessary to regard the growth as of undoubted fœtal origin—an *epiblastoma*, if I may use the word. For there can now be no doubt that the syncytium of pregnancy is derived entirely from the outer portion of the epiblastic covering of the ovum. That it is not of maternal origin the researches of Kastchenko, myself, and others clearly show. It is found at first on the early ovum, from which it spreads to the surface of the decidua, which is related to the chorion ; it has trophoblastic powers and can penetrate the decidua, reaching even into the muscular part of the wall ; it opens the maternal sinuses in the serotina, and portions of it may be found free in the veins, and may

thus be carried as small emboli some distance from the uterus, even to the lungs.

It would not, therefore, appear to me marvellous if the fœtal epiblast should sometimes overstep the normal range of its activity, and take on malignant action. A dermoid cyst of the ovary is a tumour derived from the early epiblast, and it is widely recognised that, in case of rupture, it is very apt to set up secondary growths in the peritoneum as a result of infection by its epiblastic elements. These may become malignant.

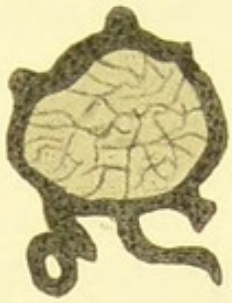


FIG. 201.—Deciduoma malignum villus-like mass in a tumour of the uterus, which developed after the expulsion of a hydatid mole. —Drawn from a specimen kindly given to me by Professor SPENCER, University College, London.

Group 3.—This is made up of cases in which the tumour has developed after a hydatid mole has been expelled from the uterus. The new growth and metastases are in some cases composed entirely of masses of syncytium and of structures exactly resembling, on section, villi in various stages of development, *i.e.* solid syncytial buds, vacuolated buds or rings of epiblast filled with mucoid tissue; in other cases besides these elements there are large cells, which may possibly have originated from the Langhans or deep layer of the epiblast.

The appearances presented by the first of these classes are so very like those seen in microscopic sections of the placenta, both in uterine and ectopic gestation, that one is inclined to agree with Klebs in regarding the new growth as a case of fœtal parasitism, due to malignant changes in fœtal remains left in the uterus.

Treatment.—Owing to the rapid formation of metastases, operative measures will often be useless. When, however, the growth is localised to the uterus or tube, secondary growths not having occurred, complete removal of the whole organ is the only treatment to be employed. When removal is impossible, it may be neces-

sary to curette the cavity of the uterus as a palliative measure.

Cystic Distensions of the Uterine Cavity.

Hydrometra, hæmatometra, and pyometra may follow congenital or acquired atresia of the cervix (*vide* p. 436). After the menopause they are sometimes met with. They required to be emptied by opening the cervix.

Uterine Polypi.

Different varieties of these are found, *e.g.*—

1. Pedunculated Nabothian follicle (*vide* p. 419).
2. Submucous fibroid (*vide* p. 475).
3. Mucous polypus.
4. Fibrous polypus of the mucosa of the corpus uteri.
5. Placental and fibrinous polypi.
6. Papilloma of the cervix.
7. Sarcoma.
8. Carcinoma.

Mucous polypi.—These grow most frequently from the cervix. According to some authorities they occur only as a result of inflammatory changes, being a mere local hypertrophy and hyperplasia. While many undoubtedly originate in this way, I think that some must be regarded as simple adenomata. These polypi vary from a pea to a hen's egg in size. They are made up of the elements of the mucosa and are very vascular, usually of a cherry-red colour. Often more than one are found.

They are covered with columnar epithelium ; when growing near the os externum, they may be partly or, sometimes, entirely covered with stratified squamous epithelium. They are made up of spaces lined with columnar or cubical epithelium, lying in a delicate connective tissue stroma, rich in capillaries ; often blood is found diffused among the fibrils.

In some cases, where the spaces are somewhat distended, the lining epithelium may be considerably flattened. They contain thick or thin mucus.

As these polypi grow and descend they dilate the cervix. Sometimes those growing in the body do not tend to work their way down through the cervix.

They sometimes tend to recur; in some cases there is a malignant tendency.

Sometimes these growths may have a covering of stratified squamous epithelium, though growing from the cervical mucosa.

Diagnosis. — Menorrhagia and metrorrhagia occur. Hæmorrhage is apt to occur after violent exertion, straining at stool, coitus, physical examination, in cases in which the polypus hangs in the vagina. Leucorrhœa is common. The muco-purulent discharge may be from the tumour as well as from the uterine mucosa. Pain is rare save when the tumour is big, and has not passed through the cervix; it is chiefly present at menstruation.

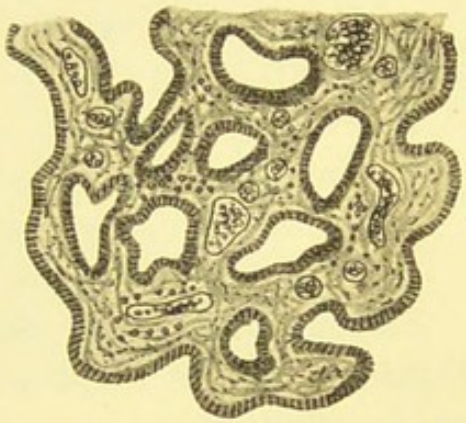


FIG. 202. — Section through part of a mucous polypus.

Sometimes anæmia is rapidly brought about; the patient may have a cachectic appearance in some cases, which may increase the suspicion of malignancy.

Sterility may be present, and may be due sometimes to plugging of the cervix; sometimes, to associated inflammation in the mucosa.

Sometimes with these as with other polypi, pigmentation and enlargement of the breasts, morning sickness, etc., may be present. When the polypus projects beyond the cervix it is felt as a soft, velvety mass. If it does not project much it may be mistaken for a catarrhal patch, sometimes for malignant disease, especially if ulceration or gangrene be

present. Through the speculum the mass is seen to be of a cherry-red colour.

When the growth is within the uterus, it may easily be missed, for the symptoms may be considered as being due to other conditions. Very often patients are allowed to run for a long time with the condition undiagnosed. In doubtful cases, the cervix may be dilated, and the cavity carefully explored with sound, finger, or curette. With small polypi the uterus is not necessarily much enlarged.

If microscopical examination of fragments be made, it may be impossible to distinguish a glandular endometritis from a piece of a simple adenoma.

Differential diagnosis :—

1. From the various other forms of polypi above-mentioned.
2. From hæmorrhagic endometritis.
3. From malignant disease of the body or cervix.
4. From remains of membranes, placenta, or decidua.
5. From early pregnancy.

Fibrous polypus of the mucosa of the corpus uteri.—Haultain has described an interesting case in which, in an old woman of 70, a series of large polypi developed from the mucosa of the body, leading to hæmorrhages. It was made up of fibrous tissue in the centre, and of more cellular tissue near the periphery; it was covered with columnar epithelium, and contained canals, evidently gland-like spaces. This polypus verges towards sarcoma.

Placental and fibrinous polypi.—Remains of membranes or placenta may give rise to a coagulation of blood, which may undergo partial organisation, forming a large mass which may hang from the wall of the uterus like a polypus. It tends to undergo decomposition, giving rise to a fœtid discharge.

Diagnosis.—There are irregular losses of blood, which may be very profuse. Other symptoms are due to the sub-involution. When decomposition occurs, the condition may be mistaken for malignancy.

Fibrinous polypi may sometimes be developed independent of the puerperal state. They may sometimes develop on the site of removal of a large intra-uterine polypoidal tumour, the blood becoming deposited, layer upon layer.

Papilloma of the cervix.—This is very rare as a simple tumour. It may spring from the mucosa of the cervix, and extend downwards as a cauliflower mass, being covered with cubical or columnar epithelium. It is said to grow more slowly in the vagina of a nullipara. It may arise near the os externum, and be covered partly with stratified squamous,

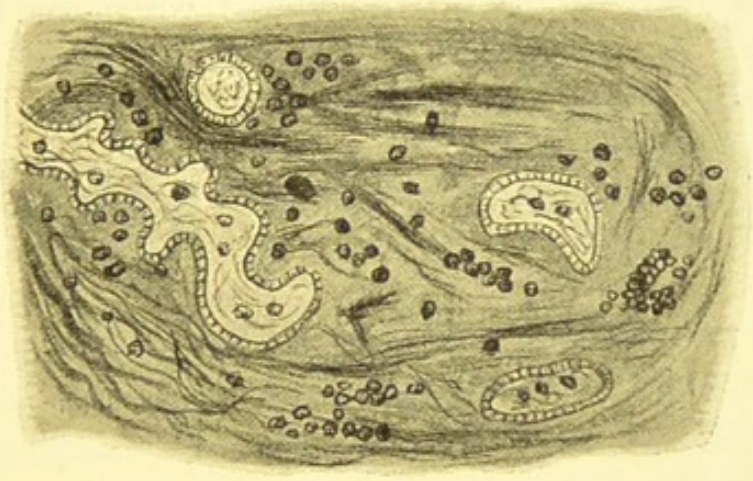


FIG. 203.—Section through part of a placental and fibrinous polypus. Degenerating villi surrounded by fibrin are shown.

partly with columnar epithelium. It may be sometimes entirely covered with stratified squamous epithelium. These contain varying proportions of connective tissue and gland spaces. Malignant cauliflower growths are more common in the cervix.

Diagnosis.—Leucorrhœa is the most constant feature. Sometimes it may be bad smelling, from necrosis or ulceration of a portion of the tumour, and may lead to a diagnosis of malignancy. Hæmorrhages may occur. On examination, the cauliflower-like mass is felt. It may, in some cases, bleed on examination.

Sarcomatous polypi may develop from the uterine mucosa, or may grow from the cervix into the vagina (*vide* p. 529). Carcinomatous cauliflower growths may also project into the vagina from the cervix.

Treatment.—Polypi are to be completely removed—mucous polypi, by twisting of their necks with forceps; cervical growths hanging in the vagina, by ligature of the base, the tumour being cut away beyond it.

Placental and fibrinous polypi are removed best with a large spoon curette. Intra-uterine polypi are best removed according to the plans described on p. 494. In all cases it is well to curette the uterus when the tumour is removed. In many cases it is necessary to dilate the cervix considerably before the polypus can be taken away. In the case of a malignant polypus, high amputation of the cervix or total extirpation of the uterus may be carried out.

CHAPTER XVIII.

AFFECTIONS OF THE VULVA.

Malformations.

Double vulva.—This is a rare condition. There may be, as in the case of Katherine Kaufmann, reported by Suppinger, a double vulva, each with clitoris, hymen, urethra, and anus. Here there was also a bladder and a unicornuate uterus, with an ovary and tube in each half of the pelvis.

Infantile vulva.—In the adult this condition may be found. It may be associated with defective development of the internal genitals; also with diseased states, *e.g.* chlorosis.

Malformations of clitoris and labia.—The clitoris may be absent. It may be bifid; this may be found in epispadias, in which condition, also, there may be complete absence. The organ may be small or abnormally large.

The labia majora may be wanting; this condition is usually found with extroversion of the bladder. They may be adherent. The nymphæ may also be glued together. They may be absent in epispadias. There may be sometimes two or three on one side. Sometimes they may be hypertrophied, *e.g.* as in the case of the "Hottentot apron."

Atresia or defectus vulvæ.—Rarely, a fœtus is found in which the genital furrow has not formed, nor any division of the genital tubercle. The rectum, genital canal, and bladder may be in communication, or the rectum may end blindly, and be separate from the bladder. Sometimes

there is an anus. There is usually no vagina and no urethra. In such cases the bladder and genital canal are usually greatly distended with urine.

FIG. 204.—Complete atresia of the vulva. Rectum, vagina, and bladder communicate.
SCHROEDER.

FIG. 205.—Complete atresia of the vulva. The rectum is separate from the allantois. The bladder and vagina are distended with urine.
SCHROEDER.

FIG. 206.—Persistence of the cloacal condition, owing to the non-development of the perineal septum.
SCHROEDER.

FIG. 207.—Hypospadias. The condition of persistent urogenital sinus is shown.
SCHROEDER.

FIG. 208.—Hypospadias. The urethra is absent, the bladder and vagina opening directly into the vestibule.
SCHROEDER.

The condition is mainly found in non-viable fœtuses, *e.g.* acephalic and sympodial types.

In some cases the atresia is only superficial, being due to the blending of the labia majora or minora; usually it is incomplete, a small opening being found near the clitoris

through which menstrual blood can escape. The condition is probably due to an adhesive vulvitis.

Persistence of a cloaca.—Sometimes the perineal septum is not developed, the urogenital sinus remaining open and communicating with the rectum.

Hypospadias.—This is found in two forms. In one, the perineum has fully developed, but the urogenital sinus has retained its embryonic condition (persistent urogenital sinus).

The vestibular canal is long, the urethra and vagina opening into it high up.

In the other form the urogenital sinus has disappeared; there is no urethra, the bladder and vagina opening into the vestibular canal. Here the lower part of the allantois, instead of forming a urethra has simply given origin to the bladder. On examining the case, the opening of the bladder is seen on the anterior vaginal wall.

Hermaphroditism.—*True.*—For a long time it has been believed that both ovaries and testes may be found in the same person, on one or both sides, the external organs of one sex predominating, thus determining the sex. Recently, strong criticism has been advanced in regard to these long held views, so that the occurrence of true hermaphroditism may be considered as very doubtful. (I have already given Nagel's reason against its non-existence, see p. 8.)

Pseudo-hermaphroditism.—Here there are malformations in the external genitals, whereby a resemblance to the opposite sex is produced.

(*a*) In the female, the clitoris may be hypertrophied, resembling the penis. The labia may be fused, and possibly also the nymphæ, hiding the vulvar opening, and forming a condition which resembles the scrotum.

Sometimes there may be a hernia of the ovary into the labium, increasing the resemblance.

At birth, if this condition be recognised, the labia may be separated, usually revealing the true nature of the case.

The clitoris may be 1 or 2 in. in length. In these cases the internal genitals are female, though they may be irregularly developed.

(*b*) In certain males, often monorchid or cryptorchid, there are external female characteristics, *e.g.* large breasts. There may be a depression in the middle line of the scrotum, and, if the testes are absent, there may be considerable resemblance to the external genitals of the female.

Most cases, however, are instances in which there is hypospadias in the male, *i.e.* the persistence of urogenital sinus, or perineoscrotal fissure. The penis may be small, the urethra opening at its base. A frenum extends from under the end of the penis to the urethra. Below the latter is a small vulvar orifice. A hymen may sometimes be found, and there may be rudimentary nymphæ. The vagina varies in extent. The uterus and tubes may also be developed. Sometimes the vagina may open into the prostatic part of the urethra. The testes are rudimentary, and secrete sterile semen. The breasts, larynx, buttocks, and thighs may be feminine. The beard is scanty or well developed.

These persons are generally considered as females, and they may marry men. Their husbands usually have coitus by the dilated urethra. Sometimes irregular bleedings from the urethra are regarded as menstruation. But in some cases where the uterus is present there is undoubted menstruation, though the ovaries be absent.

In many cases these persons prefer the female, and are able to go through coitus to a certain extent. They are usually ill-balanced in mental organisation.

There is another condition in the male, namely, epispadias, in which the urethra and bladder are open anteriorly, which might possibly be mistaken for pseudo-hermaphroditism, but the nature of the case is evident from the presence of scrotum, testicles, and normal perineum.

Inflammation in the Vulva

(Vulvitis).

Pathology.—Vulvitis may be acute, subacute, or chronic. It may start on the outer surface or on the parts in apposition, and may begin in the hair follicles, the sweat glands, the sebaceous glands, Skene's glands, the ducts from the Bartholinian glands, the meatus urinarius.

The surface surrounding the introitus vagina, and urethral orifice, or the labia, may be red, swollen, and tender. The orifice of the Bartholinian duct may be surrounded by a red areola, and pus may be squeezed out. Small acne-like swellings may be produced in some cases, and small localised abscesses may be formed. An abundant discharge may cover the parts. Sometimes a phlegmonous vulvitis is found. Erosions and ulcerations of the surface may be produced. The glands of Bartholin may be affected, and they may become distended with pus. The inguinal glands may be secondarily affected.

Etiology.—Specific venereal diseases ; it may be secondary to vaginitis ; it may result from irritating discharges caused by carcinoma, vesico-vaginal fistula, etc. ; dirty habits in fat women ; masturbation, awkward coitus, ill-fitting pessaries ; dribbling of urine in dirty, weakly, or strumous children, In most of these cases no doubt the chief agent in the inflammation is some form of micro-organism.

Symptoms.—There is tenderness or pain in the region of the vulva, aggravated on walking, on micturition, and on coitus. There is a free discharge. When very acute, febrile symptoms may be produced, especially if suppuration occur in the inguinal glands.

Treatment.—In acute cases the patient should be kept quiet for a few days. The parts should be douched several times daily with boric, lead and opium, corrosive sublimate, or formalin (1 in 3000) lotions. The irritated parts

may be painted with silver nitrate (1 in 50) to lessen the pain and to act as an antiseptic.

After douching, the parts may be powdered with a mixture of naphthaline and calamine, or of iodoform and talc (1 in 10), and the labia may be kept apart by antiseptic wool.

The orifice of the Bartholinian duct should be cauterised with a nitrate of silver pencil, after enlarging it with a fine knife. Crypts should be burned with a fine cautery point. Abscesses should be opened, their lining wall destroyed with a cautery, and the cavity packed with iodoform gauze. In chronic cases, corrosive sublimate or copper sulphate lotions may be used.

Œdema and Gangrene.

Œdema is noticed in pregnancy sometimes, or in the puerperium. It may also occur in connection with general anasarca. Sometimes it may accompany chancres, and may be found on the labia minora, labia majora, or prepuce of the clitoris.

Gangrene may occur in weakly infants; in various septic and acute febrile conditions, *e.g.* typhoid, scarlet fever, etc. It may follow injury in labour, if sepsis develops.

Treatment. — Local antiseptic applications are to be made, and adhesions prevented from forming.

Eczema Vulvæ.

This affection is found chiefly on the labia majora, but it may affect the mons veneris and other parts.

In the acute condition there is swelling of the skin with a small vesicular eruption; there is itching and tenderness. Considerable discharge may be produced. Chronic eczema may follow the acute affection, or may be chronic from the first. The skin is rough, scaly, and may be fissured and excoriated; it may also be considerably hypertrophied.

Rheumatism is an important factor in predisposing to these attacks; in some cases they occur only in the spring. The scrofulous diathesis may have an influence also.

Treatment.—Locally, in the acute stage, alkaline and bran baths are beneficial, followed by a mild ointment. Starch poultices may also be employed. Painting with nitrate of silver gives relief from the heat and itching. The parts should not be scratched. It may be necessary to wear drawers at night to prevent this. Often the following paste cures quickly:—

℞

Acidi salicylici, Resorcini,	ana grs. v.
Ichthyolici,	♏ x.
Lanolini, Vaselini, Zinci oxidi, Pulveris amyli,	ana ʒii.

Misce leniter terenda diu, fiat pasta.

In chronic cases, when there is leathery infiltration, compresses of absorbent wool, soaked in a lotion of water, containing one quarter the quantity of the following mixture, are helpful:—

Resorcini, Glycerini,	ana 5.0
Sp. vini rect.,	90.0

This may be succeeded by the above-mentioned paste, or by an ointment containing equal parts of lead plaster and the best vaseline. Sometimes it is well to paint the parts with iodine.

General measures must not be forgotten. The diet must be simple. The bowels must be kept regular. The influence of rheumatism or scrofula should be kept in mind.

Herpes Zoster.

This condition is sometimes found. The vesicles may be few or many, discrete or confluent. Sometimes large bullæ may be formed. In the early stage there is redness round about. They may give rise to superficial ulcers with crenated edges. A crust usually forms over these, under which healing takes place in the course of a week or two. There is generally considerable heat and smarting pain. It may be found with or without local irritating conditions. Sometimes it may occur monthly before menstruation; sometimes it is found in pregnancy. The inguinal glands are often painful. It must not be mistaken for syphilides or soft chancre.

Treatment.—Early, the vesicles should be painted with flexible collodion, which should be renewed daily.

Where large blebs form they should be pricked with an aseptic needle, and the part should be dusted with an antiseptic powder and covered with antiseptic absorbent wool. The ulcers are treated in this way too; they should also be touched with nitrate of silver solution. Pain may be assuaged by local bran baths.

Lupus of the Vulva.

Several varieties are found. There is always some degree of hypertrophy and often ulceration. The ulceration may be very superficial and of a deep red colour. Sometimes a number of nodules can be seen on the ulcer. Healing often takes place on one side, as advance is marked on the other. It may extend irregularly in various directions, or it may eat deeply. Perforation of rectum and bladder may be caused. Interference with the urethra may be brought about by cicatrisation. There is not a very abundant discharge.

The hypertrophied parts may be very large. The labia

or clitoris may be affected, either continuously or in detached areas. These swellings are usually not painful. The disease progresses slowly. It may be mistaken for malignant disease, venereal disease, or for elephantiasis. Tuberculosis is a predisposing cause, and the affection is probably a local tuberculosis.

Whitridge Williams believes that some of the described cases have been due to carcinoma, syphilis, elephantiasis, or tuberculosis.

Treatment.—The hypertrophied areas should be excised, and the ulcers cauterised. The superficial ulcerations may be scraped.

Tuberculosis of the Vulva.

Williams thinks that some of the cases which have been described as lupus are of undoubted tubercular origin.

True tuberculosis, in which the bacillus has been found, or inoculation results obtained, are very rare. In the cases described, phthisis was also present. Ulcers were formed with irregular edges, and having a base studded with granulations.

Erysipelas.

Erysipelas is sometimes primary in newly-born children. It may be found in women, often occurring periodically in association with menstruation, or in amenorrhœa.

Varix.

A varicose condition of the vulva may be found in connection with large tumours in the pelvis or in connection with pregnancy. Masses of considerable size may be formed. There is produced a feeling of weight and discomfort. They may rupture spontaneously, or as a result of traumatism, or they may become inflamed.

Hæmatoma.

This may occur in non-pregnant women as the result of a blow, or in pregnant women as the result of injury during labour. The swelling formed is of a violet colour. It may absorb, rupture, or suppurate.

Treatment.—If small, it should be left alone, the patient being kept quiet and cold applications applied; the vulva and vagina being washed regularly with an antiseptic lotion. If large, it should be opened, the blood clot cleaned out, iodoform gauze stuffed in the cavity, the bleeding vessels being held for a time, if possible, with forceps.

Kraurosis Vulvæ.

This term is applied to a condition, probably of inflammatory origin, which may occur in women at any age, but especially after the menopause, affecting the external genitals. The tissues get dry, brittle, and atrophied, and are easily torn. The sebaceous glands disappear as well as most of the sweat glands; the corium is atrophied, the papillæ are ill-developed, and fissures tend to develop. In parts a small-celled infiltration may be found in the corium. At the edges of the diseased part, according to Orthmann, there is hypertrophy of the tissues and abundant small-cell infiltration. Prolapse of the urethral mucosa or caruncle may be found with this condition.

Symptoms.—Sometimes there are few or none. Usually there is itching and burning, especially during micturition; there may be some discharge. Coitus is painful or impossible.

Treatment.—The only means of relief is afforded by the removal of the affected part.

Pruritus Vulvæ.

This is the condition in which there is a feeling of itchi-

ness, more or less constant, in some part of the external genitals.

Etiology.—This condition may be caused reflexly, *e.g.* by the presence of worms in the rectum, by various diseases in the pelvis. It may be due to local irritating conditions, *e.g.* kraurosis vulvæ, eruptive and inflammatory affections, the drying of diabetic urine on the vulvæ, discharges from diseased states of vagina and uterus, worms in the vulva and vagina, congestion of the parts. Some years ago I showed that in another class of cases pruritus was associated with the development of a slowly progressing fibrosis, affecting both terminal nerves and nerve endings. Sänger has also found the same changes. Several writers state that some cases are purely neurotic in origin. This may be so, but it cannot be definitely established unless parts are cut out and submitted to microscopic examination.

FIG. 209.—Fibrosis of a genital corpuscle of Krause in pruritus vulvæ.

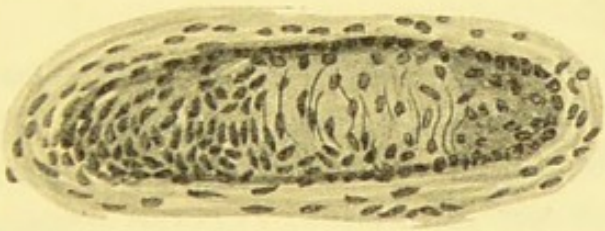


FIG. 210.—Fibrosis affecting part of a Meissner's corpuscle in the clitoris in pruritus vulvæ.

Seat of pruritis. — Most commonly the clitoris and labia minora are affected. The labia majora, mons veneris, perineum, or inner side of the thigh, hymen, or introitus vaginæ may also be attacked.

Symptoms.—In some cases the itching is constant, in others paroxysmal. It is worse at night in bed, and is also made worse by movements. Sometimes the condition is so bad that the woman may become a complete nervous wreck. There are cases on record in which suicide has

been committed. Local excoriations, eruptions, and hypertrophy of the skin may result. On microscopic examination, subacute inflammatory changes may often be found as a result of the scratching.

Treatment.—Where some distinct cause can be made out it should be attended to. Various local applications may give relief, *e.g.* corrosive sublimate (1 in 1000), boracic acid, carbolic acid, nitrate of silver, alkaline lotions; chloroform (2 parts) and oleum amygdalæ (60 parts); ointments containing menthol, cocain, opium, or belladonna. Various drugs have also been used internally, *e.g.* potassium bromide, sulphonal, arsenic, etc.

There are cases which resist all these measures. The only method of dealing satisfactorily with these is by *complete removal of the affected part.*

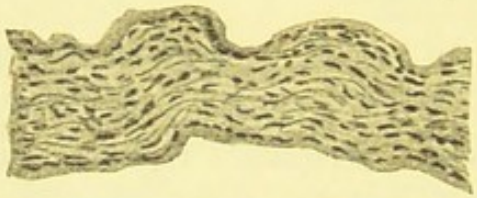


FIG. 211.—Fibrosis of nerve in the clitoris in pruritus vulvæ.

The operation is a simple one. The skin (it may be, the clitoris and labia minora) is removed, and the raw surface closed with continuous catgut, and dressed antiseptically.

It is important not to remove parts only affected secondarily, as a result of irritation due to the itching. The central portion should be taken away, and the surrounding subacutely inflamed tissues allowed to become normal. Sometimes it is necessary, however, to perform a second operation, removing a small portion affected with the primary trouble which was left behind.

ELEPHANTIASIS.

This disease is mainly found in the tropics. It may affect the labia and clitoris, and may lead to the formation of large masses. There is a hypertrophy and hyperplasia of the skin, generally with great dilatation of the lymph spaces.

The surface may be smooth and shining, or warty. It may be hard or soft on palpation. The affection may begin suddenly or develop slowly.

Symptoms.—There is often itching, smarting, and a feeling of weight or discomfort. There may be some discharge. Walking, coitus, micturition, and defæcation may be interfered with.

Treatment.—The diseased part should be removed. It is best to cut away from behind, closing the wound bit by bit as the incision is made.

New Growths.

Carcinoma.—Primary cancer of the vulva is not common. It most often develops at the junction of the labia majora and minora; also in the clitoris and around the urethral orifice. All forms are found, most commonly epithelioma. It usually begins as a hard nodule in the skin. This may protrude and become warty, or ulceration may take place leading to a blood-stained discharge. When it begins on one side, the opposite labium may become infected, apparently by contact inoculation. Surrounding tissues gradually become involved. There is no tendency to spread up the vagina, save when the disease affects the urethral wall. The inguinal glands become affected. Metastases develop in different parts.

Symptoms.—Pruritus is the earliest symptom. It may be very marked when the clitoris is affected. There is a nasty discharge, causing discomfort. Pain and bad hæmorrhage are usually marked only in the advanced stages. There may be micturition troubles.

Sarcoma.—This is very rare. It may be round or spindle-celled, or melanotic.

Differential diagnosis of malignant disease.—The following conditions must be diagnosed from carcinoma and sarcoma:—

1. Simple tumours.

2. Lupus.
3. Hard and soft chancre.
4. Papillary growths, warts, or condylomata.

Treatment.—The only means of curing the patient is by removing the local disease before the inguinal glands are affected. If the glands are even slightly enlarged, the growth should be removed, as well as the inguinal glands, because sometimes the latter, in the early stage of the disease, may be only sympathetically enlarged. If the glands are much enlarged, we cannot hope to remove the whole disease. Sometimes it is justifiable to remove the vulvar mass, simply to take away the patient's local discomfort. The removal can best be carried out with the knife.

If removal is out of the question, palliative measures must be employed, *e.g.* frequent washing with antiseptic lotions, application of iodoform gauze and antiseptic powders to the ulcerations, and the smearing of surrounding parts with borated vaseline.

Papillary growths, warts, condylomata, vegetations.—In dirty conditions of the vulva, *e.g.* sometimes in children and in pregnant women, frequently in connection with venereal affections, warty growths may develop on the vulva, perineum, around the anus, or in the vagina. They may be simple or multiple, and may reach a large size in some cases. They are pale or deep red in colour, and often resemble a "cock's comb." They give rise to a discharge, generally foul smelling; they may become fissured or inflamed. Patients generally complain of smarting pains.

Treatment.—Complete removal is best. This should be carried out even if the woman be pregnant.

Fibroma, fibromyoma, myxoma.—These new growths are rare. They are mostly found in the labia majora.

Lipoma is sometimes found, especially in the mons veneris.

Enchondroma is very rare. It is sometimes found in the clitoris.

Cysts of the vulva.—Small cysts are sometimes found in the vestibule, probably of sebaceous origin; sometimes in the hymen. They may be found at the urethral orifice, possibly due to occlusion of Skene's glands. Sebaceous cysts may occur in the labia majora. In this situation may also be found an encysted hydrocele of the round ligament, blood cysts, dilated lymphatic cysts, dermoids. The most important cystic swellings are those which occur in the Bartholinian or vulvo-vaginal glands. They are the following:—

In one variety the Bartholinian cyst may vary in size from a marble to an egg. It may be single, ovoid, and smooth, or it may be lobulated. It is mostly on the left side, though it may be right-sided or bilateral. The contents may be colourless or yellow mucus, or a mixture of mucus and blood. The duct of the gland, or the gland itself, may be distended. In the former case the swelling is small and near the vagina, into which it projects; it may discharge from time to time, and refill. In the latter case the swelling usually becomes large, and is more external than the other. Sometimes the skin may be so thinned over these cysts as to make them translucent.

Etiology.—These cysts arise as a result of vulvitis (mostly gonorrhœal in origin), which leads to a closure of the duct.

Symptoms.—Discomfort on walking and in coitus.

A second variety of cyst is that due to purulent distension of the gland. It may be produced acutely, or as the result of changes in the above-described cyst.

Physical signs.—In the acutely-formed condition the swelling has all the characteristics of an abscess. It may be surrounded by œdematous tissue, may tend to point, and gives a feeling of fluctuation; there is much pain on palpation.

It may burst, usually on the inner surface of the labium.

The suppuration may extend to surrounding tissues, and, rarely, may burrow through the rectum or perineum. After it bursts, fistulæ may remain for a long time; sometimes an ulceration develops at the seat of rupture.

When the abscess is slowly produced by pus formation in a pre-existing cyst, there are usually no signs like those found in acute abscess formation.

Symptoms.—There is discomfort on walking and in coitus, and in the acute condition sharp pains of a distressing nature.

Differential diagnosis of Bartholinian cysts—

1. From hydrocele of the round ligament.
2. From hernia of the ovary.
3. From hernia of bowel or omentum.
4. From cyst of the gland, along with hernia.
5. From other cysts of the labium majus.
6. From peri-rectal abscess.
7. From a vaginal cyst.

Treatment.—In some cases the cyst may be dissected out, the wound being closed with continuous catgut. Where this cannot be carried out, it should be opened, the inner surface destroyed with a cautery, and the cavity stuffed with iodoform gauze and allowed to heal by granulation.

Venereal affections.—I have already described the changes produced by gonorrhœa (*vide* "Vulvitis").

The syphilitic hard chancre usually develops after an incubation period of about a month, and appears as a small, red, indurated lump, which often ulcerates. It is generally single, but may be multiple. It usually develops on the labia or nymphæ; sometimes on the clitoris or fourchette; rarely on the vaginal wall or cervix.

In secondary syphilis, mucous patches and papular eruptions may develop on the vulva.

In tertiary syphilis, gummata may form and may ulcerate. The inguinal glands in syphilis enlarge somewhat, are very hard, and do not tend to suppurate.

Soft chancre usually develops within twenty-four hours after infection. It begins as a small vesicle or pustule, which gives rise to a spreading ulcer with a yellow base and a sharp, red edge. It discharges freely, and in weakly women, *e.g.* the alcoholic, it may slough or assume a phagedænic form. They are generally multiple. The inguinal glands usually inflame and tend to suppurate.

Wounds of the vulva.—*Vide* p. 558.

Hernia into the vulva.—Hernia is sometimes met with. It may be omental, intestinal, or a combination of these. Femoral is more common in women than inguinal hernia. There is one rare form in which the hernia descends posterior to the broad ligament, between the rectum and vagina, and extends into the labium or perineum; this form may be readily mistaken for a Bartholinian cyst. In another rare form, the hernia may descend in front of the broad ligament between the bladder and vagina and bulge into the labium.

CHAPTER XIX.

INJURIES AND DISPLACEMENTS OF THE PELVIC FLOOR.

Wounds of the vulva and vagina.—These may be produced as a result of coitus, parturition, or injuries.

The first coitus usually tears the hymen, though it may not. Often the tear is only slight. It may, however, extend into the vestibule, labia minora, labia majora, or vaginal wall. Sometimes the whole hymen may be torn off. Rarely the peritoneum may be opened. These violent ruptures take place when coitus is very forcible, when there is much disproportion between the penis and introitus vaginæ, or when the female parts are brittle, as in old age.

During labour the hymen is stretched and torn in a primipara. The vagina is often slightly torn in its lower part; sometimes it may be badly lacerated. The conditions favouring severe vaginal lacerations are brittleness, dryness, and toughness, as sometimes found in old primiparæ; cicatricial changes in the wall, resulting from past operative procedures, or inflammation; where there is obstruction in labour owing to dystocia on the part of the child or hard passages; artificial delivery, *e.g.* the use of forceps. Sometimes not only the vagina, but the bladder, rectum, or peritoneum may be opened into; in some cases the paravaginal tissue may be badly torn; lacerations produced in labour are most usually on the posterior vaginal wall, on one side of the middle line. As a result of tears, atresia or stenosis may follow (*vide* p. 590).

Symptoms.—Hæmorrhage is produced, and may be very severe. If septic infection of the wound occur, severe inflammations may be set up.

If the bladder or rectum be opened, the symptoms due to these lesions develop (*vide* pp. 622, 643).

Treatment.—Slight tears require no treatment save careful antiseptic douching. Bad tears require immediate arrest of hæmorrhage and repair of the wound by aseptic operative measures. For the treatment of atresia and stenosis, *vide* p. 596, and for that of vesical and rectal fistulæ, pp. 623, 643.

Rupture of the perineum.—This injury is produced during labour. In almost all labours the hymen is torn; sometimes the fourchette is uninjured, but generally it, along with the anterior margin of the perineum, is lacerated. In some cases the perineum is more or less deeply torn mesially, sometimes into the anus. Rarely it may tear from the centre outwards.

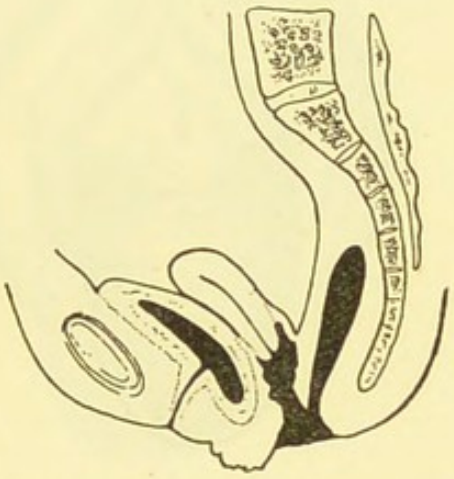


FIG. 212.—Complete rupture of the perineum into the anus.

Sometimes the subcutaneous tissues of the perineum are lacerated, the skin being left intact.

Central rupture rarely occurs. The child may sometimes be born through the rent. I have known this brought about by the accidental cutting of the perineum with a scissor blade as the head bulged it down.

Etiology.—The following conditions lead to rupture:—Large head or body of a child; precipitate labour; rigidity of tissues, due to disease or as found in old primiparæ; improper use of instruments; introduction of hand through the vaginal orifice without careful dilatation; delivery of occipito-posterior cases in which the occiput is posterior, or of face cases in which the chin has rotated to the back;

narrow subpubic angle; straight sacrum; excessive antero-posterior measurement of perineum.

Results of rupture.—Incomplete rupture tends to close somewhat, healing by granulation, the perineum being left shorter than before the labium. Complete rupture very rarely tends to heal in this way. The existence of an imperfect perineum is one of the factors which tend to bring about a downward displacement of the pelvic floor (*vide* p. 567). If the anus be opened into, there is partial or total incontinence of fæces, varying according to the amount of destruction of the anal sphincters.

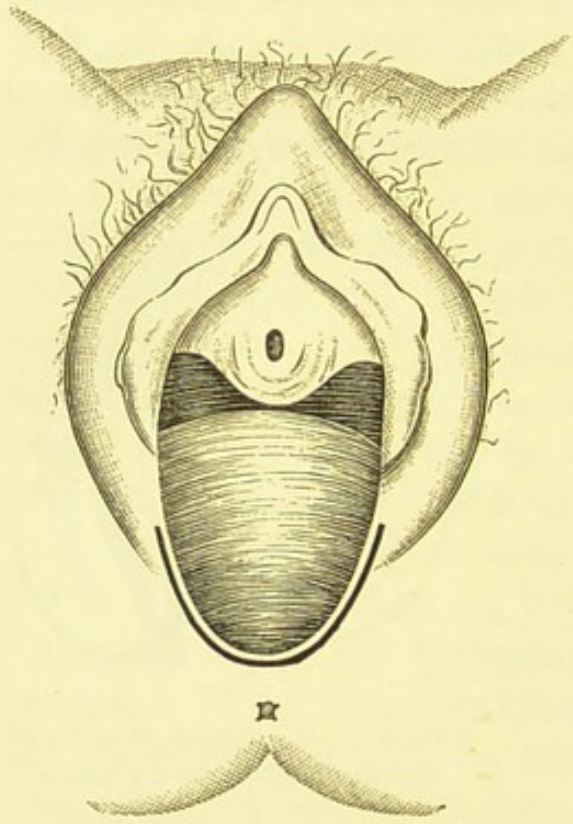


FIG. 213.—Operation for repair of incomplete rupture of perineum. The line of incision is shown.

Treatment.—**Immediate rupture.**—When this occurs, during delivery of the child, repair should be performed at once, unless the tear is a very slight one.

The raw surface is closed by a continuous catgut suture (No. 3) applied from the bottom of the wound to the superficial parts. Plenty of tissue should be pierced by the needle, in order that in the softened condition due to pregnancy it may not tear.

Old-standing rupture.—(*a*) Where the anus is not included in the rupture.

The following operation is the best:—

The patient is placed in the lithotomy position, having been carefully prepared beforehand. With a pair of angled scissors a horseshoe-shaped cut is made between the anus and introitus vaginæ, the sides of the

incision running on the inner surfaces of the labia majora.

The incision is extended into the tissues for nearly an inch. The anterior flap is then drawn forwards by a volsella, which grasps it in the middle line. The edge of the posterior flap is pulled backwards by a volsella attached in the middle line.

In this way a gaping, lozenge-shaped, raw surface is produced. This is closed from side to side by a continuous catgut suture (No. 3), carried in several stages from the deepest portion of the wound to the skin surface. The parts are dried and an iodoform suppository is placed in the vagina. Antiseptic powder is sprinkled over the vulva, and a pad of gauze placed over the wound. A morphine suppository is given per rectum, and the patient put to bed.

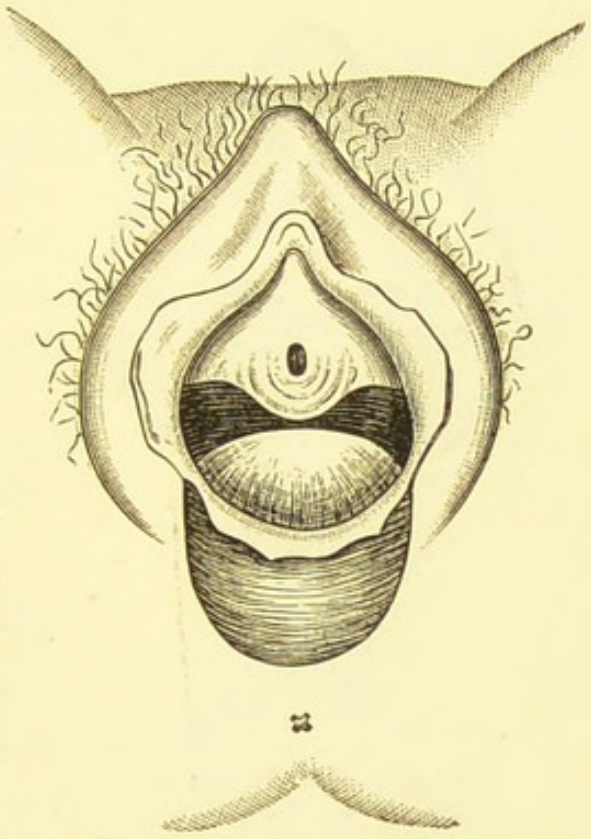


FIG. 214.—Operation for repair of incomplete rupture of perineum. The vaginal flap is carried forwards somewhat to expose the raw surface made by incision.

After-treatment. — The urine is drawn off every six hours for four days. The vulva is washed with antiseptic lotion each day, antiseptic powder being sprinkled over the perineum, and a gauze pad placed there afterwards. An iodoform suppository is placed in the vagina daily. Between the second and third week the patient is allowed to rise.

(*b*) Where the anus is involved in the rupture, or at least the sphincter apparatus.

A lateral incision is made through the skin on each side, extending from the torn end of the external sphincter forwards on the inner margin of the labium majus for an inch or slightly more. Then another incision is made with sharp, angled scissors into the lower or free edge of the recto-vaginal septum. These incisions are then deepened.

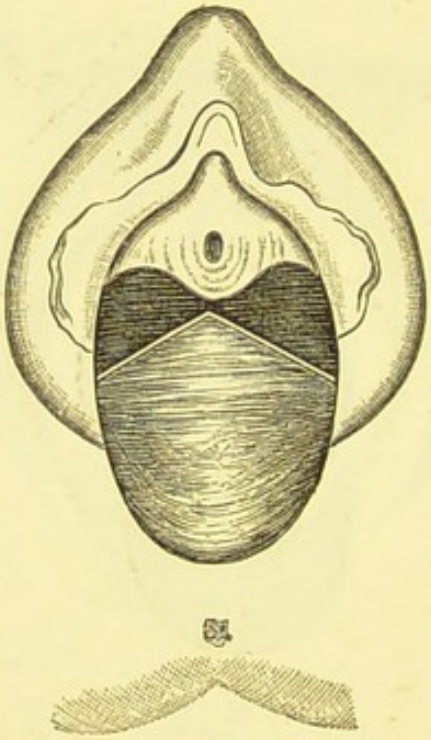


FIG. 215.—Operation for repair of incomplete rupture of perineum. The vaginal flap is carried farther forwards.

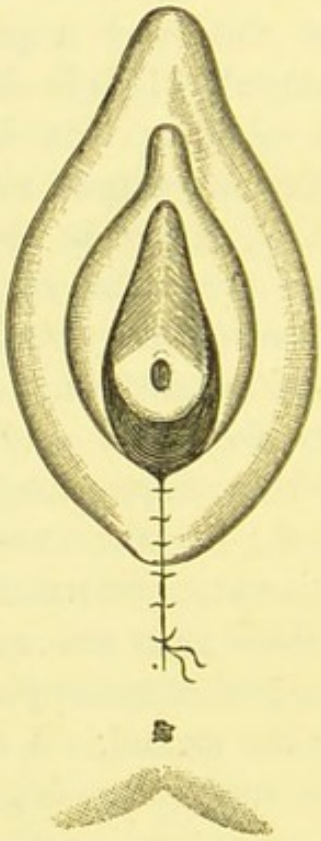


FIG. 216.—Operation for repair of incomplete rupture of perineum. Appearance of perineum at end of operation.

They result in the formation of four flaps, two anterior or vaginal, and two posterior or anal.

These are held at the corners with artery forceps, while the raw surface is incised as much as is thought necessary. The vaginal flaps are then turned forwards and the anal backwards, so that the large quadrilateral raw surface is

exposed, in the lower angles of which the torn ends of the external sphincter are found.

The anterior or vaginal flaps are next brought together in the middle line by a few catgut sutures tied on the vaginal surface. The posterior or anal flaps are also stitched together in the middle line by several catgut sutures tied on the bowel surface. The quadrilateral raw surface is then closed from side to side by a continuous catgut suture applied in several stages, great care being taken to approximate the torn sphincters. At the end of the operation a new perineum exists, the anus has been repaired, and the introitus vaginæ diminished.

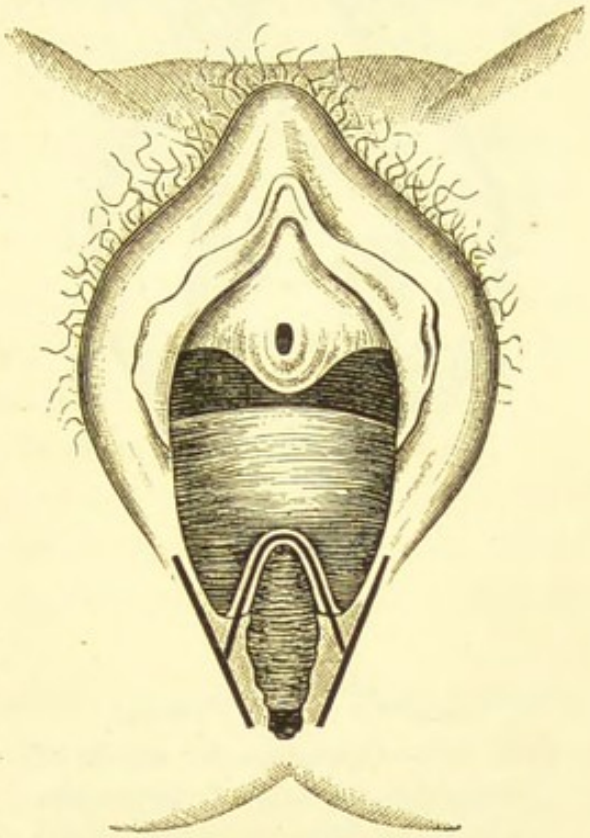


FIG. 217.—Operation for repair of complete rupture of perineum. The line of incision is shown.

After-treatment. — The same as after the last operation.

On the fourth day a saline aperient should be given, olive-oil or glycerin being injected into the rectum carefully before the bowels move. Thereafter, on the second day, a little opening medicine should be given. The patient lies in bed for about eighteen or twenty days ordinarily. If suppuration has occurred, so that healing is longer delayed, she must rest for a long period.

Injuries to fasciæ and muscles of the pelvic floor.— Beside the outward tears produced by labour which I have just described, there are produced probably rather frequently solutions of continuity or permanent stretching in the fascial

and muscular structures of the floor, especially in the former. I have already stated that this may take place in the perineum without any external lesion, this structure being left after labour as a thin, weak septum, which may become a factor in the production of a downward displacement of the floor just as if there had been a complete laceration. It is, therefore, not difficult to believe that similar results may be produced in other parts of the pelvic floor as a consequence of the great stretching which takes place in labour. Stratz, Skene, and Kelly have given some attention to this subject, but we are not in possession of very definite information regarding it.

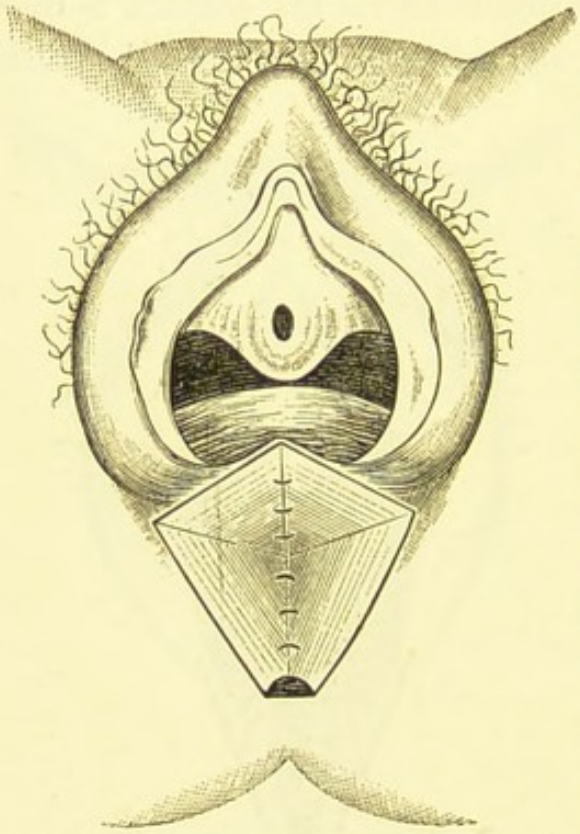


FIG. 218.—Operation for repair of complete rupture of perineum. The rectal flaps have been turned down and sutured together; the vaginal flaps have been turned forwards and sutured together. A large lozenge-shaped raw surface is thus left exposed. This is closed from side to side with continuous catgut suture.

DOWNWARD DISPLACEMENTS OF THE PELVIC FLOOR.

Prolapsus uteri. — *Nature and mechanism.*—For many years Berry Hart's views as to the nature and mechanism of prolapsus uteri have occupied a prominent place in British gynecology. While he has done the greatest service in establishing the hernial nature of the affection, I think that his explanation as to the mechanism by which the condition is produced is open to serious criticism.

His description of the nature and mechanism of this

affection is based chiefly upon the view of the pelvic floor obtained by a study of coronal and transverse sections. Examined in this way, he finds that a ring of loose connective tissue can be traced in the pelvic floor, running in the following direction :—Beginning behind the pubes as the retropubic fat, it passes back on each side, on the inner aspect of the obturator internus and upper portion of the levator ani, and then between the posterior vaginal and anterior rectal wall. This ring divides the pelvic floor into—

(*a*) *The entire displaceable portion*, consisting of bladder, urethral and vaginal walls, with the uterus and appendages resting upon it.

(*b*) *The entire fixed portion*, consisting of all outside the inner aspect of the levator ani and all behind the posterior aspect of the posterior vaginal wall.

The loose tissue between these is a line of weakness.

The entire displaceable portion is supported by the entire fixed portion. In prolapsus uteri the former is driven down past the other, this line of weakness forming the "line of cleavage" between the two.

Is Hart's division of the pelvic floor in this way in keeping with the anatomical details furnished by dissection? Does such an important line of weakness exist in the pelvis? Yes, *if we leave out of consideration the pelvic fascia*, as Hart has done. There is no doubt whatever that there is in the pelvis, as I have already pointed out, loose tissue behind the pubes, at the sides of the bladder, vagina, and rectum, and between the upper part of the vagina and the rectum. Hart's description, however, gives one the erroneous impression that this tissue is the sole link between the structures internal and those external to it, and that because of *its weakness* it is possible for the internal to slide down upon the external. The important structures which have been overlooked are the visceral layers of the pelvic fascia, forming ligaments for bladder and urethra, for vagina and rectum,

as well as the triangular ligament, the deep superficial fascia and the anal fascia which blend with one another in the perineum, and also with some of the visceral layers, thus binding together inferiorly the structures described as "entire displaceable," and those described as "entire fixed." Verily, the pelvic floor described without the pelvic fascia ranks on the same footing as a house described without foundations, girders, or rafters.

It is as if we were to make a transverse section of a barrel *between the hoops*, and then to describe the whole barrel as consisting of a series of cylindrically arranged staves (without reference to the very important, though few and small, hoops).

The truest idea of the pelvic floor is gained when we consider it as having a strong fascial framework in which are suspended bladder, vagina, uterus, and rectum, and having in connection with it certain muscular structures which give additional strength. The floor as a whole thus resists intra-abdominal pressure, the anterior and posterior parts of the floor being intimately connected by the fascial and muscular tissues. Anatomically, therefore, it can be proved that the so-called "displaceable portion" does not merely *rest* on the "fixed portion" in such a manner as that when the support of the latter is gone the former falls down. Clinically also, it seems to me, the facts are against this view. Many cases of perineum ruptured even into the anus are not followed by prolapse; whereas, if Hart were correct, in every case, owing to the loss of support, this should immediately occur.

Prolapse of the bladder, urethra, and vagina, with the uterus, in reality, it will be found, depends upon the power that the fascial and other tissues, suspending them between the bony pelvic walls, possess of resisting intra-abdominal pressure. If the former be weakened, or the latter increased, or both these conditions be combined, prolapsus occurs.

The nature and mechanism of prolapsus uteri is still a very disputed question. There are certain points, however, which are granted by everybody. These are as follows:—

Prolapse may be acute, subacute, or chronic; the last is by far the most common variety, and is the form ordinarily referred to under this term. It is extremely rare in women who have never been pregnant. It is rare in women who are in good circumstances and lead a comfortable life, even though they are multiparæ. It is common among poor, hard-working women.

The influence of pregnancy and labour on the floor is as follows:—Its tissues are softened and stretched by the increased intra-abdominal pressure, as well as during the birth of the child, when it may also be torn. After labour the floor bulges down more because of this stretching. Among the poor, women usually rise too soon from bed and begin too early to do such work as lifting, carrying, etc. Hence the greater tendency to a prolapse of the floor among them.

What part does the perineum play? There is no doubt that it is usually found to be more or less ruptured. Thomas, who described the perineal body as a wedge supporting the anterior part of the floor, said that the destruction of the wedge resulted in the prolapse. This is no longer believed in. Hart says that rupture of the perineum is rupture of the "entire fixed segment," and that thus the "entire displaceable" portion can be driven down more easily. That rupture of the perineum favours prolapse when other causes are in operation is undoubtedly true. It does so, however, not because a supporting wedge is removed, acccording to Thomas, nor because a supporting segment of the floor is weakened. These mechanical explanations are not in keeping, as I have shown, with the anatomy of the floor. Neither is it, as is so often said, because the junction of the levatores ani is torn through. In an ordinary mesial tear passing even into the anus, only a small part of the pubo-coccygeus can be torn, namely, those fibres which are deflected inwards to the perineum from the main mass of the muscle which passes back on each side of the middle line to the coccyx. The most important structures torn

through are the various fascial tissues which meet in the perineum—a point which has been entirely overlooked.

These are the following :—

1. Triangular ligament—anterior and posterior layers.
2. Recto-vaginal visceral layer.
3. Anal fascia.
4. Deep superficial fascia.

It is evident that such a rupture must lead to a weakening of the suspensory framework of the floor, especially in its anterior half.

The tearing of the small muscles, *e.g.* transversus perinei profundus, transversus perinei, sphincter vaginæ, and sphincter ani, gives them afterwards but a small share in the support of the floor, though their loss is of minor importance when compared with that of the fascial structures.

In many women, chiefly among the well-to-do, who undergo little physical exertion, these losses may be present for a long time and yet no prolapse occur. This is because the rest of the suspensory framework is sufficient to resist the normal intra-abdominal pressure. If in such, however, chronic bronchitis supervene, the result may be that a prolapse occurs because the intra-abdominal pressure is too strong for the weakened floor. It is well known that there may be congenital deficiency of the perineum without prolapsus. One interesting case is recorded by Prochownik, in which a girl lived in this condition until she was nearly twenty. She then, however, was put to very hard physical exertion for seven months, and the result was a prolapse.

Now as to the nature of the prolapse. Hart says that the uterus has nothing to do with it, the condition being really a hernia of which the uterus forms part of its covering. Schultze, on the other hand, in his classical work on the subject, says that the essential part of the affection is a descent of the whole uterus, the direct cause being the relaxation of its essential attachments—the utero-sacral ligaments, giving rise to the retroversion, which is always,

according to him, the preliminary stage of a prolapse. Hart does not mention the utero-sacral ligaments as having any part to play whatever, and he says that the retroversion occurs during the progress of the prolapse.

Hart says that, first of all, the floor in front of the anterior rectal wall is driven down—the anterior vaginal wall from below upwards, followed by the uterus, and then by the posterior vaginal wall from above downwards. Tension on the cervix is caused, and hence retroversion results. Schultze, however, says that the displacement backwards which results from relaxation of the utero-sacral folds leads to the prolapse of the anterior vaginal wall, not the latter to the former; this displacement diminishes to one-half or one-third the distance which previously separated the uterine and pelvic insertions of the vagina, and so forces the anterior vaginal wall with the bladder to bulge into the lumen of the canal. He thinks that the part which the anterior vaginal wall plays in dragging down the uterus is over-estimated; though not proven, he says that it is most probable that the first descent of the uterus is not thus brought about.

These differences of opinion are certainly very great. The exact truth is, I believe, to be found midway between them. The mechanism is not the same in all cases.

1. Prolapsus in early life is rare, but when it does occur it is undoubtedly a condition connected with weakening of the floor. In fact, the whole floor may be prolapsed, *e.g.* as in a case of a child, recorded by Breisky, where bladder, vagina, uterus, perineum, and rectum were prolapsed. Prolapsus of the uterus alone in childhood is undoubtedly one of the rarest conditions, though it and the vagina are more favourably placed than in the adult condition, being more vertical in the pelvis.

2. Prolapsus uteri may occur, the uterus remaining anteverted or anteflexed. Even Schultze admits this, though he says it is rarely met with. Breisky figures a case by Schroeder.

(In fairness, however, it must be said that possibly the anteverted position was brought about, in these cases, after the prolapse had been completed.)

There can be little doubt that prolapse with the uterus lying anteverted can only be referred to weakening of the floor. In a normal condition of the floor with the uterus lying to the front, Schultze himself says that the intra-abdominal pressure only tends to make the organ more decidedly anteverted, and that this opposes a tendency to prolapse; abnormal anteversion, he says, is an absolute bar to its occurrence.

3. Most cases of prolapse undoubtedly have the mechanism described by Hart, *i.e.* the anterior vaginal wall and bladder descend first, the lowest part appearing first, followed by the cervix, and lastly by the posterior vaginal wall, its lowest part appearing last.

Against Hart's views are the following facts—

1. Prolapse may occur more or less rapidly in nulliparæ where the pelvic floor has hitherto been sound and strong, as a result of falls or sudden lifts of heavy weights, etc.

2. Cases of traumatic retroversion in nulliparæ have been sometimes found to be followed by prolapse of the uterus.

3. In some cases of chronic prolapsus the anterior vaginal wall does not descend first, but the uterus, dragging after it the vaginal walls.

4 Cases of cystocele are not necessarily accompanied by prolapse of the uterus.

The only satisfactory manner in which these differences can be explained is by admitting that there are various kinds of prolapsus in the pelvic floor. My conclusions I would state in the following propositions:—

1. The pelvic floor, as a whole, is a suspensory structure closing the outlet, having let into its substance bladder, urethra, vagina, uterus, and rectum. It is in this way weakened.

2. The floor may be prolapsed as a whole (rarely), as in children—due to weakness of the floor as a whole.

3. The anterior vaginal wall and bladder may prolapse alone (cystocele), due to weakness of their supports.

4. The posterior vaginal wall may alone prolapse on account of weakening of its connections.

5. The posterior vaginal wall and anterior rectal wall may together prolapse (rectocele), due to weakening of their supports.

6. The uterus alone may be the first to prolapse, dragging after it the parts of the floor attached to it. It must not be forgotten that the uterus has less strong attachments to the rest of the floor and to the bony wall than either the bladder, vagina, or lower part of the rectum. It has no strong fascial layer attaching it to the pelvis. Its connections are more elastic in nature than those of the other structures mentioned, and they may alone become weakened. Retroversion or retroflexion usually results primarily from this. If the retro-displacement be partial, so that the uterus lies in line with the long axis of the vagina, the position is favourable to the prolapse. If, however, the fundus be driven farther back, so that a marked retro-displacement is produced, the tendency to prolapse is removed (Schultze).

7. In the majority of cases of prolapse we have to do with a descent of the anterior part of the floor in which the bladder, vagina, and uterus participate. These are the numerous cases which occur in working women who have had their pelvic floor damaged during labour, who rise too soon from bed, go to work too soon, and perform duties which increase their intra-abdominal pressure.

The condition produced is, indeed, a hernia of a considerable part of the floor. The question as to whether the uterus drags down the anterior vaginal wall and bladder, or these structures the uterus, or which is the first to be prolapsed, is of secondary importance. In the puerperium the attachments of all these structures are weakened as a result

of previous softening, stretching, or tearing; further, the uterus is usually retro-displaced during the latter part of this period. Increased intra-abdominal pressure tends to drive down the weakest part of the floor, the part which is most dependent, *i.e.* the lower part of the vagina making its appearance first beyond the normal pelvic-floor projection, in almost every case. This is what one would expect from the study of the puerperal pelvis. My sections show that after labour there is usually some bulging of the lower part of the vagina and bladder. This is a very common clinical observation also. That the lower part of the posterior vaginal wall is the last to appear is to be explained by its firm attachment to the other tissues of the perineum.

Resumé of the Factors Concerned.

1. **Rupture of the pelvic floor.**—I have pointed out that the most important rupture is that of the perineum. It is possible that occasionally rupture of fascial and muscular structures in other parts of the floor occurs.

2. **Weakness in parts of the floor.**—Though actual rupture may not have occurred, permanent weakness may be induced by the great stretching of parts in labour, and may affect fascial structures, muscle, cellular tissues, and ligaments.

As the uterus enlarges also from metritis it tends somewhat to weaken its attachments.

3. **Increase in the intra-abdominal pressure.**—This may abnormally affect the pelvic floor. It is due to various causes. In pendulous belly it may be produced, owing to the sinking downwards of the intestines. Chronic coughing may lead to it; also tumours or ascites in the abdomen; too tight constriction of the body by the clothing; extra muscular efforts, *e.g.* lifting, carrying; habitual over-distension of bladder and bowel. In faults in the bony pelvis, as A. R. Simpson points out, in which the brim becomes more

or less parallel to the horizon, downward displacements of the uterus are favoured, the intra-abdominal pressure acting forcibly and directly on the floor.

Complications. — The uterus, besides changing its position, as I have described, hypertrophies.

The whole organ may be enlarged, or the cervix may especially become elongated. Endometritis or endocervicitis is often present. Cancer is sometimes developed on the cervix, but very rarely.

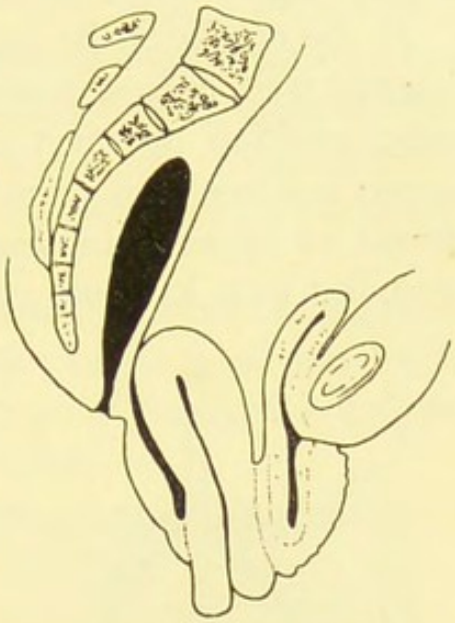


FIG. 219.—Prolapsus uteri.

The vaginal wall is often somewhat inflamed. In complete prolapse it loses its rugosities, thickens, and becomes skin-like. It may be eroded or ulcerated; sometimes epithelioma may develop at these patches.

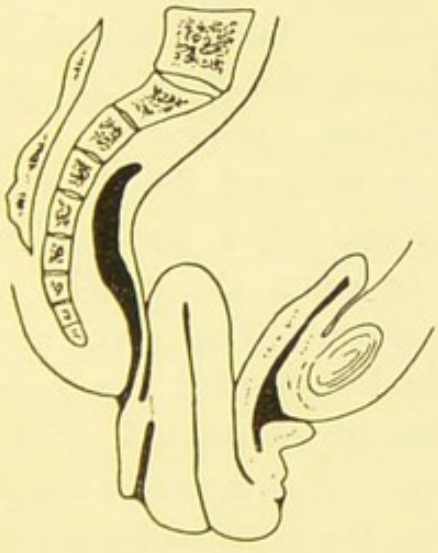


FIG. 220.—Prolapsus uteri. The cervix is considerably thickened.

The bladder is prolapsed below the level of the meatus, and cystitis may develop in the diverticulum thus formed; calculus may result from this.

The rectum may be irritated, especially if a rectocele form; fæcal matter may lodge in the latter. Sometimes prolapsus recti may exist. Ordinarily there is no rectocele, the posterior vaginal wall having peeled from the gut.

The appendages are dragged downwards. Peritonitis may occur, forming adhesions in the hernial sac and among the viscera, rendering it dangerous to attempt reposition.

Physical signs in prolapsus uteri.—It is evident that many different conditions may be found, varying according to the degree of the prolapsus.

If the condition be partial, the lower part of the anterior vaginal wall bulges downwards when the patient is in the erect position or when she coughs or presses down; the cervix is lower than normal, and this may cause the posterior fornix to appear abnormally deep. The uterus is enlarged and lies with its long axis in line with the vagina. If the prolapsus be complete, the true hernial nature of the affection is readily understood, the sac of the hernia being the peritoneum; its boundaries the pubes, anterior rectal wall, obturator internus, and levator ani muscles; its coverings, bladder, anterior and posterior vaginal walls and uterus; in the hernial sac are intestines. The parts may be far below the level of the pelvic-floor projection. If they are replaced, they may be prolapsed, when the patient rises or when she coughs or bears down. The uterus may be considerably enlarged; the vaginal walls over it may be much hypertrophied and ulcerated or excoriated. The sound may be passed into the cavity. A catheter or sound passed into the bladder distinguishes the prolapsed portion. A finger passed into the rectum makes out whether there is or is not any rectocele.

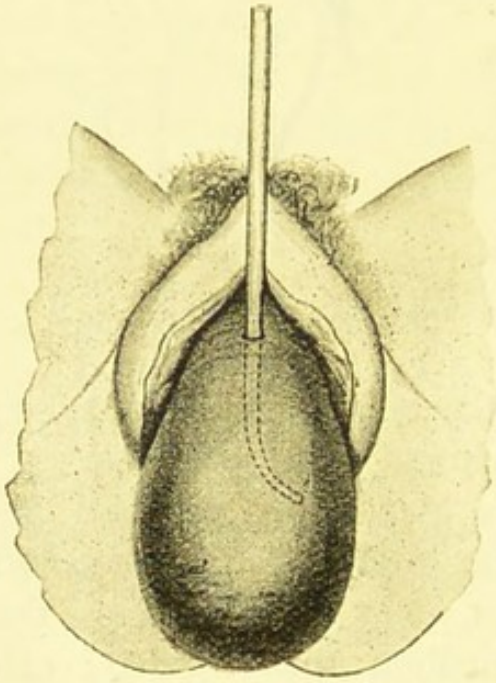


FIG. 221.—Complete prolapsus uteri. A sound is passed into the bladder to show its relation to the prolapsed mass.

Symptoms of prolapsus uteri.—The patient has a feeling of dragging and weight in the loins or pelvis. When the uterus is outside, or partly outside, she feels discomfort.

There may be difficulty in micturition, or frequency. Symptoms of cystitis and of stone may develop. Diarrhœa or difficulty in defæcation may exist. Menorrhagia is often present, due to the associated endometritis. Leucorrhœa may arise from the same cause, from endocervicitis or from irritation of the vaginal walls. As a rule there is sterility; but conception may occur, and there may be much discomfort in the early months.

Differential diagnosis.—The condition must be diagnosed from hypertrophic elongation of the cervix, cystocele, rectocele, inversion of the uterus, polypus of the uterus, polypus with inversion, swelling of the pudenda.

Prognosis.—When once a prolapsus is established, it shows no tendency to recover itself. It may be modified by pregnancy. During the first three months the uterus tends to sink down more markedly, and abortion may occur. If the womb be supported during this period until it has begun to rise above the brim, there is usually no trouble during the rest of pregnancy. Occasionally a slight case may, after a long rest in the puerperium, tend to be restored. Often, however, the condition is aggravated after labour.

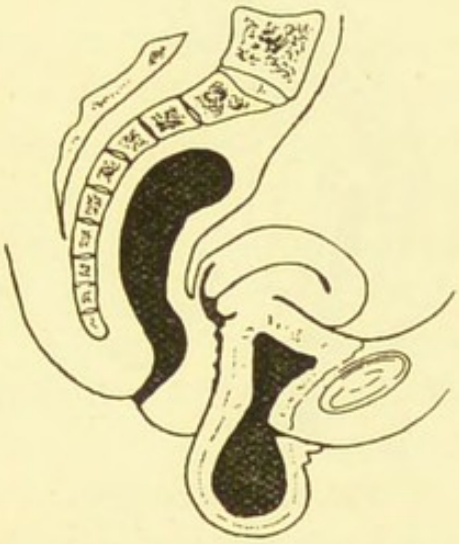


FIG. 222.—Cystocele.

The condition may be also modified by the menopause. The parts undergo some degree of atrophy, and there may be some relief in symptoms. Often, however, the prolapse becomes more marked.

Diagnosis of cystocele.—There is a pouching downwards of the anterior vaginal wall and bladder, the uterus and posterior vaginal wall being undisturbed. The patient may complain of something falling down, or may feel discomfort.

It is aggravated on coughing or straining. There may be trouble in micturition.

Diagnosis of rectocele.—The lower part of the anterior rectal wall bulges forward with the posterior vaginal wall. This is especially apt to occur if there be a marked tear of the perineum. The uterus and anterior vaginal wall are in position; sometimes a cystocele may exist with it. The finger passed into the rectum feels the pouching. Fæces are apt to collect in it.

Diagnosis of vaginal enterocele.—Anterior or posterior enterocele may occur. In the first-mentioned the intestines are forced downwards between the upper part of the vaginal wall and the bladder, bulging the former into the vaginal canal. In the last-mentioned the intestines descend between the rectum and vaginal wall, and bulge the latter into the vaginal canal. On passing the sound the bladder is found to be in position, or perhaps pushed somewhat forwards in anterior enterocele. In posterior enterocele the exploring finger makes out that there is no rectocele.

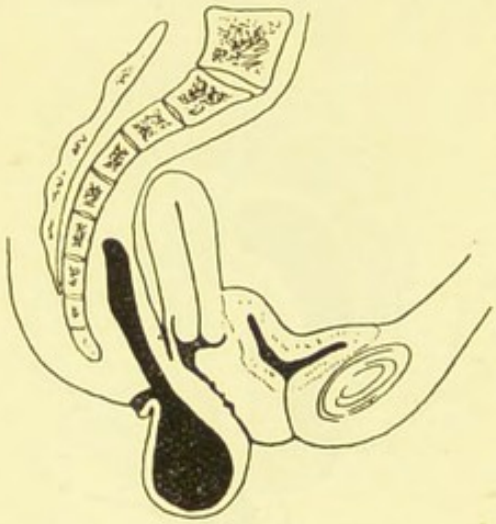


FIG. 223.—Rectocele.

Treatment.—Prophylaxis is important. Labours should be conducted carefully. Ruptures should be restored at once, or as soon as possible afterwards. The patient should not be allowed to rise too soon or to work too early.

Actual treatment is carried out on the following lines:—

The prolapsed condition should be reduced first of all. Sometimes in bad prolapsus uteri the parts are so swollen that it is necessary to put the patient to bed for a few days, during which time she should get the hot douche and hot hip-baths. Where there is peritonitis it may be dangerous to replace the parts. Antiphlogistic measures should be

carried out, and efforts to replace the parts made slowly and cautiously.

If reduction is carried out, various forms of treatment may be employed. But in all cases inflammatory complications should be attended to. Where there is anterior enterocele or cystocele alone, a ring, a diaphragm ring, a Hodge pessary with transverse bars, or a globular or egg-shaped pessary, may be introduced into the vagina to retain the parts. If the perineum be ruptured, only the ring pessaries should be used, and even they may not be retained.

When a pessary fails to support the prolapsing part, an operation should be tried. The most thorough method is to perform an anterior colpotomy without opening into the peritoneal cavity if possible, rawing the anterior surface of the cervix and the posterior wall of the bladder, and then stitching them together. An oval-shaped flap of the anterior vaginal wall, extending from near the anterior fornix to near the urethral orifice, should then be removed, and the raw surface closed by continuous catgut sutures. Care must be taken not to injure the ureters. When there is posterior enterocele or rectocele alone, retention by means of the same pessaries may be tried. When they fail, operative measures must be employed.

In the former condition the following measure should be adopted:—

A vertical mesial incision should be made in the posterior vaginal wall, the peritoneum should be stripped upwards as high as possible, and the anterior wall of the anus should be stitched to the vaginal wall, after a portion of the latter has been cut away parallel with the incision. In this way a new recto-vaginal septum is formed. Operation is not very satisfactory in this condition.

In rectocele a posterior colpoperineorrhaphy may be performed. Some, however, prefer the above-described procedure. In prolapsus uteri which is slight, the organ is

usually retroverted. It should be replaced and a Hodge or Albert Smith pessary introduced into the vagina. If these will not remain in place, owing to the tear of the perineum, a ring may be employed or a repair operation may be performed on the perineum, in order that an instrument may be worn afterwards.

Where *the uterus is markedly prolapsed* along with more or less of the vaginal walls, a Hodge, ring, ball or Zwanck pessary may be used to support the parts, the choice of an instrument depending largely upon the state of the perineum.

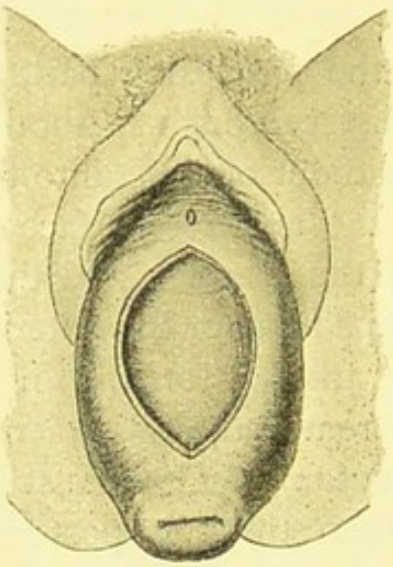


FIG. 224.—Anterior colporrhaphy in a case of prolapsus uteri. The oval-shaped raw surface on the anterior vaginal wall is shown.

In extreme cases, especially of old standing, no pessary will remain in the vagina unless it be held by bands. In these cases operative treatment is imperative. Where the patient will not submit to this method, a cup-pessary attached to an abdominal belt, or a T-bandage, may be employed. Sometimes women prefer periodic packing of the vagina with iodoform gauze or oakum; this should only be carried out after the menopause.

The operative treatment in these cases is as follows:—

After careful preliminary preparation of the patient, she is placed in the lithotomy position. If the uterus is enlarged to any extent (and it usually is in these cases), it should be curetted, and the cervix amputated in order to stimulate the organ to involution.

Then an anterior colporrhaphy is performed in the following manner:—The cervix is pulled downwards and backwards, and held. The anterior vaginal wall is grasped with a volsella above the urethral orifice and held steady. An

oval incision is made through the vaginal mucosa as large as is required, the long diameter being in the long axis of the vagina. The size varies according to the degree of prolapse. A vertical incision is made from end to end of the oval through the mucosa, and each lateral flap of mucosa is dissected off until the oval raw surface is left. This is then closed from side to side by a continuous catgut suture (No. 2 or 3) passed in stages. Next, the perineum should be repaired in the manner described on p. 560. In this way the uterus is made smaller; the vagina is narrowed by the constriction resulting from the colporrhaphy, and a new strong, thick perineum is formed.

In more marked cases, where the posterior vaginal wall is much prolapsed and stretched, it is best after doing the anterior colporrhaphy to perform a posterior colporrhaphy, along with an operation to repair the perineum, *e.g.* a colpoperineorrhaphy. Various methods are employed. The following may be adopted:—An anterior spatular speculum is introduced to pull up the anterior vaginal wall. The vulva is widened by means of retractors. The middle of the posterior wall of the vagina, about 1½ in. above the perineum, is held with a volsella. Below this on each side the lateral edges of the same wall are held with forceps. In this way the lower part of the posterior wall is put on the stretch. Then with a knife an incision is made on the posterior vaginal wall and perineum, the outline being that indicated in Fig. 225. The flap is then dissected off, and the raw surface closed from side to side by a continuous catgut suture. The vaginal portion should be closed before the perineal part is stitched.

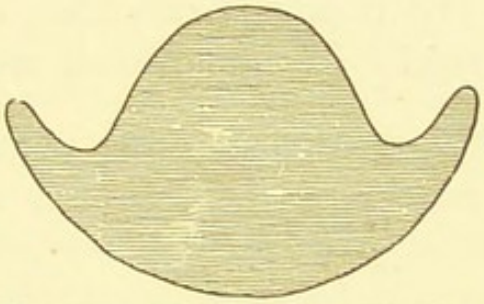


FIG. 225.—Colpoperineorrhaphy. The diagram shows the rawed surface made on the posterior vaginal wall and perineum.

After-treatment.—Practically the same as after a tear of

the perineum. In the most marked cases the following operative procedures are recommended by some, namely, shortening of the round ligaments, stitching the uterus to the anterior abdominal wall (*vide* p. 460). These methods are still on their trial.

Their necessity or value has not yet been clearly defined. Most are agreed that they should not be carried out apart from the various operative procedures already recommended, *e.g.* curetting, amputation of cervix, colporrhaphy, perineorrhaphy. Their application must be a very limited one, and might be recommended where the other methods used alone fail.

Very often after these operations no pessary requires to be worn. But sometimes it may be necessary to use one. The improved condition of the vagina and perineum will render its employment more satisfactory.

CHAPTER XX.

AFFECTIONS OF THE VAGINA AND HYMEN.

Vaginitis.

Pathology.—In acute vaginitis the mucosa is swollen and red; the papillæ are markedly hypertrophied, owing to infiltration of them. The epithelium over them may become thinner owing to shedding, so that the red points are clearly seen like granulations—the so-called granular vaginitis. The discharge is slightly acid or alkaline. If due to gonorrhœa, it is creamy and purulent, gonococci being found in the fluid, the leucocytes, and epithelial cells of the discharge. Sometimes vegetations are found in prolonged gonorrhœal attacks.

In chronic cases, the inflammation may only be found in certain spots, *e.g.* in the fornices and in the Bartholinian ducts or glands.

In senile vaginitis, the mucosa is affected in patches which appear red, owing to the shedding of epithelium. They tend to adhere to one another, leading to cicatrisation and shrinkage of the walls. Sometimes the cervix may be completely shut off in this way.

In diphtheritic vaginitis the wall becomes swollen and covered with the characteristic membrane. The term is sometimes wrongly applied to the condition found in connection with severe septic affections or in the acute exanthemata.

Exfoliative vaginitis is a condition described by Farre, in

which periodic exfoliation of the vaginal epithelium is said to occur, probably associated with menstruation.

In severe phlegmonous perivaginitis the vaginal wall may necrose and be thrown off.

Winckel has described a condition known as emphysematous vaginitis, in which little cysts occur containing gas, accompanied with swelling of the parts and a discharge; this affection has been found mainly among pregnant or puerperal women.

Etiology.—At the present time the tendency is to regard all forms of vaginitis as dependent upon the action of micro-organisms. Of these, the most common is the gonococcus. There are some who hold that this germ is not specific, but that it is merely one which is found in different cavities of the body, *e.g.* in the urine (Sternberg and others), taking on pathogenic characters under suitable conditions. This view is probably incorrect, and we may regard it as fairly well established that the gonococcus is pathogenic. Some hold that ordinarily the vagina is not directly attacked, but only the urethral and cervical mucous membranes; if, however, the vaginal wall becomes lowered in vitality from any cause, or its epithelium at all softened, the microbe may develop in it. In such cases the characteristic appearances, described by Neisser, may be seen in the pus discharge, in epithelial cells in the discharge, and in the very substance of the wall.

As regards the vagina in childhood, there is no doubt that the gonococcus may attack it directly. Bumm was the first to state that it could not develop in the stratified squamous epithelium of the vagina, but only in the epithelium lining the urethra and cervix. He placed gonococci in the vagina for twelve hours in several cases without setting up any vaginitis. He also excised a portion of the vaginal wall in a severe case of gonorrhœa, and found, on microscopic examination, no gonococci in it. The swelling and tenderness in the vaginal walls he there-

fore regarded as due to irritation from the vulvar and cervical discharges. Bumm has, however, since modified these views, and he now believes that occasionally in the adult a true acute gonorrhœal vaginitis may occur, *e.g.* when the vaginal wall is very delicate, as in early life, or thinned, as in old age. Schwarz, Touton, Dinkler, and others have opposed Bumm's original views. Sänger believes that the vagina is attacked only when its wall is delicate, thin, or impaired in vitality, *e.g.* in infancy and youth, in pregnancy and in senile conditions. Mandl has carefully examined excised portions of the vaginal wall in several cases of gonorrhœa. He found the sub-epithelial connective tissue infiltrated with leucocytes and pus cells; the epithelium was thinned in parts so that the papillæ were almost exposed; in other places it was infiltrated with pus cells. The whole wall was deeply injected, and had a red raw appearance.

Gonococci were found on the surface and in the entire thickness of the epithelium, many being in the pus cells. In many places they were found in the sub-epithelial connective tissue, having penetrated most deeply where the epithelial layer was thinnest.

Mandl points out that it is important to examine sections of the vaginal wall in the early stages of the disease. At later periods the dead or degenerating cocci may fail to take on the stains.

The pathogenic micro-organisms of suppuration may also set up vaginitis if they enter the vagina in sufficient numbers, and find plenty of discharge in which to develop; any weakened condition of the vaginal wall is a favouring cause.

Possibly certain saprophytic organisms may be a cause, under favouring conditions.

In some cases microbes higher than bacteria may set up vaginitis, *e.g. Oidium albicans*, *Monila candida* and *Leptothrix vaginalis*.

The favouring conditions for the development of vaginitis

are many. Discharges from the uterus; these act by softening the vaginal epithelium, and by affording an alkaline medium in which the microbes may develop.

Irritation of the vaginal walls from worms, fistulous communication with bladder or rectum, from tumours, prolapsus uteri, pessaries, douches, examination, or operative procedures, excessive coitus, masturbation, horseback riding, the use of a sewing-machine; certain constitutional conditions weakening the tissues or causing desquamation of epithelium, *e.g.* the exanthemata, dysentery, tuberculosis, diabetes.

Symptoms.—In acute cases there is heat and pain in the vagina; increased secretion, which may give rise to a pruritus; pain and frequency of micturition, when the urethra is involved; pain on coitus.

Where the condition is of the phlegmonous or erysipelatous variety, there may be considerable constitutional symptoms. In chronic cases the discharge is the chief complaint, though there may be as well pain on coitus. A protracted case may lead to a weakening of the health.

Physical signs.—On examination in the acute stage the vagina is hot, and the movements of the fingers cause pain. In the granular form the hypertrophied papillæ may be felt. Through the speculum the redness of the wall is visible, and the granular condition if it exists. When the urethra is affected, pus may be squeezed from it or from Skene's glands. Generally, also, in gonorrhœal cases, it can be forced from the ducts of the Bartholinian glands.

Vegetations may be seen in gonorrhœal cases, or in non-gonorrhœal vaginitis of pregnancy. In the senile form the adhesions may be felt, and the reddish patches may be visible. (It is important to note that a pelvic abscess discharging into the vagina has been mistaken for vaginitis.)

Prognosis.—In most cases of non-gonorrhœal inflammation, the disease is curable; the most unfavourable are

those in which irritation of the vaginal wall is kept up by discharge from cancer of the uterus or from a fistula.

Gonorrhœal inflammation is a serious matter, because of the difficulty of curing it, and because of the complications which may follow.

After a case has been thought to be cured, inflammation may remain in the cervix or Bartholinian glands for a long time. It may affect the whole uterine mucosa, the Fallopian tubes, ovaries, and peritoneum. (I have already referred to the question as to whether in these cases the gonococcus acts, or other germs which develop in the secretions due to the gonococcus, *vide* p. 153).

In these chronic cases, weakening conditions, *e.g.* chills, fatigue, the puerperium, may cause a recrudescence of activity in the affection.

Treatment.—The local irritating cause should be removed and also the weakened conditions. In acute cases the vagina should be douched with corrosive sublimate lotion (1 in 3000), carbolic lotion (1 in 50), creoline or lysol (1 in 100), peroxide of mercury, (1 in 5000), salicylic acid (1 in 200), formalin (1 in 1000). If these cause too much pain, lead lotion or solution of permanganate of potash may be used.

Hot sitz-baths may also be employed. The patient should rest; the diet should be simple, and the bowels should be kept freely open. Sometimes morphia is necessary on account of the pain. Copaiba and cubebs are rarely given to women for the urethral affection, being badly borne. When the acute stage is past, the antiseptic douching may be vigorously employed, *e.g.* a mercuric iodide or chloride lotion of 1 in 2000 to 4000 may be employed. The vagina and vulva may be swabbed with nitrate of silver (3 to 5 per cent.), copper sulphate (2 to 5 per cent.), or crude pyroligneous acid.

It is also necessary to make a thorough antiseptic application to the interior of the uterus. In some cases curetting

of the uterus or removal of a bad patch of endocervicitis is advisable. Iodoform pencils may be used in the urethra. Sometimes Skene's glands may require to be cauterised. I have already referred to the carrying out of the same procedure when the duct of the Bartholinian gland is affected. In very old cases, astringents, *e.g.* douches of alum, copper sulphate, sulphate of zinc, borax, etc., may be used.

General treatment may be necessary, *e.g.* iron, tonics, change of air, etc.

In the sloughing forms of vaginitis it is well, besides using antiseptic douches, to insert plugs of iodoform gauze, so as to keep the walls apart.

Vaginismus.

This is an excessive hyperæsthesia of the vulva, whereby spasms of muscles occur when coitus is attempted or when the physician tries to make a vaginal examination. In some cases there is hyperæsthesia without contraction.

Etiology, pathology.—The condition is generally found in young and nervous women. It may be found where no local lesion is present. Generally, however, one or other of the following conditions is present:—Tender carunculæ myrtiformes; unruptured sensitive hymen; fissures or sores of the vulva or anus; polypus; prolapse or caruncle of the urethra. Contractions may occur in the sphincter of the vagina, levator ani, sphincters of the anus, and other perineal muscles.

Differential diagnosis.—The condition must be distinguished from dyspareunia, imperforate hymen, and atresia vaginæ.

Treatment.—Operative treatment is generally necessary in this condition. If the cause be any local irritation, *e.g.* urethral caruncle—this is removed as described on p. 605; if tender hymen or carunculæ myrtiformes, these are to be cut away, and the vaginal orifice somewhat stretched.

Fissures around the vaginal orifice or in the anus are to be divided or stretched.

If no local cause can be discovered, contraction of the sphincter vaginæ occurring reflexly when the penetration is attempted, stretching of the vaginal entrance by means of the large Hegar dilators, as well as by the fingers arranged in a cone-shaped mass, should be performed. Or, the fibres of the sphincter vaginæ may be cut on each side of the fourchette, the ostium vaginæ being afterwards somewhat stretched.

After all of these procedures, a glass tube is worn while the patient lies in bed, and when she walks about, for two or three weeks after the operation.

The outer end of the tube has a rim to which are tied tapes. These pass in front and behind the thighs, and are fastened to an abdominal band.

General treatment may be necessary as well. Sometimes patients get very much run down and even hypochondriacal.

Tumours of the Vagina.

Cysts.—Small cysts may be found, sometimes, scattered over the vaginal walls, due, according to Winckel, to inflammatory changes.

Larger cysts are also found, varying in size from a bean to a walnut, or even larger. They are mostly found on the anterior wall, but may be found on the posterior. They may be developed from remains of the Müllerian duct, from dilatation of lymphatics, or from extravasation of blood. According to some, they may also arise from remains of the Wolffian ducts (*vide* pp. 68, 601.)

They are usually single, but there may be more than one. Sometimes the cyst may be high up, sometimes low down; rarely the hymen may form part of the wall.

The vaginal mucosa may be so thinned over the cyst that it is somewhat translucent. The lining of the cyst

may consist of columnar (sometimes ciliated), flattened, or pavement epithelium; in some cases no epithelial lining can be made out. Kaltenbach and Graefe have described papillæ attached to it. The contents vary, and may be clear and viscid, yellowish, turbid, or dark.

It is possible that sometimes a cyst may be formed by gradual occlusion of the neck of a urethrocele. Sometimes the cyst may be found with a vertical mesial vaginal septum, thus pointing to its Müllerian origin.

Symptoms.—There may be no symptoms if the cyst be small. If large, there may be a bearing-down feeling and discomfort in walking. Leucorrhœa may be caused by its irritation.

Differential diagnosis.—These cysts must be distinguished from cystocele, urethrocele, rectocele, periurethral cysts, swellings of the labia, swellings external to the vagina, *e.g.* prolapsed ovaries, inflammatory masses, hydatid, etc.

Treatment.—These should be removed if possible. A longitudinal incision is made through the vaginal mucosa over them. The cyst should then be dissected out, and the raw cavity closed with continuous catgut suture. If a communication exists between it and the urethra, the edges should be pared and closed with sutures.

When high up on the posterior vaginal wall, it may not be possible to dissect it out. Part of the wall may be excised, the lining swabbed with iodised phenol, and the cavity stuffed with iodoform gauze.

Fibroma and fibromyoma.—These are rare. They are found mostly on the anterior wall, and are sessile or polypoidal. They may be very adherent to the urethra.

Diagnosis.—Small tumours may cause no trouble. Larger ones may cause a feeling of weight and discomfort. Leucorrhœa may be present; micturition troubles may occur. There may be difficulty of coitus. Other symptoms may arise, due to changes in the tumour, *e.g.* inflammation, sloughing, etc.

The condition must be diagnosed from uterine tumours, prolapsus, or inversion of the uterus; when sloughing or ulcerated it may be mistaken for malignant disease.

Treatment.—The vaginal wall and capsule should be opened and the tumour shelled out. When the tumour is pediculated, ligature of the pedicle with removal of the growth should be carried out. If the tumour be extensive, its removal may be difficult owing to its relation to neighbouring structures. Sometimes it is only possible to remove part of the mass.

Carcinoma.—This disease is rare as a primary affection. Out of 4628 cases of primary carcinoma tabulated by Roger Williams, only forty were vaginal, whereas 1571 were uterine (not one being tubal). It may occur as the cauliflower growth, or as any of the other forms. The former generally grows on the posterior vaginal wall; the other varieties begin in nodules which tend to spread by infiltration. Sometimes the vagina may be completely surrounded by the disease. Ulceration usually occurs over it. When the lower part of the vagina is attacked the inguinal glands enlarge.

The symptoms are the same as in cancer of the cervix. The early condition must be diagnosed from a hard and soft chancre.

Treatment.—If diagnosed early, the mass may be removed. When advanced, palliative measures only can be employed. Extirpation of the vagina in bad cases, in which the posterior wall is affected, has recently been advocated by several authorities. Olshausen operates as follows:—

The perineum is divided obliquely, and the rectum separated from the vagina, the pouch of Douglas being pushed up. As much of the wall as is necessary to remove the growth completely must then be removed. Where the uterus has to be removed as well, the pouch of Douglas is opened. Secondary cancer may spread from the vulva, cervix, or bladder.

Sarcoma.—This disease is rare. It may occur at any age, even in childhood. It may be diffuse, soft, and rapidly growing, hard and circumscribed, or melanotic. Spreading to neighbouring parts occurs, rapidly in the case of the first form.

Treatment.—The same as in cancer of the vagina. Eiselberg reports an interesting case in which the recto-vaginal septum was involved. He resected the coccyx, extirpated the whole disease, and made an artificial anus in the posterior part of the wound. The uterus was pulled down and fastened, so that the wound could be thoroughly closed.

Tuberculosis of the vagina.—This is more frequent than tuberculosis of the vulva. It is usually secondary to tuberculosis of the upper genital tract, though it may occur independently (Williams). It may be found in the miliary form, or as an ulcer. The latter is irregular in outline; it is shallow, its base being covered with granulations and caseous matter; around the ulcer miliary tubercles may be found. The ulcers may perforate bladder or rectum. The disease is generally found on the posterior wall and on the upper third. It is most common between 20 and 40, but may be found earlier and later.

It may exist when the uterus is not diseased, but when the tubes are affected; it may be secondary to peritoneal or vesical tuberculosis; or it may be found with distant tuberculosis. It is possible that tuberculosis may sometimes be primary in the vagina or on the vaginal portion of the cervix.

Treatment.—Tincture of iodine, iodoform, or lactic acid may destroy the disease and lead to healing by healthy granulations. If this will not suffice, the ulcer may be excised and the raw surface closed with sutures.

Stenosis and Atresia of the Vagina.

These conditions may be congenital, or they may result from injury.

1. **Acquired.**—In most cases of acquired stenosis or atresia, difficult labours account for the condition. The vagina may be torn, and inflammation and after-cicatrisation set up, causing stenosis. Parts may slough, owing to compression against the sacrum or the pubes, and this may lead to great contraction.

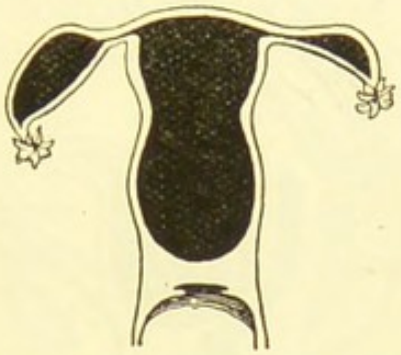


FIG. 226.—Atresia of the lower end of the vagina. The tubes, uterus, and upper part of the vagina are distended with blood.

Injury may also be produced in other ways, *e.g.* by a long-retained pessary, and may lead to contraction. It may follow cauterisation. It may result from the use of too hot a douche, causing scalding. It may be due to diseases, *e.g.* lupus, syphilitic ulceration, cancer, gangrene, phlegmonous vaginitis. It may be due to senile vaginitis.

The cicatrices may be in any part of the vagina. Those resulting from injury in labour are usually situated high up. They may extend completely or partially around the vagina.

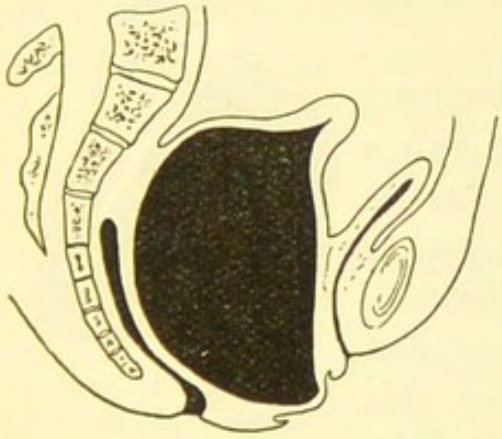


FIG. 227.—Hymeneal atresia, with distension of the vagina and uterus by retained menstrual blood.

Symptoms.—These vary according to the degree of the affection. They may develop slowly as cicatrisation advances, and may be retarded somewhat if coitus be frequent. If sufficient space be left for the escape of the menstrual flow and for coitus, the patient may notice nothing until the contraction be well advanced. When the passage becomes very narrow there may be painful menstruation or difficult coitus.

When complete atresia takes place, the menstrual dis-

charge accumulates behind the contraction, and the same results follow which I shall describe in connection with congenital atresia.

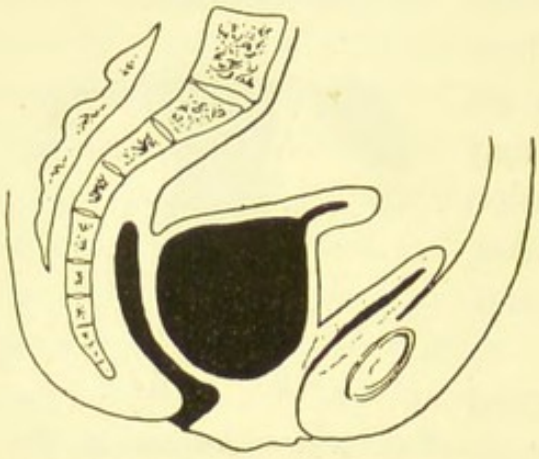


FIG. 228.—Atresia of the lower part of the vagina. The upper portion of the vagina and part of the uterus are distended with blood.

In some cases, however, amenorrhœa is brought about (Kennedy).

Treatment.—In the non-pregnant state, the cicatricial bands may be cut in different places; the vagina should then be fully packed with gauze for a few days, and, afterwards, glass or vulcanite dilators should be employed. In some cases where there is a thick cicatrix, it may be better to excise it, and to transplant a fresh flap of skin.

2. **Congenital.**—Various malformations have been described in connection with those of the uterus.

Stenosis may exist as an abnormal narrowing of the vagina, along with a normal uterus. It may be due to fœtal colpitis, and annular, oblique, or spiral ridges or bands may be formed. Some authorities think that the so-called supplementary hymen arises in this way. But arrested development of the Müllerian ducts may also cause the condition. Sometimes one of the Müllerian tracts may not have contributed at all to the vagina.

FIG. 229.—Uterus bicornis bicollis, in which there is atresia of the lower portion of the right vagina, the parts above being distended with blood.

Atresia may be found in different parts. Most frequently the hymen and lower end of the vagina are affected.

Sometimes the whole vagina is solid, and may only be

represented by a thin fibrous or fibromuscular band. Sometimes a mere diaphragm may exist at some point.

Complete absence of the vagina, or *defectus vaginæ*, may be considered here also. In this condition there is not a trace of tissue between the rectum and bladder. It is a condition mostly found in monstrosities. According to Ballantyne, it is probably always associated with absence of uterus, tubes, external genitals, and with imperfect development of the mammæ.

Changes resulting from atresia.—These usually do not develop until puberty. When menstruation begins blood accumulates above the atresic portion, and gradual dilatation takes place. This may affect the vagina above the hindrance, as well as the uterus and tubes. Hypertrophy of the vaginal wall may occur, but it may become thin and rupture. Rupture of the Fallopian tubes may also occur. The retained blood is at first thick and brown. Later it becomes paler; fibrin forms on the walls, and blood crystals get deposited. The uterine mucosa may have an eroded appearance; its glands may be almost entirely destroyed, and inflammatory changes may take place in it. Pus formation may take place. Sometimes the atresic portion may rupture or slough through. Peritonitis may develop about the distended parts.

I have described an interesting case in which the dilatation was most peculiar. The girl had complained of an abdominal swelling and pains for three years. There was an atresia of the lower portion of the vagina, and yet there was no dilatation of the upper portion nor of the uterus. Only the left tube was distended with blood.

It is generally thought that in atresia cases the distended vagina forms a large part of the retention tumour, and also, as G. Veit has pointed out, that this may develop even before there is any accumulation in the uterus. Usually, also, both tubes are affected, unilateral distension being generally found only where there is atresia of one-half of a double

genital tract. The source of the tubal blood in my case was not evident. It was either purely tubal, or purely uterine menstrual blood, which had been forced upward into the tube, or a mixture of both. In favour of the first hypothesis is the fact that, at the examination of the patient before operation, no distension of the uterus was found—a condition never before recognised in a case where a patient had menstruated, and had retained the discharges for one or more years; against this view is our present knowledge regarding the sources of the blood in menstruation.

Bandl and a few others believe that, in menstruation, blood is poured from the tubal as well as from the uterine mucosa, and that one of the chief causes of the hæmatosalpinx in atresia cases is the retention of this tubal flow, owing to some obstruction in the tube lumen.

All recent observations are opposed to this view. Besides, in my case, the tubal distension was only on one side. No communication could be made out between the distended tube and the uterus. Hennig has pointed out the frequency of closure or contraction of the inner part of the tube in these cases.

Against the purely uterine origin of the tubal blood is the supposition that reflux of blood from the uterus into the tube could not go on for a long period through the very narrow lumen of the interstitial portion. We know, however, that instrumental pressure can force fluids in this direction, and there is no reason why it should not take place as the result of strong contraction and resistance on the part of the uterus, owing to the way of escape being cut off from below.

In this relation should be remembered the tendency of blood in the genital tract to keep fluid. It is remarkable, if this explanation be correct, that reflux should take place only into one tube, if the lumen in both were patent. It is probably due to the fact that the resistance was so much greater on one side, for some reason or other, that the flow,

having started by one route, continued so. If the reflux hypothesis as to the origin of the tubal blood be not true, then, either no blood had escaped from the uterine mucosa, or, having done so, reabsorption had soon taken place.

It is possible that the blood was both tubal and uterine. It is not improbable that, after the tube had been somewhat stretched, as a result of reflux uterine blood, hæmorrhage might take place into the tube lumen during the periods of menstrual congestion. Were the latter, however, the sole cause of the condition (*i.e.* as affecting the tubes), both sides should have been distended.

Symptoms.—Sometimes the accumulation of mucus may lead the girl to distinguish a swelling before puberty. Usually, however, no distinct symptoms develop until after puberty. The menstrual periods recur, and there are all the usual signs save escape of blood. Pelvic pain is felt at these times. It increases in duration as the girl grows older, until in many cases it may be continuous. In some cases there is very slight trouble owing to the small quantity of blood produced. There may even be sometimes amenorrhœa. In other cases the pain may not tend to become continuous, but only to be felt at the menstrual periods. The patient may complain of micturition or defæcation troubles, and of an abdominal swelling, as well as of one at the vulva.

Physical signs.—On inspection of the external genitals, in case of hymeneal atresia, a bulging may be seen in the position of the introitus vaginæ. It may have a bluish tinge, and resemble a bag of membranes. If the lower part of the vagina be atresic, a similar bulging may also be seen, and often the hymen may be made out below it and distinct from it. The urethral orifice is dilated. In atresia high up in the vagina, no bulging is seen at the vulva.

On abdomino-rectal bimanual examination, the distended

portions may be distinguished. If the atresia be at the hymen, or in the lower third of the vagina, the rest of the canal distended above it is felt as an elastic sac. Sometimes, as in the case to which I have alluded, there is no distension of the vagina above the atresia.

If the case be an early one, the uterus is felt to be hypertrophied above the vaginal swelling. Later, the cervix dilates, and, afterwards, the body. Then one or both of the Fallopian tubes may dilate; but, as I have shown, tubal distension may occur without uterine or vaginal retention.

When the vagina is completely atresic, a sound passed into the bladder may be easily felt per rectum. Yet, in a case where there is only atresia of the lower portion, the upper part being normal and undistended, this method of examination may lead to a false diagnosis. When the whole vagina is congenitally wanting, the uterus is usually malformed, though sometimes it is not.

Treatment.—The condition should be operated upon as soon after puberty as it is discovered; sometimes before puberty, owing to the accumulation of mucus, interference may be necessary.

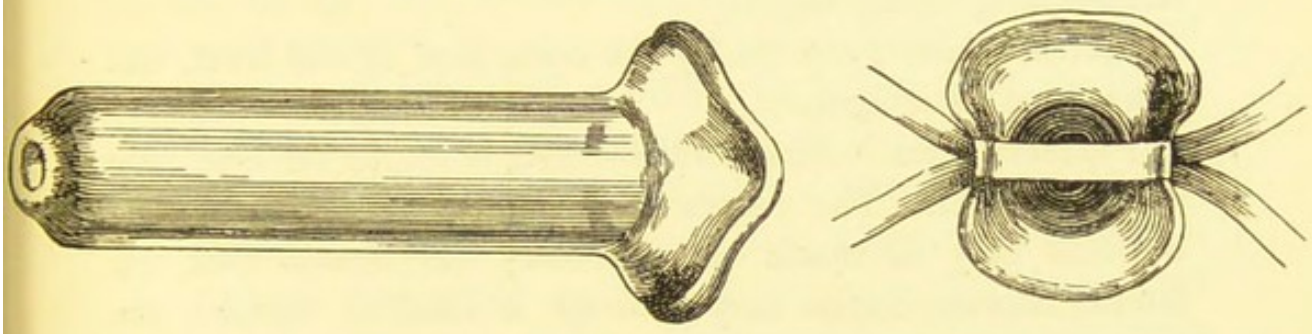
Just as in cases of atresia of the cervix, the condition of the tubes should be examined. If they are distended, they should be removed first of all. When very slight distension is present, it would be justifiable simply to aspirate the fluid from the tubes, and to close the openings, in the hope that they may recover their functional activity.

If an abdominal section be performed for the treatment of the tubes, the vaginal condition should be attended to after the patient has thoroughly recovered. If, however, it has been found that the whole vagina is wanting, there being no possibility of tunnelling a new slit, nothing can be done after the tubes and uterus are emptied or removed by abdominal section. When the hymen or lower part of the vagina is atresic, an opening should be made in much

the same manner as described in atresia of the cervix (*vide* p. 436). The hymen may be cut away.

When the whole vagina is atresic, a new vaginal slit may sometimes be made by tunnelling the recto-vesical septum. This is carried out with bistoury, scissors, and fingers. Care should be taken not to injure bladder, ureters, or rectum. A sound should be held in the bladder by an assistant during the operation.

The operation is more difficult when there is no accumulation of blood above the atresic portion. In such a case the uterus should be pushed downwards through the abdominal wall by an assistant, in order that the operator may be better able to work his way to the cervix.



1. 2.

FIG. 230.—Vaginal tube.

1. Side view. 2. Outer end, showing mode of attaching straps.

Whenever an atresia is incised, the retained fluid above it is allowed to drain away slowly. The opening is then made as large as possible, and a glass tube introduced. The patient is kept in bed until the freshly-rawed surface granulates and heals. Thereafter she should wear the glass plug for a year or more (except at her menstrual periods), and should understand how to remove it, clean it, and give herself a vaginal douche from time to time.

Atresia of one-half of a septate uterus and vagina.—Sometimes the lower end of one-half of a septate vagina may be atresic. This leads to the accumulation of blood

on this side, forming the condition known as lateral hæmatocolpos; if suppuration occur in it, lateral pyocolpos. The corresponding left half of the uterus may be distended—lateral hæmatometra; sometimes suppuration may occur in the uterine collection. At times rupture of the vaginal sac may take place into the patent vagina. Pelvic peritonitis or cellulitis may be set up.

Symptoms.—There may be some accumulation of mucus behind the vaginal atresia before puberty. Usually, however, it is only when menstruation begins that marked symptoms occur. There are pains in the pelvis at menstruation, and, often, between periods, dysuria and defæcation troubles. There may be a feeling of discomfort due to the swelling in the vagina.

Menstruation goes on by the open part of the tract, but it tends to be irregular.

Physical signs.—An elastic swelling is found on one side of the vagina. The uterus is enlarged, and distension of one-half may be made out. Breisky has shown that the lateral hæmatocolpos may undergo a kind of torsion, the lower end becoming anterior, the upper posterior.

Differential diagnosis.—When the atresia is low down, the swelling may be mistaken for a vaginal cyst, a hernia, a pelvic hæmatoma. When situated high, diagnosis may be very difficult, and the condition may be mistaken for a broad ligament or intraperitoneal swelling close to the uterus. It must also be diagnosed from atresia of half of a septate vagina, where the uterus is bicornuate, or where there is a rudimentary cornu.

If pregnancy take place in the open half, the difficulty of diagnosis is great, and the condition may easily be mistaken for ectopic gestation. Where there is very great doubt as to the condition of parts, an abdominal exploratory incision may be necessary. Winckel has pointed out that lateral vaginal atresia is also to be distinguished from a condition in which pockets exist on the side of the vagina, due to

inversions of the mucosa; they may be an inch or more in length.

Treatment.—If, with this condition, the Fallopian tube on the corresponding side be at all distended, it should be removed. The atresic vagina should be opened and drained, the septum being cut away. The cervix should then be pulled down with a volsella, and the septum in the uterine cavity removed. Afterwards the vagina should be douched daily with an antiseptic lotion.

Septate vagina.—This is the condition in which fusion of the two Müllerian ducts has not taken place. Very rarely, as in the case of Katherine Kaufmann referred to (p. 541), there may be a double vulva as well. Usually the vulva is single, though the hymen may have two openings. In the majority of cases, the two canals are side by side, one of them, generally the left, tending to lie a little in front. Sometimes the septum is somewhat transverse, so that one canal lies quite in front of the other. Usually one canal is a little larger than the other. The septum may extend throughout the whole vagina; it varies in thickness, and may be perforated at spots. In some cases there may be a mere band or a ridge on the wall.

In most cases where the condition is well marked the uterus is septate, bicornuate, or didelphous. The uterus may be single, communicating with only one vaginal canal. It may be unicornuate, the other horn being rudimentary; in such a case the corresponding vaginal half is rudimentary.

There may be a single vulva and hymen, and the septum may not reach quite to the latter, but sometimes it may pass into the hymen, which has two openings. The septum is composed of fibromuscular tissue.

Symptoms.—Sometimes there may be difficulty in coitus, or dyspareunia, but generally the condition is not made out until labour comes on, when it may cause obstruction.

Treatment.—The septum should be excised.

Unilateral vagina.—This condition is found, generally,

where there is a unicornuate uterus. The canal is narrowed, and lies somewhat lateral to the mesial plane.

Abnormal openings into the vagina.—The vagina may communicate with the rectum or urethra. Sometimes it may be septate in this condition. Fordyce has described a septate vagina in an infant where each half opened into the urethra, both canals being atresic at their lower ends.

Most instances, however, of communication are due to malformation of the vulva, whereby remains of the cloacal stage or of the urogenital sinus condition are left.

Abnormalities in the structure of the hymen.—The hymen may be very thick and rigid.

This condition may lead to dyspareunia, or prevent penetration in coitus. Pregnancy, however, may take place. If it exists during labour, it may obstruct the passage of the child. When it does tear, the laceration may be a bad one, and may go deeply into the vulva or perineum.

Sometimes the hymen is abnormally elastic, and may not tear on coitus or even in labour. In some cases the hymen may be unusually vascular, and may lead to sharp hæmorrhage when torn in coitus.

Cysts are sometimes found in the hymen. They were first described by Bastelberger, who regarded them as due to an infolding of the surface-epithelium, which became closed in its outer part and afterwards distended. Schauta held a somewhat similar view. Döderlein and others believe that they are caused by the blending of double hymeneal folds. Ulesko-Stroganowa states that they arise from the obstruction of glands, a mode of origin to which she attributes, also, vaginal cysts; in reference to this view, however, it is to be said that, normally, no glands are found either in the hymen or vagina, though, as Ruge has demonstrated them on the inner surface of the hymen in a case of atresia hymenalis, it is evident that they may occasionally be found. Klein and von Preuschen have also pointed out their occasional occurrence.

Palm and others think that these hymeneal cysts are the closed-off ends of a canal (probably the Wolffian duct). There is, however, considerable discussion as to the original position and relationships of the Wolffian duct (*vide* p. 67), it being denied by some that it is impossible that Wolffian duct remains should be found as low as the hymen.

CHAPTER XXI.

AFFECTIONS OF THE URETHRA AND BLADDER.

URETHRA.

DEVELOPMENTAL DEFECTS.—**Absence of the whole urethra** sometimes occurs. This may be found with or without other malformations. The bladder may open by a slit into the lower part of the vagina in such cases. Sometimes only the inner portion may be wanting; sometimes, the outer; sometimes, the middle portion.

Epispadias, or defect of the upper wall of the urethra, may be found without any corresponding affection in the bladder, but usually this viscus is also involved. The whole or outer part of the urethra is found as an open groove. On each side lies one-half of the split clitoris with its corresponding labium minus. The labia majora may be joined normally in the anterior commissure, or may be divergent. The bladder is complete, and usually the symphysis is closed. There may be a scanty growth of hair on the mons veneris. The bladder is generally smaller than normal.

Symptoms.—Incontinence of urine is the chief feature. This may be continual, but usually it is only marked when sudden movements are made. The genitals become tender and excoriated. Menstruation usually continues, however, and pregnancy may take place.

Treatment.—A plastic operation should be performed

for the purpose of closing in the deficiency. If this fail, a urinal requires to be worn continually.

Hypospadias occasionally occurs. This may be found as a mere deficiency of the posterior wall of the urethra; more commonly it exists as part of the condition known as persistence of the urogenital sinus.

Dilatation of the urethra.—This condition may affect the whole or the outer part of the urethra. It may be caused by coitus where the vagina is defective, or it may be brought about by means of a tumour.

Treatment.—Longitudinal furrows may be burned along the dilated portion. If this is not sufficient, a plastic operation may be tried, a portion of the posterior wall being cut out and the raw edges brought together.

Stricture or stenosis of the urethra.—This may result from cicatrisation, after bad labours or from the presence of a new growth. It may gradually form in a vesico-vaginal fistula. Sometimes it follows gonorrhœa. It may also develop after operations on the urethra.

Treatment.—If no tumour exists, gradual dilatation with bougies is to be carried out. Sometimes it is necessary as well to cut the cicatrix from without.

Displacement.—The whole urethra may be altered in position, following displacements of the bladder.

Urethritis.—Inflammation in the urethra is generally due to gonorrhœa. It may follow the use of dirty instruments, injuries, the irritation of a new growth, masturbation, awkward coitus.

The mucosa swells, becomes congested, and a catarrhal discharge is produced.

When acute gonorrhœal infection is the cause there is usually first an itchiness about the urethra, then a prickling, burning pain; frequency of micturition and dysuria; in three or four days a sticky secretion oozes out, and then an abundant purulent discharge. In about twenty days this begins to decrease, and it may entirely disappear in thirty

or forty days. Sometimes there may be blood in the discharge. Catarrh of the bladder may also be present. Skene's glands, and those around the meatus, may remain affected for a long time. Prolapse of the mucosa may take place.

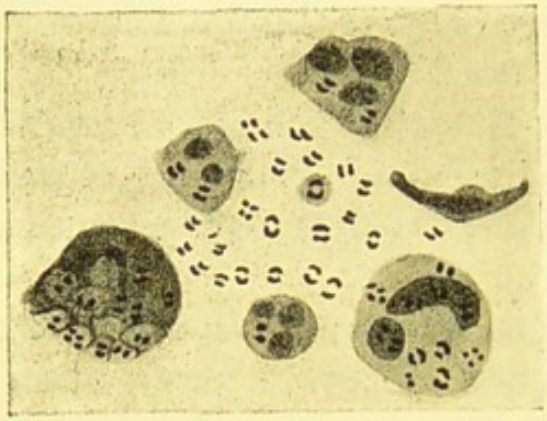


FIG. 231.—Pus from urethra, stained to show gonococci.

Treatment. — *Vide* "Acute Vulvitis," p. 545.

Urethrocele.—This is a dilatation of the posterior urethral wall. It forms a swelling on the anterior vaginal wall. Inflammation may occur in it, and deposit of lime salts take place. Possibly, in some cases, the neck may become closed, so that a cyst is left in the anterior vaginal wall.

The cyst may become as large as an egg. This condition may cause a feeling of discomfort, as of something pressing down; there may be dysuria; sometimes there is incontinence when sudden movements are made; dyspareunia may be present.

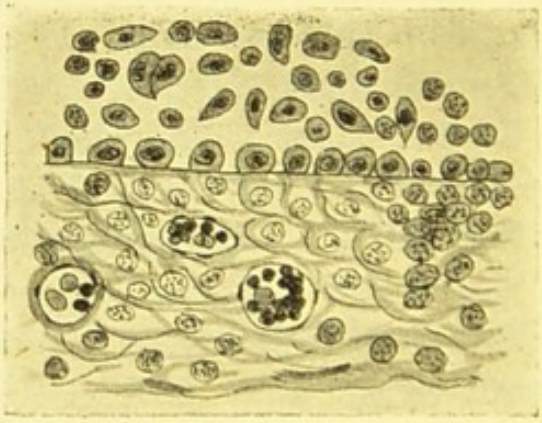


FIG. 232.—Section of part of urethral wall in acute gonorrhœa. The epithelium is considerably shed.

Treatment.—The anterior vaginal wall should be incised, the cyst removed, and the opening closed with continuous catgut suture. In some cases it may be well to drain the bladder by a lead catheter for two or three days after the operation.

Retention cysts are sometimes found near the meatus; they are probably due to closure of the outer ends of Skene's glands.

Fissure of the urethra.—This condition is sometimes found at the inner end of the urethra. It is a very troublesome condition, and may cause much discomfort and pain, especially in connection with micturition.

Treatment.—At first, dilatation of the urethra should be tried. The function of the sphincter is destroyed for a time, and, during this period of rest, the fissure, which has been stretched, has a chance to heal. Along with the dilatation the application of the cautery to the fissure by means of an endoscope is made by some operators. If these methods fail, the establishment of a vesico-vaginal fistula for a time may be necessary.

FIG. 233.—Section through portion of urethral caruncle. Large blood-spaces are shown.

NEW GROWTHS.—**Angioma or urethral caruncle** is important. It may vary in size from a pea to a hazel-nut, and forms a deep red mass at the urethral orifice. It may be somewhat pedunculated, and bleed easily. Usually only one exists; sometimes two or three. It consists of dilated capillaries; blood is often diffused among the connective tissue; it is rich in sensory nerves.

It causes pain on coitus and dysuria; sometimes, retention. It bleeds on being irritated.

Treatment.—It should be thoroughly burned off with a cautery at a dull red heat. If there should be much after-bleeding, a plug of gauze held against the spot by a perineal band acts as a hæmostatic. Fibroma sometimes grows in the wall of the urethra. It may be polypoidal in the canal. Myxoadenoma, sarcoma, carcinoma, and other growths may be found.

Prolapse of the urethra.—Kleinwächter describes two varieties, one in which the mucosa near the meatus is

everted, the other in which it becomes loosened higher up, gradually extending down until it appears at the meatus. A. R. Simpson has described two interesting cases of the former condition; in one of these it developed suddenly, following a fall; in the other, it was caused by the dragging down of a caruncle as large as a cherry. Inflammatory changes may take place, and erosion or ulceration or gangrene be caused. The prolapsed mucosa may in old cases sometimes take on a skin-like character.

I examined Professor Simpson's cases microscopically, and found that in both cases the epithelium covering the prolapse was transitional, like that in the upper end of the bladder. Cross-sections resembled the structure of a caruncle, and in the second specimen it was impossible to say where the caruncle began and the prolapse ended. It is, indeed, possible that a caruncle may begin as a localised prolapse.

The symptoms vary. Sometimes there is no discomfort. In other cases they are the same as in caruncle. Sometimes the patient only complains of the bleeding which is found.

Treatment.—The prolapsed portion may be cut off, and the edge sutured to the margin of the urethra.

In the case of prolapse of the upper portion of the mucosa, it may be necessary to split open the urethra in order to remove the redundant portion.

Bladder.

Malformations.—**Epispadias** (ectopia vesicæ, extroversion of the bladder) is rare in the female. In the most common variety, there is a failure in development of the anterior wall of the bladder, and of the anterior abdominal wall in front of it. There is also a deficiency in the pubic arch in the majority of cases.

The posterior bladder wall appears as a red surface, which bleeds easily. The openings of the ureters may be seen, from which urine escapes in small irregular jets. Here and

there the mucosa has epidermic characters; at the edge of the red area the mucosa joins the skin. The skin is marked by cicatrices, supposed to be remains of the allantois. The ectopion may reach up to the umbilicus.

The labia and halves of the clitoris are separated. The vagina and uterus are occasionally double. The sacrum usually projects well forward. The ureters bend down into the pelvis before passing up towards the kidneys. They may be elongated and distended.

There is a rarer condition of ectopion in which the whole cloaca opens anteriorly, the bladder not having been developed to any extent. Variations may be found between this and the first-mentioned form.

Symptoms.—Usually the patient is run down in health. There is constant dribbling of urine, and much local discomfort. Excoriation, inflammation, ulceration may develop on the vesical mucosa or skin; the ureters may become affected, and the kidneys get diseased. Sexual appetite is usually absent, though pregnancy may occur. Menstruation is irregular.

Treatment.—Previous to any attempt at operative treatment, the health of the patient should be made as good, and the local conditions as favourable as possible. If the urethra be deficient, it should first of all be restored by a plastic operation.

Afterwards, the malformation in the lower abdominal region is closed. If there be a mere fissure, the edges should be pared and stitched together. If there be considerable deficiency in the anterior abdominal wall, a plastic operation should be undertaken.

Flaps are made from adjacent parts of the abdominal parietes and turned inwards over the opening, their edges being stitched together and to the pared edges of the opening. In this way the skin surface forms the new anterior wall of the bladder. The flaps may be taken from above and from each side of the opening, or one large one may be taken from an inguinal region.

Some prefer, after making the flaps, to cover the raw surface with skin grafts. Afterwards, at a second operation, the edges of the flaps and of the opening are brought together. If the skin-grafting is not undertaken, it is necessary to dress the raw surface carefully with iodoform collodion. If these attempts fail, an artificial urinal should be worn.

Double bladder.—Two bladders are very rarely found (*vide* p. 541). Sometimes the single bladder has a median partition, large or small. Or it may be found with sacculations.

Absence of the bladder is sometimes met with. The ureters may open, in such a case, into urethra, rectum, or vagina, or through the abdominal wall.

Cyst of the urachus is sometimes found, communicating with the bladder. Sometimes the urachus is patent, and communicates with the exterior at the umbilicus.

Displacements.—The bladder may be displaced in various ways by tumours. It may be dragged downwards by prolapsus uteri or by supravaginal hypertrophic elongation of the cervix; in cystocele; by old cellulitic or peritonitic cicatrisations. It may form a hernia into the inguinal, femoral, obturator, or sciatic foramen; sometimes it may bulge into the abdominal wall at the scar of an old laparotomy incision or of a healed abscess, or if the muscles be weak or separated in the middle line.

Where the bladder becomes herniated, it tends to become sacculated; urine may collect in the protruding part, decomposition set up, and calculus, perhaps, formed. The bladder is also somewhat displaced in labour.

Prolapse of the vesical mucosa through the urethra is a very rare occurrence. It is stated by some that the whole bladder wall may thus prolapse—inversio vesicæ.

Cystocele.—This condition has been considered under "Downward Displacements of the Pelvic Floor" (*vide* p. 571). It is not uncommon in fat multiparæ with pendulous belly, and in women after the menopause.

Inflammation in the bladder.—*Pathology.*—Cystitis may be acute or chronic. In most cases, the inflammation begins in the mucosa, and is mainly limited to it, though, sometimes, the wall may be infected from the outer surface.

In *acute* cases there is congestion of the mucosa, proliferation, cloudy swelling, and shedding of the epithelium, while leucocytes and serum are poured out of the dilated capillaries. Inflammatory products may also be found in the neighbouring part of the wall. This condition may become chronic, may get well, or may give rise to abscesses in the wall, ulcers, or a gangrenous condition. Sometimes a croupous membrane forms.

When the latter takes place, exfoliation of a large area of the mucosa or even of the muscular part of the wall as well may result.

In *chronic* cases the mucosa is generally of a greyish colour, irregularly mottled in parts, and covered with a layer of pus. It is increased in thickness; the covering epithelium is considerably altered from the normal and exfoliated; ulcerations may be present; the wall outside the mucosa is somewhat hypertrophied, owing to infiltration with inflammatory products, so that its capability of expansion may be greatly diminished. In some cases a croupous false membrane forms on the surface, composed of fibrinous material, or, sometimes, of proliferated epithelium. It may extend up the ureters to the kidneys sometimes. Rarely villous projections may form on the wall—the so-called "villous cystitis." In many cases phosphatic deposits are found on the wall.

Etiology.—It is extremely likely that the active factor in causing cystitis is micro-organismal. The microbes may enter by way of the urethra, with or without inflammatory changes in the urethra, *e.g.* gonorrhœa. They are often introduced by the use of dirty instruments in catheterising and in performing operations.

Various microbes may set up cystitis, one of the most

common being the *Bacterium coli commune.* Staphylococci are often the cause, being usually the agents in puerperal cases. In infection from gonorrhœa the gonococcus is rarely found in the bladder, staphylococci probably being the important attacking agents. The different germs causing suppuration may also be found as well as other varieties.

Various conditions tend to depress the vitality of the wall and to favour infection, *e.g.* pressure of the fœtal head in labour, of a tumour, or of a vaginal pessary; chronic congestion in the pelvis, as in metritis; inflammation outside the bladder; downward and backward displacements of the uterus, especially in early pregnancy; foreign body in the bladder; over-distension of the bladder; cold, excessive coitus, poor health, rheumatism, gout, tubercle, certain drugs, *e.g.* cantharides, excess of balsams, quinine, iodides.

Symptoms and physical signs.—In *acute* cases there is painful and frequent micturition. There is a feeling of weight and fulness in the pelvis, and if the patient try to retain urine, sharp darting pains occur in the region of the anus. Rectal tenesmus is often found, occurring at intervals. After emptying the bladder, pain may continue for a time. Examination by the vagina or rectum causes pain; also the introduction of a sound into the bladder. There is often no rise in temperature; if this takes place, it may point to an extension of the inflammation up the ureters or outside the bladder wall. The urine is diminished, highly acid, and contains epithelial cells, blood, pus, mucus, urates, uric acid, etc. Only slight traces of blood are usually found. When the pus is uniformly diffused through the urine, there is probably an extensive affection of the mucosa; when the first and last portions of the urine contain it most abundantly, the neck and base are probably affected.

In *chronic* cases the symptoms may begin gradually or may follow an acute attack. The symptoms are those already described, only modified. In old cases the patient

gets thin and worn, and the whole system runs down. There may be pain on coitus; and rises in temperature.

The urine contains mucus and pus in various quantities; it is alkaline, and has a somewhat strong unpleasant smell, decomposition being easily set up in it. On bimanual examination some pain is caused when the bladder is pressed between the fingers. It may be felt to be thickened.

Cystitis must be diagnosed from tuberculosis of bladder or kidney, pyelonephritis, neuropathic vesical conditions, cystocele, pressure of tumours, and other swellings outside the bladder which cause frequency of micturition, vesical tumours, calculus.

In all doubtful cases the interior of the bladder should be carefully examined by the Kelly method, and, if necessary, urine should be drawn from the ureters, so that the discharge from each kidney may be examined (*vide* p. 185).

Treatment.—If any favouring condition exist, it should be attended to. In *acute* cases the patient should be placed in bed, the bowels kept open, and a diet of milk and diluent drinks administered. A mixture containing liquor potassæ, hyoscyamus, and buchu should be given internally. Sometimes morphine suppositories must be used on account of the pain. Hot hip-baths are often beneficial.

In the most severe cases some authorities recommend dilatation of the urethra, or making an opening into the bladder through the anterior vaginal wall, in order to give the viscus thorough rest.

In chronic cases, the bowels should be carefully regulated; milk diet and diluent drinks should be given, alcohol being avoided. Inwardly, salol, ammonium benzoate, or boracic acid may be given.

In obstinate cases of this condition, when the ordinary medical treatment is insufficient, continual drainage of the bladder may be tried. This should be done by means of the urethra, which must be dilated with Hegar's dilators. The action of the muscles which compress the urethra is

interfered with for a time. If the muscles regain their power too soon, another dilatation should be performed.

The patient remains in bed. During the day she may rest against an inclined plane, so that the back is somewhat elevated. Twice daily a weak antiseptic douche is given, *e.g.* boracic; iodoform bougies should be passed into the bladder cavity. If too much dilatation be made, permanent paralysis of the urethra may remain. A diameter of 20 mm. is the usual limit in an adult. When drainage by the urethra fails to cure the case, an artificial opening should be made through the anterior vaginal wall. The patient is placed in the lithotomy position. The cervix is pulled down, and the anterior vaginal wall held steady with volsellæ.

A sound is passed into the bladder, the point being made to press the base forwards just above the inner end of the urethra. A mesial incision is then made through the anterior vaginal wall and the base of the bladder, the knife cutting on the point of the sound. With a pair of scissors this incision is lengthened upwards for about three-quarters of an inch. A finger is introduced to feel the condition of the bladder wall. If any crystals of lime are attached to the wall, they should be removed. The bladder is next washed out. Then, with small full-curved needles and catgut sutures (No. 2), the vesical and mucosal edges of the wound are united all around the opening. The patient remains in bed, daily vaginal antiseptic douches being given.

When the patient is cured, the fistula is closed, according to the method described on p. 626.

Tuberculosis of the bladder.—This disease may be found at all times of life; it is more common in women than in men. Very rarely is it limited only to the bladder; there is usually tuberculosis elsewhere in the body. Miliary tubercles develop in the mucosa, and in advanced stages ulceration takes place, either as several small ulcers or as a large one. The disease may extend down the urethra or

perforate the vagina and rectum. It may lead to an abscess outside the wall, which may burrow and open in different directions. It tends gradually to shrink up behind the symphysis. The walls may become sclerosed, and the muscle atrophied, so that the viscus loses its power of contracting and expanding. The disease may spread to the ureters and kidneys.

The early symptoms are frequency of micturition after meals and at night; afterwards, in the daytime as well. Slight traces of blood appear in the urine. Pain gradually develops, and pus is produced. All the conditions of chronic cystitis are then found. Sometimes there may be reflex spasms of the walls of the urethra, causing retention. Where ulceration destroys the neck of the bladder to a considerable extent, there may be incontinence. The pain varies greatly; it is sometimes slight, but usually severe, being felt in micturition or continuously. Sounds should not be passed for diagnosis in this disease because of the danger of injuring the wall. The urine usually contains tubercle bacilli, but these may not be found if there be much pus.

The general treatment is the same as for tuberculosis elsewhere. Articles of diet and drugs which irritate the bladder should be avoided, *e.g.* alcohol, spices, cantharides, nux vomica, etc. Morphine may be often necessary. Local treatment often consists in washing out the bladder with 1 in 8000 to 1 in 10,000 corrosive sublimate lotion, or with a solution of formalin (1 in 4000).

As a last resort, suprapubic cystotomy may be tried, in order to apply antiseptics to the bladder.

Necrosis of the bladder.—This condition has been chiefly studied by Haultain in recent years. He thinks that it may be brought about by traumatism, local poisons, and interference with the circulation. Thus, it may be found as a result of retroflexion of the gravid uterus, the pressure of the fœtus in a delayed labour, distension of the bladder,

cystitis, etc. It is extremely probable that in most cases the action of microbes is an important factor.

The mucosa alone may be affected, or the mucosa and submucosa; sometimes these along with the muscular coat, or, indeed, the whole thickness of the wall. The wall may be perforated; exfoliation of the dead tissue may occur, and this may be followed by the opening.

Clinical features.—They differ considerably. The temperature varies in different cases; it is always raised when exfoliation takes place. Retention and incontinence of urine are often found. The urine contains much débris and is usually ammoniacal. The exfoliated portion may protrude as a non-vascular, foul-smelling mass. It may be mistaken for an inversion of the bladder, which has not, however, these characteristics.

Treatment.—When exfoliation is taking place, the urine should be drawn off and the bladder washed out every few hours with a strong antiseptic. If there is a tendency to retention of urine, it is best to make an opening into the bladder through the anterior vaginal wall.

Calculus in the bladder.—This condition is rarer in women than in men (5 to 100, according to Auvard). The causes of stone are not so often met with in women, and, owing to the shortness and dilatability of the urethra, small calculi may easily be passed from the bladder.

Etiology.—A stone may pass from the kidney, and increase in the bladder. Cystitis and decomposition of urine may give rise to it. It may develop in connection with foreign bodies or tumours in the bladder, in conditions where a *cul de sac* may form in which urine may gather and decompose, *e.g.* sacculated and herniated bladder, prolapsus.

Pathology.—There may be only one or many, and great variations in size are found. They are of different shapes; when several exist together, they are usually faceted. The surface is smooth, granular, or rough.

Oxalate of calcium usually forms in rounded, nodulated, slate-coloured masses.

Calculi of uric acid and ammonium urate are ovoid and somewhat flattened, with a smooth or granulated surface; the uric acid masses being yellow. Phosphatic calculi are irregular in shape, as a rule, and of a grey-white colour. Mixed forms may be found.

Symptoms.—Pain is often found. It may be constant in some cases; probably, where there is cystitis. Generally the pain is felt after jumping, walking, driving, riding, etc. It is usually eased when the patient lies down. Where the stone is of some size, there may be much pain in the bladder, urethra, perineum, loins, groins, or in the legs, owing to the contraction of the bladder on it. There is frequency of micturition; sometimes the flow is stopped suddenly. Hæmaturia is an important symptom; it usually occurs after much exertion, or after driving, riding, etc.

In some cases of small stone there may be no symptoms, or very slight ones. Sometimes they may be passed *per urethram* spontaneously.

Physical signs.—On bimanual examination it may be possible to feel the mass or masses in the bladder. With a sound they may be felt when the instrument is introduced into the viscus.

Treatment.—Small stones may be removed through a dilated urethra by means of a pair of slender forceps. If necessary, a tubular speculum may be used.

A stone of moderate size may be crushed in the ordinary manner, the débris being washed out.

If there be much cystitis, or if the stone be too large or too hard to allow of crushing, it must be removed by an opening through the anterior vaginal wall or by suprapubic cystotomy. The former method is to be chosen, save when it is not possible to adopt it. The patient is placed in the lithotomy position, the vagina well exposed with specula, the cervix pulled down, and the anterior vaginal wall fixed.

If necessary, a sound is passed into the bladder as a guide to the knife. The incision is made in the middle line as long as is necessary. The stone is then removed *en masse*. It may be crushed if it is too large to extract otherwise. The interior of the bladder should be carefully washed out, and then explored with the finger. If there be little or no cystitis, the wound should be closed with catgut sutures (No. 2 or 3), as in the case of repair of a vesico-vaginal fistula (*vide* p. 627). The after-treatment is the same as in the case of a fistula repair.

If marked cystitis be present, it may be necessary to close only the upper part of the wound, leaving the lower part open to act as a drain for a few weeks. When the patient has recovered, complete closure can be carried out.

Neoplasms of the bladder.—New growths are most frequently found in the region of the trigone, next on the posterior wall, then at the neck, and, finally, on the anterior and lateral walls (Auvard). The benign tumours are usually rounded and localised, the malignant more diffused.

Carcinoma may be found in its various forms. It is usually secondary to rectal, vaginal, or uterine cancer; it may, however, be primary. It may grow from a single nodule, or several nodules may fuse; it tends to infiltrate widely, and ulceration occurs in the mucosa over it. As a rule, cancer of the bladder grows slowly.

Sarcoma is rare.

Myoma, fibroma, fibromyxoma are sometimes found; the latter are pedunculated.

Adenomata or **mucous polypi** sometimes develop from the vesical mucosa, and may grow down through the urethra or distend the bladder.

Papilloma is found either as a stalk with long villous projections, composed of delicate, vascular connective tissue stroma, covered with epithelium, or as a sessile or pedunculated warty growth of firm consistence; the latter may be single or multiple, and varies in size from a pin's head to a walnut.

Angioma, dermoid cyst, and **simple cyst** may sometimes be found in the wall.

Bilharzia hæmatobia in the tropics sometimes leads to the formation of fungating masses in the bladder.

The following changes may be found as a result of new growths in the bladder:—Deposit of salts on the growth, formation of calculus, cystitis, hydronephrosis, nephritis, pyelonephrosis, hypertrophy of bladder wall.

Symptoms.—In some cases of benign tumour, there may be no symptoms. Usually, however, hæmaturia, pain, and micturition troubles are present, though varying greatly in their severity in different cases. The most important of these is hæmaturia. It may appear at any time in small or large quantity, and is not related to strains or jolts. It may last for hours, days, or weeks, and then suddenly disappear. The blood is more marked at the end of micturition usually. In cases where the blood loss is slight, the patient may notice the darkening of the urine, most marked in the morning. Where the blood loss is great, clots may form.

The patient may become very anæmic and cachectic-looking, even when the tumour is benign, and the legs may become œdematous. Pain usually appears late, and is mostly due to cystitis; but it may be caused by the infiltration and extension of malignant disease. Micturition is frequent, and in some cases painful. The flow may be stopped by a clot or by a piece of the tumour; sometimes there is much difficulty in emptying the bladder.

Physical signs.—Sometimes a small tumour may be seen projecting out of the urethra. On bimanual examination, especially under an anæsthetic, the neoplasm may sometimes be distinctly felt. When small or soft it may be missed in this way. On examination of the interior by the Kelly method, the growth may be seen. On dilating the urethra, it may be felt with the exploring finger.

A valuable aid in diagnosing the source of blood is dis-

tension of the bladder with aseptic water; if, on expulsion, the fluid be followed by hæmorrhage, the vesical origin of the blood is indicated. Sometimes, where the neck of the bladder is affected, blood flows through the catheter as it is introduced or removed.

Treatment.—The treatment depends on the size and situation of the tumour. Sometimes small pediculated growths may be twisted off through the dilated urethra.

Larger growths may be removed by means of a vertical mesial incision through the anterior vaginal wall and base of the bladder. The tumour should be removed with the cautery at a dull red heat. The opening into the base may then be closed. For large growths the operation of suprapubic cystotomy may be employed. This operation is performed as follows:—The patient is prepared as for an abdominal section. She is placed in the dorsal or Trendelenburg position. Some operators distend the bladder or rectum with air or warm sterilised water (99° F.) in order to push up the peritoneum as much as possible. Others think this unnecessary. It may be dangerous to distend the bladder when there is disease in its wall. If it be not distended, it should at least be filled.

A vertical mesial incision 2 or 3 in. in length is made through the skin and superficial fascia immediately above the symphysis. It is then carried transversely across the top of the pubes. The origins of the recti and pyramidales muscles are divided a short distance above the bone. The thumb and finger are passed behind the symphysis, the peritoneum being separated somewhat from the bone if it be attached, and the extraperitoneal tissues in the region of the apex of the bladder drawn upwards.

A loop of silk-worm gut or of silk is now passed through the thickness of the muscular wall at the lowest part of the bladder which can be reached behind the symphysis. Another is passed higher up just below the attachment of the peritoneal reflection. The wall of the bladder is divided

vertically between these fixation loops until the vesical mucosa is seen as a bluish membrane. All bleeding is checked, and the mucosa is incised with a bistoury. The finger is quickly introduced to prevent escape of the contained fluid, and the bladder is explored. The opening may be enlarged according to the requirements of the case. Sometimes it may be necessary to resect a triangular portion of the symphysis subperiosteally, in order to obtain room. The base of the triangle is the upper margin of the symphysis.

After the operation is finished, the bladder wall is closed by two rows of catgut sutures. One of these secures the mucosa, the other the muscular coat and the overlying cellular tissue. The divided ends of the recti and pyramidales are brought together and the outer wound closed, save at the lower end, where an iodoform-gauze drain is placed in the wound.

After-treatment.—Practically the same as after a vesico-vaginal fistula repair. In addition the abdominal wound must be cared for.

When the tumour cannot be removed, it is sometimes advisable to remove as much as possible, the raw surface being cauterised. In such cases it may be necessary to establish a permanent fistula either by the vagina or by the abdominal wall.

Foreign bodies in the bladder.—Various articles may be introduced, *e.g.* hairpins, buttons, etc. They may ulcerate through the wall, *e.g.* a pessary from the vagina; worms, fæces, and other bodies from the bowel; portions of a fœtus from an ectopic gestation sac; contents of abscesses and cysts. They tend to set up cystitis, and may work their way through the wall, attended by suppuration. They may become the nucleus of calculi.

Treatment.—They are to be removed according to the principles observed in the removal of stone. Complications require attention.

Rupture of the bladder.—This may be caused sometimes by violent straining, made by a patient when the bladder is distended, or from some injury, *e.g.* a kick in the abdomen. Generally, the rupture is intraperitoneal, though it may be extraperitoneal; sometimes both varieties are found in the same tear. Very rarely may rupture take place spontaneously, as a result of over-distension, *e.g.* in retroversion of the gravid uterus, and various weak conditions of the bladder wall. Sometimes rupture may be due to ulceration, or to sloughing, following inflammation or pressure.

The most common site of rupture is the posterior wall. Urine is poured into the peritoneal cavity, when the rupture is intraperitoneal. Peritonitis may or may not quickly follow, depending on the presence of micro-organisms. When the urine is extraperitoneal it becomes extravasated.

In diagnosis it may be of service to inject a warm aseptic lotion into the bladder; if the viscus be all right, it enlarges, and the fluid can again be drawn off through the catheter.

Treatment.—The condition of shock which is present must be attended to. If the rupture be into the peritoneum, abdominal section should be carried out, the rupture sutured, and the bladder drained by the urethra for days. If it is necessary to wait for a time before this operation can be carried out, the bladder should be drained per urethram, until abdominal section can be carried out. In extraperitoneal rupture it may be sufficient to carry out continuous drainage of the bladder by way of the urethra.

URETERS.

Anomalies.—The ureter may be double on one or both sides. Those of one side sometimes cross in their course. Occasionally a larger number have been reported. It may sometimes open into the rectum, vagina, or urethra; though in such cases the bladder may be absent. It has been

stated that it may sometimes open at the side of the hymen, or in the mons veneris.

Genito-Urinary Fistula.

The following fistulæ may be formed between the urinary and genital passages :— Urethro-vaginal, urethro-vesico-vaginal, vesico-vaginal, vesico-uterine, uretero-vaginal, and uretero-uterine.

Etiology.—Malignant disease of the bladder, cervix, or vagina may establish the fistula. It may be brought about by ulceration resulting from an ill-fitting or a too long-retained vaginal pessary. It may follow a phlegmonous vaginitis or a necrosis of the bladder wall from any cause. It may result from the perforation of fœtal bones which have worked their way into the bladder from a suppurating ectopic gestation sac. In the same way a calculus or vesical foreign body may perforate the wall. In the great majority of cases, however, fistula can be attributed to labour. In connection with this process, it may be brought about in two ways, namely, by direct rupture, associated with or without manual or instrumental interference on the part of the accoucheur ; in most instances the fistula follows a sloughing of tissue succeeding a long-continued pressure of the soft parts against the pubes by the fœtal head.

Pathology.—The most frequent fistula is the vesico-vaginal. It varies in size ; in the most extreme case the whole vesico-vaginal septum may be destroyed. Occasionally more than one opening is found. Some fistulæ may only admit a probe ; others a finger or two. At first the edges of the fistula are swollen. Later on, as cicatrisation occurs, they become thin and hard. Contraction tends to take place in the opening. When the fistula is large, the mucosa of the bladder may bulge somewhat through.

The urethra, through disuse, contracts and may become greatly stenosed. The vagina may be contracted as a result

of the injury which led to the fistula, and may present cicatricial bands. These may give rise to pockets, in which urine may collect and decompose, leading to calcareous deposit. The cicatrisation may cause the vaginal wall to become closely adherent to the pelvic wall; this may sometimes considerably affect the urethra.

Cystitis is often present, and ureteritis is sometimes found; the ureter may be dilated if the cicatrisation about the fistula interferes with the lower end. When the ureter is opened it is usually secondary to a vesico-vaginal fistula; the vesical wound may heal, leaving the opening into the ureter. Where there is an opening in or near the cervix, the irritation tends to keep up endometritis.

Symptoms.—When the fistula is established there is an involuntary flow of urine into the vagina. In connection with labour, if the cause be a tear, this immediately follows delivery; if due to pressure and sloughing, it may be delayed for several days (three to ten). The quantity of urine which escapes depends on the situation and size of the fistula. Where there is a ureteric opening, the bladder acts normally in connection with the normal ureter, but there is a constant dribbling as a result of the fistulous opening into the other.

If a vesico-vaginal fistula be near the cervix, there is only a continuous flow when the patient lies down; in the erect posture, that part of the bladder below the level of the opening collects a quantity of urine, and if the patient makes water frequently there may be only occasional overflow through the fistula. If the fistula be near the urethra, the patient may only be much troubled when standing or walking; when lying on her back she may be able to hold considerable urine in the bladder. When there is a urethro-vaginal fistula, urine escapes into the vagina only during micturition.

As a result of the flow of urine in fistulous cases, there is a urinous odour about the patient. The external genitals are tender; they may become excoriated and inflamed.

Amenorrhœa and sterility are common. The general health may become greatly deteriorated.

Diagnosis.—Large fistulæ may be seen or felt on vaginal examination. A sound may be passed through the urethra into the vagina by way of the fistula. A small fistula may be very difficult to find, owing to its being hidden by cicatricial bands, to its high situation in the vagina or in the cervix, or to its being somewhat obliquely directed. In such a difficult case, coloured fluid, *e.g.* milk and water (sterilised), or solution of potassium permanganate, should be injected into the bladder, and its escape should be watched for by way of the vagina, which is dilated with specula; the vagina should be thoroughly dried beforehand. Sometimes a piece of blotting-paper, placed in the vagina, may be used to catch the first drops of fluid, thus showing the site of the fistula.

FIG. 234.—Right and left vesico-vaginal fistula knives.

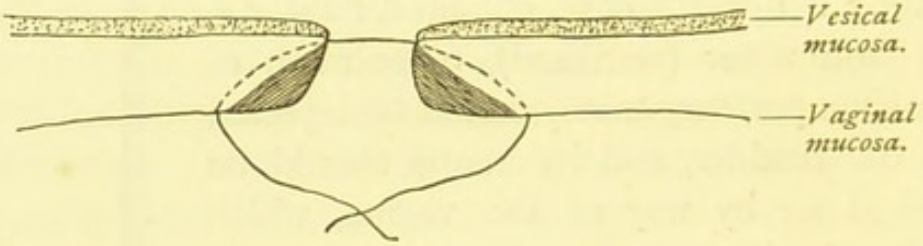
If the fistula communicate with the cervix, it may be well to dilate the cervical canal before making the examination. If the fistula communicate with the ureter only, injection of the bladder is not followed by any escape through the vagina. Sometimes the urine may be seen to escape from the ureteric opening by little jets.

Treatment.—For many years the operative methods employed for the closure of vesico-vaginal fistula have been based upon the principles laid down by Marion Sims, *i.e.* free paring of the edges of the fistula, and adaptation of the raw surfaces by means of sutures. Sims was not the first to suggest this method. It is certain that it was recommended

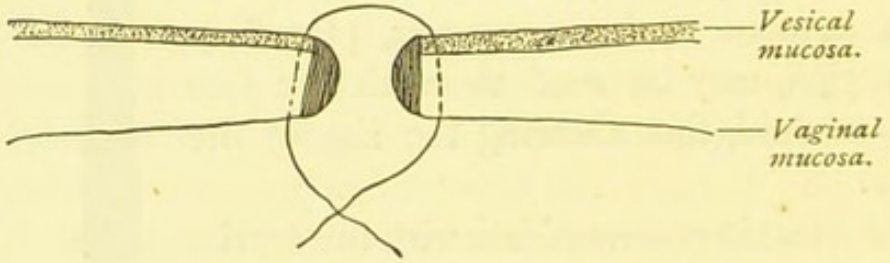
by Van Roonhuysen of Holland, in the seventeenth century, and that Fatio of Basel and others employed it successfully in the eighteenth century.

In the early part of the present century, Hayward of Boston, U.S.A., pointed out the necessity of making a large raw surface, while Mettaner of Virginia advocated the use of the silver suture.

It is, however, to Marion Sims, and later to Simon, that we are mainly indebted for the elaboration of the operation, and for the demonstration of its superiority over the other



Sims' operation.



Simon's operation.

FIG. 235.

methods of treatment. They have, indeed, made universal the plastic operation as the only reliable means of treating fistulæ. Yet, important as the results of their methods have been, there can be no doubt that better results can be obtained by the employment of certain modifications, both in regard to the manner of preparing the raw surfaces and of uniting them.

Sims and Simon recommended that the edges of the fistula should be rawed by the removal of a strip of tissue, extending from the vaginal to the vesical mucosa. The former pared the edges by a sloping incision, which did not

divide the latter, but passed close to it. Simon made an incision less sloping, which did not specially avoid the vesical mucosa.

The improvements upon these methods which are to be recommended may be best considered in relation to the following varieties of fistula, classified according to size:—

1. Very small.
2. Small or medium.
3. Large.
4. Very large.
   (*a*) With lower edge not cicatrised close to pubes.
   (*b*) With lower edge cicatrised close to pubes.
5. Utero-vesico-vaginal.
6. Utero-vesical.
7. Urethro-vaginal.
8. Uretero-vaginal.
9. Uretero-cervical.
10. Incurable.

1. **Very small fistulæ**, *i.e.* those through which only a probe or sound may be passed.

In these cases it is entirely unnecessary to employ the Sims or Simon method. The following plan is more easily carried out, and is thoroughly effective.

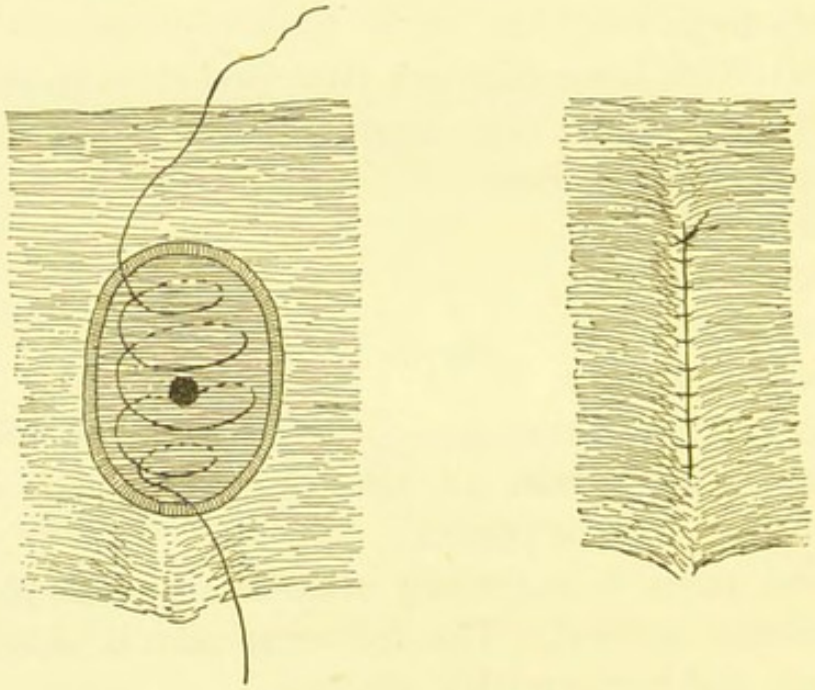
The patient is placed in the lithotomy position. The cervix uteri is drawn down, and the anterior vaginal wall exposed, as in the operation of anterior colporrhaphy.

A small oval flap of vaginal mucosa, $\frac{1}{2}$ in. or $\frac{3}{4}$ in. in diameter, is dissected from the anterior wall of the vagina, the fistula being in the centre of the flap.

Then, with a continuous catgut suture, applied in two or three stages, the raw surface is closed until only a longitudinal wound is left. In this way the fistula is covered by a thick mass of vaginal tissue.

2. **Small or medium-sized fistulæ**, in which there has been no loss of tissue, and whose edges may be approximated fairly closely.

Here it is not a good principle to remove a strip of tissue, as recommended by Sims and Simon. Every gynecologist has had experience of ill-success by the use of their methods in these cases. Sometimes this is due to too great tension on the stitches. Sometimes, in fear of this danger, too small an amount of tissue is removed, so that either non-union or only partial union results. In successive attempts new raw surfaces are obtained only by renewed paring of the edges.



a. *b.*

FIG. 236.

a. Raw surface with fistula in its centre, and first stage of continuous suture.

b. Appearance of vaginal wall after closure of raw surface.

Such cases may require five, six, or more operations before permanent cure can be effected.

There can be no doubt that the method of denudation by removal of tissue is bad in these cases. Just as in the operation for perineal repair, this principle has been displaced by the flap operations of Lawson Tait and A. R. Simpson, so the Sims and Simon methods must be abandoned, in the cases of vesico-vaginal fistula

now under consideration, for the flap-method introduced by Walcher, called by the French *auto-plastie par dédoublement.*

The operation should be performed as follows:—The patient is placed in the lithotomy position, the anterior vaginal wall being exposed in the ordinary manner, and steadied with forceps applied near the fistula. The edge of

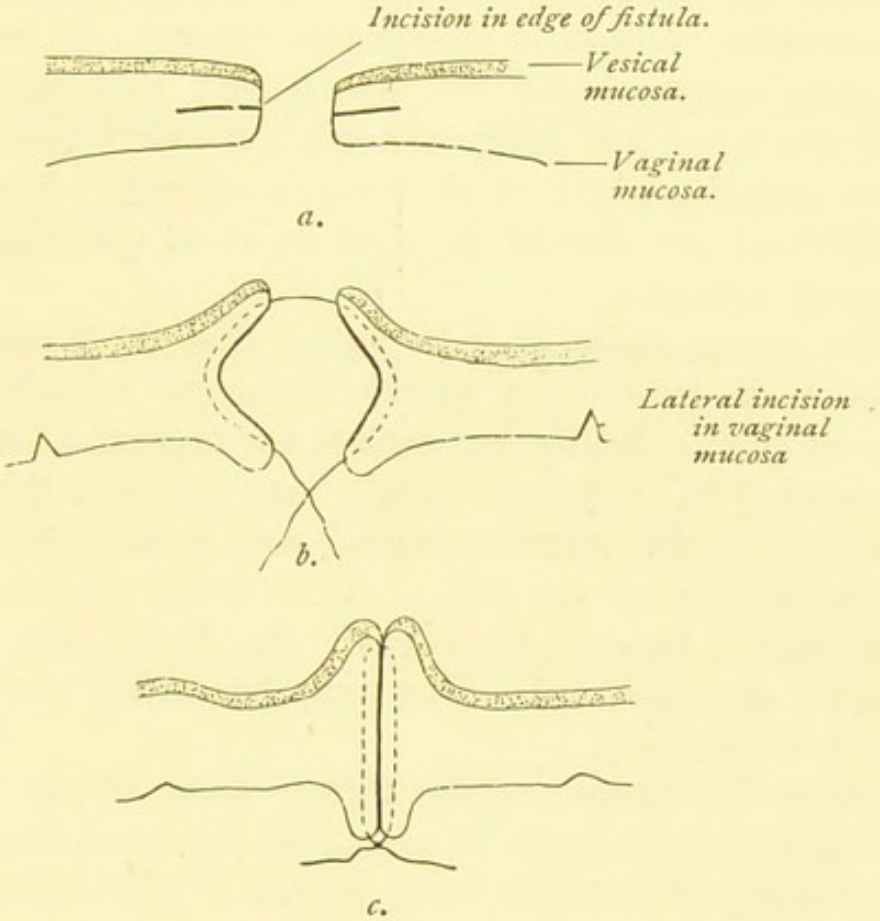


FIG. 237.

a. Edge of fistula with incision.
b. Flaps separated and suture passed.
c. Raw surface of flaps approximated.

the fistula is then divided to the depth of $\frac{1}{4}$ in. or thereabouts, so that a vaginal and a vesical flap are formed. In the operation originally described by Walcher this was preceded by the removal of a thin strip of tissue from the extreme edge of the fistula. Winckel, however, in an im-

portant paper, which he published in 1891, highly recommending this new method, showed that such a step was unnecessary. If the vesical flap be now pushed inwards, and the vaginal flap pulled outwards, it will be seen that a large raw surface exists all round the fistula. Sutures are next applied. Walcher brought the vesical flaps together with catgut, and the vaginal flaps with silk. This is not necessary. Catgut alone may be employed either by the continuous method or by separate sutures. In either case a deep series should be first passed, each one entering the raw tissue just inside the edge of the vaginal mucosa, and emerging close to the vesical mucosa. Afterwards a superficial set should be used to close the edges of the vaginal mucosa.

In certain cases, if it be feared that the tension of the stitches is excessive, a simple means of relieving it may be adopted. Before the sutures are applied a longitudinal incision $\frac{1}{2}$ in. or $\frac{3}{4}$ in. in length may be made through the mucosa of the anterior vaginal wall, somewhere near the outer border of the wall. As a result of this incision the vaginal flaps at the edge of the fistula may be more readily approximated. This may be carried out on both sides, if necessary.

After the closure of the fistula, these lateral incisions, which have been made to gape, may be closed more or less thoroughly, the sutures being passed at right angles to the original incision.

3. **Large fistulæ**, in which there has been some loss of tissue. When the fistula is large, and its edges cannot be approximated owing to the loss of tissue which has occurred, it is useless to attempt its closure by the Sims method or even by *dédoublement*.

For such cases the following method may be tried. It has been described by Professor Ferguson of Chicago, in the *American Journal of Obstetrics* for April 1895. It was, however, first employed and recommended by Martin

of Berlin in 1891. The operation is based upon Volkmann's procedure in ectopia vesicæ.

The patient is placed in the lithotomy position. The anterior wall is well exposed, and held with three or four pairs of forceps. An incision is made through the vaginal mucosa around the fistula, at a distance from its edge of little more than half the average transverse diameter of the opening. This flap is then dissected almost to the edge of

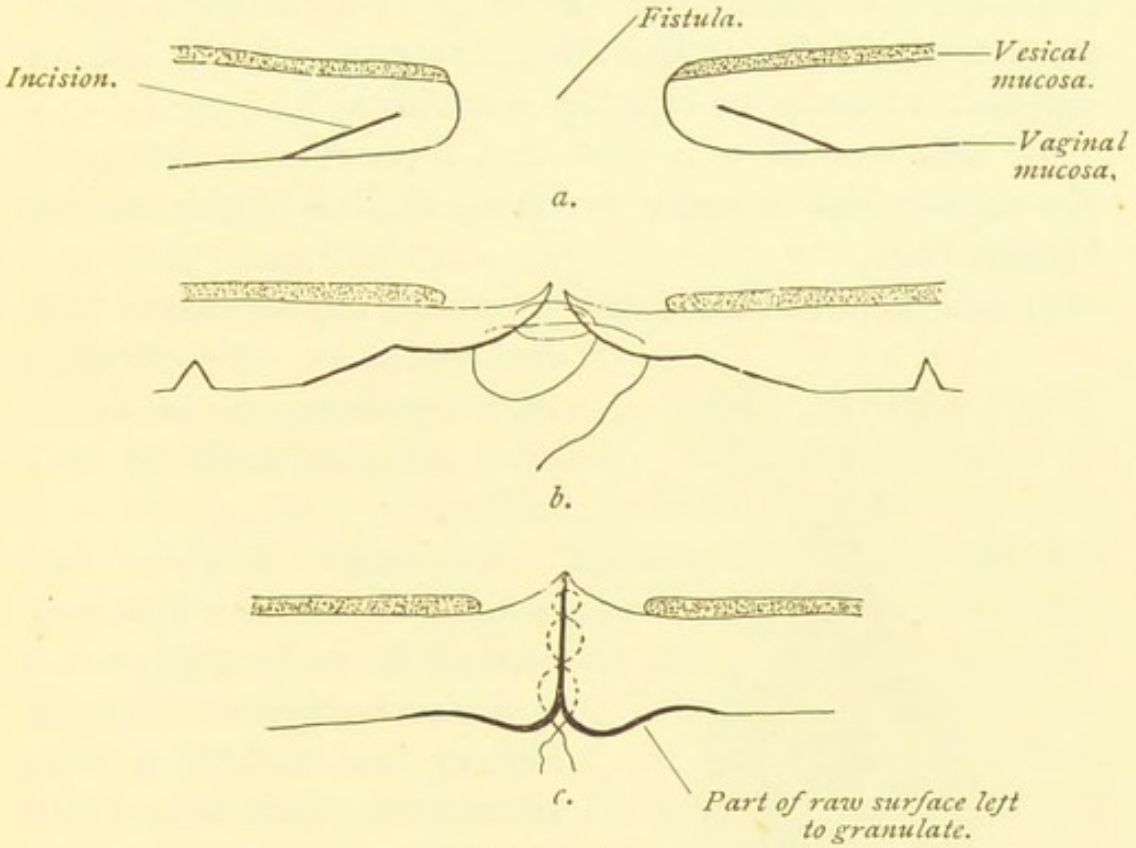


FIG. 238.

a. Incision around fistula.
b. Flap turned inwards and suture introduced.
c. Raw surfaces of flap approximated by means of suture.

the fistula, and is then turned inwards so as to bridge across the opening.

It is thus evident that the vaginal surface of the flap has been turned towards the bladder, while a considerable raw surface looks towards the vagina, part of which belongs to the flap, part to the vaginal wall from which it was dissected.

The edges of the flap are next brought together with catgut, and the whole raw surface is closed as much as possible with continuous catgut suture, just as in the operation of colporrhaphy.

If necessary, the lateral incisions, recommended in the last-described operation, may be made, in order to allow of the approximation of the edges of the wound with as little tension as possible.

If the raw surface be too large to allow of complete closure, the vaginal edges of the wound may be left unstitched, in order to heal by granulation.

By this method it is seen that the turned-in surface of the vaginal flap becomes the inner surface of the restored bladder-base.

If this method should not be completely successful after one operation, any fistulous tract remaining can be closed by a subsequent plastic procedure.

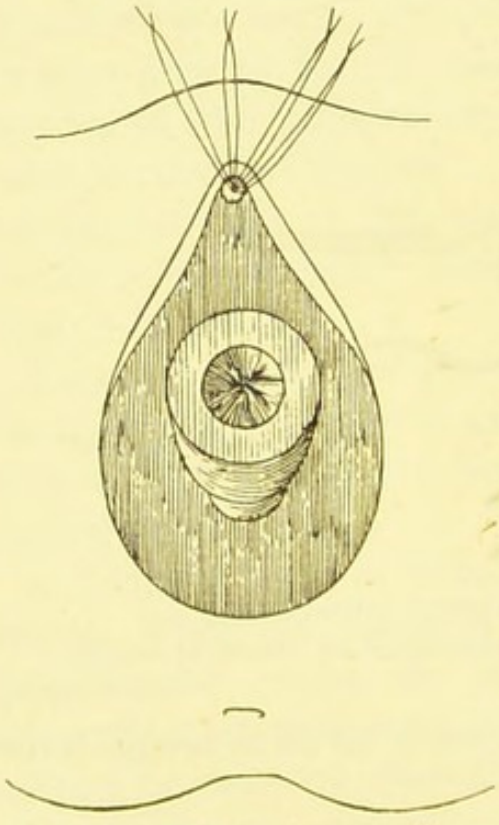


FIG. 239.—Bishop's operation for vesico-vaginal fistula.

Stanmore Bishop has recommended the following method in such cases:—

A circular incision is made around the fistula, passing through the mucosa and part of the underlying tissue, so that a continuous flap can be raised and separated near to but not through the edge of the fistula. Through four equidistant points in the margin of the turned-in flap threads are passed, their outer free ends being knotted. Then a curved pair of forceps is passed through the urethra until its beak reaches the fistula, where it grasps the knotted

ends of the four threads. These are thereby drawn through the bladder and out through the urethra. Gentle traction is made on the threads so as to invert the circular flap into the bladder. Just before this inversion, however, the edges of the flap are well approximated by means of a fine silk suture carried round the flap near its free margin. It is tightened and tied just after the process of inversion.

The urethral threads are then drawn upon, further inverting the flap, and the raw surfaces may be still more approximated by means of another circular suture. In this way the fistula is closed.

The urethral threads are then cut and withdrawn.

4. **Very large fistulæ.**[1]—(*a*) Those in which the lower edge of the fistula has not been cicatrised close to the pubic bone.

For such cases there can be no doubt as to the superiority of Mackenrodt's method. This is as follows:—After fixing the cervix and anterior vaginal wall with forceps, a mesial longitudinal incision is made through the base of the bladder and the vaginal wall at the lower and upper parts of the fistula, which is thereby made continuous with the incisions. In this way the bladder is opened from cervix to urethra. The edge of the whole opening is then split, so that the bladder is thereby separated from the vagina for a short extent around the edge.

The bladder is also separated from the cervix for a

[1] Other methods of treating these fistulæ are not to be recommended. I refer to such as the following:—Trendelenburg (*Deutsche med. Wchnschr.*, Leipzig, 1892, No. 23, S. 518) opened into the bladder extraperitoneally from above, cutting through the abdominal wall close to the upper margin of the symphysis. Wikhoff (*Wien. klin. Wchnschr.*, 1893, No. 11, S. 195) tried the same plan, performing symphyseotomy in addition; the latter procedure gave no advantage, scarcely any separation of the bones being obtainable. Dittel (*Wien. klin. Wchnschr.*, 1893, No. 25, S. 448) performed a laparotomy, separating the cervix from the bladder and then closing the fistula.

considerable distance from the upper end of the incision. In this way it is made possible to bring the edges of the bladder wall into apposition at the fistula. These are next united by a series of catgut sutures, extending from the cervix to the urethra. Afterwards, the vaginal flaps of the fistulous margin are sutured. If there be any difficulty in carrying out the closure of the latter at the upper angle of the wound, the cervix may be drawn down and the vaginal flaps stitched to its posterior rawed surface.

(*b*) Those in which the lower edge of the fistula is cicatrised close to the pubes.

For these the method advocated by Schauta is the best yet devised. A vertical incision is made through the labium majus on the side on which the cicatrisation exists. It is carried deeply as far as the ramus. Then, with the finger and a spatula, the vaginal wall along the cicatrised edge of the fistula is separated from the bone. The wound is then stuffed with gauze, while the edges of the fistula, which are now easily brought together, are rawed and closed. Afterwards, the outer wound is closed.

5. **Utero-vesico-vaginal fistulæ**, those in which at the apex of a tear in the cervix there is an opening into the bladder.

These may be closed simply by making a raw surface around the fistula, and closing it with continuous catgut. To get a complete exposure of the opening it may be necessary to split the cervix at some point.

This method may not be successful if the fistula be difficult of access, and it does not leave the woman free from danger of reopening at another confinement. It is therefore better to employ the operation used in the treatment of utero-vesical fistula, next to be described.

6. **Utero-vesical fistulæ.**—For these there can be no doubt that the following method is the best. A transverse incision is made in the anterior fornix, and the bladder

separated from the cervix as far up as is necessary to allow the fistulous tract to be well exposed.

The vesical and cervical portions of the tract are then closed separately with catgut sutures. Afterwards, the wound in the anterior fornix is closed.

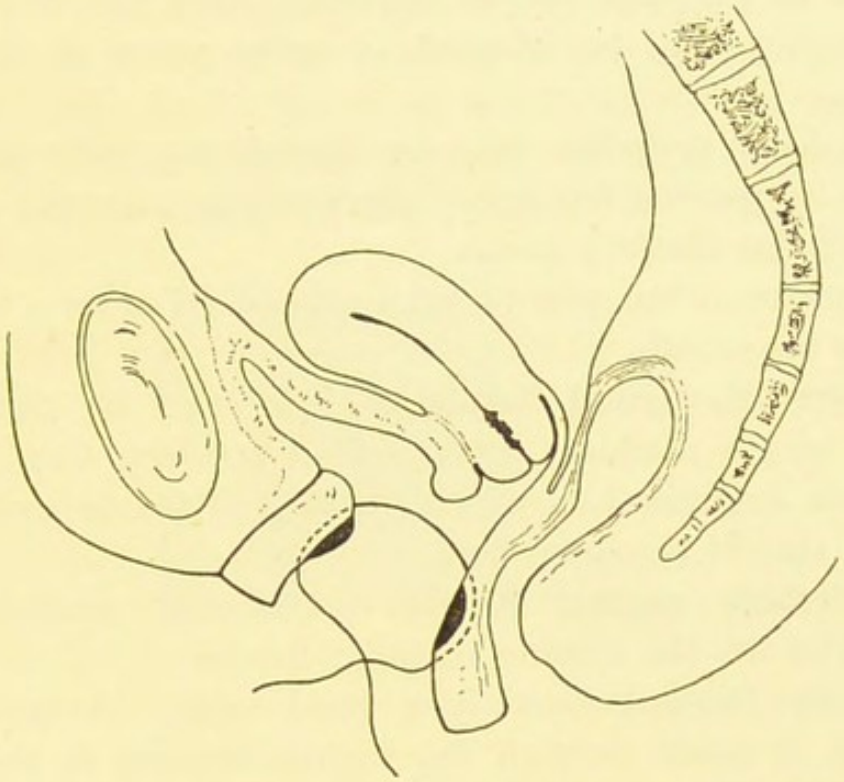


FIG. 240.—Kolpokleisis. The diagram represents the application of the sutures after the raw surfaces are made.

This method was first employed in England by Champneys, but it has also been used successfully abroad by Follet, Wölfler, Winternitz, and others.

All these operations should be preceded by the most thorough disinfection of the mucosa of bladder, vagina, and uterus; the strictest antiseptic precautions being observed during the operation.

Catgut is sufficient for all sutures, Lister's chromic gut, Nos. 2 and 3, being serviceable; it should, however, be thoroughly soaked in carbolic lotion (1 to 20) before use. The best needles are Martin's small full-curved variety; his simple needle-holder is also the best.

After the operation it is probably best to drain the bladder, per urethram, by a soft metal catheter. One should be used at night and another during the day, the unemployed one being kept in an antiseptic lotion. The catheter must be passed carefully, so as not to tear the wound in the base of the bladder. After five or six days the patient may be allowed to make water at short intervals.

Iodoform pessaries may be introduced daily into the vagina for the first few days; afterwards an antiseptic douche may also be carefully given.

Ammonium benzoate or salol may be given for a week or two by the mouth.

7. **Urethro-vaginal fistulæ.**—These may be closed by either of the methods described on pp. 625, 627.

When a urethral as well as a vaginal fistula exists, the former should be closed first.

8. **Uretero-vaginal fistulæ.** — Different methods are employed for the closure of these fistulæ.

Pozzi's flap-operation is a good one. A transverse incision is made through the vaginal mucosa at the level of the fistula, extending outwards on each side for about three-eighths of an inch. At each end an incision is made at right angles. Each flap is dissected back for about three-eighths of an inch. They are raised, and the fistula is seen in the centre of the raw surface. The flaps are then drawn together, their raw surfaces being in apposition. Stitches are carefully applied.

Landau adopts another plan. If there be no large opening into the bladder in connection with the fistula, he makes one by the removal of an oval strip in the direction of the ureter. A fine elastic catheter is passed into the ureter, and carried into the bladder through the urethra. A raw surface is made around the fistula, and then closed with stitches, care being taken not to pass them around the catheter. The catheter is left *in situ* for several days.

9. **Uretero-cervical fistulæ.**—These cannot be repaired successfully. Closure of the vagina or removal of the kidney on the affected side may be recommended.

10. **Incurable urinary fistulæ.**—Closure of the vagina or kolpokleisis may be recommended. First of all, if there be no large communication between the bladder and vagina, one should be made by excising a portion of the walls. The opening should be about two-thirds of an inch in diameter. After the edges of the incision have healed closure of the vagina is carried out. A circular ring of

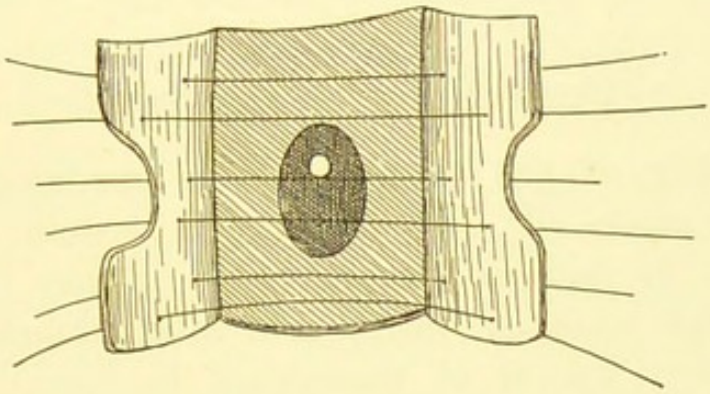


FIG. 241.—Pozzi's method of closing a uretero-vaginal fistula.

vaginal mucosa is dissected off, half an inch or more in width. The raw surfaces are brought together with silk-worm gut or linen sutures.

The patient is placed in bed, and treated as after a vesico-vaginal fistula operation.

When healing takes place, it is evident that the upper part of the vagina has been transformed into a diverticulum of the bladder. Menstruation thereafter occurs by way of the urethra.

If hæmorrhage occur from the wound, vaginal plugging may be necessary, if a hot douche does not check it. If the bladder fills with clot, the urethra should be dilated and the clot broken up with a wire loop.

When hæmorrhage cannot be stopped, fresh stitches must be applied.

Should the ureter be hurt, or included in a ligature, there is pain in the loins, vomiting, and rise of temperature. In such a case the offending ligature must be removed; otherwise, it will ulcerate through the ureter.

Incontinence of urine may last after the fistula has been closed, from loss of tone in the muscular fibres surrounding the urethra owing to disuse.

For this condition various medical means are tried—*e.g.* electricity, strychnine, massage, hot douches. Some recommend the removal of a small amount of tissue in order to diminish the calibre of the outer portion of the urethra.

Disorders of Micturition.

Irritability of the bladder. — This condition may be used to include all cases in which a woman micturates or desires to micturate frequently. It may be due to states of the urine, *e.g.* highly acid urine, abundant urates in the gouty, excess of phosphates in nervous women, oxaluria.

Various affections of the bladder and urethra may cause it, *e.g.* cystitis, contracted bladder, calculus, new growth, fissure of urethra, caruncle, urethritis; it may be due merely to a full bladder. It may be associated with various affections in neighbouring parts, *e.g.* swellings of all kinds pressing on the bladder, prolapsus uteri; or it may be reflex, from such conditions as fissure of the anus, piles, intestinal worms, irritating vaginal and vulvar discharges, operations in various parts of the pelvis. It may be due to certain conditions of the kidney, *e.g.* chronic Bright's disease, acute parenchymatous nephritis, sometimes cystic degeneration, stone, pyelonephritis, tuberculosis.

It is found in certain remote diseases, *e.g.* diabetes, in certain conditions of locomotor ataxia. It may occur in neurotic or hysterical women, in times of emotional excitement, and in various mental states. It is found in early and

in late pregnancy. It is important to distinguish between this state and the condition of overflow from a distended bladder.

Retention of urine, complete or partial, is the state in which normal emptying of the bladder does not take place. It may be found in a variety of conditions, *e.g.* in such conditions as fevers, shock, injury to brain and spinal cord, general paralysis, various kinds of insanity, locomotor ataxia, myelitis of cord, hysteria; neighbouring inflammations, *e.g.* acute peritonitis, cellulitis; pressure on the neck of the bladder, *e.g.* by tumours, retroversion of the gravid uterus; obstruction in the urethra, *e.g.* polypus, blood clot, calculus; contraction of sphincter may be caused by various local conditions, *e.g.* acute gonorrhœa, operations on various pelvic conditions, *e.g.* piles.

Incontinence of urine may be marked by continuous dribbling or by intermittent evacuations. This condition may be found in hysteria; in various injuries or diseases of the brain and spinal cord where the sphincter power of the neck of the bladder and urethra is lost, *e.g.* in certain stages of locomotor ataxia, epilepsy; in advanced tuberculosis impairing the sphincter action; in vesico-vaginal fistula; dilatation of the urethra; intoxication; in various forms of stupor, *e.g.* typhoid state; it may be due to strong stimuli acting on the bladder, urethra, or neighbouring parts, *e.g.* applications to neck of bladder or inner end of urethra; acute cystitis, calculus, sudden submucous hæmorrhages, caruncle, fissures, inflammation in tubes, ovaries, uterus, rectum; it may be found in early pregnancy.

In childhood there may be a true incontinence due to sphincter paralysis, hyperæsthesia of the vesical mucosa, some localised trouble, or a nervous condition; but in the majority of cases the irritation is reflex, from such conditions as oxaluria, lithæmia, worms in the bowel or vagina, polypi of rectum, eczema of vulva or perineum, etc., and is in most

cases only found at night. Once the habit is formed, it may remain long after the cause is removed.

It is of great importance to distinguish between incontinence of the above varieties, and that which is due to the dribbling overflow of a distended bladder, such as may be found in locomotor ataxia and some other nervous diseases, in retroflexion of the gravid uterus, etc.

Pains in the urinary tract.—Pain in the bladder may be continuous or only at times of micturition; it may be due to actual disease, *e.g.* cystitis, tuberculosis, new growth, especially carcinoma, calculus. The differences in this symptom I have considered under the various headings. The pain may be out of all proportion to the lesion, *i.e.* the patient may be extremely sensitive or neurotic. In some cases of neurosis there may be no local lesion whatever. It may be due to organic nerve disease, *e.g.* locomotor ataxia.

Bladder pain may be merely referred, *e.g.* from the kidney. There may be disease in the kidney, such as stone or tuberculosis, and the pain may be felt only in the bladder. Or it may be referred from several diseased conditions in the pelvis. Thus Fenwick says that stone in the bladder may be simulated by a variety of conditions. It is important, also, to note that the bladder may be the seat of disease, though the pain may be referred to some other part, *e.g.* kidney, sacrum.

Pain in the urethra may be due to inflammation, new growth, caruncle, fissure; it may be referred from bladder, from extravesical, pelvic, or renal states.

Pain in the ureter may be caused by the passage along it of a stone, blood clot, a slough, a mass of débris, *e.g.* mucopus; it may be due to ureteritis; it may be owing to various renal conditions, *e.g.* stone, etc., especially those which tend to block its upper end; it may be found in twists or constrictions of the tube.

Pain in the kidney is felt in different conditions, though

there are great variations. Cancer causes it usually only in the late stages; but it may be early, if blood clots pass into the kidney pelvis, if the growth be rapid, if stone form, or inflammation occur. Sudden increase of tension, *e.g.* from congestion or back pressure from the lower urinary tract, may produce this dull feeling in the loins.

Calculus, which is loose in the pelvis, usually causes bad pains, which may be very intense, because of the irritation to the mucous membrane, because of accompanying inflammation, or obstruction of the ureter. In some cases very large stones may be present in the kidney without any symptoms, or with only an occasional aching in the loins.

In tuberculosis there is generally only a dull feeling in the loins, but where the pelvis of the kidney is affected there may be severe pains. Hydronephrosis, developed slowly, is usually accompanied only by a dull aching in the loins, which may be occasional or constant. If the condition is developed quickly, intense pain may be caused.

It is important to note that in some cases of kidney trouble the pain may be felt elsewhere. Thus stone in one organ may cause symptoms only in the other. The pain may be referred to the ureter, to the bladder, to distant parts, such as the shoulder, groin, thigh, leg. Pain may be caused in the region of the kidneys by organic nervous disease, *e.g.* locomotor ataxia; in neurotic conditions, by myalgia in neighbouring fasciæ and muscles; in pleurisy of the lower part of the chest.

Suppression of urine.—This condition may be due to shock; to reflex causes, *e.g.* injury to a kidney, sudden blocking of a ureter, injury to the lower urinary tract, operative procedures; to acute septic changes spreading to the kidneys; sometimes it is found in acute Bright's disease; sometimes in advanced inflammatory and cirrhotic forms of Bright's disease; rarely, it is found in hysteria. It may be caused by impaction of calculi in both ureters; by stricture of both ureters in advanced carcinoma in the

pelvis; impaction of a calculus in a ureter, the kidney of the opposite side being destroyed; new growth of bladder implicating both ureters. Thus suppression may be absolute, or a little urine may be passed. The condition must be distinguished from retention.

CHAPTER XXII.

CERTAIN AFFECTIONS OF THE RECTUM.

Rectocele.—In this condition there is a protrusion of the lower part of the anterior rectal wall along with the posterior vaginal wall into the vaginal slit. I have already referred to it (*vide* p. 576).

Prolapse of the rectum.—This may be partial, when only the mucosa is prolapsed, or complete, when the whole wall is down. The former is the most common.

Etiology.—It may be due to the dragging down of piles or new growths attached to the mucosa, to inflammatory exudation outside the mucosa; chiefly, to severe or prolonged expulsive efforts, especially where the anal sphincters are relaxed; thus it may be found in all conditions where the patient has to strain hard to make water. Sometimes it is due to parasites in the bowel or to diarrhœa. It is more common in early than in advanced age. Complete may follow partial prolapse.

Physical signs.—In *partial prolapse*, the red protruding mucosa is visible, the sulci between the folds radiating from the lumen; the mass does not reach a large size. After defæcation the mass may be returned; in old cases replacement may be difficult, and prolapse may develop at times other than defæcation. There may be a muco-purulent discharge, and slight bleeding often occurs.

In complete prolapse, a large mass may be formed outside the anus, on which the sulci between the mucosal folds are mainly parallel to the margin of the anus. The

peritoneum descends with the prolapse especially in front, and surrounds it except where the mesorectum is attached. Hernia of intestine may take place into the peritoneal pouch. The prolapse may rupture, may ulcerate or slough, and peritonitis may follow.

Treatment.—The prolapse should be reduced. If necessary, a pad may be placed over the anus, and the nates fastened together with plaster. In many slight cases it is sufficient to see that the bowels are regulated carefully, and that they are moved in the dorsal or lateral posture; it is best to do this at bedtime, so that rest follows the act. The anus may be washed with cold water, alum, or oak-bark lotion. In some cases more active measures are necessary.

Where the prolapse is not great nor of long standing it may be sufficient, after reduction of the prolapse, to dilate the anus with a speculum, and to cauterise the mucosa by a dull red point in a series of vertical lines extending from 3 to 4 in. above the anus, down to the junction of the anal mucosa and skin. The patient is then kept in bed for a week or two, the bed-pan being used for two weeks or more when the bowels are moved, enemata of warm water being given to help defæcation.

Where this method fails, or in cases where the prolapse is of old standing, Robert's operation may be performed. The bowel is cleansed and reduced, the patient being in the lithotomy posture.

A mesial incision is made into the skin just in front of the coccyx. With a finger the posterior connections of the bowel are separated. Then with a bistoury a triangular piece of tissue is removed, including skin, cellular tissue, and sphincter; the base of the triangle is the margin of the anus. Next a triangular piece of the posterior bowel wall is removed, the apex being about 3 in. from the anus. The edges of the rectal incision are then tied with catgut sutures on the mucosal surface. The outer wound is then

closed. Afterwards, iodoform pessaries should be passed into the anus daily.

In irreducible cases Mikulicz's plan may be tried. The outer covering of the prolapsed portion is divided transversely in its anterior half by an incision from two-fifths to three-fifths of an inch from the anus. Then an incision is made on the posterior half at from three-eighths to six-eighths from the anus. If a hernia of small intestine be found on reaching the peritoneum, it should be reduced, the sphincter ani being cut if necessary to effect this.

A strip of the anterior portion of bowel wall is dissected off, and the edges of the raw surface are brought together with sutures. The same procedure is carried out on the posterior position. Then the gut is reduced, and iodoform pessaries introduced.

Fissure of the anus.—This is an ulcer or crack in the mucosa internal to the anal opening, or in the skin at the opening. It leads to pain of a distressing nature, especially after defæcation. There is pain on examination with a finger. It may cause vaginismus, and pains may be reflected to other parts, *e.g.* loins, groins.

Treatment.—A good plan consists in passing a tenotomy knife under the base of the fissure, and cutting through it, dividing the fibres of the sphincter close to it. Equally good is the plan of stretching the sphincter, so as to paralyse it for a few days. In addition, some operators prefer to cut away the ulcer or fissure.

Hæmorrhoids or piles. — These are very common in women. For an account of the condition a work on surgery should be consulted.

Recto-vaginal fistula. — This condition is caused by rupture in labour, by necrosis following long-continued pressure of the head, by the ulceration of a foreign body, by carcinoma, by abscess formation.

Treatment.—Where cancer is not the cause, the following method may be employed. Small fistulæ may be made to

heal by the use of the cautery or nitrate of silver. If of some size, operative repair is to be carried out. The same principles are to be observed as have been noted in the repair of vesico-vaginal fistulæ.

Thus a posterior colporrhaphy may be sufficient to bring about closure. The *dédoublement* method is valuable in some cases. When the fistula is low in the recto-vaginal septum, it is best to divide the perineal body in the middle line below the fistula and then to repair the parts as in the case of a complete tear into the anus.

Rectal fistula.—This may be complete, when it extends from the skin to the mucosa, or it may be incomplete, where there is only one opening; of the latter, there are two varieties, in one of which the opening is internal—blind internal fistula; in the other of which it is external—blind external fistula.

Most commonly the cause is ischio-rectal abscess, which may be independent of or due to changes in the bowel wall. Sometimes there may be more than one external opening, but there is usually only one internal. Sometimes the internal and external openings may be on opposite sides of the bowel, "horse-shoe" fistula. On examining the patient the internal opening is hard to find.

The condition is a distressing one, causing escape of gas or fæcal discharge and incomplete fistula, sometimes blood. Tenesmus may be present. If the fistula get blocked, pain may be set up and a second suppuration started.

Treatment.—If the tissue around the fistula is in a healthy condition, the following plan may be carried out:—

A probe is passed to the top of the fistula into the bowel. With a bistoury the tissues are divided from the anus to the probe. Any secondary sinus or fistula is then opened up, and the fistulous surface is curetted until it is raw. The wound and the bowel are thoroughly cleansed with an antiseptic, and then the raw surface is completely closed with continuous catgut or with interrupted sutures.

Morphine and iodoform suppositories are passed daily into the bowel.

When the tissues are not healthy enough to ensure healing, it is best, after incision and curetting, to pack the cavity with iodoform gauze, and to allow gradual healing from the depth of the wound to occur.

Gonorrhœal inflammation.—Sometimes the rectal mucosa may be the seat of an acute gonorrhœal purulent inflammation. If there be piles, prolapse of the mucosa, fissure, or relaxation of the sphincter, the liability to infection from the vulvar or vaginal discharge will be greater. The disease causes much pain and local distress. Gonococci are found in the discharge usually.

Ulceration.—Different forms of ulcers are found. One is associated with congestion in the mucosa; it tends to be very chronic, has irregular edges, and bleeds occasionally.

The follicular ulcer may be single or multiple; it arises in connection with the solitary follicles of the mucosa. I have already described the irritable ulcer in fissure. Ulceration may be due to tuberculosis, and may be primary or secondary. It may occur in connection with carcinoma.

New Growths.—The following are the most common benign growths which occur:—

Adenoma, which grows as a pedunculated, irregularly lobulated mass.

Fibroma, which also tends to become polypoidal; this may often be developed directly from internal piles.

Papilloma, a rare form, polypoidal, with short villous projections, covered with columnar epithelium. A form may grow at the anus, warty in nature, covered with squamous epithelium.

Symptoms.—Polypi may cause no symptoms in some cases, especially where they are high. When they are low they may cause a feeling of unpleasantness in the bowel, and there may be expulsive efforts, with tenesmus, mucous discharge, bleeding.

Treatment.—These may be removed by drawing down the tumour, applying a pair of forceps to the base of the pedicle, and cutting away the tumour outside the forceps. The latter are left attached for two or three days. Some operators prefer to ligature the pedicle.

The following malignant growths are found :—

Carcinoma.—The most common form is the malignant adenoma or columnar-celled epithelioma. The scirrhous, medullary, and colloid forms are also found, and also the squamous epithelioma of the anus.

The condition may be primary, or it may be secondary to uterine cancer, in which case it grows 4 in. or more above the anus. Primary cancer is most frequent in the lower portion of the rectum.

The disease may be annular, in nodules, or on one side of the bowel. Sometimes it may be polypoidal. Ulceration may occur, and surrounding parts tend to be infiltrated. The bowel gets constricted. Glands get infected ; when the disease begins within the anus, the pelvic and lumbar glands are first involved. When the skin at the anus is diseased the glands of the groin are involved, or these may enlarge where there is extensive infiltration of the pelvic glands. Metastatic growths develop, *e.g.* in liver, peritoneum, pancreas, lungs, etc.

Sarcoma is rare. It has been found as an infiltration inside the anus, or as a mass bulging at the anus. Melanotic sarcoma may rarely be found (according to Virchow the only part of the intestine in which it is found).

Symptoms.—The symptoms are usually very insidious in the early stages. Pain is a common symptom, but it varies in different cases ; it is usually worst when the anus and surrounding structures are encroached upon. Bleeding is generally present. There is also a fœtid discharge in many cases. There may be diarrhœa or constipation, or an alternation of both these conditions.

Defæcation may become very painful. The digestion

gets out of order, the health runs down, and cachexia gradually becomes established as toxic matters are absorbed into the system. Œdema of a leg may develop in the later stages. Perforation of the vagina, uterus, or peritoneum may occur.

Treatment.—Extirpation should be tried in early cases. There are two methods of performing the operation :—

1. *By resection of the coccyx and part of the sacrum.*—The patient is placed on her left side. A crescentic incision is made over the sacrum, reaching from the posterior part of the right sacro-iliac joint to the left of the anus. When the bone is exposed the structures attached are divided, and then the sacrum is divided transversely with forceps or chain saw, below the second lowest sacral foramen. The rectum is then separated from surrounding tissues near the anus.

If possible, the peritoneum should not be opened, but should be stripped upward off the bowel. If it be necessary to open into the peritoneum, the bowel should be drawn down after this is done, and the opening should be closed with sutures well above the disease. The rectum, from the anus upward, is thoroughly separated from surrounding structures.

Two courses may now be carried out—(*a*) In the one case, the lower part of the rectum containing the diseased portion may be entirely removed and the anus closed. The end of the bowel above the line of division is then drawn backwards and stitched to the skin edges below the sacrum, thus forming an artificial anus. The rest of the wound is stuffed with iodoform gauze, and allowed to heal slowly. In such a case, if the posterior vaginal wall be infiltrated, it may also be removed. All glands affected alongside the bowel must be removed.

(*b*) In the other case, the piece of rectum containing the disease is removed and the two ends of the bowel are then stitched together, the rest of the wound being stuffed with iodoform gauze.

When there is plenty of bowel to pull down, Kocher's

plan of suturing it may be tried. Before the division of the gut above the disease a ligature is placed around it just above the line of incision. The bowel is then cut below this ligature, and at the top of the internal sphincter. The mucosa of the anus is then stripped downwards and removed.

Then, by means of the ligature, the end of the rectum is drawn down through the anal canal, to which it is stitched with a number of sutures. The protruding part of the rectum is cut off below the ligature, which is left attached, and allowed to drop off of its own accord. In this way the bowel contents are kept from infecting the wound. The wound is then stuffed with gauze, which is brought out at the lower end, the skin edges of the upper portion being brought together with interrupted sutures. In three or four days the gauze may be removed, the cavity washed out, and fresh gauze inserted.

2. *By a parasacral incision.*—The patient is placed in the lithotomy or left lateral position. An incision is made from behind the anus to the upper end of the gluteal cleft, and thence to the left as far as the posterior inferior iliac spine. The tissues attached to the left edge of the coccyx and lower part of the sacrum are divided, and the rectum is freed from surrounding tissues, as above described. At this stage it is a good plan to plug the rectum as high as possible with iodoform gauze. To exercise traction on the rectum on freeing it, a loop of gauze may be passed around it. With this incision the coccyx may be removed if necessary.

After the removal of the diseased part, the bowel end may be brought to the anus and treated as above described.

Note.—In these cases the operation should be preceded by the most careful emptying and cleansing of the bowel.

When the bowel first moves a few days after the operation, opening medicine should be given, and an oil or

glycerin enema administered before the motion. When extirpation is impossible, palliative measures must be adopted. Where there is much obstruction, a colotomy may be carried out with advantage to the patient.

Stricture of the rectum.—This may be due to malignant disease. It may also be due to syphilitic ulceration, or possibly to some other form of ulceration, leading to cicatrisation. It may be due to new growths and other swellings outside the bowel.

Symptoms.—These may be very vague. In the non-malignant cases, the most frequent are diarrhœa alternating with constipation. The motions may be narrow, but this condition may be produced where there is no stricture in the rectum.

Treatment.—Dilatation with bougies may be necessary, and must be carefully carried out. Sometimes division of the stricture may be performed; the posterior wall of the anus and rectum is also divided back to the sacrum, the wound stuffed with gauze and allowed to heal by granulation. Excision of the stricture has also been carried out. Sometimes it may be necessary to perform colotomy where the stricture is bad and cannot be improved by local means. Where the stricture is due to some condition outside the rectal wall, treatment must be directed to that condition.

Pruritus ani.—Itchiness about the anus may be a very troublesome affection. It may be due to scabies, pediculi, parasites in the rectum, hæmorrhoids, sluggish circulation, fissures, eczema, etc. Continued scratching may lead to eczema, cracks, thickening of the skin.

In the cases in which there is no discoverable cause, it is possible that there may be a fibrosis of terminal nerves and end organs, such as I have found in pruritus vulvæ.

Treatment.—The digestive tract should be put in order. Stimulants diminished, and the bowels regulated. Regular exercise should be enjoined. Any local causes must be attended to. The various lotions and ointments mentioned

in connection with the treatment of pruritus vulvæ may be tried.

Temporary relief may be quickly got by painting the itching part with a solution of silver nitrate in spiritus ætheris nitrosi (15 grs. to the ounce). Lassar's paste with 10 minims of ichthyol and 10 grs. of hydrochlorate of cocain is of great value (Jamieson). After it is applied, a piece of absorbent wool may be kept between the nates.

Coccydynia.—This is a tender or painful condition in the region of the coccyx, and may be considered here.

It is most pronounced in nervous women, no discoverable lesion being present. It may, however, be due to a fall, a blow, or injury in labour, leading to stretching of ligaments, dislocation, or inflammation. It may be a referred pain in diseases of ovaries, uterus, anus, etc. In some cases there may be a condition of neuritis.

The pain varies. It may be worse after any kind of strain or exertion, *e.g.* riding, driving, defæcation, rising from sitting posture. Pressure increases it and may cause the pain to radiate widely. The general health may suffer.

Treatment.—The neurotic complication must be attended to. Cocain, hypodermically, may be necessary; sometimes morphine. These drugs, however, must be used with great discretion.

In some cases, pelvic inflammation, uterine or ovarian displacement, is associated with the pain complained of. In other cases the affection seems to be neuralgic in nature, and not associated with physical change. In others again the pain is distinctly associated with lesions of the coccyx or ligaments attached to it.

In the first class of cases the existing pelvic condition should be treated. In the second class, faradic electricity should be employed, one electrode being placed on the coccyx and the other on the sacrum. Two to eight applications may suffice. The strength of current should be increased from time to time.

In the third class of cases, extirpation of the coccyx should be carried out. An incision is made through the skin, the bone is separated from the soft tissues attached to it, and is then divided transversely by a chain saw or by bone forceps.

APPENDIX.

THE EXPLANATION OF MENSTRUATION.

At the present time there is universal ignorance as regards the causation of menstruation, its meaning as a sexual character, and the method by which it has become established among the higher mammalians.

The following views have been advanced to explain the meaning of the process :—

I. Relation to Ovulation.

For a long time it has been believed that ovulation and menstruation are so closely related that they occur at about the same time, the former being the cause of the latter. Of those who hold this view, some think that the blood discharge results from a general pelvic congestion, supposed to be present during the ripening and escape of the ovum. Thus, Matthews Duncan often compared the menstrual flow to the red flag outside the door of an auction-room, which indicates that something is taking place inside.

Others regard menstruation as a process induced by ovulation, necessary to the preparation and development of the ovum, in case it should be fertilised.

A careful examination of the evidence on which these statements are founded reveals their untrustworthiness. It is, indeed, a wonder that they have so long been believed.

The following facts relating to maturation and escape of the ovum are now definitely ascertained. These pro-

cesses are usually in operation some time prior to the development of the phenomena of puberty and before menstruation appears; sometimes they occur in childhood and in fœtal life. There is no proof at all that pelvic congestion takes place, either coincident with or secondary to these processes, at any time in a woman's life.

Ovulation may also occur without menstruation in the dodging period of puberty and of the menopause, or for several years after the menopause, as Hegar has pointed out; during lactation; in certain diseased conditions, *e.g.* anæmia, phthisis, lead poisoning. Pregnancy may take place at any of these times. De Sinéty describes an interesting case which he examined of a woman, 38 years of age, who had never menstruated. In the ovaries there was the normal condition of Graafian follicles, and *corpora lutea* indicating that ovulation had taken place. The body of the uterus was undeveloped.

Then, in abdominal and post-mortem sections made at all times between menstrual periods, Graafian follicles may be found on the point of rupture or recently ruptured; and in examinations made during menstruation no sign of ovulation may be visible.

In this connection it is interesting to note that Heape examined the pelves of forty-two monkeys (*Semnopithecus entellus*) during their menstrual periods and found evidences of ovulation being in progress in only two cases.

It is a common observation that extensive disease of both ovaries, *e.g.* cystoma, suppuration, malignant growth, may not affect the menstrual function to any appreciable extent in many cases. These various facts are sufficient, it seems to me, to overthrow the view that menstruation is a necessary accompaniment or sequel of ovulation. Yet it can scarcely be denied that there is some relationship between the processes.

Removal of the ovaries is followed by cessation of menstruation, though in a certain number of cases this does

not happen. As an interesting instance of this may be mentioned Lawson Tait's patient, from whom both ovaries and tubes along with a part of the uterus were removed, menstruation still continuing.

These exceptions have been carefully considered by several authorities, lately by Bland Sutton. He states that the reported cases have been mostly those in which chronic inflammation in and around the appendages has been present, or those in which operation has been performed for myoma uteri. His explanation of the persistent menstruation is that either small bits of the ovary have been left behind, or that in the cases of myoma a submucous tumour may exist, leading to hæmorrhages. Many cases have undoubtedly been recorded, in which, after removal of the ovaries for fibroids, menstruation has continued.

The long-held view of supernumerary ovaries is discarded by Bland Sutton. He thinks that these so-called structures are merely small bits separated from the main mass of the ovary by deep fissures. In several of these cases of unchecked menstruation, second operations have been performed by which small bits of ovary left from the first operation have been removed, being followed by a complete cessation.

II. Relation to the Fallopian Tubes.

According to Lawson Tait, removal of the tubes, the ovaries being left out *in situ*, is followed in 95 per cent. of cases by cessation of menstruation. This remarkable statement has been little noticed. If it can be established by extended observations, it proves that there is some close relationship between the tubes and the menstrual process.

III. Relation to a Special Nervous Mechanism.

Johnstone has advanced the view, supported by Lawson Tait and others, that the menstrual act is a special function

related to a distinct nervous mechanism. They think that possibly a special nerve trunk, running in the upper part of the broad ligament, may convey the regulating currents. Johnstone suggests that *when the ovaries or tubes are removed, menstruation is checked because this nerve is ligatured or divided.* In the cases in which removal of the appendages is not followed by cessation of the flow, he thinks that the nerve may have escaped division or ligature, owing possibly to its being placed low in the broad ligament.

While undoubtedly believing in this special nervous mechanism of menstruation, it seems to me that possibly the nerve tract is not so limited as Johnstone suggests. The plexiform nature of the nerves about the uterus is so complex that it is presumable that the impulses affecting the mucosa of the uterine body travel by many routes in the broad ligaments.

IV. Relation of Menstruation to Conception.

a. By some it is believed that menstruation is a process for preparing the uterine mucosa for the engrafting of the fertilised ovum, that it is, in fact, an essential feature. This idea was promulgated when it was thought that the ovum required a connective tissue, free from covering epithelium, to become engrafted on.

I have repeatedly urged its improbability on the following grounds :—

(*a*) In most mammalians below *Homo*, so far as is known, the ovum grows in relation to the epithelium-covered uterine mucosa, and does not require a connective tissue surface. The uterine epithelium is undoubtedly non-essential, but it is destroyed by degenerative processes and by the trophoblastic action of the outermost layer of the fœtal epiblast. As far as our observations go in human development, the same processes occur there.

(*b*) Pregnancy may occur in a girl before the onset of

menstruation; at a time, therefore, when the mucosa cannot be denuded by that process.

(*c*) It may occur during the lactation period, long after the uterine mucosa has been restored, and at a period in which menstruation is in abeyance.

(*d*) It may take place in one of the periods of amenorrhœa during the progress of the menopause.

(*e*) It may occur in periods of amenorrhœa due to diseases, *e.g.* anæmia, phthisis.

(*f*) Clinical experience of cases of pregnancy following a single coitus, proves that development of the ovum may begin at any time—not necessarily immediately after menstruation. (It must be stated that this evidence is of doubtful significance, owing to the uncertainty in our knowledge as to the time it takes the ovum to pass from the ovary down through the genital tract, and as to how long the spermatozoa may live in the tract.)

(*g*) Pregnancy may occur in the rudimentary horn of a malformed uterus, menstruation never having taken place in that horn. Whereas, as P. Müller points out, there is no record of a pregnancy having occurred in the atresic horn of a bicornuate uterus, in which, as we know, menstruation occurs, the blood accumulating above the atresia.

(*h*) It may occur years after menstruation has ceased at the supposed menopause. An interesting example is Renaudin's case, in which a woman of 62 was delivered, though she had not menstruated for over ten years.

(*i*) In male pseudo-hermaphrodites, where testes but not ovaries are present, vagina, uterus, and tubes may exist, and menstruation may occur regularly or irregularly.

β. Another view is to the effect that, along with the maturation of the ovum, the endometrium swells, as the first stage in the formation of a decidua which will receive the ovum if it be fertilised. If fertilisation does not occur, breaking down of the superficial portion, the so-called "menstrual decidua," occurs, and the menstrual discharge

takes place; in this way menstruation may be regarded as the expression of the failure of a process meant to be initial to pregnancy. For, if fertilisation occurs, it is thought that the swollen mucosa advances to form the decidua of pregnancy.

This view, it is evident, is based upon a fallacious assumption, and my objections to the last-mentioned theory may be quoted to refute it.

There is no proof whatever that changes in the mucosa accompany maturation of the ovum; and the best evidence we possess regarding the alterations in the uterine mucosa during menstruation, namely, the observations of Johnstone, Bland Sutton, Heape, Minot and Mandl, goes to show that practically only blood and small portions of the lining epithelium escape. There is normally no exfoliation of a layer worthy the name "menstrual decidua."

I think this term is a bad one; it is to be clearly understood that no change occurs in the connective tissue elements of the mucosa during menstruation, namely, enlargement of cells. This change only occurs in connection with the influence of a fertilised ovum.

γ. Löwenthal has advanced still another explanation. He believes that menstrual bleeding is neither a physiological function nor an accompaniment of one, but that it is due to innumerable repetitions of an unnatural state of things, namely, the non-fertilisation and death of the ovum. He says that the swelling of the uterine mucosa is the result of the embedding in it of the last ovum discharged from the ovary. If this ovum be fertilised, the swelling mucosa goes on to form the decidua of pregnancy; if no fertilisation takes place, the ovum dies, and as a result of this death a breaking down occurs in the mucosa. He therefore regards the menstrual flow as having all the characteristics and effects of other bodily hæmorrhages.

Löwenthal's view is a piece of speculation without any actual basis. No one knows anything about the unfortunate

ova which do not fulfil their highest destiny. It is a sympathetic imagination which makes them cling in their downward course to the walls of a repellent uterus, forcing changes upon that organ, in the fond hope that a wandering spermatozoon may cleave to it in consummative union.

Fanciful, also, the picture of death following bitter disappointment, the coincident decay of the dead ovum's resting-place, and the final bearing away in a blood-red funeral stream of the fragments of a once active individuality.

Δ. Johnstone believes that the simplest definition of menstruation is a periodic wasting away of the corpuscles that are too old to undergo the changes which must occur in connection with the attachment and development of the fertilised ovum. He does not regard the endometrium above the internal os as mucous membrane, but as belonging to adenoid tissue.

Menstruation is for it what the lymph stream is to the lymph glands or the blood stream to the spleen. The development of the corpuscular elements, he thinks, takes place in the endometrium as in the blood glands, spleen, thymus, etc.

The existence of menstruation in the human female, and its absence in the mammalian orders below the Primates, he explains by postural differences, and by differences in the structure of the endometrium. From his studies he is of the opinion "that nature has supplied the endometrium with an abundant lymph stream, which, in the unimpregnated state, washes away the ripe material to the general circulation, exactly as it does any other lymph corpuscle. But in women, where, on account of its erect position, the uterus has to depend on the tenacity of its own fibres for the preservation of its shape, no such thing as loose tissues of a lymphatic network can be depended on. So, to preserve the integrity of the uterine wall, the emulgent stream is poured into the cavity of the body, and got rid of through the vagina."

V. Relation to Body-Metabolism.

Geddes and Thomson in their "Evolution of Sex" have advanced the theory that the menstrual process is related to the balancing of anabolism and katabolism in the female organism.

After puberty a surplus is produced in the system, because the anabolic preponderates over the katabolic. When pregnancy occurs, this excess is spent in the nutrition of the ovum during its parasitic intra-uterine life and during lactation. When these methods of using the anabolic surplus are wanting, menstrual losses occur in order that it may be got rid of.

Biological Considerations.

Scarcely any attention has been given to the consideration of menstruation in its biological aspects. The speculation of the distinguished biologists, Geddes and Thomson, is one of the most suggestive which has yet been advanced, and it is worthy of an elaborate study.

The careful investigations of many forms of plant and animal life by zoologists and botanists have enabled the biologist to establish a distinction between "maleness" and "femaleness," not only in terms of morphological characters, but of psychological and physiological reactions. It is only recently, however, that sex differences have been investigated on these more subtle and difficult bases of inquiry. Too long have reproduction and sex been considered by themselves as if they were something to be disassociated from the general physiology of the organism.

The most important sex distinction which has been established is that which has to do with the general metabolism or protoplasmic chemistry of the body. Every living cell and every organism is continually representing two forms of metabolism; one, the anabolic, by which

nutrition is taken in, waste repaired, energy stored, structure improved or altered; the other, the katabolic, by which potential is changed into kinetic energy, and movement or activity manifested, structural alterations reduced, and waste created.

Throughout the animal kingdom, the distinctive and predominant characteristic of the male sex is katabolism, and of the females, anabolism. Generally speaking, the males show activity, continual expenditure of energy, disruptive metabolism; the females, passivity, quiescence, constructive metabolism. The same distinction is also widely spread in the plant world.

The lines of inquiry, on which this generalisation has been made, are the following:—

1. A study of sexual characteristics in the fully developed state, and in the history of the individual.

2. An investigation into the condition of the lowest forms of animal and plant life, where sex has its beginning.

3. Observation of normal and pathological changes in the reproductive apparatus.

4. An experimental inquiry into the nature of the factors which determine sex.

Details regarding these lines of research are beyond the limits of this chapter, yet some reference must be made to them.

As regards the differences found in the adult forms in the Invertebrata and among fishes, it may be stated that in general the body temperature is lower in the female. (This is so in many plants.) Their longevity is greater. They are in general larger, and more sluggish in habits. The males expend energy more freely, thus preventing storage accumulation and increase in size. Among birds and mammals, while the general metabolic differences exist, the males are usually larger than the females owing to special factors which have come into operation, and which do not exist in the lower orders of life. Darwin

and Geddes have explained these. They show that the differences in size in the higher forms are mainly in bones and muscles. This is explained partly by the extra stress and strain thrown on the males while the females are in a state of pregnancy, and caring for the young; partly by the strengthening effect of fights between the males, the strongest tending by natural selection to perpetuate their kind; partly by the effects on the female constitution of the excessive reproductive demands found among the higher animals.

The distinction between the sexes is universally marked in the spermatozoon and ovum, the former being small, active, energising—katabolic; the latter large, passive, highly nourished—anabolic. While the metabolic differences between male and female have been mainly studied in plants and the lower animals, some work has also been done in the human subject, though here the difficulties are increased owing to the greater complexity of the organism.

Blood.—The red corpuscles are more numerous in the male, and the percentage of hæmoglobin greater than in woman. The specific gravity is the same until puberty. Afterwards it is higher in men than in women during the sexual life. In old age it is usually higher in women. It is thus evident that the menstrual life is associated with a fall in the specific gravity of the blood.

Pulse rate.—The pulse rate is slower in men than in women. This holds good for nearly all animals.

Respiration.—Men produce more carbonic acid than women, as estimated by the breath. After puberty, the amount is nearly double that produced by woman. It increases in the latter during pregnancy, and after the stoppage of menstruation.

Excretion.—The urine of women is usually lighter in colour than that of men, and its specific gravity lower. The amount of urinary solids is both absolutely and relatively less than in the case of men, especially during the reproductive era of her life.

It is highly probable that those features which we call secondary sexual characters, *e.g.* richer pigmentation, excess of hairs and feathers, activity of scent glands, etc., which are found in the males, are but the multiform expressions of the katabolic predominance in the male organism. And it is important to note that, in the great run of cases, these characters are only fully developed as maturity is established. In early life there is practically no physiological distinction between the sexes. The establishment of the reproductive functions is associated with the development of sexual features, which, as Darwin has pointed out, modify the males to a much greater extent than the females throughout almost the entire animal kingdom. "Generally," he states, "the female retains a closer resemblance to the young of her own species than to the adult members of the same group."

Experimental evidence regarding the influence of various conditions on the production of sex points also strongly towards the conclusion that "in the determination of sex, influences inducing katabolism tend to result in the production of males, as those favouring anabolism similarly increase the probability of females" (Geddes and Thomson).

Poor or abnormal food, deficient light, moisture, excessive lactation, and other conditions tending to diminish the repair supply, or to cause a surplus of waste—the katabolic habit, tend, in experiments made on lower animals, to the production of males. Such tests strengthen the view that the male is the index of a preponderating katabolism, and the female of an equally marked anabolism.

Now, throughout the greater part of the animal kingdom, this anabolic predominance in the female affords the means of counteracting the katabolic influence of the part she has to play in reproduction.

During the sexual life of females, among most of the Primates, the anabolic habit does not find sufficient employment in supplying this destructive influence. An

overplus exhibits itself in the production of milk during the early period of the child's life, and, after lactation, in a discharge of blood from the uterus.

Cases of menstruation during lactation might, by this theory, be easily explained. The production of milk does not use up the anabolic surplus, which, therefore, becomes disposed of through the usual menstrual outlet.

In all mammalians below the Primates, the balance is regulated without the occurrence of any loss through menstruation, reproduction, lactation, the care of the offspring, and their moving habits apparently making such demands upon the maternal anabolism, as that no surplus corresponding to the menstrual blood of the human female is produced by the system.

(In the vegetable kingdom, also, it is interesting to note, "the distinctly anabolic overflow of nectar ceases at fertilisation, and the surplus of continual preponderant anabolism is grafted into the growing seed or fruit"—Geddes and Thomson.)

One of the most striking characteristics of menstruation, as observed in the human female, is its variability in type, and in the quantity and duration of discharge. One need not specify these in detail. I wish in particular to direct attention to the great range of variation in the time of its appearance in relation to the development of those other phenomena which we call the "sexual characteristics."

In the majority of cases, these features, *e.g.* activity in ovulation, menstruation, hair-development, growth of breasts, etc., become established at a definite period, known as puberty, which, as we know, varies according to climate, race, environment, and other conditions.

But of far greater importance are the variations which prove that there may be no concurrent incidence in the determination of the phenomena in the individual. They are as follows:—

1. Menstruation may begin very early in life, even within

the first year, without the development of any of the other outward signs of puberty. These become marked, at varying periods in different cases, and in different orders. Generally, they appear together after a number of years, but sometimes the breast changes precede the others, sometimes the growth of hair, sometimes the changes in bodily contour.

2. In other cases, the development of menstruation at a very early period may be associated with one or more of the other secondary sexual characteristics.

Thus the breasts may be well marked, or the external genitals well developed, or the voice altered. The other features appeared in later years.

3. In other cases, some of the secondary sexual characteristics, other than menstruation, may be developed in very early life, this function becoming established sooner or later afterwards. Thus the breasts may become well marked, menstruation following after months or years. In a case recorded by Bouchut, in which the breasts were well formed at birth, menstruation began at the age of 22 months, and the rest of the sexual features became marked in the succeeding two years, so that at the age of 4 the child had all the characters of a fully-developed girl.

Sometimes the breasts and external genitals may develop early together. Sometimes the latter alone may be very early marked, being followed sooner or later afterwards by menstruation and the other phenomena. Sometimes the breasts develop early along with axillary and pubic hairs, being followed after months or years by menstruation. Sometimes the body contour may resemble the adult form, the hair and external genitals being well developed at a very early period; the appearance of menstruation, and the growth of the breasts, being delayed for months or years.

4. As regards the condition of the internal genitals, only

a few opportunities have presented themselves of observing them in the above-cited cases, so that it is impossible to know in how many ovulation was in progress, or the uterus well developed. It is, however, clearly established that in some of these precocious cases ovulation is in progress, and the uterus has adult features. There can be no doubt, therefore, that puberty may be completely developed in the first years of life as regards the physical changes. As is to be expected, the psychical alterations are wanting.

5. Finally, the cases must be alluded to in which, during infancy and child life, ovulation has been noted, though none of the other signs of puberty have been present. It has been found in progress even before birth. In the great majority of cases of normal development of puberty, it may be in progress several months before the other phenomena appear. In the adult state marked variations are found as regards the degree to which the sexual characters are developed. These need scarcely be specified, so commonly are they observed by physicians.

They affect the breasts; the pubic and axillary hairs; the formation of the external genitals; the type, quantity, and duration of the menstrual discharge; the psychical development. These differences exist between different races and between the various members of the same race.

From the consideration of these facts, we are forced, it seems to me, to regard the menstrual function as a highly specialised means, gradually produced, in the evolution of the highest mammals, by which the two great factors in tissue-metabolism—the anabolic and katabolic, are properly balanced.

Normally, it becomes established along with the various phenomena which characterise the development of sexual activity—at puberty, because it is then that the metabolic habit peculiar to females, namely, predominance of anabolism, manifests itself.

The rhythmical character of the menstrual function has

probably been gradually determined by the forces of evolution, and the marked range of variations which it presents in the human female (unassociated with pathological conditions) points very strongly to an early period of instability in the process, preceding its present fairly fixed habit. It is, indeed, impossible for us to think of a rational explanation for the peculiarities which are found, except on the ground of biological variations—atavistic reminiscences.

The menstrual function, then, being closely correlated with the well-recognised sexual characters, is, like them, undoubtedly closely related to a nervous regulating mechanism, the nature of which is unknown as yet.

There may be a special cord centre governed by still higher cortical centres, but there is also a subtle and intimate connection between the sexual functions and the general nervous mechanism of the body.

As Johnstone ably states in regard to the uterus, "its association with ovarian activity is that of two separate departments of an army, each of whose work must be thoroughly accomplished before the one common object can be attained. They are both controlled by branches from the sympathetic system, and instead of their actions being determined by each other, their orders come from that higher power which controls all functional activity.

It is this correlation which has been wrongly interpreted, especially in the case of the tubal and ovarian functions, with neither of which is the process *directly* connected. That it is indirectly related to them, and capable of being influenced by them, cannot be denied, and that, in the whole sexual apparatus, the ovaries are the "predominant partner," is not to be wondered at.

We have proof enough as regards their influence on body-metabolism, *e.g.* in osteomalacia, marked improvement immediately follows removal of the ovaries. Whether this be due, as Curatulo believes, to the secretion by these organs of a chemical substance capable of facilitating the oxida-

tion of the phosphoric organic substances supplying material for the bone salts, or whether it acts merely by altering an ill-proportioned relationship between anabolic and katabolic functions, thus secondarily affecting the diseased process, is only a matter of speculation.

After the removal of the ovaries in gynecological practice, certain effects are noted which must be associated with altered neurotrophic functions. Thus "heats" or "flushes" —vasomotor storms—are very often troublesome features; the uterus tends to shrink; the gland tissue of the breasts tends to atrophy, while fat is often increased in the body.

There is, however, very great variation as regards the effect of removal on the sexual characters. These are so marked as to demand a careful investigation for the purpose of determining them accurately, and of establishing a comparison between the bodily changes following the operation, and those taking place in connection with the normal climacteric. At present many exaggerated ideas are current.

While, in the majority of cases, removal of the ovaries is followed by an altered body-metabolism, owing to the absence of the most important sexual organ—marked by disappearance of the anabolic overflow of menstruation, it is not surprising that variations should occur in the alterations produced, so that instances might happen in which the menstrual function does not cease. It is certainly not an uncommon experience to find discharges of blood from the uterus after the operation, apparently an indication that the changes in body-metabolism are being brought about but gradually in these cases.

As regards the relation of the tubes to menstruation, if Lawson Tait's observations be accurate, namely, that after their removal menstruation ceases in the great majority of cases, the ovaries being left behind, the explanation may be either that such a marked alteration in the genital tract may reflexly alter all the sexual functions along with body-

metabolism, or that it may bring about the result through an indirect influence (such as inhibition of function) on the ovaries.

(Bland Sutton's statements as regards the effects of removal of the tubes are directly opposed to those of Lawson Tait. His words are: "The Fallopian tubes exercise no influence on menstruation, and in order to produce artificial amenorrhœa both ovaries must be completely removed." I do not consider that Bland Sutton is justified in making these statements from the facts given by him. He quotes a few cases in which ligature of the tubes was performed without causing a cessation of menstruation. Tait, however, speaks of *removal of the tubes*,—a much more serious disturbance.)

Though there can be little doubt that menstruation has been established in the higher mammals by a gradual process of evolution, we have been entirely in the dark as to the steps of this process. Seeing that it is limited to the *Anthropidæ* and *Simiadæ*, the earliest appearance must have taken place among some common ancestors of both.

The peculiarity probably first began as a variation, which proved to be advantageous, and by natural selection became a fixed character, being transmitted from generation to generation. Had it been of no advantage it would have been eliminated.

The only suggestion which has yet been advanced as to the possible advantage of this variation is that of W. E. Fothergill, who believes that it consisted in a greater tendency to conception, owing to the rawing of the uterine mucosa.

This suggestion cannot be entertained in the light of present knowledge. We know that rawing of the surface is not necessary to the attachment and nidation of the fertilised ovum, and that in the great mass of the mammals it does not occur.

The introduction of menstruation in the evolution of the

mammalians has not been associated with greater but with diminished fertility, for there can be no doubt that the non-menstruating mammals are on the whole by far the most prolific.

Indeed, natural selection has acted in the highest ranks of the animal world, not in the direction of establishing a numerical superiority, but one based on the specialisation of individual characteristics in a selected number.

The advantage of the variation in our distant progenitors must therefore be sought for in relation to factors tending to diminish the number of offspring, and to improve the quality of the individual.

As to the origin of the variation, our only reasonable speculation seems to be that it is associated with the development of the single uterus, with the diminution in the number of offspring, with the determination of the semi-erect or erect posture—characteristics found throughout the Primates, at least in the *Simiadæ* or *Anthropidæ*. (The division of the Primates known as *Lemuridæ* stands by itself. These forms are believed not to be in the direct line of the other divisions, but a separate offshoot from some early common mammalian stock. They have a double uterus, and, so far as we know, do not menstruate.)

Of prime importance, I believe, among these factors is the change from the bicornuate to the single condition of uterus. In the great mass of mammals with the former variety, the excess of anabolism is used up in the large demands of breeding and nursing. When the single uterus appeared as a variation, marked by a diminished area for the attachment of ova, the unused anabolism found an outlet in the escape of blood.

It is possible that this took place at first from different parts of the body, thus helping to explain the occasional occurrence in females of "vicarious menstruation."

If this were the case, natural selection must have acted

in eliminating all except those in whom the blood escaped from the uterus.

But it is also likely that the tendency to sit on the ischial tuberosities and to move about more or less in the semi-erect position, may have somewhat determined the occurrence of the congestion chiefly in the pelvis, relief being found by a discharge from the delicate mucosa.

The blending of two blood supplies in a single uterus, which had previously been distributed to two cornua, must have had an influence in inducing a special tendency to uterine congestion. Probably also another factor helped to determine the localisation of the congestion to the pelvis, namely, the habit already fixed among many of the lower mammals of the periodic pelvic congestion of the rutting period.

In the beginning it is likely that the menstrual discharge took place at irregular intervals (thus explaining the occasional irregular types which are now found among females). Natural selection would here come into play in determining regularity of type.

Females who were irregular in regard to the discharge would be objects of inconvenience to the males, who would very soon learn to seek out and prefer those whose unseemliness manifested itself only at expected and definite periods ; and so, gradually, regularity would come to be the predominant feature in succeeding generations of offspring.

It is a striking fact that among all races there is a careful avoidance of menstruating females by the males. This is particularly marked in most primitive peoples. Very possibly it had its origin in a feeling of disgust on the part of the males, and it is not difficult to understand how, among the earliest human beings, there might gradually develop the belief that women were possessed of some unclean or evil spirit which had to escape periodically.

It is thus easy to explain the universal though varied customs and practices prevalent in many races, by which

the woman is forced at her period to avoid association with others, to abstain from coitus with men, and to withdraw even from observation, in order that her evil influence might not spread.

Next, it is of great interest to inquire into the possible gains that might result from the fixing of menstrual process in females.

It is a remarkable fact that in the highest mammals, namely, the *Simiadæ* and *Anthropidæ*, is found the highest development of the altruistic principle, as exhibited between parents and offspring. As Westermarck points out, among the Invertebrata the male is interested only in the act of fertilisation, while the female shows no further concern or responsibility after she has laid her eggs. In the lower Vertebrata parental care is almost unknown, though there are a few exceptions, *e.g.* chiefly in the Chelonia, the males caring for the young in some cases, the females in others, while in a few instances there is joint parental attention.

In the Birds, however, it is the rule that the parents live in most intimate relationships, both during and after the breeding-season, the female hatching and rearing, the male acting as protector and provider of food.

Among the great mass of mammalians, below the Primates, this is not the case; the mothers alone showing great concern for the young offspring, while generally the males are only interested in the females at the rutting-time.

Exceptions are, however, found, *e.g.* among whales, seals, certain deer, moles, squirrels, and a few other forms. The parents remain together after the birth of the young, the male acting as protector.

Among the Primates the rule is that the males and females unite in a more or less enduring partnership, both having great concern for the care of the offspring, the males possessing one or more wives.

There is an abundance of facts to establish this statement,

and from them Westermarck has established his induction in a masterly work, that our human marriage is an inheritance from an ape-like ancestor, controverting the long-held belief of Sir John Lubbock and others, that our progenitors formed one vast free-love community where promiscuity of sexual intercourse prevailed.

This habit is therefore another interesting possession of mammals with a single uterus. It marks a great advance in the character of the individual above the types found in the lower orders of animal life.

Very evidently it was fostered by means of natural selection, being most essential where the female gave birth to a small number of young who passed a long time in a state of helpless infancy and tutelage. Such a species, undoubtedly, stands a better chance of surviving when the parents unite their energies in the task of protecting and nurturing the offspring.

Indeed, it would appear that the great determining factor of conjugal relationships is care for the young. Among several primitive races (and in some of the highest) marriage is never supposed to be established until offspring appear.

Wherever in the animal kingdom we find that the parents have no concern for the offspring, the females give birth to a very large number of young, the prodigality of births allowing of the safeguarding of the preservation of the species.

Thus the cod lays each year about a million eggs, to which she gives no after-care, and probably the greater number become destroyed. On the other hand, the turtle-dove lays only two eggs, but owing to the care of the parents, the young generally grow to maturity.

Another important point to notice regarding intercourse between the sexes is that while among the majority of mammals there are special times of pairing, conditioned by divers necessities, varying in different species, among the

Quadrumana the rule is, probably, that fruitful intercourse may take place at any time, though undoubtedly exceptions occur, owing to conditions of food, environment, etc.

In the evolution, therefore, of the higher mammals possessing one uterus there has been a departure from the condition of periodic excesses of sexual rioting to one in which there is, especially in the female, a more diffuse and consequently less intense manifestation of the sex instinct.

The menstrual function occurring regularly in animals so placed must have served beneficially in giving the mothers continually recurring periods of ensured rest (for, so far as we know, coitus is universally desisted from during menstruation), and in teaching the males continual lessons in self-restraint.

Relation of Menstruation to Rut.

There is a widespread belief that these phenomena are identical. Thus a very recent writer (Letourneau) states that "menstruation is essentially identical with the intimate phenomena of rut in the females of mammals, and corresponds to an ovarian congestion, or to the swelling and bursting of one or more Graafian follicles." A few writers have in recent years disputed this view, among whom may be chiefly mentioned Lawson Tait.

There are many who believe that the rut, or œstrus, or pairing-time is conditioned by ovulation—that ova are only shed at these intervals, causing the phenomena. There is no basis of facts for this statement. The examination of many rutting animals proves that ovulation goes on at all times. The origin and significance of rut are uncertain, but it seems probable that the habit has been developed by natural selection, for the purpose of limiting the chance of fertilisation to certain seasons, mainly with reference to dietetic and climatic requirements for the offspring.

Among the mammalians this period is found at all times of the year. Thus, the bat pairs in January and February; the wild cat and fox in February; the weasel in March; the musk-ox in August; the badger in October; the orongo-antelope in November and December.

When the different cases are inquired into, it will be found that the time of pairing is related to the duration of pregnancy, it being necessary that the young should be born at a time when they stand the best chance of living.

Thus the majority of mammals produce offspring early in the year; in the tropics at the beginning of the rainy season —the time of birth evidently being related to abundance of food, water, warmth of climate, conditions most favourable to existence. In polar and temperate regions the animals pair at a later period than in warm countries. These differences are seen when the same species are placed under changed climatic conditions.

When no definite pairing-season exists, as among elephants, whales, many rodents, the explanation is very evident. The conditions of their environment and of their food-supply are such as not to necessitate the birth of offspring at special times.

As regards the Primates, it is doubtful if there is a rutting season among many species. It is stated by some observers that it exists in the orang-utan and gorilla. In general it is to be expected that in the *Simiadæ* and *Anthropidæ*, whose food-supply is of a much more diverse nature than in the lower mammalians, consisting of animal and vegetable matter in different forms, there is no necessity for the birth of offspring at special times. Moreover, it must be remembered that the anxious time as regards the newly-born does not last only for a few months after birth in the *Simiadæ*, but for years, the period of infancy being long, just as in the case of *Homo*. It is therefore likely that, as far as food requirements are concerned, one season is as propitious as another for birth.

Another important factor must be borne in mind, namely, that where there is a strong development of parental affection, and conjoint parental care for the young, an important additional reason exists for diminishing the necessity of special pairing-seasons. This is all the more marked in the *Anthropidæ*, where, owing to a higher intelligence, individuals learn to combat the injurious influences of their environment and to make it possible for the offspring to have as good a chance of surviving at one time of the year as at another.

If, then, there be found exceptional cases of a special pairing-season among the higher Primates, it must be because natural selection has conserved the habit in relation to the special conditions in which those species are placed.

Among the Reptilians and Birds, the rule is that pairing occurs in the spring; and it is probable that, as Westermarck points out, the world-wide association of the spring-time with the awakening of sexual affinities has been based upon the observations made mainly on birds.

The modifications in the pairing-season which can be induced by artificial means, *e.g.* domestication, are a strong evidence in favour of the bearing of external influences on reproduction among the higher Vertebrata.

Indeed, it is evident that just as rut becomes adapted to the requirements of separate species, so it may become altered in relation to the needs of individuals under varying conditions.

Another interesting fact must be mentioned, namely, that while the rutting period is practically the only time when the females will copulate with the males, the menstrual period is the time above all other periods when they will not engage in this act. This is universal among mankind, and is true for the *Simiadæ*, as far as our observations go.

Moreover, the changes in connection with rut result among other things in softening and dilating the outer genitals for the reception of the penis, they being at other times in many animals too much constricted for this. It is well known

that a bitch will not generally allow the dog near her until the rut has been in progress for a time, *i.e.* until the vulva and vagina are sufficiently dilated.

So far as our facts go, it seems likely that rut in the higher Vertebrates is merely the expression of the force of sexual affinity necessary to ensure fertilisation of the ovum, which is found throughout the whole animal kingdom, diffusely spread in the lower forms, highly specialised and limited in the upper forms, owing to the influences of environment and natural selection, and affecting both males and females alike. This participation of the males is important to bear in mind. It is found everywhere. Thus many fishes, when the love period arrives, put on brilliant colours, become vigorous and play about among the females in the most lively fashion—evidently in a state of sexual excitement. In some, *e.g.* the stickleback and salmon, great pugnacity is manifest. The male salmon develops a special crook in connection with the lower jaw at this time, while the teeth enlarge markedly. Among many Amphibians also various changes affect the males, and sexual desire becomes very marked. Among the Reptilia similar changes occur, the male tortoise, for example, being fierce and noisy.

In snakes the scent glands become active during the pairing-season.

Among the birds, the changes in the love season are very marked. The male is altered in various ways, and takes to dancing, coquetting, and to vocal and instrumental music. His scent glands grow active, his ornaments become more marked, and he develops strong fighting tendencies.

Among mammals the intensification of sexual desire in the males, accompanied with a feeling of jealousy and a keenness to fight, is universal. In all orders the voice is used in the rutting-time more than at any other season. Indeed, the porcupine and giraffe are said to be mute at all other periods.

In stags the larynx and thyroid enlarge when rut comes

on. The nose of the male sea-elephant becomes greatly elongated. In the bladder-nose seal the hood covering the head becomes markedly inflated. Scent glands emit stronger odours. In some cases the colour of the skin changes.

Among the great majority of females, no such marked variations occur. They play their normal rôle of passivity, the alterations brought about by the wave of sexual excitement being mainly psychical.

In many mammalians the only physical changes recognisable at the œstrus are congestion of the soft parts in the pelvis, dilatation of the vulva and the vagina, and the free discharge of mucus, which is often blood stained. These differences between males and females in regard to the rutting period are in keeping with the organic distinction to which I have so often referred in these pages.

The manifold changes in the males are the outcome of their predominant katabolism.

The females need to conserve their energies, *i.e.* their anabolic surplus, for the strain of pregnancy, consequently there is no waste in outward exuberant manifestations, except in very slight measure in the cases to which I have just alluded.

Finally, it may be stated that the relation of rut to menstruation in mammalian evolution is simply this—that when, owing to the different reasons which I have elaborated in an earlier part of this chapter, ménstruation appeared as a new variation, one of the factors in determining the escape of the anabolic overplus by way of the genital tract was the habit already fixed, in many of the mammalians with a bicornuate uterus, of the periodic yearly pelvic congestion of the rutting-time.

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