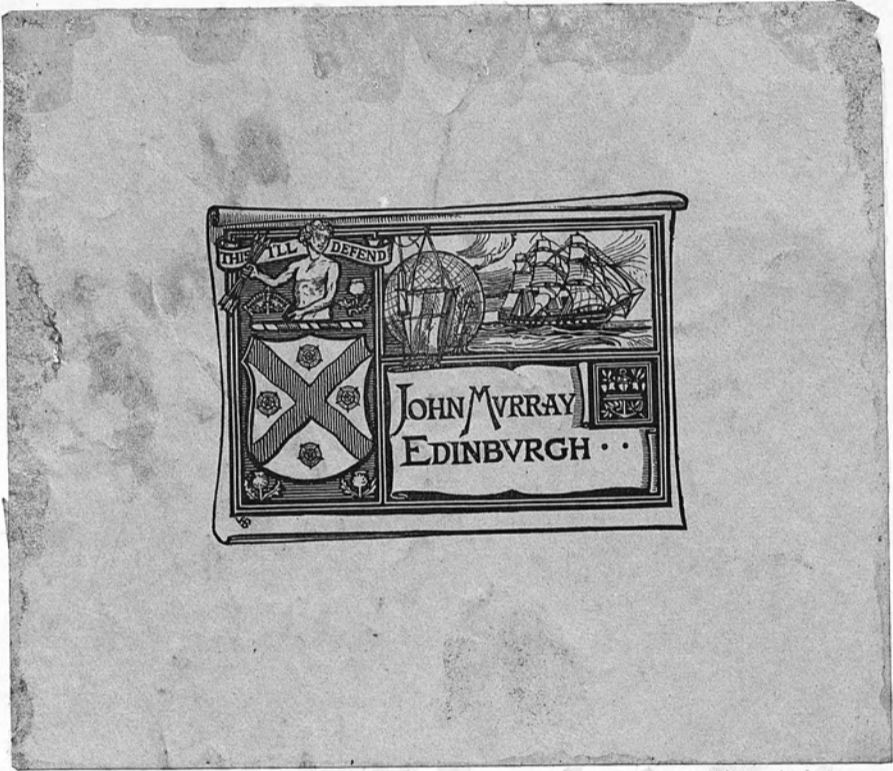


*The Structural Anatomy of the
Female Pelvic Floor.*

DR. HART.



With the Author's compliments

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The Structural Anatomy

OF

The Female Pelvic Floor

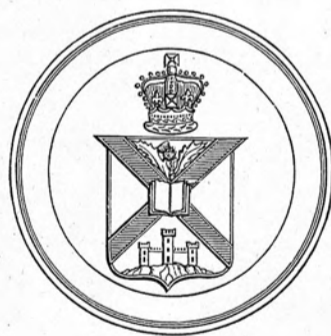
BY

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*Being a Thesis for Graduation at the University of Edinburgh, for which a
Gold Medal and the Syme Fellowship were awarded.*



Edinburgh:

MACLACHLAN AND STEWART, 64 SOUTH BRIDGE.

London: SIMPKIN, MARSHALL, & CO.

1880.

PRINTED BY FRANK MURRAY,
9A AND 11 YOUNG STREET, EDINBURGH.

TO

ALEXANDER RUSSELL SIMPSON, M.D., F.R.S.E.

PROFESSOR OF MEDICINE AND MIDWIFERY AND THE DISEASES OF WOMEN AND CHILDREN IN THE
UNIVERSITY OF EDINBURGH

This Work

IS RESPECTFULLY DEDICATED BY HIS ASSISTANT

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Preface.

THE observations given here were first published in scattered papers in the *Edinburgh Medical Journal*, vol. xx. They were collected and expanded as a Graduation Thesis at the University of Edinburgh. On the advice of several friends this has been published in the present form.

My obligations to Professor SIMPSON for placing his valuable specimens at my entire disposal, and for his kind help and criticism, are inadequately expressed in the dedication to him. I have to thank my friends, Dr. F. M. CAIRD for drawing several of the Illustrations on wood, and Dr. A. H. BARBOUR for revision of proof sheets.

Messrs. W. & A. K. JOHNSTON have done everything in their power to make the Lithographic Plates accurate. I have to thank Mr. JOHN FRASER for the fidelity with which he has drawn from nature, and engraved, the majority of the Woodcuts in the text.

65 FREDERICK STREET, EDINBURGH,

November 1880.

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The Structural Anatomy of the Female Pelvic Floor.

Introduction.

THE following Work is an attempt to consider the Female Pelvic Floor in its structural aspect.

The deficient bony outlet of the pelvis is filled in by a thick fleshy layer known as the pelvic diaphragm or pelvic floor, with the pelvic and abdominal viscera resting on it. This superincumbent mass is readily supported by the male pelvic floor, seeing that it is structurally an unbroken layer. The female pelvic floor is, however, not such an unimpaired layer, as it has running in its midst the vagina, which, in Parturition especially, comes to be opened up to an extent almost coinciding with the true bony pelvis itself. The question, therefore, may be asked, What is really the architectural arrangement of this pelvic floor; how is it sufficient to support comfortably its superincumbent load of viscera, and yet admit of the passage of the foetal head; what are the exact mechanical arrangements by which the vagina opens up in certain postures? and so on. If the pelvic floor has really a definite structural arrangement, all physiological and pathological changes in its segments should be definite; and all our instrumental means of exploring the recesses of this pelvic diaphragm should be based on a knowledge of its construction.

The object of the present inquiry then is, to consider the mechanical structure of the Female Pelvic Floor. With its minute anatomical structure I do not deal, neither have I any contribution to offer to the vexed question of the normal uterine position. In each of the pelvises figured in the plates the uterus is abnormally placed. The anteflexed uterus, however, is valuable pathologically.

In the execution of the Lithographic Plates I. and II., care has been taken to draw only what was found to exist. There has been no meddling nor trimming to suit any one's fancy or theory, so that measurements, &c., can be made on them just as on the actual specimens themselves. The reader can, therefore, verify my statements and correct what deductions may be erroneous.

In the Appendix I have discussed some points whose introduction into the body of the work would have interfered unduly with its sequence.

Part First.

I.—The Closed Female Pelvic Floor in A. VERTICAL MESIAL SECTION.

PLATE I. shews the pelvis of a young girl in mesial vertical section. (Cf. also Fig. 1.) Stretching from pubis to sacrum we have the pelvic diaphragm shewn with undisturbed relations, unless it be the inevitable relaxation of the sphincter ani and the admission of air thereby. What is thus seen we shall now take up *seriatim*.

The Anus being imagined closed, it will be evident on inspection that the fleshy diaphragm stretching from pubis to sacrum is an unbroken one. Traversing it, we find three "faults" or "slits"—the Urethra, Vagina, and Anus.

The Urethra is practically a capillary slit, its anterior and posterior walls being in close apposition; the anus is closed by the strong muscular sphincter. Neither of these, it is evident, in any way impairs the structural efficiency of the floor.

The Vagina, as shewn here, is a mere slit, with its walls, anterior and posterior, in accurate apposition.

Now, further, the urethra and vagina run obliquely in the pelvic floor, or more precisely, run parallel to the plane of the pelvic brim. The bearing of this will be seen further on. The "vaginal slit" forms a natural division of the floor into two halves. This is not a mere convenient division, but one based, as I shall attempt to shew, on anatomical structure and function. For ease of description I shall speak of the PUBIC SEGMENT of the pelvic floor, and the SACRAL SEGMENT of the pelvic floor.

The PUBIC SEGMENT consists of what extends from symphysis pubis to anterior vaginal wall, inclusive of the latter, and is chiefly made up of bladder. The SACRAL SEGMENT makes up the rest of the pelvic floor, and extends from sacrum to posterior vaginal wall.

The PUBIC SEGMENT OF THE PELVIC FLOOR is evidently triangular in shape on mesial sagittal section, and has a *pubic*, *vaginal*, and *peritoneal* aspect.

The pubic side is separated from the posterior aspect of the symphysis pubis by a pyramidal deposit of loose fat. In this way a play up and down of the segment is

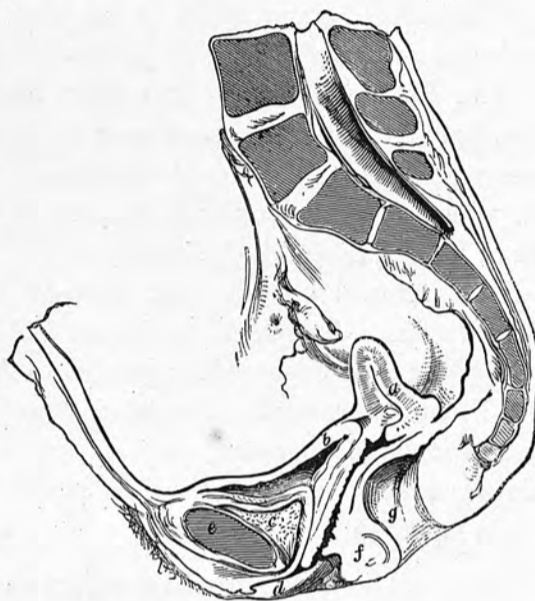


FIG. 1.—VERTICAL MESIAL SECTION of ADULT FEMALE PELVIS (a little less than half-size).

a. Uterus; b. Bladder; c. Fatty tissue in front of Bladder; e. Symphysis pubis; f. Perineum; g. Rectum.

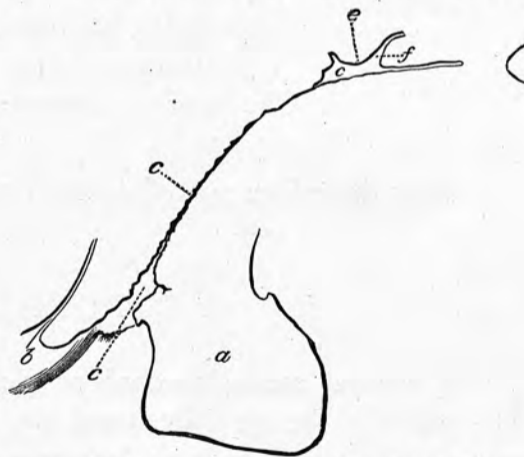


FIG. 2.—LIFE-SIZE DRAWING of VAGINAL SLIT in VERTICAL SECTION.

a. Perineum; b. Urethra; c. Vagina; e. Anterior lip of Cervix; f. Os uteri.

evidently arranged for. The nature of the peritoneal and vaginal aspects is evident from inspection. Their respective lengths are here—

Pubic side	6 cm.
Peritoneal side	8 „
Vaginal side	6 „ (Cf. Plate I.)

It should be specially noted, that the anterior vaginal wall is closely incorporated with the urethra, but loosely with the posterior wall of the bladder.

The pubic segment of the pelvic floor is thus loose in texture, has only a loose bony attachment anteriorly, and will evidently permit of mobility in an up or down direction.

The SACRAL SEGMENT has been already defined. It is roughly quadrangular in shape, has a dovetailed attachment to the sacrum and coccyx, and is made up chiefly of strong muscular and tendinous tissue. Its anterior margin is the posterior vaginal wall, which is only loosely connected to the anterior rectal wall until just above the apex of the “perineal body.”

The perineal body is seen here on vertical section lying between anus and lower part of vagina. Its special usefulness will be considered afterwards (p. 19). The vaginal aspect of the sacral segment is parallel to the plane of the brim.

The sacral segment of the pelvic floor is strong in structure, has a strong dovetailed attachment to the sacrum, and is only movable downwards, with, of course, a recoil upwards, when it revolves round the sacrum and coccyx as a centre.

So far, then, as our present facts go, we see that—

1. The pelvic floor is compact as a whole.
2. It consists of two segments anatomically contrasted.
3. Three artificial lines differentiate it so far as “mobility” is concerned.

These are—

- a. One running in the vagina between its anterior and posterior walls—the vaginal line.
- b. One running between posterior vaginal wall and anterior rectal one—the recto-vaginal line.
- c. One running between anterior and posterior wall of rectum—the rectal line.

What these lines specially signify we shall see afterwards.

B. CORONAL MESIAL SECTION.

A coronal mesial section¹ of the left half of a female pelvis is shewn at Fig. 3. The points to be specially noted are, that the floor is attached by a split to the bony pelvis, and that there is no looseness of connection in the attachment, such as we find behind the symphysis. The bladder, vagina, and rectum are in this section mere slits.

We have thus described the structure of the female pelvic floor as it can be learned from a study of sagittal and coronal mesial sections. If regarded as a whole, it can readily be seen that it is a thick fleshy diaphragm, convex on its lower surface, concave on its upper, and attached all round by a dovetailed split to the inferior outlet of the pelvis.

¹ That is, cut parallel to the coronal suture, and midway between the sacral promontory and symphysis pubis.

Running through it, mesially and antero-posteriorly, from the convex to the concave aspects of the diaphragm, and parallel to the direction of the pelvic brim, is a slit, the vagina. This slit does not extend from side to side of the bony pelvis, and therefore, while it divides the pelvic floor into two contrasted parts, it does this incompletely, so that the pubic and sacral segments of the pelvis are continuous with each other on the right and left sides of the vagina respectively.

The VAGINA, then, is an incomplete cleft or slit in the pelvic floor, making an angle of 60° with the horizon. It possesses no capacity other than that dependent on the separation of the pubic from the sacral segment of the floor. The anterior vaginal wall is the posterior boundary of the pubic segment; the posterior vaginal wall is the anterior boundary of the sacral segment. These boundaries are naturally in contact in all postures, and never separate unless in those positions, such as the genu-pectoral, where the thoracic end of the abdomen is lower than the pelvic one, and then only when the vaginal orifice is artificially opened.

It is analogous, therefore, to the cleft between two folding doors. It runs from side to side of the pelvic diaphragm, but stops short of the bony side walls. If the finger be passed into this cleft, these points can be ascertained; and it will be further noticed, that the anterior wall is triangular in shape with the apex below, and that the posterior wall is the same, but longer. Both, therefore, are broader above than below, blend at the sides, and their walls are plicate. Their vertical length varies, but 5 cm. (anterior wall) and $7\frac{1}{2}$ cm. (posterior wall) give this approximately. The lower end of this slit is transverse, *i.e.*, the orifice of a woman's vagina, although somewhat puckered by the hymen, runs in the same direction as her mouth, and at right angles to the slit between the labia. Each wall is reflected on the cervix uteri, and thus the slit is terminated above by this relation to the uterus. The infra-vaginal portion of the cervix attains a lower level than the highest point reached by the vaginal walls, which are consequently reflected down on it, forming the fornices.

The vagina thus in vertical and transverse section is always a slit—never a tube; *i.e.*, the pelvic floor in all postures is naturally unopened, although the vaginal walls may, under certain conditions, bound a cavity.

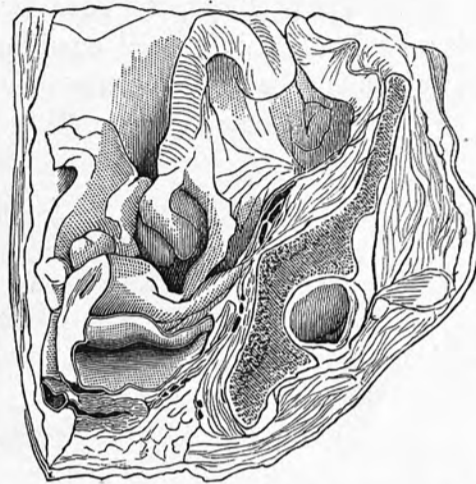


FIG. 3.—CORONAL MESIAL SECTION OF LEFT HALF OF FEMALE PELVIS.

II.—The Pelvic Floor Opened Up Naturally.

A. IN PARTURITION.

THE Pelvic Floor has been already shewn to be an unbroken layer in the female, unless under certain special conditions. This may be put in other words by saying, that the vagina is then a slit, and the pelvic floor unopened.

Now, as Braune's section, Tab. B,¹ beautifully shews, this is the case at the end of pregnancy.

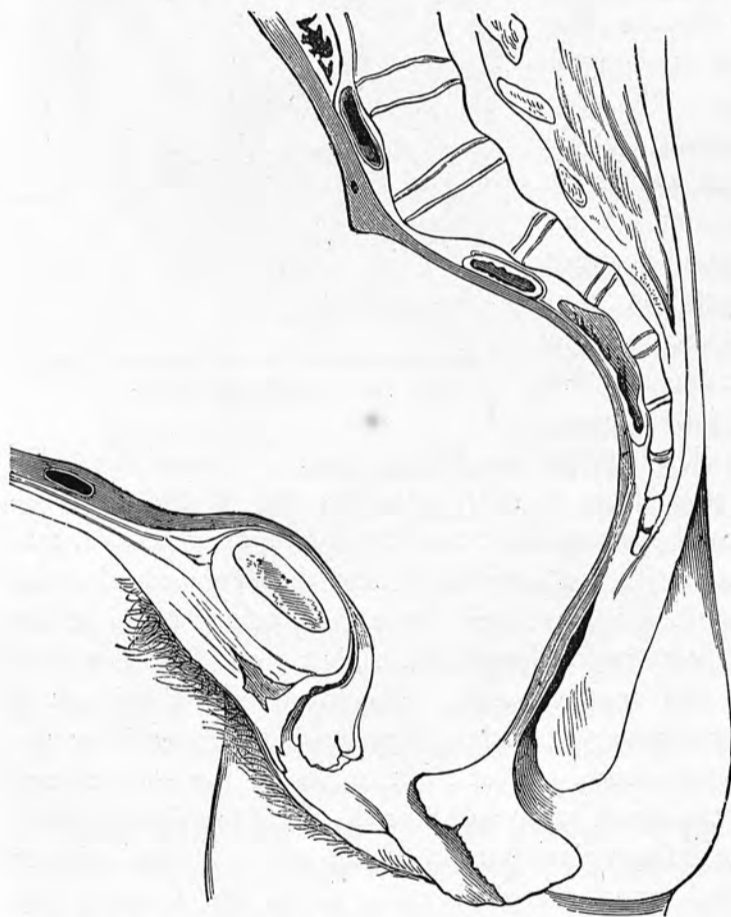


FIG. 4.—THE PELVIC FLOOR OPENED UP DURING LABOUR, the Pubic Segment drawn up, and the Sacral one driven down (after Braune).

During labour the pelvic floor becomes opened up into a canal for the passage of the child's head. As the head advances the pubic segment of the floor is in front of it, the sacral segment behind it. The questions, therefore, may be fairly asked, Is there any special way in which the pelvic floor opens up during parturition; how does the pubic segment behave; is it simply squeezed out of the road by the advancing head; or have we a definite mechanism? These questions I shall now endeavour to answer.

In Braune's Tab. C we have a trustworthy vertical section of a woman who died when labour had advanced as far as the completion of the first stage. The special points to be noted as bearing on the changes in the pubic segment of the floor are as follows.² (See Figs. 4 and 5.)

1. The anterior uterine wall is much thicker (15 mm.) than the posterior (9 mm.)³ (See Fig. 5.)

¹ Braune, *Die Lage des Uterus und Fötus am Ende der Schwangerschaft*. Leipzig, 1872.

² Braune, *loc. cit.*, Tab. C. The student should carefully study these splendid sections in the original life-size plates. If unable to obtain these, he will find reduced and accurate copies of them in Playfair's *Midwifery*, in Bellamy's *Translation of Braune's Plates*, and in Martin's *Atlas*, edited by Dr. Fancourt Barnes. It is very curious that none of these authors point out what the student may learn from them. In addition to the facts already given by me, he should note—*a. As to the Fötus*. In Tab. B, the foetus lies in the second position of Naegele (the alleged third in frequency), and exhibiting the Roederer (occipito-frontal) and Solayres obliquities. He should specially note that the separate foetus of Tab. C shews how it behaves as a plastic mass during labour, retaining the os internum and symphysis marks, and that the head is not synclitically placed. *b. As to the Uterus*, he should note that in Tab. B, where the woman was not in labour, the venous sinuses are full; whereas in Tab. C, where the woman was in labour, and the uterus contracted, the sinuses are squeezed empty. Finally, in Tab. B, he will see the pelvic floor closed; in Tab. C he will see it opened up.

³ These measurements are made on the life-size plates.

2. The os internum is 5 cm. above the level of the pelvic brim in front, while posteriorly it is almost on a level with it.¹

3. The bladder is above the symphysis.

4. The peritoneum is stripped off the bladder.

5. The pubic segment of the pelvic floor is separated from the sacral one, is a thin flattened-out hour-glass segment, with the part of it below the symphysis shortened.

6. The sacral segment is being driven down, and the vagina is no longer a slit.

7. The os externum is on a higher plane anteriorly than posteriorly.

If Braune's Tab. B of a woman at the end of pregnancy be consulted as to these seven points, it will be found—

That (1) the anterior and posterior uterine walls have about the same thickness (6 mm.)

(2) The os internum is below the level of the pelvic brim.

(3) The bladder is below the level of the symphysis pubis.

(4) The peritoneum covers it as usual.

(5) The pubic segment of the pelvic floor is in its normal position, and is in exact apposition with the sacral one.

(6) The sacral segment is not driven down, and the vagina is a mere slit.

The explanation of the changes shewn in Tab. C is as follows :—

The longitudinal muscular fibres pass into the cervix (Luschka). An inspection of Plate I. shews that the cervix is attached by its anterior lip to the posterior angle of the pubic segment of the pelvic floor; by its posterior lip to the upper part of the sacral segment, just below the peritoneal reflection which constitutes the pouch of Douglas. When the uterus contracts it pulls on the cervix, and pushes the foetus down. Anteriorly, therefore, it pulls on the cervix, and thus tension is made on the pubic segment of the pelvic floor, as well as on the sacral. The pubic segment, from its anterior anatomical connections, can be pulled up, while the sacral cannot.

Accordingly, the pubic segment is hauled up partly above the brim, and thus the os internum of the cervix is higher anteriorly than it is behind. The anterior wall of the uterus is thus more contracted, and is therefore thicker. The bladder is lifted up above the symphysis, and stripped of its peritoneum. The bladder relations will, however, be considered in a special section.

It will be now seen, then, that the compact unbroken layer forming the pelvic floor opens up during labour in a perfectly definite way. Before labour the floor is made up, as it were, of two folding doors, accurately opposed at their broad oblique margins, whose contact forms the vaginal slit. During labour, the action of the uterus opens these up as follows. It pulls up the pubic segment, and drives the child down against the sacral one. When the child is expelled the pubic one swings back, and lies on the oblique sacral support. In fact, the process is just the same as when one passes out through two



FIG. 5.—DRAWING REDUCED BY PHOTOGRAPHY FROM BRAUNE'S SECTION, Tab. C, to show Elevation during Labour of Pubic Triangle.

a. Anterior uterine wall; *b.* Posterior uterine wall—note comparative thicknesses; *c.* and *d.* Os internum shewn by veins—note height above pelvic brim; *e.* Bladder; *e.* and *f.* Anterior or pubic segment of pelvic floor. The labour is at end of first stage.

¹ See Appendix, Note A.

swinging bank doors. One half is pulled towards the passenger, the other is pushed from him. In this way he makes room for his exit, and, when past, the doors swing into accurate apposition again. (Fig. 6.)

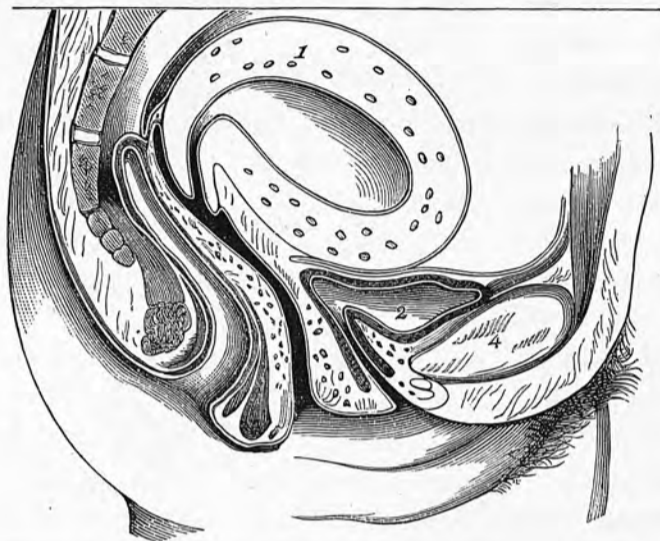


FIG. 6.—VERTICAL SECTION OF PELVIS AFTER DELIVERY, to shew how the Pubic Segment returns to its usual position. Compare with it Fig. 5.

1. Anteflexed post-partum uterus. 2. Pubic segment.
(After Legendre.)

During labour, then, uterine effort causes tension on the segments of the pelvic floor, by means of the attachment of the cervix there. The pubic segment is pulled up, chiefly in the middle line, and less so, as we pass right and left. The sacral segment is little, if at all, hauled up, but is distinctly driven down by the advancing foetal head.

We therefore see that in labour the pubic segment is pulled up, the sacral one driven down, a differentiation in function of the segments as marked as their difference in anatomical structure.

The first line (p. 12), therefore, differentiates the pelvic floor as follows. It divides it so that all in front

is hauled up, all behind driven down during labour. The fact I have now shewn has many important practical applications. These I hope to point out further in the course of this work. At present I wish to consider its bearing on labour.

All obstetricians now admit, that remarkable changes go on in the cervix during labour. It is elongated, thinned, dilated, and drawn up. From a canal of 4 cm. in length, only admitting one or two fingers, it becomes a tube, 10 cm. long, and 9 cm. broad, antero-posteriorly, sufficient in size for the passage of the child's head. What we wish to point out more particularly is, that anteriorly its upper limit is 5 cm. higher above the pelvic brim than it is posteriorly. At the beginning of labour it is at the level of the pelvic brim (Bandl),¹ or even below this. Now, as has been more particularly shewn by Bandl, over-thinning of the cervix leads ultimately to rupture of the uterus. By suprapubic palpation, the furrow between distending cervix and thickened uterine muscle can be felt even at the navel in threatened rupture.² Previous observers, among whom are Bandl, Matthews Duncan, and Angus Macdonald, assert, that this elongation should be estimated as starting from the symphysis pubis or even below it. But in Braune's section, which is that of a normal labour, we have the os internum already 5 cm. above the pelvic brim. This, of course, is due to elevation of the pubic segment, as I have already shewn.

The important fact, therefore, comes out, *that in normal labour the upper limit of the cervix may be felt at least 3-4 cm. above the pelvic brim. An unduly elongated cervix has, therefore, elongated from 3-4 cm. above the pelvic brim, and not from the symphysis pubis.*

Professor Domenico Chiara of Milan, has published lithographic plates of frozen sections of a woman who died while the foetus was undergoing spontaneous evolution.³ In these plates the same phenomena are seen, viz. :—

(1) The bladder is above the pubis.

¹ Bandl, *Über Ruptur der Gebärmutter und ihre Mechanik*. Wien, 1875, S. 47.

² Appendix, Note A.

³ *La Evoluzione Spontanea sorpresa in atto mediante la Congelazione*, per il Prof. Domenico Chiara. Milan, 1878.

(2) The pubic segment is therefore drawn up.

(3) The anterior uterine wall is thicker than the posterior. Although, unfortunately, the peritoneal relations of the bladder are not drawn, the lithograph confirms the views already advanced by me.

B. BY GENU-PECTORAL POSTURE.

There is hardly any natural phenomenon in connection with the female pelvic floor more striking than the distention of the vagina with air when certain postures are assumed. This subject has attracted special attention in America, where it has been worked at by several eminent gynecologists—Marion Sims, H. F. Campbell, Paul F. Munde, and others—whose enquiries have thrown much light on the whole subject, although on some points their opinions are defective.

In conducting an enquiry into the matter, I began with clinical observation, but soon found that the data so obtained were insufficient to explain all the facts. The views I have already given as to the construction and varying mobility of the segments of the pelvic floor, cleared up much that was formerly obscure to me. Still I was puzzled by some points, and for the purpose of settling these, a female cadaver was frozen in the genu-pectoral position and sawn in the mesial line. A life-size coloured drawing of this, with detailed commentary, will shortly be published by Professor A. R. Simpson and myself. At present, I wish, briefly however, to consider the phenomenon generally, in order to keep up the completeness of the present enquiry.

CLINICAL FACTS AS TO THE DISTENTION OF THE VAGINA WITH AIR IN THE GENU-PECTORAL POSITION :—

For the purpose of observing the clinical facts well, a multipara, with lax and redundant genitals and lax abdominal walls, one of those women who have easy labours and look phthisical, should be selected. All fastenings about the waist should be undone, and the patient only lightly clad. While she lies on her back the genitals when inspected will be found so arranged that no mucous membrane is seen. She should be now made to turn on her hands and knees, and assume the position whose outline is figured by Sims¹ and more fully by H. F. Campbell.² The phenomena that now ensue are briefly as follows—As the result of this change in position it will be found that the vertebral column is partly straightened out; that the curve of the abdominal walls is more pronounced, *i.e.*, the recti are nearer the vertebral column at their lower part, and further away nearer the diaphragm; and that the pelvic floor, especially in the middle line, is driven down nearer the thoracic diaphragm. It is still unbroken; the vaginal walls are still in contact; and the pelvic viscera are nearer the diaphragm. If now the vaginal orifice be opened a distinct hiss will be heard from air rushing in, and, in exceptionally good cases, the sacral segment of the pelvic floor can be seen to spring up. The finger passed in, will find the vaginal slit converted into a cavity whose boundaries it can scarcely reach, the os uteri can be touched with difficulty, and the anterior fornix vaginae can be felt almost obliterated. It is evident, then, that the opening of the vaginal orifice in the genu-pectoral position differentiates the pelvic floor functionally, *i.e.*, into a vertebral part, the sacral segment; and an intestinal, the pubic segment—the pubic segment leaves the sacral and passes down with the viscera.

¹ *Clinical Notes on Uterine Surgery*, p. 13.

² *Pneumatic Self-replacement of the Gravid and Non-Gravid Uterus*. *American Gynecological Transactions*, vol. i.

A great many interesting points crop up here, but these will be fully discussed elsewhere, as I have already said. What I wish to enforce now is, that *after air is admitted into the vagina when the pelvis is raised, the pelvic floor is differentiated into a vertebral (sacral) and intestinal segment (pubic).*

As one would expect, this differentiation occurs in all women, but with varying intensity, *i.e.*, it is least marked in the virgin, and best in the puerperal woman, since her pubic segment has, by parturition, got its anterior pubic attachments slackened.

III.—The Female Pelvic Floor Displaced Pathologically in

A. SACRO-PUBIC HERNIA, OTHERWISE KNOWN AS PROLAPSUS UTERI.

In the formation of the female pelvic floor a structural problem had to be solved as follows:—The floor had to be constructed so that we should have some method by which it could be opened up to admit of the passage of the child's head; and while this was to be arranged in such a way as not unduly to impede parturition, the pelvic floor was not to be impaired in its structural efficiency, and was to remain sufficiently firm to resist ordinary, and, to a certain extent, extraordinary intra-abdominal pressure.

In the erect posture the female vertebral column may be regarded as practically

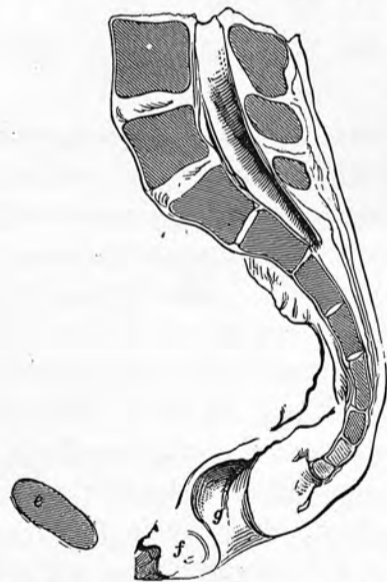


FIG. 7.—THE SACRAL OR SUPPORTING SEGMENT (*f. g.*) OF THE PELVIC FLOOR IN SAGITTAL MESIAL SECTION. The Pubic or Displaceable Segment, Uterus and Posterior Vaginal Wall, have been removed. *e.* Symphysis Pubis; *f.* Perineal Body; *g.* Anus.—(From nature.)

vertical. At the fifth lumbar vertebra the arrangement alters, and the first two bones of the sacrum make an angle backwards with the vertical of about 110° . The other vertebræ (3–5 sacral and 1–3 coccygeal) curve gradually forwards, so that the whole sacrum and coccyx form a surface concave forwards. The further continuation of this bony curve is fleshy, reaching to about $1\frac{1}{2}$ cm. from the symphysis pubis, forms what I have already termed the sacral segment of the pelvic floor (Fig. 7), and makes an angle of about 60° with the horizon. The space between the posterior aspect of the symphysis and the posterior vaginal wall is filled up by the pubic segment of the pelvic floor, whose vaginal aspect closely fits on the anterior aspect of the sacral segment, and is, as already described, continuous and blended with it on either side of the vaginal slit. (Plates I. and II.)

Anteriorly the pubic segment has a loose attachment to the symphysis; while posteriorly, where it does not blend with the sacral segment as above given, it is attached to it indirectly through the uterus by the posterior vaginal wall. This forms a strap-like attachment, and is only firmly blended to the sacral segment at the perineum. (Plates I. and II.) Had the sacral segment been prolonged close to the symphysis pubis, it is evident that women would never have had prolapsus uteri; but then parturition, as we know it at present, would have been an impossibility. The pelvic floor is really built so as to support the superincumbent viscera well, and yet not so strongly as to unduly

impede the birth of the head. The happy medium of strength sufficient but not too great has been struck.

Anatomically considered, then, the part of the pelvic floor, weak in structure and attachments, is the pubic segment and the posterior vaginal wall. So far as displacement of the pelvic floor is concerned, then, we have only to consider the action of the intra-abdominal pressure on this part. There is never any prolapsus of the sacral segment. Rectocele is a distention, and not a hernial phenomenon.

I have spoken of the whole sacral segment as being the supporting one. Usually, however, the perineum is regarded as performing this function. Opinions as to the value of the perineal body vary from strong statements that it has nothing to do with prolapsus uteri, to equally strong assertions that it is the only safeguard against it.

The inferior angle or free edge of the sacral segment is that part of it which is most liable to injury during parturition, since it is the thinnest, and is unsupported by any bony structure. (Plates I. and II.) It is, therefore, strengthened here by a pyramidal wedge of elastic and muscular tissue known as the perineal body. On vertical section this body is found to be $1\frac{3}{4}$ cm.¹ in height, and to touch with its apex a line joining the bottom of the symphysis pubis and sacro-coccygeal joint. The apex of the perineal body is distant about 5 cm. from the top of the posterior vaginal wall. I have been thus particular in defining it, since Thomas of New York, in a recent able paper, has greatly exaggerated its dimensions.² (Fig. 8).

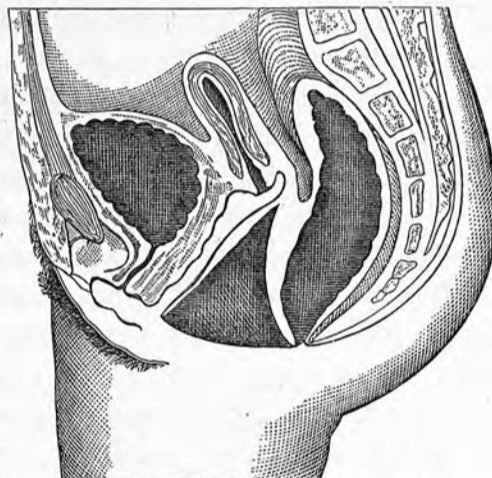


FIG. 8.—SAGITTAL MESIAL SECTION OF FEMALE PELVIC FLOOR, shewing Perineal Body "considerably exaggerated."—(Thomas.)

The perineal body, therefore, tips and strengthens the inferior angle of the sacral segment like the brass-bound edge of a door-step exposed to much traffic, and acts as a strong attachment to the important perineal muscles. It is erroneous, however, to draw it, as Thomas has done in Figure 8, with twice the height and one and a half times the breadth of the reality. This gives it the importance of the sacral segment itself—an importance not warranted by fact.

The intra-abdominal pressure acts on the pelvic floor as follows:—We must regard the viscera from the thoracic to pelvic diaphragm as so much weight of fluid. Atmospheric pressure does not come into consideration, because the atmospheric pressure on the anterior abdominal transmitted to the peritoneal surface of the pelvic diaphragm is counteracted by that on the external aspect of the pelvic floor. If we consider the viscera as acting like a fluid, their pressure is at right angles to the limiting surface, *i.e.*, the peritoneal aspect of the pelvic floor. A consideration of Fig. 9

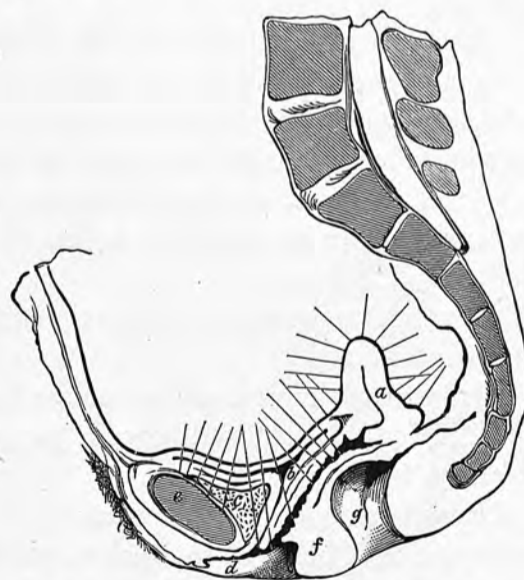


FIG. 9.—SAGITTAL MESIAL SECTION OF FEMALE PELVIC FLOOR, shewing effect of Intra-abdominal Pressure on it. *b. c.* Pubic or Displaceable Segment.—(From nature.)

¹ This I found as its average height in six vertical sections. ² *American Journal of Obstetrics*, April 1880, p. 312

will shew, then, that part of the intra-abdominal pressure will press the pubic segment of the pelvic floor against the sacral (lines, 10-14, counting from the symphysis.) Another part will have a resultant pressing it in the same way, but also tending to force it down out at the vaginal orifice (lines 8 and 9). A third portion will press it against the symphysis pubis (1, 2, 3), and other moieties will tend to drive it out of the vaginal orifice (6 and 7). As a whole, then, the intra-abdominal pressure will tend to press the pubic segment against the supporting sacral segment and symphysis. The resultants tending to force the pubic segment past the sacral will be counteracted so far by the want of rigidity of the pubic segment, by the cohesion of the vaginal walls, and the lateral bony attachments of the pubic segment already given. The pelvic floor, however, as already said, is not thoroughly strong. Its weak portion is all that in front of the anterior rectal wall. Any long-continued strong intra-abdominal pressure will therefore tend to displace it, and displace, as a whole, a definite portion of it, viz., the pubic segment, the uterus, and the posterior vaginal wall.

The pubic segment has a weak attachment anteriorly, and its connection to the sacral segment through the posterior vaginal wall is also weak. The uterus lies between, and therefore extra intra-abdominal pressure pushes all three—*i.e.*, pubic segment, uterus, and posterior vaginal wall—down *en masse*. Anatomically considered, then, all in front of the recto-vaginal line is what intra-abdominal pressure can displace. (P. 12).

The sacral segment is, therefore, the supporting one, and the pubic segment the displaceable one. It is almost always stated that the posterior vaginal wall is the supporter, and its special sigmoid curve is believed by Thomas to have a special mechanical value in preventing prolapsus. Thomas's mechanical principle is accurate enough, but the fallacy in its application is, that he considers intra-abdominal pressure as applied to the top of the vaginal wall. If one wishes to consider the effect of intra-abdominal pressure on the posterior vaginal wall, one must consider the viscera and pubic segment as pressing like a fluid on the posterior vaginal wall (really on the sacral segment), and at right angles to it.

To regard the perineum and the posterior vaginal wall as the supporting part is wrong. The perineum is only a certain fraction of the sacral segment, made of a stronger tissue, to be sure, but yet having a value only in proportion to its size, and the fact that it gives insertion to many muscles, and is the bit of the sacral segment usually torn by the foetal head.

We have thus considered the natural structural arrangements of the pelvic floor. This leads us, then, to its chief pathological displacement, viz. :—

HERNIA THROUGH THE FRONT HALF OF THE PELVIC FLOOR, OTHERWISE KNOWN AS PROLAPSUS UTERI.

Hardly any subject in Gynecology has given rise to more discrepancy of opinion than the pathological condition known as prolapsus uteri. Examination of the opinions advanced by Huguier, Matthews Duncan, Goodell, Marion Sims, Thomas, Protheroe Smith, and many others, will shew how widely their views diverge. By some, lesion of the perineum is believed to cause no predisposition to its occurrence, while others seem to imagine that its integrity is the only safeguard against it. It is interesting to note that so many acute observers should hold such divergent opinions. Some of the reasons for this, however, are well worthy of our preliminary attention.

In the first place, the stability and structural arrangements of the female pelvic floor have been ignored.

In the second place, the importance of the intra-abdominal pressure has been much

underrated. The gynecologist, looking at the stages of a prolapsus uteri occurring in a living woman, is apt to think that the anterior vaginal wall is pulling down the uterus, and the uterus pulling down the posterior vaginal wall, ignoring the reality of the mass of viscera above pushing these down as a whole. The uterus is only an insignificant fraction of this mass, and its supra-vaginal cervical portion still more so. To regard the pelvic floor as the sphere of prolapsus uteri is erroneous. The parts concerned reach from the thoracic diaphragm downwards.

In the third place, the term "prolapsus uteri" is a most unfortunate and misleading one. It has led most gynecologists either to accept without question, or to attempt to prove the supposition that the uterus has some important part in causing its own prolapsus; whereas, as I hope to shew, it really plays no part in it at all. Had surgeons termed "inguinal hernia" "prolapse of the cremasteric fascia," it is evident they would have been led as far astray as gynecologists.

Fourthly, it has been chiefly studied clinically.

Prolapsus uteri, however, must not only be studied clinically, but also in vertical section on the actual cadaver, as it is only by combining what we learn from these, and what we know of the structural arrangement of the pelvic floor, that we can obtain true views as to its nature.

I therefore now take up—

1. *Clinical Features of Prolapsus Uteri.*
2. *Anatomical Nature.*
3. *Explanation of (1) Definite Mechanism; (2) Varying position of Uterus during Descent of a Prolapsus Uteri; (3) Enlargement of Uterus.*
4. *Nature of Prolapsus Uteri.*
5. *Factors producing Prolapsus Uteri.*
6. *Nomenclature.*

1. *Clinical Features of Prolapsus Uteri.*—If a patient with a complete prolapsus uteri be laid on her side, the whole prolapsed organs replaced,¹ and if she be then bid strain, the following structures will appear and pass out at the vaginal orifice:—The anterior vaginal wall first appears from below upwards. *Pari passu* with its descent the uterus and posterior vaginal wall have come down, the cervix tracing the pelvic curve, and the uterus becoming more and more retroverted, until when the os uteri is at the vaginal orifice, the uterus lies in the vaginal axis, with the posterior vaginal wall forming a pouch, the half of its own length behind it. Further efforts by the woman will now drive the uterus outside the orifice, with the fundus lower than the cervix, and the posterior vaginal wall is now completely everted, its lowest part appearing last.

2. *Anatomical Nature.*—The anatomical features can be studied only in vertical section. Schütz's diagram of a vertical section of the parts in complete prolapse, from a frozen section, illustrates the descrip-

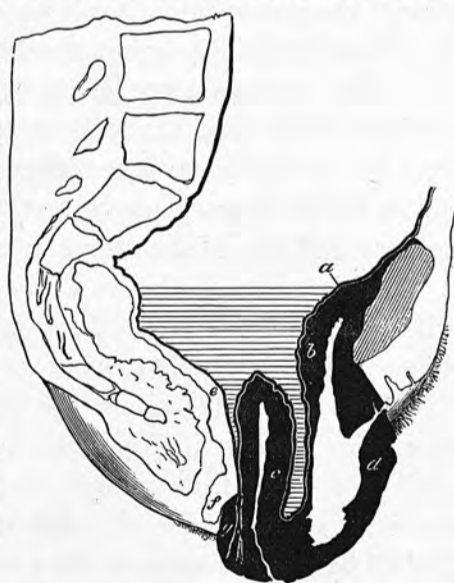


FIG. 10.—DIAGRAM MODIFIED FROM SCHÜTZ, shewing the hernial nature of prolapsus uteri. The coverings of the hernia are in black; the transverse lines indicate viscera. *a.* Peritoneal line, *i.e.*, sac; *b. d.* Pubic segment; *c.* Uterus; *f.* Remains of Perineal body; *g.* Posterior vaginal wall; *e.* Anterior or rectal wall.

¹ This should be done so that what comes down first is replaced first. The order of replacement is, therefore, posterior vaginal wall, uterus, and anterior vaginal wall.

tion we have given, admirably.¹ Figure 10, which is modified from Schütz's drawing, shews that in a nearly complete prolapsus, we have, from before backwards, pubic segment of the pelvic floor, uterus, and posterior vaginal wall. The rectum is quite in position, and the part of the posterior vaginal wall not prolapsed, is that part of it opposite the perineal body where the loose connection between posterior vaginal wall and anterior rectal wall ceases. The peritoneal lining of the displaced structures is well seen.

3. *Explanation of (1) Definite Mechanism; (2) Varying position of Uterus during descent of a Prolapsus Uteri; (3) Enlargement of Uterus.*—From all we have now gone over it is evident that so-called prolapsus uteri is, as we anticipated anatomically, a displacement downwards *en masse* of all the structures in front of a line drawn between the posterior vaginal wall and anterior rectal one; and if this be considered it will readily be seen why we have always a definite mechanism when viewed at the vaginal orifice.

Two points now come up for consideration, viz., the position of the uterus during the descent of a prolapsus uteri, and the relation of the enlargement of the uterus to prolapsus uteri. In regard to the first point, it will be seen that the uterus, while it is being forced down, has the position of its long axis continually altering. This is often expressed by saying that the uterus becomes more and more retroverted as it is forced down. The real fact is, that as the pubic segment is forced down, it is stretched, chiefly on its peritoneal aspect. In this way tension is made on the cervix uteri, with the effect of throwing the fundus back and making it rest on the retrojacent structures. As these have roughly the pelvic curve, we get the uterus in this way constantly altering its axis-lie.

It is a fact clinically, that, in most cases, the uterus in prolapsus is enlarged. At present I am only considering prolapsus uteri in a mechanical aspect; whereas the question of this enlargement is to be settled clinically and by anatomical sections. My own belief is, that the enlargement is not purely cervical, but affects the whole uterus, pubic segment and posterior vaginal wall too, and that it is a consequence of prolapsus uteri, and not a factor in its production. If we view a prolapsed uterus, with the os at the ostium vaginae, through the pelvic brim, it can be seen that it lies, as it were, at the bottom of a valley, the sides of the valley being the broad ligaments, the bed of the valley the uterus. The parts of the uterus do not lie on the same horizontal plane, but the cervix lies lower. It is evident, then, that the venous supply of the uterus, having a mechanical disadvantage to its return, will have a tendency to stasis most marked at its cervical end. This may lead to areolar hyperplasia at first, and, so far as our present knowledge goes, accounts for the increased size of the uterus in prolapsus.

4. *Nature of Prolapsus Uteri.*—The uterus has nothing to do with prolapsus uteri. It is a time-honoured term, but a misleading one. Prolapsus uteri is really a hernia, and is analogous in every point to what we term a surgical hernia; such as femoral hernia, and so on.

Thus it has (1) a *sac*, the peritoneum; (2) a definite road to travel along, whose boundaries are—*a.* in front, the pubic symphysis; *b.* behind, the sacral segment of the pelvic floor—*i.e.*, from anterior wall of rectum back to sacrum; *c.* side walls; (3) definite coverings, viz., *a.* pubic segment of pelvic floor; *b.* the uterus; *c.* posterior vaginal wall. Like all herniæ, its sac contains small intestine. (Fig. 10).

What I have already given is sufficient evidence as to the hernial nature of prolapsus uteri. The matter will be made more evident by a consideration of an ordinary oblique inguinal hernia. Here the same structural problem had to be solved, viz., how to get the foetal testicle from the abdominal cavity into the scrotum without unduly impairing the strength of the abdominal wall. Hence we get the spermatic cord lying in an oblique

¹ *Archiv für Gynakologie*, Band xiii., S. 262.

slit, so made that the intra-abdominal pressure presses at right angles to it, *i.e.*, in such a way that the boundaries of the inguinal canal behind the cord are pressed against those in front of it. Still this is the weak point in the wall, and the point where hernia generally occurs. In any such hernia the coverings are thickened, yet no surgeon regards this otherwise than as a result of the hernia itself, caused by excessive intra-abdominal pressure on a part anatomically weak. The same view holds good for a prolapsus uteri. It is a hernia too, and the uterus is only a thickened covering.

If this view be correct, it is clear, then, that the theory of prolapsus uteri, which makes its initial cause lie in the supra-vaginal elongation of the cervix, is open to the objection that it would be the only case of a hernia known where a thickening and hypertrophy of a covering caused the hernia itself. I deny *in toto* the truth of any such view as to the causation of prolapsus uteri.¹

5. *Factors producing Prolapsus Uteri.*—The factors producing prolapsus uteri are three in number, viz.—(1) *Deficient sacral support*; (2) *Deficient tone of pubic segment of pelvic floor*; (3) *Intra-abdominal pressure*.

(1) *Deficient Sacral Support.*—By this I mean that through parturition the sacral segment has got straightened out and notched, or deficient at its lower margin—the perineum. It is wrong to imagine that tear of the perineum is everything in prolapsus uteri. The perineum may be considerably torn, but if the sacral segment is still sufficiently curved, and the intra-abdominal pressure not too great, there will be no prolapsus. Tear of the perineum is not everything in prolapsus uteri; but it is too great a rebound from this view to say that it never has anything to do in bringing it about. Deficient sacral support makes the task of intra-abdominal pressure easier. The bearing of the second and third factors is sufficiently evident. Of all the three, the third, viz., increased intra-abdominal pressure, is the most important, and is sufficient to cause prolapsus even in virgins. The first and second are adjuvant.

The etiology of prolapsus may thus be summed up—1. Intra-abdominal pressure alone may cause it; 2. An inspection of the figures already given will shew that deficiency of the perineum and straightening of the sacral segment will form important factors in prolapsus uteri; *i.e.*, they cannot resist intra-abdominal pressure sufficiently. Want of tone of the pubic segment will make it more easily driven down. It should not be forgotten that the downward displacement of the pubic segment is most marked mesially.

There are many anatomical points still to be settled. These I would briefly indicate. We do not know the amount of displacement on each side of the middle line; nor do we know exactly the changes in the peritoneum, &c. Such points, however, do not affect the general view I have advanced.

6. *Nomenclature.*—The nomenclature in prolapsus uteri is very embarrassing and deceptive. All such terms as “cystocele,” “prolapse of anterior vaginal wall,” &c., should be avoided. The term “prolapsus uteri” is misleading but convenient, and need not mislead if we define what we mean by it. The gradations of prolapse are best named by describing how much of the anterior vaginal wall, uterus, or posterior wall is seen at the vulvar orifice.

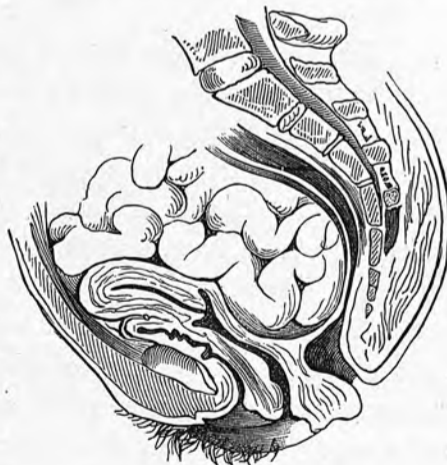


FIG. II.—RECTO-VAGINAL HERNIA—(Breisky).

¹ See Appendix.

The term "sacro-pubic hernia," though scientifically correct, will not displace the classical one of prolapsus uteri.

A very rare form of hernia should be noticed here. Sometimes the intestines are forced between the anterior rectal and posterior vaginal walls—a result evidently permitted by their anatomical relations. It is of course to be diagnosed from prolapsus uteri by its not presenting the same mechanism. In it the posterior vaginal wall is pushed out at the orifice from below upwards, the pubic segment remaining in position.¹ (Fig. 11.)

B. IN HAULING DOWN OF THE UTERUS, WITH SOME REMARKS ON UTERINE SUPPORT.

The use of specula and other gynecological instruments has given rise to one false impression only recently shaken off by gynecologists, viz., that the uterus is an organ which can only be seen or treated at the top of the vaginal slit. The uterus can really be brought, by means of a volsella, to the ostium vaginae by a moderate amount of traction.

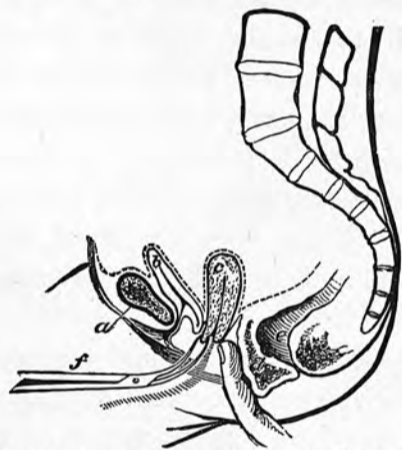


FIG. 12.—VERTICAL SECTION OF PELVIS, shewing relations when Uterus is hauled down. *a.* Symphysis; *b.* Bladder; *c.* Uterus; *d.* Perineum; *e.* Rectum; *f.* Volsella.

A full account of the practical bearings of this fact will be found in a paper by Professor A. R. Simpson,² whose figure, shewing the mechanism in the hauling down, I reproduce, through his kindness. It should be compared with the prolapsus uteri diagram, when it will be at once seen that it differs essentially from it. Thus, when the uterus is hauled down so that the os uteri is at the ostium vaginae, the anterior vaginal wall is only inverted, and is still within the vulvar orifice. In prolapsus uteri, with the os uteri at the ostium vaginae, the anterior vaginal wall is completely outside the vulvar orifice. It is therefore evident that if the uterus "came down" in prolapsus uteri, as is so often said, we would get the same mechanism as when it is hauled down—which, of course, we do not.

This section is the natural place to consider how the womb is supported. The fact that the uterus can be hauled down with so little force, shews that its ligaments have little to do with sustaining it in position. The vagina has often been credited with being the main supporter, for what specially good reason I do not know. If a surgeon were asked how the male bladder is kept in position, he would answer promptly, that it rested on the unbroken pelvic floor, and that its ligaments, true and false, had nothing to do with its support. The uterus is supported in the same manner. It rests on the compact unbroken pelvic floor, not on the vaginal walls alone. The position of the uterus *quâ* descent is determined by the position of the pubic segment, which itself depends on the integrity of the sacral one, *i.e.*, uterine position depends on whether or not the pelvic floor is compact and closed. Whenever the pubic segment of the floor is displaced downwards, so is the uterus. The uterus, therefore, is not *suspended*, but *rests*. (Plate I.)

Some minor points will be further discussed in Part II.

¹ Compare *Die Krankheiten der Vagina*, von Dr. A. Breisky, in Billroth's *Handbuch der Frauenkrankheiten*.

² *Edinburgh Medical Journal*. October 1879.

IV.—*The Peritoneum, Bladder, and Retro-Pubic Fat.*

Hitherto the pubic segment has been regarded as a whole. A more careful examination shews, however, that it is made up of bladder, peritoneum, and retro-pubic fat. I have described certain definite changes in position as occurring in the pubic segment; and, therefore, the question may now be fairly asked, What are the detailed changes in position in these three components of the pubic segment?

The Peritoneum lines the visceral aspect of the pelvic floor. The important facts as to its relations to it are best and most usefully seen in mesial vertical section. If Plate I. be examined, it will be noted that, a little above the top of the symphysis pubis, the peritoneum passes over the fundus of the empty bladder, and then to the anterior surface of the cervix uteri; over the anterior surface of uterus, fundus uteri, and then down the posterior uterine aspect. It extends down to a lower level here than it does in front, and is then reflected upwards on the structures lying in front of the sacrum. Its dip behind the uterus is known as the pouch of Douglas. This part is important as being the lowest portion of the peritoneal cavity, and, consequently, the first part to be filled with free effused blood. It is only when the bladder is distended that we get a vesico-uterine pouch, in such a section as is shewn at Plate I.¹ There is no appreciable amount of anterior abdominal wall uncovered by peritoneum. The incorporation of the peritoneum with the subjacent tissues varies. It is loose over the abdominal wall and fundus of bladder, firm over the uterus.

The Bladder and Retro-pubic Fat.—The empty female bladder generally forms with the urethra a Y-shaped outline on vertical section, the urethra forming the leg of the Y, and the bladder the limbs.¹ It then has a pubic, peritoneal, and vaginal side. Its vaginal side is uniformly straight, is loosely incorporated with the anterior vaginal wall, and anterior surface of cervix to about its junction with the body of the uterus proper. The anterior side of the bladder lies behind the pubis, but is not parallel to it. It only touches the symphysis near the top of the latter, and then runs back at an acute angle to the urethra. Thus the greater portion of the posterior surface of the pubis is not in contact with bladder or urethra, and in this way there is here a definite angular space filled with loose fat. This looseness of connection between pubis and bladder is of the highest importance, and is found in all pelvises, and figured in drawings of vertical sections taken from actual specimens. Skene, in his admirable work,² alleges that "anteriorly the bladder is closely attached to the posterior face of the symphysis pubis." This, however, is erroneous. (Plate I.)

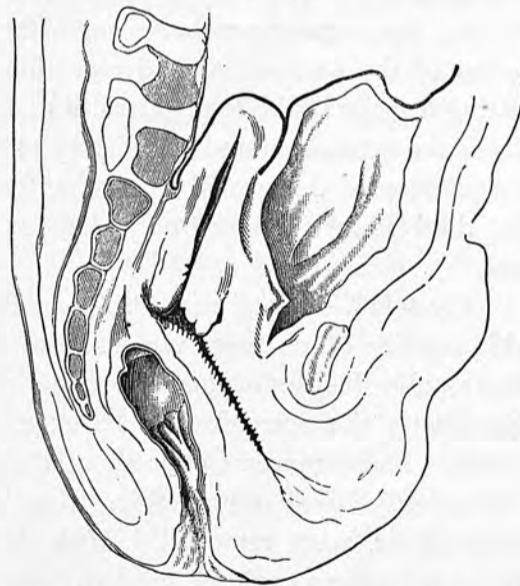


FIG. 13.—VERTICAL MESIAL SECTION OF FETAL FEMALE PELVIS (life size), with bladder naturally distended and uterus driven back.

The empty female bladder thus has most often an antero-posterior and transverse diameter, but no vertical one.¹ It should be noted, however, that in perfectly normal

¹ Appendix, Note C.

² Skene's *Diseases of Bladder and Urethra in Women*, 1878.

pelvis the empty bladder has only a vertical and transverse diameter, and there is a vesico-uterine pouch. (Fig. 25.)

The bladder arrangements in the advanced foetus, and child in infancy, are curiously different from those of the adult. The anterior surface of the bladder in the foetus lies behind the abdominal wall; the empty bladder, even, is an abdominal organ, and has no antero-posterior, but only vertical and transverse diameters. Its relations and diameters are thus quite the reverse of what it ultimately possesses. (Fig. 13.) What the precise changes are which bring about its final state in the adult, I do not know. There is probably a greater development of the pelvis than of the pelvic contents, and perhaps some sinking of the bladder. At any rate, the adult female bladder, when empty, becomes a pelvic organ.

I have now to submit certain anomalous and hitherto unexplained clinical facts, and to endeavour to clear them up on the basis of the facts already laid down. It is probably every gynecologist's experience that, in certain circumstances, the female bladder may seem very much distended, so far as supra-pubic palpation and inspection give evidence, but that when the catheter is passed, an unexpectedly small quantity of urine is drawn off. The female urethra is short, averaging only 3 cm. in length, but yet gynecologists use, and use rightly, a long flexible gum elastic catheter. Finally, surgeons who deal with retention of urine in the male do not meet with such anomalies. Before trying to reconcile these facts, it will be best to narrate four contrasted and carefully observed cases.

CASE I.—A B, æt. 18, was seen in Professor Simpson's out-patient clinique on account of white discharge and pain on making water. Ocular examination of the external parts shewed a recent laceration of the hymen and glairy discharge from the ostium vaginæ. On vaginal examination, the cervix was found normal in all respects, except that the os looked downwards and forwards. Bimanually, a fluctuating tumour, reaching up a little above the level of the pelvic brim, was felt in front of the partially retroverted unimpregnated uterus. The catheter introduced drew off 27 oz. of urine. (Fig. 15.)

CASE II.—Mrs. C. was admitted to Professor Simpson's ward on account of retention of urine, necessitating catheterism. Bimanual examination shewed a large tumour in the hollow of the sacrum, marked elevation of the os uteri above the symphysis, and a fluctuating tumour in the hypogastric region, reaching almost as high as the umbilicus. This physical examination and the history of four months' amenorrhœa made the diagnosis of retroversion of the gravid uterus perfectly plain. What concerns us here, however, is, that the bladder contained only about 23 oz. of urine—a less amount than in the previous case.

CASE III.—Along with Professor Simpson, I saw at the Maternity Hospital a patient with rigidity of os uteri, supposed to necessitate early application of the long forceps. Supra-pubic inspection and palpation revealed a fluctuating tumour, bluntly triangular in shape, with the apex down. Exact measurements shewed that vertically it extended for 4 inches, and transversely for about the same. The catheter, passed deeply up, drew off only 2½ oz. of clear urine. Some time afterwards the same apparent distention occurred, when 3½ oz. were removed. After the bladder was thus emptied, the furrow between cervix and uterus could be felt two finger-breadths above the symphysis pubis.

CASE IV.—In the *Centralblatt für Gynäkologie* for 7th June, Litzmann of Kiel¹ relates a case where the Cæsarean section was had recourse to on account of threatened rupture of

¹ Kaiserschnitt mit temporärer Ligatur der Cervix durch den Esmarch'schen Schlauch wegen drohender Ruptur des Uterus bei hochgradiger Beckenenge und abnormer Resistenz des Muttermundes.

the uterus. In this communication Litzmann makes two valuable observations, without, however, explaining them. He notes that after the abdominal cavity and uterus were incised and the child removed, the summit of the bladder was seen four finger-breadths above the pubis. Although there was urine in the bladder (*eine ziemliche Menge*), its position was not due to over-distention, as it had been evacuated before the operation. But further, it was observed that the peritoneum was somewhat separated from the abdominal wall. Lastly, it was noted, on post-mortem, that the peritoneum was separated from the anterior wall of the bladder, which was elongated in form.

In the first case narrated, the bladder was simply distended. It had pushed the intestines up, tilted the uterus back, but its posterior wall was still in its normal position. The peritoneum was still on the summit of the bladder, but of course was stripped to a certain extent from the lower part of the posterior aspect of the anterior abdominal wall. (Fig. 15.) Thus the bladder, though its summit was only at the level of the brim, was considerably distended.

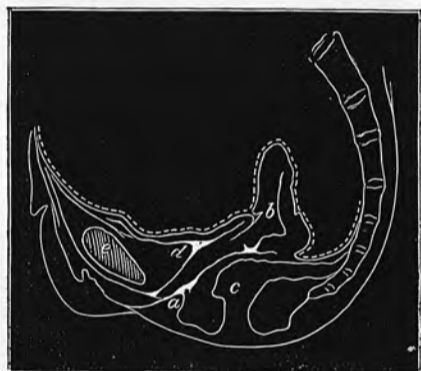


FIG. 14.—VERTICAL SECTION OF FEMALE PELVIS. *a*. Vagina; *b*. Uterus; *c*. Rectum; *d*. Bladder; *e*. Symphysis. The dotted line shows peritoneum covering bladder, which is empty and below pelvic brim.



FIG. 15.—VERTICAL SECTION OF FEMALE PELVIS WHERE BLADDER HAS BEEN OVER-DISTENDED. (Pirogoff.) The bladder is above pubis, but peritoneum still covers it.

Now, in the retroversion of the gravid uterus, the bladder was certainly distended. Supra-pubic palpation, however, misled as to the amount of distention, and for the following reason. The cervix uteri was tilted high up behind the symphysis pubis, and, consequently, the bladder, to whose posterior angle the cervix is attached, was swung up, as it were, into the abdominal cavity, a movement permitted by the anatomical relations behind the pubis. The peritoneal relations were the same as in Case I.

In the third case the bladder was of course drawn up, and its relations were as follows:—In front, it touched anterior abdominal wall; behind, the child's head—the cervix, of course, intervening. In this way the anterior and posterior vesical walls were in contact, and thus a film of urine, as it were, gave the appearance of distention. (Fig. 17.)

In Litzmann's case the explanation is as follows. In the elongation of the cervix, which happens during parturition, we get the pubic segment drawn up. The bladder is thus elevated, but owing to the firmer connection between peritoneum and uterus than between bladder, abdominal wall, and peritoneum, the peritoneum strips off. After the pubic segment has been so far elevated, the cervix will yield more than it, and thus the peritoneum is completely drawn off the bladder. But it may be urged that the *distention* of the bladder may alone account for the *elevation* of it I have described. It does not, however, as I shall now shew.

The bladder may be elevated above the pubis by distending it with water, or by distending the rectum forcibly. In these cases the bladder is pushed up, while during labour it is drawn up. The different causation makes a marked anatomical distinction. When the elevation of the bladder is due to a pushing up, the peritoneum is unaltered in its relations to it, as is seen in the plates published by Pirogoff, Legendre, Braune, and myself. If, however, we look at Braune's Tab. C, where the section is that of a woman in labour, then it can be well seen that the bladder is only tipped at its summit by the peritoneum. Litzmann thinks that the separation happens during pregnancy. At the end of pregnancy, however, the peritoneum still covers the bladder and lower part of the abdominal wall. (Figs. 16 and 17.)



FIG. 16.—VERTICAL SECTION OF WOMAN AT END OF PREGNANCY. (After Braune.) The Bladder, *d*, is below Pubis, and covered with Peritoneum.



FIG. 17.—VERTICAL SECTION OF PELVIS OF A WOMAN IN SECOND STAGE OF LABOUR. (After Braune.) *a*. Vagina distended by membranes; *d*. Bladder above Pubis—the dotted line shews Peritoneum drawn off bladder.

The physiological elevation of the bladder during labour differs, therefore, essentially from that caused by pathological distention or elevation by pressure from below, both in its causation and anatomical relations.

We are, therefore, now in a position to state the following facts:—

1. *Peritoneum*.—The peritoneum can be differentiated just as the segments of the pelvic floor can. *The peritoneum, lying over the lower part of the anterior abdominal wall and bladder, can be elevated; that on the uterus and sacral segment cannot.* When the bladder is empty, the peritoneum runs on the anterior abdominal wall close down to the symphysis pubis (Plate I.); in the genu-pectoral posture, it falls short of it by a 2½ cm. or so. In distention of the bladder, the peritoneum is stripped from the anterior abdominal wall to an extent varying with the distention (Fig. 15); while during labour the same thing happens when the bladder is above the pubis, with the addition, however, that the peritoneum is drawn off the bladder itself. (Fig. 17.)

2. *Bladder*.—(1) The retro-pubic anatomical attachments of the bladder admit of its distention and passage upwards. (2) Supra-pubic palpation gives no sure indication of the amount of urinary distention. (3) When the summit of the bladder is above the pubis, it may be—*a*. a pure distention (Case 1); *b*. distention, plus a tilting up (Case 2); *c*. drawing up of the bladder, with almost no distention (Case 3); *d*. the result of the genu-pectoral posture when the fundus of the empty bladder rises above the pubis.

The reason why gynecologists use a long gum elastic catheter is very evident. I before described the empty bladder in the non-parturient female as usually forming a Y-shaped

figure on vertical section. During parturition, however, the urethra is elongated, and forms with the bladder, on vertical section, a continuous tube.¹ (Fig. 17.) Only that part of the bladder above the pubis is available for the reception of urine, so that in this way the path for the catheter to travel is increased. In Braune's section of a woman in labour, the distance for the catheter to travel is about 11 cm., more than thrice what it is normally.

Further, a comparison of Figs. 13 and 15 will shew that the distended female adult bladder is quite comparable in its anatomical relations to the distended foetal one. This may point to the explanation that the ultimate changes which convert the urinary bladder from an abdominal organ into a pelvic one are chiefly in the bony pelvis itself.

3. *Retro-pubic Fat.*—This lies behind the pubis when the bladder is empty (Plate I.); is above it during labour (Fig. 17); and partly above it in the genu-pectoral posture.

As the whole subject of this section is a little intricate, I may summarise it as follows:—

Bladder empty.—Below level of pubis; peritoneum down to symphysis pubis, and over fundus of bladder; fat, retro-pubic (Plate I.)

Bladder distended.—Above level of pubis, peritoneum a varying distance above symphysis, but on fundus of bladder. (Fig. 15.)

Bladder during labour.—Above level of symphysis pubis, peritoneum separated from symphysis, and drawn off bladder; fat above pubis. (Fig. 17.)

Bladder during genu-pectoral posture.—When empty, is above pubis; peritoneum separated from symphysis, but still on fundus; fat partially above pubis.

¹See *Die Lage des Fœtus.* Braune, Tab. C.

Part Second.

IN the previous Part I have attempted to shew that the pelvic diaphragm has a definite mechanical structure; and, as a result of this, opens up and becomes displaced in a perfectly definite manner.

It follows also, that our means of gynecological examination and mechanical support should be performed in a special manner, just as a box or door is opened, and indeed can only rightly be opened in one way.

I therefore now purpose taking up the consideration of—

1. *The Pelvis explored Manually.*
2. *The Pelvic Floor opened up Artificially.*
3. *The Pubic Segment and Uterus supported Artificially.*

I.—The Pelvis explored Manually.

The fundamental and all-important method of pelvic examination is that known technically as the *Bimanual*.

The object of the Bimanual is to grasp the uterus, its annexa and pathological products near, between the fingers of the two hands. For this purpose, the fingers of the one hand are in the vagina, while the other hand is above the pubis, resting on the skin between the iliac crests. (Fig. 18.)

The possibility of the execution of the Bimanual depends on three things—

1. The mobility of the pubic segment.
2. The lax state of the abdominal walls, especially in multiparæ.
3. The power the examiner has of shortening vertically the fleshy part of the sacral segment.

The best way to explain the theory of the Bimanual will be first to state precisely how it should be done. The patient should have the bowels and bladder empty, and should be on her back, with her knees drawn up and her head supported on a pillow. The dress should be so loosened that the hypogastric and iliac regions can be palpated. The examiner stands at the patient's right side. The warmed and oiled index and middle fingers of the right hand should be passed below the patient's right thigh into the vagina, the thumb lying over the pubis, and the other fingers resting in the cleft of the nates. With the middle finger resting on the os, and the index finger in the anterior fornix, the whole hand is pushed up towards the promontory of the sacrum. Thus the whole pubic segment and uterus are elevated, the uterus more markedly anteverted, and the fleshy part of the sacral segment shortened.

The upper hand, thoroughly warmed, has in the meantime been lying on the lower part of the abdominal skin, with its long axis coinciding with the line joining the iliac crests, and the ulnar edge of the palm lower than the radial. By steady pressure the abdominal wall below the hand is depressed, until in this way the pubic segment, uterus, etc., are caught between the two hands.

Thus, by the Bimanual, all in front of the "rectal line" (p. 12) is lifted up.

The difficult bimanual cases are those where the pubic segment is rigidly fixed, as in

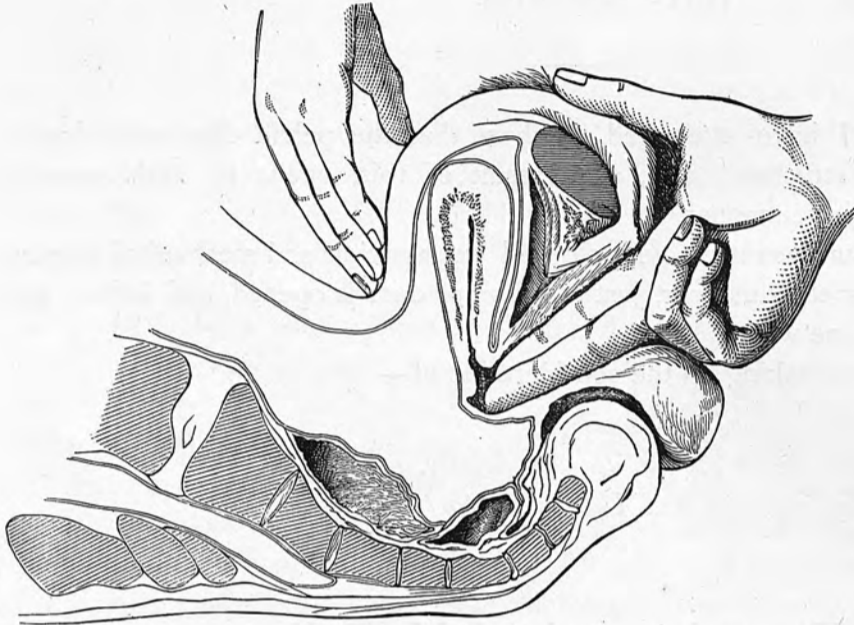


FIG. 18.—DIAGRAM OF BIMANUAL METHOD OF EXAMINATION.

as, "Uterus to front, and nothing else felt;" or "Uterus to front, and a rounded

pelvic inflammatory affections; or the abdominal walls firm and unyielding, as in fat nulliparous women. The best bimanual cases are found in multiparæ, a fortnight or so after confinement. The student of Gynecology should first and foremost practice his Bimanual. He should aim at knowing this thoroughly, and should make his first diagnosis simply "Bimanual diagnosis." By this I mean such a statement

tumour about the size of an apple behind it," and so on. Until this is mastered, he can make no progress in Gynecology.

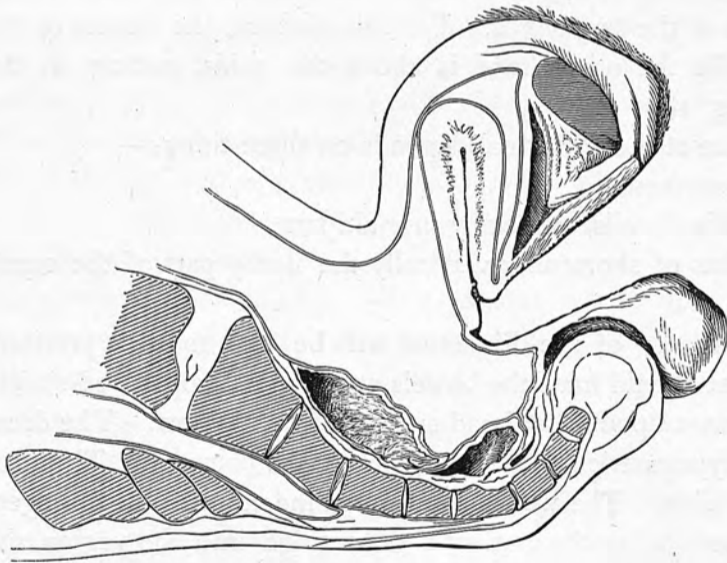


FIG. 19.—DIAGRAM OF PELVIC FLOOR DISPLACEMENT IN BIMANUAL EXAMINATION.

further than the vaginal one, and can get behind the broad ligaments.

Fig. 18 is an attempt to shew diagrammatically how the Bimanual should be performed. It is based on the sections already given, and on diagrams by Marion Sims, Barnes, and Chrobak. The middle finger may often be advantageously passed into the rectum, as by the rectal bimanual better results are obtained than by the abdomino-vaginal, seeing that the rectal finger can pass up

II.—*The Pelvic Floor Opened Up Artificially.*

Any artificial method of opening up the pelvic floor should be based on the natural one. The genu-pectoral attitude and subsequent opening of the vaginal orifice distends the vagina so thoroughly that the means of imitating this, first taught by Marion Sims, was one of the most important steps in gynecological examination and treatment.

If a patient, therefore, be placed in the genu-pectoral posture, opposite a good light, and the sacral segment hooked up by the fingers or Sims speculum, a thorough view of the vaginal walls and cervix is obtained. This method of opening up the floor is awkward, however, and objectionable to all. We therefore employ a modified posture—the semiprone.

I shall therefore now describe the best plan of opening up the pelvic floor, explain its theory, and test other methods by it.

The patient, with her dress loose, should be placed on her left side, partially athwart the couch, with the lower arm over the side of the couch next the gynecologist. The hips should lie close to the edge, and their sacral plane should be oblique, *i.e.*, the upper hip should be in advance of the lower. The knees should be well drawn up.

The Sims speculum, of a chosen size, should then be warmed, and oiled on its convex surface only. The index and middle fingers of the right hand should open up the vaginal orifice, and the speculum blade should then be passed with the left hand, and with its convex surface looking backwards and its long axis in the vaginal axis. The finger of the right hand should now ascertain that the cervix is in front of the distal end of the speculum.

Three further manœuvres are now needed—

The speculum is hauled steadily back at right angles to the posterior vaginal wall, and then rotated so that the distal end is in advance of the proximal one. The proximal end of the blade is finally tilted up so as to lie higher above the horizontal plane than the distal end. The second manœuvre tilts the cervix forward into the field of view, and the third keeps up the upper labium.

The speculum has been passed, and now lies so that its long axis runs downwards and backwards. Nothing has been said about the anterior wall of the vagina, or rather pubic segment of the pelvic floor, because the posture of the patient has caused it to sag down, as already explained in the section on the Genu-pectoral Position. *Sims' speculum hauls back the sacral segment of the pelvic floor; the pubic segment is allowed to gravitate down, and in this way the natural method of opening up the vagina is imitated exactly.* All modifications of Sims speculum, such as anterior bars and so on, are constructed by gynecologists who do not know its real action.

Sometimes a patient is restive and strains, forcing the pubic segment down. A volsella to lay hold of the anterior lip of the cervix remedies this.

Now, in regard to the Fergusson and Cusco specula, I have only to say that they are bad instruments. The Fergusson prizes the pelvic floor open in reality, and prevents operative manipulation. From the fact that it ignores the structural anatomy of the pelvis, prevents the recognition of splits of the cervix, encourages the niggling medication of so-called ulceration, and is useless in operative treatment, it has done more to retard the progress of Gynecology than any other instrument in the gynecologist's armamentarium.

The anterior blade of the Cusco is useless, but the instrument is as a whole not quite so objectionable as the Fergusson.

When the Sims speculum is properly used, *all in front of the "vaginal line"* (p. 12) *sags down; all behind it is hauled back.* It is, therefore, the most scientific speculum. The question as to which is the most convenient one is more difficult to answer.

III.—The Pubic Segment of the Pelvic Floor supported Artificially.

The female pelvic floor is not thoroughly strong, and parturition often further weakens it. Impairment of the strength of the sacral segment and extra intra-abdominal pressure, singly or combined, lead to a displacement downwards of the pubic segment, more or less marked as the case may be. The uterus itself shares in this downward sagging; and, independently of this, is liable to displacement, of which the backward is the all important. When a woman's pelvic floor is compact, when the pubic segment fits the sacral one accurately, and when the uterus lies on the pubic segment, *i.e.*, to the front, she is, as a general rule, comfortable, and needs as little treatment¹ as a man does, *qua* his pelvic diaphragm. But if this be not the case, if the pubic segment be not properly supported by the sacral one, or if the uterus be retroverted, then a series of symptoms arises which demand treatment. To put it shortly, the pubic segment requires to be supported, and the pelvic floor rendered compact—its physiological state in the non-parturient woman.

This can only be done by mechanical treatment, *i.e.*, by vaginal pessaries. The day of sneering at mechanical treatment has now gone by; a result due, let me say, chiefly to the introduction of the well-known Hodge pessary. We are indebted to America for the best pessary, just as we have seen it has given us the most useful speculum. I therefore now take up the consideration of the Hodge and allied pessaries. To understand how these act, I must first state some preliminary matter.

If, while the patient lies on her left side, the finger be passed into the posterior fornix, and then pushed up either in the direction of the vaginal axis or axis of the brim, so as to make the fornix tense, two things result. In the first place, the whole pubic segment is slung up; and, secondly, the uterus becomes more anteverted than it was previously. If the uterus be retroverted, then the same manœuvre will render it less so. The reason for these two results is evident. When the posterior fornix is rendered more tense in an upward direction than usual, it is evident that upward tension is made on the posterior aspect of the pubic segment, so that it becomes slung up. Tension is also made on the cervix, drawing it backwards, and thus the uterus lies more anteverted. If the finger be now placed in the anterior fornix, and tension made by pushing it up in the axis of the brim, it will be found that the pubic segment is slung up, and the fundus uteri tilted back. I need not give the reason for this after what has been said previously. It should be noted, however, that in either case the fundus uteri is not acted on directly by the pressure, if at all, but that it is the cervix that is displaced. If a patient then has a slight downward displacement of the pubic segment, tension in the posterior fornix, or

¹ That is, so far as prolapsus and retroversio uteri are concerned. She may, of course, have other troublesome diseases.

rather the restoration of the posterior vaginal wall to its former state (Plate I.) will remedy it.

The type of vaginal pessary useful for this purpose is the well-known Hodge. Albert Smith's modification is, however, more useful, and more in accordance with the shape of the vagina itself. (Plate I. A.) As already described, the vagina is a slit whose walls are triangular in shape, and therefore broader above than below. All pressure in it is antero-posterior, *i.e.*, from anterior wall to posterior, and there is no lateral or side to side pressure at all. When a patient is erect, the anterior surface of the sacral segment, *i.e.*, the back wall of the vagina, is oblique to the horizon, as Plate I. and Fig. 7 shew. Simply from this obliquity, then, a pessary, or any small structure, will rest in the vagina when a patient is erect. Now, an Albert Smith pessary, when looked at from the side, is sigmoid, *i.e.*, it has the curve of the posterior vaginal wall. When viewed from the front it is broader above than below. To fit the vagina with one of these, then, it should have the sigmoid curve; and the special pessary should never be longer, and may be shorter than the posterior vaginal wall; and, while broader above than below, should have its upper breadth such that it easily passes the vaginal orifice. It is quite unnecessary that the pessary should extend from side to side of the vagina. Such a pessary, then, is really an outline mould of the vagina, but on a smaller scale transversely. It should be noted carefully, that a pessary longer and broader than the vagina, can be forced into it, owing to the rugosities stretching out, and the elastic nature of the walls. Such an instrument will do irretrievable damage, however.

The questions to be answered now are—

1. How does such a pessary remain in the vagina?
2. How does it act on a retroverted uterus?

(1.) From the obliquity of the posterior vaginal wall it rests firmly there. The pubic segment of the pelvic floor also naturally presses it against the sacral so that the pessary is kept in position, just as it is when pressed between the palms of one's hands.

(2.) How does it act in a retroverted uterus?

Fig. 20 shews a profile view of an Albert Smith pessary *in situ*. The posterior vaginal wall runs round the upper bar like a pulley, pulls the cervix back, and, as already explained, keeps the fundus forward.

The full explanation is therefore as follows:—The Albert Smith, when introduced, is kept in position by its resting on the oblique sacral segment, and by being pressed by the pubic segment against the sacral one. The pessary is the length, or nearly so, of the posterior vaginal wall, keeps up the tension of the posterior fornix, and tilts the cervix back, thus keeping the fundus forward.

The "lever theory" of the Hodge pessary is one advocated by eminent gynecologists. I am convinced that it is entirely erroneous.

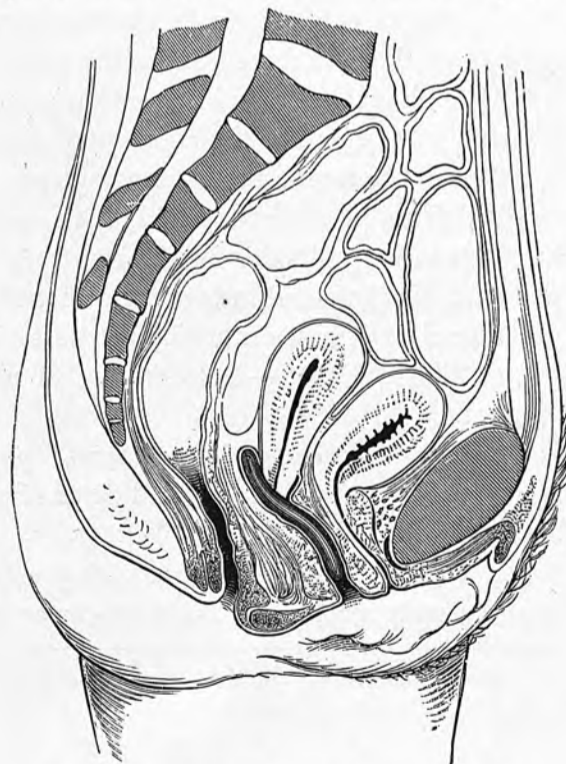


FIG. 20.—DIAGRAM OF FEMALE PELVIS, with Hodge Pessary in Vagina.

If a vertical section of a female, with a

pessary *in situ*, be made, then it is evident that we have a fluid pressure on the posterior vaginal wall, and therefore on the pessary, equable and at right angles. It is a piece of

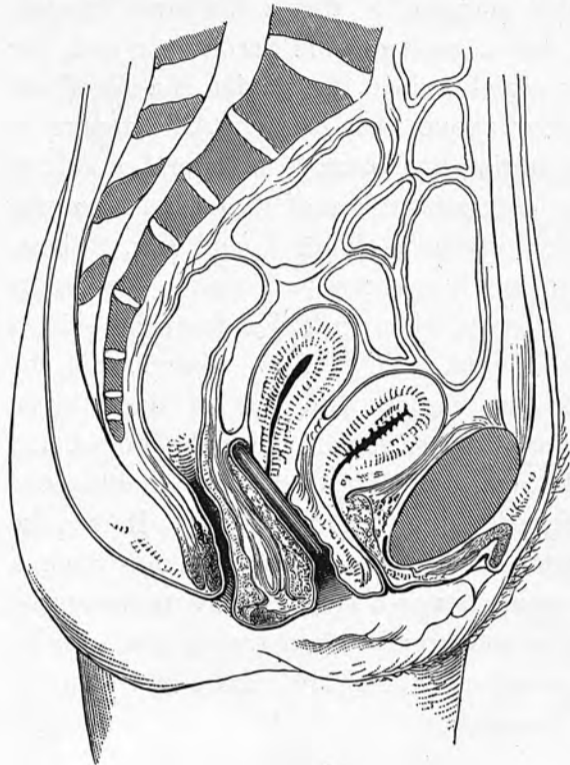


FIG. 21.—VERTICAL SECTION OF FEMALE PELVIS, with Ring Pessary in Vagina.

pure assumption that the pressure is greater on the lower part of the pessary, and that consequently its upper bar tilts forward. The pessary is pressed downwards and backwards as a whole, the lower bar probably more than the upper. When a patient strains down, the sacral segment must revolve like a one-armed lever round the sacrum and coccyx. Any instrument resting on it must do likewise.

The pessary acts in the same way, in a slight prolapsus, due to extra intra-abdominal pressure. If, however, the sacral segment does not support the pessary properly, *i.e.*, if the perineum is too much torn, and the sacral segment too straight, then the Albert Smith is forced out. It is in such cases that the ring pessary is valuable. As Fig. 21 shews, it rests on that part of the sacral segment available for support, and acts then just like the Albert Smith.

But there remains a class of cases where the ring fails. It is in such that anteversion

pessaries prove useful.¹ Their posterior part rests on the sacral segment, while their arched anterior part practically shortens the vaginal aspect of the pubic segment, and thus tightens up the part forced out at the vaginal orifice.

The Albert Smith and ring pessaries, when fitted, as I have already indicated, can never do harm. In regard to the anteversion form, I would speak more guardedly.

One of the most useful temporary pessaries is the glycerine plug. It really acts as a pessary, since, after introduction, it is squeezed between the segments of the floor, and thus kept in its position. Apart from this, it has a depletory and antiseptic action, which renders it highly useful in congestive conditions of the cervix, ovary, or fundus uteri.

The class of cases in which the pessaries mentioned are useful is as follows:—

1. *Albert Smith*.—Retroversion of uterus; slight downward displacement of pubic segment.
2. *Ring*.—Retroversion of uterus; prolapsus uteri, where Albert Smith is forced out.
3. *Anteversion*.—In marked cases of prolapsus uteri. Repair of perineum competes favourably here.
4. *Glycerine plug*.—Inflammatory conditions of cervix, uterus, ovary, pelvic peritoneum; split cervix; displaced uterus or ovary.

¹ See an able article "On the Class of Cases in which Vaginal Anteversion Pessaries give relief to Symptoms," by G. Ernest Herman, M.B. (Lond.), *London Obstetrical Journal*, vol. viii., p. 284.

Summary.

THE Pelvic Floor can be differentiated into a Pubic and Sacral Segment, contrasted as follows :—

<i>Pubic Segment.</i>	<i>Sacral Segment.</i>
Loose in its attachments.	Firm in its attachments.
Drawn up during labour.	Driven down during labour.
Driven down in prolapsus uteri.	Always remains in position (posterior vaginal wall excepted) in prolapsus uteri.
Passes down with viscera in genu-pectoral posture, when vagina is distended by air, and is therefore intestinal.	Remains in position in genu-pectoral posture, with vagina distended by air, and is therefore vertebral.

Three vertical "lines of cleavage" exist in the pelvic floor :—

1. *Vaginal, i.e.*, between vaginal walls. All in front is drawn up in labour, and goes down with viscera in genu-pectoral posture; all behind is driven down during labour, and remains *in situ* in genu-pectoral posture after vagina is distended with air. (Figs. 4 and 5.)

2. *Recto-vaginal*, between anterior wall of rectum and posterior wall of vagina. All in front comes down in prolapsus uteri; all behind remains *in situ*.¹ (Fig. 10.)

3. *Rectal*, between the anterior and posterior walls of rectum. All in front of this is lifted up in the "bimanual," and when rectum is distended with air. (Fig. 19.)

The first line is therefore the physiological line of cleavage, the second is the pathological, and the third the instrumental. (Fig. 22.)

The Sims speculum pulls back the sacral segment, while, by posture of patient, the pubic segment sags down.

The Hodge and ring pessaries are kept in position by the pubic segment pressing them against the oblique sacral one. In retroversion of the uterus, and in prolapsus uteri, they keep the posterior vaginal wall its proper length and render it rigid, so that it runs round the top bar of the pessary like a pulley, and is reflected down on the cervix making it tense. It thus pulls the cervix back and keeps it so.

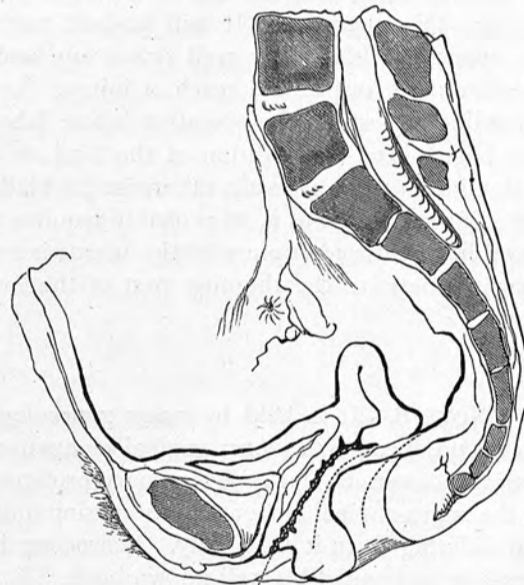


FIG. 22.—DIAGRAM shewing lines of Cleavage in Pelvic Floor.

¹ Intra-abdominal pressure, therefore, may force down all in front of the rectal line; or it may more rarely force intestine between the anterior rectal and posterior vaginal walls; or still more rarely, between the posterior vesical and anterior vaginal walls.

Appendix.

NOTE A.—It will be seen that I consider Braune's ostium internum in Tab. C as the boundary between the cervical canal and the cavity of the uterus proper. Other gynecologists, more especially Bandl of Vienna, consider that what Braune figures as the upper limit of the cervix is really in the uterine cavity proper. This view seems to me untenable, for the following two reasons. In the first place, if Bandl's view were correct, we should have the anterior and posterior limits of Braune's os internum at the same level above the pelvic brim. Bandl tries to account for the high position of the os internum anteriorly, by supposing that it is really a part in the uterine cavity, not having noticed the facts as to the elevation of the pubic segment of the floor I have pointed out.

In the second place, the explanation given by me accounts for all the hitherto unexplained features in Tab. C—viz., the high position of the os internum anteriorly, the position of the empty bladder above the pubis, the stripping of the peritoneum off the bladder, and the greater thickness of the anterior uterine wall, as compared with the posterior one.¹

Another point of interest, as bearing on the elevation of the pubic segment and bladder, is in regard to Thomas' operation of Gastro-elytrotomy. This scientific operation, revived by Thomas of New York, performed by Skene and Gillette of America, Hime of Sheffield, and Edis of London, has been found very successful in these cases. One curious fact in regard to it is, that the bladder is sometimes opened into, and thus a vesico-vaginal or uretero-vaginal fistula may follow. The point I wish to emphasize is, that the elevation of the pubic segment, *i.e.*, of anterior vaginal wall and bladder, favours this operation. It will be best performed, then, some time after the os uteri is dilated, *i.e.*, when the bladder is well drawn up, and thus the vaginal wall more easily reached, and the bladder more out of the reach of injury. In Porro's operation, on the other hand, it is probably advisable to perform the operation before labour has started. If performed some time after labour has begun, then the position of the bladder above the symphysis should be kept in mind, when the abdominal incision is made, otherwise the bladder may be cut into.

The statement at p. 16 probably requires modification. It is doubtful if the furrow felt near the navel in threatened rupture of the uterus is between cervix and uterus proper. It is more probable that it is between the thinning part of the lower uterine segment and the thicker contracting part above.

NOTE B.—It is held by many gynecologists, that what is commonly called prolapsus uteri, is really produced by a supra-vaginal elongation of the cervix, this elongation being a growth due to intrinsic causes, or started by primary prolapse of the vaginal walls. Some authors, however, believe in the supra-vaginal elongation as causing a displacement in many respects similar to prolapsus uteri, but differing from it essentially. Schroeder, indeed, treats of them as two different processes in two separate sections of his well-known book. For the purpose of putting the supra-vaginal elongation of the cervix fairly, I shall, therefore, state it as given by him.²

Schroeder divides the cervix into three portions, viz., one infra-vaginal, one middle, and one supra-vaginal. Of these we need only define the last as being that portion of the cervix above the reflexion of the posterior vaginal wall.

Schroeder states, "That the prolapsus vaginæ exerts general omnilateral traction on the cervix. . . . Should the uterus be retained in its position by normal or pathological supports, and thus be unable to follow the traction of the vagina, a drawing out of the cervix in a downward direction easily occurs, usually not merely a simple elongation with attenuation, but, through the irritation, an increase in bulk of the whole cervix."³

"The uterine hypertrophy, generally about 6 inches, is chiefly confined to that portion of the

¹ See also *Contributions to Obstetrics and Gynecology*, by Professor A. R. Simpson, p. 162. Edinburgh: A. & C. Black, 1880.

² *Diseases of the Female Sexual Organs*, by Professor C. Schroeder of Berlin; Ziemssen's *Cyclopaedia*, vol. x., American Translation, 1875.

³ *Loc. cit.*, pp. 81 and 82.

cervix which is situated above the vaginal insertion. As a rule, this condition is due, as stated above, to the primary prolapse of the vaginal mucous membrane. But in the other class of cases, when the upper portion of the cervix grows downwards, the vagina becomes more inverted, the more considerable the hypertrophy, until, finally, becoming turned entirely inside out it protrudes from the body. . . . The fundus is situated at its normal height or but little lower, occasionally even somewhat higher than usual. The ante-uterine duplicature remains unchanged." (Fig. 23.)

By this process we get a displacement of parts out at the vaginal orifice exactly as in prolapsus uteri; and if everything be replaced, it is forced down, just as described at page 21. Now to the acceptance of this pathological condition, as stated by Schroeder, I have the following objections:—

If the displacement in prolapsus uteri be due in some cases to a simple growth downwards of the supra-vaginal portion, the mechanism of displacement, so far as the anterior wall of the vagina is concerned, must be that it unfolds from above downwards just as when the uterus is hauled down, as in Fig. 12. This, however, is not the case, as the vaginal wall always appears from below up.

Primary prolapse of the anterior vaginal wall is supposed to occur, and to pull on the cervix, causing hypertrophy in its supra-vaginal portion. Now primary prolapse of the vaginal wall alone is anatomically impossible. The part seen coming out at the vaginal orifice is the anterior vaginal wall, but really the whole pubic segment, and uterus too, are being pushed down by the viscera. Then the ligaments are supposed to keep the fundus *in situ*, and thus allow of tension of the cervix. They are not strong enough for this however. Further, I cannot conceive how a prolapsus vaginae can be pushed down by visceral force, and the uterus not driven down too, *pari passu*. In no specimen that I have examined have I found the ante-uterine fold of peritoneum in its normal position, as given by Schroeder in Fig. 23. Schütz's section already quoted, and one by Spiegelberg in the same number of the *Archiv für Gynäkologie*, have the ante-uterine peritoneal fold low down; and Dr. Barnes figures¹ this also—all these being from actual specimens.

I have never found the enlargement of the uterus greater than five inches—a length incompatible with the fundus remaining in position. In this, my observations agree with those of Barnes.²

The theory, therefore, that a displacement of the pubic segment, and posterior vaginal wall, exactly as in prolapsus uteri, can be produced by a supra-vaginal elongation, seems to me to be lacking in sufficient proof. Many writers who describe and believe it throw out hints as to its defects. This can be seen in Dr. Barnes' admirable chapter on the subject.³

Goodell of Philadelphia, who usually writes with a pencil of light, was evidently in difficulties, unusual to his nimble pen, when he wrote, in regard to prolapsus uteri caused by supra-vaginal elongation of the cervix—

"It is a vicious circle throughout: the prolapsing organ—say the vagina—tugs at the bladder, which yields, and in turn lends its weight towards the further descent of the former; by alternately coercing and being coerced, their united action at last begets the circular hypertrophy of the cervix; the latter returns the favour by edging and nudging on the vagina, which responds by still more increasing the prolapse of the bladder and the hypertrophy of the cervix, and by aiding them in drawing out the supra-glandular portion of the cervix. Thus this reciprocation is kept up until the constantly elongating and growing cervix has attained length and weight enough to act aggressively. Aided now by the downward succussions communicated to it by the movements of the body, it completes the work by wholly inverting the vagina. The resistance of the vaginal tube to this final extrusion, being spent upon its cervical attachment, pulls the already gaping lips of the os still more apart, makes the cervical canal funnel-shaped, and sometimes everts it so completely as to convert the internal os into an external one."⁴

I believe that in all cases of prolapsus uteri, the causation is as follows. The sphere of prolapsus



FIG. 23.—SUPRA-VAGINAL ELONGATION OF CERVIX. *aa*. Uterine body; *bb*. Elongated supra-vaginal portion of cervix; *cd*. Bladder. (Schroeder).

¹ *The Diseases of Women*, second edition, fig. 124, p. 644.

² *Loc. cit.*, p. 642.

³ *Loc. cit.*, pp. 646, 651.

⁴ *Lessons in Gynecology*, p. 194.

uteri reaches up to the diaphragm (Fig. 24). All in front of the anterior rectal wall has a weak attachment behind to the rectum, and in front to the pubis. Intra-abdominal pressure, therefore, displaces

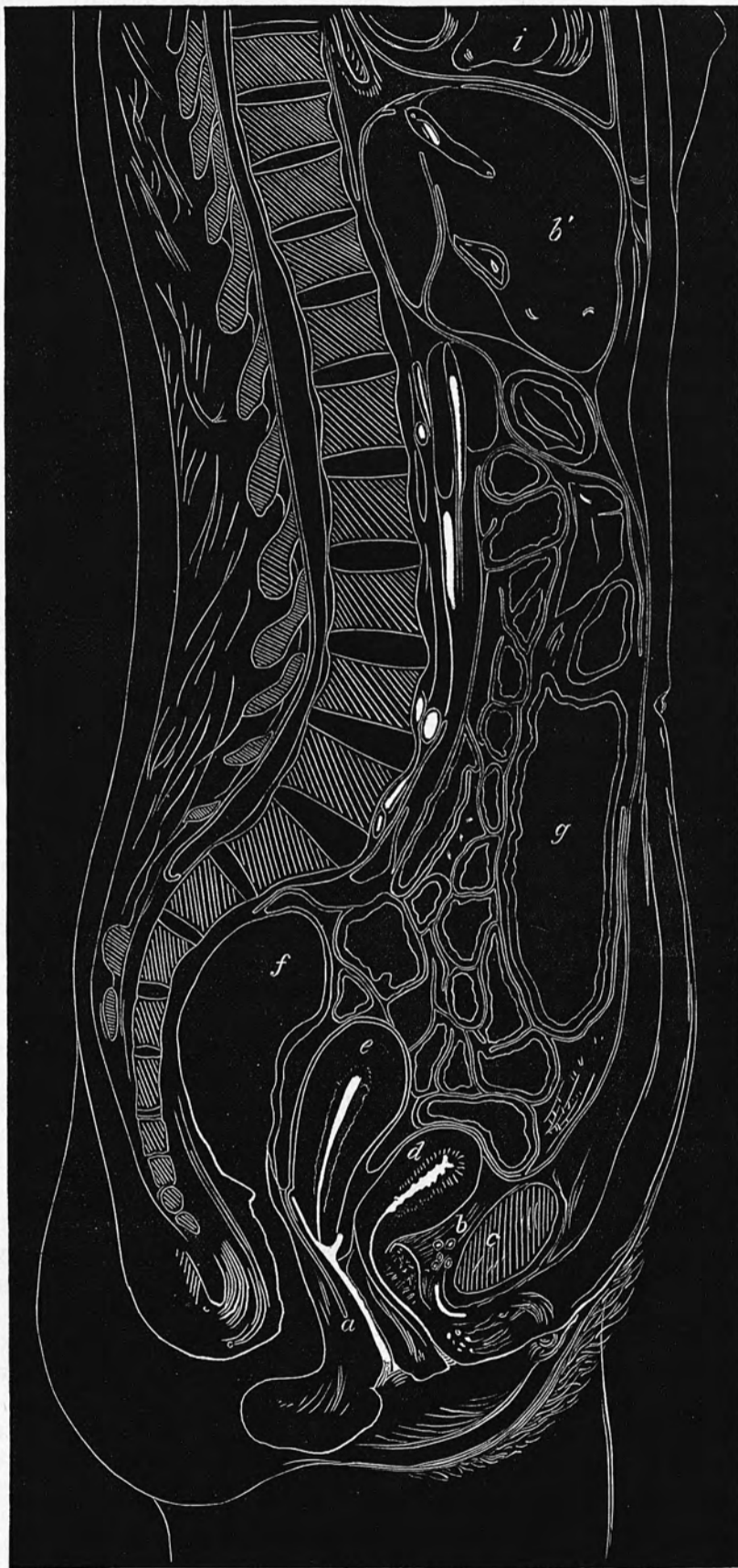


FIG. 24.—DIAGRAM OF ABDOMINAL CAVITY AND PELVIC FLOOR IN THE FEMALE, to shew the parts concerned in Prolapsus Uteri. *a.* Loose attachment of pubic segment posteriorly. *b.* Do. do. anteriorly. *c.* Symphysis pubis. *d.* Bladder. *e.* Uterus. *f.* Rectum. *g.* Colon. *b'*. Liver. *i.* Lies above diaphragm. The sphere of prolapsus uteri reaches up to the diaphragm; and when the anterior vaginal wall passes out at the vaginal orifice there is a coincident downward displacement of all above it.

this as a whole, and the vascular disturbances consequent cause a congestion and hyperplasia of the uterus and pubic segment.

The peculiar structure of the pelvic floor, and the relation of the pubic segment to the uterus, account, I believe, for the facts we know as to prolapsus. It is always a hernia, and I hold, therefore, that exact proof is as yet lacking that there is the pathological condition known as supra-vaginal elongation of the cervix, and that the condition called prolapsus uteri is not produced by it, chiefly, as Huguier asserted, but that its causation is as given by me at pages 18-24.

NOTE C.—The bladder possesses unstriped muscular fibres, whose precise function is as yet unsettled. As a general rule, it has on mesial vertical section the shape figured in Plate I. It does not follow, however, that it has always this form. Figure 25, from Heitzmann,¹ shews the form of the bladder when contracted. It can be seen that the anterior and posterior walls are in contact, and that consequently it has no antero-posterior diameter.

Some points of interest now crop up. It can be seen, by inspection of Plate I., that anteriorly the bladder is loosely connected to the pubis, and posteriorly also loosely to the uterus. When the bladder contracts, these loose attachments permit evidently of its assuming the shape figured in Fig. 25, *i.e.*, allow the anterior and posterior walls of its cavity to come into contact.

But it may be asked, why in so many instances has the empty (contracted?) bladder the shape figured in Plate I. The reason is apparently as follows. The uterus in Plate I. is drawn back as a whole by a thickened cicatricial band, whose special significance will be considered in Note D. It is evident, however, as one result, that the bladder is drawn back, and thus its retro-pubic attachment is tense. Consequently, when contracting, its anterior and posterior walls cannot be brought into contact, as in Fig. 25, seeing that the retro-pubic fat is stretched to its utmost, and the uterus also fixed back. When the urine is expelled, therefore, the bladder must assume the shape formed in Plate I., as it is fixed anteriorly and posteriorly. I believe, therefore, that Plate I. gives the most common, but not the normal form of the empty bladder. The latter is seen in Fig. 25.

This fact is of practical import. I have seen a case of alleged hysteria where the patient retained her urine, apparently wilfully, for forty-eight hours; but where on examination the ante-flexed uterus was found drawn very much back as a whole to the right sacro-iliac synchondrosis. Thus the bladder was fixed anteriorly and posteriorly, and its evacuation hindered. In such a case, bimanual massage, to bring the uterus forward, is indicated.

NOTE D.—In Plate I. the uterus is ante-flexed, and drawn back and to the right side. The cause of the ante-flexion is evidently a thickened band—apparently the right utero-sacral ligament. There has been an attack of right-sided pelvic inflammation followed by cicatrization, so that the right utero-sacral ligament has become shortened, and has drawn back the uterus as a whole, and specially at the point of insertion of the ligament. The fixation of the cervix in the pelvic floor, and of the fundus by the viscera surrounding it, have allowed the dragging back to be chiefly effective at this point of the uterus, and in this way we get the ante-flexion produced.

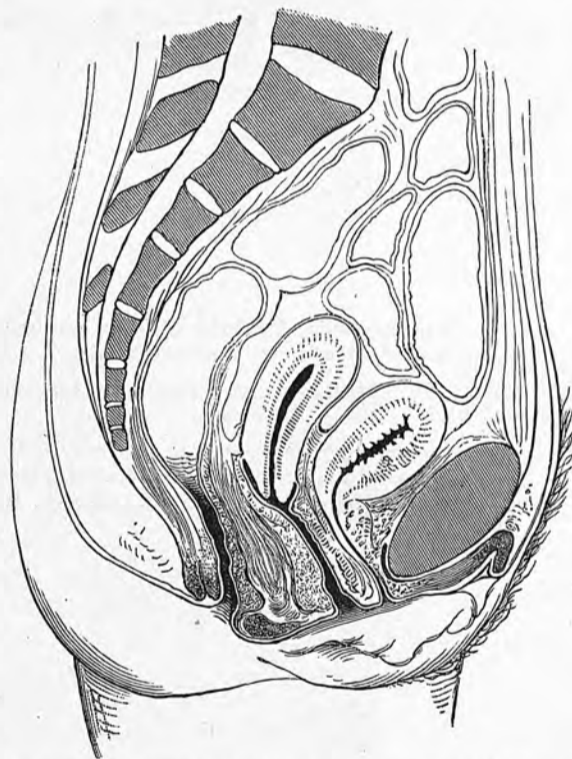


FIG. 25.—VERTICAL MESIAL SECTION OF FEMALE PELVIS, shewing form of Contracted Bladder, and existence of a vesico-uterine and retro-uterine pouch filled by serum, and containing no intestine. (Heitzmann.)

¹ *Die Descriptive und Topographische Anatomie des Menschen*, von Dr. C. Heitzmann. Wien, 1875. Fig. 402.

It quite confirms the view given by Schultze¹ in a valuable paper on the subject (Fig. 26). The view entertained by Dr. Graily Hewitt,² viz., that abnormal softness of the uterine tissues is the

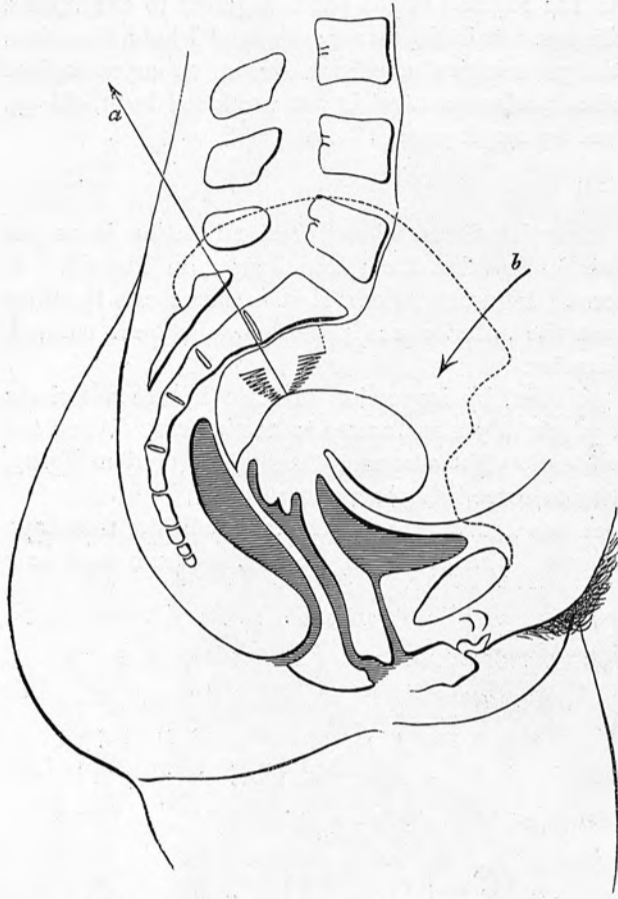


FIG. 26.—DIAGRAM shewing Anteflexion of Uterus, produced by Inflammatory Cicatrization behind it.—(Schultze.)

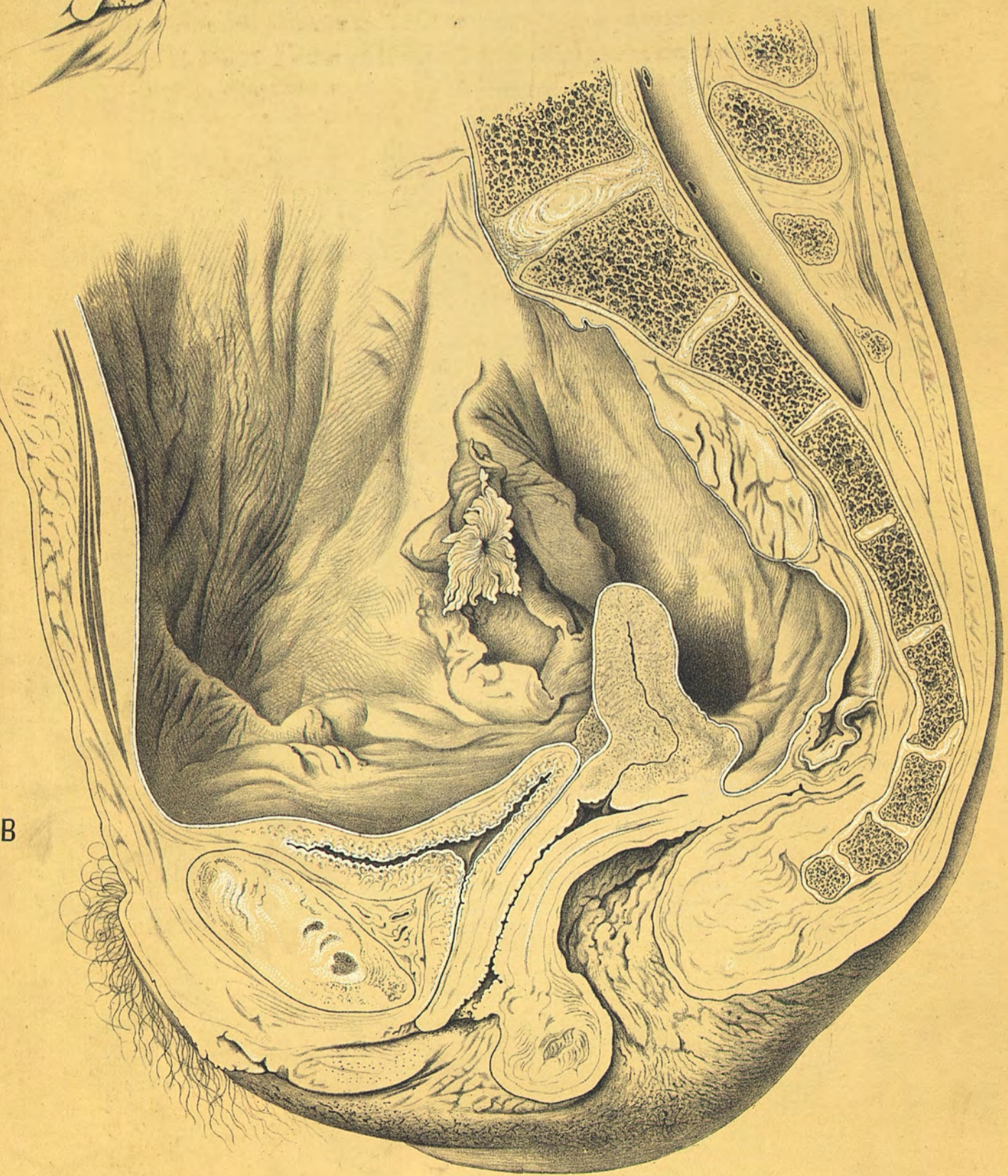
the ovaries or compressed the Fallopian tubes, should make us cautious in prognosis as to the cure of sterility.

cause of anteflexion, is one difficult to prove, and not, so far as my knowledge goes, supported by clinical or pathological evidence. I have observed a clinical case where a perfectly straight uterus became anteflexed after pelvic cellulitis following curetting for incomplete abortion, and where dysmenorrhœa and sterility also ensued. This pathology of anteflexion gives valuable help in treatment. An inspection of the uterus will shew how mechanical division of the cervix, according to Sims' method, would be effectual in relieving the flexion. The importance of first treating the pelvic inflammation is evident, and the great value of preliminary bimanual massage in order to stretch and relax the cicatrized tissues is apparent. Mere passage of the sound or division of the cervix, would prove ineffectual in relieving the dysmenorrhœa consequent on such a condition, and their rash employment would do great damage. In such cases the sequence of treatment should be—subduing of inflammation; bimanual massage to relax cicatrices in peritoneum and pelvic cellular tissue, followed by passage of sound, forcible dilatation, or division of cervix, according to Sims' method. The fact that pelvic inflammation is often set up by treatment should never be forgotten; and the possibility that the original pelvic inflammation may have seriously damaged

¹ *Über die Lageveränderung der Gebärmutter*, von B. Schultze, Volkmann's *Sammlung*, No. 50.

² *The Mechanical System of Uterine Pathology*. Longmans, Green, & Co., London, 1878.

A



B

VERTICAL-MESIAL SECTION OF FEMALE PELVIS.

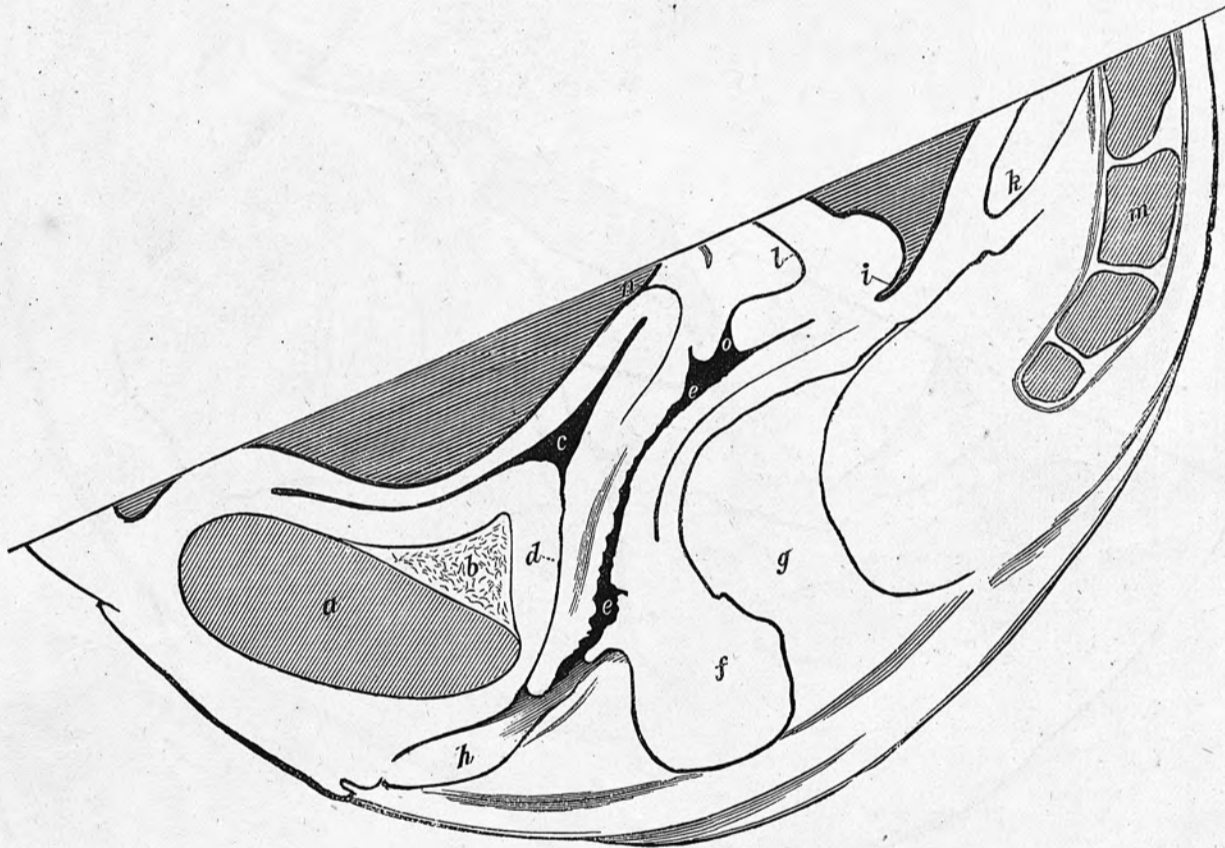
KEY TO PLATE I.

A. Right half of Virgin Vagina with walls held apart. Note

- (1) The abundant transverse rugae.
- (2) The greater depth of the Vagina above than below.
- (3) The hymeneal segment.

B. Vertical Mesial Section of Female Pelvis.

See Fig. below, and Appendix, Note D. Note fimbriated extremity of Fallopian tube and ovary behind it.

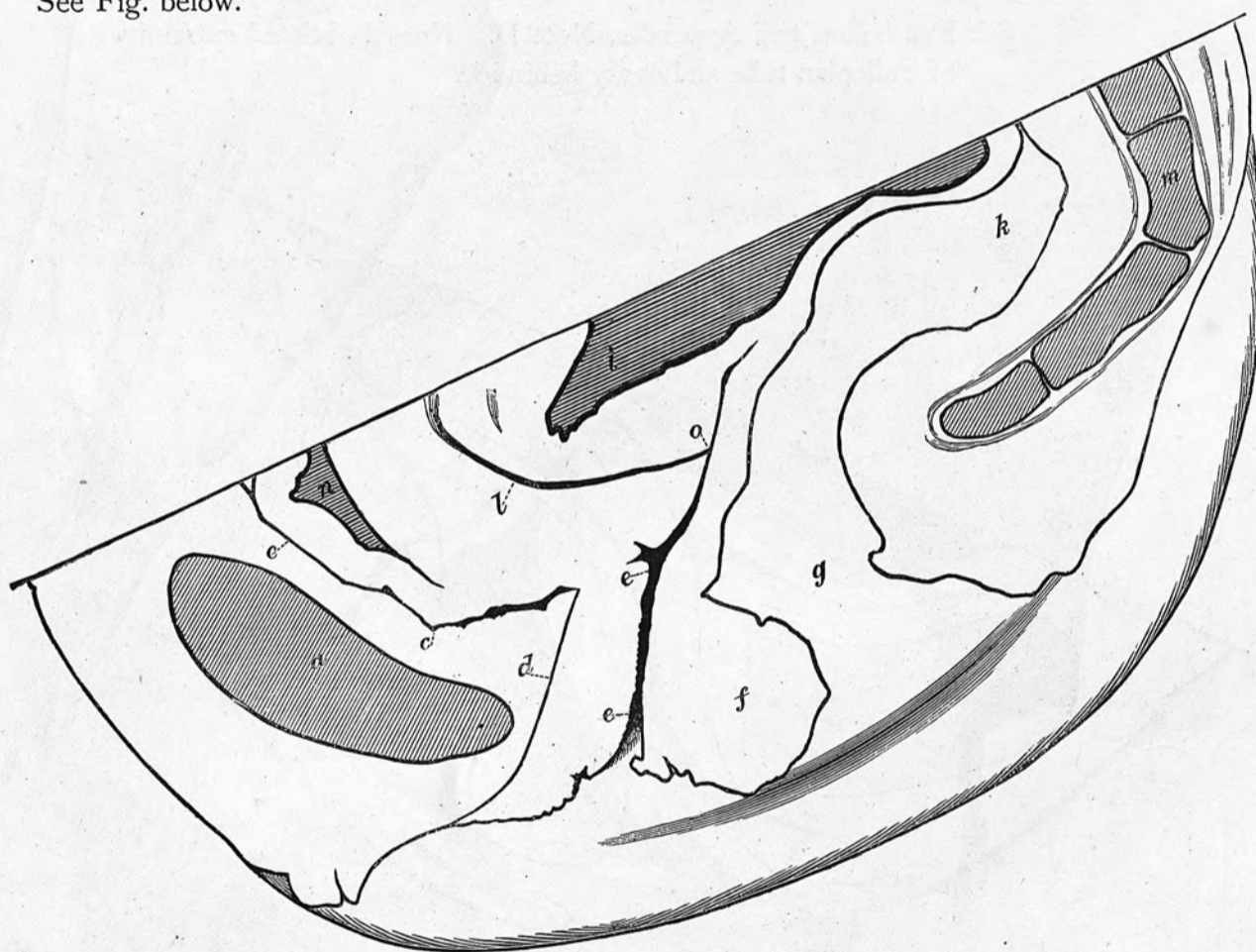


PELVIC FLOOR OF VIRGIN, Life Size. *a.* Symphysis pubis. *b.* Retro-pubic fat. *c.* Bladder. *d.* Urethra. *ee.* Vaginal slit. *f.* Perineum. *g.* Anus. *h.* Labium minus. *i.* Pouch of Douglas. *m.* Coccyx. *n.* Vesico-uterine pouch. *k.* Rectum cut. *o.* Os externum. *l.* Cervical canal. From symphysis pubis to *ee* is pubic segment; from *ee* to coccyx is posterior quadrilateral division. The black line between vagina and rectum indicates the loose connection between the posterior vaginal wall and the anterior rectal one. The anus is open, but of course is closed during life.

KEY TO PLATE II.

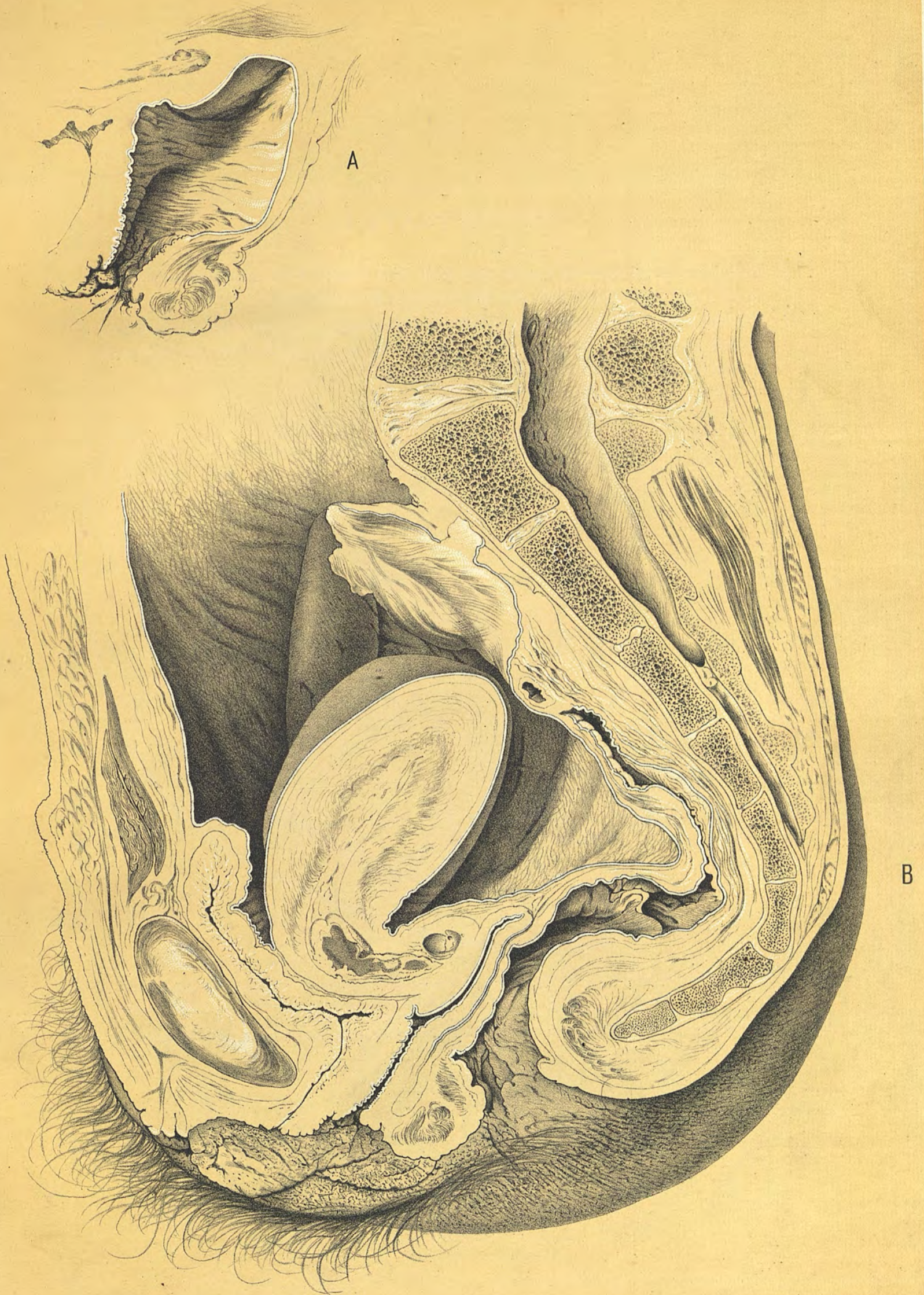
- A.* Right half of Multiparous Vagina, with walls held apart. Note comparative absence of rugae on posterior wall, and their presence on anterior one.
- B.* Vertical Mesial Section of Female Pelvis. The uterus, cut to one side, is retroflexed and pregnant two months. The details of this are not given, however, as Braune has figured a much more beautiful specimen.

See Fig. below.



PELVIC FLOOR OF FEMALE PELVIS, Life Size. In this case the uterus is retroflexed, and pregnant two months.
a. Symphysis pubis. *cc.* Bladder. *d.* Urethra. *ee.* Vaginal slit. *f.* Perineum. *g.* Anus. *i.* Pouch of Douglas. *k.* Rectum.
l. Cervical canal. *m.* Coccyx. *n.* Vesico-uterine pouch. *o.* Os uteri.

Note here how, owing to the retroflexion, the pouch of Douglas is enlarged, the pubic segment diminished, and the bladder elevated by compression.



D. B. Hart, sculp.

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VERTICAL-MESIAL SECTION OF FEMALE PELVIS.