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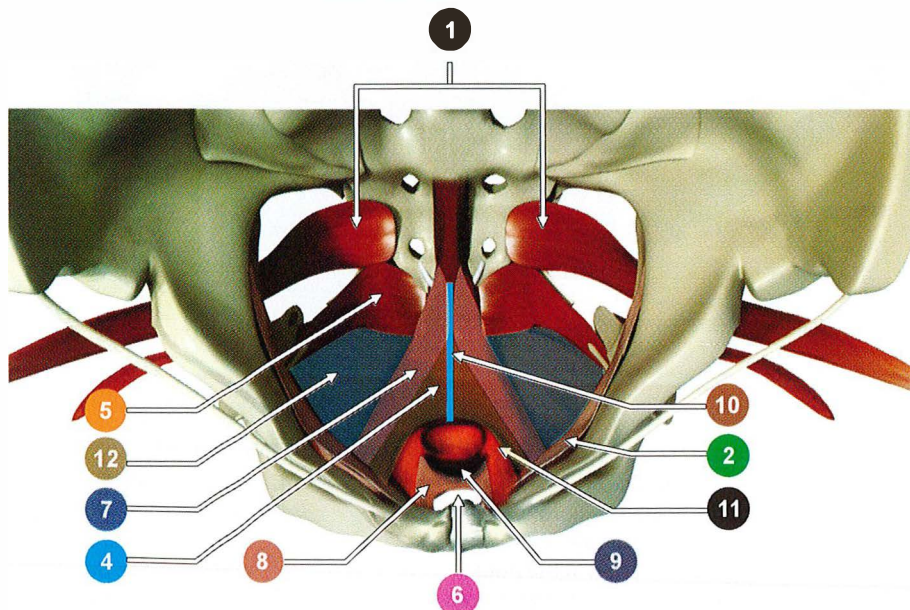
■ Instruments 590; • Spatula, Broom (Plastic) and Cytobrush 590; • Sims' Double Bladed Posterior Vaginal Speculum 591; • Cusco's Bivalve Self-retaining Vaginal Speculum 592; • Auvard's Self-retaining Posterior Vaginal Speculum 592; • Female Rubber Catheter 593; • Female Metal Catheter 593; • Foley's Catheter 594; • Cervical Dilators 594; • Multiple Toothed Vulsellum 595; • Single Toothed Vulsellum 595; • Anterior Vaginal Wall Retractor 595; • Olive Pointed Malleable Graduated Metallic Uterine Sound 596; • Uterine Curette 596; • Uterine Dressing Forceps 597; • Sponge Holding Forceps 597;

- Ovum Forceps 598; • Allis Tissue Forceps 598; • Lanes Tissue Forceps 599; • Uterus Holding Forceps 599;
- Cervical Occlusion Clamp 599; • Myoma Screw 599; • Bonney's Myomectomy Clamp 600;
- Hysterosalpingography Cannula (Leech Wilkinson Variety) 600; • Kocher's Artery Forceps 601;
- Landon's Bladder Retractor 601; • Insufflation Cannula 601; • Abdominal Retractors 602;
- Doyen's Retractor 602; • Balfour Self-retaining Retractor 602; • Deaver's Retractor 602; • Long Straight Hemostatic Forceps (Spencer Well's) 603; • Babcock's Forceps 603; • Needle Holder 603; • Punch Biopsy Forceps 604; • Dissecting Forceps 604; • Scalpel 604; • Needles 605; • Scissors 605; • Towel Clips 606; • Loop Hook 606; • Electrocautery 606; • Cryoprobe 607; • Laparoscopic Instruments 607;
- Trocar and Cannula 607; • Hysteroscopic Instruments 608; • Hodge-Smith Pessary 608; • Ring Pessary 608; • Laparoscopic Ovarian Drill Needle 609; • Processing of Instruments 609; • Sterilization of Instruments 609;
- Suture Materials 609; • Classification 609; ■ Specimens 611; ♦ Imaging Studies in Gynecology 622;
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- Nomogram for Calculating Body Surface Area of Adults 633; • Nomogram for Calculating Body Mass Index 634

Atlas: 3D Models of Female Pelvic Floor Anatomy

1

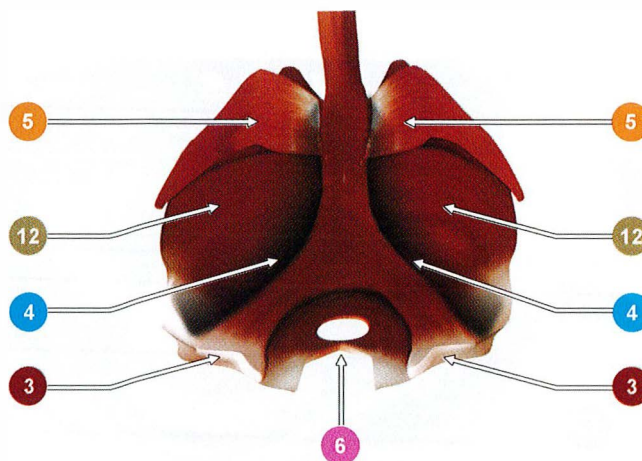
FIGURE



Muscles of Pelvic Floor (view from above).

2

FIGURE

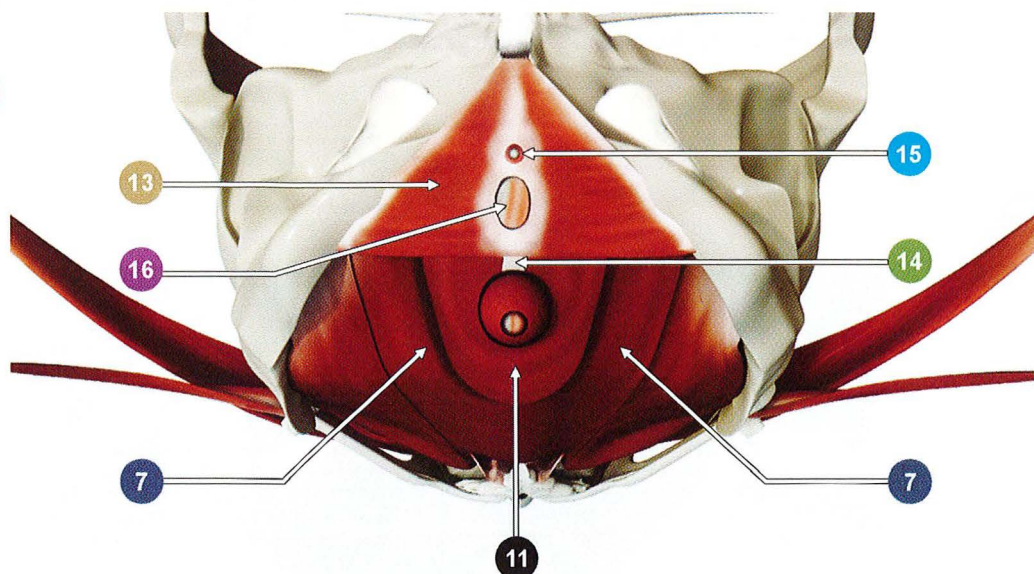


Muscles of Pelvic Floor (without attachments).

- | | |
|--|--|
| 1. Piriformis muscle | pubococcygeus, and iliococcygeus. |
| 2. Obturator internus | It plays important role in stabilizing |
| 3. Tendon of obturator internus | the abdominal and pelvic organs.] |
| 4. Levator ani muscle [It is broad | 5. Coccygeus muscle |
| muscular sheet that attaches to | 6. Urogenital hiatus |
| the bodies of the pubic bones | 7. Pubococcygeus muscle |
| anteriorly, ischial spines posteriorly | 8. Pubovaginalis muscle |
| and to a thickened fascia of the | 9. Anal aperture |
| obturator internus muscle and | 10. Anococcygeal ligament |
| formed by collection of three | 11. Puborectalis muscle |
| muscles: puborectalis (puboanal), | 12. Iliococcygeus muscle |

3

FIGURE

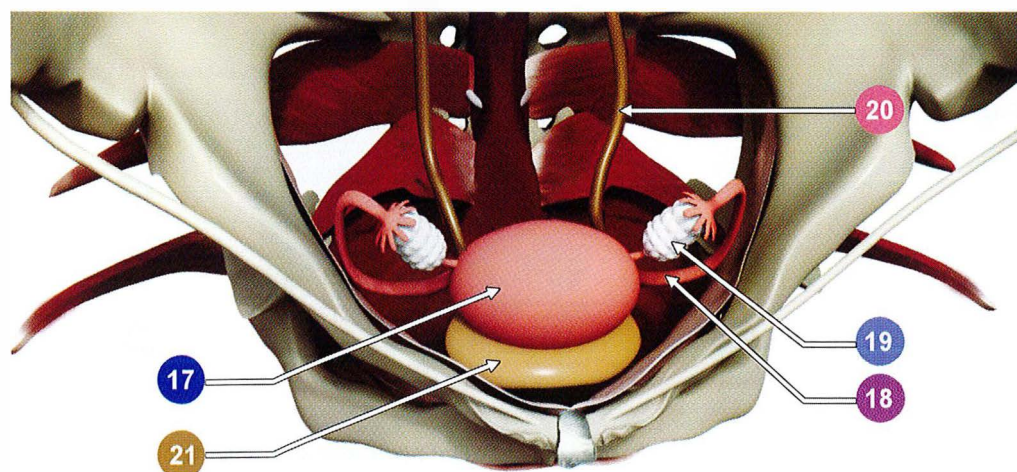


Muscles of Pelvic Floor (view from below).

- | | |
|--|--|
| <p>13. Perineal membrane (The perineal membrane is a dense fibrotic layer situated over the urogenital triangle. Laterally, it is inserted in the pubic arch and has a free posterior margin anchored in the midline by the perineal body.)</p> | <p>14. Perineal body (It is also referred to as the central tendon of the perineum, is a fibromuscular structure located in the midline of the perineum. It attaches to 9 muscles in pelvic floor of female.)</p> |
| | <p>15. Urethral orifice</p> |
| | <p>16. Vaginal orifice</p> |

4

FIGURE



Pelvic Floor with Female Genital Organs and Urinary Bladder.

- | | |
|-----------------------------------|-----------------------------------|
| <p>17. Uterus</p> | <p>20. Ureter</p> |
| <p>18. Fallopian tubes</p> | <p>21. Urinary Bladder</p> |
| <p>19. Ovaries</p> | |

1

CHAPTER

Anatomy of the Female Pelvic Organs

CHAPTER OUTLINE

- **External Genital Organs**
- **Internal Genital Organs**
 - ▶ Vagina
 - ▶ Uterus
 - ▶ Fallopian Tube
- ▶ Ovary
- ▶ Female Urethra
- **Other Internal Organs**
 - ▶ Urinary Bladder
 - ▶ Pelvic Ureter
- ▶ Rectum
- ▶ Anal Canal
- **Pelvic Muscles**
- **Perineum**
- **Pelvic Fascia and Cellular Tissue**
- **Ligaments**

EXTERNAL GENITAL ORGANS

(SYN: VULVA, PUDENDUM)



The vulva includes **mons veneris, labia majora, labia minora, clitoris, vestibule** and conventionally the **perineum**. These are all visible on external examination. It is, therefore, bounded anteriorly by the mons veneris, laterally by the labia majora and posteriorly by the perineum (Fig. 1.1).

■ MONS VENERIS (MONS PUBIS)

It is the pad of subcutaneous adipose connective tissue lying in front of the pubis and, in the adult female, is covered by hair.

■ LABIA MAJORA

The vulva is bounded on each side by the elevation of skin and subcutaneous tissue, which form the labia majora. They are continuous where they join medially to form the posterior commissure in front of the anus. The inner surface of the labia majora are hairless. **The labia majora are covered with squamous epithelium and contain sebaceous glands, sweat glands and hair follicles.** Beneath the skin, there are dense connective tissue and adipose tissue. The adipose tissue is richly supplied by venous plexus, which may produce hematoma, if injured during childbirth. **The labia majora are homologous with the scrotum in the male.** The round ligaments terminate at its anterior third.

■ LABIA MINORA

Labia minora are two thick folds of skin, devoid of fat, on either side just within the labia majora. Except in the parous women, they are only exposed when the labia majora are separated. Anteriorly, they are divided to enclose the

clitoris and unite with each other in front and behind the clitoris to form the prepuce and frenulum, respectively. The lower portion of the labia minora fuses across the midline to form a fold of skin known as fourchette. It is usually injured during childbirth. **Between the fourchette and the vaginal orifice is the fossa navicularis. The labia minora do not contain hair follicle.** The folds contain connective tissues, numerous sebaceous glands, erectile muscle fibers and numerous vessels and nerve endings. **It is homologous to the ventral aspect of the penis.**

■ CLITORIS

Clitoris is a small cylindrical erectile body, measuring about **2.5 cm** situated in the most anterior part of the vulva. It consists of glans, a body and two crura. **The glans is covered by squamous epithelium and is richly supplied with nerves.** The vessels of the clitoris are connected with the vestibular bulb and are liable to be injured during childbirth. **Clitoris is an analog to the penis in the male,** but it differs basically in being entirely separate from the urethra. It is attached to the undersurface of the symphysis pubis by the suspensory ligament.

■ VESTIBULE

Vestibule is a triangular space bounded anteriorly by the clitoris, posteriorly by the fourchette and on either side by labium minus. **There are four openings into the vestibule (Fig. 1.1).**

Urethral Opening

The opening is situated in the midline, just in front of the vaginal orifice about **1–1.5 cm below the pubic arch**. The paraurethral ducts open either on the posterior wall of the urethral orifice or directly into the vestibule.

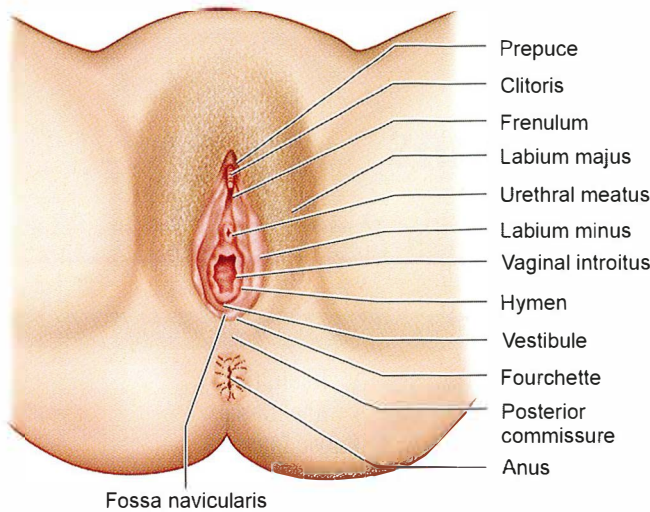


Fig. 1.1: The virginal vulva (external genitalia).

Vaginal Orifice and Hymen

The vaginal orifice lies in the posterior end of the vestibule and is of varying size and shape. In virgins and nulliparae, the opening is closed by the labia minora but in parous, it may be exposed. **It is incompletely closed by a septum of mucous membrane, called hymen.** The membrane varies in shape but is usually circular or crescentic in virgins. The hymen is usually ruptured at the consummation of marriage. **During childbirth,** the hymen is extremely lacerated and is later represented by cicatrized nodules of varying sizes, called the **carunculae myrtiformes**. **On both sides, it is lined by stratified squamous epithelium.**

BARTHOLIN'S GLAND

The Bartholin's glands are situated in the superficial perineal pouch, close to the posterior end of the vestibular bulb. They are pea-sized, of about 0.5 cm and yellowish-white in color. **During sexual excitement, it secretes abundant alkaline mucus which helps in lubrication.** **Contraction of bulbocavernosus helps squeeze the secretion.** The glands are compound racemose variety and are lined by columnar epithelium. **Each gland has got a duct which measures about 2 cm** and opens into the vestibule, outside the hymen at the junction of the anterior two-thirds and posterior one-third in the groove between the hymen and the labium minus. **The duct is lined by columnar epithelium but near its opening by stratified squamous epithelium (Fig. 1.2).** **The Bartholin's gland corresponds to the bulbourethral gland of male.**

Vestibular Bulbs

These are bilateral elongated masses of erectile tissues situated beneath the mucous membrane of the vestibule. Each bulb lies on either side of the vaginal orifice in front of the Bartholin's gland and is incorporated within the bulbocavernosus muscles. **They are homologous to the**

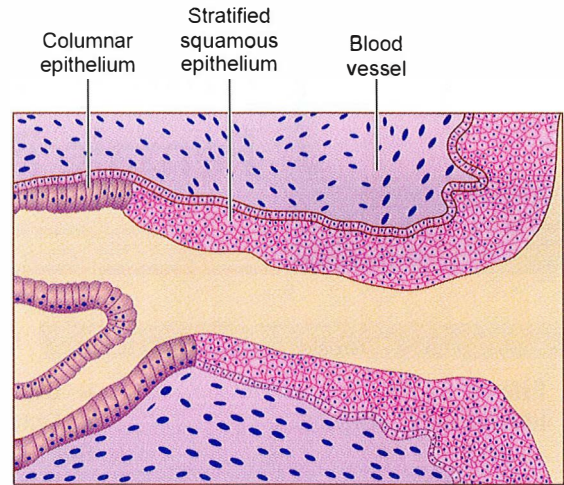


Fig. 1.2: Mucous lining of Bartholin's duct.

single bulb of the penis and corpus spongiosum in the male. They are likely to be **injured during childbirth** with brisk hemorrhage (Fig. 1.3).

PERINEUM

The details of the anatomy of perineum are described later in this chapter (p. 16).

BLOOD SUPPLY OF THE VULVA

Arteries: (a) Branches of internal pudendal artery—the chief being labial, transverse perineal, artery to the vestibular bulb and deep and dorsal arteries to the clitoris and (b) branches of femoral artery—superficial and deep pudendal.

Veins: The veins form plexuses and drain into—(a) Internal pudendal vein; (b) Vesical or vaginal venous plexus; (c) Long saphenous vein. Varicosities during pregnancy are not uncommon and may rupture spontaneously causing visible bleeding or hematoma formation.

NERVE SUPPLY OF THE VULVA

The supply is through bilateral spinal somatic nerves. Anterosuperior part is supplied by the cutaneous branches from the ilioinguinal and genital branch of genitofemoral nerve (L_1 and L_2) and the posteroinferior part by the pudendal branches from the posterior cutaneous nerve of thigh ($S_{2,3,4}$). Between these two groups, the vulva is supplied by the labial and perineal branches of the pudendal nerve ($S_{2,3,4}$).

INTERNAL GENITAL ORGANS

The internal genital organs in female include vagina, uterus, fallopian tubes, and the ovaries. These organs are placed internally and require special instruments for inspection.

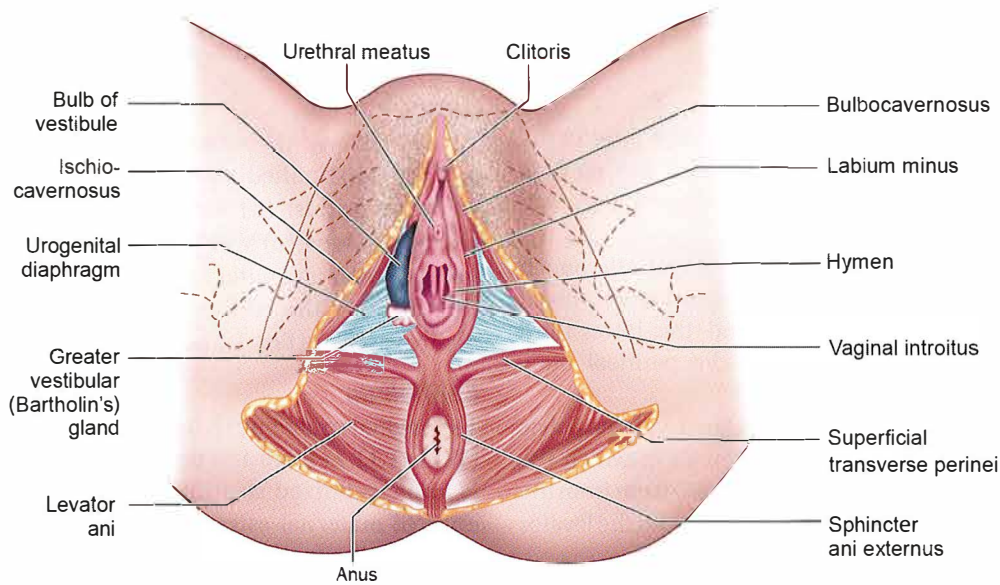
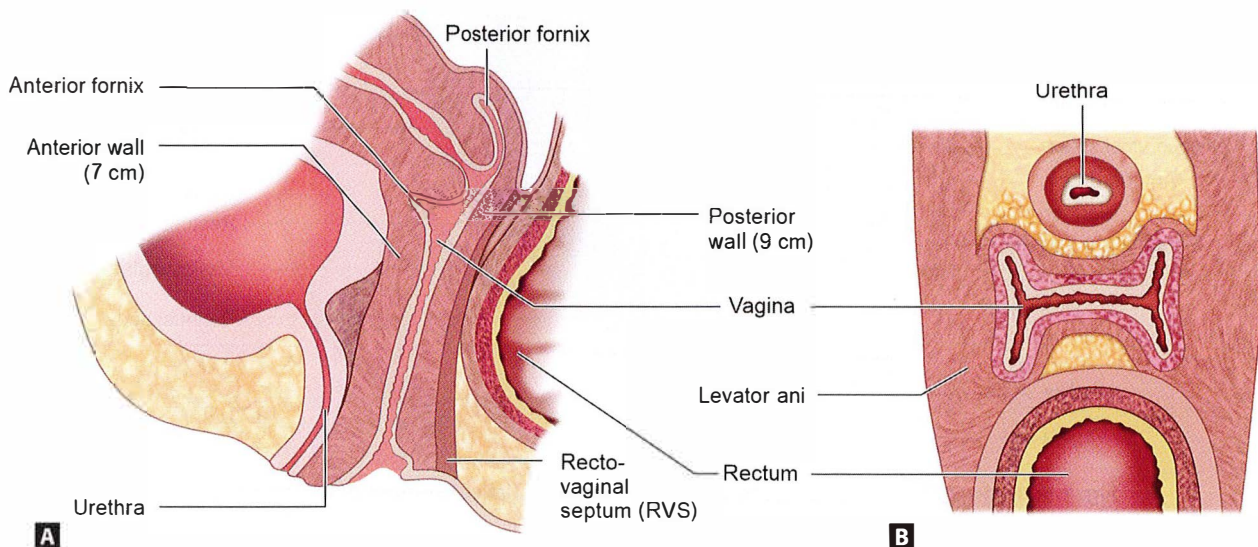


Fig. 1.3: Exposition of superficial perineal pouch with vestibular bulb and Bartholin's gland.



Figs. 1.4A and B: (A) Relation of the anterior and posterior vaginal wall; (B) 'H' shaped on cross-section.

VAGINA

The vagina is a fibromusculomembranous sheath communicating the uterine cavity with the exterior at the vulva. It constitutes the excretory channel for the uterine secretion and menstrual blood. It is the organ of copulation and forms the birth canal of parturition. **The canal is directed upwards and backwards forming an angle of 45° with the horizontal in erect posture. The long axis of the vagina almost lies parallel to the plane of the pelvic inlet and at right angle to that of the uterus. The diameter of the canal is about 2.5 cm, being the widest in the upper part and the narrowest at its introitus. It has got enough power of distensibility as evident during childbirth.**

Walls

Vagina has got an anterior, a posterior, and two lateral walls. The anterior and posterior walls are apposed together but the lateral walls are comparatively stiffer especially at its middle, as such it looks 'H' shaped on transverse section. **The length of the anterior wall is about 7 cm and that of the posterior wall is about 9 cm (Figs. 1.4A and B).** The upper end of vagina is above the pelvic floor.

Fornices

The fornices are the clefts formed at the top of vagina (vault) due to the projection of the uterine cervix through the anterior vaginal wall, where it is blended inseparably with its wall. There are four fornices—one anterior, one