



Manual
on
Shirish Sheth
VAGINAL SURGERY

Series Editors

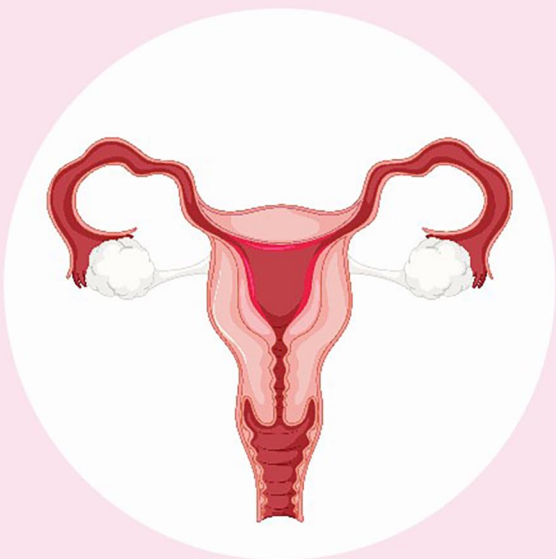
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Understanding the Anatomy of the Vagina: A Comprehensive Guide

Ragini Agrawal, Monika Dalal

■ INTRODUCTION

Vagina is the cornerstone of the female reproductive system, embodying both complexity and resilience. Its structural integrity and functionality are supported by a multifaceted network of anatomical components. By comprehensively understanding the anatomy and function of vaginal support, we aim to shed light on the importance of this intricate system in women's health and well-being.

Functions of vagina are passage for sexual intercourse, transport of sperms, expulsion of the menstrual blood and the delivery of the baby. It is a narrow, muscular but elastic organ and connects the external genital organs to the uterus. It starts at the vulva externally and ends at the cervix internally. The posterior wall is about 4.5 inches long, whereas the anterior wall is about 3.5 inches.¹ Therefore, the posterior vaginal wall is longer than the anterior vaginal wall. In relaxing position, the anterior and posterior walls of vagina are in contact with each other.

The vaginal portion of the cervix protrudes into the upper anterior part of the vagina, which leads to the formation of anterior, posterior, and lateral fornices. As cervix protrudes through anterior vagina, posterior fornix is the deepest.

There are three sulci on the anterior vaginal wall. Submeatal sulcus lies above the urethral meatus. There is another sulcus, about 3.5 cm above submeatal sulcus in the anterior vaginal wall, called as transverse vaginal sulcus. It corresponds to the junction of urethra and bladder. Further above is the sulcus of bladder and indicates the junction of the bladder to the anterior vaginal wall.

G-Spot: The Grafenberg spot, commonly known as the G-spot, is an erogenous zone located on the anterior wall of the vagina, about 1–2 inches from the entrance. Stimulation of the G-spot can lead to intense sexual pleasure and, for some individuals, orgasm.²

Epithelium: The vaginal mucosa is lined by stratified squamous epithelium. There are no glands in the vagina and the vaginal secretions are mainly

derived from the mucus discharge of the cervix and transudation through the vaginal epithelium. The vestibular glands located in labia minora provide moisture for the vagina. Normal pH of vagina during reproductive age is about 4.5. Acidic pH inhibits the growth of other pathogenic organisms and increases resistance to infection.

■ RELATIONS (FIG. 1)

Anterior: Anteriorly, the vagina is related to the bladder in upper two-thirds and urethra in the lower third. It is not covered with peritoneum anteriorly.

Posterior: Posteriorly, vagina is related to the rectouterine pouch (pouch of Douglas), the ampulla of rectum, the perineal body, and the anal canal.

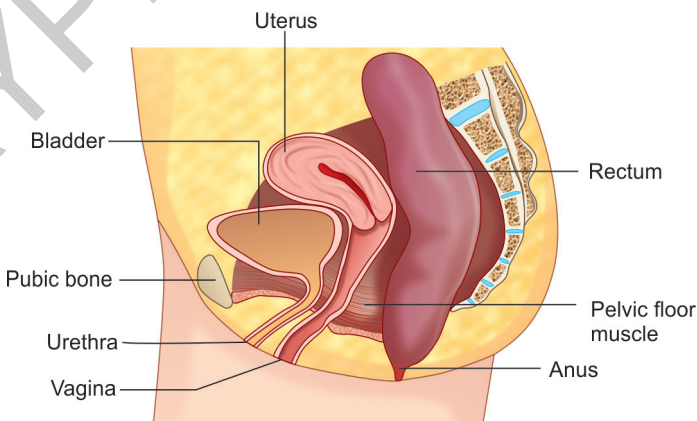
Lateral: Ureter, uterine artery, levator ani muscle, and the urogenital diaphragm.

Blood Supply

The blood supply of vagina is by the vaginal and uterine branches of the internal iliac artery. Inferior vesical and middle rectal arteries anastomose freely on the vaginal wall and also contribute to the blood supply of vagina. The venous drainage of vagina is through the vaginal venous plexus with the vaginal vein which drains into the internal iliac vein or the uterine vein.

Nerve Supply

The uterovaginal nerve plexus lying in the base of the broad ligament gives rise to the parasympathetic and sympathetic nerves supplying the vagina. The sympathetic fibers are derived from lumbar splanchnic nerves, whereas



Female pelvic muscles

Fig. 1: Relations of vagina.

the parasympathetic fibers are derived from the pelvic splanchnic nerves. The nerve supply to the lower part of the vagina is from the branch of pudendal nerve called the deep perineal nerve.

Lymphatic Drainage

The lower one-third of the vagina drains to the superficial inguinal lymph nodes (similar to the vulval drainage), while the upper two-thirds drain into the external and internal iliac and sacral nodes (similar to that of cervix).

Supports of Vagina

If one looks at the vaginal canal from the side, he or she can appreciate different levels of support as described by DeLancey and colleagues.³

Level I: Uterosacral and cardinal ligaments

Level II: Levator ani

Level III: Perineal membrane

Level I: Uterosacral and Cardinal Ligaments

The level I support is composed of the uterosacral and cardinal ligaments that form the support of the uterus and upper one-third of the vagina (**Fig. 2**). In level I, the paracolpium connects the vagina from the lateral pelvic walls. Fibers of level I extend both vertically and also posteriorly toward the sacrum.

Clinical significance: The upper portions of the anterior vaginal wall can prolapse due to lack of level I support and failure of uterosacral-cardinal complex. With time, this may increase load in the paravaginal area and lead to failure of Level II paravaginal support. Resuspension of the vaginal apex

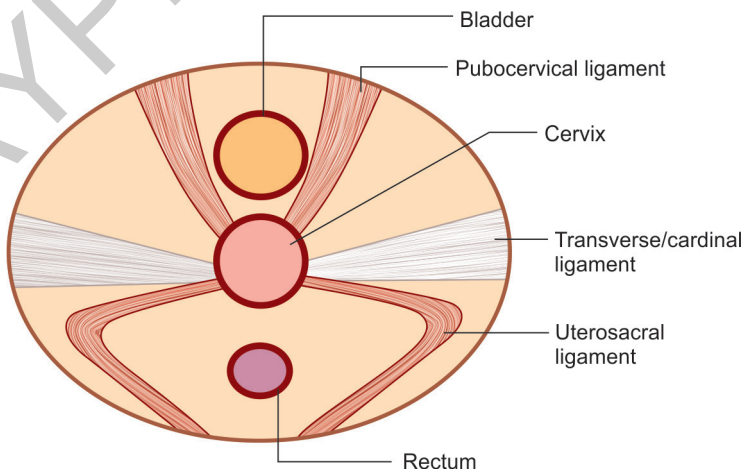


Fig. 2: Uterosacral and cardinal ligaments.

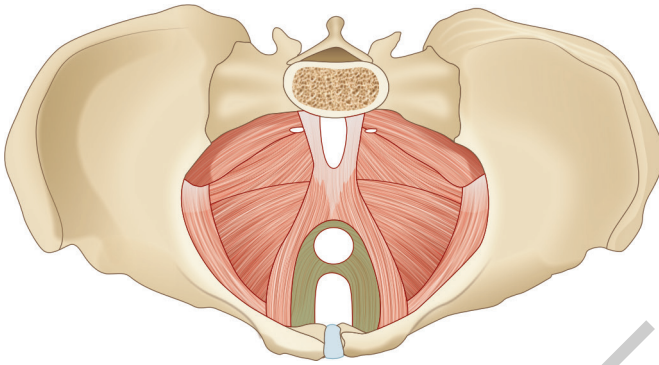


Fig. 3: Levator ani muscle.

at the time of surgery, in addition to paravaginal or anterior colporrhaphy, may help to return the anterior wall to a more normal position or at least to prevent future failures.⁴

Level II: Levator Ani

It is the most important muscle in the pelvic floor. It has slow-twitch fibers which maintain a constant tone and fast-twitch (type II) fibers with an increased density in the periurethral and perianal areas. The levator ani muscle is in a continuous state of contraction, similar to the external anal sphincter and some postural muscles and keeps the urogenital hiatus closed by compressing the urethra, vagina, and rectum towards the pubic bone.

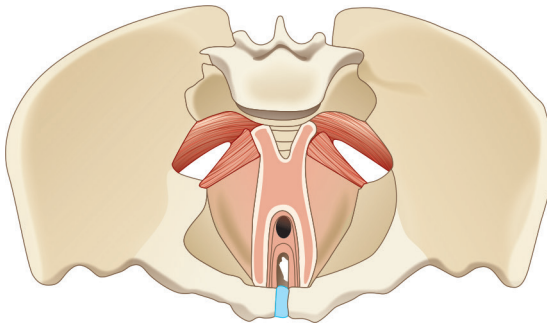
Attachment: Levator ani (**Fig. 3**) is attached to posterior surface of pubis, fascia over obturator internus called arcus tendineus and ischial spine and inserts on coccyx and then meets in the midline on the midline raphe. Arcus tendineus is a fascial thickening on the surface of obturator internus muscle bilaterally that runs from the pubic ramus ventrally to the ischial spine dorsally and gives origin to levator ani.

The levator ani comprised of three striated muscles:

1. Puborectalis
2. Pubococcygeus
3. Ileococcygeus

Puborectalis muscle: These are the thicker, narrower medial fibers of levator ani muscle (**Fig. 4**). Its origin is from posterior aspects of the right and left pubic bones. It passes inferiorly to fuse with its opposite side and form a U-shaped sling behind the ano-rectum and bounds the urogenital hiatus.

Pubococcygeus muscle: These are the intermediate fibers of levator ani which is lateral to puborectalis (**Fig. 5**). It originates from the inner surface of the pubic bone and arcus tendineus and passes posteriorly. Medial fibers merge



- Levator ani:*
- Pubococcygeus
 - Pubovaginalis
 - Puborectalis
 - Iliococcygeus
 - Coccygeus

Fig. 4: Puborectalis muscle.

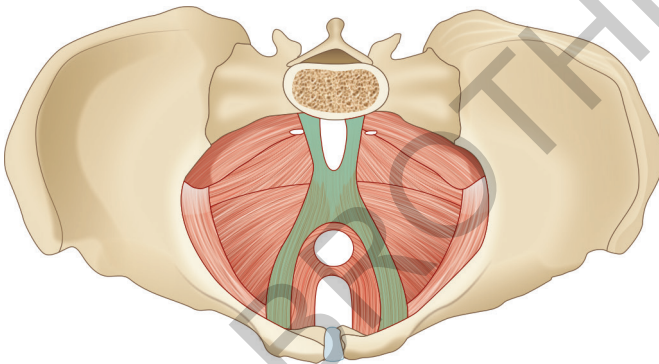


Fig. 5: Pubococcygeus muscle.

with fibers from opposite side and form levator plate and anococcygeal raphe. It loops around vagina and anorectal portions and insert into perineal body and external anal sphincter muscle. The urethral part merges with the periurethral musculature.

Iliococcygeus: They are the thin posterolateral fibers of levator ani (**Fig. 6**). It originates from posterior tendinous arc and ischial spine. Posteriorly, the medial fibers merge to form levator plate and lateral fibers insert to the last two segments of the coccyx.

Levator plate: Medial fibers of the opposite sides of levator ani merge together behind the anus and form a fibrous raphe or tendinous plate called levator plate which is between anus and the coccyx. It provides a shelf on which the pelvic organs like uterus, upper vagina, and rectum rest. The levator plate is horizontal in standing position.

Urogenital hiatus: In the midline anteriorly, levator ani muscle has a U-shaped defect called urogenital hiatus which gives passage to the urethra and vagina. It is supported anteriorly by pubic bones, the levator ani muscles laterally,

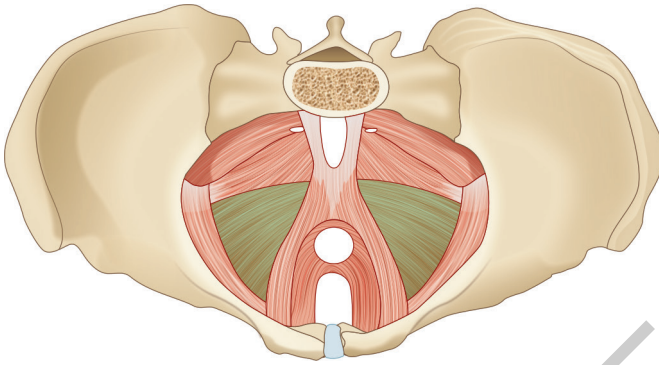


Fig. 6: Ilococcygeus muscle.

and dorsally (posteriorly) by perineal body and external anal sphincter. The perineal membrane covers this gap from the inferior side.

Fascia: The Silent Architect: Wrapping the pelvic floor like a supportive sheath, fascia emerges as an indispensable component of vaginal support, providing structural integrity and cohesion to the surrounding tissues. Several layers of fascia—endopelvic fascia, perineal fascia, and visceral pelvic fascia—contribute to the robustness of the pelvic floor and its ability to withstand intra-abdominal pressure.⁵

Clinical significance: Level I and levator ani muscles are interdependent. Intact levator ani muscles balance the tension of the level I support structures, and intact level I support lessens the pressure imposed from above on the pelvic floor.

In level II, the vagina gets its support by levator ani, arcus tendineus fasciae pelvis and the superior fascia of levator ani. Anterior vaginal wall, through its connections to the arcus tendineus fasciae pelvis, forms a supportive layer clinically referred to as the pubocervical fascia. A simple case of a distension cystocele could result from a defect in pubocervical fibromuscularis. Detachment of arcus tendineus from the levator ani is associated with stress incontinence and anterior prolapse. The detachment can be unilateral or bilateral, causing a displacement cystocele.⁶

As in the anterior compartment, a simple defect in rectovaginal fibromuscularis can cause a distention rectocele. A defect in the posterior arcus also called arcus tendineus rectovaginalis (ATRV) is associated with a pararectal defect that can be unilateral or bilateral.

Level III: The Perineal Membrane

A critical but perhaps underappreciated part of the pelvic floor support is the perineal membrane as it forms level III support (**Fig. 7**). It is a single connective tissue membrane, with muscle lying immediately above. The

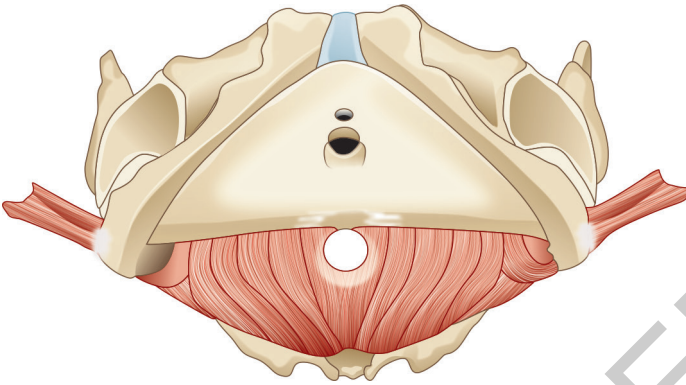


Fig. 7: Perineal membrane.

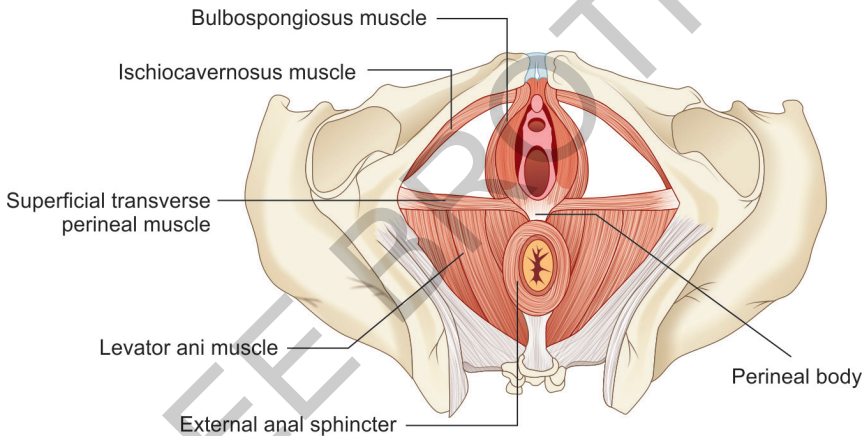


Fig. 8: Perineal body.

perineal membrane is at the level of the hymen, and it gives support to vagina by attaching it to perineal body and ischiopubic rami.

It lies inferior to the urogenital hiatus of the levator ani muscle. It is a triangular sheet of dense, fibromuscular tissue that spans the anterior half of the pelvic outlet and is attached to the bony framework of a pubic arch. It has two openings, for urethra and vagina.

Perineal body: Perineal body is also called central tendon of the perineum. It is ill-defined connective tissue structure and lies at the midpoint of posterior border of perineal membrane (**Fig. 8**). It is bound anteriorly by the lower vagina, posteriorly by anus and below by perineal skin. Occupying a central position within the perineum, the perineal body emerges as a nexus of connective tissue and muscle, orchestrating the symphony of pelvic support. This fibromuscular structure serves as a convergence point for various

muscles and ligaments, including the levator ani, transverse perineal muscle, and superficial perineal muscles. By anchoring these structures to a common focal point, the perineal body contributes to pelvic floor stability and function

Clinical significance: The fibers of the perineal membrane connect through the perineal body, thereby providing a layer that resists downward descent of the rectum. If perineal membrane support is lost, then the resistance to downward descent is lost and a perineocele develops.⁷ Clinical diagnosis of this can be made by realizing the patient's need to splint close to the vaginal opening to have a bowel movement, and on physical examination an elongated or "empty" perineal body can be noticed. During perineorrhaphy, reattachment of the separated structures can correct this defect and is a mainstay of reconstructive surgery.

■ CONCLUSION

The support of the vagina is an intricate tapestry woven from the threads of the uterosacral and cardinal ligaments, levator ani, endopelvic fascia, perineal membrane and perineal body. Each of these anatomical components plays a pivotal role in maintaining pelvic floor integrity, supporting pelvic organs, and facilitating normal pelvic function. Dysfunction or weakness within this complex system can manifest as pelvic floor disorders, including pelvic organ prolapse, urinary incontinence, or sexual dysfunction, necessitating targeted interventions to restore pelvic support and alleviate symptoms. By comprehensively understanding the anatomy and function of vaginal support, healthcare providers can tailor treatment strategies to address individual needs and optimize women's pelvic health and well-being. Moreover, promoting awareness and education about vaginal support empowers individuals to advocate for their own reproductive health and seek timely intervention when needed.

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Manual on Shirish Sheth VAGINAL SURGERY



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