1d. Anatomy of Female internal and external genital organs with applied aspects

d) Anatomy of Female Internal & External Genital Organs — with Applied Aspects

Learning goals

By the end of this chapter you will be able to (i) name and describe the **external genitalia (vulva)** and **internal genital organs** with relations, blood-lymph-nerve supply and supports; (ii) recall classical Ayurvedic descriptions relevant to **yoni/garbhāśaya** and marma-kṣetra; and (iii) apply key points to obstetric–gynecologic procedures and common clinical conditions.

Female Reproductive System Foundation
3D model
Female System Reproductive (Basic)
3D model
Female External Genitalia and Perineum
3D model
Female Urogenital Triangle
3D model
Vulva Anatomy 3D model
Female Reproductive System Tour
3D model
Female Reproductive Cross Section (Sagittal)
3D model

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1) Orientation: classical–modern bridge

Ayurveda uses the functional term **Yoni** (the parturient passage/apatyapatha) and **Garbha-āśaya (uterus)** for the reproductive bed, set amidst **basti** (urinary bladder) and posterior viscera. Suśruta lists the **garbhāśaya** as an additional *āśaya* unique to females; women also have external conduits for **stanya** and **ārtava**. (Suśruta Saṃhitā, Śārīrasthāna 5; English translation index)

> **"शरीरे चैव शास्त्रे च दृष्टार्थः स्याद्विशारदः।**
> **दृष्टश्रुताभ्यां सन्देहमवापोह्याचरेत् क्रियाः॥ (सु. सं. शारीरस्थ 5/51)"** — *One becomes adept when the truths of the body and the śāstra are both directly seen; removing doubts by what is seen and heard, one should then act.*

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2) External genital organs (Vulva)

2.1 Components you must enumerate

- **Mons pubis:** fatty pad over pubic symphysis.
- **Labia majora:** hair-bearing skin folds; meet at anterior/posterior commissures; contain **round-ligament terminations** and superficial venous plexus.
- **Labia minora:** thin mucocutaneous folds; form **prepuce** and **frenulum** of clitoris; join inferiorly to form **fourchette**.
- **Clitoris:** erectile organ (two crura → body → **glans**); homologous to male corpora cavernosa; rich dorsal neurovascular bundle.
- **Vestibule:** space between labia minora housing **external urethral meatus**, **vaginal orifice**, **openings of para-urethral (Skene's) glands** and **greater vestibular (Bartholin) glands** at 4 & 8 o'clock.
- **Bulb of vestibule:** paired erectile masses along vaginal opening, covered by **bulbospongiosus**.

- **Perineal body (central tendon):** fibromuscular node posterior to vaginal opening anchoring **bulbospongiosus, superficial & deep transverse perineal, external anal sphincter, parts of levator ani**—critical for pelvic support.

2.2 Blood–lymph–nerve supply

- **Arterial:** primarily **internal pudendal** (perineal branches; **dorsal artery of clitoris**); superficial regions from **external pudendal** (femoral).
- **Venous:** pudendal venous plexus → internal pudendal vein.
- **Lymph:** superficial vulva → **superficial inguinal nodes** (remember: **labia minora/clitoris deep channels** also to deep inguinal).
- **Somatic nerves: pudendal nerve (S2–S4)** — **inferior rectal**, **perineal**, **dorsal nerve of clitoris**; ilio-inguinal & genitofemoral supply the mons/anterior labium. Sensation is somatic—hence episiotomy pain requires regional block.

2.3 Applied anatomy (external)

- **Pudendal nerve block:** insert needle near **ischial spine** (palpated transvaginally) close to **sacrospinous ligament** to anaesthetise perineum for repair/forceps delivery.
- **Episiotomy: mediolateral** episiotomy avoids injury to **external anal sphincter**; protect the **perineal body** to prevent future prolapse.
- **Perineal tears:** Degree I (mucosa/skin) → IV (including anal mucosa). Correct layered repair prevents fistula and chronic pain.
- **Bartholin pathology:** cyst/abscess at posterolateral introitus; **marsupialization** in recurrent cases.
- **FGM and trauma awareness:** scarring can distort vestibule, complicate delivery and micturition (counseling and multidisciplinary care).

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3) Vagina (Apatyapatha: first avarta in classical mapping)

Extent: vestibule → **cervix**; length ~8–10 cm; anterior/posterior **fornices** surround cervix (posterior fornix deepest). **Relations:** anterior—bladder & urethra; posterior—rectouterine pouch (Douglas) and rectum; lateral—pelvic fascia & **ureter** high up.

Wall: mucosa (stratified squamous, rugae), muscular (inner circular, outer longitudinal), adventitia (rich venous plexus). **pH ~ 3.5–4.5** (lactobacilli).
Arterial supply: vaginal artery (internal iliac), plus branches from **uterine**, **internal pudendal** and **middle rectal**.
Venous: vaginal venous plexus → **internal iliac veins**.
Lymph: upper 2/3 → internal iliac nodes; **lower 1/3 → superficial inguinal** nodes.
Nerves: upper vagina—visceral (uterovaginal plexus); **lower 1/5**—somatic via **pudendal** (pain, touch).

Applied:

- **Cervical smear** taken at **transformation zone** (squamocolumnar junction) via speculum; posterior fornix is safe site for **culdocentesis** in suspected hemoperitoneum.
- **Vesicovaginal/rectovaginal fistulae** follow obstetric trauma—prevention is meticulous obstetric care and perineal repair.

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4) Uterus (Garbha-āśaya)

Site & position: normally **anteverted–anteflexed** between **bladder (anterior)** and **rectum (posterior)**. **Nulliparous size:** ~7.5 × 5 × 2.5 cm; weight ~50–60 g. **Parts: fundus**, **body**, **isthmus (internal os ↔ histological change)**, **cervix** (supravaginal & vaginal parts).

Layers: Perimetrium, **myometrium** (oblique spiral fibers—haemostatic "living ligatures"), **endometrium** (functional & basal layers).

Blood supply:

- **Uterine artery** (internal iliac, traverses **cardinal ligament**, crosses **ureter** "**water under the bridge**").
- **Ovarian artery** (aorta)—anastomoses at uterine cornu.
  Venous plexus drains to internal iliac; **lymph**—**fundus → para-aortic (via ovarian vessels)** and along **round ligament → superficial inguinal**; **body → external iliac**; **cervix → internal iliac & sacral**.
  Nerves: uterovaginal plexus; pain from **fundus/body** with sympathetics (T12–L2), from **cervix** with parasympathetics (S2–S4).

Supports of uterus (write these exactly):

- **Passive:** anteversion/anteflexion over bladder; endopelvic fascia; intra-abdominal pressure.
- **Fibromuscular ligaments: cardinal (Mackenrodt's/transverse cervical)**, **uterosacral**, **pubocervical**; **round ligaments** maintain anteversion.
- **Pelvic diaphragm: levator ani** (pubococcygeus—especially **pubovaginalis**/**pubocervicalis**), coccygeus.
  Applied correlations:
- **Uterine prolapse** follows perineal body & ligamentous failure—rehabilitate pelvic floor (mild) or perform suspension procedures.
- **Lower segment caesarean section (LSCS)** exploits **thin lower uterine segment**; avoid urinary bladder injury (reflection of peritoneum).
- **Hysterectomy**—guard **ureter** at uterine artery crossing ("water under the bridge").
- **Fibroids (leiomyomas)**—commonest tumour; submucous fibroids cause menorrhagia & infertility; blood supply from uterine artery explains **uterine artery embolization** logic.

Classical note: Suśruta lists **Garbhāśaya** as an additional *āśaya* in females and counts **ducts/canals** for **stanya** and **ārtava** that open to the outside—an elegant early systems view.

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5) Uterine (Fallopian) tubes — tubā uterīnae

Length: ~10 cm; **parts: intramural (uterine)**, **isthmus**, **ampulla** (widest; **usual site of fertilization**), **infundibulum** with **fimbriae** (one **ovarian fimbria** attaches to ovary).
Blood: uterine & ovarian arteries (arcade at mesosalpinx); **lymph:** para-aortic via ovarian vessels.
Applied: Ectopic pregnancy most common in **ampulla**—rupture risk; **salpingitis** from ascending infections may cause infertility; **tubal ligation** commonly at **isthmus**.

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6) Ovaries

Shape & size: almond-shaped ~3 × 2 × 1 cm (childbearing age); **position: ovarian fossa** (bounded by external iliac vessels superiorly, ureter posteriorly).
Attachments: to uterus via **ovarian ligament**; to lateral pelvic wall via **suspensory ligament (infundibulopelvic ligament)** carrying **ovarian vessels**; to broad ligament via **mesovarium**.
Blood: ovarian artery (aorta, below renal); **veins:** right → IVC; left → **left renal vein**.
Lymph: para-aortic (lumbar) nodes—**key pathway for ovarian carcinoma spread**.
Applied: Ovarian torsion (sudden pain, enlarged ovary) compromises arterial inflow/venous outflow through IP ligament; **PCOS** shows enlarged, thick tunica albuginea with multiple peripheral follicles (ultrasound correlation).

7) Broad ligament & associated folds

Broad ligament (peritoneal double fold) has **mesometrium** (uterine body), **mesosalpinx** (tube), **mesovarium** (ovary). Contents include **uterine vessels**, **round ligament**, **ovarian ligament**, **epoöphoron/paroöphoron** remnants.
Applied: Broad-ligament fibroid, **paratubal/paraovarian cysts** arise within its leaves; **Gartner's duct cyst** (Wolffian remnant) may present along lateral vagina.

8) Integrating classical points

8.1 Yoni, Garbhāśaya and female-specific channels

- **Females possess Garbhāśaya** as a distinct *āśaya* and **additional srotas** for **stanya** and **ārtava** opening externally. (Suśruta Śārīrasthāna 5 — Chapter V)
- **Ārtavavaha srotas (mūla): garbhāśaya + raktavāhinī dhamanīs**—classical authority from Caraka: **"अर्तवस्य विसर्गश्च काले येन प्रवर्तते।**
  तद्वहानि स्रोतो ज्ञेयं गर्भाशयसमाश्रयम्॥
  तस्य मूलं रक्तवाहिन्यः स्युः गर्भाशयः स चोच्यते॥ (च. सं. विमान 5/8)"

8.2 Marma-saṅgraha around the female breast–pelvis (for applied caution)

Suśruta's **Marma-vibhāga** includes **stana-mūla/stana-rohita**, **basti**, **guda**, **nābhi**, **vaṅkṣaṇa**, **kukuṇḍara**, etc.; obstetric–gynecologic procedures must respect these vital zones to avoid **grave bleeding/functional loss** (e.g., suprapubic approaches, perineal repairs). (Śārīrasthāna 6 — Marma chapter)

9) Blood, lymph & nerve

Organ	Arterial supply	Venous drainage	Lymphatic drainage	Nerve (pain pathway)
Vulva (labia, clitoris, vestibule)	Internal pudendal; external pudendal (mons/labia)	Pudendal plexus → internal pudendal v.	Superficial inguinal (most of vulva)	Pudendal (S2–S4)
Vagina	Vaginal, uterine, internal pudendal	Vaginal plexus → internal iliac v.	**Upper 2/3** internal iliac; **Lower 1/3** superficial inguinal	Upper: visceral; lower: pudendal
Uterus (fundus/body/cervix)	Uterine ± ovarian	Uterine plexus → internal iliac v.	Fundus → para-aortic & superficial inguinal (round lig.); Body → external iliac; Cervix → internal iliac & sacral	Fundus: T12–L2; Cervix: S2–S4
Tubes	Uterine & ovarian (arcade)	Ovarian/uterine plexuses	Para-aortic	Visceral afferents
Ovaries	Ovarian (aorta)	Rt ovarian → IVC; Lt → left renal	Para-aortic	Visceral afferents (T10–T11)

10) High-yield applied anatomy set

1. **Prolapse prevention & repair:** understand **perineal body** plus **cardinal–uterosacral complex**—failure yields cystocele/rectocele/uterine descent. Restoration of these is the core of site-specific repairs.

2. **Ureter at risk:** during hysterectomy near **uterine artery** and at **cardinal ligament**; always recall **"water under the bridge."**
3. **Ectopic pregnancy: ampullary** most common; rupture into **pouch of Douglas** → referred shoulder tip pain (phrenic irritation); posterior fornix tap can reveal non-clotting blood.
4. **Pudendal block & episiotomy:** landmark **ischial spine**; mediolateral incision avoids anal sphincter.
5. **Cervical screening:** sample **transformation zone**; persistent high-risk HPV affects this zone.
6. **Lymph routes to memorize:** ovarian cancers → **para-aortic nodes** early; **uterine fundus** also has a **round-ligament channel** to **superficial inguinal** (exam favourite).
7. **PCOS & infertility:** enlarged ovaries with stromal hyperplasia; tubal patency & endometrial receptivity are assessed together (HSG/sonosalpingography) in modern work-up—map them conceptually to **ārtavavaha** channel health.
8. **Obstructed labour & fistula:** protection of **perineal body** and judicious **episiotomy** prevent 3rd–4th degree tears and vesicovaginal fistulae.

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11) Classical–modern synthesis lines

- **Definition line:** *Yoni = apatyapatha; Garbha-āśaya = uterine bed for reception, retention and nourishment of garbha.*
- **Orientation:** *Garbha-āśaya between basti (front) and rectal structures (behind); females have stanya/ārtava outlets.*
- **Supports list:** pelvic diaphragm + cardinal, uterosacral, pubocervical, round ligaments (write all four).
- **Supply summary:** uterine-ovarian arterial arcade; uterine artery crosses ureter; lymph of fundus to para-aortic ± superficial inguinal (round lig.).
- **Ayurvedic clincher:** *Ārtavavaha mūla—garbhāśaya + raktavāhinī* (quote Caraka 5/8) ; **marma caution** around basti/guda/stana-mūla.

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12) Self-assessment

Female Internal Genitalia Part I Quiz
3D model
Female Internal Genitalia Part II Quiz
3D model

A. Short answers (60–80 words each)

1. Enumerate the **supports of the uterus** and explain their role in uterine position.
2. Describe the **blood supply and lymphatic drainage of the uterus**, highlighting implications for cancer spread.
3. Write a note on the **perineal body** and its clinical importance in obstetrics.
4. Define **pudendal nerve block** with anatomical landmarks and structures anaesthetised.
5. Explain the **Ayurvedic concept of ārtavavaha srotas mūla** and correlate with modern uterine vasculature.

B. Long answer (any one)

1. Describe the **anatomy of the internal genital organs** (vagina, uterus, tubes, ovaries) with relations, supports, and applied obstetric–gynaecological anatomy. Integrate **classical points** with appropriate citation.
2. Give a detailed account of the **external genital organs** and **pelvic floor**, their blood-lymph-nerve supply, and **clinical applications** (episiotomy, tears, nerve block).

C. MCQs

1. Lymph from **ovarian** malignancy primarily drains to:
   a) External iliac b) Internal iliac c) **Para-aortic** d) Superficial inguinal
2. The **ureter** most at risk in hysterectomy lies:

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a) Above the uterine artery b) **Below the uterine artery** c) Lateral to ovarian artery d) Medial to round ligament

3. **Ampulla** of tube is the commonest site for:
   a) Salpingitis b) **Fertilization** c) Fistula d) Leiomyoma
4. **Pudendal nerve** arises from:
   a) L1–L2 b) T12–L1 c) **S2–S4** d) S1–S2
5. **Fundal uterine lymph** reaches superficial inguinal nodes via:
   a) Uterosacral lig. b) Broad lig. c) **Round ligament** d) Cardinal lig.

Answer key: 1-c, 2-b, 3-b, 4-c, 5-c.

References

Classical sources

1. **Suśruta Saṃhitā**, **Śārīrasthāna 5 — "The anatomy of the human body"** (English translation index; includes statement that females possess **garbhāśaya** as an additional *āśaya* and external openings for **stanya/ārtava**).
2. **Suśruta Saṃhitā**, **Śārīrasthāna 6 — "Marmas (vital parts)"** (names/distribution including **stana-mūla**, **stana-rohita**, **basti**, **guda**, **nābhi**, **vaṅkṣaṇa**, etc.).
3. **Suśruta Saṃhitā**, **Śārīrasthāna 5/51** — Devanāgarī text quoted above on direct anatomical study.
4. **Caraka Saṃhitā**, **Vimāna-sthāna 5/8 (Srotovimāna)** — Devanāgarī text quoted for **ārtavavaha srotas mūla**: **garbhāśaya + raktavāhinī**.

Standard modern texts

- **Snell's Clinical Anatomy by Regions**; **Dutta's Gynecology/Obstetrics**; **Datta's Essentials of Human Anatomy**; **Gray's Anatomy** — for modern relations, supports, neurovascular supply, and applied procedures.

30-second recap

- **External genitalia:** labia–clitoris–vestibule–bulbs–Bartholin; supply by **internal pudendal**; lymph to **superficial inguinal**; **pudendal block** at ischial spine.
- **Vagina:** fornices; **upper 2/3 lymph to internal iliac**, lower 1/3 to **superficial inguinal**; lower 1/5 somatic (pudendal).
- **Uterus: A-V-A-F** position; **uterine + ovarian arteries**; **fundus lymph to para-aortic & via round ligament to superficial inguinal**; supports = **cardinal + uterosacral + pubocervical + pelvic floor + round**.
- **Tubes: ampulla fertilization**; ectopic risk. **Ovary:** para-aortic nodes, torsion risk.
- **Classical:** females possess **garbhāśaya** as special *āśaya*; **ārtavavaha** rooted in **garbhāśaya + raktavāhinī**; respect **marma-kṣetra** in procedures.