



Normal Uterine Anatomy and Histology in the Non-pregnant and Pregnant Patient

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FWGBD Uterine Hemostasis Colloquium
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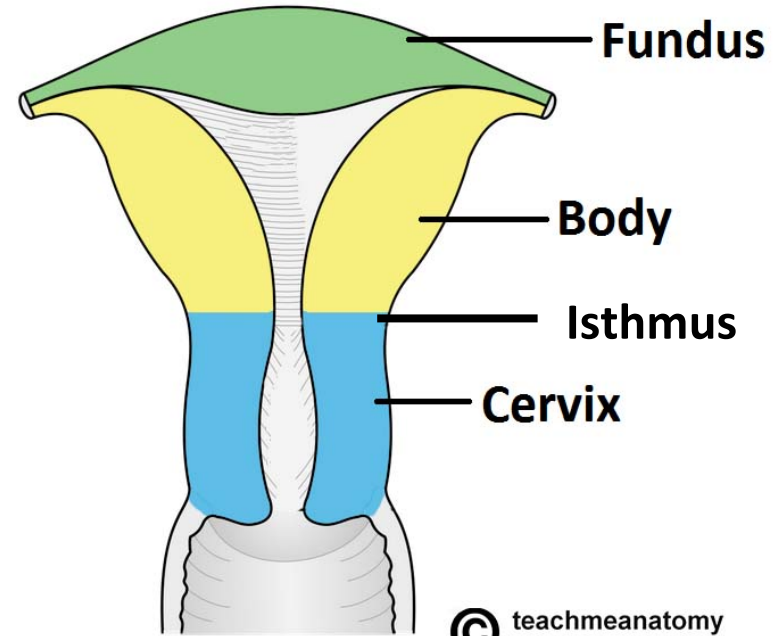
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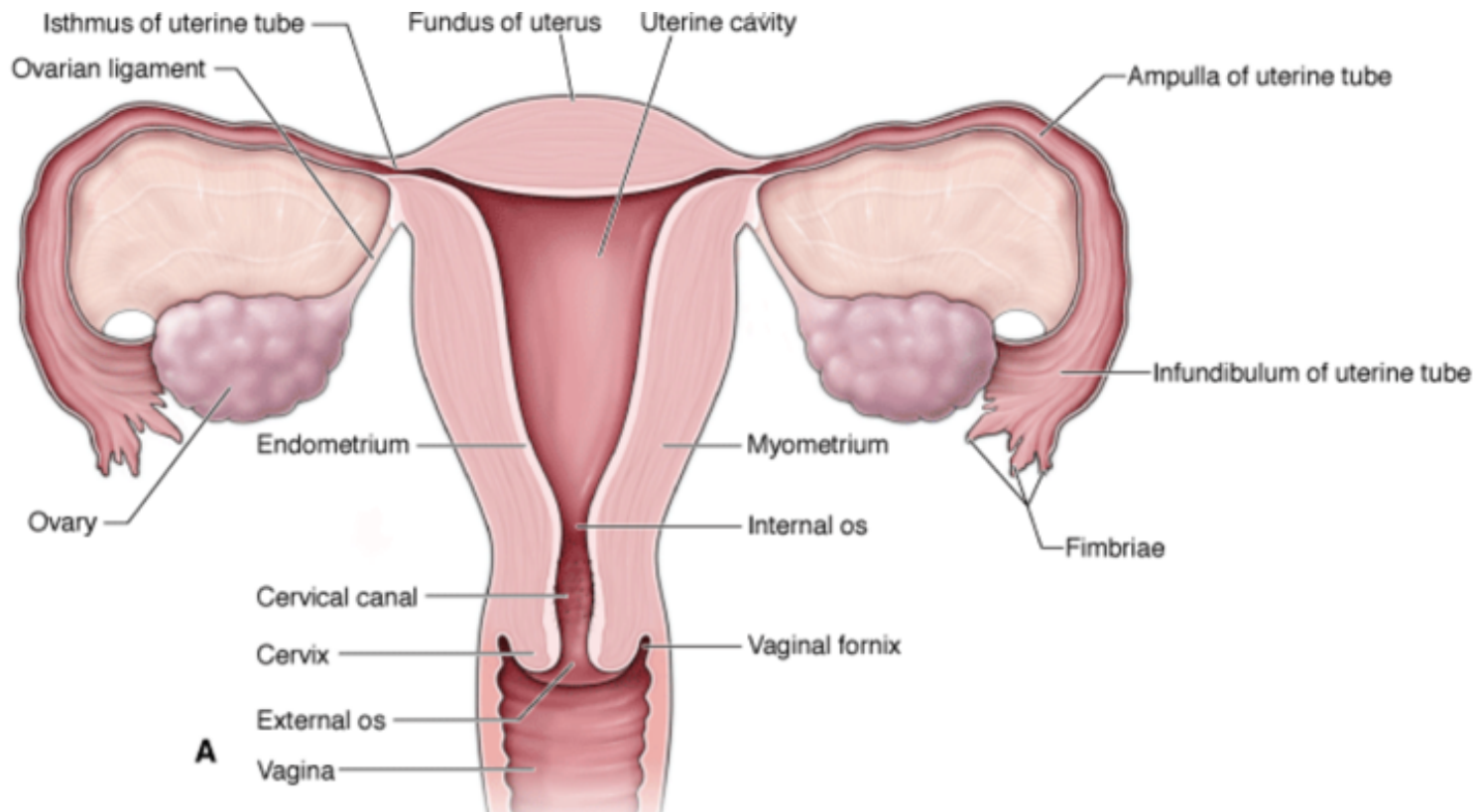
- None



Uterus

- Nulliparous: 6-8 cm in length
- Multiparous: 9-10 cm in length
- Consists of the main body (corpus), with a superior fundus
- Constriction of the body occurs superior to the cervix (isthmus of uterus)







Uterus: Relationship to Pelvic Organs

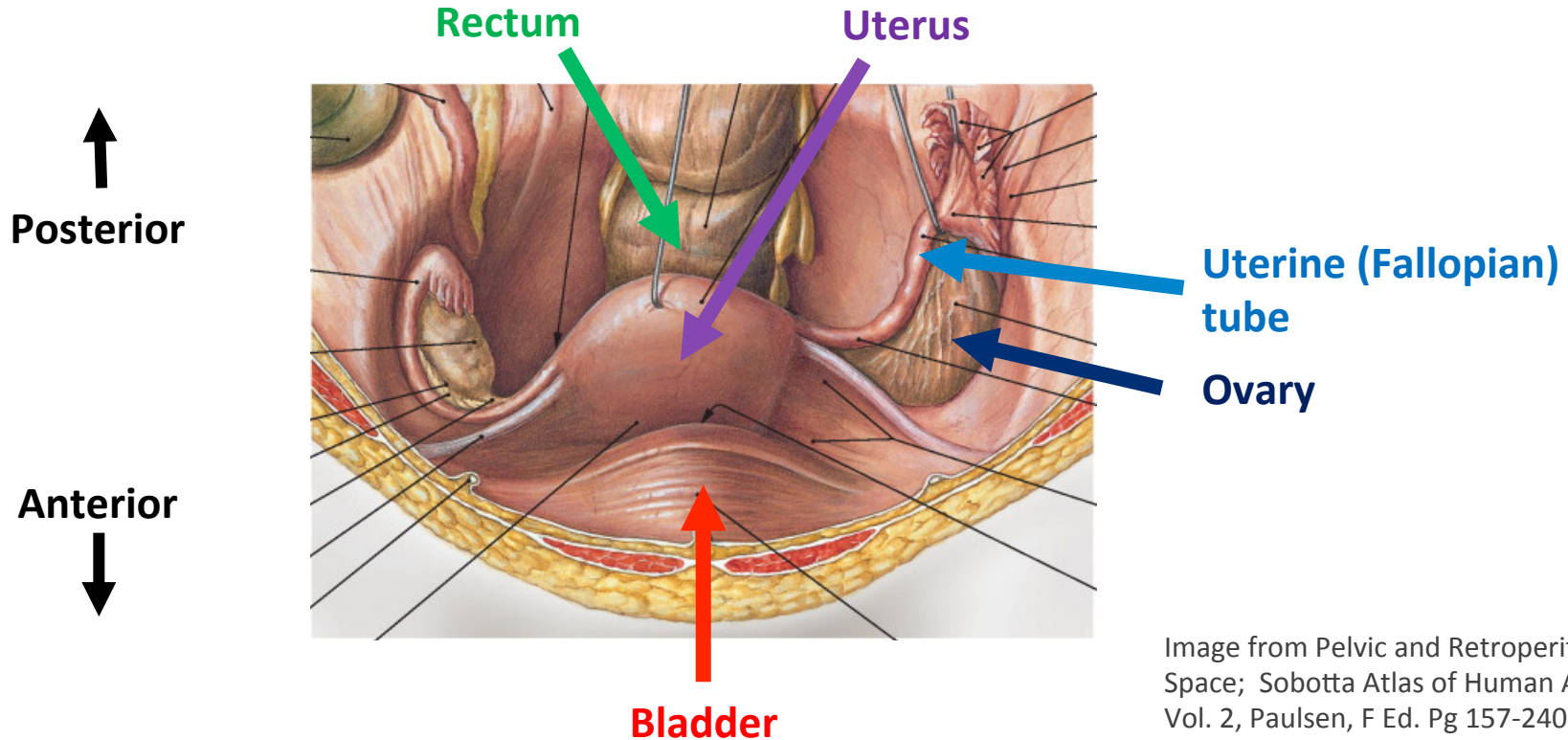


Image from Pelvic and Retroperitoneal Space; Sobotta Atlas of Human Anatomy, Vol. 2, Paulsen, F Ed. Pg 157-240, Fig 7.76, © 2013



Relationship of Bladder to Uterus

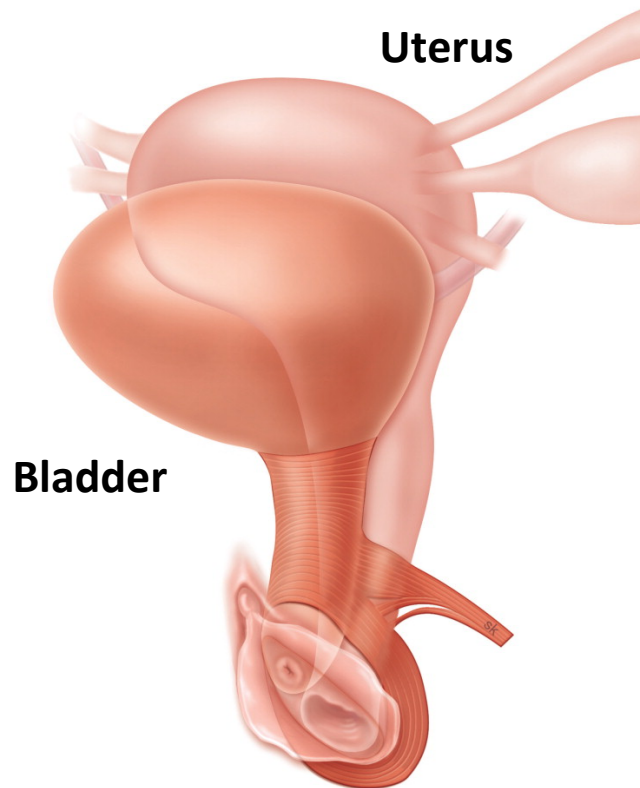
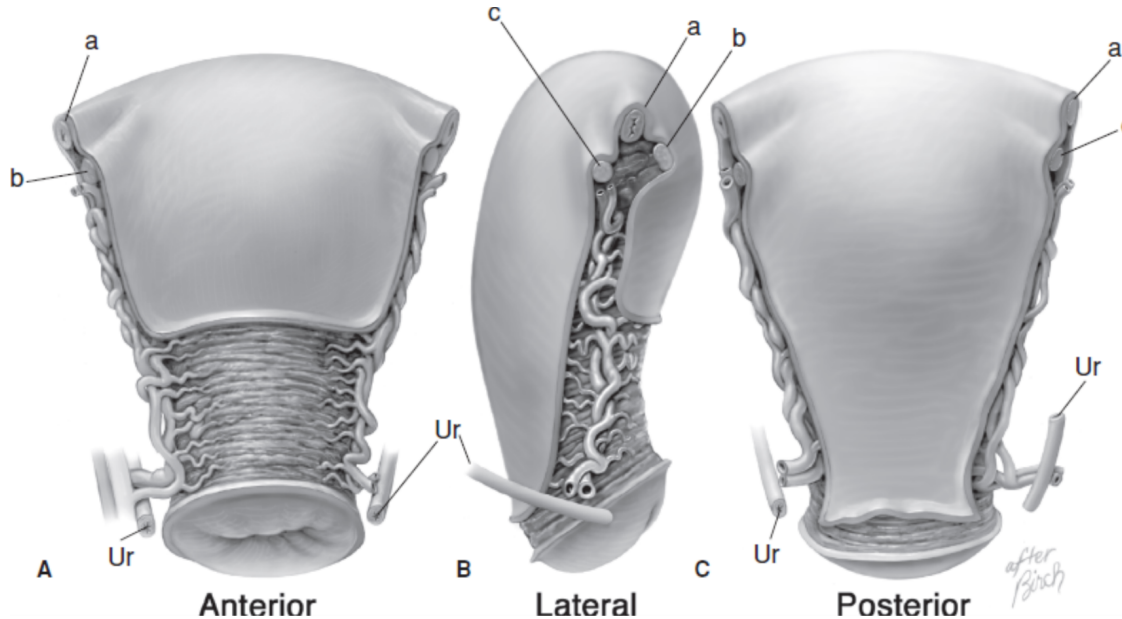


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Uterine Peritoneal Reflections

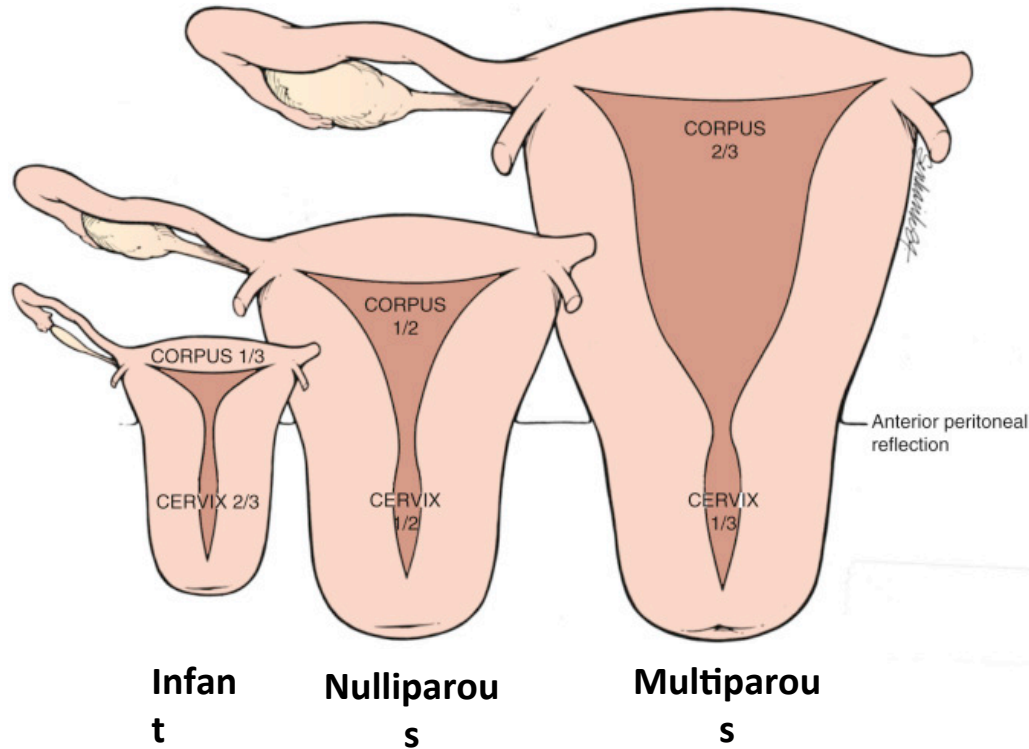


Uterus covered by reflection of the pelvic peritoneum (lining of the abdominal cavity)

- Reflection continues laterally to form the **broad ligament**.
- Broad ligament houses the major uterine vessels and the fallopian tubes at their apices.



Uterine Size Through Lifespan



Following menopause, uterus shrinks, often to nulliparous size



Uterine Fundus Levels During Pregnancy

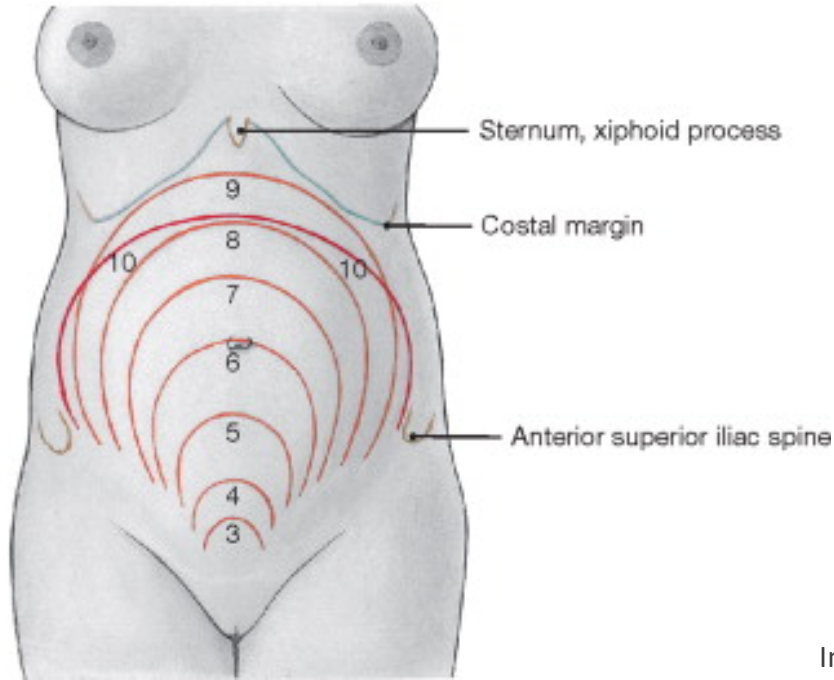


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Uterus With Placenta and Fetus (near term)

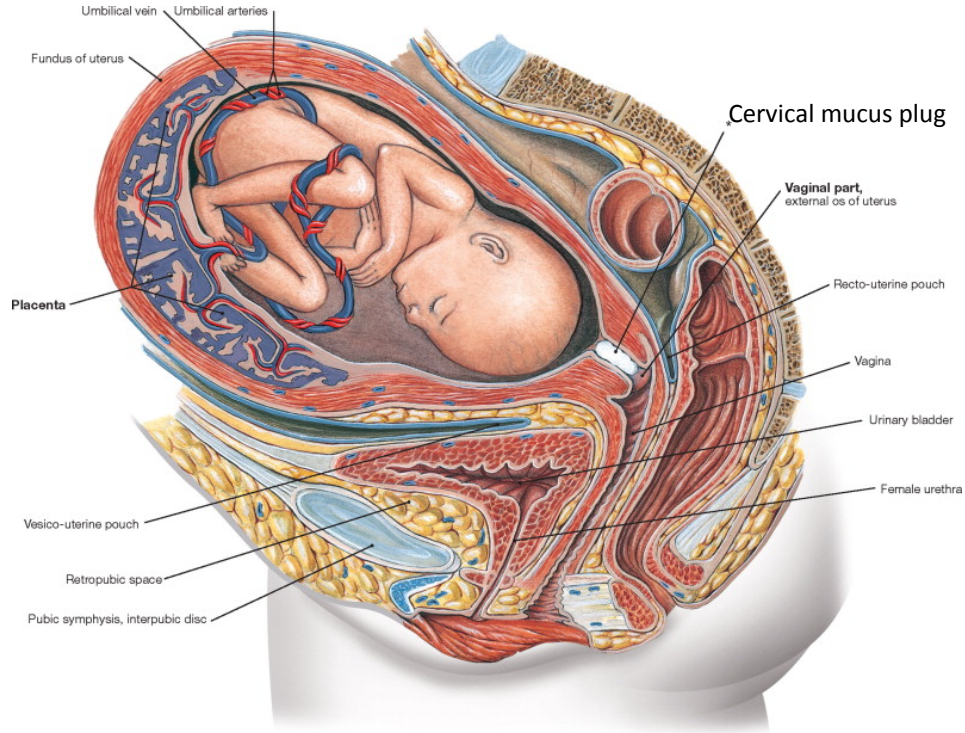


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Major Vessels of the Pelvis

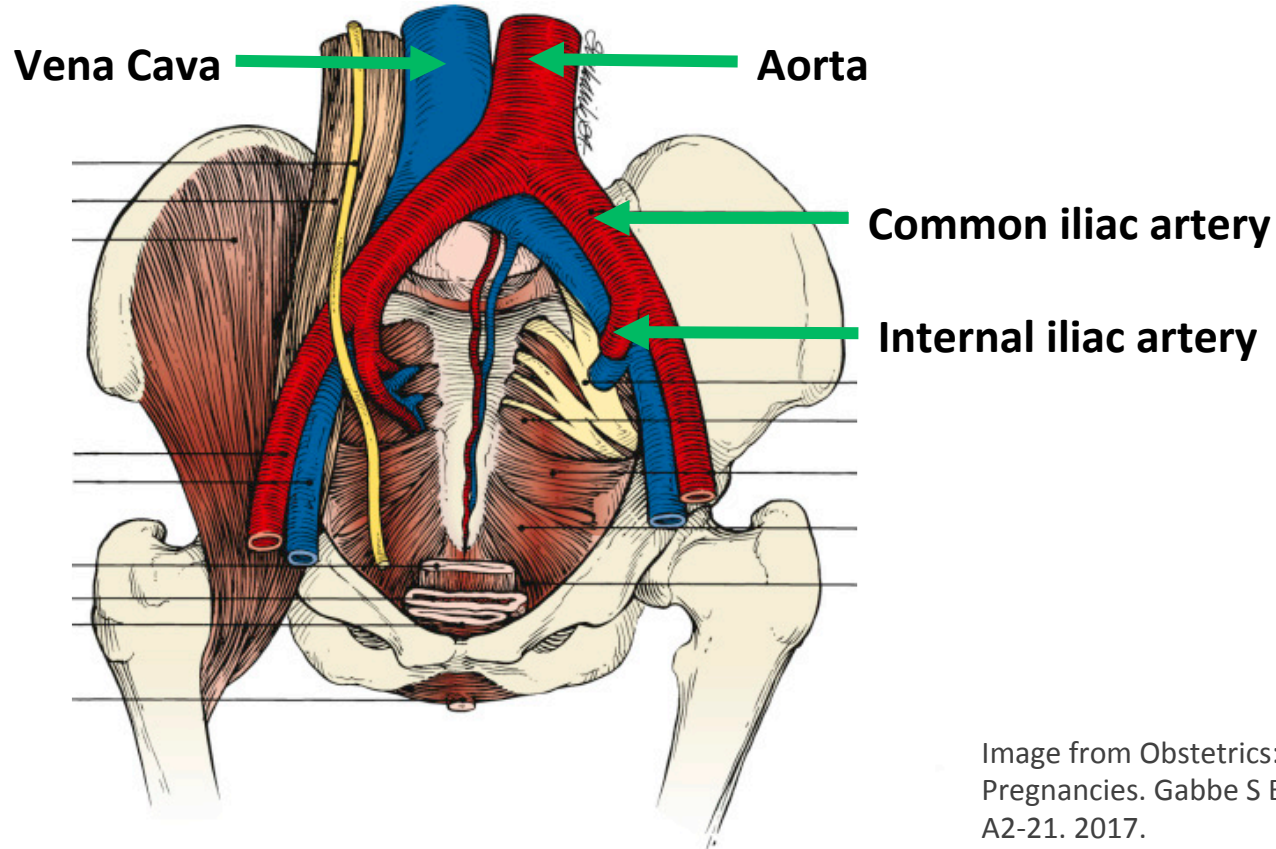


Image from Obstetrics: Normal and Problem Pregnancies. Gabbe S Ed., pg 1224.e16, E-Fig A2-21. 2017.



Uterine Arterial Supply

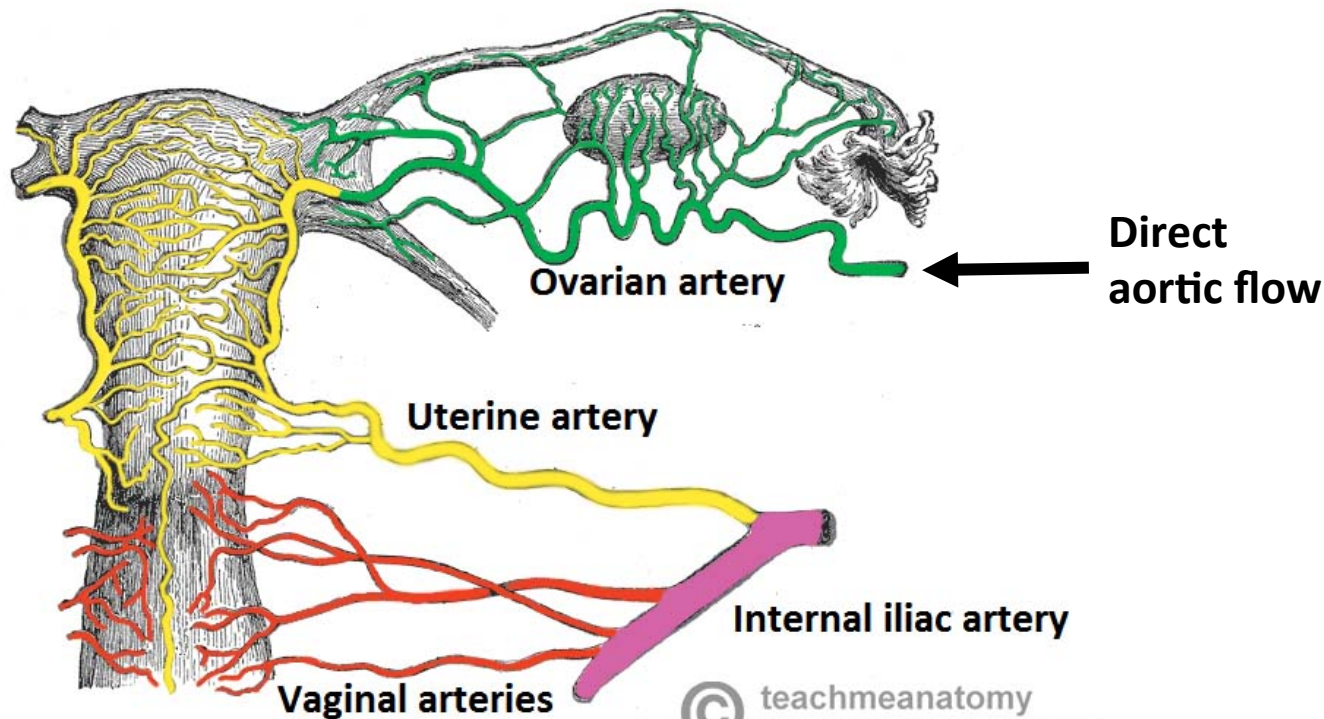
Uterine artery:

branch from internal iliac artery

Ovarian artery:

direct branch from aorta

Dual arterial supply to uterus from anastomoses between these two systems

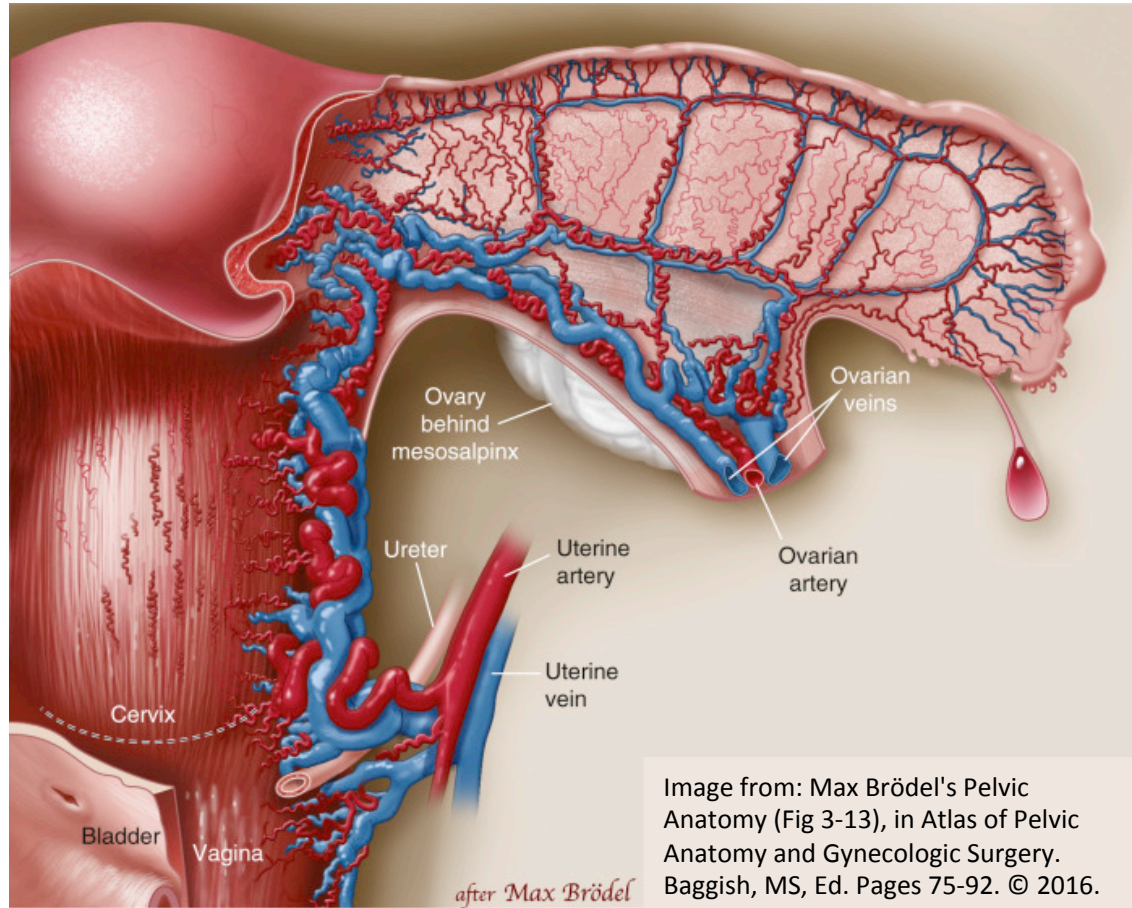


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The #1 Applied Human Anatomy Site on the Web.



Uterine Venous Systems



Uterine veins accompany their respective arteries.

Uterine veins empty into internal iliac vein.

Ovarian veins:

- Right: empties into vena cava
- Left: empties into left renal vein

Image from: Max Brödel's Pelvic Anatomy (Fig 3-13), in Atlas of Pelvic Anatomy and Gynecologic Surgery. Baggish, MS, Ed. Pages 75-92. © 2016.



Uterine Histology

Three major layers:

1. **Endometrium:** fibroblast stromal cells and endometrial glands
2. **Myometrium:** smooth muscle cells, vascular plexus, and lymphatics
3. **Perimetrium:** serosal connective tissue layer

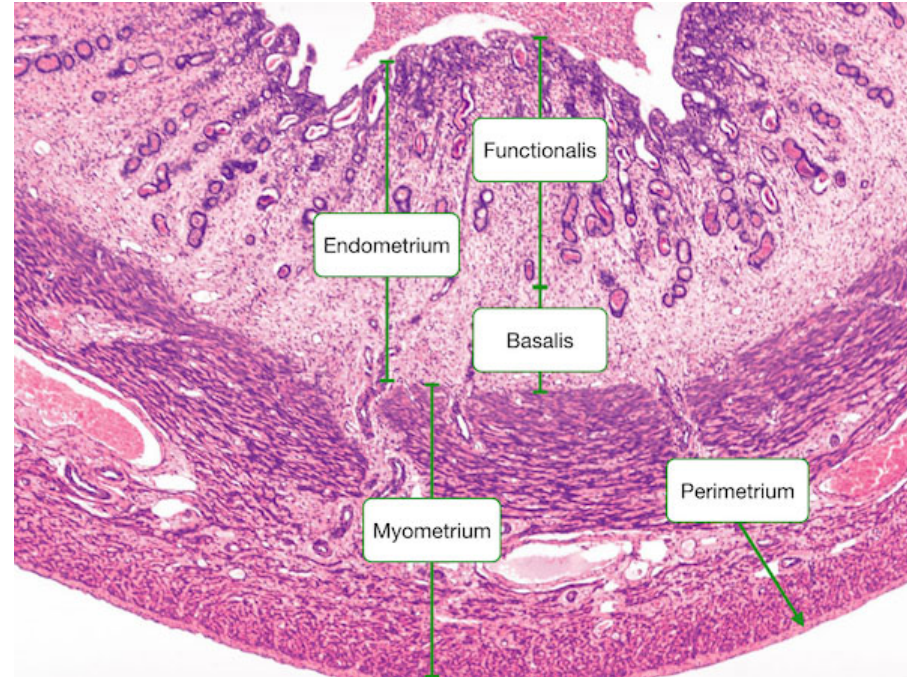


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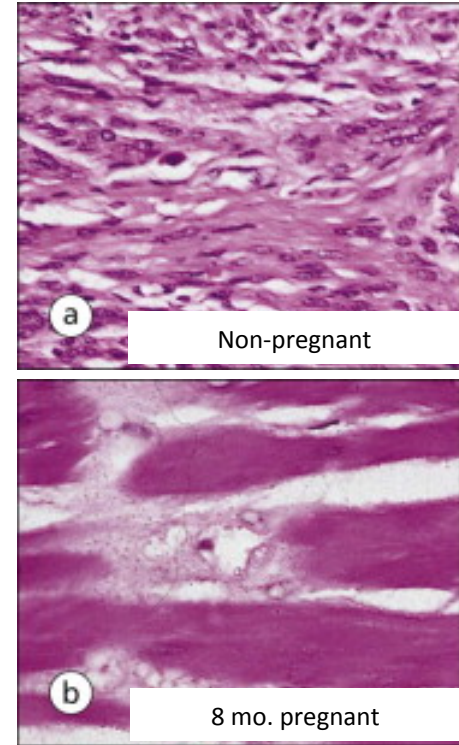
http://medcell.med.yale.edu/histology/female_genital_tract_uterine_cycle.php

last accessed 4/1/2017



Myometrium

- Mostly smooth muscle, but also contains collagen, elastin and fibronectin.
 - Outer longitudinal muscular layer
 - Inner circular submucosal layer
 - Thick middle layer rich with vessels and random interdigitating fibers
- More smooth muscle in body, less in lower uterine segment and cervix



Images from: Female Reproductive System, in
Stevens & Lowe's Human Histology.
Lowe JS, Anderson PG. Pages 337-362. © 2015.
FIGURE 17.10



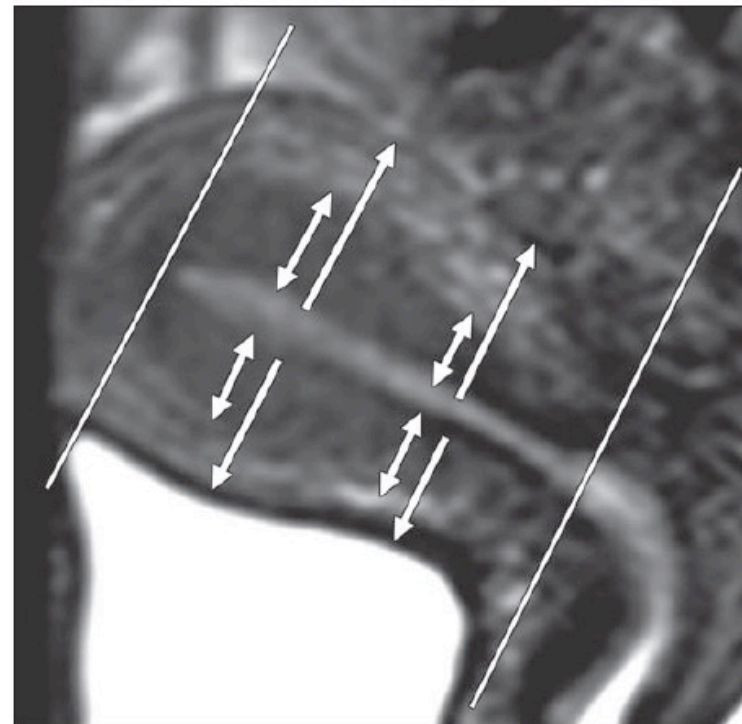
Myometrial Growth During Pregnancy

- Estradiol drives myometrial hypertrophy and hyperplasia
- Myometrial cells have dramatic increase in number of gap junctions (to permit for coordinated uterine contractions)
- Uterine weight increase: $\sim 75 \text{ g} \rightarrow \sim 1300 \text{ g}$
- Following delivery:
 - Loss of 85% of weight in 3 weeks, mostly due to intracellular volume contraction and collagen degradation.



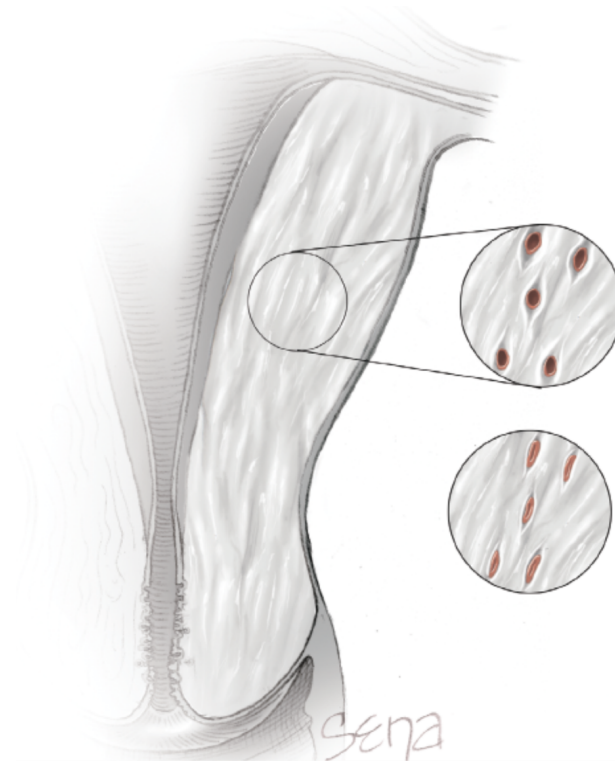
Myometrium

- Junctional Zone (JZ): low signal on T2-weighted MRI identifying junction between basal endometrium and myometrium.
- JZ less prominent in pre-menarche and post-menopause; poorly seen in pregnancy but reappears weeks to months post-delivery.
- More concentric myocyte arrangement (outer is more longitudinal)



Junctional Zone: short arrows
Full myometrium: long arrows

Myometrial smooth muscle compress blood vessels when contracted.





Uterine Corpus Endometrial Histology

Two layers:

1. Basalis

- Irregular junction with myometrium, interdigitated with smooth muscle and endometrial stroma
- “Reserve cell layer” of the endometrium
- Few changes with menstrual cycle

2. Functionalis

- Contains distal endometrial glands
- Significant changes with menstrual cycle

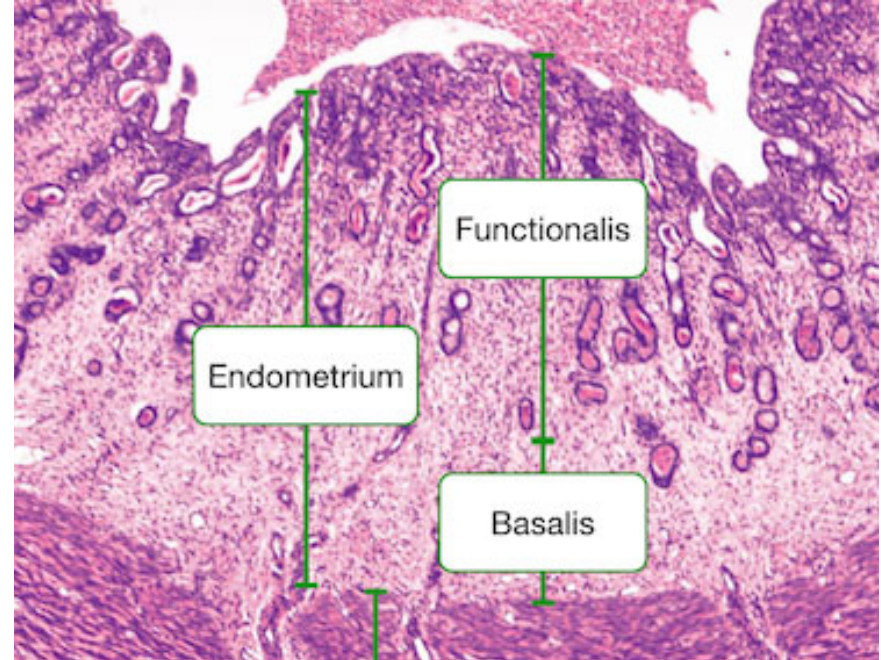
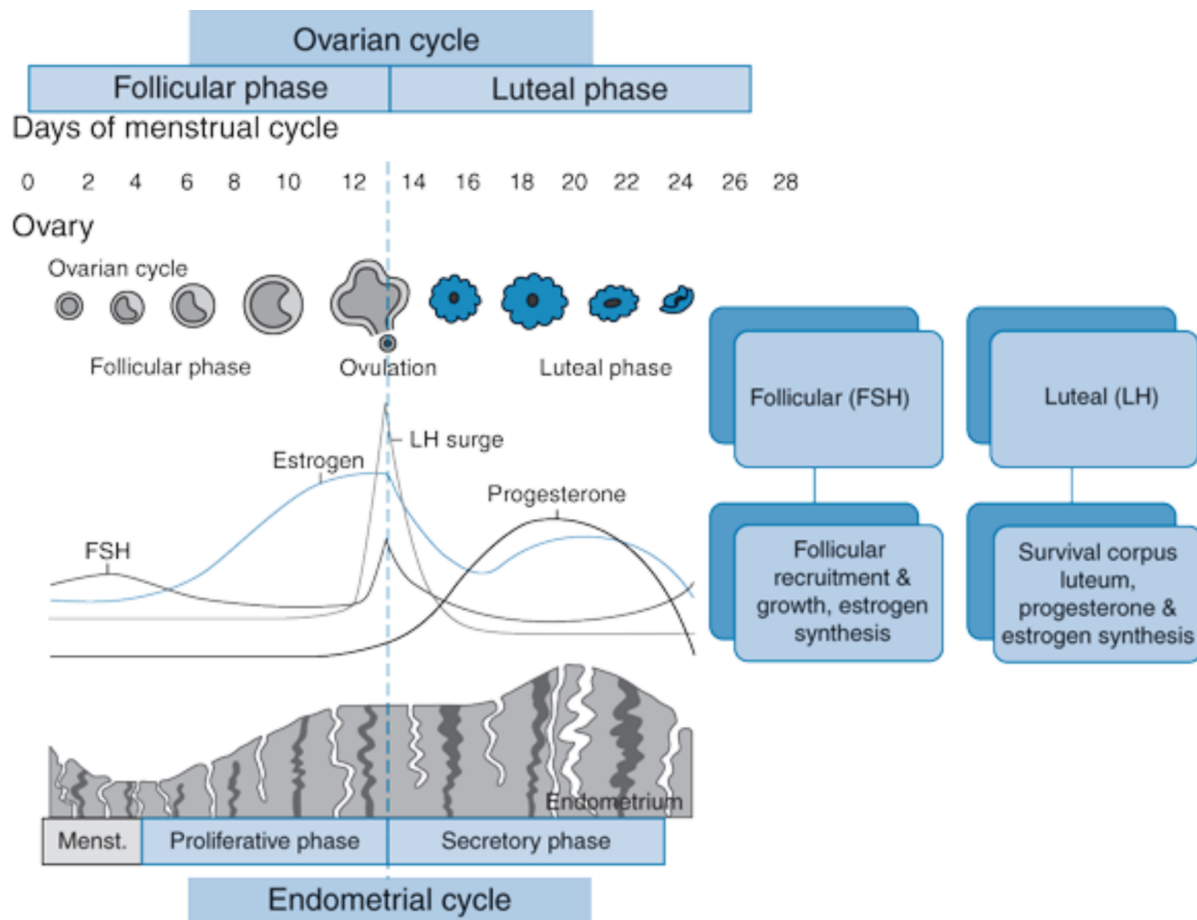


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Proliferative Endometrium

Glands: small, straight

Stromal cells: small, scant cytoplasm

- Late proliferative: increased intra- and extracellular collagen

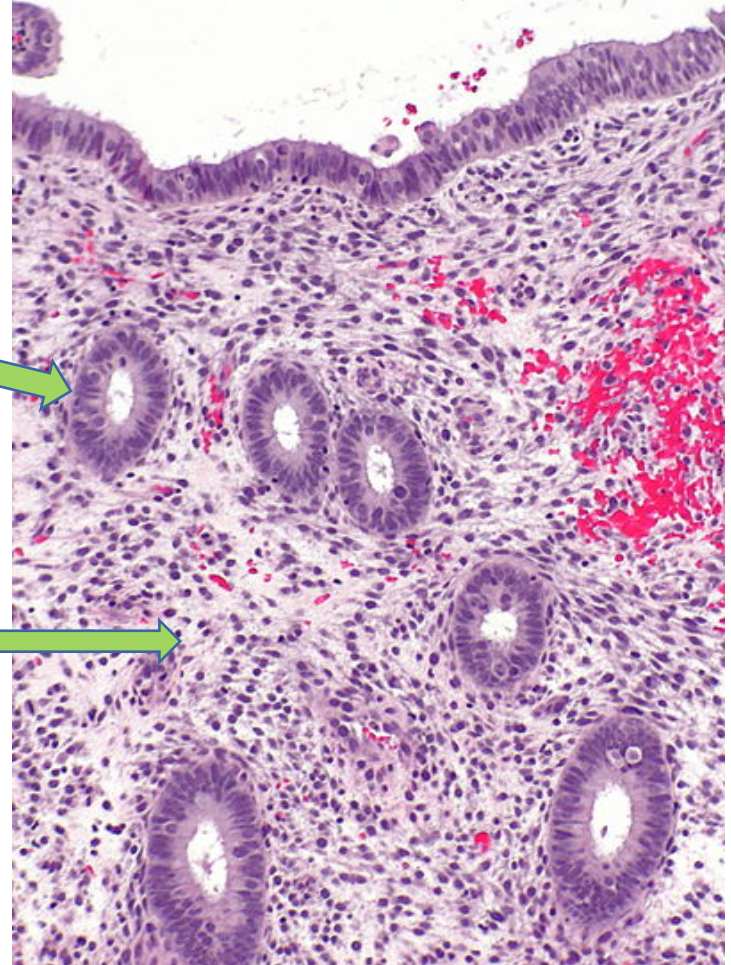


Image from URL:

https://librepathology.org/wiki/Proliferative_phase_endometrium,

last accessed 4/1/2017



Secretory Endometrium

Glands: Coiled, serrated

Stromal cells: “Predecidualization” —
small sheets of polygonal cells with
distinct cell borders due to increased
pericellular matrix

Increased stromal edema

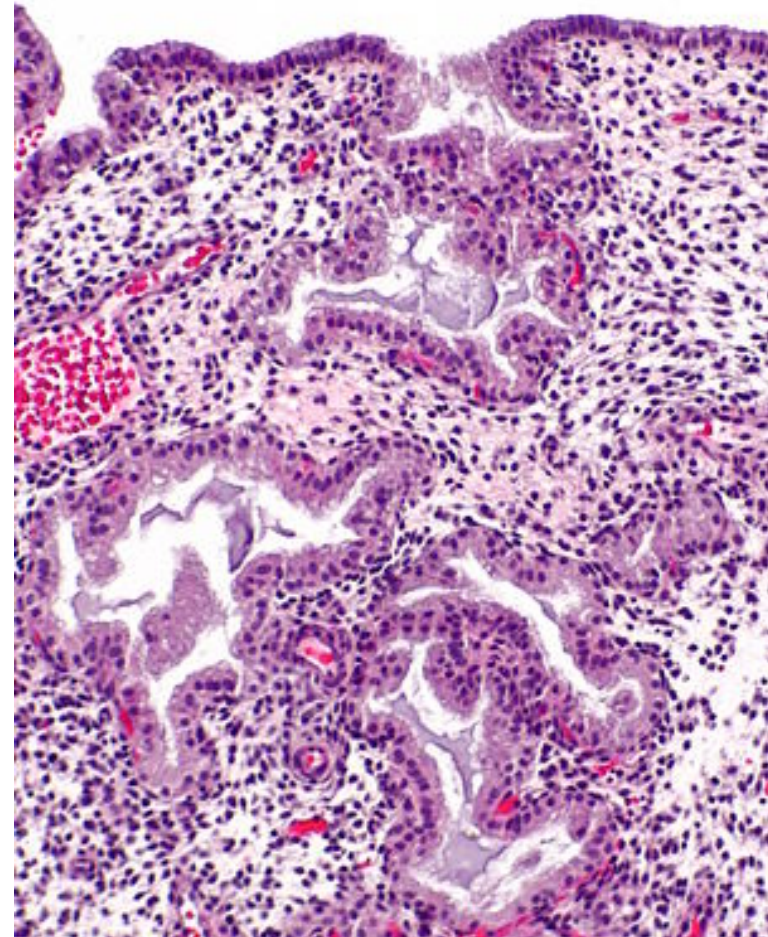


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[Secretory phase endometrium](https://librepathology.org/wiki/Secretory_phase_endometrium) last accessed 4/1/2017



Decidualized Endometrium

- **Decidua**: specialized endometrial stroma of pregnancy
- Secretes products involved with paracrine and autocrine regulation of feto-maternal interface.
- Decidual cells are capable of phagocytosis and play role in collagen scaffold breakdown at implantation site.

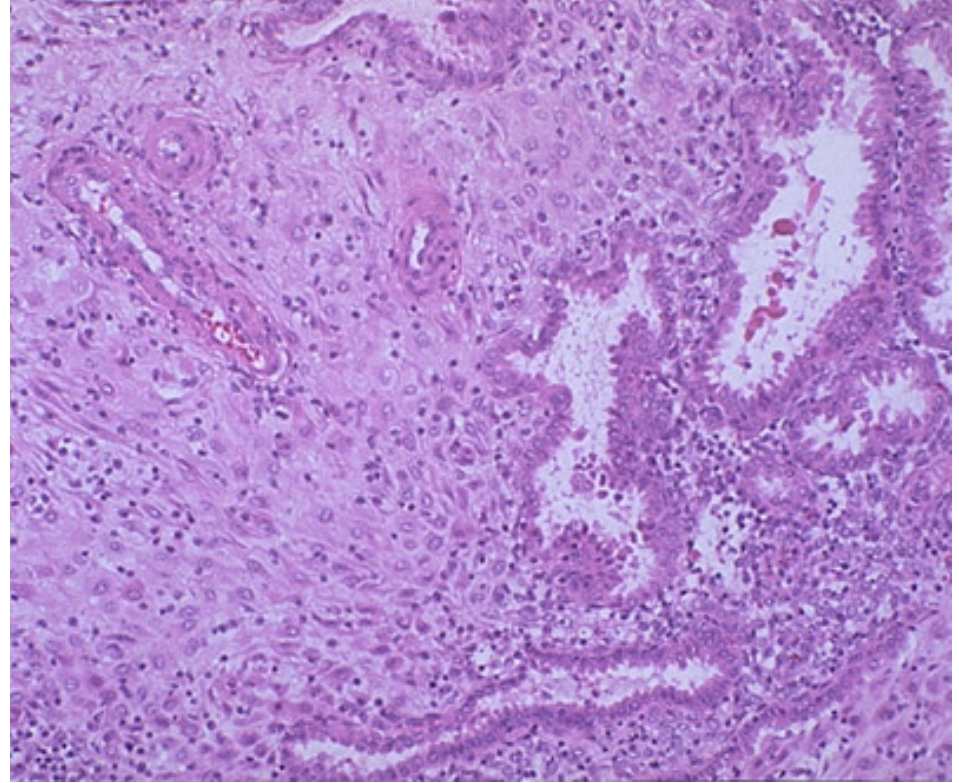


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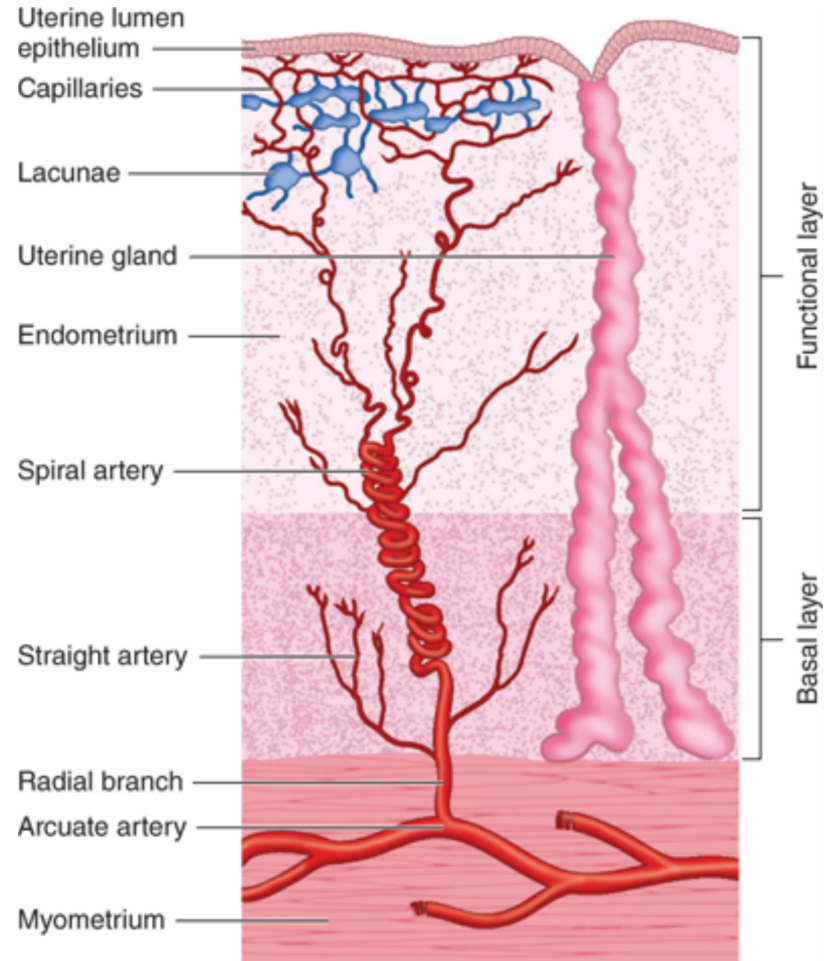
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Microvascular Supply of Endometrium

Uterine and ovarian arteries give rise to arcuate arteries.

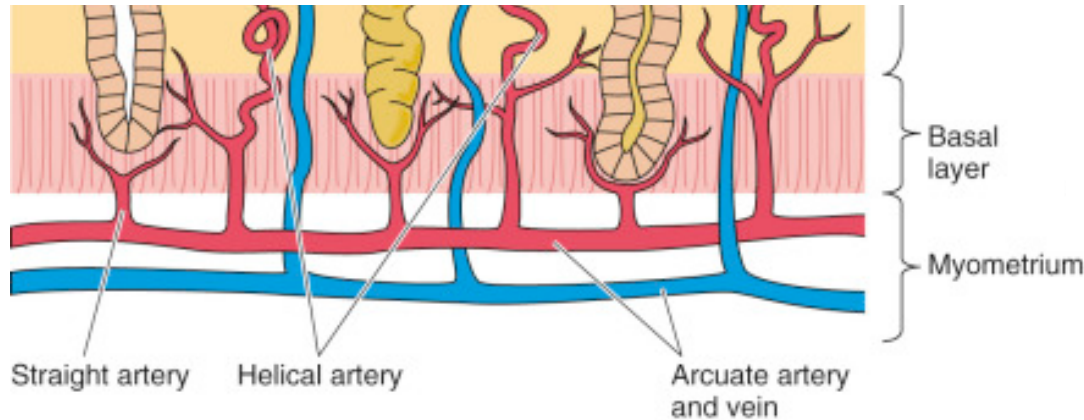
Arcuate arteries branch into radial, straight and spiral arteries, which supply endometrium.





Uterine Microvasculature During Menses

Uterine cavity



With loss of endometrial layer, fluid within the uterine cavity can enter the uterine venous system.

Uterine intrinsic veins do not contain valves;¹ loss of endometrial layer also causes venous blood loss.

Image from: **Female Reproductive System**; Textbook of Histology. Gartner, L Ed. Pages 529-558.e3. © 2017.
Figure 20–11

1. Chap 59: Management of pelvic congestion syndrome and perineal varicosities. White JV, Schwartz LB, Ryjewski C. In Handbook of Venous and Lymphatic Disorders, 4th Ed. Gliviczki P, Ed. 2017 CRC Press p 685-687



Questions?