Bastyr University
Human Gross Anatomy II
BC 5125
A. Thomas PhD

PERINEUM

The perineum is the region of the inferior aperture of the pelvis that lies between the upper parts of the thighs and lower parts of the buttocks and is hidden in the erect posture. The perineum is best visualized when the subject lies supine with the thighs flexed and abducted – such a position is called the lithotomy position.

The perineum is a diamond-shaped space bounded in front by the symphysis pubis; at the sides by the conjoint rami of the pubis and ischium, the tuberosities of the ischium, and the sacrotuberous ligaments (hidden by the gluteus maximus); and the tip of the coccyx posteriorly.

The diamond-shaped perineum is divided into an anterior triangle known as the urogenital triangle and a posterior triangle called the anal triangle, by an imaginary line drawn between the two ischial tuberosities and passing in front of the anal orifice

ANAL TRIANGLE: The region of the anal triangle is composed of the anus in the midline and an ischiorectal fossa on either side of the anus

Anal Canal: The anal canal extends from the lower end of the rectum to the anus and is 4 cm long. Its upper part lies in the pelvic cavity surrounded by the thickened inferior part of the circular muscular layer of the intestine which constitutes the involuntary internal anal sphincter, and with the lower parts of the levator ani muscle on each side.

The inferior part of the anal canal lies in the perineum surrounded by the external anal sphincter. The sphincter ani externus muscle is a voluntary muscle and consists of three parts:

1. A subcutaneous part which has no bony attachment and its fibers decussate in front and behind the anus
2. A superficial part which is oval in shape with fibers that arise from the coccyx and anococcygeal body behind and pass anteriorly to the central point of the perineum
3. A deep part which passes round the lower half of the anal canal from the central perineal tendon and fuses with the inferior portion of the levator ani – the puborectalis part – and assists in drawing the anal canal forward, thus increasing the angulation between it and the rectum; thereby preventing the untimely descent of the feces.

ISCHIO-RECTAL FOSSA: This is a wedge-shaped fossa and has the following boundaries.

Laterally – Obturator internus muscle and its fascia
Medially – Levator ani and external anal sphincter muscles
Anteriorly – Base of the urogenital diaphragm
Posteriorly – Sacrotuberous ligament and gluteus maximus muscle
Base – Skin
Apex – The origin of levator ani from the obturator fascia

Contents:

1. Fat
2. Internal pudendal vessels and pudendal nerve lying in the lateral wall within the fascia of obturator internus (pudendal canal or Alcock's canal). The pudendal nerve, after giving off the inferior hemorrhoidal nerve, splits into the dorsal nerve of the penis (clitoris in female) and perineal nerve. The perineal nerve in turn divides into the posterior scrotal or labial nerves and deep perineal nerve which innervates the muscles in the deep and superficial perineal pouches
3. Inferior hemorrhoidal nerve and vessels. The nerve is motor to the external sphincter and sensory to the skin around the anus mucous membrane of the anal canal below the anal valves

Clinical Note: The ischiorectal fossa is infected quite often resulting in an "ischiorectal abscess". The abscess is very painful due to the abundant nerve supply. The abscess quite often bursts into the anal canal resulting in a fistula-in-ano. The opening into the anal canal may be below the external sphincter, between internal and external sphincter, or above the internal sphincter. Therefore, it is imperative that an ischiorectal abscess be incised and drained early – collection of pus in one fossa may travel round the front or back of the anus into the other fossa as the fat of the two fossae is continuous in front and behind, resulting in a horseshoe abscess or fistula.

UROGENITAL TRIANGLE: The most superficial structures in this area, in both male and female are the external genitalia

Male External Genitalia: They consist of the penis and the scrotum

1. The scrotum is a cutaneous pouch which is divided by a median septum into two compartments, each containing the testis, epididymis, spermatic cord and vas deferens. The testis is about 4 cm long; 2.5 cm antero-posteriorly and 2 cm transversely. It is enclosed in a thick fibrous tissue called the tunica albuginea, which is covered by the visceral layer of tunica vaginalis except where it is in direct contact with the epididymis superiorly and posteriorly

   The appendix testes is a small, sessile body attached to the upper border of the testes and is remnant of the embryonic paramesonephric duct which forms the fimbriated end of the uterine tube in the female. The epididymis consists of a complexly convoluted tube where spermatozoa undergo maturation. It is divided into a head, body and tail

   The ductus deferens is the thick-walled, muscular part of the duct system which transports the sperms from the testes to the urethra. The spermatic cord contain:
   a) Ductus deferens
   b) Testicular artery
   c) Artery of ductus deferens
   d) Pampiniform plexus of veins

   For the rest of the contents; refer to the descent of testes lecture

   Clinical Note:
   a) Orchitis – an inflammation of the testes and painful in nature. Seen in mumps
   b) Hydrocele – an accumulation of fluid within the tunica vaginalis and is the most common cause of

swellings. Treatment: eversion of the sac, aspiration or tapping

c) Undescended testes – the testes is an abdominal organ which during development descends to the scrotum, which it reaches at birth. The undescended testes may be in the abdomen, in the inguinal canal or groin. Abdominal testes is prone to malignant changes. Treatment: 1) hormonal treatment – chorionic gonadotropins 2) orchiopexy and 3) orchiectomy
d) Torsion of appendix testes – is primarily a prepubertal condition. Treatment is surgical excision of the appendage

2. The penis consists of a root which is located in the superficial perineal pouch and a body which is pendulous and fully covered by the skin. The body of the penis is made up of three portions which contain distendable venous cavities

There are two corpora cavernosa, and a single corpus cavernosum urethra (corpus spongiosum)

The glans penis is the dilated distal end of the corpus cavernosum urethra at the tip of which is located the eternal urethral orifice

The fold of the skin that covers the glans penis is known as the prepuce, which is attached to the under surface of the orifice by a medial fold called the frenulum

Female External Genitalia: Includes the labia majora, labia minora, clitoris and vestibule

1. Labia majora – Bilateral folds of skin homologous to the two compartments of the scrotum in the male and enclose the labia minora
2. Labia minora – Two cutaneous folds and is homologous to the urethra; surface of penis in the male
3. Clitoris – Like its homologus, the penis, it is an erectile organ and has a body and a root. The root is located in the superficial pouch. The crura of the clitoris – these two parts join as the corpora cavernosa clitoridis and constitute the body. A small mass of erectile tissue, the glans clitoridis, caps the body of the clitoris
4. Vestibule – An elongated area bounded on either side by the labia minora. The anterior opening is the urethra and the posterior opening is the vagina which in the virgin is partially closed by the hymen

PERINEAL POUCHES: The deeper constituents of the urogenital triangle are the superficial perineal pouch and the deep perineal pouch

The Superficial Perineal Pouch in the Male: This space is located between the membranous fascia of the perineum (fascia of Colles), which is continuous with the fascia of Scarpa of the anterior abdominal wall, and the perineal membrane (inferior layer of the urogenital diaphragm)

Boundaries of the Superficial Perineal:

Inferiorly – the fascia of Colles
Superiorly – perineal membrane
Laterally – inner surface conjoining rami of pubis and ischium
Posteriorly – fascia of Colles blends with the perineal membrane

Anteriorly – opens where the Colles fascia becomes continuous with the fascia of Scarpa of abdomen

Contents of the Superficial Perineal:

1. The three constituents of the root of the penis – bulb and the two crura
2. The three paired muscles:
    a) Ischiocavernosus muscle lying on the crus penis
    b) Bulbospongiosus muscle lying on the bulb
    c) Superficial transverse perineal muscle – which forms the posterior limit of the space and extends from the central tendon of the perineum (perineal body) to the ischial tuberosities
3. The three terminal branches of the perineal nerve; the two cutaneous scrotal or labial nerves and the deep perineal nerve which is motor to all the muscles of the superficial pouch
4. The three superficial arteries: two scrotal or labial arteries and transverse perineal artery

Perineal Pouches in the Female: In the female, the vagina divides the superficial pouch into right and left halves; Bulbospongiosus into right and left sphincter vaginae; bulb of clitoris into right and left bulb of vestibule

The female perineal pouch has the same muscles, nerves and vessels that the male has, but in addition has greater vestibular glands (Bartholin's glands)

Perineal Body: The perineal body or central tendon of the perineum is a mass of fibrous tissue located between the anal canal and the vagina or bulb of penis. The following muscles gain insertion or attachment to this body:

1. Muscles of the superficial pouch: Bulbospongiosus, Superficial transverse perineal muscle
2. Muscles of the deep pouch: Deep transverse perineal muscle
3. Muscles of the anal triangle: Sphincter ani externus
4. Muscles of the pelvis: Levator ani

Clinical Note:

1. Extravasation of urine into the superficial pouch occurs in injury to the penile or spongy portion of the urethra. Due to the fact that the pouch is closed all around except anteriorly, the urine can extend on to the anterior abdominal wall
2. Tears of the perineal body: occurring during childbirth are to be sutured carefully to prevent prolapse of the uterus and other pelvic organs
3. The close relationship of the female urethra to the anterior vaginal wall is to be realized. The female urethra which is about ½" long and is practically embedded in the anterior vaginal wall. In prolonged labor, where the fetal head is at the outlet for a long time, the urethra is pressed against the symphysis pubis and can undergo pressure necrosis resulting in a urethrovaginal or vesciovaginal fistula
4. In most normal childbirth, the obstetrician cuts the vagina to facilitate delivery. This is called the episiotomy – which may be lateral or median in portion. The episiotomy is carefully sutured after the delivery

The Deep Perineal Pouch: The area between the superior and inferior layers of the deep perineal fascia and contains the sphincter urethrae and deep transverse perineal muscles which constitute the urogenital diaphragm

Boundaries:

Superiorly – Superior layer of the deep perineal fascia
Inferiorly – Inferior layer of the deep perineal fascia, also known as the perineal membrane

Laterally – the Conjoint rami of the pubis and ischium
Anteriorly and Posteriorly – the Superior and inferior layers of the deep perineal fascia fuse together closing the deep perineal pouch

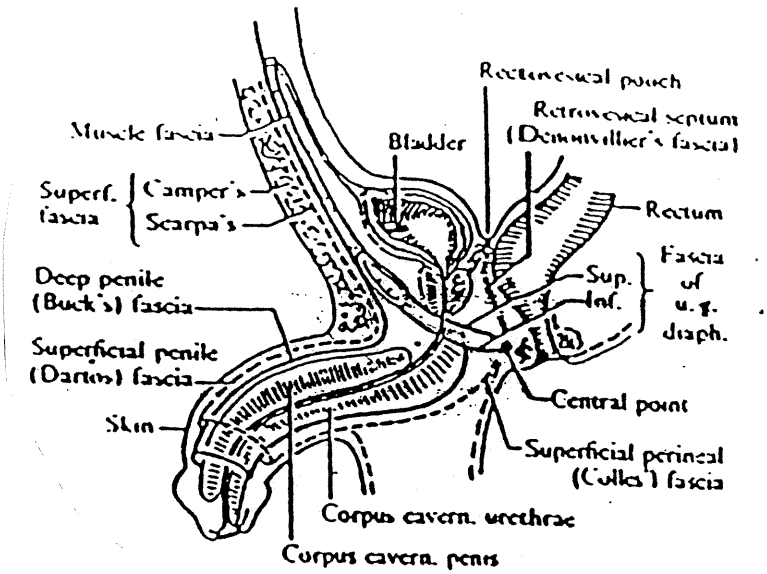
Contents:

1. Membranous portion of the urethra
2. Bulbourethral glands
3. Muscles: sphincter urethrae and deep transverse perineal muscles
4. The artery of the penis or clitoris (terminal branch of the internal pudendal artery) and its branch – artery to the bulb. The artery of the penis or clitoris terminates by dividing into the dorsal artery and the deep artery of the penis (clitoris)

Fascia of Perineum:

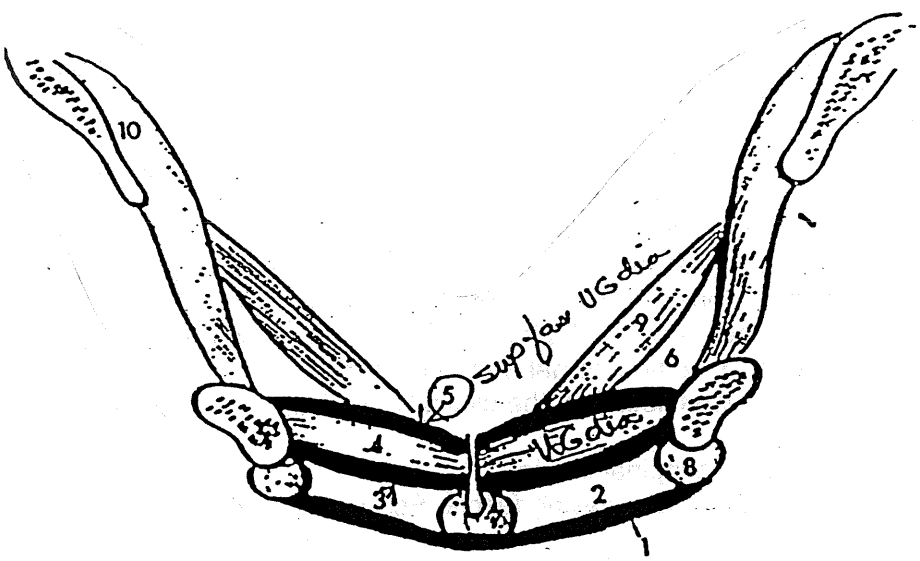
Superficial:
- Fatty layer
- Membranous (Colle's) and its attachments

Deep:
- External deep (Buck's over penis)
- Inferior (superficial) of UG diaphragm
- Superior (deep) of UG diaphragm



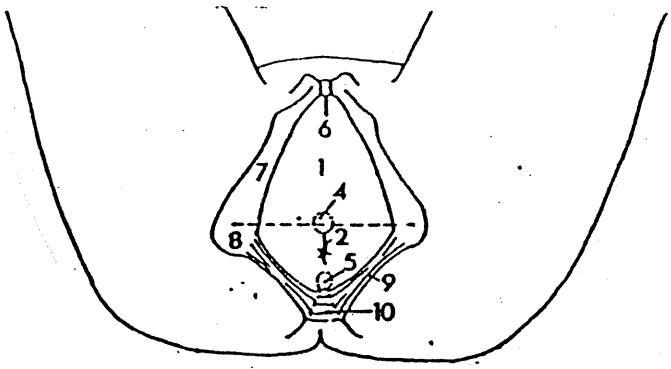
Perineal Pouches and Fascia:

The perineum is composed of a superficial pouch, between the membranous or deep layer of the superficial fascia and the perineal membrane, and a deep pouch, between the perineal membrane and the superior fascia of the UG diaphragm. The deep or membranous layer of the superficial fascia in the perineum is called the Colle's fascia and is the same fascia as the Scarpa's fascia of the abdomen, and the Dartos fascia of the scrotum (Colle's = Scarpa's = Dartos). Colle's fascia is attached to the deep fascia along the ischiopubic rami and transversely from tuberosity to tuberosity. This is continuous with the attachment of Scarpa's fascia to the fascia lata, just distal to the inguinal ligament. These relations are clinically important. Buck's Fascia is deep to Colle's fascia



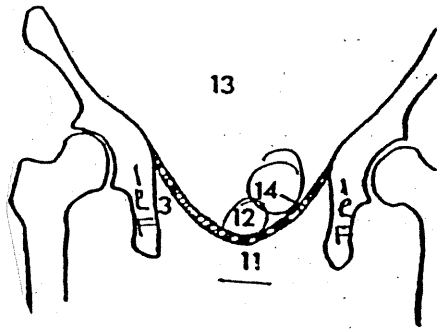
SCHEMATIC CORONAL SECTION

(1) Colle's Fascia (Scarpa's fossa)
(2) Superficial pouch
(3) Perineal membrane – inferior fascia of the UG diaphragm
(4) Deep pouch – occupied by the UG diaphragm
(5) Superior fascia of the UG diaphragm
(6) Anterior recess of the IRF
(7) Bulb of penis or vestibule
(8) Crus of penis or vestibule
(9) Pelvic diaphragm
(10) Obturator internus



Surface Projection:

(1) Urogenital (UG) triangle
(2) Anal triangle
(3) Ischiorectal fossae
(4) Perineal body
(5) Coccygeal body – along with the perineal body there are two condensations of fascia important for muscle attachment



FRONTAL SECTION

Boundaries:

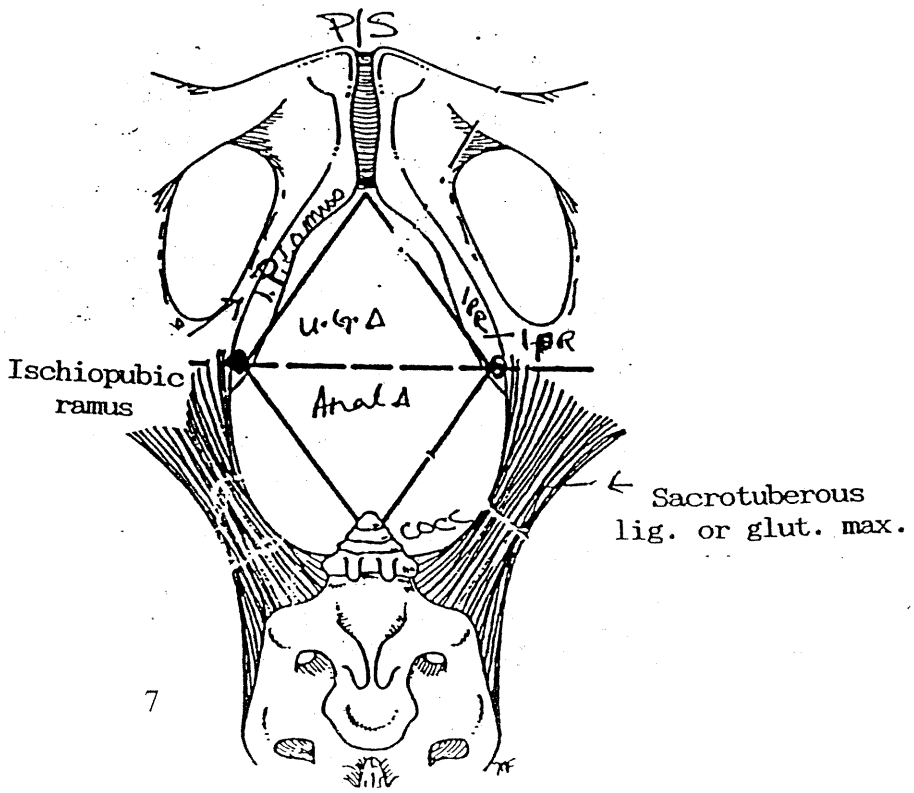
(6) Pubic symphysis
(7) Ischiopubic ramus
(8) Ischial tuberosity
(9) Sacrotuberous ligament
(10) Coccyx

Review:

(11) Perineum
(12) True pelvis
(13) False pelvis
(14) Pelvic diaphragm

Male Perineum:

Boundaries:



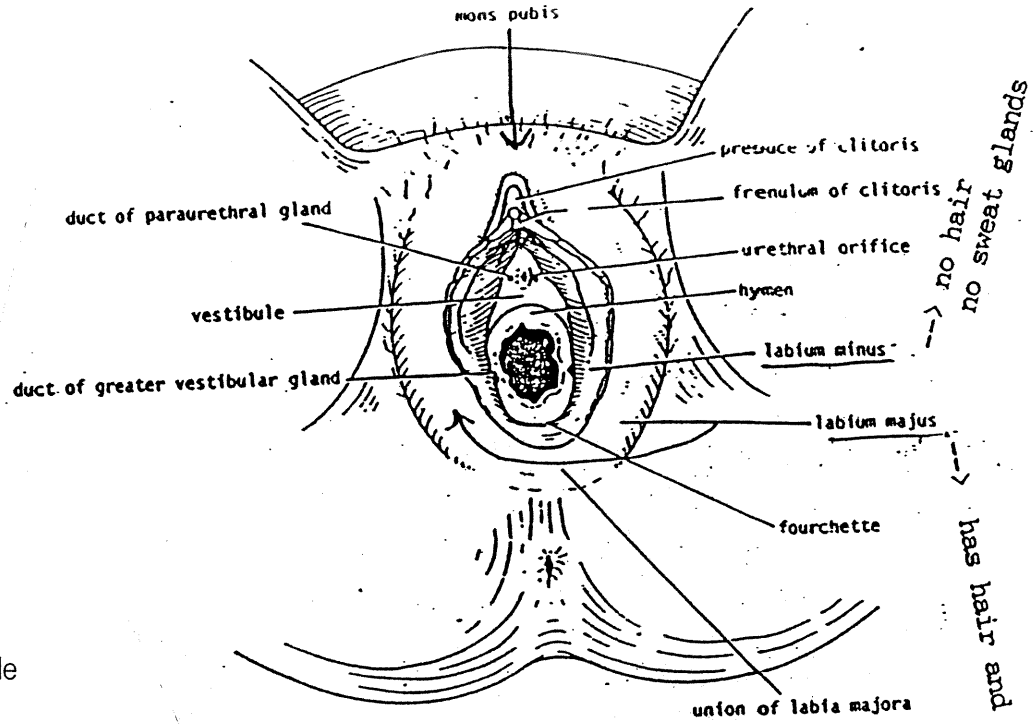
Urogenital triangle

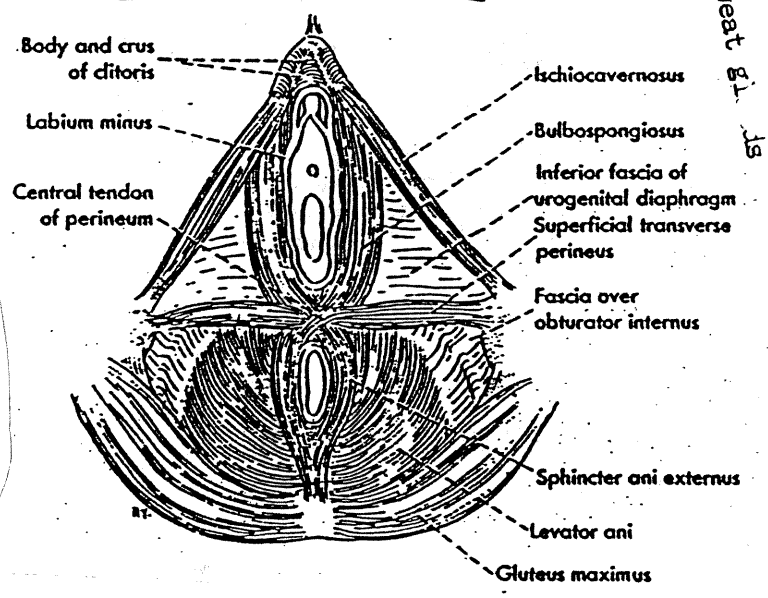
Anal triangle

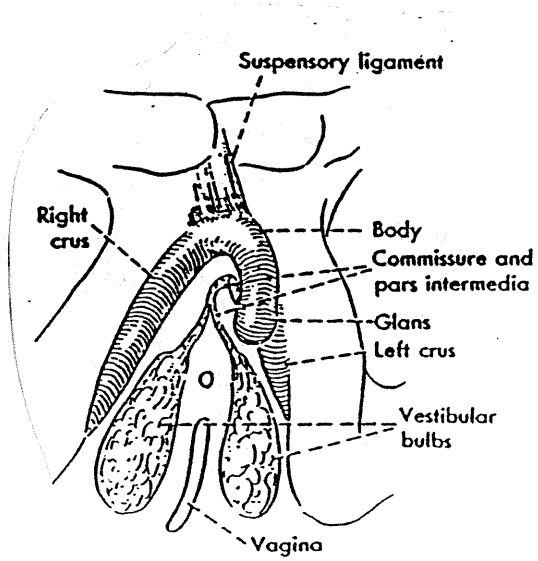
Bastyr University
Human Gross Anatomy II
BC 5126
A. Thomas PhD

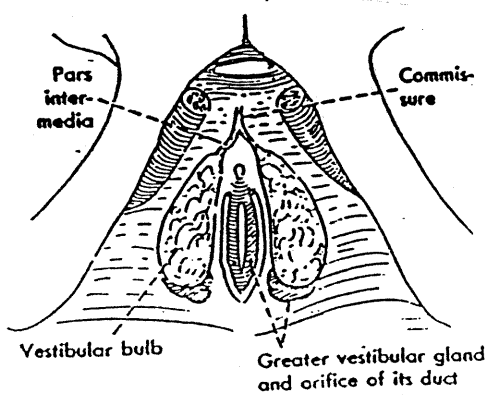
Female Perineum:

1. Vulva
2. Mons pubis and labia majora
3. Labia minora
4. Vestibule
   - openings
   - hymen
5. Fascial layers
6. Perineal body
7. Superficial pouch
   - Root of clitoris
     - Bulb of vestibule
     - R and L Crura
   - Bulbospongiosus muscle
   - Ischiocavernosus muscle
   - Superficial transverse perineal muscle
   - Greater vestibular glands
     (Bartholin's glands)



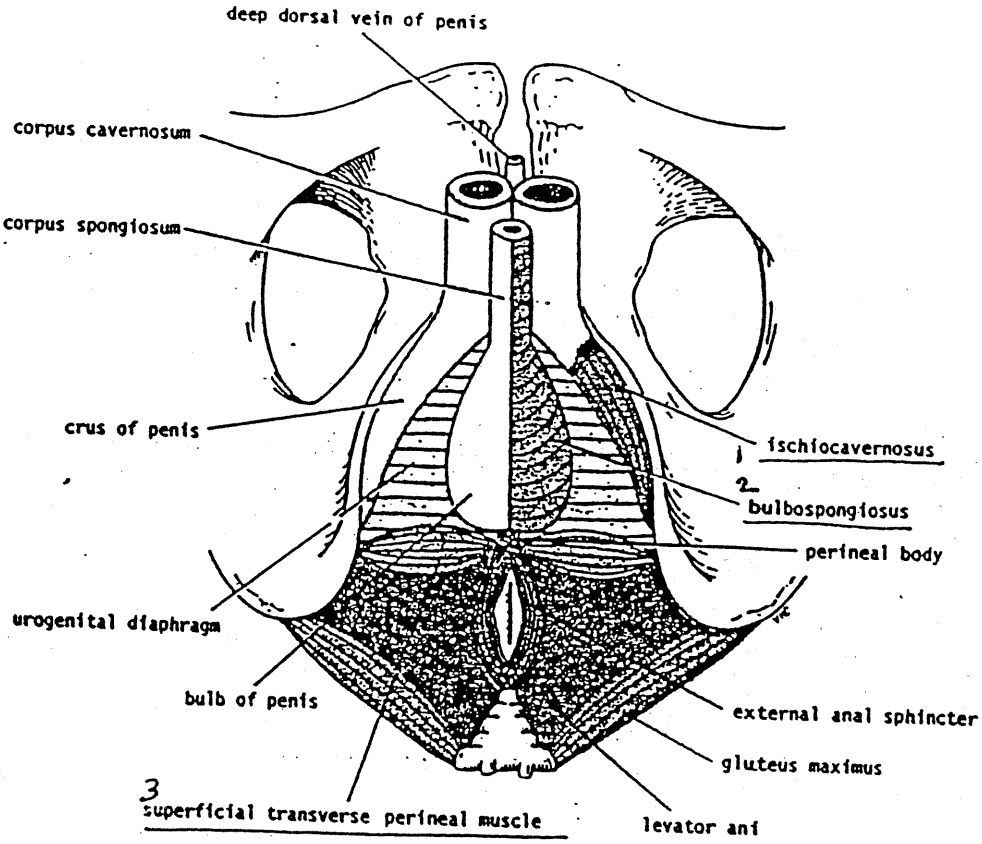






Bastyr University
Human Gross Anatomy II
BC 5126
A. Thomas PhD

Superficial Perineal Pouch:



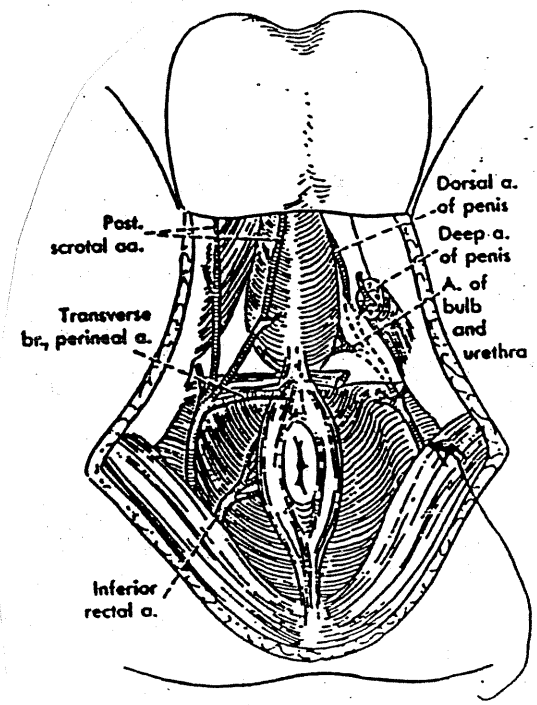
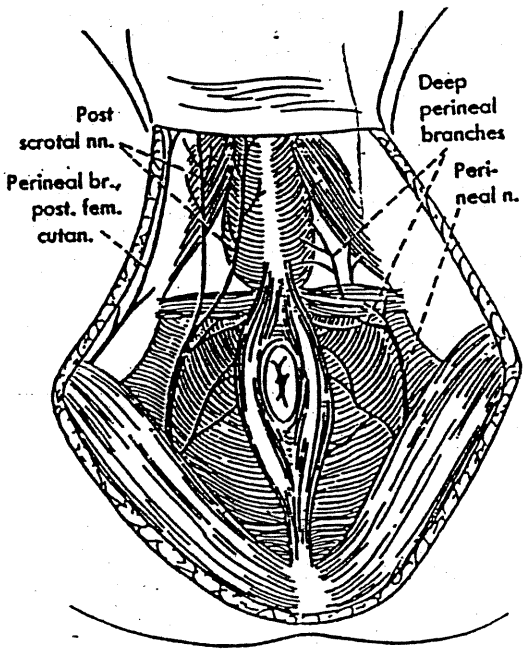


Fig. 22-7. The internal pudendal artery. The perineal branches of the artery are cut away the right, as is most of the corpus cavernosum of the penis, to show the deep branches; the course of the artery through the urogenital diaphragm is indicated by broken lines.



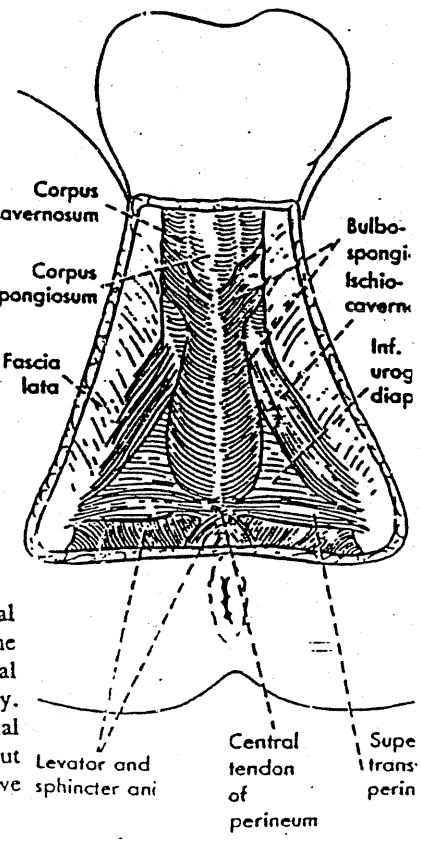
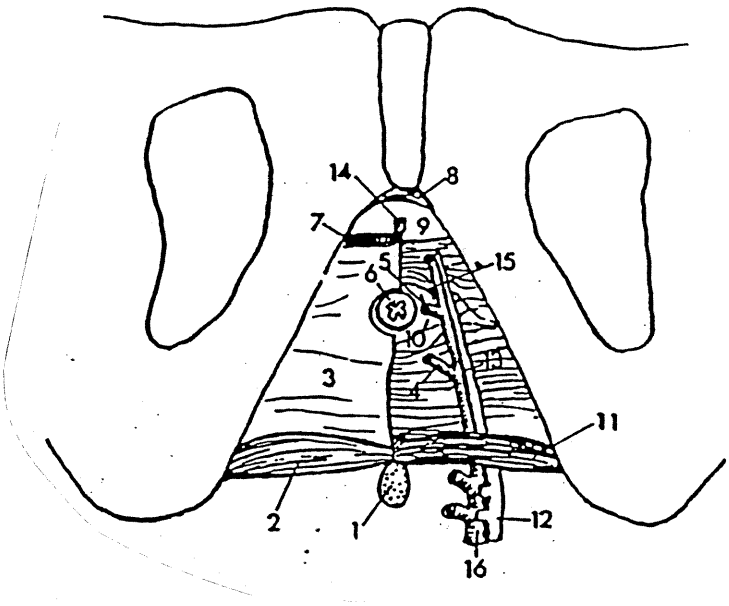
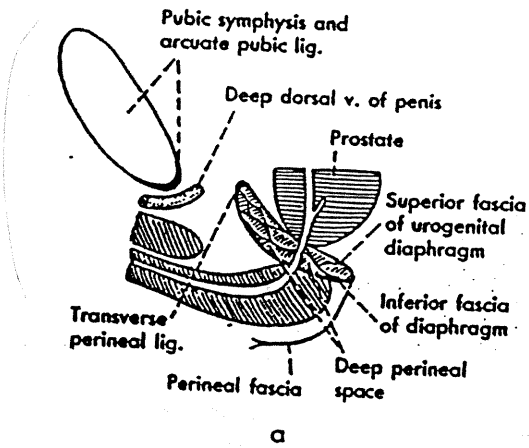


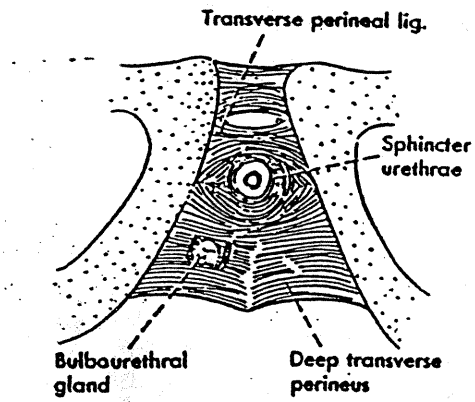
Fig. 22-8. Nerves in the superficial perineal space in the male. On the reader's right the posterior scrotal nerves, the superficial branches of the perineal, have been cut away. In the ischiorectal fossa the inferior rectal nerve, a branch of the pudendal, is shown, but the dorsal nerve of the penis, here lying above the perineal nerve, does not appear.

Contents of the Deep Pouch:

(1) Perineal body
(2) Superficial transverse perineus muscle
(3) Perineal membrane
(4) Deep artery of the penis
(5) Artery to the bulb
(6) Urethra
(7) Transverse ligament of the pelvis
(8) Arcuate ligament of the pelvis
(9) Aperture for the deep dorsal vein
(10) Sphincter urethrae
(11) Deep transverse perineus m.
(12) Pudendal nerve
(13) Dorsal artery of the penis
(14) Deep dorsal vein of the penis
(15) Dorsal artery of the penis
(16) Internal pudendal artery







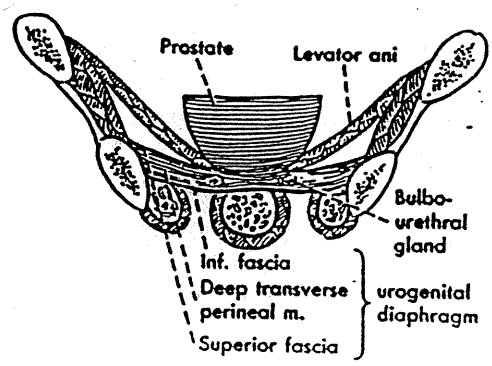
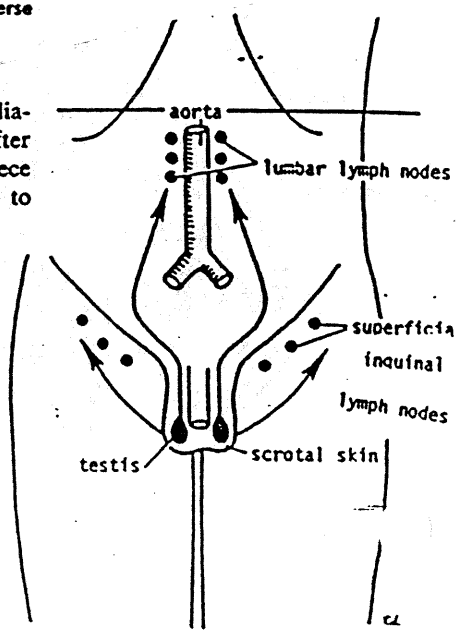


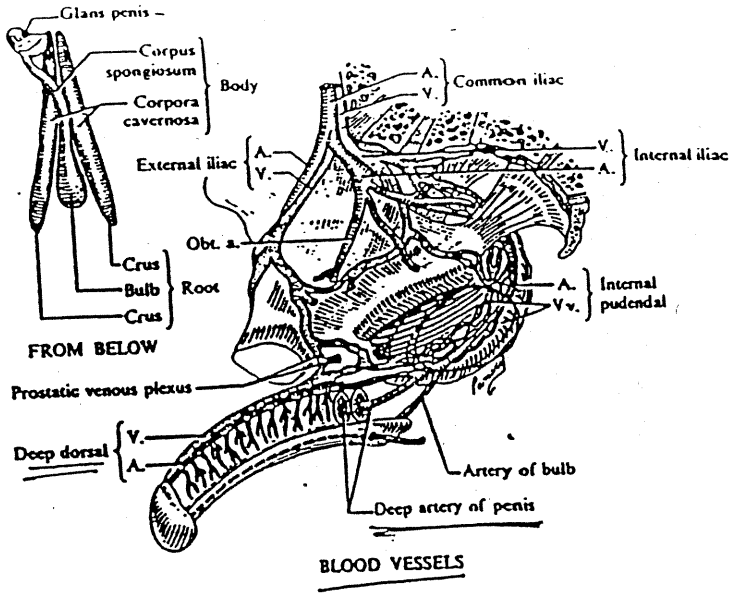
Fig. 22-23. The urogenital diaphragm and the deep perineal space in sagittal section, a, and in frontal section through its posterior part, b.

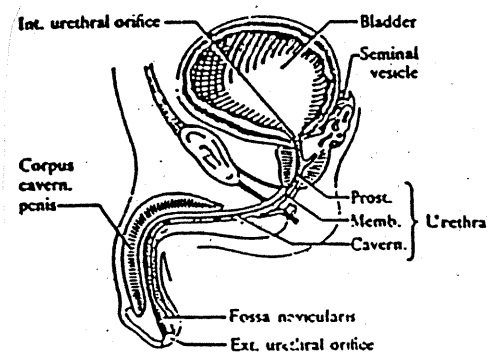
Fig. 22-24. The muscle of the urogenital diaphragm of the male seen from below after removal of the inferior layer of fascia. A piece has been cut from the muscle on the left to show the bulbourethral gland.

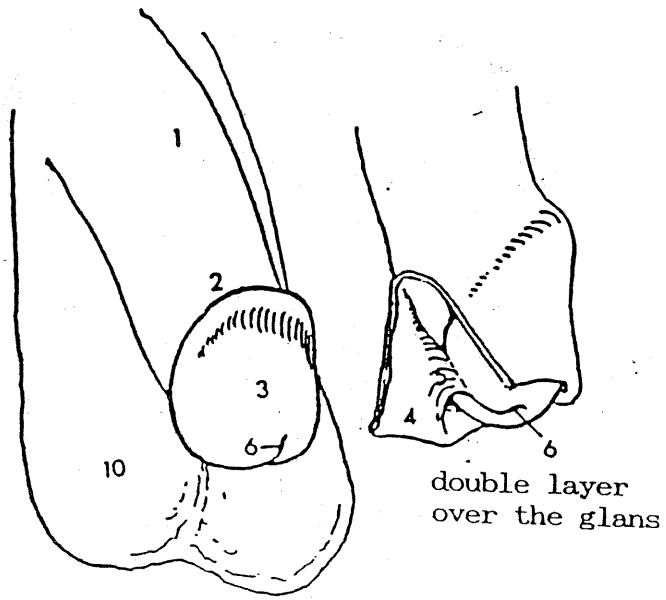


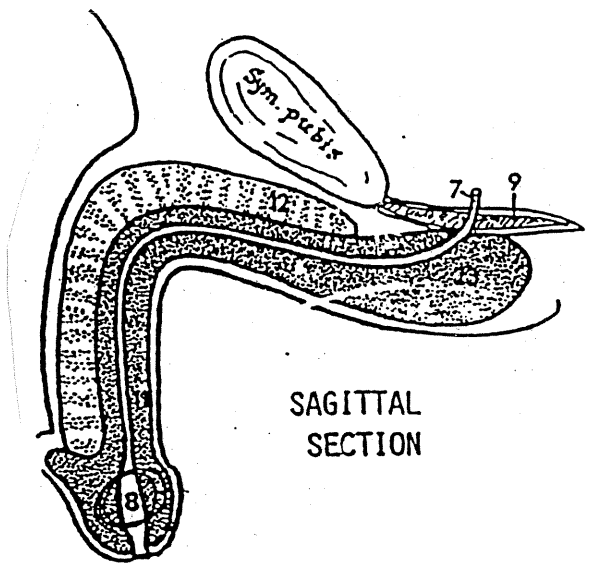
Penis: Structure, Blood Supply, Venous Drainage, and Urethra

(1) Shaft of penis
(2) Corona
(3) Glans
(4) Prepuce or foreskin
(5) Frenulum
(6) External urethral meatus
(7) Urethra
(8) Navicular fossa
(9) UG diaphragm
(10) Scrotum
(11) Corpus spongiosum
(12) Corpus cavernosum
(13) Buck's fascia
(14) Colle's fascia (Dartos)
(15) Superficial dorsal vein
(16) Deep dorsal vein
(17) Dorsal artery
(18) Dorsal nerve
(19) Deep artery
(20) Tunica albuginea
(21) Septum
(22) Skin
(23) Bulb of the penis

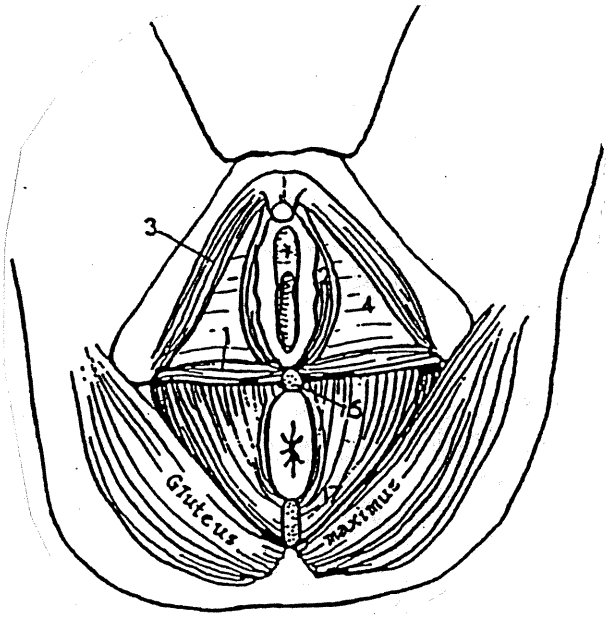






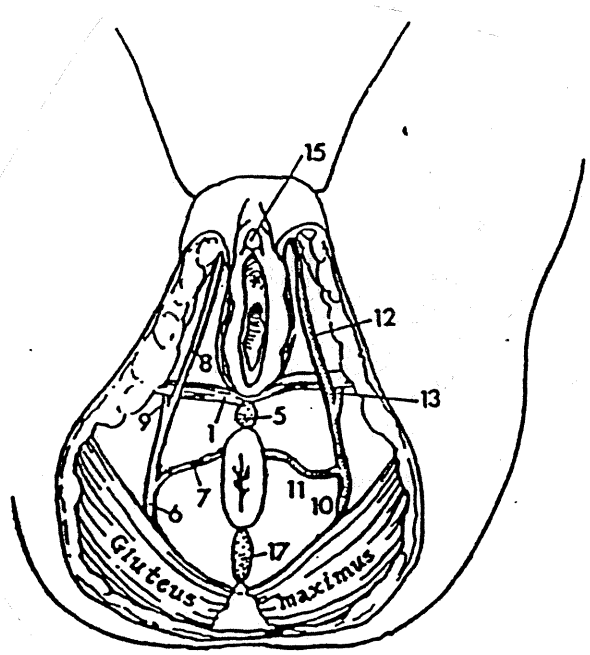


Female Structures:

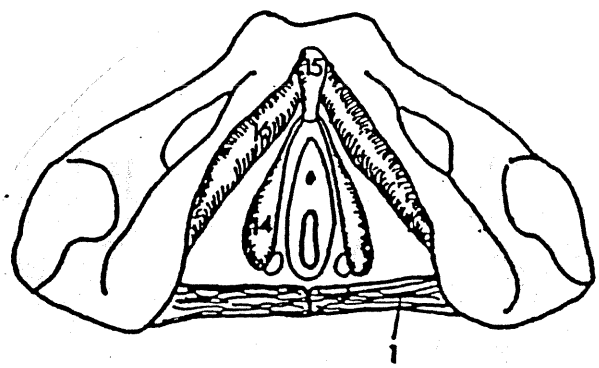


MUSCLES

(1) Superficial transverse perineus m.
(2) Bulbospongiosus muscle
(3) Ischiocavernosus muscle
(4) Perineal membrane
(5) Perineal body
(6) Pudendal nerve
(7) Inferior rectal nerve
(8) Perineal nerve
(9) Nerve of the clitoris
(10) Internal pudendal artery
(11) Inferior rectal artery
(12) Perineal artery
(13) Artery of the clitoris
(14) Vestibular bulb
(15) Clitoris
(16) Crus of the clitoris
(17) Coccygeal body

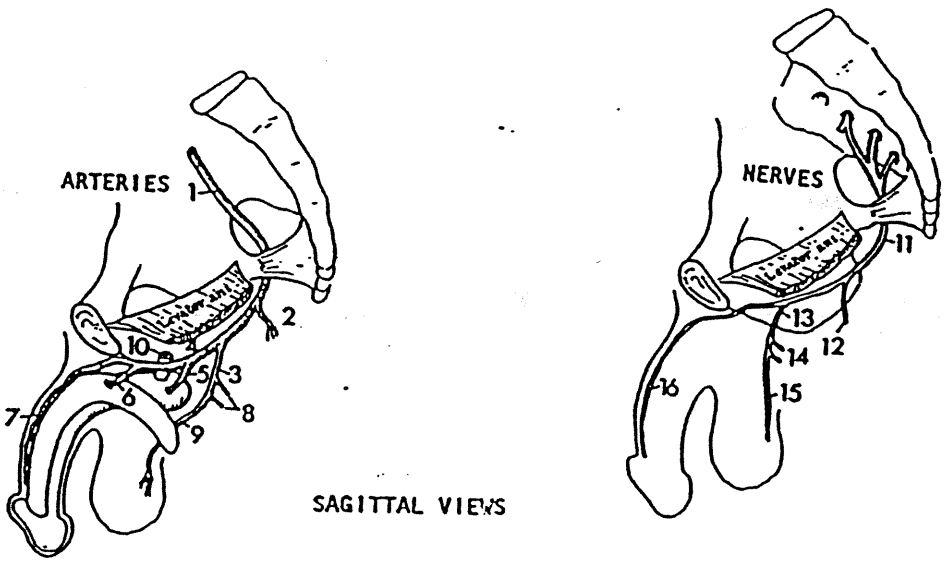


NERVE AND ARTERIES



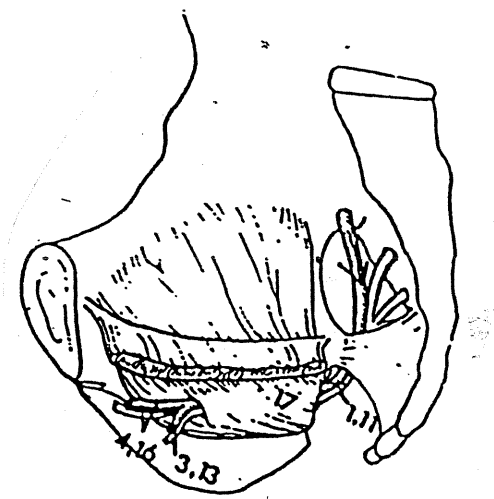
DEEP STRUCTURES

The Pudendal Canal of Alcock:



Alcock's Canal is a fascial tunnel along the medial aspect of the obturator internus which conveys the pudendal nerve and vessels. The pudendal nerve is sensory to the perineum and motor to the levator ani, anal and perineal muscles. Remember: S2,3,4 keeps your rectum off the floor

(1) Internal pudendal artery
(2) Inferior rectal artery
(3) Perineal artery
(4) Artery of the penis
(5) Artery of the bulb
(6) Deep artery of the penis
(7) Dorsal artery of the penis
(8) Muscular branches
(9) Posterior scrotal artery
(10) Urethra
(11) Pudendal artery
(12) Inferior rectal nerve
(13) Perineal nerve
(14) Muscular branches
(15) Posterior scrotal nerve
(16) Dorsal nerve of the penis
(17) Pudendal canal



Course of Neurovascular Elements in the Pudendal Canal:
Side of pelvis – pudendal artery and nerve thru the tunnel (Alcock's canal)