L'enseignement de l'anatomie des appareils digestif, urinaire et génital par l'utilisation de vidéos d'anatomie 3D en anglais, intérêts pédagogiques par rapport aux méthodes classiques d'enseignement

PERINEUM

I.   INTRODUCTION

The perineum consists of that part of the trunk of the body caudal to the pelvic diaphragm, levator ani and coccygeus muscles, and situated between the pubic region, forwards, and the intergluteal cleft backwards. A line joining the anterior parts of the ischial tuberosities divides this diamond-shaped area into a larger posterior anal region and a smaller anterior urogenital region. (Figure 1)

The anal region contains the anal canal and the ischioanal fossae with their contents. Its sides are formed by the sacrotuberous ligaments covered by the lower border of gluteus maximus muscle and its base is formed by the line between the anterior parts of the ischial tuberosities. Its contents are the same in each sex. The urogenital region lies in front of the line joining the anterior parts of the ischial tuberosities and is bounded laterally by the conjoined ischiopubic rami. In each sex, it contains the external genitalia.
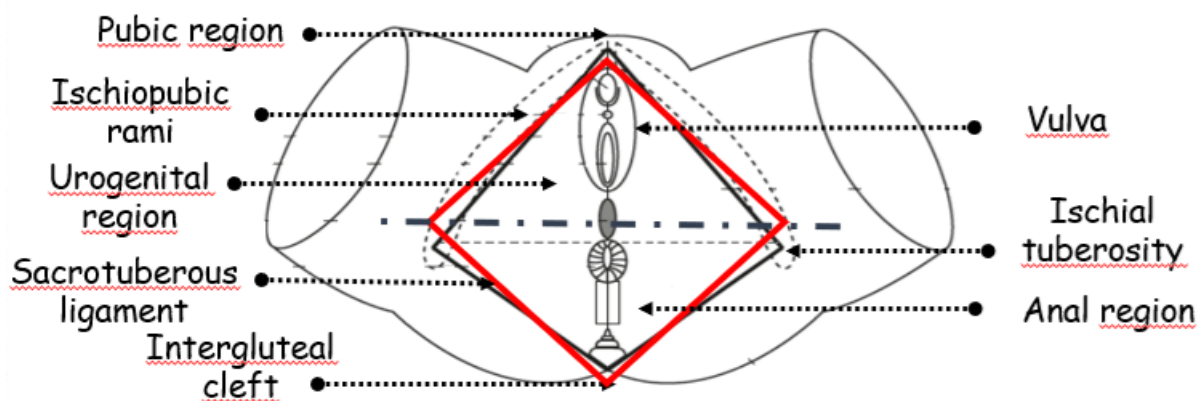

Figure 1: Schematic anterior view of the female perineum

II. ANAL REGION

A- ISCHIOANAL FOSSA

The ischioanal fossa is a wedge-shaped space filled with fat lateral to the anal canal. The base of each fossa is above the skin over the anal region of the perineum. The anal canal and the sloping levator ani muscles form the medial wall of each fossa, while the lateral wall is formed by the ischial tuberosity below with obturator internus above. (Figure 2)

The sharp apex of the wedge is where the medial and lateral walls meet where levator ani is attached to its tendinous origin over the obturator fascia. At the base the anterior boundary is the posterior border of the perineal body and urogenital diaphragm, and the posterior boundary is the sacrotuberous ligament overlapped by the lower border of gluteus maximus.

Each fossa has an anterior and a posterior recess. The anterior recess passes forwards above the urogenital diaphragm as far as the posterior surface of the body of the pubis; the posterior recess is smaller and extends from the lower border of gluteus maximus to the under lying sacrotuberous ligament.

Although the anococcygeal body separates the two fossae low down, they communicate with one another through loose tissue behind the anal canal higher up, providing a horse shoe-shaped path for the spread of infection from one fossa to the other. The name ischiorectal was a misnomer, since the levator ani muscles keep the spaces separated from the rectum

Each fossa contains the ischioanal fat pad, the pudendal canal, and a number of vessels and nerves. The ischioanal fat pad allows for dilatation of the anal canal during defaecation and of the vagina during parturition when the passage of the fetal head virtually obliterates the space.

The pudendal canal of Alcock is a connective tissue sheath in the lower lateral wall of the fossa, overlying obturator internus and the medial side of the ischial tuberosity. It contains the pudendal nerve and internal pudendal vessels, which it conducts from the lesser sciatic notch to the deep perineal pouch above the perineal membrane.

The canal is most simply considered as being formed by a splitting of the obturator fascia joining the falciform process of the sacrotuberous ligament. An alternative theory suggests that another sheet of tissue, the lunate fascia, not recognized in official terminology, overlies the obturator fascia, remaining separate from the obturator fascia low down where it joins the falciform process, and at the apex of the fossa turning medially to cover the under surface of levator ani.

The pudendal nerve and internal pudendal vessels leave the pelvis through the greater sciatic foramen, passing beneath the lower border of piriformis to reach the buttock. Their course in the buttock is short. They turn and enter the lesser sciatic foramen, the vessels passing over the tip of the spine of the ischium, the nerve more medially over the sacrospinous ligament. They enter the pudendal canal, which is in continuity with the lesser sciatic foramen, and run forwards in it to supply the perineum.

Note that the nerve to obturator internus, which has crossed the base of the ischial spine, is now above this level and, moreover, is beneath the fascia over the muscle, and sinks into the fleshy fibres to innervate them. Their course is not straight across the base of the fossa, but arches convexly upwards through the fat towards the apex and then downwards to the anal canal. Incisions to drain ischioanal abscesses usually do not interfere with them. Accompanied by the vessels, the nerve breaks up into several branches which supply the external sphincter, mucous membrane of the lower anal canal and perianal skin. The important feature about the accompanying veins is that they link up in the upper part of the anal canal with superior rectal tributaries which belong to the portal system. At the front of the fossa the posterior scrotal or labial nerves and vessels, from the pudendals, pursue a very short course in it before leaving to pass superficially into the urogenital region.

At the back of the fossa the perineal branch of S4 nerve and the perforating cutaneous nerve are also in the fossa for a very short distance. The former runs into levator ani, and the latter pierces the sacrotuberous ligament to become cutaneous round the lower border of gluteus maximus.
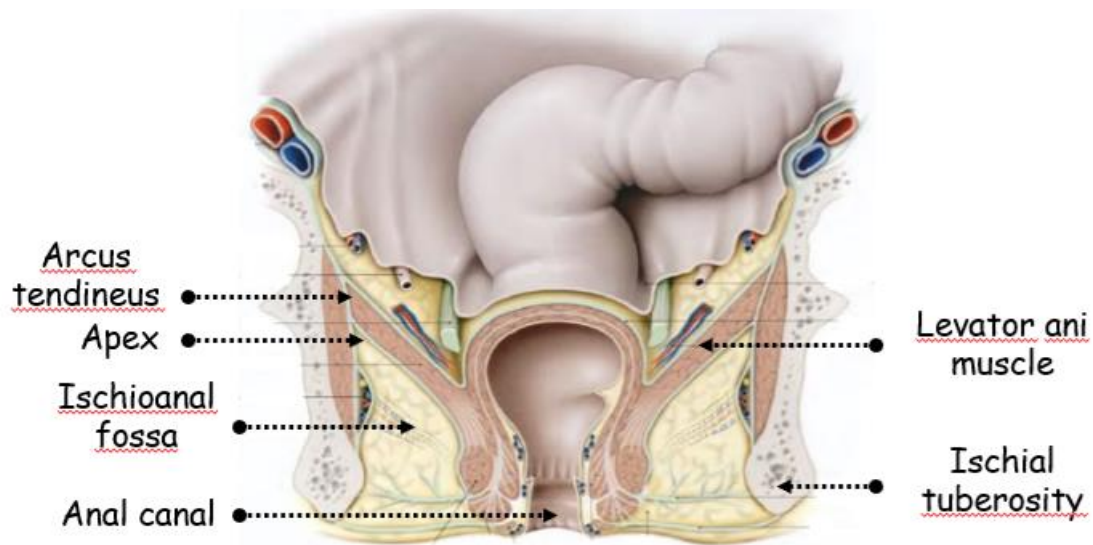
Figure 2: Coronal section of the pelvic cavity (from KAMINA)

B- PERINEAL BODY

The perineal body, now properly called the central perineal tendon, is an elongated midline fibromuscular mass to which a number of muscles gain attachment. (Figure 3)

It lies in front of the anal canal and behind the posterior border of the perineal membrane to which it is also attached, and therefore in the female it is between the anal canal and the pudendal cleft. The rectovesical and rectovaginal septa blends into it above. The muscles running into it include parts of two sphincters, the external anal and external urethral and four other pairs: levator prostatae or pubovaginalis part of levator ani, bulbospongiosus, and the superficial and deep transverse perinei. Its position and connexions provide an important stabilizing influence for pelvic and perineal structures. Injury to it during childbirth may weaken the pelvic floor and lead to prolapse of the vagina and uterus. It should be noted that obstetricians use the term perineum to

mean only the perineal body and not the whole perineal region below the pelvic floor.

A midline episiotomy involves incision through the posterior vaginal wall, perineal skin, perineal body and some fibres of the external anal sphincter, whereas the more common posterolateral episiotomy involves the vaginal wall, bulbospongiosus and the superficial transverse perineal muscle, skin over the ischioanal fossa and anterior pubococcygeal fibres of levator ani.
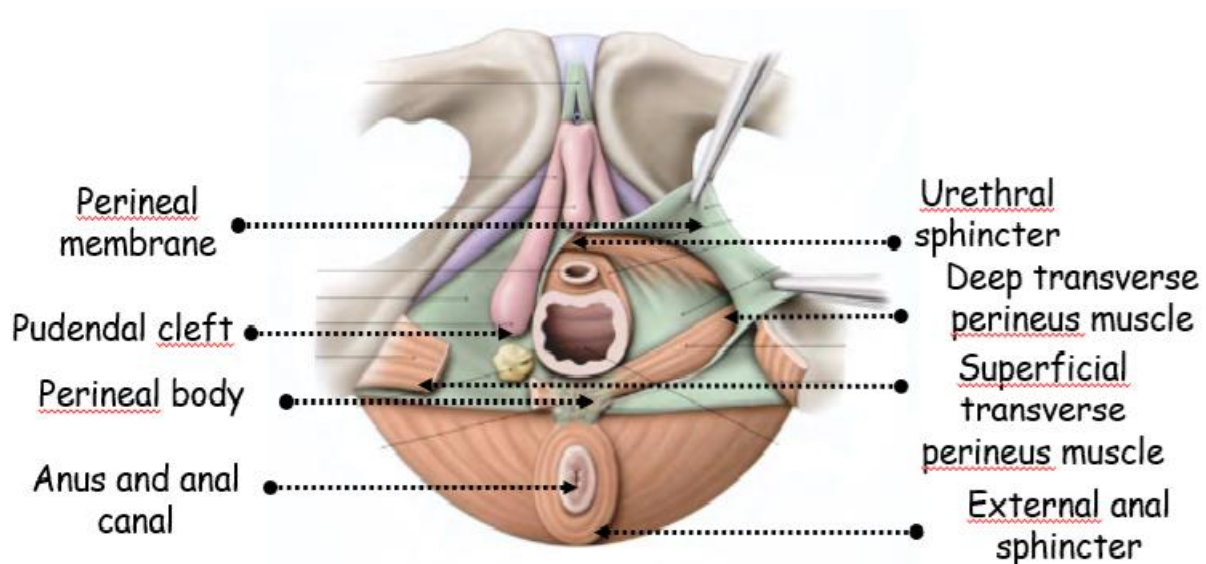

Figure 3: Anterior view of the female perineum (from KAMINA)

C– ANOCOCCYGEAL LIGAMENT

The fibres of the iliococcygeus and pubococcygeus parts of levator ani interdigitate in front of the coccyx as the anococcygeal raphe which extends from the tip of the coccyx to the anorectal junction. Raphe and skin diverge from each other as they pass forwards to the upper and lower ends of the anal canal. In the midline space between them is a fibromuscular mass of tissue,

the anococcygeal ligament, which separates the two ischioanal fossae behind the lower part of the anal canal. Fibres of the superficial part of the external sphincter pass superficial to the anococcygeal ligament to become attached to the tip of the coccyx forming the anococcygeal muscle. Lateral to this, the sacrotuberous ligament limits the fossa.

III.   <u>MALE UROGENITAL REGION</u>

Among the principal contents of this region are a small mass of muscle constituting the urogenital diaphragm, and three layers of fascia: the superior and inferior fasciae of the urogenital diaphragm, the inferior being commonly called the perineal membrane, and the superficial perineal fascia of Colles which is the continuation into the perineum of the membranous layer of superficial fascia of the anterior abdominal wall, Scarpa's fascia.

The superficial perineal fascia is attached to the back of the perineal membrane and forms a sheath for the penis and scrotum. The area between this fascia and the perineal membrane is the superficial perineal pouch which contains the root of the penis, the superficial perineal muscles and some branches of the pudendal nerve and vessels, together with the pendulous part of the penis, the testes and spermatic cords. (Figure 4)

The area between the two diaphragmatic layers of fascia is the deep perineal pouch, which contains the urogenital diaphragm with the membranous part of the urethra passing through it

centrally, the internal pudendal vessels, dorsal nerve of penis and perineal nerve at the sides, and the paired bulbourethral glands of Cowper at the sides of the urethra.

A- <u>DEEP PERINEAL POUCH</u>

The perineal membrane forms the lower boundary of the deep perineal pouch and is an unyielding sheet of fibrous tissue which forms the basis upon which the penis and penile musculature are fixed. It is attached on either side to the ischiopubic rami from just behind the subpubic angle back to the level of the anterior part of the ischial tuberosities, along a ridge which lies on the inner part of the medial surface of each ramus. Its anterior border forms the transverse perineal ligament, and there is a small gap between this and the arcuate pubic ligament through which the deep dorsal vein of the penis passes to reach the vesicoprostatic plexus. Its anteroposterior extent is about three centimetres and half, and the superficial perineal fascia of Colles is attached along its posterior border, which fuses centrally with the perineal body. When standing upright, the perineal membrane lies approximately horizontally. Above the membrane lies the membranous urethra surrounded by the urethral sphincter, below the apex of the prostate. The membrane is pierced by the urethra, the ducts of the bulbourethral glands, and by foramina for nerves and vessels.

Above the perineal membrane is the muscle mass called the urogenital diaphragm. This consists of the sphincter urethrae, often called clinically the external urethral sphincter, and the paired deep transverse perineal muscles. It is important to appreciate that this rather small mass

of skeletal muscle does not form a flat sheet as illustrated in most anatomical texts. The deep transverse perineal muscles do run horizontally, from the ischiopubic rami to the perineal body, with some fibres merging with the sphincter muscle and a few crossing from one ramus to the other, but the urethral sphincter itself is roughly pear-shaped. The thinner upper end of the pear extends upwards out of the deep perineal pouch to surround the lower part of the prostatic urethra; the lower more bulbous part is below the apex of the prostate and above the perineal membrane within the deep perineal pouch. Some of its fibres arise from the pubic rami and pass as U shaped loops in front of and behind the urethra, some run from the transverse perineal ligament to the perineal body, and some completely encircle the urethra. Although consisting of skeletal muscle, the sphincter fibres are of smaller diameter than usual and are of the slow twitch variety, clearly distinguishing them from the most medial fibres of levator ani, levator prostatae, which are immediately adjacent but not attached to the sphincter. A further distinguishing feature is that the sphincter does not possess muscle spindles. The muscles of the urogenital diaphragm are supplied by the perineal branch of the pudendal nerve.
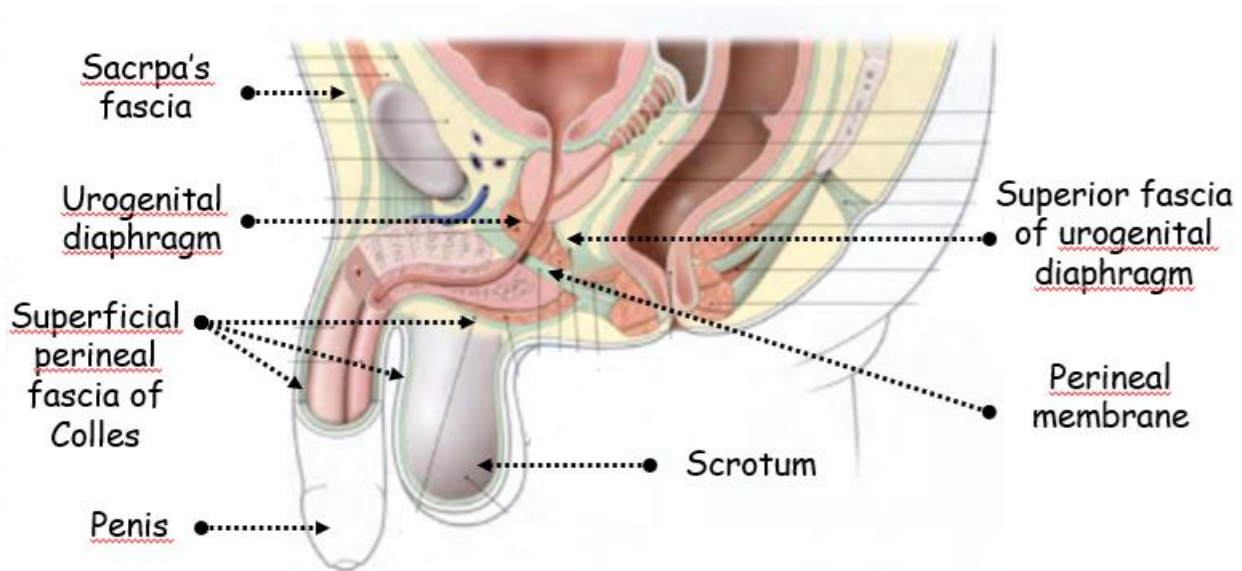
Figure 4: Sagittal section of the male pelvic cavity (from KAMINA)

B- SUPERFICIAL PERINEAL POUCH

This area contains the structures that lie below the perineal membrane and within the region bounded by the superficial perineal fascia of Colles, the root of the penis, superficial perineal muscles and their associated vessels and nerves. Continuing into the perineum from the membranous fascia of Scarpa of the anterior abdominal wall, the edges of Colles' fascia become attached to the front of the pubic bone, the pubic ramus and the posterior margin of the perineal membrane, thus closing in the subfascial space that lies beneath it in continuity with the space deep to the membranous fascia of the anterior abdominal wall. From its marginal attachments in

the urogenital region, Colles' fascia is projected into a bulbous scrotal expansion and a cylindrical penile expansion, the distal end of the latter being attached round the corona of the glans penis. Rupture of the penile urethra permits extravasation of urine beneath Colles' fascia whence the collection distends the tissues of the scrotum and penis and can then pass upwards over the anterior abdominal wall beneath Scarpa's fascia. Theoretically it could reach the submammary space and axilla, but it could never extend to the back, for Scarpa's fascia does not exist beyond the midaxillary lines and the subfascial space is obliterated there.

C- SUPERFICIAL PERINEAL MUSCLES

The bulb and each crus of the penis are provided with overlying muscles, bulbospongiosus and ischiocavernosus respectively. In addition, there is a transverse paired muscle, the superficial transverse perineal, along the posterior border of the perineal membrane. The three superficial perineal muscles of each side thus form a triangular pattern when viewed in the lithotomy position.

Bulbospongiosus is the current name for what was appropriately called compressor urethrae or accelerator urinae in former days. It arises from the perineal body and in front of that from a median raphe that joins the pair together. Its posterior fibres are directed forwards and laterally over the bulb to be inserted into the perineal membrane. The fibres arising from the raphe are inserted into a dorsal fibrous expansion on the penis; the more posterior of these fibres clasp the corpus spongiosum, while the more anterior extend on to the corpus cavernosum.

The older names indicate the action of the muscles; they empty the urethra from urine or semen.

Ischiocavernosus arises from the posterior part of the perineal membrane and from the ramus of the ischium. The fibres spiral forwards over the crus and are inserted into the upper surface of the commencement of the corpus cavernosum. Their function is to assist in the support of, and move slightly, the erect penis. The superficial transverse perineal muscle arises from the ischial ramus just behind the attachment of the perineal membrane and is inserted into the perineal body. It helps to stabilize the perineal body. All three muscles are supplied by the perineal branch of the pudendal nerve corresponding to S2 and S3 roots.

IV.   FEMALE UROGENITAL REGION

The female perineal membrane is wider but weaker than in the male, being pierced transversely by the vagina, although the opening of the vagina in the vulva is longitudinal. (Figure 5)

It gives attachment to the crura of the clitoris, each of which is covered by an ischiocavernosus muscle. Medial to each crus, attached to the perineal membrane at the side of the vagina, is a mass of erectile tissue, the bulb of the vestibule, one on each side of the orifices of the vagina and urethra. They join in front of the urethral orifice and pass forwards to the glans of the clitoris. Each bulb is covered by a bulbospongiosus muscle, whose fibres extend from the perineal body round

the vagina and urethra to the clitoris. They form a perineal sphincter for the vagina in addition to

its pelvic sphincter, the pubovaginalis parts of levator ani.

The female deep perineal pouch is traversed by both the urethra and vagina, but

as in the male contains the sphincter urethrae and the deep transverse perineal muscles, and

comparable nerves and vessels. There is a similar but less well-defined superficial perineal fascia

forming the boundary of the superficial perineal pouch, but instead of forming a sheath for the

penis and scrotum, it is centrally deficient because of the vulval slit. It is the fat of this superficial

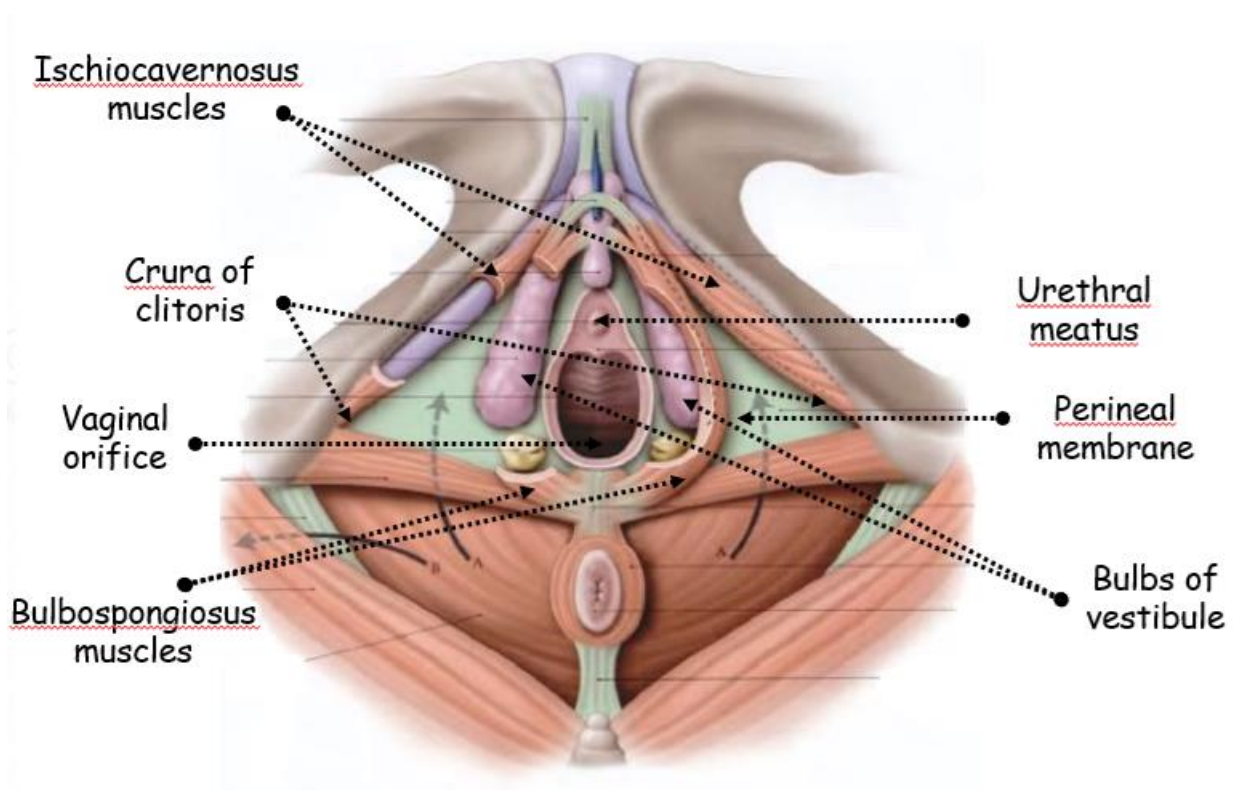fascia that forms the labia majora.

Figure 5: Anterior view of the female perineum (from KAMINA)

V. NERVE SUPPLY

The skin of each side of the anal region is supplied by the inferior rectal nerve S3, S4, the perineal branch of S4 and some twigs from the coccygeal plexus S5.

In the urogenital region, the ilioinguinal nerve L1 supplies the anterior third of the scrotum and labium majus down to the anterior axial line. The skin of the penis and clitoris is supplied by the dorsal nerve S2. The posterior two-thirds of the scrotum and labium majus are supplied laterally by the perineal branch of the posterior femoral cutaneous nerve and medially, labium minus in women, by scrotal or labial branches of the perineal branch of the pudendal nerve S3. On the scrotum and labia note the gap in the sequence of dermatomes between L1 at the front and S3 further back. For this reason, a pudendal nerve block will not anaesthetize the whole vulva; the anterior part must be locally infiltrated to supplement the main nerve block.

VI. CONCLUSION

Although the perineum is a limited region, its functional implication is major not only for urinary and fecal continence but also for erectile purposes. It is, frequently, involved in clinical medicine and more particularly in the obstetrical context.