

Basic anatomic features in perineology

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Perineology is based on the diagnosis and treatment of “specific defects” so it is important to define these “defects”¹⁻³ and for this purpose a good knowledge of anatomy is necessary.⁴⁻⁵ Although the anatomy of this area may seem well described in textbooks, some key features are usually underestimated or even forgotten.

In order to improve the understanding of this complicated anatomy, we present a simplified three-dimensional model that describes the most important features of the functional anatomy together with some demonstrative figures.

THE PERINEAL BODY (Fig. 1)

The Perineal Body is a medial fibro-muscular structure made by the bulbocavernosus, the transverse perineal muscles and the external anal sphincter.⁴⁻⁵ Apart from the transverse muscles it is the only superficial pelvic structure that is not lying in a sagittal or oblique axis.

The Perineal Body makes a kind of structural beam positioned in the medial part of the perineum and able to support the sagittal overlying structures. As a result it can be regarded as the “center of gravity” of the perineum.

The Perineal Body is involved in creating the angle of the vagina and is the key structure that defines the first part of the vagina.⁶ The angle of the vagina, divides it into two parts and facilitates perineal balance allowing the posterior movement of the viscera (bladder, second vaginal part and rectum) and their support on the levator plate.

The perineal body is one of the key elements of vaginal support and its defects (usually post delivery) are causative for most of the perineal dysfunctions (Fig. 2). Anatomical reconstitution of the perineal body is thus critical in perineal surgery.

THE LEVATOR ANI MUSCLES

Instead of the usual description in three components (pubo-coccygeus, ilio-coccygeus and coccygeus) which is open to anatomical and functional misinterpretation, we consider like Shafik there are only two anatomical and functional entities:

- The **pubo-rectalis** (Fig. 3),^{7, 8} muscular sling that surround the three visceral axis and the upper part of the perineal body. It is the muscle of urinary and anal continence. It corresponds to the upper loop of the anal sphincter. It is impossible to repair a damaged pubo-rectalis by surgery. The best way to improve its function is still physiotherapy.

- The **levator plate** (Fig. 4), thin muscular layer attached around the pelvic floor and interacting, in the centre, with the different visceral axis through the suspensory sling described by Shafik.⁹ It probably plays an important role in the opening of the anal canal during defecation. Furthermore, this thin muscular layer is able to support the different viscera of the pelvis. Sagging of the levator plate is a key defect that can be treated in Perineology.¹⁰

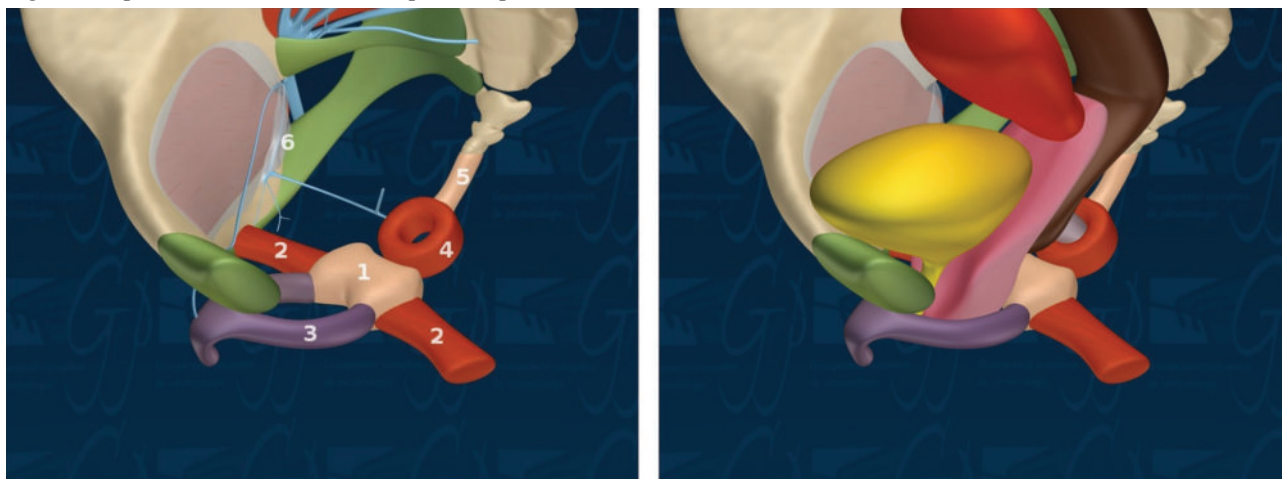
Because there is no levator ani muscle between the vagina and the rectum, levator myorrhaphy at this level would not be anatomical.¹¹

THE PELVIC FASCIA (Fig. 5)

Mixed connective structure directly related with the different local connective tissues, it forms in places different ligaments described under specific names which are also open to misinterpretation.

In our point of view,^{4, 5} the fascia must be seen as a thin layer stretching all over the pelvis with lateral insertions on

Fig. 1. – Superior and lateral view of superficial perineum and its innervation.



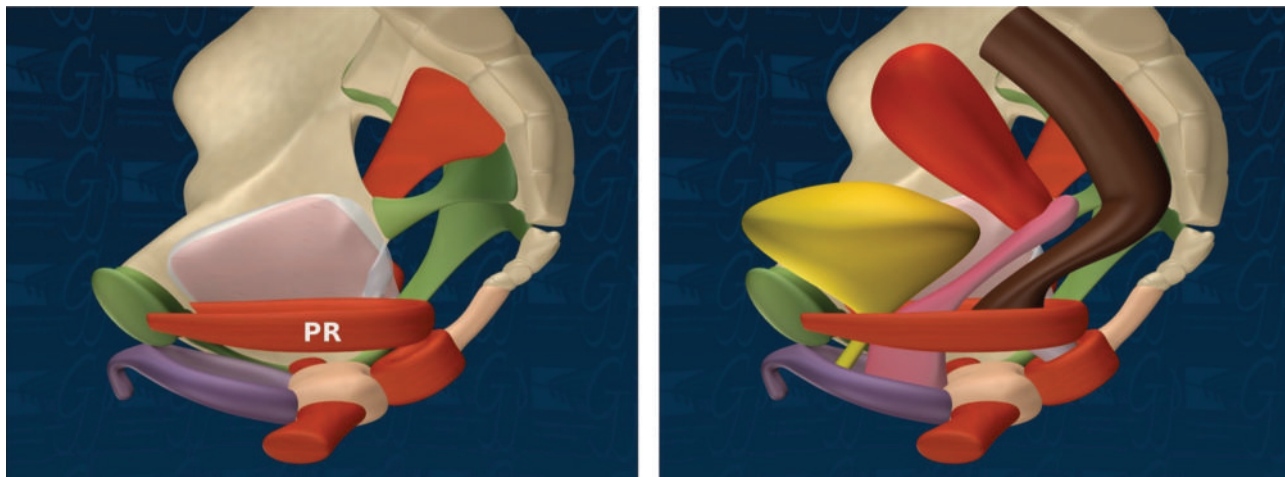
This layer plays an important role in the transversal support of the pelvic floor. 1: perineal body, 2: transverse muscle, 3: bulbocavernosus muscle, 4: sub-cutaneous external anal sphincter = base loop of Shafik, 5: ano-coccygeus ligament = intermediate loop of Shafik, 6: pudendal nerve in Alcock’s canal.

Fig. 2. – Example of long term consequences of perineal body's injury: cystocele arising because of lack of support (2A: normal anatomy, 2B: perineal body's injury and cystocele).



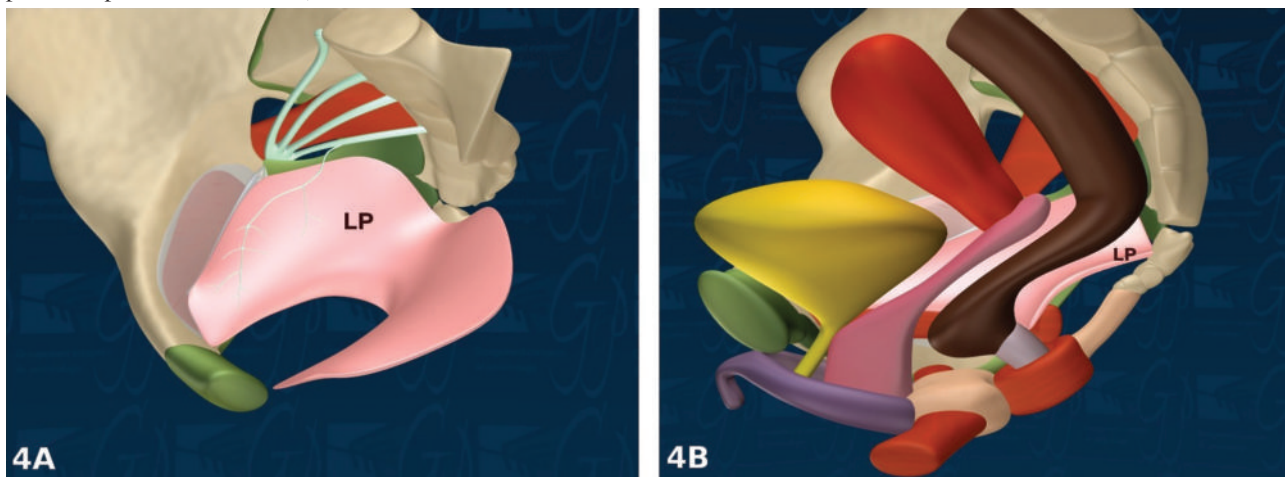
Perineal body's repair is one of the most important surgical procedures available to restore pelvic floor anatomy and to treat efficiently genital prolapses.

Fig. 3. – Pubo-rectalis muscle (PR).



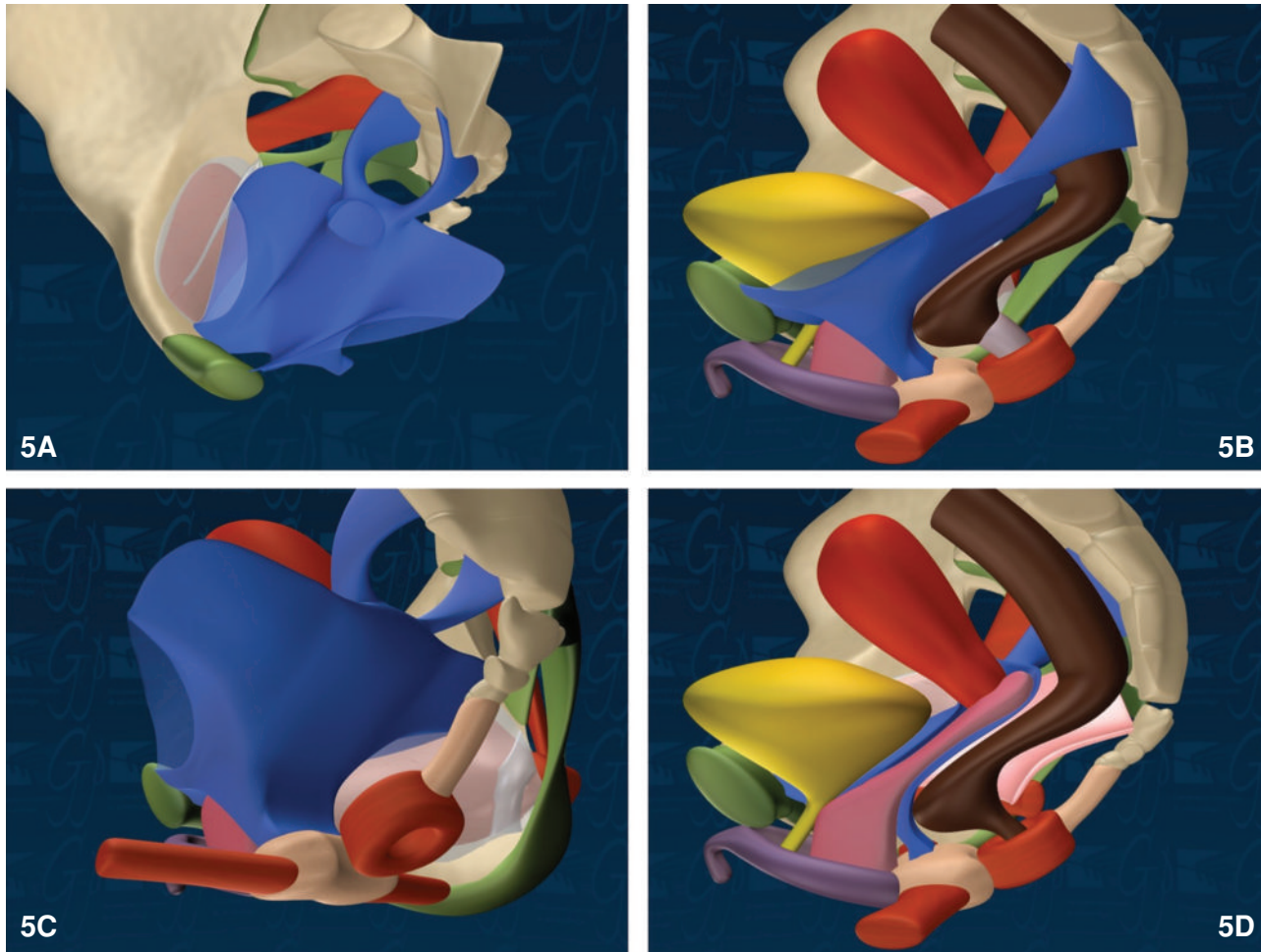
Its resting tone takes part in the support of pelvic floor. Its contraction ensures continence keeping. Its relaxation is involved in micturition and defecation. These pictures show the Shafik's triple-loop system which compresses opposed alternating anal segments. The top loop is equivalent to puborectalis muscle and exerts traction to the front. The intermediate loop is equivalent to the top part of the external sphincter that merges with the ano-coccygeus ligament and pulls to the back. The base loop is equivalent to the bottom part of the external sphincter that merges with the perineal body and pulls to the front.

Fig. 4. – Levator plate (LP) and its innervation (4A : Superior and lateral view, 4B : lateral view with hemisection of levator plate and puborectalis muscle).^{13, 15}



It is easier to consider this structure as unique, instead of describing several muscles. This muscular plate plays a passive role in supporting viscera. Its contraction could take part in supporting function and defecation.

Fig. 5. – Several views of pelvic fascia (in blue color): this conjonctive structure stretches transversally and, from front to back, from its nearly circonferencial insertion.



It presents thicker and stronger areas like the utero-sacral ligaments and the pubo-urethro-vaginal ligaments. The vagina is included between the anterior and the posterior layers that merge with the perineal body. Pelvic fascia is insufficient to ensure by itself the stability of the pelvic floor. The integrity of the other perineal structures is really essential.

the white lines and, from back to front, on the sacral wall to surrounding the cervix (**utero-sacral ligament**) and after, with a division in two sheets:

- toward the pubic bone, the **pubo-cervical fascia (Halban's fascia)**¹² close to the second part of the anterior vaginal wall (defect of which results in a cystocele) and then continuing to the posterior part of the pubic bone (**pubo-urethral ligaments**).

- toward the perineal body, the **recto-vaginal fascia (Denonvilliers fascia)** close to the second part of the posterior vaginal wall and going to attach to the perineal body. Its defect allows the development of enterocele, rectocele and uterine descent.

According to this concept, the 2nd part of the vagina is de facto included in the fascia which is involved in the angular layout of the vagina.

Therefore, the anatomy of the vagina is dependent on the quality of the connective tissue even if we think that the fascia is totally passive, its defects being usually the repercussions of the underlying perineal neuro-muscular diseases rather than direct connective tissue lesions.

THE ANAL SPHINCTER (Fig. 1, Fig. 3)

We totally agree with the concept of the three loops described by Shafik:⁸

- the **top loop** is the **pubo-rectalis** which pulls anteriorly the upper part of the anal canal;

- the **intermediate loop** corresponds to the **ano-coccygeal ligament**. This ligament is a strong fibro-muscular structure which pulls posteriorly the medial part of the anal canal;

- the **bottom loop** is the classic **sub-cutaneous sphincter**.

These antagonistic forces contribute to anal continence but also to the balance of all the perineum. To-day, this ano-coccygeal ligament remains the “unknown” of the pelvic floor. Its size and its structure are surely linked with an important function.

THE PUDENDAL AND LEVATOR NERVES (Fig. 1, Fig. 4)

Their importance deserves a later updating.^{13,14}

It is this anatomical approach that led us to the concept of Perineology. It is a global vision of all the perineal structures, but also of the different perineal diseases. This global approach is also essential in planning and performing surgery.

All the perineal diseases can be summarized in seven defects more or less associated. The job of the perineologist is to assess and diagnose these different defects and then to cure each of them.

A later contribution in this journal will explain the different surgical procedures available to cure these defects.

The figures presented in this manuscript are samples of a DVD explaining the 3 D static and dynamic normal anatomy and perineal defects. This DVD will be available on www.perineology.com

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