

International Journal of Surgery

Journal homepage: ijsopen.org

Case Report

Chinese Expert Consensus on Recommended Standardized Terminology for the Pelvic Membrane Anatomy

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ARTICLE INFO

Keywords:

Pelvis

membrane anatomy

terminology

consensus

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<https://dx.doi.org/10.60122/j.IJS.2024.10.07>

Received 26 January, 2024; Accepted 19 February, 2024

Available online 18 March, 2024

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1. Introduction

Total mesorectal excision (TME) proposes the concept of membrane anatomy-guided surgery, which changes the traditional view that surgical dissection focuses on organs or blood vessels, and has led to the development of third-generation surgical anatomy, “membrane anatomy”. Membrane anatomy mainly studies various membrane structures of the abdominopelvic cavity related to surgery, such as peritoneum, mesentery, fascia, serosa, and their derived ligament, lamina, septum, bundle, space, sheath, etc. In clinical practice, membrane anatomy emphasizes that the complete excision of the organ-specific mesentery is conducted through the membrane anatomical plane, which can significantly reduce bleeding and ensure the integrity of the mesentery. Due to the rapid development of the theory and practice of membrane anatomy, it is urgent to revise and update the existing terms for more standardized and reasonable use. Published in 1998 by the Federative Committee on Anatomical Terminology (FCAT), Terminologia Anatomica presents the international reference standard of anatomic terms. However, Terminologia Anatomica only assigns anatomical terminology to the pelvic connective tissue bundle covered with the peritoneum and lacks definitions for the connective tissue planes and space used in surgical practice [1, 2]. Moreover, pelvic anatomy involves many disciplines in clinical practice, such as urology, gynecology, and colorectal surgery. Each discipline has its anatomical term, which easily leads to different terms being used for a single structure. With the development of anatomy, many definitions of membrane anatomical terms have changed and new terms have appeared. Because of this, the Chinese Society of Colorectal Surgery

(CNSCRS) organized experts to create a standardized list of preferred terminology for pelvic membrane anatomy to be used in medical communication.

2. Methodology

The Consensus Drafting Group included colorectal, urologic, and gynecologic surgeons with extensive clinical, anatomic, surgical, and imaging expertise and statisticians with experience in systematic review methodologies. First, the Medline database was searched from inception until December 31, 2022, based on the following 17 medical subject heading terms: pelvis, mesentery, mesorectum, mesometrium, fascia, peritoneum, serosa, ligament, lamina, bundle, tendon, sheath, septum, space, fossa, layer, plane. The obtained abstracts were screened by five researchers using the online software Abstrackr (Link). The included literature was mainly related to cadaveric anatomy, surgery, and pelvic imaging, and literature dealing with anatomical variations, histology, and biomechanics was excluded. Finally, 6387 abstracts were excluded, and the remaining 2146 abstracts were further screened by full-text extraction, and 312 full-text literatures were obtained. To ensure that the selected anatomical terms are more representative, 10 classic anatomical monographs were added by group consensus [3-12]. The group reviewed 312 full-text documents and 10 anatomical monographs, obtaining 632 anatomical terms, 207 of which were excluded because they were not relevant or representative of pelvic membrane anatomy, and finally retained 425 membrane anatomical terms covering 143 independent anatomical structures (Figure 1).

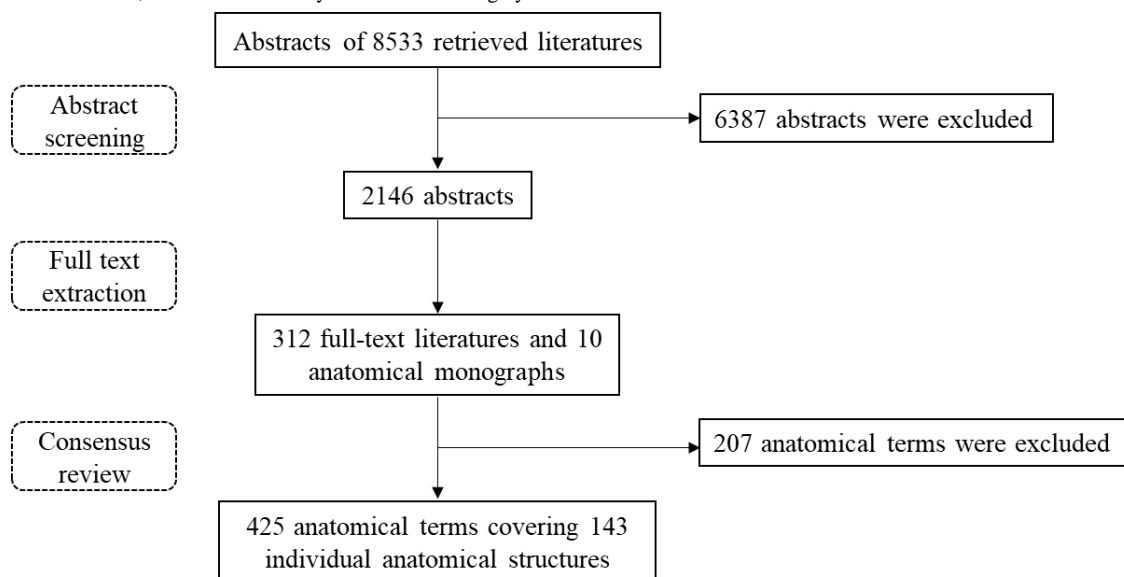


Fig.1. Flow chart of literature and anatomical terms screening.

For the final list of anatomic terms, all terms with an exact reference in Terminologia Anatomica were accepted. The remaining identified terms were discussed until group consensus was obtained on which terms to recommend for use based on the frequency of occurrence in the literature. The initial findings were presented at the 16th annual meeting of the Chinese College of Surgeons (CCS) in July 2017 in Shanghai. The

list of terms, definitions, and key references was then distributed to 79 experts across 33 different cities and 71 hospitals for review and confirmed by secret voting using an electronic program. Consensus was established as 75% agreement among the participating experts on the definition of each term.

3. Recommended Terms of Pelvic Membrane Anatomy

The elucidation of each term includes the identification number in Terminologia Anatomica if it has, synonym (different names appeared in the literature), and definition (the widely accepted concepts previously).

3.1 Generic Terms

3.1.1. Visceral Pelvic Fascia (A04.5.03.002)

3.1.1.1. Synonym

Visceral layer of the pelvic fascia [13], fascia pelvis visceralis [14].

3.1.1.2. Definition

The visceral pelvic fascia is a generic term for the fascia which lies immediately outside the visceral layer of the serosae together with that which immediately surrounds the viscera [3, 5, 10, 12].

3.1.1.3. Annotation

There are three different layers of viscera fascia: i) The fasciae surrounding individual organs. ii) The septum between organs. iii) The sheath or ligament that connects organs to the pelvic wall (neurovascular sheath) [10, 15]. However, the clinically accepted definition of visceral pelvic fascia has changed since the introduction of total mesorectal excision (TME) in clinical practice. It refers specifically to a dense layer of fascia posterolateral to the rectum, and the mesorectum is enveloped by the visceral fascia (Figure 2) [16-18].

3.1.1.4. Recommendation 1

Visceral pelvic fascia is a generic anatomical term and can be defined as the fascial system originating in the reflection of the parietal pelvic fascia, which envelops the individual organs and attaches them to the pelvic walls. The term "visceral fascia" should be avoided to refer to specific pelvic fascia such as the mesorectal fascia. Approval rate: 98.6% (70/71).

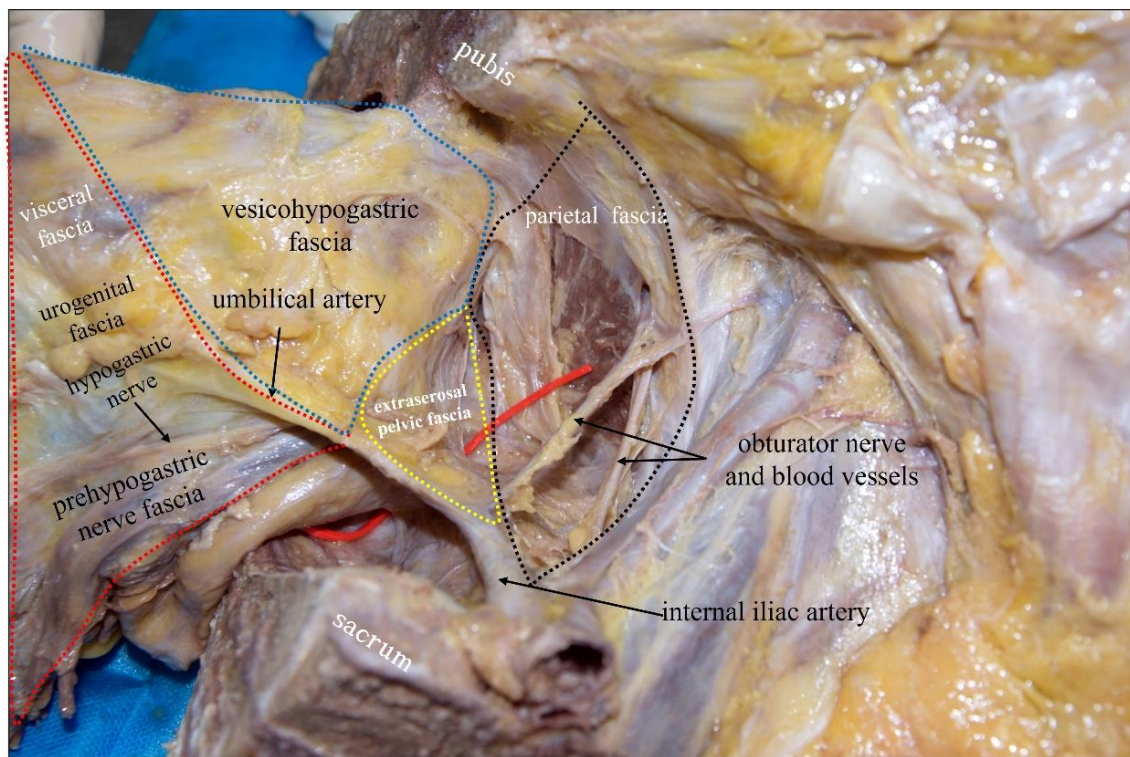


Fig. 2. Anatomy of the pelvic visceral fascia, parietal fascia, and extraperitoneal fascia.

The red dotted line is the visceral fascia (urogenital fascia) according to classic anatomy [16]. The blue dotted line is the vesicohypogastric fascia. The black dotted line is the parietal fascia. The yellow dotted line is the extraperitoneal fascia.

3.1.2. Parietal Pelvic Fascia (A04.5.03.007)

3.1.2.1. Synonym

Endopelvic fascia [1], fascia pelvis parietalis [14].

3.1.2.2. Definition

The parietal pelvic fascia is the fascia that extends from the endoabdominal fascia and covers the inner surface of the pelvic parietal muscles and bones. It can be divided into four parts: the superior fascia of the pelvic diaphragm, piriformis fascia, obturator fascia, and presacral fascia [6, 10, 12, 19-21]. The parietal fascia is locally thickened to form

a tendinous arch or ligament, such as the tendinous arch of pelvic fascia, the tendinous arch of the levator ani, the tendinous arch of rectovaginal fascia, and the pubovesical ligament [7, 22].

3.1.2.3. Annotation

The fasciae covering the surface of the diaphragm, psoas major, quadratus psoas, and transverse abdominis are collectively referred to as the endo abdominal fascia or the transversalis fascia in a general sense [23]. Two anatomical views on the parietal fascia are questionable. First, the Japanese anatomical literature divides the subperitoneal fascia into the deep layer (anterior renal fascia or Gerota's fascia) and the superficial layer (posterior renal fascia or Gerota's fascia), and are called visceral fascia and parietal fascia respectively when extending to the pelvic

cavity [17, 24]. This view is contradicted by the viewpoint that the parietal pelvic fascia continues from the endo abdominal fascia or the transversalis fascia. Second, the parietal pelvic fascia is divided into two layers and encloses the autonomic nerve such as the hypogastric nerve according to Western perspectives [25-27]. This view confuses the definitions between visceral and parietal fascia because the fascia constituting the neurovascular channels belongs to visceral fascia according to Recommendation 1 (Figure 3).

3.1.2.4. Recommendation 2

The parietal pelvic fascia covers the pelvic walls, and consists of four parts: superior fascia of the pelvic diaphragm, piriformis fascia, obturator fascia, and presacral fascia. Approval rate: 100.0% (71/71).

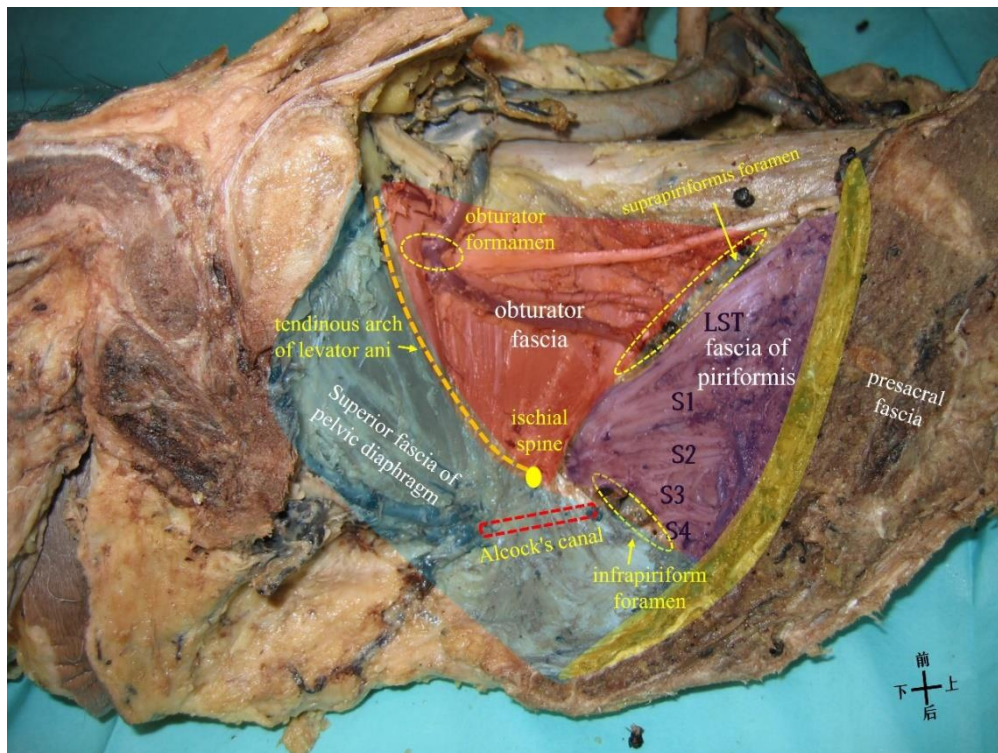


Fig. 3. Anatomy of parietal pelvic fascia.

3.1.3. Endopelvic Fascia (A04.5.03.007)

3.1.3.1. Synonym(s)

Extraserosal pelvic fascia [22].

3.1.3.2. Definition

The pelvic visceral fascia and parietal fascia are collectively called endopelvic fascia [14, 21, 28].

3.1.3.3. Annotation

The description of endopelvic fascia is fairly standardized. Terminologia Anatomica identifies it as parietal fascia [1]. Hollinshead [10] believed

that endopelvic fascia belongs to visceral fascia. Grant's Atlas of Anatomy called the connective tissue between the visceral and parietal fascia endopelvic fascia. The endopelvic fascia is composed of loose and condensed parts. The loose part is the fat tissue filled in the potential space. The dense part constitutes the neurovascular channel between the organs and the pelvic side wall [3, 6, 8], which is consistent with the definition of extraserosal fascia proposed by Ercoli *et al.* [22] (Figure 2). However, the neurovascular sheath belongs to the visceral fascia in a strict sense. In recent years, it is more inclined to regard the endopelvic fascia as a general term of visceral and parietal fascia, and it is believed that all the fascia or ligaments of different densities in the pelvic cavity are parts of the endopelvic fascia [14, 21, 28]. (Figure 2).

3.1.3.4. Recommendation 3

The endopelvic fascia is a general term for pelvic visceral fascia and pelvic parietal fascia. It is recommended to use parietal endopelvic fascia and visceral endopelvic fascia to distinguish them. Approval rate: 97.2% (69/71).

3.2. Specialized Anatomical Terms

3.2.1. Terms Related to Visceral Fascia

3.2.1.1 Fasciae of Organs

3.2.1.1.1. Fascia of the Individual Organ (A04.5.02.003)

3.2.1.1.1.1. Synonym(s)

None.

3.2.1.1.2. Definition

The proper fascia of pelvic organs [1].

3.2.1.1.3. Annotation

Fascia of individual organ is part of the visceral fascia, which can be specifically divided into vesical fascia, rectal fascia, and vaginal fascia [15, 22] (Figure 4).

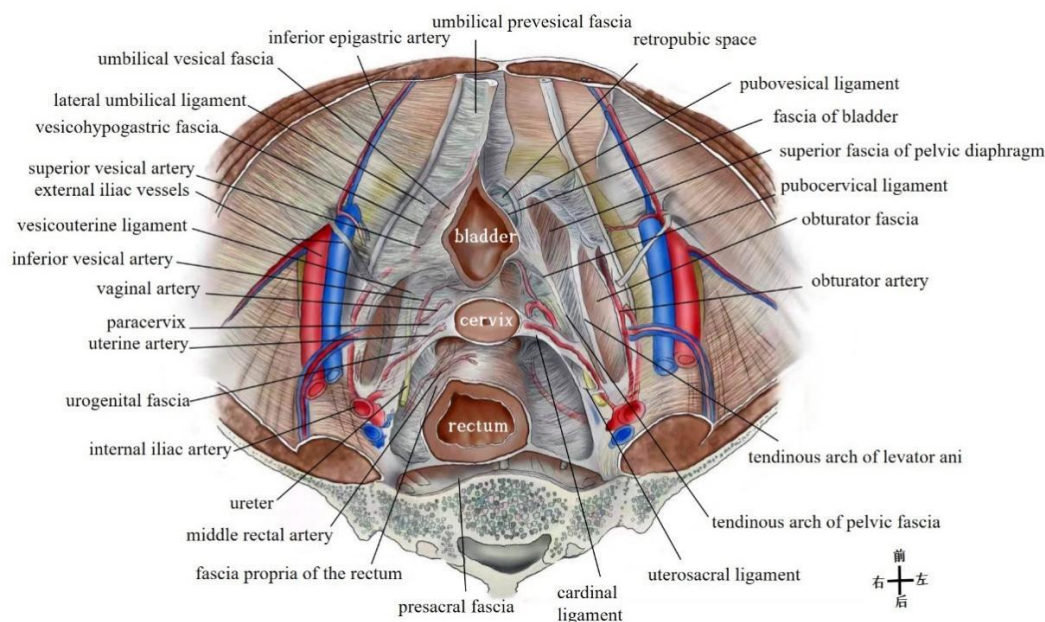


Fig. 4. Anatomy of the main pelvic fasciae (Drawn by Le Chang).

3.2.1.1.2. Fascia Propria of the Rectum

3.2.1.1.2.1. Synonym(s)

Mesorectal fascia [29], perirectal fascia [30], rectal fascia [31], visceral fascia [16].

3.2.1.1.2.2. Definition

The innermost layer of fibrous connective tissue surrounding the mesorectum is called the fascia propria of the rectum [32, 33].

3.2.1.1.2.3. Annotation

The fascia propria of the rectum is more pronounced anterior to the rectum because it contains less fat, and sometimes is referred to as the posterior layer of Denonvilliers' fascia [10, 34]. The fascia propria of the rectum is always thought to be part of the visceral fascia, which wraps the rectum to form the mesorectum, so the plane between the visceral and parietal fascia constitutes the "Holy plane" of rectal cancer surgery [16, 18, 35]. Recent studies have suggested that fascia propria of the rectum and "visceral fascia" described by Heald *et al.* [16] are two independent layers of fascia, but they fuse at the level of S2~S4, and the fusion line is not fixed (Figures 5 & 6) [32, 36].

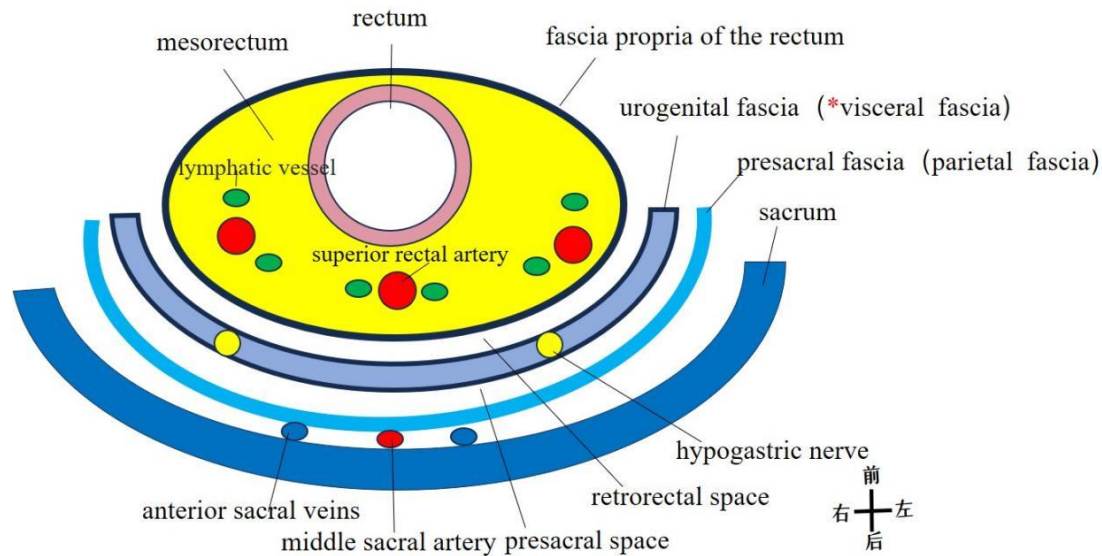


Fig. 5. Anatomy of the fascia propria of the rectum and visceral fascia (Drawn by Moubin Lin).

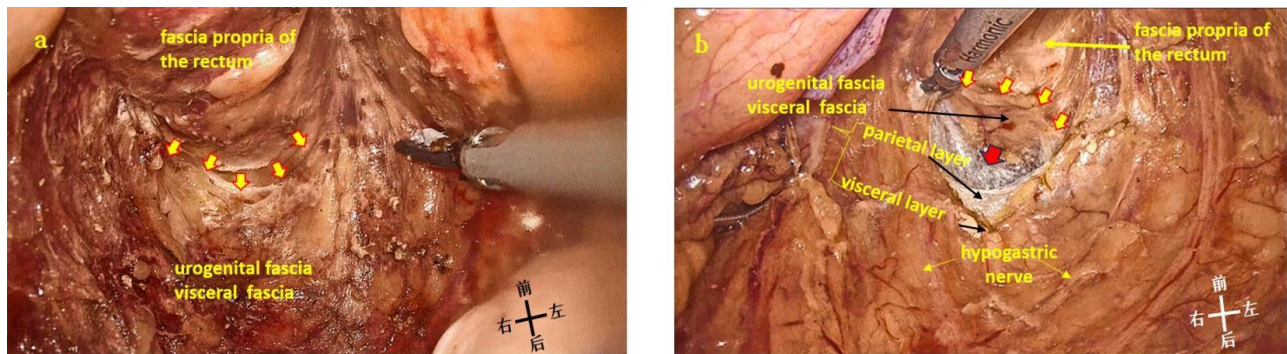


Fig. 6. a) The fascia propria of the rectum and visceral fascia fused at the level of S2-S4 (yellow arrow is the fusion line). b) The fusion line is incised to show the plane between visceral fascia and parietal fascia (red arrow).

3.2.1.1.2.4. Recommendation 4

In terms of the fascial continuity, the colonic fascia surrounding the mesocolon is in continuity with the fascia propria of the rectum enveloping the mesorectum in the pelvis. The anterior and posterior renal fascia extending into the pelvic cavity is called urogenital fascia which is actually the "visceral fascia" described by Heald *et al.* Therefore, visceral fascia and the fascia propria of the rectum are two independent layers of fascia. Approval rate: 97.2% (69/71).

3.2.1.2. Septum between Organs

3.2.1.2.1. Rectovesical Septum (A04.5.03.004), Rectovaginal Septum (Rectovaginal Septum, A04.5.03.004)

3.2.1.2.1.1. Synonym(s)

Denonvilliers' fascia [37], rectovaginal fascia [21], peritoneoperineal fascia [11], rectogenital fascia [38], prostatoseminal vesicular fascia [39], prostatoperitoneal membrane [40].

3.2.1.2.1.2. Definition

The rectovesical septum lies between the rectum and the prostate /seminal vesicle, while the rectovaginal septum lies between the rectum and the vagina [3]. The rectovesical (vaginal) septum passes from the peritoneum of the rectovesical (vaginal) pouch above to the pelvic floor in the region of the perineal body below [20].

3.2.1.2.1.3. Annotation

According to the Nomina Anatomica, personal names cannot be used to name anatomical structures, so "Denonvilliers fascia" cannot be used as a standard anatomical term [1]. The rectovesical (vaginal) is obvious in males but hardly is identifiable in females. The appearance varies considerably, from a fragile translucent layer to a tough leathery membrane [41]. There is still controversy as to whether the rectovesical (vaginal) septum is a single or double layered structure. At present, it is widely recognized as a single-layer structure, and the posterior layer is the fascia propria of the rectum (Figure 7) [34, 42, 43].

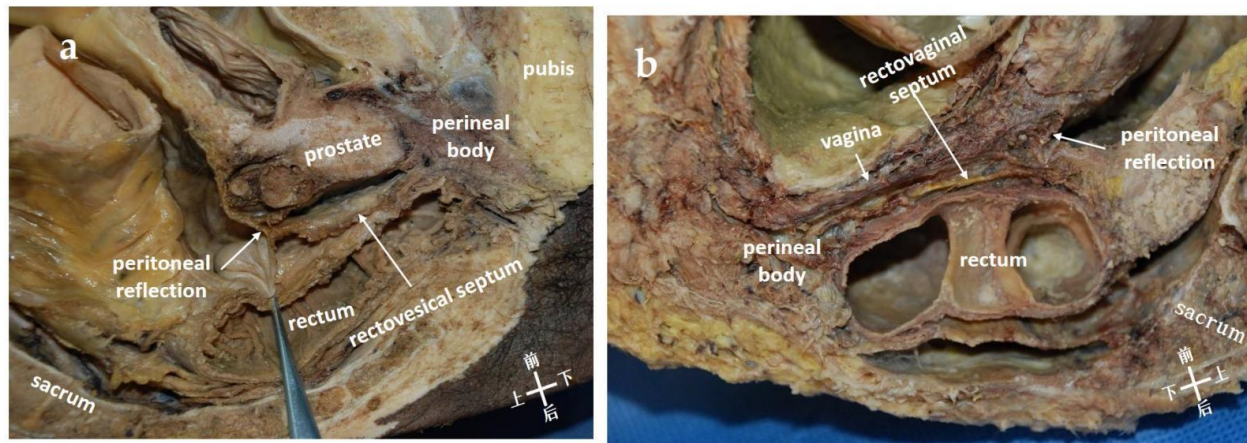


Fig. 7. Anatomy of rectovesical septum and rectovaginal septum.

3.2.1.2.1.4. Recommendation 5

It is recommended to use the rectovesical septum or rectovaginal septum instead of Denonvilliers' fascia, and to avoid referring to the fascia propria of the rectum as the posterior layer of Denonvilliers' fascia. Approval rate: 85.9% (61/71).

3.2.1.2.2. Pubovesical Ligament (A04.5.03.013)

3.2.1.2.2.1. Synonym

Pubourethral Ligament [5], puboprostatic ligament [5].

3.2.1.2.2.2. Definition

The pubovesical ligament extends from the bladder neck to the inferior aspect of the pubic bone [8, 44]. The dorsal vein complex (DVC), also known as the Santorini plexus, passes between the paired pubovesical ligaments [45].

3.2.1.2.2.3. Annotation

This ligament is called the pubovesical ligament in females and the puboprostatic ligament in males [5]. Although this term is commonly used, the pubourethral ligament is questioned as a different structure than the tendinous arch of pelvic fascia [6, 22, 46]. Due to the ligament containing smooth muscle derived from the bladder, it is also thought to be part of the detrusor apron (Figure 4) [38, 45].

3.2.1.2.3. Pubocervical Ligament (A09.1.03.030)

3.2.1.2.3.1. Synonym(s)

Pubocervical fascia [21].

3.2.1.2.3.2. Definition

The pubocervical ligament originates from the pubic symphysis and attaches to the cervix and upper vagina [3].

3.2.1.2.3.3. Annotation

Classical anatomical literature including Gray's Anatomy (41st edition) considers the pubocervical ligament to be an exact anatomical structure formed by thickened pelvic fascia [3]. Since its alignment with the pelvic fascia tendon arch, it has been suggested that the pubocervical ligament is part of the pelvic fascial tendon arch and is located between the pelvic fascial tendon arch and the lateral wall of the middle and lower 1/3 of the vagina [22]. However, it has also been suggested that the pubocervical ligament is the vesicouterine ligament (Figure 4) [47].

3.2.1.2.4. Vesicouterine Ligament

3.2.1.2.4.1. Synonym

Anterior parametrium [48], bladder pillar [49], vesicovaginal ligament [50], vesicocervical ligament [51], vesicocervical pillar [51], vesicovaginal pillar [51], Amreich's fleboduct [22].

3.2.1.2.4.2. Definition

The vesicouterine ligament is formed by the extension of both sides of the uterine tissue to the ventral side and surrounding the blood vessels, nerves, and distal ureter, and is located above and beneath the ureter to form a "ureteral tunnel" [48, 52, 53].

3.2.1.2.4.3. Annotation

The vesicovaginal ligament can be divided into deep and superficial layers, or anterior and posterior lobes, bounded by the ureter. There are also literature that refer to the superficial layer as the vesicovaginal ligament and the deep layer as the vesicovaginal ligament [53]. The superficial layer of the vesico-uterine ligament forms the top of the ureteral tunnel and covers the ureter above the layer of connective tissue between the cervix and the bladder, which contains the cervico-vesical vessels from the uterine artery. The deep (posterior) layer of the vesicouterine ligament is located beneath the ureter and is the connective tissue connecting the posterior wall of the bladder with the cervix and

the lateral side of the upper vagina. The veins and nerves of the bladder run along it (Figures 4, 8 & 9) [54].

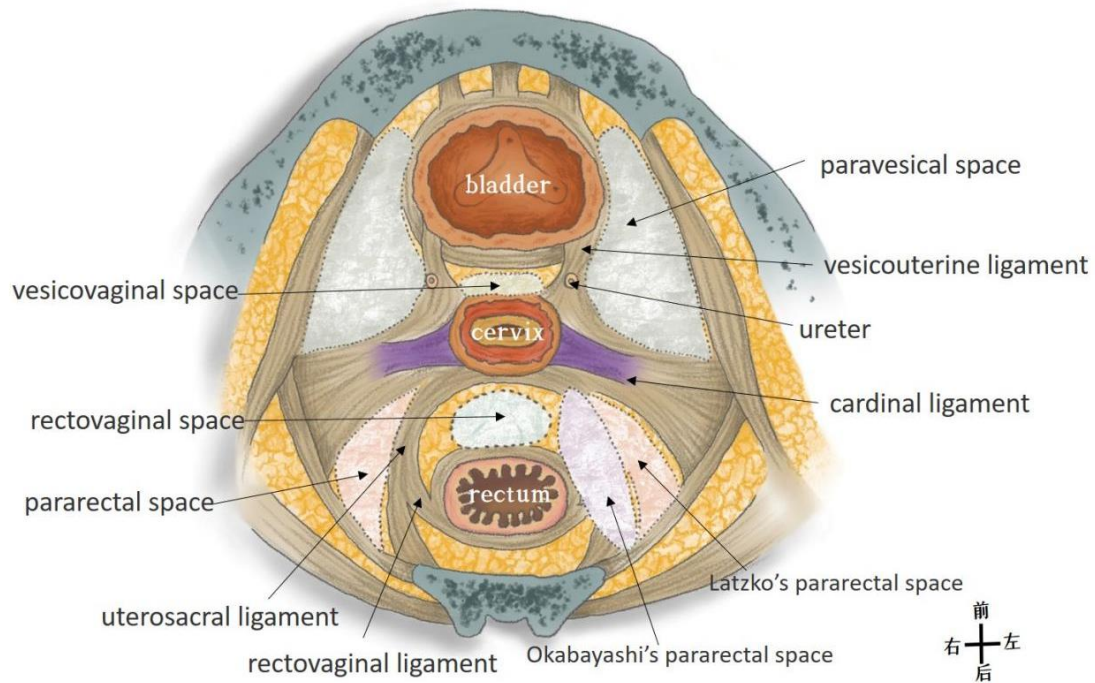


Fig. 8. Anatomy of vesical and uterine ligaments (Drawn by Le Chang).

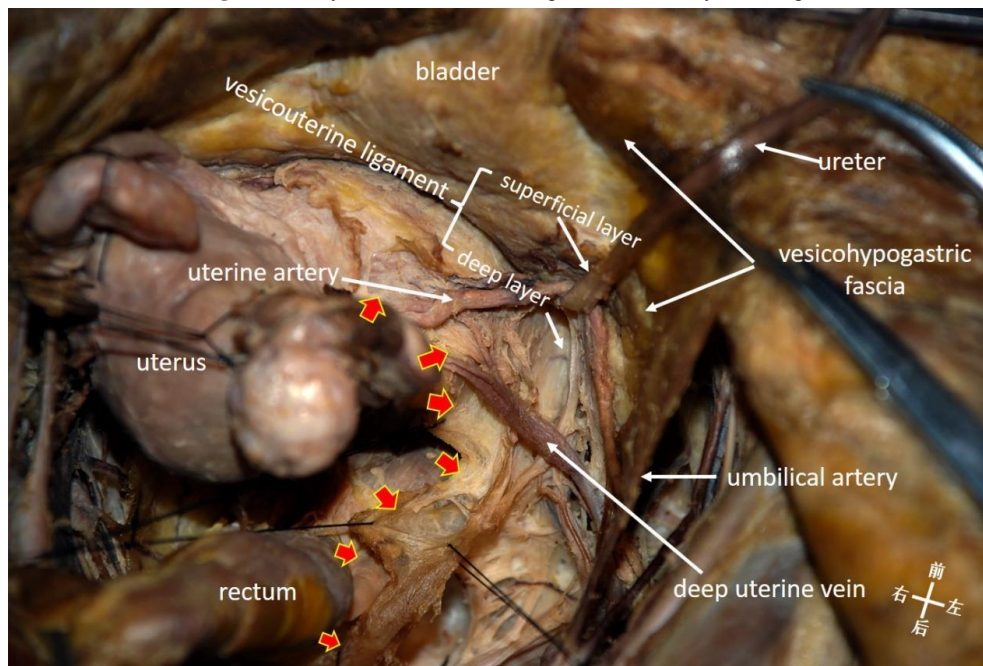


Fig. 9. Anatomy of vesicouterine ligament (Contributed by Moubin Lin).

3.2.1.2.4.4. Recommendation 6

The vesicouterine ligament is a connective tissue containing nerves and blood vessels located between the end of the ureter, the urogenital fascia,

and the vesicohypogastric fascia. It is divided into a superficial layer and a deep layer by the ureter. Voting approval rate: 98.6% (70/71).

3.2.1.2.5 Uterosacral Ligament (A09.1.03.032)

3.2.1.2.5.1. Synonym(s)

Rectouterine ligament [55], rectovaginal ligament [55], sacrouterine ligaments [56], posterior parametrium [57].

3.2.1.2.5.2. Definition

The uterosacral ligaments emanate from the cervix and the corpus uteri and are attached to the front of the sacrum through both sides of the rectum [3, 4].

3.2.1.2.5.3. Annotation

The uterosacral ligament consists of three parts: recto-uterine fold, rectouterine ligament, and rectovaginal ligament [58]. The anatomic feature of the uterosacral ligament is that it has a hypogastric nerve and pelvic nerve plexus on the external side [55, 59] and is not directly attached to the sacrum [60], which is consistent with the anatomic feature of the urogenital fascia (Figures 8 & 10) [61].

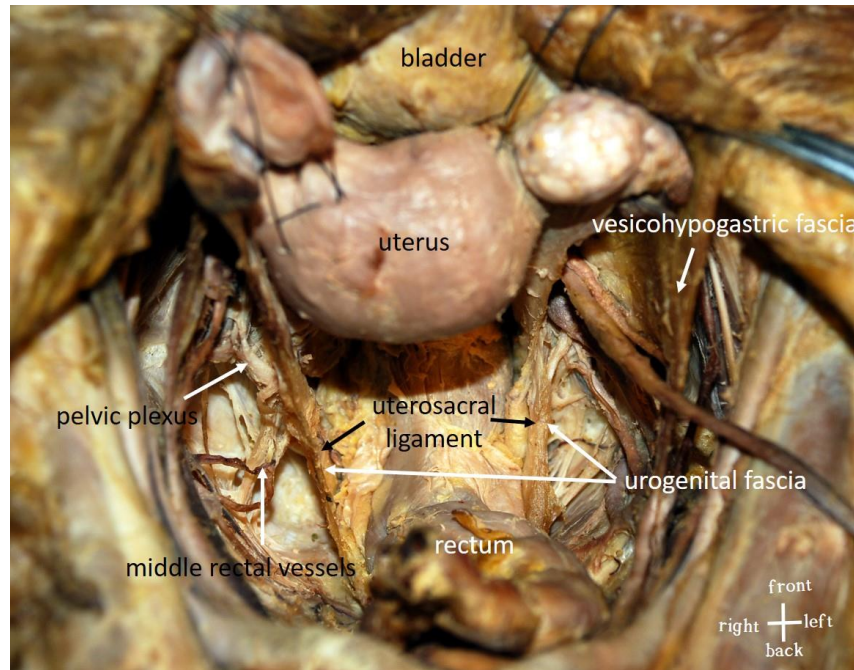


Fig. 10. Anatomy of the uterosacral ligament (Contributed by Moubin Lin).

3.2.1.2.5.4. Recommendation 7

The uterosacral ligament is a part of the urogenital fascia located between the anterior sacral and the uterus. Voting approval rate: 100.0% (71/71).

3.2.1.2.6. Rectosacral Fascia (A04.5.03.019)

3.2.1.2.6.1. Synonyms

Presacral fascia [16], Waldeyer's fascia [16], posterior parametrium [62].

3.2.1.2.6.2. Definition

The recto sacral fascia originates from the anterior sacral fascia and extends forward and downward to join the fascia propria of the rectum. The starting point of the recto sacral fascia is not constant, but it is located in S2~S4, and the endpoint is generally 3-5 cm above the anorectal junction [3].

3.2.1.2.6.3. Annotation

Some studies have suggested that the rectosacral fascia is formed by the fusion of the anterior fascia of the hypogastric nerve and the fascia propria of the rectum at the level of S2-S4 sacrum [63], but in fact, the rectosacral fascia starts from the anterior sacral fascia (parietal fascia), runs diagonally upward, crosses the urogenital fascia (visceral fascia), and ends at the fascia propria of the rectum [61]. Anatomically, the rectosacral fascia appears as a continuation of the urogenital fascia. Some studies refer to the rectosacral fascia (ligaments) as Waldeyer fascia [64-66], or the entire anterior sacral fascia as Waldeyer fascia [16, 31]. However, in Waldeyer's book *Das Becken (The Pelvis)*, no fascial structure is described between the rectum and the sacrum, and the fascia named after Waldeyer does not exist [64]. At present, Waldeyer fascia is mostly described as formed by the fusion of the distal end of the anterior sacral fascia and the fascia propria of the rectum at the anorectal junction (Figure 11) [67-70].

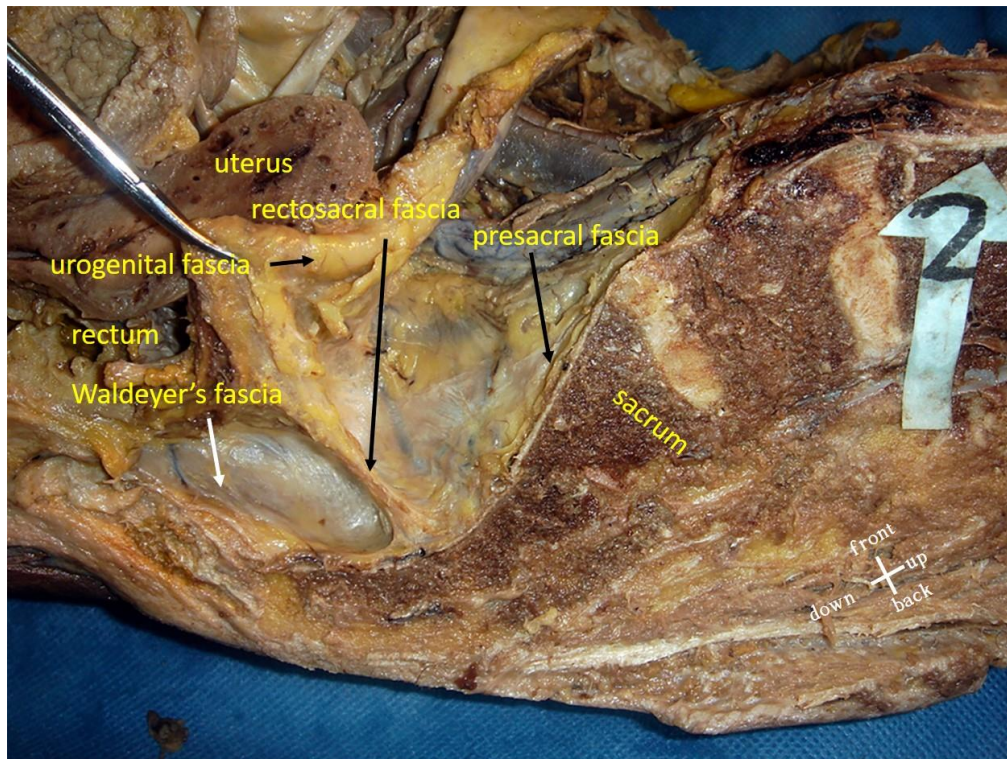


Fig. 11. Anatomy of presacral fascia, rectosacral fascia and Waldeyer's fascia (Contributed by Moubin Lin).

3.2.1.2.6.4. Recommendation 8

The presacral fascia, rectosacral fascia, and Waldeyer's fascia are three different anatomical structures. The presacral fascia is the thickened part of the presacral wall fascia, while the rectosacral fascia connects the presacral fascia and the rectal intrinsic fascia at the S2-S4 sacral level, dividing the retrorectal space into upper and lower compartments. Given the ambiguous definition of Waldeyer's fascia and its lack of specific clinical anatomical relevance, it is recommended to discard the use of Waldeyer's fascia as an anatomical term. Voting approval rate: 95.8% (68/71).

3.2.1.2.7. Urogenital Fascia

3.2.1.2.7.1. **Synonym(s)**

Ureteral sheath [71], periureteric fascia [71], perirenal fascia [72], hypogastric nerve sheath [31], ureterohypogastric fascia [73], urogenital-hypogastric sheath [74], hypogastric nerve fascia [75], urogenital sheath [75], urogenital stratum [76], sacro-recto-genitopubic lamina [77], intermediate stratum of the retroperitoneal tissue [72], ureteroneural lamina [78].

3.2.1.2.7.2. Definition

The urogenital fascia continues from the anterior and posterior renal fascia, comprising the connective tissue sheath that contains the ureter, genital vessels, and hypogastric nerve [31, 77].

3.2.1.2.7.3. Annotation

The urogenital fascia represents the continuation of the anterior and posterior renal fascia into the pelvic cavity, incorporating the ureters, gonadal vessels, hypogastric nerves, and pelvic plexus between the two layers, thus forming a "sandwich"-like structure [31, 45, 77]. It is referred to as the urinogenital fascia because this fascial layer envelopes mesodermal-origin urogenital organs, such as the kidneys and ureters, as well as reproductive organs like the testes and vas deferens. Upon extending into the pelvis, the urinogenital fascia forms a sheet encircling the rectum and stretching bilaterally to encompass the bladder, thus the two layers of the urogenital fascia are more precisely termed the visceral layer and parietal layer [76]. The visceral layer of the urinogenital fascia overlies the surface of the hypogastric nerves, and some scholars refer to it as prehypogastric nerve fascia [26, 79]. Heald posits that the hypogastric nerves reside within the visceral fascia [16, 80], while Takashi Takahashi interprets the visceral fascia as a continuous fascial layer, referred to as the visceral fascia posterior to the rectum, continuing laterally as the iliac vessel sheath, and anterior-laterally as the vesicohypogastric fascia [17]. This is consistent with the anatomical features of the urinogenital fascia, indicating that the urogenital fascia and visceral fascia represent the same anatomical structure (Figures 6, 12 & 13) [32, 61].

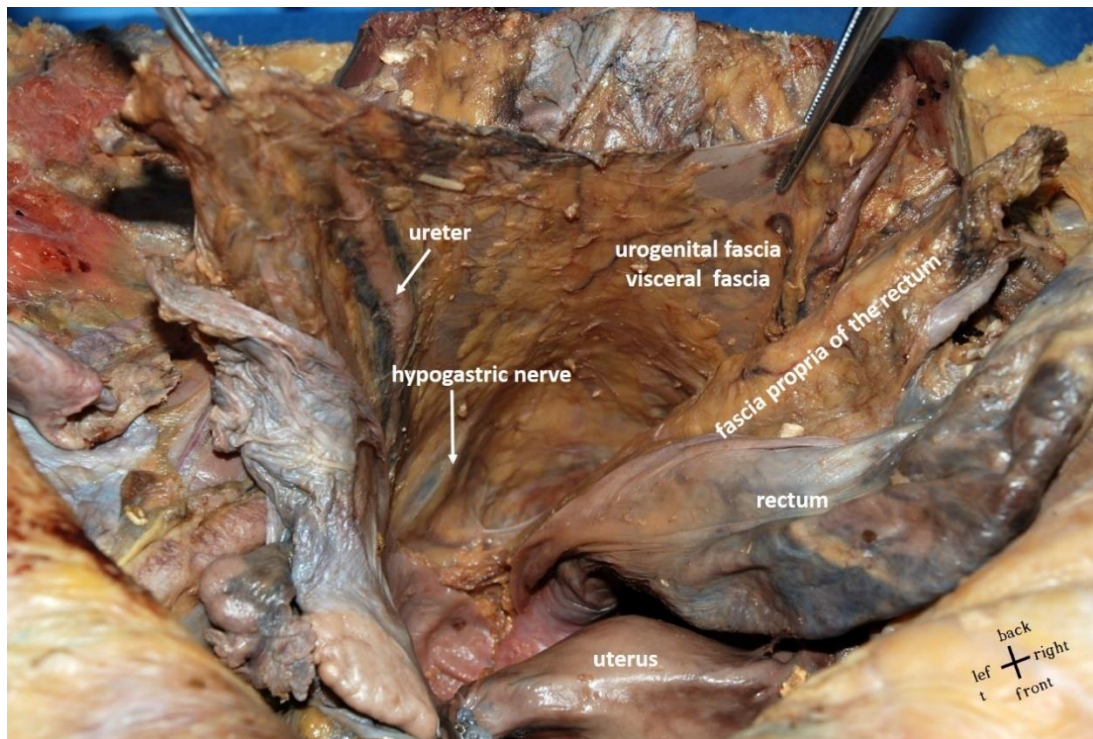


Fig. 12. Anatomy of genitourinary fascia (Contributed by Moubin Lin).

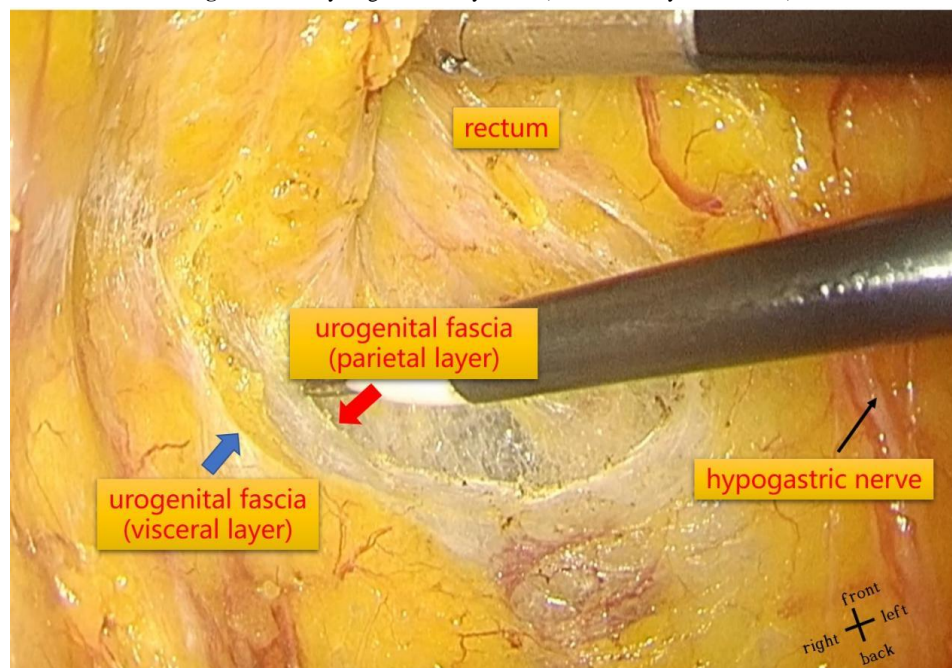


Fig. 13. The urogenital fascia is divided into two layers: visceral and wall (Contributed by Jian Qiu).

3.2.1.2.7.4. Recommendation 9

The urinogenital fascia comprises two layers, visceral and parietal, which respectively extend from the anterior and posterior renal fascia. These layers enclose the ureters, gonadal vessels, hypogastric nerves,

and pelvic plexus, thereby presenting a "sandwich"-like anatomical structure. Voting approval rate: 98.6% (70/71).

3.2.1.2.8. Prehypogastric Nerve Fascia

3.2.1.2.8.1. Synonym(s)

Urogenital fascia [63, 79].

3.2.1.2.8.2. Definition

The fascia located between the rectal mesenteric fascia and presacral fascia, and positioned ventrally to the hypogastric nerves, is referred to as the prehypogastric nerve fascia [26].

3.2.1.2.8.3. Annotation

The term “prehypogastric nerve fascia” was coined by Kinugasa [26]. It is actually the visceral layer of the urogenital fascia. However, in addition to enclosing the hypogastric nerves, the two-layer structure also contain the ureters, genital vessels and pelvic plexus. Therefore, the term “prehypogastric nerve fascia” does not fully reflect its anatomical characteristics [81]. Stelzner referred to the prehypogastric nerve fascia as the inner lamella of the parietal fascia [25], which does not align with the anatomical definition of the parietal fascia (Figures 6 & 14).

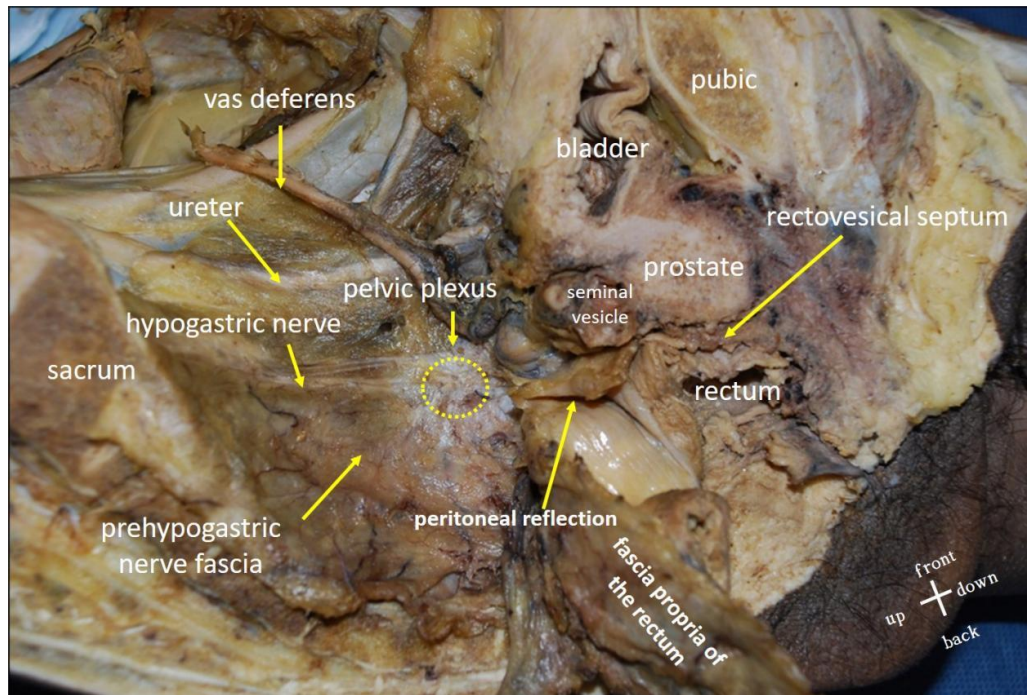


Fig. 14. Anatomy of prehypogastric nerve fascia (Contributed by Moubin Lin).

3.2.1.2.8.4. Recommendation 10

The prehypogastric nerve fascia constitutes the visceral layer of the theurogenital fascia. In males, it is distributed along the vas deferens and the internal surface of the seminal vesicle, reaching the seminal vesicle-prostate junction. In females, it covers the cervix and upper vagina. The prehypogastric nerve fascia connects anteriorly with Denonvilliers' fascia to form the anatomical morphology of the rectal mesentery. The pelvic plexus lies lateral to the junction between the prehypogastric nerve fascia and Denonvilliers' fascia. Voting approval rate: 97.2% (69/71).

3.2.1.2.9. Mesoureter

3.2.1.2.9.1. Synonym(s)

Uretreal leaf [82], sagittal rectal septum [83], lamina neuroducens [22], nerve root [22].

3.2.1.2.9.2. Definition

The mesoureter is a bilayered fascial structure extending dorsally and caudally from the ureters encapsulating within its layers both the ureters and the hypogastric nerves [2].

3.2.1.2.9.3. Annotation

The mesoureter, as a term in gynecological anatomy, is perceived to constitute the deep layer of the vesicouterine ligament in the anterior parametrium [47], as well as the outer layer of the posterior parametrium [55]. The ureteric fascia also demarcates the boundary between the medial and lateral pararectal spaces [84]. The ureteric fascia encompasses the hypogastric nerves [55] and comprises part of the ureter hypogastric fascia [85]. From the above description, it is apparent that the mesoureter is in fact a constituent of the urogenital fascia (Figure 15).

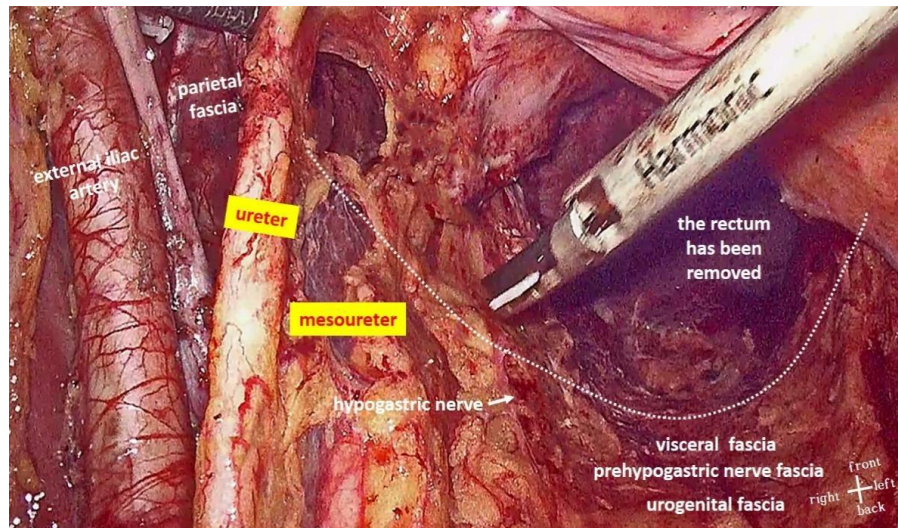


Fig. 15. Mesoureteral anatomy (Contributed by Moubin Lin).

3.2.1.2.9.4. Recommendation 11

The mesoureter is the part of the urogenital fascia extending dorsally and caudally below the ureter. Voting approval rate: 95.8% (68/71).

3.2.1.2.10. Vesicohypogastric Fascia

3.2.1.2.10.1. Synonym(s)

Lamina ligamenti umbilicalis lateralis [83], umbilical prevesical fascia [86], umbilicoprevesical fascia [87], vesicoumbilical stalk [2].

3.2.1.2.10.2. Definition

The vesicohypogastric fascia refers to the triangular fascial structure situated between the lateral wall of the bladder, the umbilical artery, and the inferior vesical artery [17].

3.2.1.2.10.3. Annotation

The term "vesicohypogastric fascia" appears mostly in Japanese anatomy literature, often described as a bilayered structure with the visceral branches of the internal iliac artery contained between the layers [36]. However, the vesicohypogastric fascia does not cover the bladder itself but circumvents the anterolateral aspect of the bladder towards the umbilicus. Therefore, the lateral wall of the bladder does not constitute the boundary of the vesicohypogastric fascia. Additionally, the inferior boundary of the vesicohypogastric fascia terminates at the tendinous arch of pelvic fascia, rather than the inferior vesical artery [45]. The vesicohypogastric fascia overlays the external (dorsal) surface of the visceral branches of the internal iliac vessels (Figures 4 & 16) [61, 88].

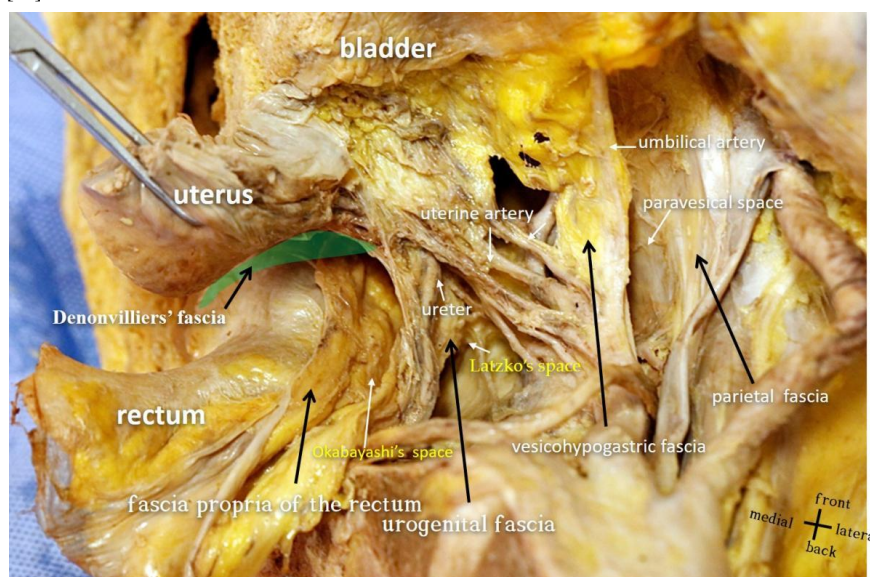


Fig. 16. Anatomical relationships between the rectal fascia, urogenital fascia, bladder hypogastric fascia and parietal fascia (Contributed by Moubin Lin).

3.2.1.2.10.4. Recommendation 12

The vesicohypogastric fascia is the fascial structure situated between the bladder, the umbilical artery, and the tendinous arch of the pelvic fascia. It overlays the surface of the visceral branches of the internal iliac artery, dividing the lateral lymph nodes into the external obturator lymph nodes (No. 283) and the internal iliac lymph nodes (No. 263) on the inside. Voting approval rate: 100.0%(71/71).

3.2.1.2.11. Umbilical Prevesical Fascia and Umbilical Vesical Fascia

3.2.1.2.11.1. Synonym(s)

Umbilical prevesical fascia, Charpy's fascia [89].

3.2.1.2.11.2. Definition

The umbilical prevesical fascia is located posterior to the transversalis fascia and between the umbilicus and the inferolateral aspect of the

bladder [90]. The umbilical vesical fascia extends from the vesical fascia, from the bladder to the umbilicus, encompassing within it the urachus and the umbilical artery [90].

3.2.1.2.11.3. Annotation

The umbilical prevesical fascia is a continuation of the extraperitoneal fascia or the urogenital fascia [77, 91], whereas the umbilical vesical fascia extends from the vesical fascia [70]. Both of these fasciae are located between the medial umbilical ligaments on either side. The umbilical vesical fascia is positioned posterior to the umbilical prevesical fascia, which itself is located posterior to the transversalis fascia. The umbilical vesical fascia, the umbilical prevesical fascia, and the transversalis fascia mutually fuse at the medial umbilical ligament and the umbilicus. Based on anatomical definitions, it is challenging to distinguish the anatomical boundaries of the two. This requires understanding from the perspective of Molmenti's "interfascial plane" theory, which posits that fascia itself is a separable multilayered membrane structure (Figures 4 & 17) [92].

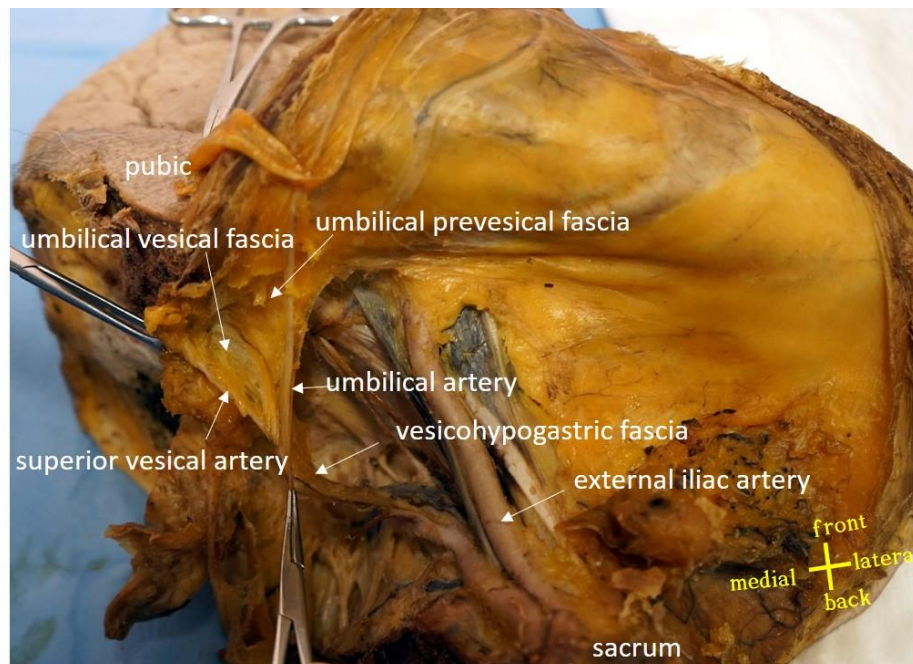


Fig. 17. The anterior umbilical bladder fascia and the umbilical bladder fascia are different parts of the proximal hypogastric fascia of the bladder (Contributed by Moubin Lin).

3.2.1.2.11.4. Recommendation 13

The umbilical prevesical fascia and umbilical vesical fascia represent the proximal part of the vesical hypogastric fascia. The vesical hypogastric fascia overlays the lateral aspect of the visceral branches of the internal iliac artery. Anterior and lateral to the bladder, it divides into two triangular fasciae: the deep umbilical vesical fascia and the superficial umbilical vesical anterior fascia. The umbilical vesical fascia contains the superior vesical artery covering the anterior bladder wall, while the umbilical vesical anterior fascia encapsulates the umbilical artery as it courses towards the umbilicus. Voting approval rate: 100.0%(71/71).

3.2.1.3. Fascial Sheaths and Ligaments Surrounding the Nerves and Blood Vessels of Organs

3.2.1.3.1. Lateral Ligament of the Pelvis

3.2.1.3.1.1. Synonym(s)

The neurovascular stalk [2], hypogastric sheath [6, 75], pelvic connective tissue ground bundle [83].

3.2.1.3.1.2. Definition

The connective tissue connecting the pelvic organs to the pelvic wall [22].

3.2.1.3.1.3. Annotation

The lateral ligament of the pelvis are formed by the vesical hypogastric fascia, the transverse ligament of cervix, and the lateral ligament of

rectum, arranged from superior to inferior and from anterior to posterior [2]. The notion of viewing the nerves, blood vessels, and ligaments of the pelvic organs as an integrated whole has long existed in gynecological anatomy, as seen in neurovascular pedicles, connective tissue basic bundles, and hypogastric sheath [6]. In contrast, total mesorectal excision [93] and total hysterectomy [94] reflect different concepts: the ligaments or blood supply of the bladder, uterus, and rectum function as independent systems without affecting one another (Figure 18).

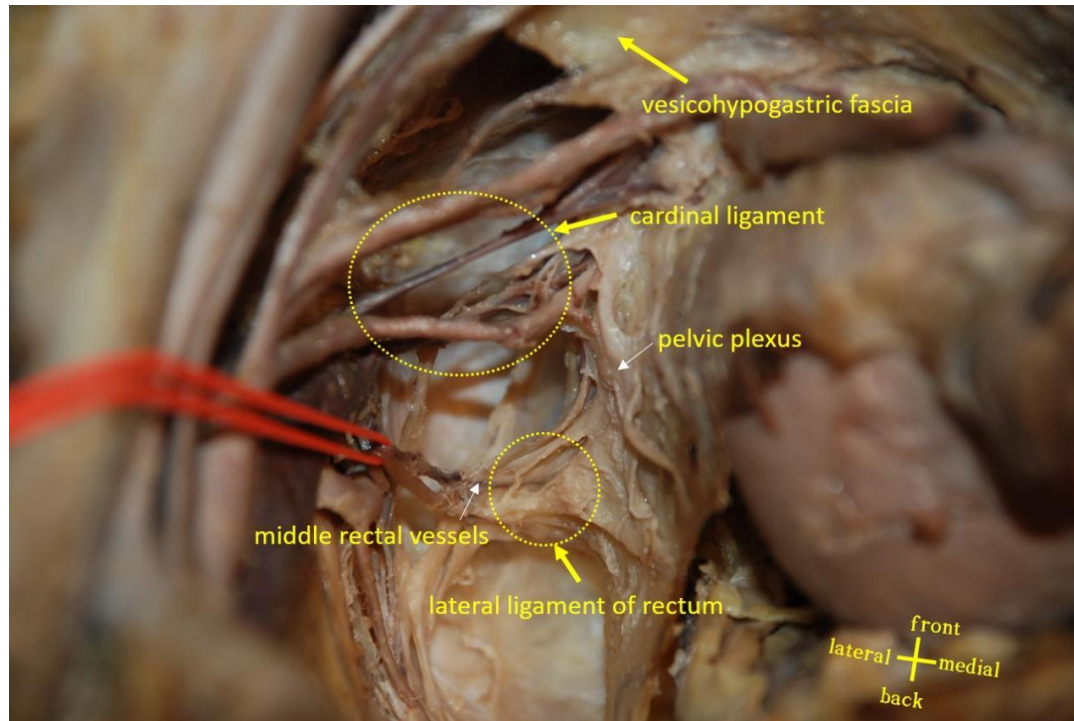


Fig. 18. Anatomy of pelvic side ligaments (Contributed by Moubin Lin).

3.2.1.3.2. Lateral Ligament of Bladder (A04.5.03.016)

3.2.1.3.2.1. Synonym(s)

Paracystium [95].

3.2.1.3.2.2. Definition

The dense connective tissue located between the vesical neck and tendinous arch of the pelvic fascia [96].

3.2.1.3.2.3. Annotation

The anatomical term "lateral ligament of the bladder" is rarely used now. In gynecological anatomy, the portion of the anterior parametrium that extends to the bladder is the connective tissue containing the inferior vesical vessels and the distal ureter, divided into the medial vesicouterine ligament towards the head and the lateral bladder ligament towards the tail, with the ureter serving as the boundary [57, 62]. However, anatomical descriptions are inconsistent. Some consider the lateral ligament of the bladder as a thin layer of connective tissue extending

caudally from the umbilical artery, dividing the paravesical space into medial and lateral compartments (Figure 4) [84].

3.2.1.3.2.4. Recommendation 14

The lateral ligament of the bladder is actually the caudal part of the vesical hypogastric fascia. Voting approval rate: 97.2% (69/71).

3.2.1.3.3. Lateral Ligament of Rectum (A05.7.04.016)

3.2.1.3.3.1. Synonym(s)

Rectal stalks [31], rectal pillars [10], rectal wing [97], paraproctium [31], [98], rectal pedicles [99], T-junction [27].

3.2.1.3.3.2. Definition

The fascia connecting the mesorectum to the posterolateral pelvic wall, containing the middle rectal vessels and nerves [100].

3.2.1.3.3. Annotation

There are two primary anatomical controversies regarding the lateral ligament of the rectum. Firstly, its position is uncertain, potentially located on the anterolateral or posterolateral side of the rectum [101]. The main reason for this controversy is the lack of recognition that the lateral ligament of rectum originates from the posterolateral pelvic sidewall adjacent to the rectum and course anteriorly and superiorly, terminating at the anterolateral proper fascia of the rectum. Secondly, its structural composition is also unclear; it may be dense connective tissue either accompanied by or lacking [66, 101, 102] neurovascular

components. In recent years, it is widely considered that the lateral ligament of rectum is formed from the fusion of fasciae, such as the fusion of the proper fascia of rectum and the parietal fascia [102], the fusion of the presacral fascia and the mesorectal fascia [28], or the fusion of Denonvilliers' fascia, the rectosacral fascia, and the prehypogastric nerve fascia [63]. The second controversy arise from not comprehensively understanding the lateral ligament of rectum. Divided by the pelvic plexus, the lateral ligament of rectum actually consists of two segments: the external segment, a connective tissue containing the middle rectal vessels and nerves, and the internal segment, representing a fusion of fasciae (Figure 19) [103].

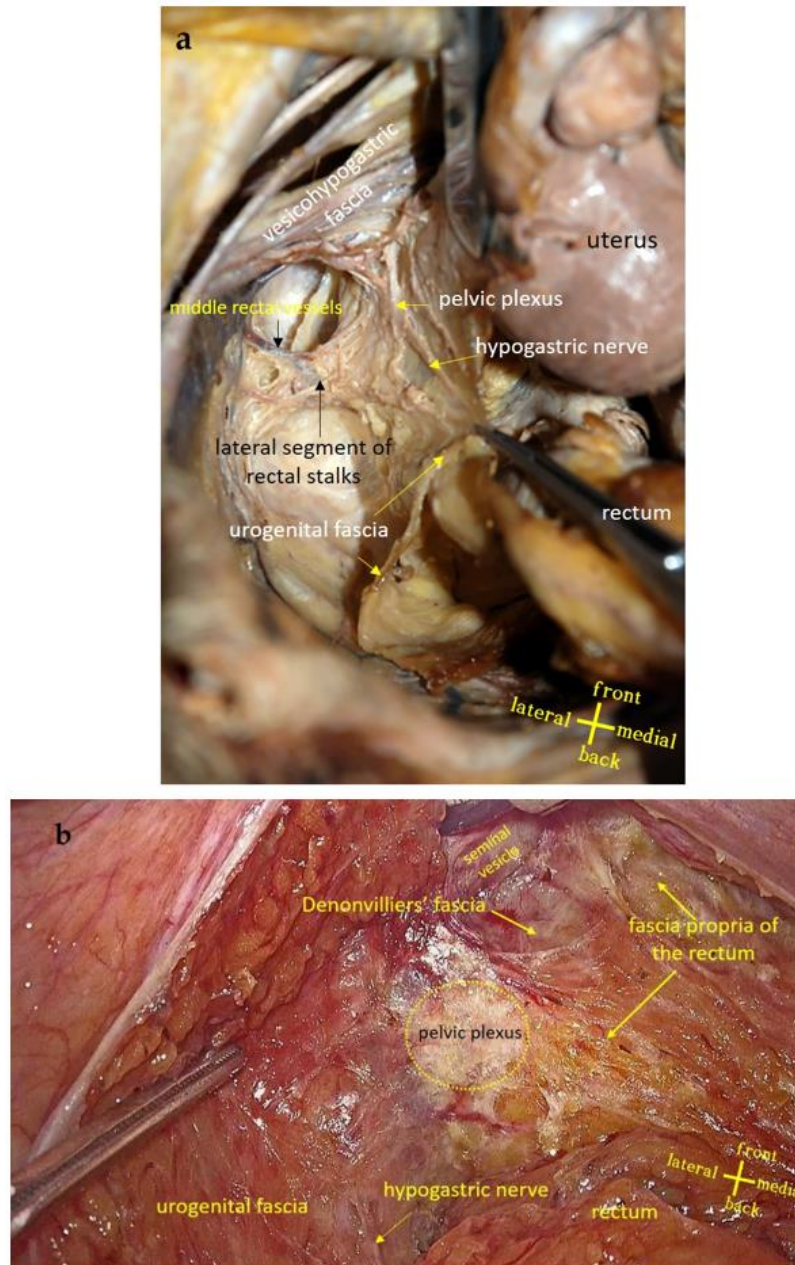


Fig. 19. Anatomical pictures and schematic diagram of the rectal ligament(Contributed by Moubin Lin). **a)** Anatomy of the lateral rectal ligament **b)** Anatomy of the medial rectal ligament.

3.2.1.3.3.4. Recommendation 15

The lateral ligament of rectum is located between the posterolateral pelvic wall and the anterolateral side of the rectum. Divided by the pelvic plexus, it consists of two segments: the external segment, located between the vesical hypogastric fascia and the pelvic plexus, and the internal segment, formed by the fusion of Denonvilliers' fascia, the prehypogastric nerve fascia, and the proper fascia of rectum. Voting approval rate: 87.3%(62/71).

3.2.1.3.4. Cardinal Ligament (A09.1.03.031)

3.2.1.3.4.1. Synonym(s)

Transverse cervical ligament [47], Mackenrodt ligament [47], The web [2], Retinaculum uteri [104].

3.2.1.3.4.2. Definition

The cardinal ligament refers to the anatomical structure located between the lateral pelvic wall and the lateral side of the cervix/vagina, formed by loose connective tissue surrounding the nerves, blood vessels and lymphatic vessels [3, 6, 105].

3.2.1.3.4.3. Annotation

The anatomy of the cardinal ligament has long been contentious, with many differing terms used to describe it [106]. Japanese scholars refer to the connective tissue containing nerves and blood vessels between the paravesical and pararectal spaces as the cardinal ligament [47]. This structure encompasses, from superior to inferior, the uterine artery, deep uterine vein, middle rectal blood vessels, and pelvic splanchnic nerves [2]. Based on this understanding, Japanese scholars have proposed an important anatomical concept for preserving function in radical hysterectomy: the cardinal ligament is divided into a superficial vascular layer and a deep neural layer (which contains the pelvic splanchnic nerves) by the deep uterine vein (Figures 4, 7 & 20) [107].

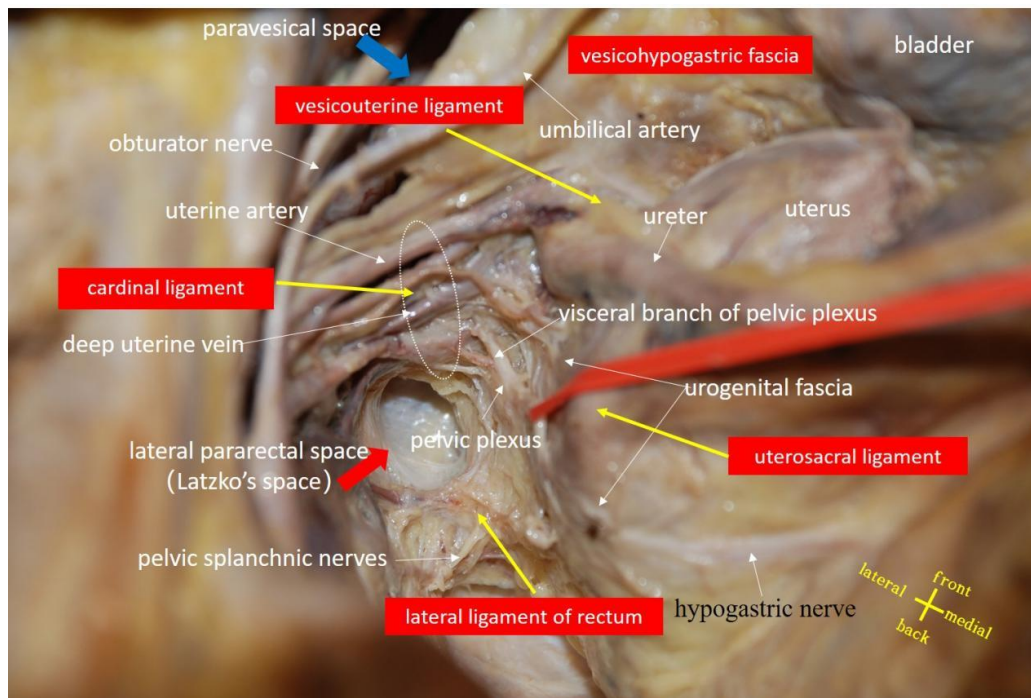


Fig. 20. Anatomy of cardinal ligament (Contributed by Moubin Lin).

3.2.1.3.4.4. Recommendation 16

The cardinal ligament is the neural and vascular connective tissue situated laterally to the cervix/vagina, between the urogenital fascia and the vesical hypogastric fascia. Voting approval rate: 100% (71/71).

3.2.1.3.5. Parametrium (A09.1.03.021) and Paracervix (A09.1.03.022)

3.2.1.3.5.1. Synonym(s)

Parametrial web [108], cardinal ligament [109], lateral parametrium [47].

3.2.1.3.5.2. Definition

Parametrium and paracervix refer to the connective tissue containing nerves and blood vessels, extending coronally from the uterus, cervix, and lateral vagina to the lateral pelvic wall. The portion above the ureter is termed parametrium, while the part below the ureter is referred to as paracervix [22, 104, 110].

3.2.1.3.5.3. Annotation

Although parametrium and paracervix are anatomical terms published in Terminologia Anatomica [1], their definitions and usages are quite confusing. For instance, Gray's Anatomy collectively refers to parametrium and paracervix as parametrium [3], which continues downward into paracolpium. Meanwhile, the Querleu-Morrow classification uses the term paracervix to substitute for the cardinal ligament, Mackenrodt's ligament, or parametrium [57]. There are mainly three perspectives concerning the understanding of parametrium and paracervix: i) divided based on organ location, the book "Chinese Terms in Human Anatomy" defines the connective tissue at the base of the broad ligament of uterus and lateral to the cervix as the parametrium and paracervix respectively [11]; ii) demarcated by vascular landmarks, the parametrium contains the uterine artery and superficial uterine vein, while the paracervix contains the venous root, vesical inferior and vaginal vessels [22]; iii) segmented from the standpoint of ligaments, the parametrium is subdivided into anterior (vesicouterine ligament), posterior (uterosacral ligament), and lateral (cardinal ligament and paracervix) portions [111], where the lateral parametrium's cardinal ligament and paracervix are divided by the ureter (Figure 4) [62].

3.2.1.3.5.4. Recommendation 17

Parauterine tissue and paracervical tissue are located around the uterus and cervix respectively, and are neurovascular tissues between the urogenital fascia and the vesicohypogastric fascia. Voting approval rate: 98.6% (70/71).

3.2.2. Anatomical Terms Related to Parietal Fascia

3.2.2.1. Tendinous Arch of Pelvic Fascia (A04.5.03.010), Tendinous Arch of Levator Ani (A04.5.04.009)

3.2.2.1.1. Synonym(s)

Tendinous arch of pelvic fascia-arcus tendineus fasciae pelvis [112], arcus tendineus of pelvic fascia [10], conjoined arch [46], tendinous ischial arch [113], tendinous arch [114], white line [114], pelvic arcus tendinous fascia [46], tendinous arch of levator ani -arcus tendineus musculi levatoris ani [112].

3.2.2.1.2. Definition

Tendinous arch of pelvic fascia is the thickened portion of the obturator fascia located between the pubic symphysis and the sciatic spine, whose medial border is the bladder and vaginal attachment. The pelvic fascial tendon arch is an important anatomical structure for procedures involving urinary incontinence and pelvic organ prolapse [6, 20]. Tendinous arch of levator ani is located lateral to the tendinous arch of pelvic fascia, which begins 2 cm anterior to the obturator canal and converges laterally into the the tendinous arch of pelvic fascia and finally fuses with the posterior 1/3 part of the tendinous arch of pelvic fascia. Tendinous arch of levator ani is the starting point of the levator ani muscle, and is also the return point of the upper and lower fascia of the pelvic diaphragm.

3.2.2.1.3. Annotation

Many anatomical documents, including the "Human Anatomy Glossary" published in 2014, identify the tendinous arch of pelvic fascia and the tendinous arch of levator ani as the same anatomical structure [11]. In fact, they are two different anatomical structures (Figures 4, 21 & 22) [51, 22, 115].

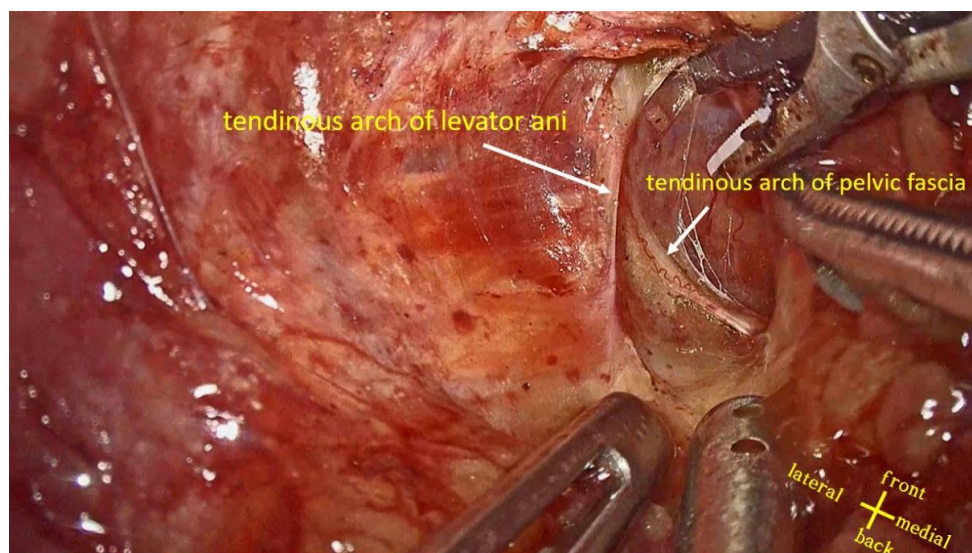


Fig. 21. Anatomy of the tendinous arch of the pelvic fascia and the levator ani tendon (Contributed by Moubin Lin).

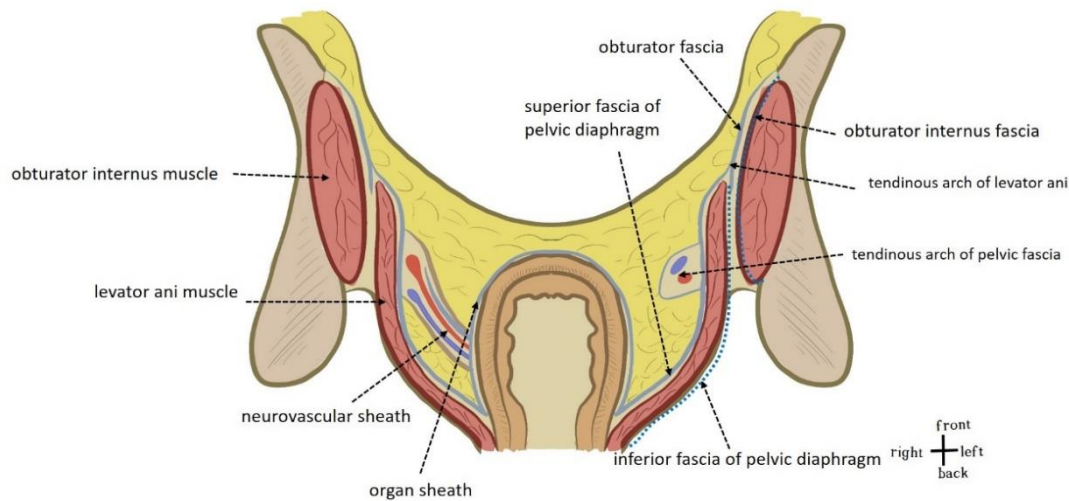


Fig. 22. Schematic diagram of the anatomy of the superior pelvic diaphragm fascia (Drawn by Le Chang).

3.2.2.1.4. Recommendation 18

Although the tendinous arch of pelvic fascia and the tendinous arch of levator ani are both formed by dense and thickened pelvic parietal fascia, they are different anatomical structures. The tendinous arch of pelvic fascia is the attachment point of the vagina and bladder, while the tendinous arch of levator ani is the starting point of the levator ani muscle and the attachment point of the upper and lower fascia of the pelvic diaphragm. Voting approval rate: 100%(71/71).

3.2.2.2. Superior Fascia of Pelvic Diaphragm (A04.5.03.012)

3.2.2.2.1. Synonym

Levator fascia [46].

3.2.2.2.2. Definition

Superior fascia of pelvic diaphragm is the fascia covering the pelvic surface of the levator ani and coccygeus muscles [11].

3.2.2.2.3. Annotation

The obturator fascia is divided into three parts at the tendon arch of the levator ani muscle. One part covers the surface of the obturator internus muscle and enters the ischiorectal fossa. The other two parts cover the deep and superficial sides of the levator ani muscle and coccygeus muscle respectively to form the superior and inferior fasciae of pelvic diaphragm, respectively (Figures 4 & 22).

3.2.2.3. Presacral Fascia (A04.5.03.018)

3.2.2.3.1. Synonym

Lateral rectal fascia [6], retrorectal fascia [64], rectosacral ligament [65], Waldeyer's fascia [10].

3.2.2.3.2. Definition

Presacral fascia is refers to the thickened parietal fascia located in front of the sacrum and covering the surface of the presacral vein and median sacral artery. Presacral fascia continues laterally and caudally with the parietal fascia covering the surface of the piriformis muscle, obturator internus muscle and levator ani muscle [20, 116].

3.2.2.3.3. Annotation

The view that the presacral fascia is a multilayered structure in clinical anatomy is questionable, mainly because the existence of the urogenital fascia is not recognized. There are two representative views. One is proposed by Hollinshead and Muntean, which believes that the hypogastric nerve and pelvic plexus are included in the presacral fascia [10, 31]. In fact, the presacral fascia here should be the urogenital fascia. Another representative view was proposed by Kinugasa. The presacral fascia is divided into two layers on the side of the rectum. The superficial layer extends to the superior pelvic diaphragmatic fascia, and the deep layer merges with the prehypogastric fascia and then continues with Denonvilliers fascia in front. Therefore, the hypogastric nerve is located between the presacral fascia and the prehypogastric fascia [26]. The former view is inconsistent with the fact that the hypogastric nerve is located within the two layers of the urogenital fascia; the latter view mistakenly regards the superficial layer of the urogenital fascia as the deep layer of the presacral fascia (Figures 3 & 11) [81].

3.2.2.3.4. Recommendation 19

The presacral fascia is part of the parietal fascia and covers the surface of the presacral vein and median sacral artery. Voting approval rate: 98.6%(70/71).

3.2.3. Anatomical Terms Related to the Space

3.2.3.1. Pararectal Fossa (A10.1.02.514)

3.2.3.1.1. Synonym

Pararectal space [111].

3.2.3.1.2. Definition

Pararectal fossa is the space located between the rectum/uterus and the internal iliac vessels, bounded anteriorly by the main ligament and posteriorly by the sacrum [111].

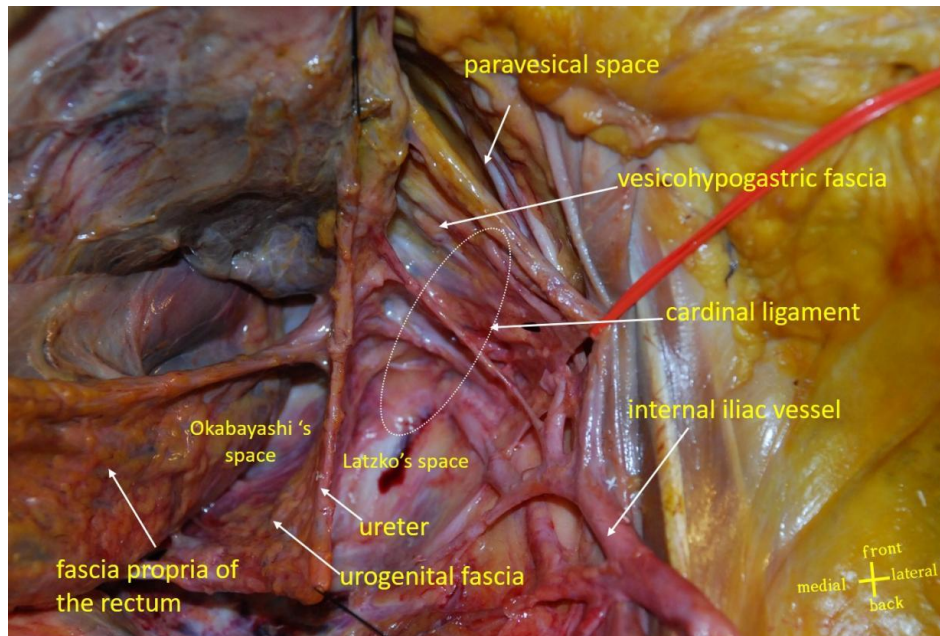


Fig. 23. Anatomy of the pararectal space and paravesical space (Contributed by Moubin Lin).

3.2.3.1.4. Recommendation 20

The medial pararectal hiatus is located between the fascia propria of the rectum and the visceral layer of the urogenital fascia; and the lateral pararectal hiatus is located between the parietal layer of the urogenital fascia and the vesicohypogastric fascia. Voting approval rate: 100%(71/71).

3.2.3.2. Paravesical Fossa (A10.1.02.502)

3.2.3.2.1. Synonym

Paraventricular space [22].

3.2.3.2.2. Definition

Paravesical fossa appears more frequently in the anatomical literature as the paravesical space. The paravesical space is bounded laterally by the parietal fascia (obturator fascia) on the surface of the obturator internus muscle and the external iliac vessels, medially by the bladder and vagina,

3.2.3.1.3. Annotation

Pararectal fossa appears more often as pararectal space in anatomy literature, especially in gynecological anatomy literature. The pararectal space is bounded by the ureter and is divided into the medial pararectal space (Okabayashi space) and the lateral pararectal space (Latzko space) [111]. Gynecological surgery dissects the hypogastric nerve and the uterine artery through Okabayashi's space and Latzko's space, respectively (Figures 8 & 23) [117].

posteriorly by the cardinal ligament, anteriorly by the pubic bone, and inferiorly by the levator ani muscle [48].

3.2.3.2.3. Annotation

The paravesical space is divided into lateral and medial parts by the umbilical artery. During surgery, the obturator lymph nodes can be dissected in the lateral space, and the uterine artery can be ligated at the root and paraarterine tissue can be dissected in the medial space (Figures 8 & 23) [118].

3.2.3.2.4. Recommendation 21

The paravesical space is the space located between the vesicohypogastric fascia and pelvic parietal fascia. Voting approval rate: 100%(71/71).

3.2.3.3. Posterior Pubic Space (A10.1.01.003), Retroinguinal Space

3.2.3.3.1. Synonym

Retropubic space prevesical space [118], space of Retzius [119], retroinguinal space-iliac area [120].

3.2.3.3.2. Definition

The retropubic space is bounded anteriorly by the pubic bone, posteriorly by the bladder, and laterally by the tendinous arch of pelvic fascia [117]. The retroinguinal space is a triangular space located between the fascia iliaca, parietal peritoneum, and transversalis fascia [121].

3.2.3.3.3. Annotation

The retropubic space (Retzius space) is a potential surgical space filled with loose connective tissue and venous plexus. The Santorini venous plexus forms the floor of the Retzius space [122]. There are many different views on the membranous anatomy of the retropubic space, which can be located between the transversalis fascia and the preumbilical bladder fascia [77], or between the retrorectus abdominis sheath and the anterior umbilical bladder fascia [123], or between the deep and superficial layers of the preperitoneal fascia [124]. Some scholars also believe that the retropubic space is formed by multiple gaps composed of multiple layers of fascia [125]. The retropubic space and the retroinguinal space (Bogros space) are generally bounded by the line connecting the inferior epigastric artery and the vas deferens, while the retropubic space and the paravesical space are generally bounded by the umbilical artery (Figures 4 & 24) [117].

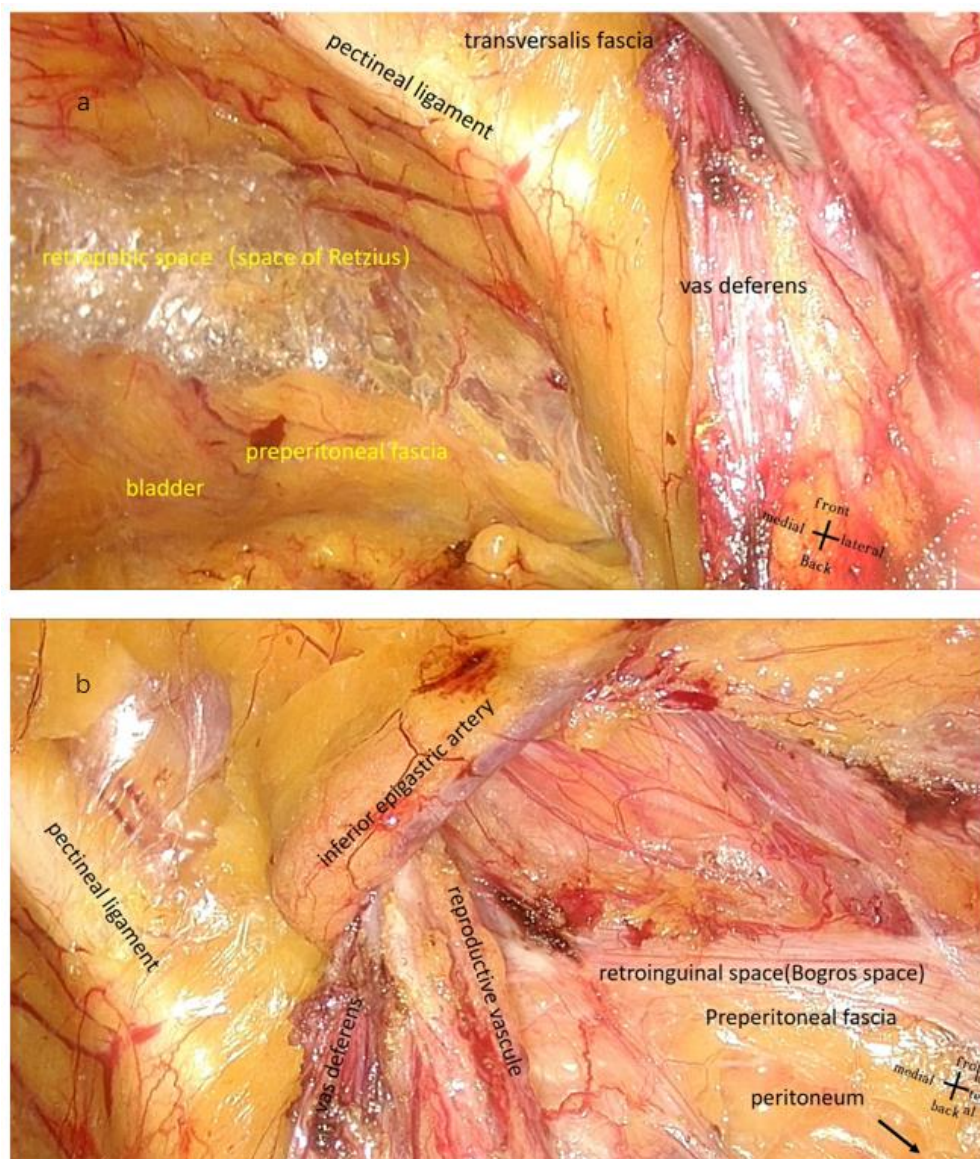


Fig. 24. Anatomy of Retzius space and Bogros space (Contributed by Jianwen Li). **a)** Retzius space; **b)** Bogros space.

3.2.3.3.4. Recommendation 22

The retropubic space is located between the transversalis fascia and the preperitoneal fascia, while the retroinguinal space is located between the preperitoneal fascia and the peritoneum. The two spaces are not in the same plane. Voting approval rate: 100%(71/71).

3.2.3.4. Retrorectal Space and Presacral Space

3.2.3.4.1. Synonym

None.

3.2.3.4.2. Definition

The space between the rectum and sacrococcygeal bone [119].

3.2.3.4.3. Annotation

Most anatomical literature considers the retrorectal space to be the presacral space. From the perspective of membrane anatomy, the retrorectal space refers to the space between the proper rectal fascia and the presacral fascia [58, 126], and is divided into the upper and lower spaces by the rectosacral fascia [127]. However, some scholars believe that with the urogenital fascia as the boundary, this space can be divided into the retrorectal space on the ventral side and the presacral space on the dorsal side (Figures 5 & 25) [27, 128].

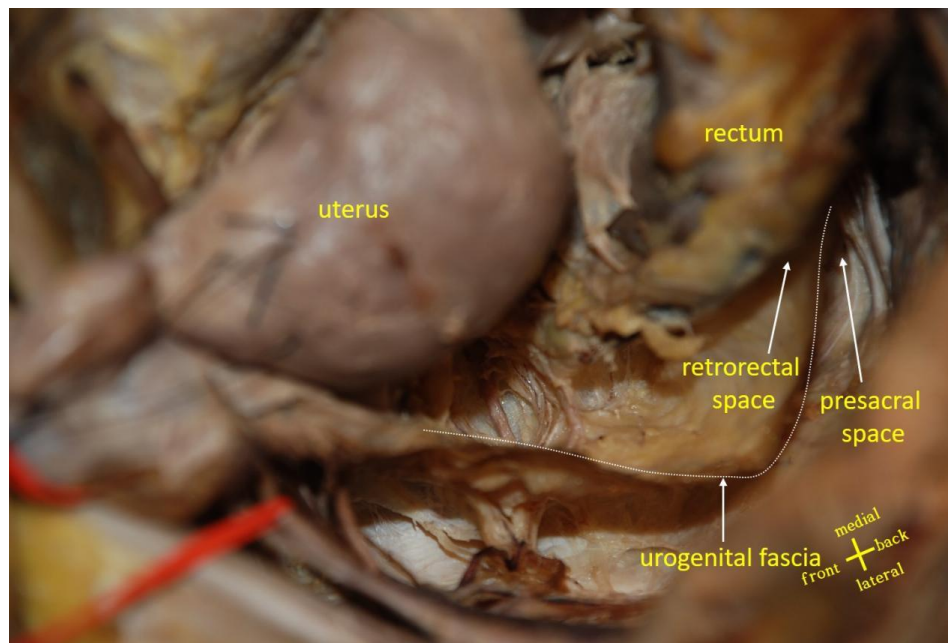


Fig. 25. Anatomy of retrorectal space and presacral space (Contributed by Moubin Lin).

3.2.3.4.4. Recommendation 23

The retrorectal space is located between the fascia propria of the rectum and the visceral layer of the urogenital fascia, and the presacral space is located between the parietal layer of the urogenital fascia and the presacral fascia. Voting approval rate: 98.6%(70/71).

3.2.3.5. The Yabuki Fourth Space and Okabayashi Paravaginal Space

3.2.3.5.1. Synonym

None.

3.2.3.5.2. Definition

The Yabuki fourth space is located between the end of the ureter, vesical nerves, blood vessels and the medial vagina [84, 111]. The Okabayashi paravaginal space is located between the blood vessels of the vagina and

cervix (paravaginal tissues) and the posterior lobe of the vesicouterine ligament [111, 129].

3.2.3.5.3. Annotation

Many anatomical literatures believe that the fourth space and the paravaginal space are the same space [49, 84], but in fact they are not the same concept [130]. Yabuki *et al.* [131] proposed the concept of the fourth space in 2000, which is located above and medial to the ureter, and it is possible to incise the superficial layer of the vesicouterine ligament along the fourth space to the beginning of the ureteral tunnel [132]. Okabayashi paravaginal space is the space between the cervix uterus and the ureter in order to separate the deeper layer of the vesicouterine ligament, and this space is located beneath and medial to the ureter. The posterior lobe of the vesicouterine ligament can be cut between the paravaginal space and the paravesical space (Figure 26) [132].

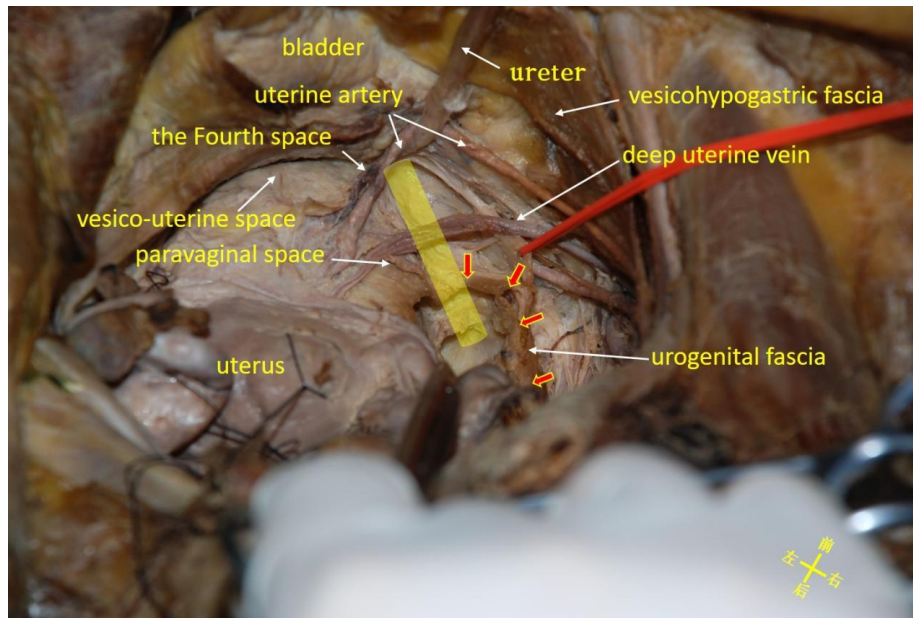


Fig. 26. Yabuki fourth space and Okabayashi paravaginal space anatomy (Contributed by Moubin Lin).

Note: the yellow column is the normal anatomical position of the ureter and the red arrow is the urogenital fascia.

3.2.3.5.4. Recommendation 24

The Yabuki fourth space and the Okabayashi paravaginal space are not the same space. The Yabuki fourth space is located above the end of the ureter, between the urogenital fascia and the hypogastric fascia. The Okabayashi paravaginal space is located beneath the end of the ureter, between the vagina and the urogenital fascia. Approval rate: 98.6% (70/71).

3.2.3.6. Obturator Space

3.2.3.6.1. Synonyms

Laterovascular space [117], lumbosacral space [133], medial psoas space [117].

3.2.3.6.2. Definition

The obturator space is located within the paravesical space. The medial boundary is the external iliac vessel, the lateral boundary is the iliac fascia and the genitofemoral nerve covering the psoas major muscle, the ventral boundary is the venae circumflexa ilium profunda, and the dorsal boundary is the furcation of the common iliac artery (Figure 27) [134].

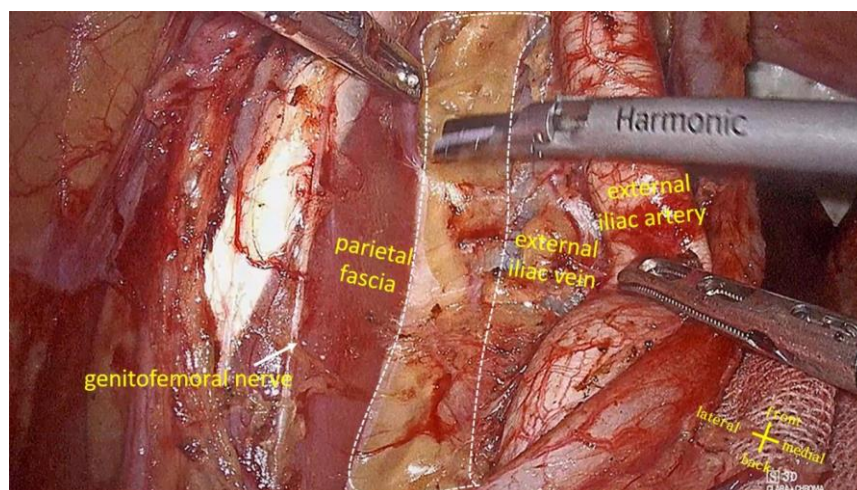


Fig. 27. Anatomy of the obturator space (Contributed by Moubin Lin).

Note: the white dotted line is the obturator gap.

3.2.4. Others

3.2.4.1. Anococcygeal Body, Anococcygeal Ligament (A04.5.04.016)

3.2.4.1.1. Synonym

Hiatal ligament [135].

3.2.4.1.2. Definition

The connective tissue behind the anal canal connecting the tailbone to the anal canal [11].

3.2.4.1.3. Annotation

Most classical anatomical monographs believe that the anococcygeal ligament is located on the dorsal side of the musculus levator ani [4-7], but Gray's Anatomy shows different illustrations of the anococcygeal

ligament. Thus, anococcygeal ligaments are depicted in different places on the ventral or dorsal side of the musculus levator ani [3]. Recent views tend to divide the procycaudal ligaments into two parts: the ventral part and the dorsal part. The ventral part is thick and loose, located between the anterior sacral fascia and the associative longitudinal muscle. The dorsal part is thin and dense, located between the tailbone and the external sphincter [136]. However, some Japanese scholars habitually call the ventral part of the anococcygeal ligament the Hiatal Ligaments [137]. The Hiatal ligament is not a real ligament, but a part of the longitudinal rectal muscle, and is that the longitudinal rectal muscle separates into fan-shaped muscle fiber bundles before passing through the levator ani hiatus and is attached and fixed to the levator ani muscle. These muscle bundles are the thickest at the 6 o'clock and 12 o'clock directions, and are actually the rectococcygeus and recto-urethralis, respectively [138]. The naming of the rectococcygeus and recto-urethralis incorporates the anatomical location and tissue composition to avoid ambiguity (Figure 28).

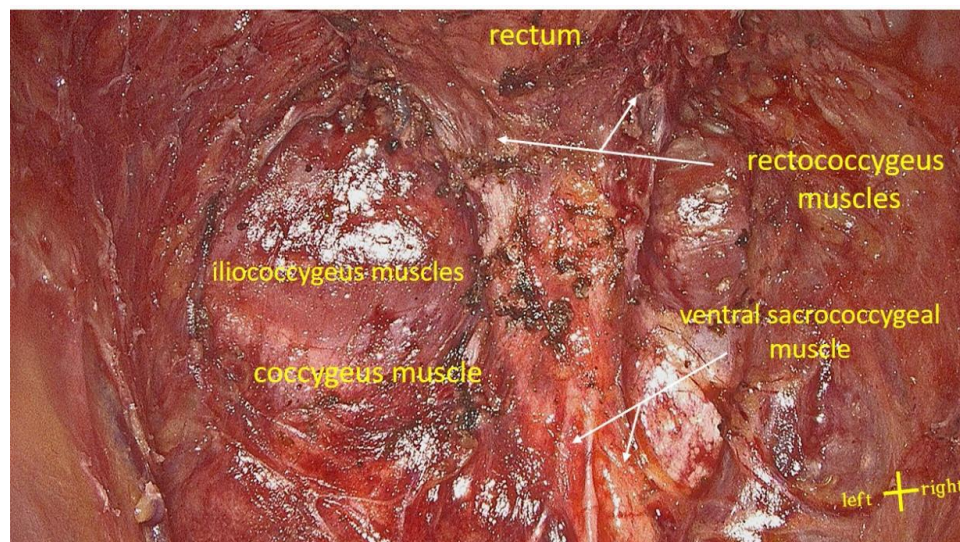


Fig. 28. Anatomy of the ventral anococcygeal ligament (rectococcygeus muscle) (Contributed by Lingyu Sun).

3.2.4.1.4. Recommendation 25

The so-called ventral anococcygeal ligament is composed of the ventral sacrococcygeal muscle and the rectococcygeus muscle. The ventral sacrococcygeal muscle extends from the sacrum to the coccyx, and the rectococcygeal muscle extends from the coccyx to the rectal wall. The generalized Hiatal ligament includes the rectococcygeus behind the rectum and the recto-urethralis in front, both of which are composed of smooth muscle. It is recommended to abandon the names of Hiatal ligament and ventral anococcygeal ligament. Approval rate: 87.3% (62/71).

3.2.4.2. Mesometrium (A10.1.02.506)

3.2.4.2.1. Definition

The broad ligament of the uterus can be divided into the mesosalpinx above, the mesovarium behind, and the mesometrium below. The

mesometrium is the largest part of the broad ligament, extending from the pelvic floor to the ovarian ligament and the body of the uterus, with the uterine artery passing between its two layers of peritoneum [139].

3.2.4.2.2. Annotation

The introduction of total mesometrial resection (TMMR) completely changed the classical concept of mesometria [140]. The mesometrium is divided into two parts, the vascular mesometrium and the ligamentous mesometrium, which extends dorsolateral and includes the blood vessels, lymphatic vessels, lymph nodes, and loose connective tissue of the uterus and vagina. The ligamentous mesometrium is a three-dimensional dense connective tissue that extends dorsally and downwardly, and appears as a horseshoe in cross section. The ligamentous mesometrium is adjacent to the mesorectum and appears as an arc covering the anterolateral side of the mesorectum and then connects with the coccyx. The muscle surface is continuous with the

intrapelvic fascia on the surface of the coccygeus muscle. The ligamentous mesometrium is actually the posterior layer of the broad

ligament, the rectouterine ligament, the rectovaginal ligament, and the rectovaginal septum in traditional anatomy (Figure 29) [140-142].

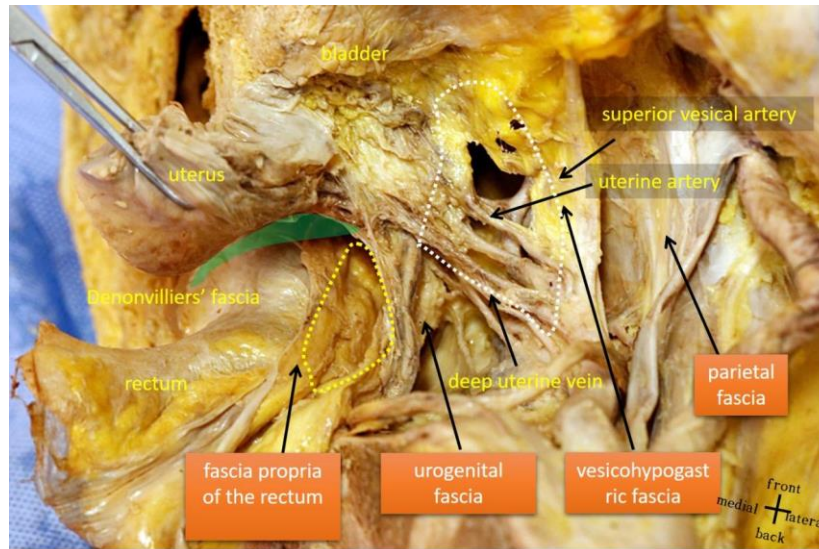


Fig. 29. Anatomy of vascular mesometrium and ligamentous mesometrium (Contributed by Moubin Lin).

Note: the yellow dotted line is the ligamentous mesometrium and the white dotted line is the vascular mesometrium.

3.2.4.3. Mesorectum

3.2.4.3.1. Definition

The surrounding fat of the rectum and its blood vessels, nerves and lymph are wrapped by fascia to form an "envelope"-like anatomical structure called the mesorectum [3].

3.2.4.3.2. Annotation

Mesentery was first proposed by Maunsell *et al.* [143]. Although it does not meet the anatomical definition of mesorectum, nor is it included in

Terminologia Anatomica. However, due to the widespread clinical use of the TME proposed by Heald, mesorectum has become a widely accepted clinical anatomical term. Classic anatomy believes that the rectovesical (vaginal) septum and the visceral fascia (pre-hypogastric nerve fascia, visceral layer of urogenital fascia) constitute the anatomical form of the mesorectum [26, 61]. In recent years, it has been found that the fascia propria of the rectum and the visceral fascia are actually two different fascia layers, thus changing the understanding of the anatomical morphology of mesorectum (Figures 16 & 30) [32].

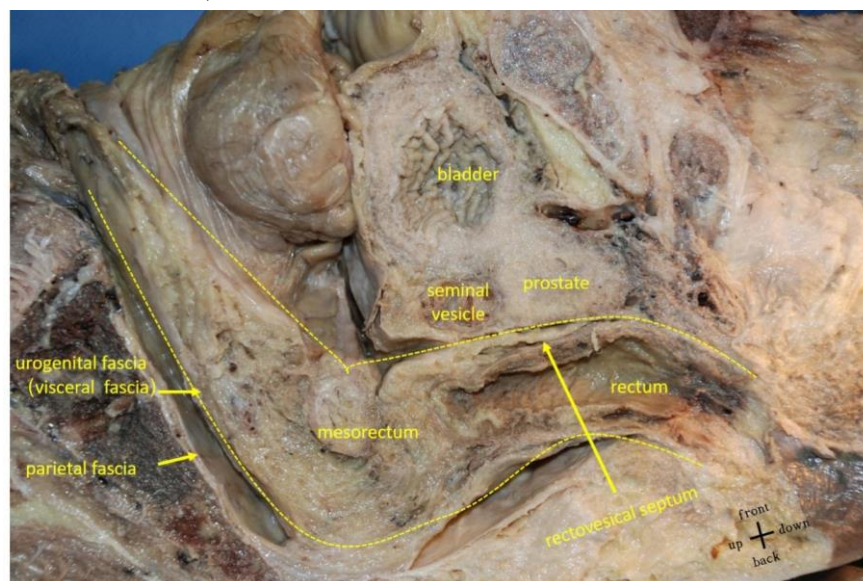


Fig. 30. Anatomy of the mesorectum according to traditional anatomy (Contributed by Moubin Lin).

3.2.4.3.3. Recommendation 26

The mesorectum is an "envelope-like" structure wrapped by the fascia propria of the rectum, and contains related blood vessels, lymphoid tissue, nerves, fat and other tissues. The fascia propria of the rectum continues with the colonic fascia cranially and fuses with the pelvic parietal fascia caudally. Approval rate: 94.4% (67/71).

Acknowledgements

Thanks to the following experts who participated in the writing and discussion: Gong Chen (Sun Yat-sen University Cancer Center); Jingbo Chen (Shandong Provincial Qianfoshan Hospital); Wenping Chen (Xi'an Daxing Hospital); Yuanguang Chen (The First Affiliated Hospital of Guangzhou Medical University); Zhifen Chen (Fujian Medical University Union Hospital); Zhaocheng Chi (Jilin Cancer Hospital); Dechang Diao (Guangdong Provincial Hospital of Chinese Medicine); Ruoxu Dou (The Fifth Affiliated Hospital of Sun Yat-sen University); Peng Du (Xinhua Hospital Affiliated To Shanghai Jiaotong University School of Medicine); Wei Fu (The Affiliated Hospital of Xuzhou Medical University); Junyi Han (Shanghai East Hospital of Tongji University); Ping Huang (Sir Run Run Hospital, Nanjing Medical University); Jianzheng Jie (China-Japan Friendship Hospital); Hangyu Li (The Forth Affiliated Hospital of China Medical University); Jianwen Li (Ruijin Hospital Shanghai Jiaotong University School Of Medicine); Jun Li (Guang'anmen Hospital, China Academy of Chinese Medical Sciences); Ming Li (Peking University Shougang Hospital); Shaotang Li (The First Affiliated Hospital of Wenzhou Medical University); Xinxiang Li (Fudan University Shanghai Cancer Center); Xinyu Li (Quanzhou First Hospital); Guole Lin (Peking Union Medical College Hospital); Qian Liu (Cancer Hospital, Chinese Academy of Medical Sciences); Jihui Luo (People's Hospital of Hunan Province); Feng Sun (The First Affiliated Hospital, Guangzhou University of Traditional Chinese Medicine); Yi Sun (People's Hospital of Tianjin); Deyan Tan (Department of Anatomy, Histoembryology, School of Basic Medical Sciences, Fudan University); Erjiang Tang (Yangpu Hospital Affiliated to Tongji University); Xin Wang (Peking University First Hospital); Hao Wang (Naval Medical University, Changhai Hospital); Kai Wang (The Affiliated Hospital of Xuzhou Medical University); Liming Wang (Shenzhen Hospital, Chinese Academy of Medical Sciences Cancer Hospital); Quan Wang (First Affiliated Hospital of Jilin University); Yanan Wang (Southern Medical University Nanfang Hospital); Zheng Wang (Union Hospital, Tongji Medical College, Huazhong University of Science and Technology); Yongyou Wu (The Second Affiliated Hospital of Soochow University); Jianbin Xiang (Fudan University Huashan Hospital); Zhongshi Xie (China-Japan Union Hospital of Jilin University); Danfeng Xu (Ruijin Hospital Shanghai Jiaotong University School Of Medicine); Dong Xu (Second Affiliated Hospital, Zhejiang University School of Medicine); Yanchang Xu (Putian First Hospital); Su Yan (Qinghai University Affiliated Hospital); Dongdong Yang (Fourth Affiliated Hospital of Harbin Medical University); Liu Yang (Jiangsu Cancer Hospital); Lu Yin (Tenth People's Hospital of Tongji University); Xiangyang Yu (Tianjin Nankai Hospital); Hong Zhang (Shengjing Hospital of China Medical University); Jianping Zhang (Second Affiliated Hospital of Nanjing Medical University); Jian Zhang

(Naval Medical University, Changzheng Hospital); Ren Zhao (Ruijin Hospital, Shanghai Jiaotong University School Of Medicine); Zongheng Zheng (Sun Yat-sen University Third Affiliated Hospital); Xiaojun Zhou (The First Affiliated Hospital of Soochow University); Yuping Zhu (Zhejiang Cancer Hospital); Ping Zhu (Traditional Chinese Medicine Hospital of Jiangsu Province). The authors also thank Jiaqi Wang (Yangpu Hospital Affiliated to Tongji University) and Huihong Jiang (Yangpu Hospital Affiliated to Tongji University) for their contributions in the preparation of the article, and Chang Le (The Second People's Hospital of Changzhou City) for his contribution in drawing the anatomical drawings.

Conflicts of Interest

None.

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