Clinical Anatomy of the Groin: Posterior Laparoscopic Approach

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In-depth knowledge of groin anatomy is essential for a successful inguinal hernia operation. Sir Astley Paston Cooper postulated in 1804, “No disease of the human body, belonging to the province of the surgeon, requires in its treatment, a better combination of accurate, anatomical knowledge with surgical skill than hernia in all its varieties” [1]. While Bassini helped to elucidate the anatomy of the anterior inguinal canal in 1884 [2] ushering in the modern era of safe and effective hernia repair, understanding of the posterior canal remained limited. W.J. Lytle reported in1945, “The operating surgeon knows little of the posterior wall of the inguinal canal, so well is it hidden from his view” [3]. In the early 1990s, laparoscopic approaches to the inguinal canal emerged. However, the posterior anatomy of the groin remained poorly understood and the laparoendoscopic view of this region was virtually unknown to most surgeons [4]. The adoption of this novel and exciting technique without a firm anatomic understanding resulted in several intra- and postoperative complications including vascular, visceral, and nerve injuries as well as high recurrence rates. Detailed study of the posterior anatomy, continuous technical refinements into well-standardized modern laparoscopic techniques, and unparalleled in vivo visualization of this region have transformed laparoscopic inguinal hernia repair into a safe, reproducible, and successful operation providing an ideal repair for all variants of groin hernias.

The basic anatomical principles of laparoscopic herniorrhaphy were first described by Spaw in 1991 based on human cadaveric dissections [4]. He coined the term “triangle of doom” delineating the region between the vas deferens and the spermatic vessels. In this triangle, the external iliac artery and vein are hidden under the peritoneum and transversalis fascia, and major vascular injury is possible with improper dissection. In his description, Spaw did not specifically consider the neuroanatomy of the preperitoneal space [4]. He described that “suturing or stapling of synthetic materials should be performed lateral to the spermatic vessels along the abdominal wall” leading to serious neuropathic consequences for many patients. Rossner was the first to describe the inguinal neuroanatomy as it pertains to posterior inguinal hernia repair in 1994 roughly delineating the anatomical course of the inguinal nerves [5]. Seid and Amos provided a more precise description of the nerves [6] postulating that the “triangle of doom” should be extended further laterally to the anterior superior iliac spine. The authors introduced the term “trapezoid of disaster” describing that in addition to potential injury to the major vessels within the triangle of doom, nerves (n. femoralis, n. genitofemoralis, n. cutaneous femoris lateralis, n. ilioinguinalis, and n. iliohypogastricus) located lateral to the testicular vessels within the “triangle of pain” were also at risk [7, 8]. The most comprehensive analysis of the posterior inguinal anatomy was given by Annibali [7, 8] including the fascial structures, vessels, and nerves. Recently very detailed descriptions of the course of the nerves and their variations have been published by Rosenberger [9], Loeweneck [10], and Reinpold [11] adding to our understanding of this anatomy.

The aim of the following chapter on groin anatomy is to translate this detailed knowledge of cadaveric anatomy and extensive clinical experience into relevant surgical anatomy that will optimize operative technique and outcomes of inguinal hernia repair:

1.1 The First View to the Groin After Introducing the Laparoscope: Peritoneal Landmarks

The initial laparoscopic view of the groin will identify five peritoneal folds (plicae) (Fig. 1.1) which serve as guiding landmarks when opening the peritoneum. The plica umbilicalis mediana (median umbilical ligament) found in the midline contains the obliterated urachus. It is less distinct but fortunately less clinically relevant to inguinal hernia repair. The medial umbilical plica (medial umbilical ligament) is the most prominent landmark seen on initial transabdominal inspection. This plica is easily recognized and contains the remnant umbilical vessels. The medial umbilical plica should not be routinely cut because the umbilical vessels may still be patent causing bleeding. If extension of the peritoneal incision is necessary, the cut should be continued cranially and parallel to the plica avoiding this problem.

The lateral umbilical ligament may be difficult to identify from this view, but its recognition is the most important of the plicae. This ligament contains the inferior epigastric vessels which divide

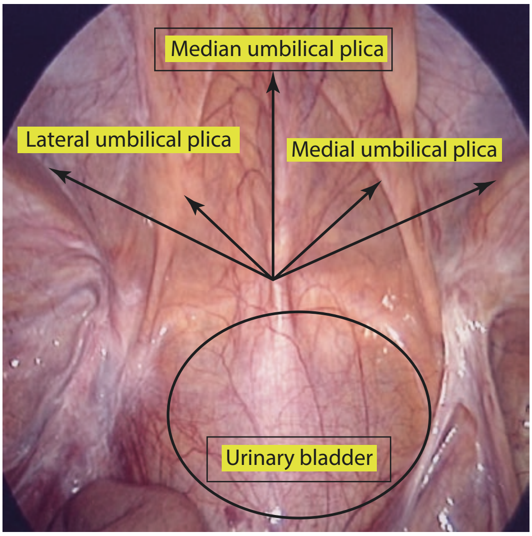


Fig. 1.1 Five peritoneal folds (plica)

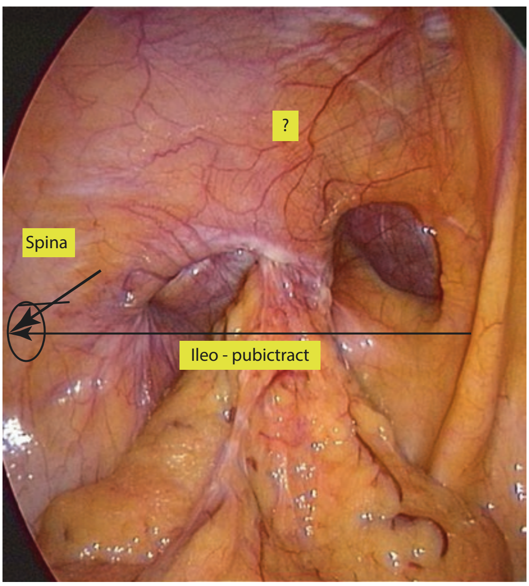


Fig. 1.2 Recurrent hernia. Lateral plica is difficult to identify (?)

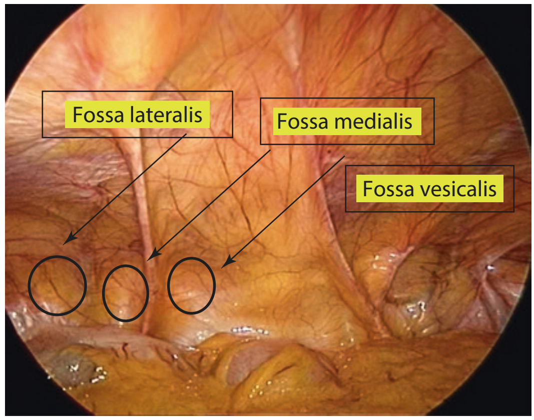


Fig. 1.3 Three flat fossae

the groin in a medial (space of Retzius) and a lateral (space of Bogros) compartment. Depending on the patient's body habitus and fat distribution, the lateral ligament may not be readily visualized laparoscopically (Fig. 1.2). However, the epigastric vessels should always be preserved, and careful assessment of the anatomy prior to dissection of the peritoneal flap is an essential operative step. External palpation of the surface anatomy allows for precise localization of the anterior superior iliac spine and pubic tubercle, thereby delineating the ileo-pubic tract that divides the groin into an upper and a most critical lower part (Fig. 1.2). The ileo-pubic tract which corresponds to the inguinal ligament seen in open surgery is therefore one of the most important landmarks and should always be identified. The inferior epigastric vessels are found approximately at the midpoint of the tract, and careful dissection in this region will prevent injury.

In addition to the five plicae, three flat fossae are recognizable on each side, corresponding with possible hernia defects (Fig. 1.3). The lateral fossa, located in the triangle between the lateral umbilical ligament and the ileo-pubic tract, corresponds to the location of the internal ring from which a lateral (indirect) inguinal hernia originates. The medial fossa is located between the lateral and the medial umbilical ligament and is inferiorly limited by the ileo-pubic tract (Fig. 1.4a). A direct hernia will be found in this region passing through Hesselbach's triangle. The third fossa (vesicalis) is located medial to the medial umbilical ligament and cranial to the ileo-pubic tract, pubic bone, and urinary bladder. Rare defects in this point of weakness may be the origin of a so-called supravesical hernia (Fig. 1.4b, c). A fourth location where a hernia may develop is within the region of the femoral canal, the triangle below the ileo-pubic tract, medial to the femoral vein and superior to the pubic bone and Cooper's ligament. A hernia present in this region can be more easily diagnosed by laparoscopy (Fig. 1.4d) compared to the totally extraperitoneal technique or open surgery.

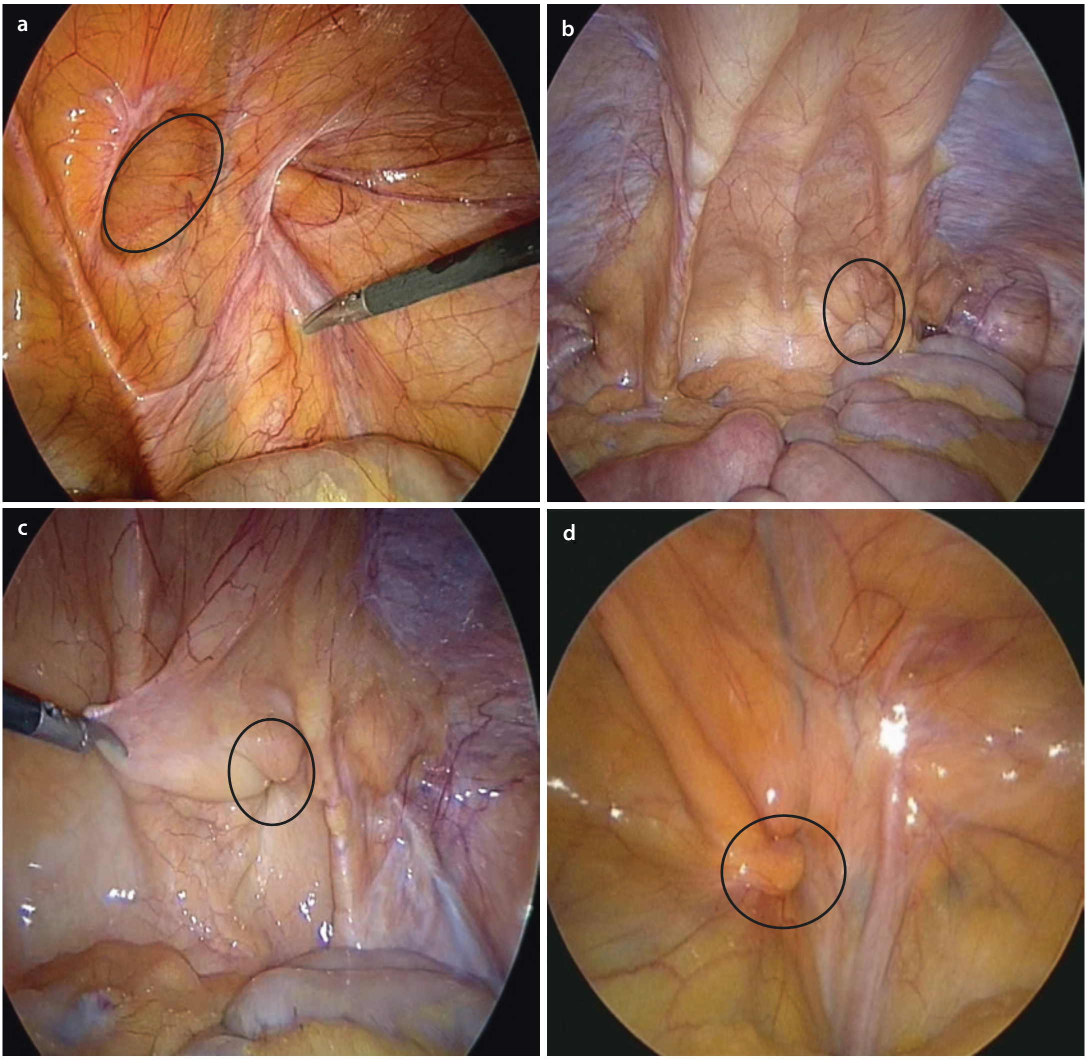


Fig. 1.4 Hernia localizations. **a** Medial and lateral hernia. **b** Supravesical hernia. **c** Supravesical hernia, partially reduced. **d** Femoral hernia

1.2 Anatomic Structures of the Preperitoneal Space: View After Creation of the Peritoneal Flap in TAPP or Total Extraperitoneal (TEP) Dissection Plane

1.2.1 Transversalis Fascia and Preperitoneal Space

Initial laparoscopic inguinal repairs utilized intraperitoneal onlay mesh (IPOM) techniques to cover inguinal hernia defects. This led to high recurrence rates and complications because of the inability to safely and securely fixate the mesh in this location rendering it "a boat in a rough sea." To address this limitation, mesh was placed within the preperitoneal space in direct apposition to the muscular, tendinous, and bony structures of the posterior abdominal wall and pelvis. The preperitoneal space lies between the peritoneum internally and the transversalis fascia externally. Within the preperitoneal space is a variable quantity of adipose tissue, loose areolar connective tissue, and membranous tissue [12]. The transversalis fascia is perhaps the most important fascial structure in the groin as it is involved in both the development of a hernia as well as its treatment.

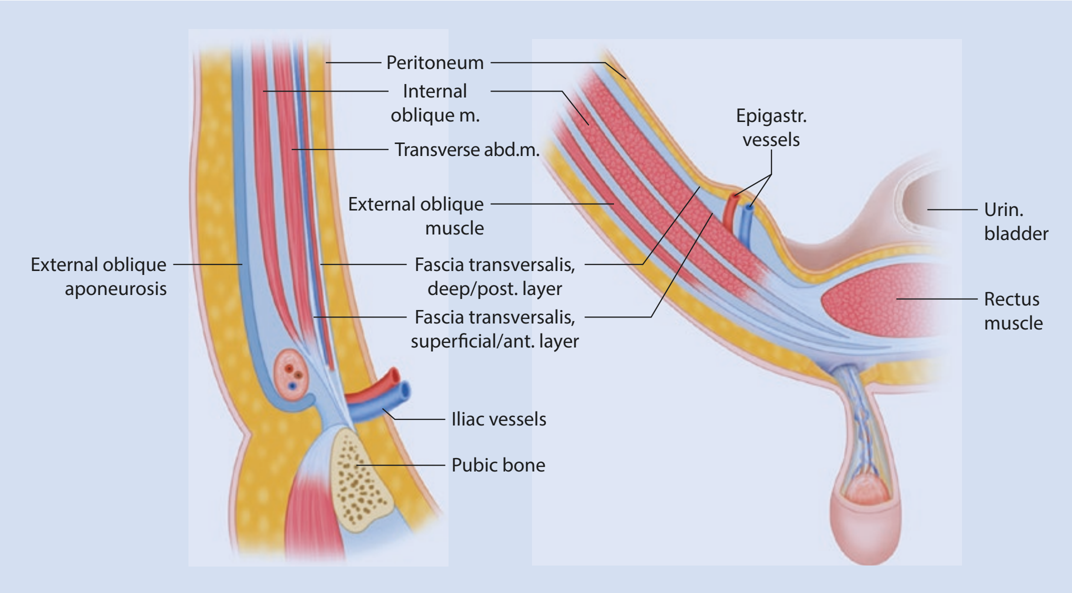


Fig. 1.5 **a**, **b** Schematic representation of the planes of the abdominal wall in the inguinal region (Modified according Colborn and Skandalakis [15])

Cooper originally described the transversalis fascia as a bilaminar structure with a strong anterior layer and a membranous deep layer [1] with the epigastric vessels lying between. However, the question whether the transversalis fascia is bilaminar or whether the "deep/posterior lamina" is simply a significant regional condensation of extraperitoneal connective tissue ("extraperitoneal fascia") [13, 14] is still unresolved [15]. Both structures appear strong and difficult to break through especially in the young patient with an indirect hernia. The deep membranous layer (extraperitoneal fascia) divides the preperitoneal space into a visceral and a parietal compartment. Mirilas and Skandalakis [16] describe this membranous septum as creating a second internal ring and separating the planes (Fig. 1.5a, b).

The parietal compartment contains the epigastric vessels and numerous small tributaries and may be associated with troublesome bleeding during dissection. The genitofemoral and lateral femoral cutaneous nerves also travel within this compartment, and over-dissection resulting in "naked" nerves should be avoided to prevent perineural scarring and direct contact with mesh. The visceral compartment is avascular and dissection should proceed in this plane. Understanding this anatomic distinction will greatly facilitate proper dissection, ease of developing the correct preperitoneal plane, and help to prevent vascular, nerve, and mesh complications [17]. Despite numerous cadaveric studies, the nature of the transversalis fascia is still a source of controversy for surgeons and anatomists [17, 18]. According to our clinical experience with more than 16,000 laparoscopic hernia repairs, two reasons may be responsible for the continuing uncertainties: (1) There is great individual variability in its topographic occurrence and strength, and (2) whereas medial to the epigastric vessels the bilaminar structure is recognizable in most patients (Fig. 1.6a, b), medially, its identification may be difficult. In some patients, especially with obesity, adipose tissue and small vessels may occupy the preperitoneal space making it difficult to clearly delineate the compartments medially. Lateral to the epigastric vessels, the deep layer is less discrete and closely related to the anterior lamina. In contrast to the medial compartment, the dissection plane is immediately in front of the deep lamina. Therefore, because it is easier to find and separate the correct plane in this region, it is recommended to start with the dissection of the groin at the lateral aspect at the level of the anterior superior iliac spine (Fig. 1.7a, b). After making a generous peritoneal incision, most of the preperitoneal dissection can be safely and efficiently performed by bluntly sweeping away the peritoneum and fatty tissue from the

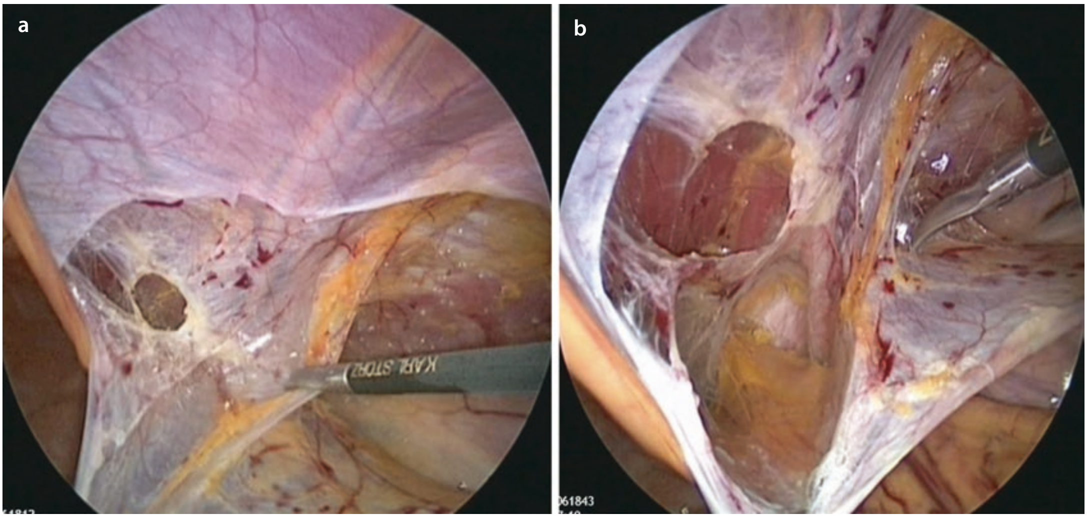


Fig. 1.6 **a** Superficial and deep layer of transversalis fascia medially. **b** Superficial layer of transversalis fascia after breaking through the deep layer

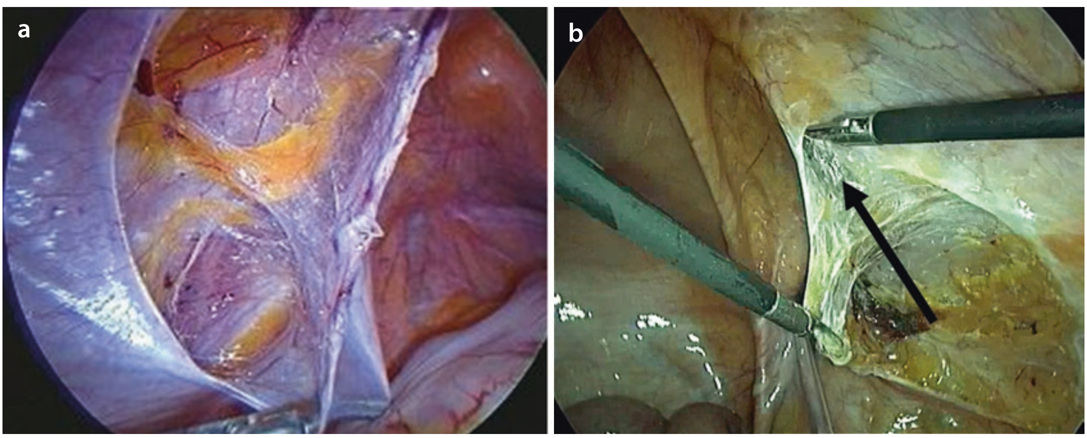


Fig. 1.7 **a** Deep layer of the transversalis fascia. **b** Access to the visceral laterally compartment from lateral-caudal. The deep layer of the transversalis fascia is protected

abdominal wall covered by the transversalis fascia. However, when crossing the epigastric vessels in order to dissect the medial compartment, it is necessary to break through the deep layer to approach the rectus muscle and the symphysis.

Medially, both laminae of the transversalis fascia insert inferiorly on the ligament of Cooper. Laterally, its course is less clear. Around the internal inguinal ring, the deep fibers may envelop the cord structures and contribute at least partially to the spermatic sheath as extensively described by Stoppa [19]. The morphology of the spermatic sheath is triangular with an anterior apex at the deep aspect of the inner inguinal orifice and a posterior medial base. The vas deferens makes up its medial border while the spermatic vessels delineate the lateral border. The base of the sheath disappears beneath the retracted peritoneal sac when parietalization is performed [19]. Additionally, the spermatic sheath covers the external iliac vessels which reside just deep to the triangle. Although the origin of this sheath is not clearly defined – prolongation of the urogenital fascia as Stoppa [19] suggested or a continuation of the deep layer of the transversalis fascia – for the surgeon it is of essential importance to recognize this sheath and not to violate it when dissecting the pelvic floor, except at the level of the internal

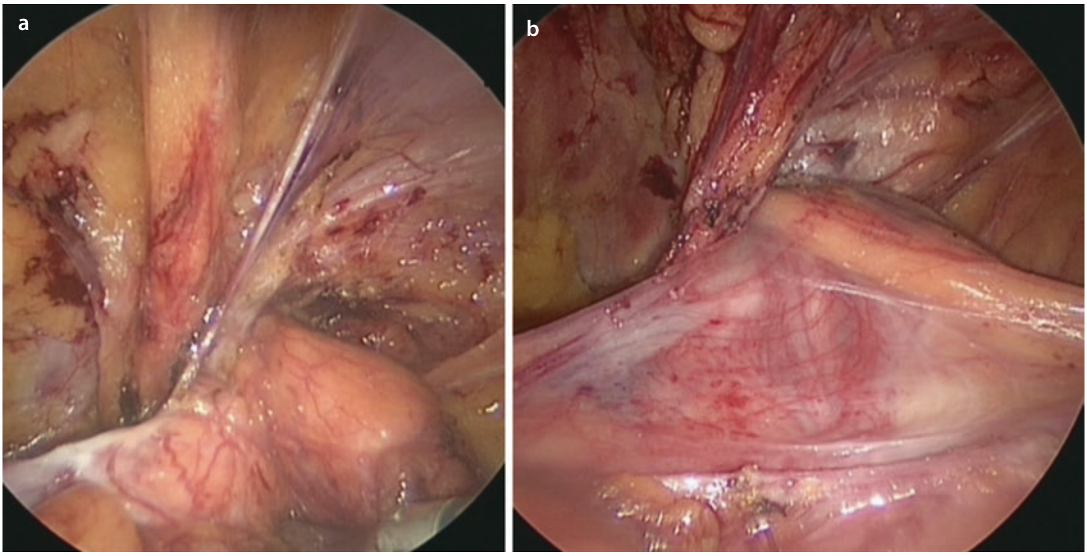


Fig. 1.8 **a** Transition of the deep layer of the transversalis fascia into the spermatic sheath (Stoppa). **b** The spermatic sheath is wrapping the cord structures

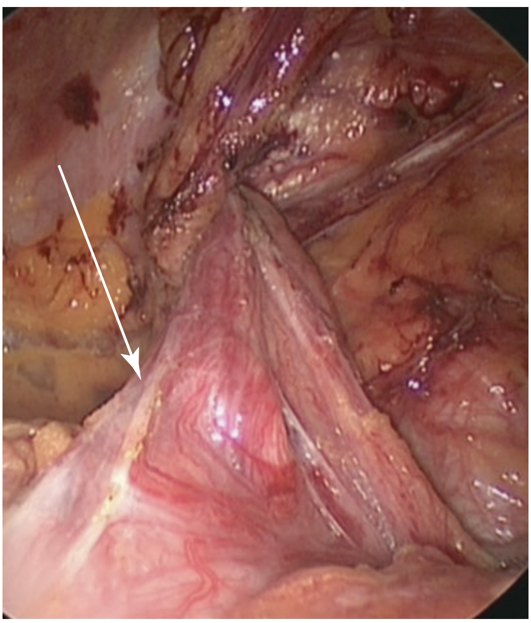


Fig. 1.9 The spermatic sheath is cut anteriorly to parietalize the hernia/peritoneal sac

inguinal ring anteriorly (Fig. 1.8a, b). With an indirect hernia, the sheath is opened at the ring to identify and reduce the hernia sac as well as when parietalizing the cord structures (Fig. 1.9).

According to Stoppa et al. [19], the sheath (deep layer of the transversalis fascia) joins the lateral wall of the iliac fossa and may be a part of the iliac fascia which covers the inguinal nerves.

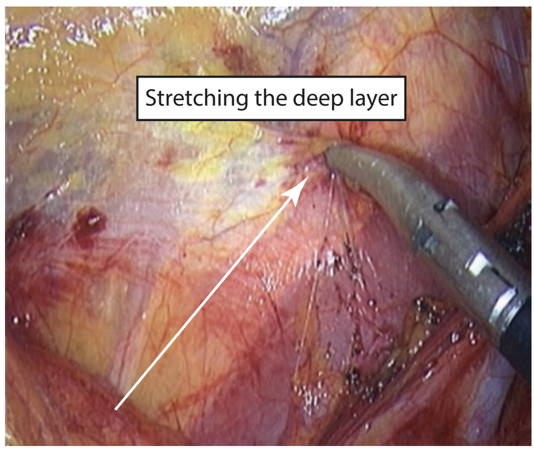


Fig. 1.10 The deep layer (extraperitoneal fascia) continues laterally into the iliac fascia which protects the nerve lying behind

In summary, the spermatic sheath (deep layer of the transversalis fascia) should be preserved during separation from the hernia/peritoneal sac (parietalization) because it protects the external iliac vessels and the nerves that are lying beneath (Fig. 1.10). The surgeon must preserve this important fascial layer for two reasons: (1) to avoid an injury to the vessels or the nerves during dissection and (2) to avoid direct contact between the nerves and mesh which may produce pain in the later postoperative period due to perineural scarring. For the same reason, implantation of a slitted mesh cannot be recommended as the integrity of the fascia will be destroyed and the nerves, spermatic vessels, and vas are all placed at risk.

1.2.2 Preperitoneal Space and the Vessels

The location and the course of the vessels remain fairly constant with a few common variations, and identification is typically straightforward. The inferior epigastric vessels are perhaps the most important landmark in the myopectineal orifice and are easily recognized even in obese patients (see above). It is important to recognize that in case a large hernia sac or a lipoma is present, the vessels may be dislocated medially (Fig. 1.11a, b). The epigastric vessels divide the myopectineal orifice into a medial and a lateral compartment. The proper dissection plane should be just in front of these vessels (from the posterior laparoscopic approach). When performing a TEP repair, creation of the preperitoneal space relies on this same dissection plane. With a dissecting balloon, the epigastric vessels should be above the plane of dissection before inflation and preserved against the abdominal muscles. With camera and manual dissection of this space, the areolar plane posterior to the epigastric vessels is developed separating the epigastric vessels from the peritoneum. The epigastric vessels originate from the external iliac vessels and may be surrounded by fatty tissue as well as lymph nodes. This tissue must be respected and not removed when dissecting the groin. The same consideration applies to the iliac vessels which are protected by the spermatic sheath. The iliac artery, located at the bottom of the pelvis and in the middle of the preperitoneal space, may be identified by following the epigastrics downward toward their origin (Fig. 1.12a, b). The iliac vessels may be accompanied by fatty tissue and lymph nodes and over-dissection may lead to bleeding, potential nerve injury, or lymphatic leakage. Preservation of the spermatic sheath will avoid these issues. The iliac vein is located posterior and slightly medial to the artery. It may be visualized during dissection of the groove in the triangle between the lower branch of the pubic bone, the iliac vessels, and the wall of the urinary bladder (Fig. 1.13).

Dissection of this region should be performed with special caution looking for the presence of a corona mortis, a vascular connection between the epigastric and obturator vessels. This variant, found in 20–30% of patients, is important because intraoperative bleeding from disruption can be difficult to control due to the dual vascular supply from the obturator and iliac vessels (corona mortis, Fig. 1.14). In case of bleeding from the corona mortis, control must be achieved from both sources of inflow. In this region, there may be several variants of anastomosing vascular branches between the pubic artery/vein and the epigastric and obturator vessels. These small vas-

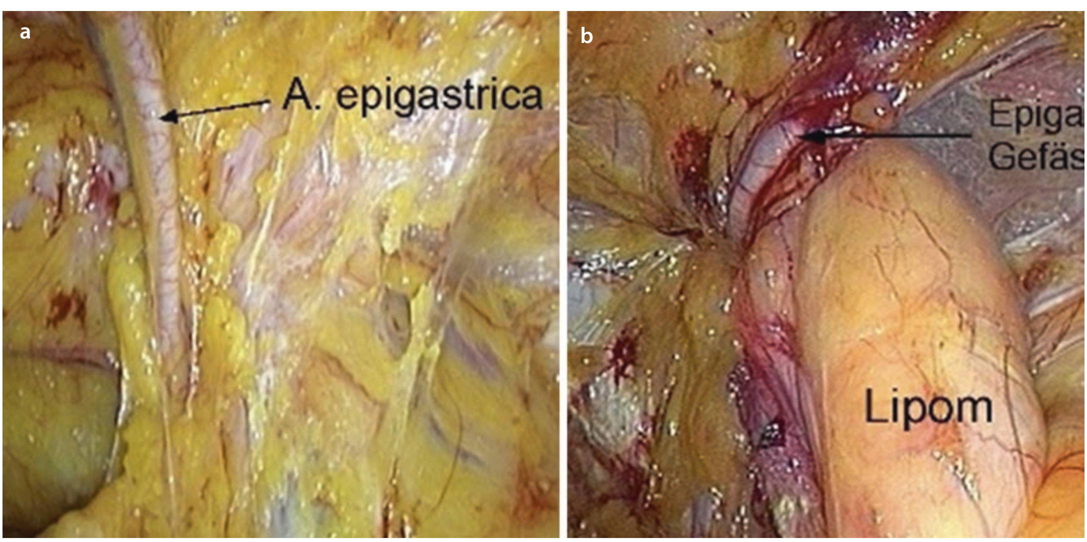


Fig. 1.11 **a** The epigastric vessels just after reduction of the peritoneum with the deep layer of transversalis fascia. **b** Epigastric vessels dislocated medially by a large lipoma

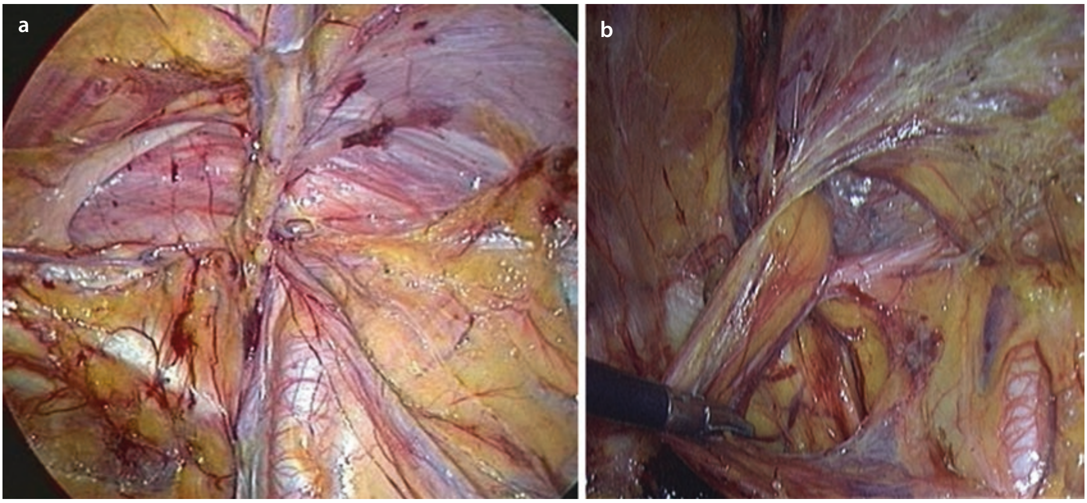


Fig. 1.12 **a** Pelvic floor after complete dissection. A. iliaca is visible directly in the middle. **b** A. iliaca dislocated laterally

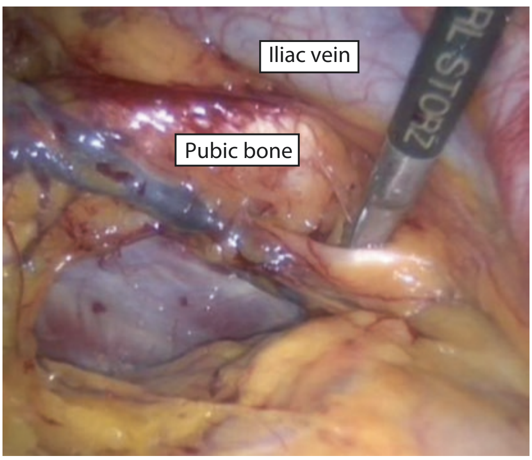


Fig. 1.13 Dissection of the "groove," exposing the obturator nerve and the iliac vein

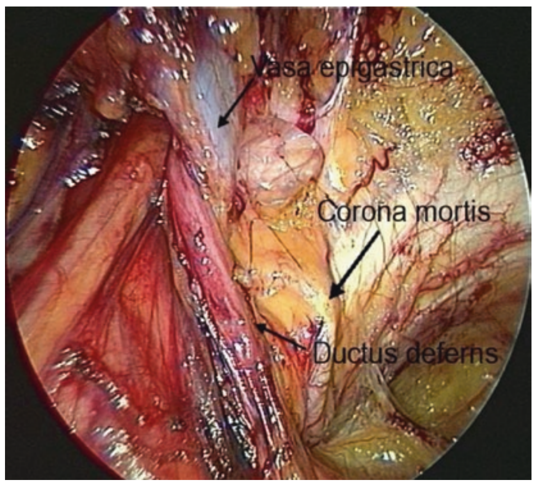


Fig. 1.14 Corona mortis

cular tributaries may form a network investing the pubic bone, Cooper's ligament, and the direct and femoral spaces (Fig. 1.15). From our clinical experience, these vessels and the underlying pubic bone are covered by a very thin membrane (deep layer of the transversalis fascia) which should not be disrupted.

The correct plane of dissection will preserve this membranous layer, and blunt dissection may be used to push away the urinary bladder developing the retropubic space for mesh placement. In special cases, e.g., recurrence after previous preperitoneal mesh repair, it may be necessary to continue the dissection downward to the urogenital space toward the origin of the remnant umbilical artery from the internal iliac artery (Fig. 1.16a, b). The vas traverses directly over the artery (Fig. 1.16a), and care should be taken when dissecting this region. The surgeon should be aware that the umbilical artery may be patent and, in the case of injury, bleeding may be profuse and difficult to control.

The testicular vessels are easily identifiable but can be most clearly defined at their caudal aspect between the external iliac vessels and the psoas muscle and course from caudal-lateral to cranial-medial. There are no significant vascular structures lateral to the testicular vessels. The testicular vessels meet the vas deferens at the apex of the triangle immediately at the entrance to internal ring. The vas deferens travels downward crossing the iliac vessels medially, following the "preperitoneal loop" (deep layer of the transversalis fascia [20]), but then changes its direction like a knee and dives down to the urogenital space to join the prostate gland. In order to complete the parietalization, it is important to cut this "preperitoneal loop" (Fig. 1.17)

1.2.3 Preperitoneal Space and Topographic Anatomy of the Nerves

The anatomy of the nerves located in the groin is extensively described by Rossner [5], Seid and Amos [6], Annibali et al. [7, 8], Rosenberger et al. [9], Loeweneck et al. [10], and recently by Reinpold et al. [11]. In total, six nerves are of interest in laparoscopic inguinal hernia repair and this neuroanatomy should be well understood by all surgeons. Anatomically, the n. hypogastricus and the n. ilioinguinalis are not involved in the dissection and repair planes utilized by laparoscopic hernia repair. These nerves have typically exited the retroperitoneum and entered into the anterior abdominal wall and inguinal canal lateral and superior to the anterior superior iliac spine. However, as a rule to the lumbar plexus neuroanatomy, there is tremendous anatomic variability especially progressing distally along the branches away from the spinal origin. In about 32% of cases, the course of the ilioinguinal nerve may be within the operating field and may be at risk dur-

Fig. 1.15 Network of pubic veins, protected by the deep layer of the transversalis fascia

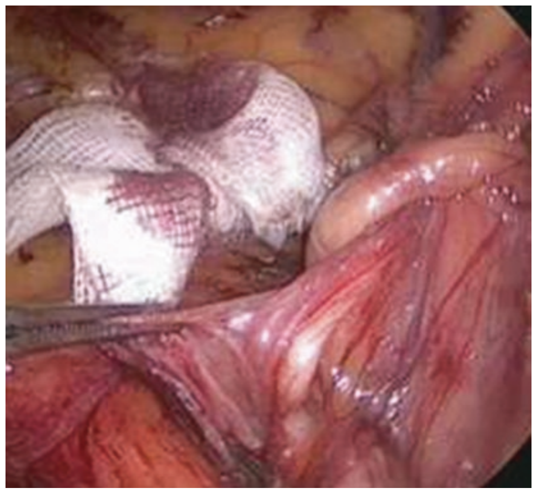


Fig. 1.17 The vas is riding on the preperitoneal loop which must be cut for complete parietalization [20]

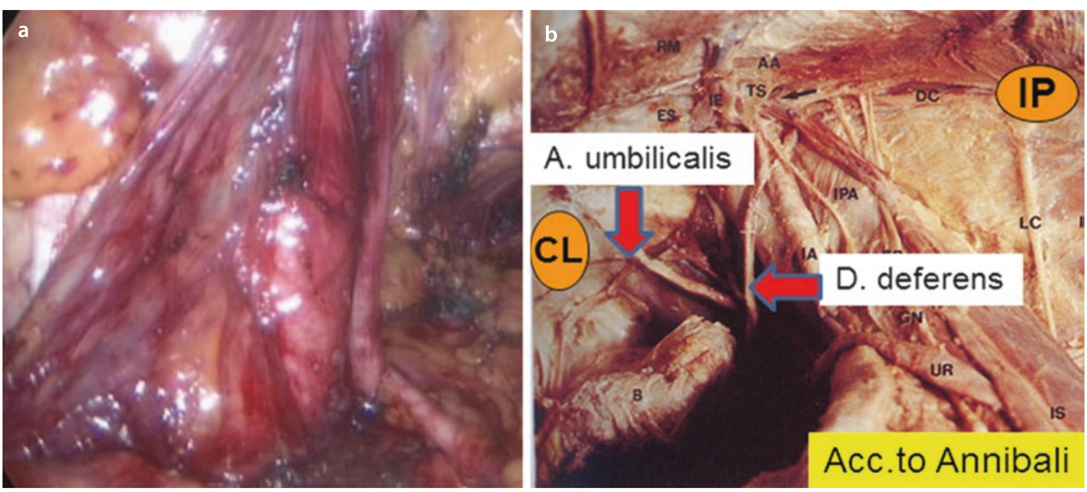


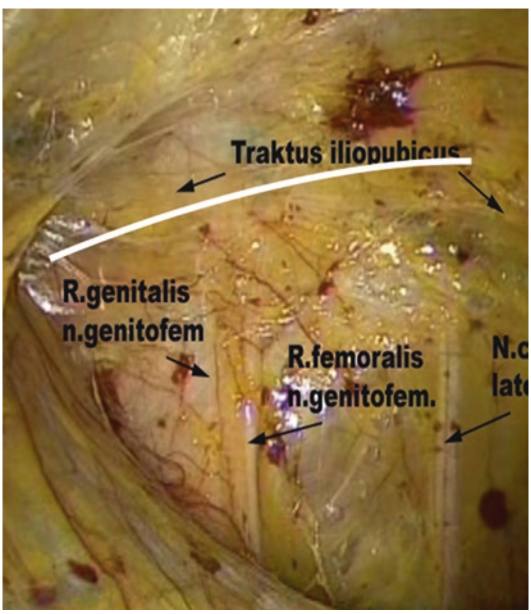
Fig. 1.16 a Remnant A. umbilicalis in situ, coming out of the internal iliac artery. b A. umbilicalis in cadaveric dissection

ing the placement of staples in the neighborhood of the anterior superior iliac spine (Rosenberger).

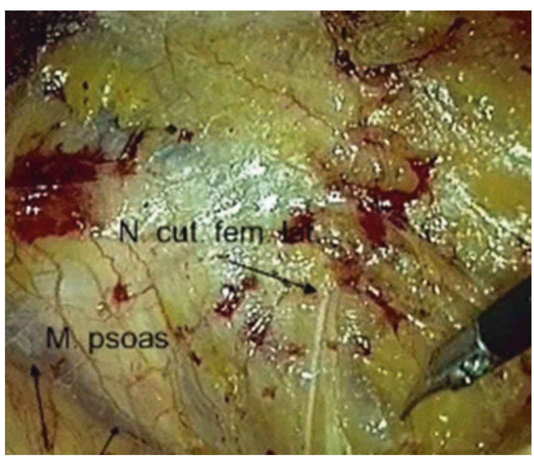
The femoral nerve, which arises from the dorsal branches of the ventral rami of the second, third, and fourth lumbar nerves, is located just lateral to the iliac vessels and lateral and beneath the testicular vessels. This is usually well protected by the psoas tendon, surrounding fatty and lymphatic tissue, and spermatic sheath or iliac fascia. Therefore, injury to this nerve is extremely rare during laparoscopic hernia repair. According to Loeweneck, damage of this nerve was seen in only 1.2% of all nerve injuries reported. Reported injury to the obturator nerve is rare and anecdotal as it shares the same origin as the femoral nerve and is well hidden deep in the triangle between the pubic bone and the iliac vessels (◘ Fig. 1.13) behind the vessels. The more common nerve injuries seen with laparoscopic inguinal repairs are lesions of the genitofemoral nerve and lateral femoral cutaneous nerve (◘ Fig. 1.18). However, in total in large series, the frequency of damage to these nerves is not higher than 0.3% [21, 22]. Nevertheless, each of these complications should be taken seriously, as it can have disastrous consequences for the patient. Intractable pain may arise when nerves are injured, clipped, tacked, or scarred to mesh. Therefore, precise knowledge of the topography of these nerves is essential to perform a high quality repair with optimal patient outcomes. While the course of the obturator and femoral motor nerves is largely predictable and constant, the course of the sensory nerves (genitofemoral and lateral femoral cutaneous) demonstrates great variability.

Most at risk during laparoscopic hernia repair are the lateral femoral cutaneous nerve (58.2% of all nerve lesions) and the femoral branch of the genitofemoral nerve (31.2% of all nerve lesions). Injury to the genital branch of the genitofemoral nerve comprises 4.7% of all published nerve lesions. The lateral femoral cutaneous nerve arises from the dorsal divisions of the second and third lumbar nerves. It emerges from the lateral border of the mid-psoas muscle and crosses the iliacus muscle obliquely traveling toward the anterior superior iliac spine. It then passes under the inguinal ligament, through the lacuna musculorum and then over the sartorius muscle into the thigh, where it divides into an anterior and a posterior branch. The anterior branch becomes superficial about 10 cm below the inguinal ligament and divides into branches which are distributed to the skin of the anterior and lateral parts of the thigh reaching as far as the knee.

The posterior branch supplies the skin from the level of the greater trochanter to the middle of the thigh. Intraoperatively, the surgeon should be aware that the lateral femoral cutaneous nerve will typically cross the middle of the operating field, but the majority (57%) demonstrates variability from the normal course. Single (44%), double (23%), or multiple nerve trunks may be identified (◘ Fig. 1.19). The point of exit where the nerve penetrates the abdominal wall is typically lateral to the



◘ **Fig. 1.18** Triangle of pain. The nerves are protected by the deep layer of transversalis fascia



◘ **Fig. 1.19** Two branches of the cutaneous lateral femoral nerve

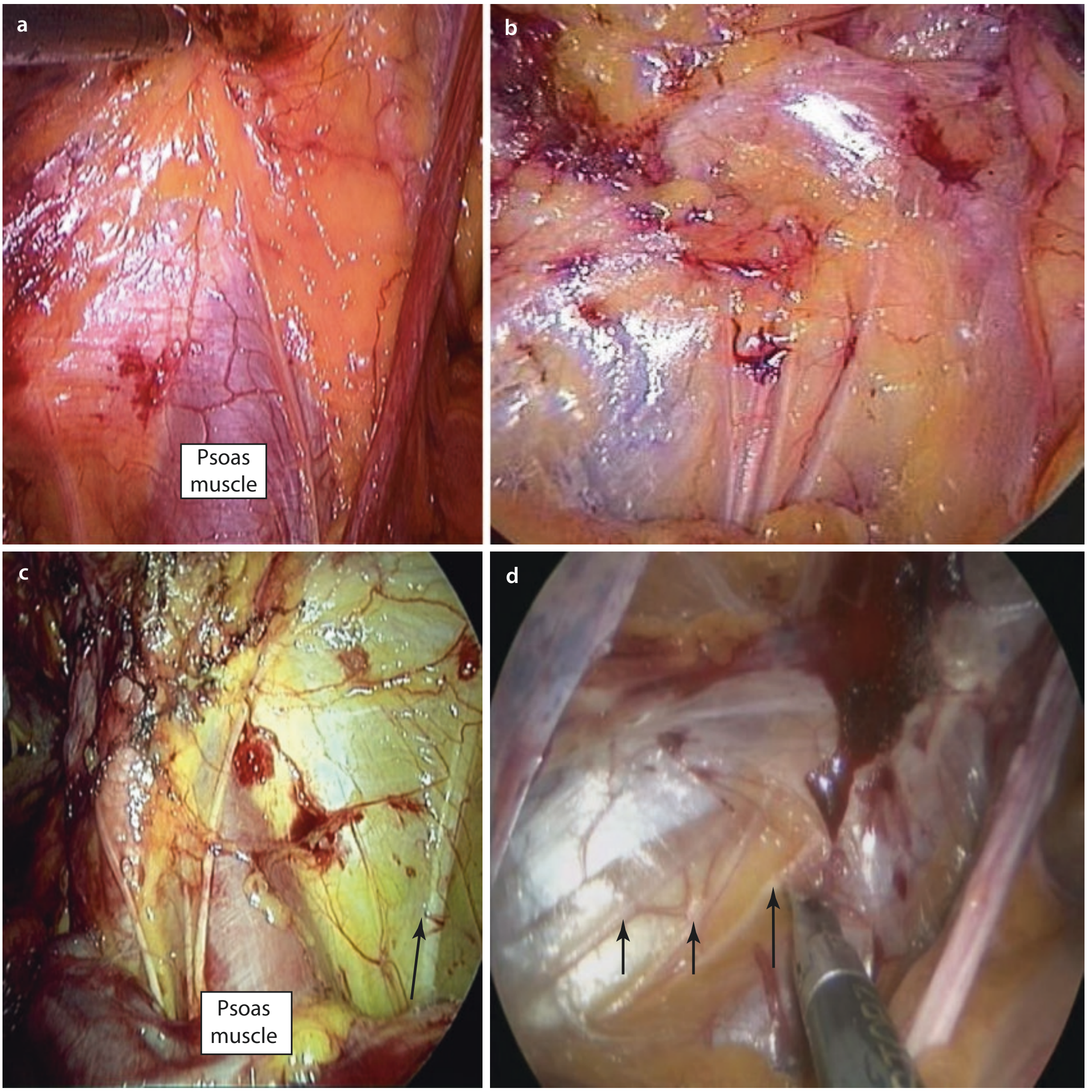


Fig. 1.20 **a** Only one branch of the genitofemoral nerve is visible. **b** Four branches of the genitofemoral nerve are visible protected by the deep layer of transversalis fascia. **c** Three branches of the genitofemoral nerve are visible. Laterally the n. cut. fem. lat. is visible (*arrow*). **d** Three branches of the genitofemoral nerve are visible

field 2–4 cm medial to the anterior superior iliac spine at the level of the ileo-pubic tract. However, this exit point also demonstrates significant variability and may be found up to 6 cm medially (only 3 cm lateral to the inner inguinal ring) and in 7% of the cases may even exit lateral and cranial to the anterior superior iliac spine [9]. The genitofemoral nerve arises from the upper L1–2 segments of the lumbar plexus. It passes downward and emerges from the anterior surface of the psoas major muscle. The nerve continues on the surface of the psoas muscle progressing caudally toward the inguinal canal and divides into two branches, the genital branch and the femoral branch (Fig. 1.18).

In men, the genital branch continues down and supplies the scrotal skin. In women it accompanies the round ligament and supplies the mons pubis and the labia majora. Wide variation in the course of this nerve are seen. In contrast to classically described anatomy, the genital branch runs through the inguinal canal in only 14% of cases. In 44% of cases, it consists of two to five branches (Fig. 1.20a–d); in 49% of the cases, the nerve perforates the abdominal wall 1–3 cm lateral to the deep inguinal ring just through the ileo-pubic tract and in 5% through the lacuna vasorum [9].

The femoral branch passes underneath the inguinal ligament (ileo-pubic tract) traveling adjacent to the external iliac artery and supplies the skin of the upper, anterior thigh. In 58% of the cases, two to five branches are found, and in 73% the branches perforate the abdominal wall 2–5 cm lateral to the deep inguinal ring. There is wide variation in the exit site with perforation of the nerve below (30%), above (16%), or through (54%) the ileo-pubic tract. In rare cases the nerve may run near the anterior superior iliac spine or through the inguinal canal [9]. The wide variation of the number and course of sensory nerves that traverse the preperitoneal space creates significant potential for overlap with the genital branch, femoral branch, lateral femoral cutaneous and even ilioinguinal nerve, and a wide area in which injury can occur. Respecting this proper dissection planes and knowledge of this neuroanatomy will minimize contact and risk.

1.3 The Ileo-pubic Tract and the Muscular/Vascular Lacuna

The ileo-pubic tract is one of the most important landmarks of the groin. Whereas the inferior epigastric vessels divide the groin in a medial and a lateral compartment, the ileo-pubic tract divides the groin in an upper and lower part. The operation should always commence with identification of the ileo-pubic tract cross-checking the anatomy with palpable surface features – an essential step of the operation (Fig. 1.21). Careful dissection is imperative below the tract because of the important structures – vessels, cord, nerves –that reside in this field (trapezoid of disasters). Above this line, typically only the epigastric vessels pose any risk. However, as noted in the prior neuroanatomy section, some aberrant branches of the genitofemoral and lateral femoral cutaneous nerve can perforate the abdominal wall up to 1–2 cm above the tract. The ileo-pubic tract corresponds to the anteriorly identified inguinal ligament and is loosely connected with it when visualized from outside. The ileo-pubic tract is a thickened band of transversalis fascia fibers that curves over the external iliac vessels attached laterally to the iliac crest, arching across the front of the femoral sheath and inserting as a broad attachment into the pubic tubercle and pectineal line. Furthermore, the tract is attached to the ileo-pectineal arch which forms a septum which subdivides the space deep to the inguinal ligament into a lateral muscular lacuna and a medial vascular lacuna, the latter hosting the iliac vessels and the femoral nerve. The ileo-pubic tract lies beneath the deep inguinal ring, forming the entire aponeurotic order of that aperture [5]. It is the ileo-pubic tract, not the lacunar ligament as usually described, that defines the medial border and roof of a normal femoral canal from the laparoscopic viewpoint, the place a femoral hernia may develop (Fig. 1.22a, b) [5].

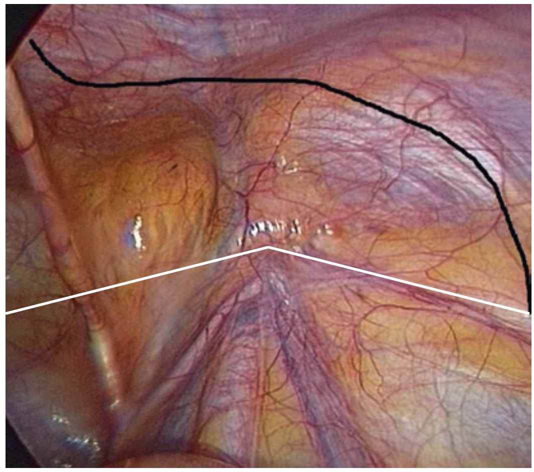


Fig. 1.21 First laparoscopic view: cross-checking of anatomy. Identifying the ileo-pubic tract (*white line*)

1.4 Conclusion

In-depth knowledge of the anatomy of the groin is indispensable for safe and successful laparoscopic hernia repair. The inferior epigastric vessels and the ileo-pubic tract are the major landmarks that define the field and facilitate identification of the essential structures of the groin and the characteristics of the hernia. A thorough understanding of the fascial architecture helps to identify the correct plane for an atraumatic dissection technique when reducing the hernia sac and preparing the pelvic floor for flat mesh implantation. Thorough knowledge of the course of the inguinal vessels and nerves and their multiple variations are absolutely necessary to avoid serious complications.

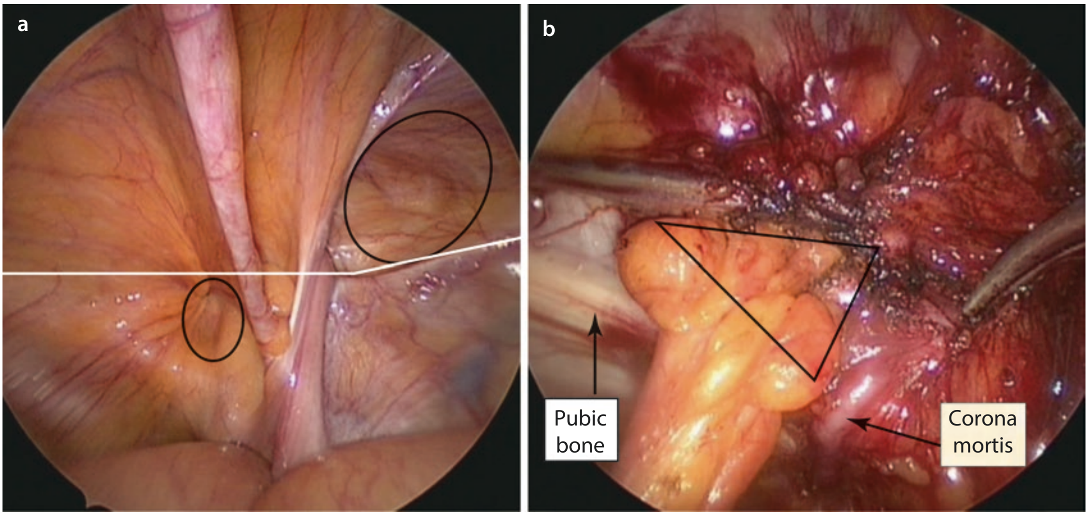


Fig. 1.22 **a** Indirect inguinal hernia above of the ileo-pubic tract; femoral hernia below of the tract (muscular lacuna). **b** Femoral canal (muscular lacuna, *black triangle*) after dissection of the peritoneum. Fatty femoral hernia content is partially reduced

Keep in mind: "A surgeon who is not familiar with the anatomy, he will be like mole-what he produces are nothing more than mounds of earth (graves)" [23].

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