Lumbar Hernia Repair

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Omar Yusef Kudsi and James Avruch

Introduction

Lumbar hernias are a rare clinical entity involving herniation of the intra-abdominal or retroperitoneal contents through congenital or acquired weaknesses in the posterolateral abdominal wall. First reported in 1731 on autopsy, they were formally credited to the French surgeon and anatomist Jean Louis Petit, who described a strangulated hernia emerging from the inferior lumbar triangle in 1783 [1]. In the modern era lumbar hernia is usually the result of prior urologic or aortic surgical intervention, although congenital and traumatic herniation is still described. Lumbar herniation is a possible etiology of both acute incarceration and strangulation of abdominal/retroperitoneal viscera as well as chronic lower back and flank pain.

The first lumbar hernia repair was described by Ravaton [2] in 1750, acutely incarcerated in a pregnant woman. The existence of the superior lumbar triangle was posited independently by Grynfellt and Lesshaft in 1870. S. Charles Kasdon described in the New England Journal of Medicine in 1954 [3] the case of an obese 67-year-old woman with a chief complaint of pain in the region of the left buttock radiating medially to the tip of the spine. In this era before the advent of computed tomography, the woman was admitted to four different hospitals over the course of 14 months and underwent state-of-the-art workup, including X-rays, intravenous pyelogram, sigmoidoscopy, and barium enema. Eventual operative exploration of the left lumbar area under general anesthesia revealed, after section of the subcuticular fascia, "a lobulated fat mass, 6-8 cm in diameter, and moderately well circumscribed, [was] protruding through a [3 cm] defect in the posterior sheath of the lumbodorsal fascia." This fat pad was connected via a well-defined stalk to the retroperitoneal fat overlying the sacrospinalis muscle. The stalk was transected and transfixed, and the lumbodorsal fascial defect was closed using interrupted fine silk suture. After a period of convalescence the patient's chronic and disabling back pain was cured. The author urged readers to consider lumbar herniation in the differential diagnosis of back pain, as "its removal was a simple procedure, and gave complete relief of symptoms." In 1970 Orcutt [1] described the case of a man who had felt a "tender knot" develop in his side after straining to lift some heavy implements. Examination revealed a tender, soft mass in the posterior axillary line immediately underneath the 12th rib which was easily reducible. He underwent flank exploration with high ligation of

O. Y. Kudsi (✉)
Department of Surgery, Good Samaritan Medical Center, Tufts University School of Medicine, Brockton, MA, USA

J. Avruch
Department of General Surgery, St. Elizabeth Medical Center, Boston, MA, USA

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a mass of herniated fat emerging from a defect under the 12th rib with complete resolution of symptoms.

Epidemiology

There have been approximately 300 cases described in the literature [2]. Because this is a seldom-reported entity, the true incidence of this type of hernia is unknown. They occur more commonly in males with a peak incidence between 60 and 70 years of age [4], typically presenting as a reducible bulge, asymptomatic or painful, in the suprailiac area and accentuated with Valsalva maneuver. They represent 2% or less of all abdominal wall hernias [5]. In a series of 109 cases published by Virgilio in 1925 it was found that hernia through the space of Grynfellt was more common than that through Petit's triangle. Hafner et al. [6] in their 1962 paper reviewing lumbar hernia and presenting two cases of Petit defect hernias reviewed the records of Henry Ford Hospital in Detroit and found only nine lumbar hernias (Grynfeltt, Petit, and diffuse) in the registration records of one million new patients. An extrapolation of this statistic suggests that a general surgeon will see at most one of this type of hernia in a career. The true incidence, however, is likely much higher than this. Hundreds of elective surgical procedures which can cause acquired secondary lumbar hernias are being performed yearly [7]. Traumatic lumbar hernia is a recognized entity, and likely underreported. It behooves the laparoscopic and robotic surgeon to be familiar with the relevant surgical anatomy and repair techniques for these uncommon hernias.

Etiology/Pathogenesis

The etiology of lumbar hernia is either congenital or acquired (Table 11.1). Twenty percent of reported lumbar herniae are congenital and 80% are acquired. Regardless of etiology, the natural history of the lumbar hernia is an increase in size along with back pain, and a certain number of reducible lumbar hernias will become incarcerated and/or strangulated; rates of up to 18–25% have been reported [8, 9] along with cases of large and small bowel obstruction [10, 11]. Thus the general consensus among authors is that these hernias should be surgically repaired once recognized.

Table 11.1 Classification of lumbar hernias

I. Congenital
II. Acquired
a. Primary (spontaneous)
b. Secondary (posttraumatic, postinfectious, postsurgical)

Congenital lumbar herniation has been described in the pediatric surgical literature in association with other hereditary anomalies, most commonly the lumbocostovertebral syndrome, neuroblastoma, meningomyelocele, and caudal regression syndrome [12]. It can also be associated with congenital aplasia of the lumbodorsal musculature, which results in bilateral hernias. To date 54 cases have been reported in the literature [13]; reported repairs of these hernias are primary or with prosthetic mesh; there have been no reported laparoscopic repairs in these patients who usually present before the age of 2 years.

Acquired lumbar hernia is further broken down into primary (spontaneous) herniation and secondary herniation. Fifty-five percent of the reported lumbar herniae in the literature are spontaneous herniation through the anatomical weak points in the lumbodorsal fascia. Herniation through the upper (Grynfeltt) triangle is more common than herniation through the lower (Petit) triangle [14]; this is likely due to the presence of the fascial orifice for the 12th intercostal neurovascular bundle. Spontaneous lumbar hernia is caused by increased intra-abdominal pressure such as in morbid obesity, strenuous physical activity, or chronic cough. Patients will describe the sensation of spontaneous herniation when it occurs, as in the case described previously. Predisposing factors in spontaneous hernia are those which cause anatomical alterations in the lumbodorsal fascia and thinning of the overlying musculature and suprafascial fat pad, such as extreme thinness, chronic debilitating illness, and increased age [15].

Secondary lumbar hernia is due to previous insult to the lumbodorsal fascia, usually in the form of previous surgical incision or trocar placement, prior infection associated with the area, or trauma both blunt and penetrating. The urologist and prolific scholar Herman L. Kretschmer reported a series of 11 lumbar hernias containing the kidney in 1951 [16]. Incisional lumbar hernias complicate 7% of retroperitoneal approaches [17]. While more old-fashioned types of procedures such as open nephrectomy and the retroperitoneal approach to aortic aneurysm repair are known common causes of lumbar hernia, they have now been described after laparoscopic extraperitoneal nephrectomy [18] and latissimus dorsi myocutaneous flap for breast reconstruction [19]. Lumbar herniation after iliac crest bone graft harvest was described as early as 1945, a procedure still commonly performed by orthopedic surgeons. In terms of infection, suppurative conditions of the flank including renal and perirenal abscess and infected retroperitoneal hematoma can predispose to future lumbar herniation.

Lumbar hernia can be due to blunt or penetrating trauma. In their review of 66 cases of traumatic lumbar hernia, Burt et al. [20] found that the majority of traumatic lumbar hernias (70%) were from the inferior (Petit) lumbar triangle; this is in contrast to congenital and other acquired hernias, which have a propensity for the superior (Grynfeltt) lumbar triangle. Seventy-one percent were due to motor vehicle collision. On impact in a motor vehicle collision, the force of deceleration is transmitted to the occupant via the seatbelt, and the lap belt portion can slip over the top of the iliac crests, a so-called "submarining" of the lap belt. This force can cause tearing of musculofascial structures in combination with a sudden massive increase in intra-abdominal pressure which can cause herniation through the lumbodorsal fascia. The diagnosis of traumatic lumbar hernia can be delayed, and in their series the diagnosis was delayed in 27% of hernias for months or years; patients may present with suprailiac bulging and a history of a remote trauma. Traumatic lumbar hernia need not be repaired at the time of initial diagnosis, especially if there are serious associated intra-abdominal and orthopedic injuries. These hernias can be safely followed and referral can be made for elective repair [21].

Computed tomography is the study of choice for patients who are referred with symptomatic flank bulges. CT provides a detailed delineation of the muscular and fascial layers of the posterolateral abdominal wall and any defects that may be present (Fig. 11.1). Lumbar hernia can contain all manner of extraperitoneal, retroperitoneal, and intraperitoneal contents. A normal CT of the lumbar region in a symptomatic patient is sufficient to completely exclude the diagnosis of lumbar hernia as a cause of pain; this is especially important in post-incisional patients, as in the absence of hernia the pain is likely intercostal neuralgia and appropriate therapy can be instituted [17].

Anatomy

The surgical lumbar region (Fig. 11.2) is defined as the area inferior to the lower edge of the 12th rib, superior to the iliac crest, lateral to the erector spinae muscle, and medial to the external oblique [14]. In this location, the lumbar wall is comprised of, from deep to superficial, the following anatomic layers: (1) extraperitoneal tissue/fat; (2) transversalis fascia; (3) deep muscular layer which consists of quadratus lumborum muscle and the psoas; (4) middle muscular layer consisting of erector spinae, internal oblique, and serratus posterior inferior muscles; (5) the thoracolumbar fascia, which is the fused fascial layer of all the muscles of the lumbar area; (6) superficial muscular layer which consists of the latissimus dorsi muscle laterally and the external oblique muscle medially; (7) superficial lumbar fascia; and (8) the skin [15] (Fig. 11.3). The two potential hernia defects within this space are the superior (Grynfeltt) lumbar triangle and the inferior (Petit) lumbar triangle. Grynfeltt was the first to note, in 1866, that the aponeurotic fibers of the transversalis fascia part to permit passage of the

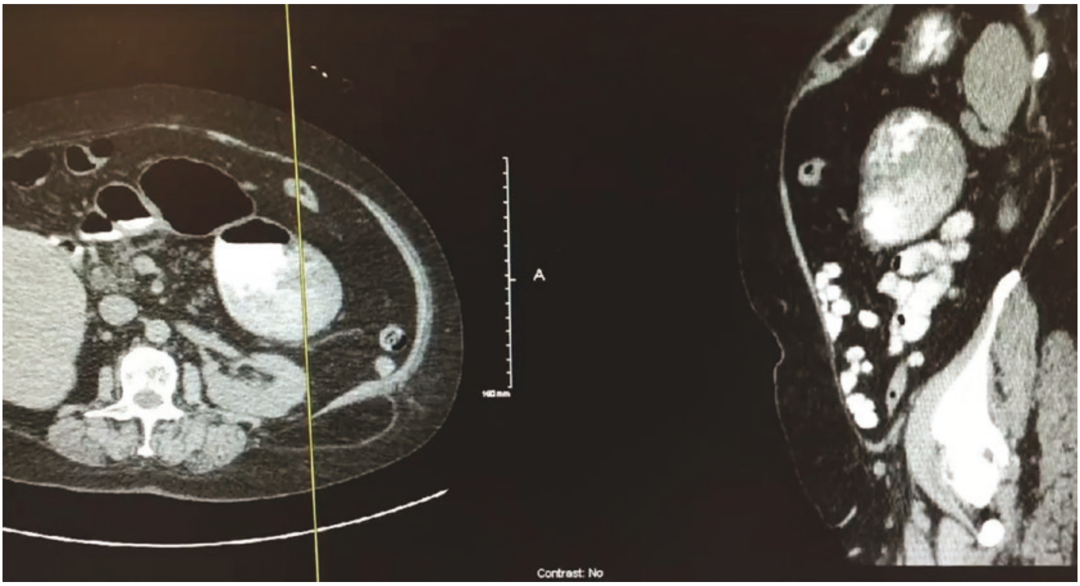

Fig. 11.1 Typical CT appearance of left-sided lumbar hernia containing preperitoneal fat

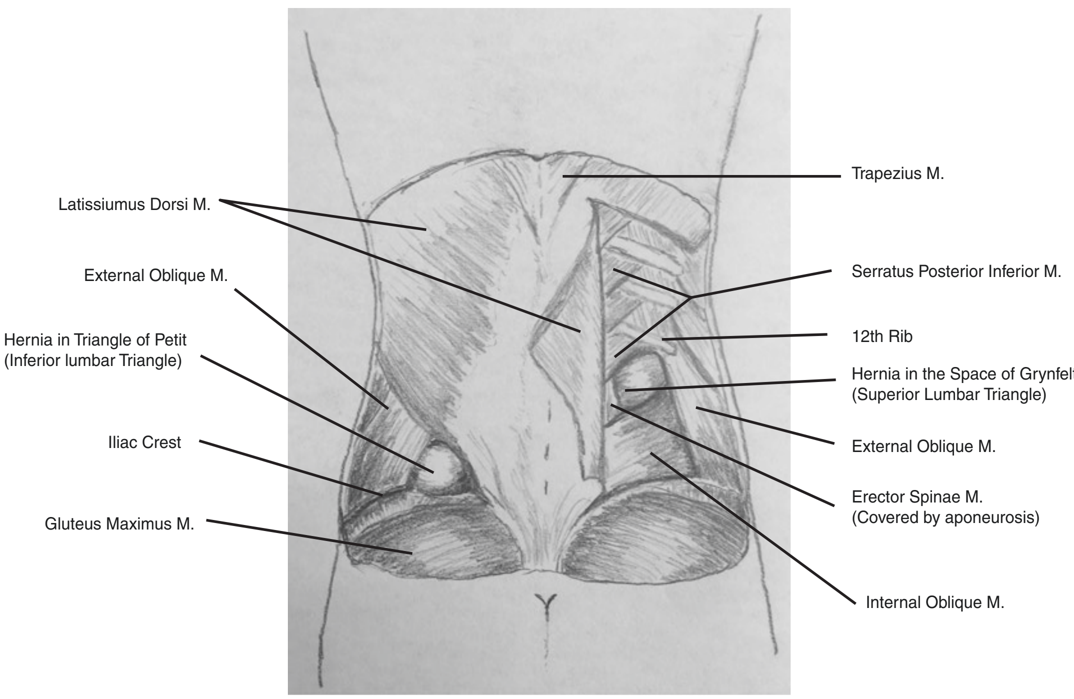

Fig. 11.2 Lumbar region anatomy showing hernia spaces

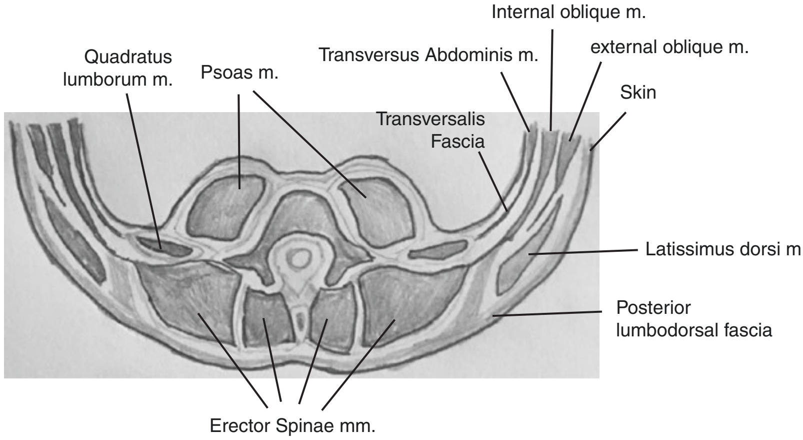

Fig. 11.3 Cross-sectional view of lumbar region

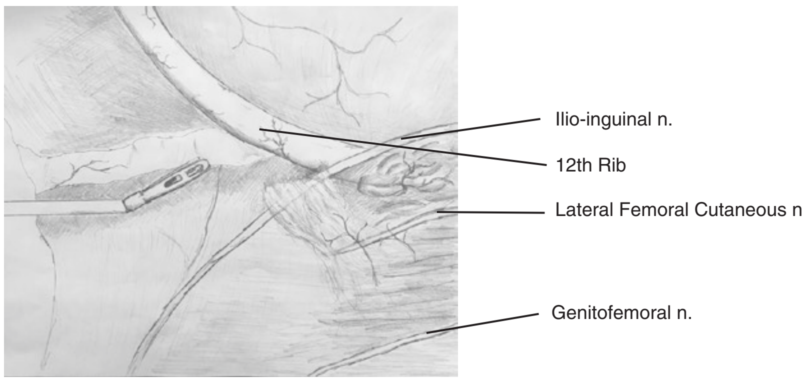

Fig. 11.4 Intracorporeal view showing course of nerves through the lumbar region

12th intercostal neurovascular bundle inferior to the 12th rib and above the origin of the internal oblique, and that this orifice, located within a natural weak point in the lumbodorsal fascia, was a potential spot of herniation [22]. The superior defect is deeper and larger than the inferior. It is bound by the posterior border of the internal oblique muscle anteriorly, the anterior border of the sacrospinalis muscle posteriorly, and has the 12th rib and the serratus posterior inferior muscle as its base, the external oblique and the latissimus dorsi muscles as its roof, and the aponeurosis of the transversus abdominis as its floor [19]. Cadaveric studies have found that it is anatomically present in more than 90% [22], with its morphology dependent on the development of the surrounding muscles and the position and length of the 12 rib. Short, round-chested people will have a larger superior triangle due to the more horizontal position of the 12th rib [5]. The inferior triangle of Petit is smaller and more superficial, and is more consistently triangular. It is bounded by the iliac crest inferiorly, the latissimus dorsi medially, and the external oblique laterally, with the internal oblique muscle as its floor.

In terms of surgical anatomic considerations, when performing a laparoscopic repair of the lumbar hernia, the mesh is laid in the retroperitoneal space. When the triangles are viewed from the retroperitoneal perspective, the paths of the sensory nerves arising from the lumbar nerve roots must be kept in mind to avoid tacks or sutures in these locations (Fig. 11.4).

Laparoscopic/Robotic Repair of Lumbar Hernias

There is no consensus on the optimal repair technique of the flank hernia [14, 23]. Techniques for open repair of these hernias used to be extremely varied, however these techniques of primary repair involving rotational muscle flaps or grafts have fallen out of favor [5]. In the modern era open repairs invariably utilize extensive preperitoneal dissection and placement of mesh, except in the pediatric population, where primary repair is favored.

The lumbar hernia can be quite challenging to repair due to the regional anatomy. Dissection and proper overlap of the mesh is limited by the presence of bone (the 12th rib superiorly and iliac crest inferiorly) [24]. The edges of the fascial defect can be difficult to define due to the location, there can be a lack of adequate surrounding fascia, and if the hernia is incisional or posttraumatic there can be thinning and atrophy of the surrounding muscles due to neuropraxia [9]. Primary lumbar hernias (Petit and Grynfeltt hernias) are small and emerge through a well-defined fascial defect, generally without attenuation of the surrounding tissues, and rarely contain visceral contents. Repair of spontaneous lumbar hernias is therefore easier and can be approached with whatever technique the surgeon is most comfortable—open, laparoscopic preperitoneal, and laparoscopic transabdominal all appear to work equally well [9]. For incisional (the majority) and posttraumatic lumbar hernias, recent evidence supports the use of laparoscopy for repair in defects less than 15 cm. The first report of a minimally invasive approach to lumbar hernia was first published in 1996 by Burick and Parascandola [25], and since then there have been multiple reports of the success of the laparoscopic approach [26]. In their retrospective study of laparoscopic versus open lumbar hernia repair, Moreno-Egea et al. [9] compiled 20 additional reports of laparoscopic lumbar hernia repair. In their series of 55 patients (35 laparoscopic versus 20 open repairs) they found mean operative time, length of stay, analgesic consumption, and pain at 1 month were significantly less with laparoscopic repair. Rate of hernia recurrence was 15% in the open repair group versus only 2.9% in the minimally invasive group. Recurrence was related primarily to the size of the hernia. Their conclusion was that laparoscopic repair of hernias with defects 15 cm or less was certainly safe and efficacious, and offered clear benefits over open surgery.

Operative Technique

Minimal invasive lumbar hernia repair can be performed via different approaches. We describe a technique for robotic-assisted transabdominal laparoscopic repair of a left-sided lumbar hernia.

Patient Positioning

The patient is placed in supine position for induction of general endotracheal anesthesia. The patient is then repositioned into the lateral decubitus on a bean-bag. For excellent exposure the operating room table is flexed in order to stretch the lumbar space. It is important to cushion all bony prominences to avoid any harm to the patient.

Trocar Placement

Laparoscopic access to abdominal cavity is performed by Veress needle technique in left subcostal space (Fig. 11.5). After insufflation of the abdominal cavity to 15 mmHg, we place an 8.5 mm reusable port at the same site of Veress needle and explore abdominal cavity to ensure no adhesions that will prohibit the placement of the remaining reusable trocars. A 30-degree scope is used to facilitate the directed visualization. Two additional 8.5 mm trocars are placed in a “C” shape at least 8 cm away from each other (this is necessary with the use of the Intuitive Si robot). The primary consideration in trocar placement is that trocars must be sufficiently distant from the working site, including both the fascial defect and the desired 3–5 cm overlap of the mesh. Robotic scissors, needle driver, and bipolar grasper are the instruments of choice for the authors.

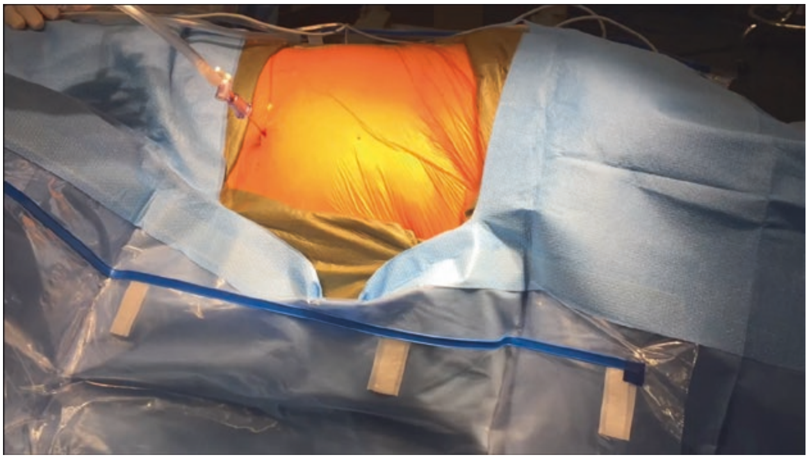

Fig. 11.5 Lateral positioning and Veress needle access

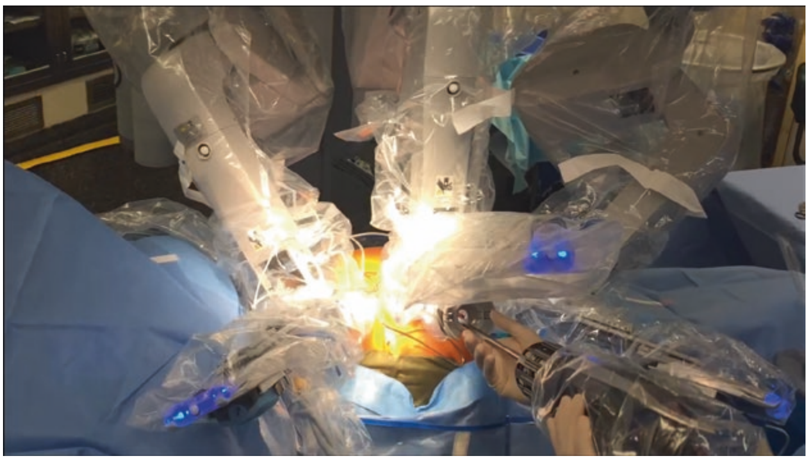

Fig. 11.6 Docking the robotic arms

Docking the Robot

The robot is brought in from the flank. Fine adjustment should be made to bring the robotic arms in line with the dissection. Sufficiently distant trocar placement is essential prior to docking to limit the collision of the robotic arms (Fig. 11.6). It is important to ensure that all arms are bumped up to ensure both that there is no tension on abdominal wall and that the range of movement for each arm is sufficient. Proper port placement and docking of the robot entails a learning curve, ensuring proper port placement and arm docking will limit extra time needed for troubleshooting during the case.

Identification of the Lumbar Hernia

The peritoneum of the left paracolic gutter is incised from the 10th rib to the iliac crest. Peritoneum and retroperitoneal tissues are dissected at least 5 cm away from the hernia defect to ensure proper mesh coverage. Reduction of all hernia contents is performed to demonstrate the dimensions of the hernia defect (Fig. 11.7).

Defect Closure

The hernia defect is closed primarily using a 12- or 18-in. length number 0 Stratafix absorbable suture on a CT-1 needle (Ethicon, NJ). Barbed sutures facilitate closure but other types can be

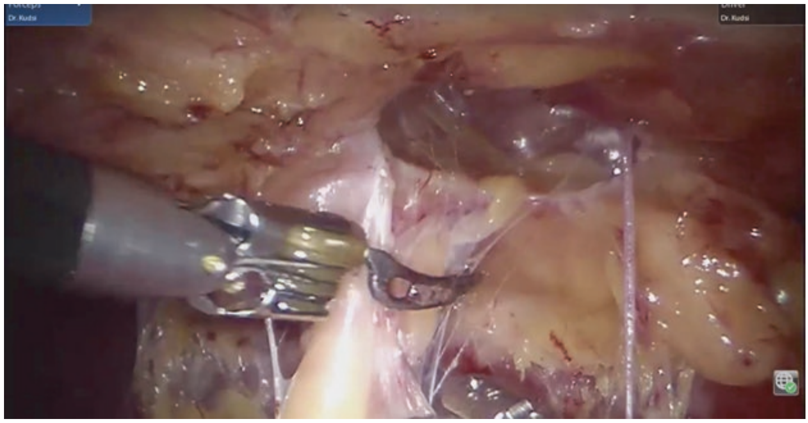

Fig. 11.7 Identification of the hernia defect

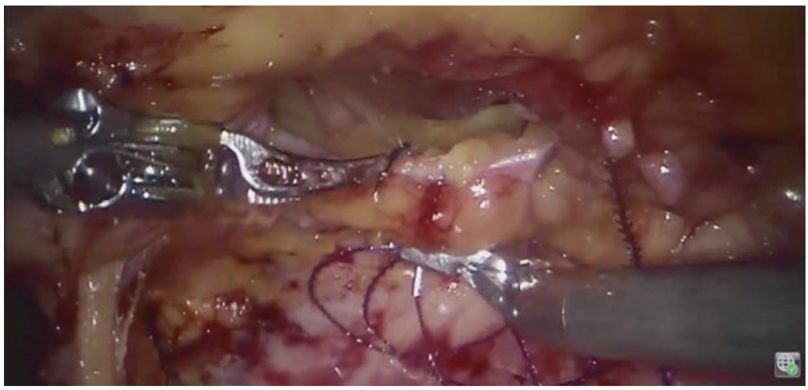

Fig. 11.8 Closure of the hernia defect

used according to the surgeon's preference (Fig. 11.8). Decreasing the pneumoperitoneum to 6 mmHg and utilizing the shoelace concept by taking all fascial bites and then tightening each one separately to decrease defect size will facilitate fascial closure in larger defects.

Mesh Placement and Fixation

It is important to size the mesh based on the defect prior to closure of the defect. Mesh should be sized with 3–5 cm overlap in mind. The authors prefer self-fixating polyester mesh but non-barrier coated synthetic polypropylene mesh is a suitable alternative. The mesh is fixed either via interrupted absorbable sutures at four corners, or in the case of self-fixating mesh, there is no need for suturing or tacking (Fig. 11.9). Techniques involving suturing the mesh or the use of absorbable tack fixation of the mesh being careful to respect the path of the nerves that arise from the anterior rami of the T12/L1 nerve roots that splay out over the psoas muscle (ilioinguinal, iliohypogastric, and genitofemoral) have been described [27]. In practice, however, the course of these nerves can be difficult to identify. The benefit of using self-fixating mesh is to avoid the possibility of grabbing any nerves while fixing the mesh in the lumbar space (Fig. 11.10). Biosynthetic glue has been described as a method for mesh fixation as well.

Peritoneum Closure

The peritoneum of the left paracolic gutter is then closed using absorbable 3-0 sutures (Fig. 11.11). The authors prefer number 9-in. length 3 V-lock 180 wound closure device (Medtronic Inc. Minneapolis, MN) on GS-21 needle. Suturing the peritoneal pocket closed is a delicate step. It is crucial to assess the peritoneal flap at the end and close any tears in the pocket that are larger than 1 cm with interrupted absorbable sutures.

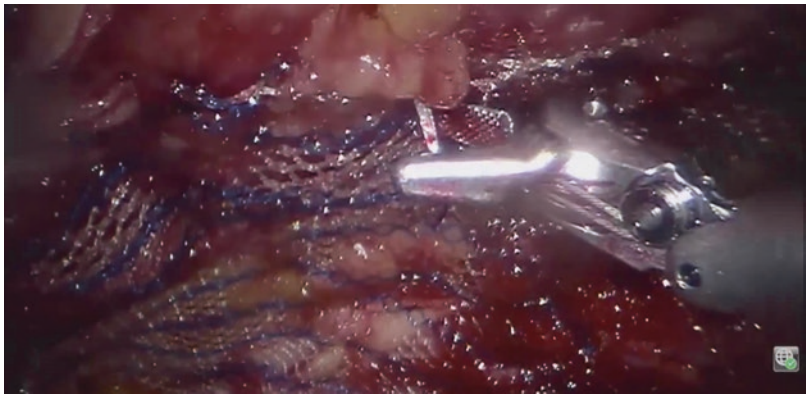

Fig. 11.9 Self-fixating mesh placement with sufficient overlap

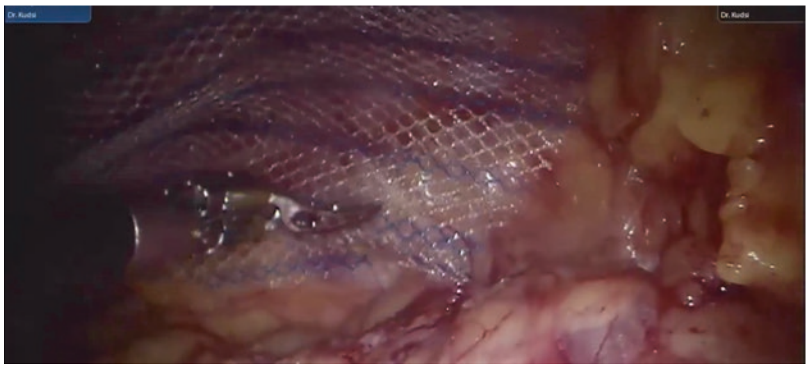

Fig. 11.10 Mesh placement

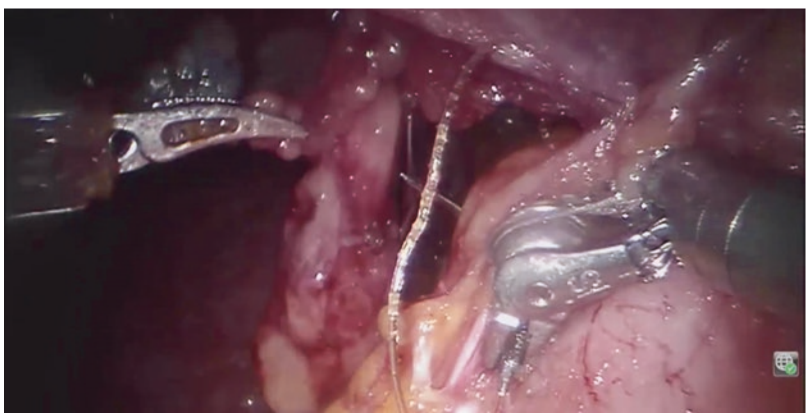

Fig. 11.11 Closure of the peritoneum

Postoperative Care

In our experience robotic-assisted lumbar hernia repair is performed in the ambulatory setting. The patient is given an abdominal binder to wear during the recovery period. Patients followed up in the office within 30 days and were asked to follow up at 1 year for assessment.

Conclusion

Lumbar hernia, although rare, can be a significant cause of chronic lumbar pain, cosmetic deformity, and potential morbidity from incarceration and strangulation of retroperitoneal and intra-abdominal contents, and all patients diagnosed with lumbar hernia should be referred for elective repair. The recognition and incidence of these hernias will continue to increase, and knowledge of repair of these hernias is essential to the practice of hernia specialists. The minimally invasive approach lends itself well to repair of circumscribed lumbar hernia defects. Adequate mesh overlap is essential, and repair of these rare hernias can be technically challenging. The increased freedom of laparoscopic articulation provided by robotic technology and the opportunity for these patients to be treated in the ambulatory setting makes this the ideal surgical modality.

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