

Laparoscopic Hernia Repair - Complications

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ABSTRACT

Laparoscopic hernioplasty is a technique which can present a number of specific complications. This paper reviews the complications that can occur during laparoscopic hernia repair and ways to avoid them; it also describes the surgical technique used successfully in over 1000 cases. Initial experience suggests that complications can be avoided with adequate knowledge, attention to surgical anatomy and the proper technique of laparoscopic hernioplasty.

Early recurrences are rare and invariably result from inadequate surgical technique. Inadequate fixation of the mesh, inadequate mesh size, and failure to cover unidentified wall defects (hernias which have never been repaired), are the main causes of early recurrence of hernia. Experience, knowledge of complications and how to avoid them, adequate training and attention to the anatomy of the inguinal region are the most important factors in correcting inguinal hernia successfully by laparoscopy.

Key Words: Hernioplasty, Laparoscopy, Inguinal hernia, Laparoscopic hernioplasty.

INTRODUCTION

The increased acceptance of inguinal hernia repair by a laparoscopic approach has led to many confused reports on technique, results, and complications related to this procedure.¹⁻⁶ With the addition of inguinal hernioplasty, a new list of specific complications involving this procedure has appeared.⁷⁻¹⁰ Many of these complications are directly related to lack of thorough knowledge of surgical anatomy (**Figure 1**), or to improper technique.^{11,12}

MATERIALS AND METHODS

During the period of September 1991 to January 1997, the authors performed 1,050 inguinal hernioplasties in 939 patients. They were bilateral in 111 patients (11.8%) and recurrent in 127 patients (13.5%). The classification of hernias submitted for laparoscopic correction included 481 indirect hernias (45.8%); 443 direct hernias (42.2%); 105 mixed hernias (10%); and 21 femoral hernias (2%).

Nine hundred and twenty seven patients (98.7%) underwent surgery as outpatients (i.e., they stayed in the hospital environment for less than 24 hours). Of the 12 remaining patients who stayed in the hospital longer than 24 hours, 10 had associated medical problems requiring longer hospitalization, and 2 patients experienced transoperative events. In one patient, a lesion of the iliac artery occurred due to a wrongly positioned clip. This injury was corrected by open inguinal approach and closure of the vessel orifice. The other case involved a perforation of the urinary bladder in a voluminous hernia. This complication was corrected with laparoscopic suture and introduction of a Foley catheter.

SURGICAL TECHNIQUE

Total intravenous anesthesia is used for the procedure.¹³ The patient is asked to urinate, while in the surgical preparation room, in order to empty the bladder. A prophylactic antibiotic (cephalosporin) is administered during the preoperative period. The abdomen is not shaved.

The Veress needle is inserted supra-umbilically to install the pneumoperitoneum, and the correct positioning of the needle is checked using the water drop test. In patients with a history of previous surgery in the lower abdomen, an alter-

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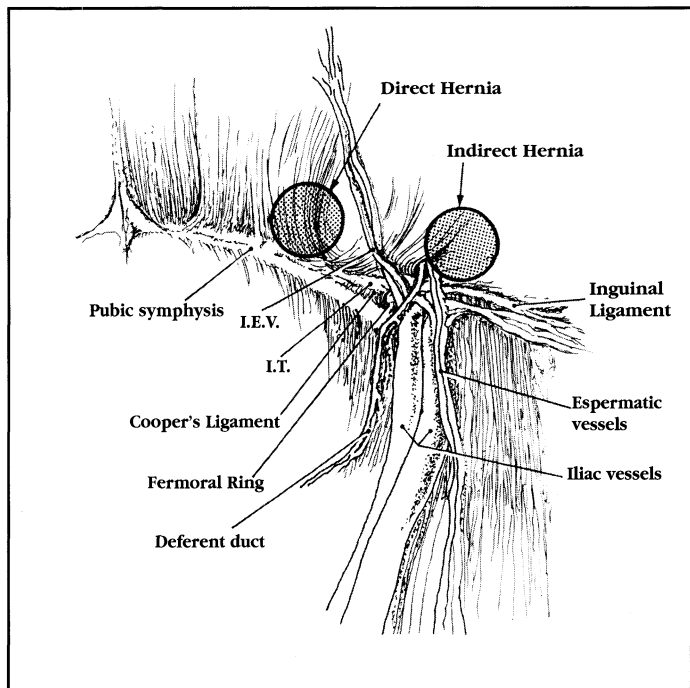


Figure 1. Laparoscopic anatomy: Inferior Epigastric Vessels (I.E.V.), Iliopubic Tract (I.T.).

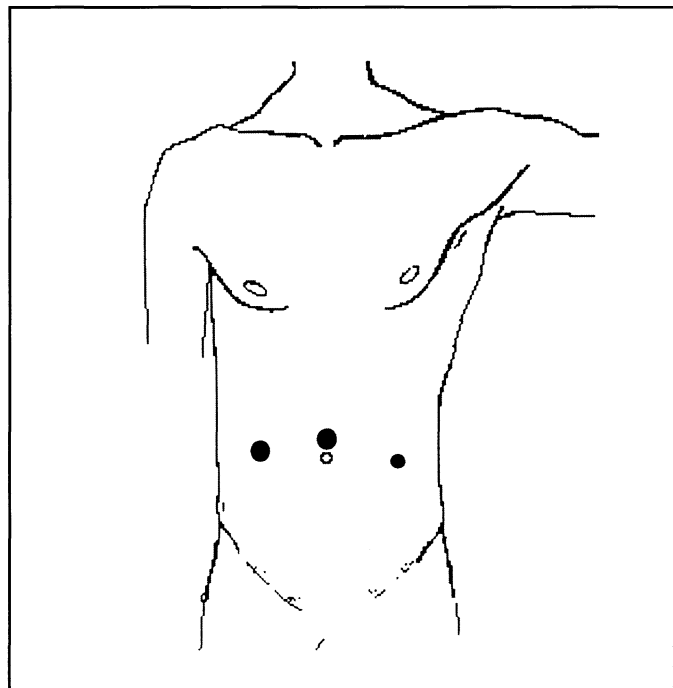


Figure 2. Trocar Position.

native access site is used, or the visiport (USSC) is employed to allow entrance under direct vision. After pneumoperitoneum of 14 mmHg has been achieved, a 10.5 mm supraumbilical trocar is inserted. A complete review of the abdominal cavity is first performed. A 0-degree, 10 mm laparoscope is used for the whole procedure. Two additional trocars are used to perform the procedure. A 11.5 mm trocar is positioned on the right side of the patient, at the level of the umbilicus, lateral to the rectus sheath (**Figure 2**). The third trocar, 5 mm in diameter, is positioned on the left side of the patient, slightly below the umbilicus lateral to the rectus abdominis muscle. As the trocars are introduced, it is useful to darken the operating theater and transilluminate the abdominal wall in order to choose the best site to prevent injuries to the blood vessels of the abdominal wall.

The position of the surgical team, independent of the side on which the hernia occurs, is always the same. The surgeon takes up a position on the right side of the patient and the assistant and scrub nurse on the left (**Figure 3**). The patient is in supine, Trendelenburg position, with the right arm along the body and venous access on the left arm. Video equipment is positioned at the foot of the operating table. Usually, a long fiberoptic cable must be used (2.5 meter) to allow adequate mobility during the procedure.

Using scissors and electrocautery, the peritoneum is incised superiorly, three to four cm above the hernia defect. This incision extends from the medial umbilical ligament to the level of the anterosuperior iliac spine laterally. Just below the peritoneum lies the bi-lamellar transversalis fascia. The posterior layer of the transversalis fascia must be divided to reach the appropriate dissection plane. Cooper's ligament is identified medially and inferiorly. Dissection is extended medially until the pubic symphysis and the lower portion of the rectus abdominis muscle are exposed; medial exposure is completed by visualizing the Hesselbach triangle and the aponeurotic arch of the transversus abdominis muscle.¹³

Dissection is extended laterally, separating peritoneum from the inferior epigastric vessels, spermatic cord and vas deferens. During this step it is very useful to use a gauze cylinder (roll) to perform the blunt dissection. The gauze roll incurs less risk of bleeding and injury to these structures. Dissection is continued laterally releasing the internal inguinal ring. In indirect hernias, the hernial sac is reduced and carefully isolated from the spermatic vessels and deferent duct. Only in giant scrotal hernias, and in a few cases of recurrent hernias, do we divide the proximal hernial sac and allow its terminal portion to remain in situ. The lateral aspect of the iliopubic tract is exposed and care is taken to prevent injury to the genitofemoral and lateral femoral cutaneous nerves which are located below the iliopubic tract.

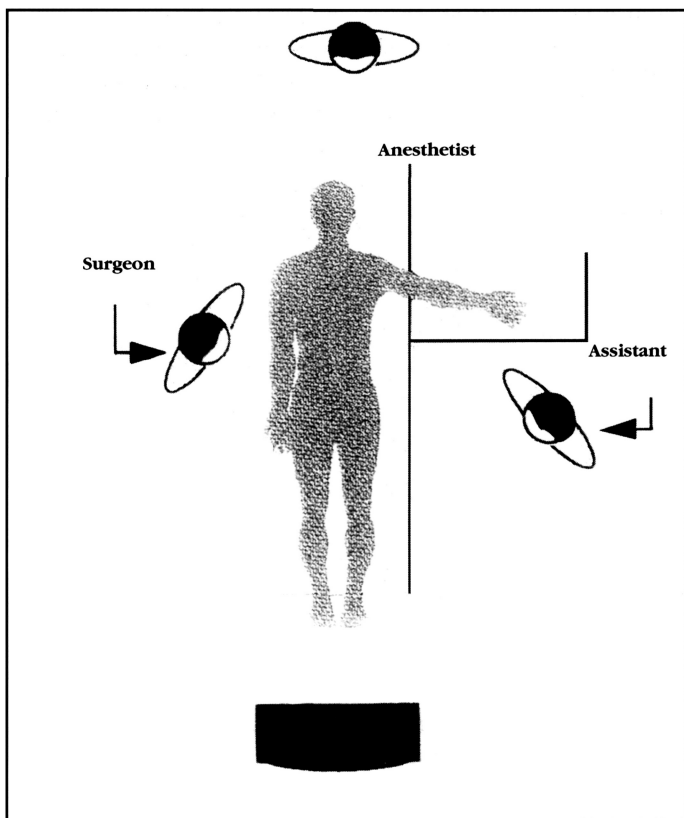


Figure 3. Position of the surgical team.

After complete exposure of the pre-peritoneal space, Marlex mesh (14 cm x 10 cm) is placed in position to cover the entire dissected region. The mesh is fixed with metal clips to Cooper's ligament, pubic symphysis, rectus abdominis muscle, and transversus abdominis tendon and muscle. One or two clips are positioned vertically over the upper margin of the iliopubic tract to secure the mesh and prevent injury to nerves below it. It is important that, when the clips are placed, external pressure be applied to the abdominal wall by the surgical assistant, to more completely anchor the clips.

This technique, described by Arregui,¹⁴ is used by us according to the method of Geis.³ Marlex mesh is split to allow passage of the spermatic cord. The peritoneum is closed with clips, and the mesh remains in a completely extraperitoneal position. The pneumoperitoneum is emptied under direct viewing with the laparoscope and external pressure is applied to the inguinal region in order to give the peritoneum full adhesion to the mesh. The orifices of the 10.5 mm and 11.5 mm trocars are closed with suture to prevent herniation. The skin is closed with monofilament nylon suture and the wounds bandaged with micro-pore tape. An elastic support for scrotal compression is placed while the patient is in the operating theater.

RESULTS

Ninety-eight point seven percent (98.7%) of the cases returned to their usual activities in one week; 1.7% required up to two weeks, and 0.5% required over two weeks.

The mean surgical time, measured between the introduction of the first trocar and the skin suture, was 32.84 minutes in unilateral hernias (range 10 to 110 minutes), and 48.5 minutes in bilateral hernias (range 20 to 130 minutes). Thirty-nine incarcerated hernias were reduced after installing the pneumoperitoneum by external compression and internal traction using forceps. It was necessary to incise the hernia ring to reduce the hernia in three cases.

During follow-up, we experienced one case (0.1%) of hernia recurrence following a transabdominal pre-peritoneal technique (TAPP). In this instance the mesh was not adequately fixed to Cooper's ligament and there resulted a medial recurrence. Four other cases of recurrence occurred in the first ten patients operated on using the "plug" technique. In these recurrences, the new repair was performed by laparoscopy in three cases, and by conventional open approach in two.

Injuries to the inferior epigastric vessels were controlled using vascular metal clips as electrocautery was not usually effective. Bleeding originating from the spermatic cord, on the other hand, can be controlled with cauterization. Preferably, however, these vessels should be selectively clipped to avoid burning the deferent duct and injuring the testicular artery. One case of injury to the iliac artery occurred during clip fixation of the mesh. Bleeding through the small vessel orifice did not cease with compression and required immediate open approach.

Hydroceles are a result of serous fluid collected in the scrotum, especially after correction of indirect inguinal hernias, where the inguinal canal is explored to release the sac. Most cases of post-hernioplasty hydrocele were solved with a single aspiration. Incarcerated hernia through a 10 mm and 12 mm trocar orifice has led to bowel obstruction. In a rapid intervention, an incision over the trocar site scar allowed reduction of a loop of small bowel and a simple suture repair of the aponeurosis.

Two patients experienced prolonged inguinal pain for three weeks, likely due to nerve injury. In one patient, the mesh 'plug' descended toward the scrotum and required excision.

One death (0.1%) occurred because of acute myocardial infarction five days after surgery. This was in a 71-year-old patient, with a large, complex right inguinal hernia who developed an ischemic cardiopathy leading to sudden death.

DISCUSSION

MacFayden¹⁵ presented a report on 359 hernias submitted to surgery in 328 patients using the TAPP technique. Postoperative complications included hematomas (11 cases), pain in the thigh (eight cases), scrotal emphysema (eight cases), and urinary retention (seven cases), with a total 10.3% morbidity. This result was to be repeated in subsequent studies, leading us to think that the learning curve would always present us with these rates in early analyses. Arregui¹⁴ had 8.4% postoperative complications and Geis³ revealed 5.2% in his study of 450 herniorrhaphies in 364 patients. The following year, literature reported rates of 4.7 to 15.9%.

Phillips¹⁶ published a multicentric study with 3,229 laparoscopic herniorrhaphies in 2,559 patients, revealing 336 (10%) complications and two deaths (0.06%). The TAPP technique (1,944 hernias) had 19 recurrences (1%) and 141 (7%) complications, similar to the rates in our cases, which had 0.9% recurrences and 8.2% complications. Using the same approach, Geis³ reported 0.6% recurrences.

In open repairs of inguinal hernias, complications appear at rates around 10%, according to Nyhus.¹⁷ Urinary retention occurs in 0.2% to 15%, testicular atrophy in 0.03% to 0.65%, and ilioinguinal and genitofemoral neuromas in less than 1%; infections of the surgical wound in primary repair occur in 1%, and in recurrences, 3%.

In studies by MacFayden¹⁵ and Phillips,¹⁶ laparoscopic inguinal herniorrhaphy with intraperitoneal mesh presented 7% to 14% postoperative complications. However, early recurrences occurred in 2% to 3% of the cases. The fully extraperitoneal technique had 7.7% to 10% complications, with a low recurrence rate.¹⁴ Due to the use of mesh in laparoscopic herniorrhaphies, all recurrences involve technical errors, folds in the mesh, non-coverage of the defect or flaws in fixation. Early recurrences do not appear only after laparoscopic corrections. Obney¹⁸ found 13% of hernias had not been diagnosed clinically; if undetected during surgery they result in early recurrence. According to Nyhus,¹⁷ recurrences of open surgery are seen in 1% to 7% of the indirect hernias, 4% to 10% of the direct hernias, 0% to 7% of the femoral ones, and 1.7% to 35% of the recurred ones. Other sources reveal even higher rates: approximately 10% of the primary hernias and 30% to 50% of the recurring ones.^{19,20} The TAPP technique had 0.1% recurrence in this study. Considering that, in Stoppa's technique the long-term results are similar to the early results. It is believed that in laparoscopic surgeries with placement of a mesh in the preperitoneal position the same occurs. We need careful follow-ups to confirm this statement.

Although it is not considered a complication, the recur-

rence of inguinal hernia is a form of morbidity and should be considered as such. The recurrence of laparoscopic hernia repair in various series, using the preperitoneal trans-abdominal technique (TAPP), appears to result from inadequate surgical technique. The inadequate fixation of Marlex mesh, inadequate size of the mesh (small) and a flaw in covering unidentified hernial defects (hernias which had never been repaired) are the main reasons for early recurrence of hernia. It is accepted that the causes of late recurrence of hernia could be stress on the tissues and the intrinsic weakness of the collagen. Since the laparoscopic technique uses synthetic material (Marlex mesh), and follows the principles of hernioplasty without tension, it is to be expected that the laparoscopic technique will not cause a significant number of late recurrences.

The rate of infection in the skin orifice is less than 1%, according to several studies. Treatment is simple, consisting of drainage and dressings. Antibiotics are used only when there are systemic repercussions.

Many surgeons are not aware that vascular lesions occur in any hernia repair technique. Reports by Barbier^{21,22} and Brown²³ show more frequent vascular injuries during the repairs of McVay (0.35% and 1.6%) than in laparoscopic herniorrhaphies; we experienced 0.2%. Major bleeding during inguinal hernia repair is not a usual complication, but can occur due to injury of the inferior epigastric vessels during surgical dissection or the fixation of the mesh with staples. Bleeding must be controlled with sutures or clips; electrocautery is usually not effective. During surgical dissection, the peritoneum should be incised in a region which lies distant from the epigastric vessels and, using traction, it should be incised the full length required to correct the hernia. Traction and preperitoneal dissection caused by pneumoperitoneum are important in preventing injury to the inferior epigastric artery. Blunt dissection with a gauze cylinder is very useful to separate the epigastric vessels from the peritoneal flap.

The spermatic vessels may suffer injury when dissecting the spermatic cord, especially in the technique using split mesh for repair. In these cases the cord must be dissected and subsequently repaired. Special care must be taken in handling the spermatic cord. It should not undergo excessive traction, and hemostasis of bleeding cord vessels should be accurately secured as many collections and hematomas during the postoperative period can be avoided. Equally, in indirect hernias, when separating the hernial sac, it is extremely important to perform strict hemostasis of the dissected area during its release.

Vascular injury to the iliac vessels can be severe and generally occurs because of staples placed in the region of the so-called "Triangle of Doom." This triangle is limited medi-

ally by the deferent duct and laterally by the spermatic vessels in the male and round ligament in the female.

Ischemic orchitis is an important, but relatively rare, complication that may occur after hernia repair. We found ischemic orchitis in 0.36% of primary hernias and 5% in recurrent ones.²⁴ Most cases occur after repair of large indirect hernias and are related to the extent of surgical trauma in dissection of the hernial sac. Testicular atrophy appears less frequently when there is no dissection of large segments of the vascular elements of the spermatic cord.²⁵

Inguinal seromas, which represented 1.1% of our series of laparoscopic repair, occur in 6.6% of open herniorrhaphies when mesh is used.²⁶ Seromas occur more often in fully extraperitoneal repairs, presumably because the liquid cannot drain to the peritoneal cavity.

Obney¹⁸ reported 0.9% cases of hydrocele in open inguinal repairs. This probably represents a persistence of the vaginal process, which loses its drainage into the peritoneal cavity when the indirect sac is connected. Our series using the TAPP technique had 1.6% cases of hydrocele. They also appear after completely extraperitoneal corrections in 0.5%.^{27,28}

Two patients in this series experienced prolonged postoperative pain that was attributed to nerve injury. Patients who undergo laparoscopic herniorrhaphy have 1.6% incidence of neuralgias, a rate similar to that of open approaches.²⁹ In laparoscopic inguinal surgery, the iliopubic tract is an important anatomic feature. Lateral to the spermatic vessels, and immediately below the fibers of the iliopubic tract, are the genital and femoral branches of the genitofemoral nerve, the femoral nerve and the lateral femoral cutaneous nerve. Consequently, clips placed below the iliopubic tract and lateral to the femoral vessels may cause temporary or permanent neuralgias, involving one or more of the nerve branches mentioned above.³⁰

It should be recalled that, even in laparoscopic surgery, the iliohypogastric and ilioinguinal nerves may be injured if the clips are applied too deep in the muscles of the anterior abdominal wall.

Bowel injury may occur in various laparoscopic situations, especially when the technique used is transabdominal (TAPP, IPOM). It may occur at initial puncture, particularly in an abdomen which has been submitted to previous surgery, or in an attempt to free peritoneal adhesions. A major problem can be incarcerated hernias, which may require opening the hernial ring or even conversion to a conventional procedure. In our experience, the installation

of a pneumoperitoneum helps reduce incarcerated hernias. In strangulated hernias, the laparoscopic approach can accurately evaluate the viability of the bowel loop involved, which is not always possible in the conventional approach. A direct inguinal hernia sometimes contains a portion of the urinary bladder, which may be injured during dissection or stapling. This injury does not cause significant morbidity if immediately corrected with primary suture in association with decompression of the urinary bladder with a Foley catheter.

Special attention should be dedicated to the puncture sites. After removal of the cannulas, one should look for possible bleeding, as cases of injury to the epigastric artery with hypovolemic shock have been described. The aponeurosis at the puncture sites, especially at the orifices of the 10 mm and 12 mm trocars, should be closed to prevent local herniation.

After completing the procedure, it is useful to evacuate the pneumoperitoneum under direct viewing. The peritoneum is pressed against the abdominal wall internally with an instrument, while the surgeon presses externally.

Scrotal ecchymosis and inguinal hematoma caused by small bleeding vessels as a result of the surgical procedure are some of the most frequent complications following inguinal hernia repair. These lesions may be lessened or prevented using an elastic support for 3-4 weeks postoperatively.

Testicular edema normally occurs when the closure of the internal inguinal ring is excessively tight around the spermatic cord. It is rarely the result of venous or lymphatic injury. Treatment is simple, with suspension of scrotal sac and restricted physical activity. Anti-inflammatory medication may be used.

Due to the variety of laparoscopic inguinal hernia repairs, it is difficult to compare laparoscopic surgery to open surgery. Until large series have been followed up for a long period of time it will not be possible to identify the method which provides the best results. However, the largest laparoscopic case series published so far are TAPP approaches.³¹ Laparoscopic herniorrhaphy is a feasible option, with low morbidity and mortality, less postoperative pain and a rapid return to normal activities.

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