Laparoscopic totally extraperitoneal inguinal hernia repair. Twenty-seven serious complications after 4565 consecutive operations

Herniorrafia inguinal laparoscópica totalmente extraperitoneal. Vinte e sete complicações graves após 4565 operações consecutivas

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A B S T R A C T

Objective: To identify and assess the complications of laparoscopic inguinal hernia treatment with totally extraperitoneal mesh placement (TEP). **Methods**: We included patients who had undergone the TEP procedure in a consecutive series of 4565 laparoscopic hernia repairs between January 2001 and January 2011. Inclusion criteria were diagnosis with symptomatic inguinal hernia, including recurrence after inguinal hernia repair and previous surgery in the lower abdomen and pelvis. All patients were 18 years of age or above. Patients with incarcerated hernia in emergency were excluded from the study. **Results**: A total of 4565 hernias were included in the study. In the group, there were 27 severe complications (0.6%): 12 bleedings (0.25%), two bladder lesions (0.04%), five intestinal obstructions (0.11%), four intestinal perforations (0.09%) one injury to the iliac vein (0.02%), one femoral nerve injury (0.02%), two lesions of vas deferens (0.04%) and two deaths (0.02%) (pulmonary embolism, peritonitis). **Conclusion**: The rate of complications with the TEP procedure is low. Laparoscopic hernia repair technique is reproducible and reliable. In our experience, there are contraindications to the TEP procedure. TEP technique must be meticulous to avoid intraoperative complications (bipolar diathermy). Complications can occur even after the surgeon has gained substantial experience.

Key words: Hernia, inguinal. Surgical procedures, operative. Laparoscopy. Herniorrhaphy. Postoperative complications.

INTRODUCTION

The repair of inguinal hernia has been a controversial issue in surgical practice since its conception[1]. The fact that numerous different procedures are used for the treatment of inguinal hernias reflects the complexity of inguinal instability and its repair. The goal of hernia repair is to mend the weakness of the abdominal wall.

The laparoscopic procedure is the only technique that allows one not to injure the abdominal wall. In the laparoscopic procedure, the repair is achieved through the placement of a prosthesis (mesh) to cover the entire inguinal area, including the regions of the indirect, femoral and obturator hernias.

The totally extraperitoneal inguinal herniorrhaphy (TEP) combines the advantages of the absence of tension by using the reinforcement of the mesh within the groin and the ones of laparoscopic surgery, reducing postoperative pain and shortened recovery time, avoiding the need for transabdominal approach[2]. The establishment of this technique by Dulucq in 1990 in Europe may be considered as an additional logical development of the procedure transabdomino-pre-peritoneal herniorrhaphy (TAPP)[3,4]. The surgeon can use the endoscopic technique for the repair of a primary inguinal hernia, and therefore must have sufficient experience in the specific procedure[5].

Informed consent for the procedure should be obtained for all patients. The surgeon must then inform in detail the operative strategy, as well as the possibility of complications or conversion to open surgery[6]. The rate of serious complications with TEP is not sufficiently known, though.

The objective of this work is to identify and evaluate the complications of the treatment of

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inguinal hernia with a totally extraperitoneal mesh placement.

METHODS

A retrospective multicenter international study was performed by high-volume surgical centers in laparoscopic hernia repair by extraperitoneal technique.

Patients who underwent elective inguinal hernia repair in the *Service de Chirurgie Générale & Digestive*, CHICAS (France); Clinique du parc, Saint-Priest-en-Jarez (France), Department of Surgery, Institute of Gastroenterology, Kawasaki Sekishinkai Saiwai Hospital, Kawasaki (Japan); Professor Edmundo Vasconcelos Hospital, Sao Paulo (Brazil) and Servicio de Cirugía General y Digestiva, Hospital Universitario Dr Peset, Valencia (Spain) were included in this study.

We evaluated a consecutive series of 4565 patients undergoing laparoscopic totally extraperitoneal inguinal hernia repair (TEP) between January 2001 and January 2011.

We evaluated all patients aged over 18 years, diagnosed with symptomatic inguinal hernia, including recurrence after inguinal hernia repair and previous operations in the lower abdomen and pelvis.

Patients with incarcerated hernia in the ER were excluded.

Demographic, operative and postoperative data were studied. The following data were collected retrospectively: age, sex, duration of operation. The intraoperative and postoperative complications were classified according to the guidelines of the European Hernia Society[5].

The placement of the mesh is performed under general anesthesia and a single dose of prophylactic antibiotics (cephalosporins: cefazolin 2g). The patient is placed in the supine position, the arm is positioned along the body in the side opposite to the hernia, as well as the surgeon. We use three trocars in midline, placed under direct visualization. With a 0° laparoscope the surgeon creates a medial tunnel. There are three anatomical structures that serve as repairs: 1 - pubic bone, 2 - arched line, 3 - inferior epigastric vessels.

The lateral dissection is done down to the psoas muscle infero-laterally, thus exposing the nerves in the "lateral triangle of pain" [7]. Only the hernia is completely dissected from the cord structures and reduced by displaying the "triangle of doom" between the vas deferens and gonadal vessels[7].

The mesh, measuring at least 10x15 cm, is introduced through the 10mm subumbilical portal and should be large enough so that the hernial ring is positioned at its center[5], being put, on the created space, to cover the direct, indirect femoral and obturator hernia defects. The used mesh has a polypropylene weight of approximately 115g/m^2. To avoid possible damage to the nerves, fixing clips on the meshes are used only in exceptional cases, involving a very wide inner ring[8]. In this case, the mesh is stapled only medially and to the Cooper ligament to prevent neuralgia[9]. Deflation is done under direct vision, the hernia sac and lipoma are placed behind the mesh. We do not use any drainage. The operation can also be performed in an ambulatory surgery unit or day hospital[10].

RESULTS

A total of 4565 operations were performed, of which 402 were in recurrent hernias. The patients were operated by seven surgeons experienced in laparoscopic surgery, in different countries, each surgeon having operated more than 150 cases. The characteristics of patients and hernias are shown in table 1.

Mean operative time was 38 minutes in unilateral hernias and 54 in bilateral ones. There were 27 serious complications (Table 2) and two deaths (0.02%), one due to pulmonary embolism and another due to peritonitis. Twenty complications required new interventions: Ten hemorrhages, five occlusions, four intestinal perforations (two in the small intestine and two in the large intestine). There were 12 hematomas, requiring a new intervention for removal of the meshes. There was an injury caused by iliac vein dissection with monopolar hook. After laparotomy, the vascular injury was sutured and the hernia was corrected by Stoppa technique.

The five bowel obstructions were caused by herniation of the small intestine in a breach of the peritoneum. All patients underwent laparotomy revision, without need of intestinal resection.

Table 1 - Demographic data of the patients and characteristics of the hernias.

Variables	N
Number of patients	3,662
Number of hernias	4,565
Age (years), mean ± SD	55 +/- 15
Gender	
Male	3,122
Female	540
Hernia site	
Right inguinal	1,672
Left inguinal	1,131
Bilateral	859
Hernia Type	
Direct	1,722
Indirect	2,582
Femoral	261

Table 2 - Types of complications.

Complications	N	
Intraoperative		
Bladder injury	2	(0.04%)
Intestinal perforation	4	(0.09%)
Iliac vein injury	1	(0.02%)
Vans deferens injury	2	(0.04%)
Femoral nerve injury	1	(0.02%)
Postoperative		
Bleeding	12	(0.25%)
Intestinal obstruction	5	(0.11%)
Total	27	(0.6%)

The two perforations of the small intestine resulted from thermal injury during outpatient operation and the symptoms manifested five to eight days after surgery. Both patients underwent revision of hernioplasty (one laparoscopic, one by laparotomy). The perforations were closed, there was no peritoneal violation or the need to remove the meshes and patients had no more complications.

There were two perforations of the large bowel that caused peritonitis. One, caused by diverticulitis, wherein the patient had not taken anti-inflammatory drugs, and the other caused by a colonoscopy carried out the day before the TEP procedure. These patients underwent revisional surgery. In one case, with the aid of laparoscopy, the perforation was closed; in the other one, Hartmann's procedure was performed.

Postoperatively, there was a femoral nerve irritation in one case, apparently caused by electrocoagulation applied in the vicinity of the psoas muscle. There were two injuries to the vas deferens. To date, there are no signs of testicular atrophy.

In this study, there were 27 serious complications, four during the learning curve (an injury to the iliac vein and three hematomas). The remaining 23 complications occurred after the learning curve.

DISCUSSION

Inguinal hernia repair is one of the most common surgical procedures performed annually. The TEP technique is considered a safe and durable procedure, with excellent long-term results[4]. This study examines ten years of TEP inguinal hernia repair in different countries.

The goal was to record the percentage of patients with serious short-term complications. The patient demographics and characteristics of hernia in our series are the same as other publications; most hernias were indirect and unilateral[4]. The TEP is a reproducible technique and is why it is used in different countries[11].

We always put the three trocars under direct vision, therefore, there were no complications related to inflation in this series. Serious complications are rarely encountered during and after surgical treatment of inguinal hernias. The most common intraoperative complication found after placement of TEP and TAPP is the injury of the bladder (0% to 0.2%), mainly in patients with a suprapubic surgical scar. We found two lesions of the bladder: one patient who had undergone previous prostatectomy and the other patient was very thin, with very fragile tissues. The bladder was sutured after laparotomy, the bladder catheter was maintained for five days. We did not use prostheses in these patients.

Studies on TEP and TAPP reported intraoperative intestinal injury at 0% to 0.3% of cases, with rates of 0% to 0.06% in large investigations involving over 1000 patients, and rates of injuries to great vessels of 0 to 0.11%[4,12]. In this study, we had five intestinal lesions and one injury to the iliac vessels. After induction, the complete reduction of the hernia sac contents is assured.

Problems can arise if the patient is not in the Trendelunburg position. In this case, the intestines can remain in the hernial sac, increasing the risk of thermal damage. The extraperitoneal laparoscopic surgery is performed under general anesthesia with good muscle relaxation, otherwise the work space is too small. Should there be any gas leak, the preperitoneal space becomes too small. For this reason we use the balloon trocar to make the incision airtight.

The dissection should always be made with the same steps, so the technique is reproducible. During dissection, the surgeon must visualize an aspect of "spider's web" to indicate that he/she is in the right direction. The dissection is blunt. At the high end of the dissection there is always a small vessel, which is a colateral of the inferior epigastric vessels. This vessel is coagulated with bipolar diathermy to prevent bleeding. The vas deferens is seen lying separately on the medial side, and the gonadal vessels are seen laterally, forming a triangle. This triangle, known as the "triangle of doom", is bounded medially by the vans deferens, laterally by the gonadal vessels, with its apex at the internal inguinal ring, and the base is formed by the peritoneum. The dissection should be clear in this region, to avoid injury to the cord structures or iliac vessels. An injury to these vessels can be fatal and usually requires an urgent laparotomy and vascular repair. During this dissection, the surgeon uses bipolar diathermy. The bipolar method is safer than the monopolar. As in the cases reported above, thermal injuries to the intestine are not generally noticed at the time of occurrence.

Patients with unnoticed intestinal lesions usually return three to seven days after injury, with fever and abdominal pain. However, a time interval between the occurrence of the lesion and the onset of symptoms ranged from 18 hours to 14 days[13]. Bipolar devices are safer and should be used instead of monopolar, particularly in

anatomically unfavorable situations. Bipolar diathermy is nonetheless very limited to dissection; only one surgeon from our group prefers to use monopolar diathermy.

There were five cases of intestinal obstruction in this series. The number is the largest reported[4]. In all cases we found breaches in the peritoneum. The TEP technique must be meticulous and all peritoneum openings should be closed to prevent postoperative occlusion.

The risk of intestinal obstruction in the postoperative period is not more important for TEP than it is for the Lichtenstein technique[14]. We use an Endoloop® or Surgiti® to close the breaches in the peritoneum. If the peritoneal tear is near the arched line, we move down scope, changing the 5mmtrocar by one 10mm to facilitate triangulation.

If the closure is impossible, the surgeon should change to TAPP or to open procedure. If a pneumoperitoneum ensues, we use a 5mm trocar (Veress) in the left hypochondrium to reduce it. If there is doubt about a peritoneal breach, we complete the procedure with a laparoscopic exploration to investigate the pelvis. If there is a gap, we can close it with sutures.

There were 12 hematomas in patients on anticoagulant therapy that required a new intervention for removal of the meshes. One patient died of a pulmonary embolism at the end of treatment. Currently, treatment with anticoagulants is, for us, a contraindication for laparoscopic hernia repair. Our other contraindications are patients unfit for anesthesia, obesity, big hernias, pregnancy, patients with a history of lower abdominal operation, recurrent hernia after laparoscopic hernia repair, and patients on anticoagulants. We operate only symptomatic hernias. The surgeon is not here to remove the hernia, he/she is here to remove the pain produced by the hernia. If the patient has a narrow pelvis and the distance between the umbilicus and the pubis is too short, the preperitoneal space is very small and the TEP procedure more difficult.

One patient developed pain and paresthesia in the femoral nerve region due to a heat injury. The lateral dissection is performed from up down to the psoas muscle infero-laterally, thereby exposing the nerves in the "lateral triangle of pain"[7]. The lateral space contains aerolar loose tissue, which is completely and bluntly dissected. We learned to prevent diathermy use during this dissection.

In this study of 4565 consecutive cases, there were 27 serious complications. Only four complications occurred in the learning curve, one injury to the iliac vein and three hematomas.

The remaining 23 complications occurred after the learning curve, in over 150 patients, before we started using only bipolar diathermy and anticoagulant treatment become a contraindication to the TEP procedure. TEP hernioplasty is an advanced laparoscopic procedure, to be carried out by experienced hands.

The rate of complications with the procedure TEP is low. Correction of laparoscopic hernia is reproducible and is our favorite technique. In our experience, there are contraindications to the TEP procedure. The TEP technique must be meticulous to avoid intraoperative complications (bipolar diathermy). Complications may occur after the learning curve.

R E S U M O

Objetivo: *identificar e avaliar as complicações do tratamento da hérnia inguinal com a colocação de tela totalmente extraperitoneal.* ***Métodos:*** *Foram incluídos, em uma série consecutiva de 4565 reparos de hérnia laparoscópica, pacientes que haviam sido submetidos ao procedimento TEP entre janeiro de 2001 e janeiro de 2011. Os critérios de inclusão foram: diagnóstico com hérnia inguinal sintomática, incluindo recorrência após correção de hérnia inguinal e cirurgia prévia em abdômen inferior e pelve. Todos os pacientes > 18 anos de idade. Pacientes com hérnia encarcerada na urgência foram excluídos do estudo.* ***Resultados:*** *Um total de 4565 hérnias foram incluídas no estudo. Ocorreram 27 complicações graves (0,6%): 12 hemorragias (0,25%), duas lesões da bexiga (0,04%), cinco oclusões (0,11%), quatro perfurações intestinais (0,09%), uma lesão da veia ilíaca (0,02%), uma lesão do nervo femoral (0,02%), duas lesões dos vasos deferentes (0,04%) e dois óbitos (0,02%) (embolia pulmonar, peritonite).* ***Conclusão:*** *A taxa de complicações com o procedimento TEP é baixa. Correção de hérnia laparoscópica é uma técnica reprodutível e confiável. Em nossa experiência, existem contraindicações para o procedimento de TEP. A técnica TEP deve ser minuciosa para evitar complicações intraoperatórias (diatermia bipolar). As complicações podem ocorrer mesmo após o cirurgião ter adquirido experiência substancial.*

Descritores: *Hérnia Inguinal. Procedimentos cirúrgicos operatórios. Laparoscopia. Herniorrafia. Complicações pós-operatórtias.*

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