

Standardized technique of single surgeon in TEP repair: 17 years experience.

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Abstract

Groin hernia repair is one of the most frequently performed operations in general surgery. From the original Bassini's procedure to the Lichtenstein's tension-free procedure, a variety of open techniques have been described to manage groin hernias. With the introduction of laparoscopy in hernia surgery in 1990s, laparoscopic repair has emerged as the procedure of choice worldwide. Since June 1993, our approach for inguinal hernia repair has been laparoscopic TEP. The purpose of this study is to present the results of a large patient cohort operated on by a single surgeon using the TEP procedure. Emphasis is made on the surgical technique, intraoperative and postoperative complications and follow-up outcome.

Key words: *inguinal hernia repair – TEP – laparoscopic surgery - outcome*

Introduction

Groin hernia repair is one of the most frequently performed operations in general surgery. From the original Bassini's procedure to the Lichtenstein's tension-free procedure, a variety of open techniques have been described to manage groin hernias. With the introduction of laparoscopy in hernia surgery in 1990s, laparoscopic repair has emerged as the procedure of choice worldwide. In addition to the well-established advantages of laparoscopy, the main advantage of the laparoscopic approach to inguinal hernia repair is that it provides the surgeon to evaluate groin anatomy bilaterally and to repair any incidental defects. [1]

Today, the most commonly used laparoscopic techniques for inguinal hernia repair are transabdominal preperitoneal (TAPP) repair and totally extraperitoneal (TEP) repair. The TAPP repair requires access to the peritoneal cavity with placement of a mesh through a peritoneal incision. On the other hand, the TEP is different in that the peritoneal cavity is not entered thus it is reported to have a lower potential for intraperitoneal complications. TEP has also been recommended as the method of choice for recurrent and bilateral hernias. [1-2-3]

Since June 1993, our approach for inguinal hernia repair has been laparoscopic TEP. The purpose of this study is to present the results of a large patient cohort operated on by a single surgeon using the TEP procedure. Emphasis is made on the surgical technique, intraoperative and postoperative complications and follow-up outcome.

Patients and Methods

The medical records of 1380 consecutive patients who underwent laparoscopic TEP hernia repair between June 1993 and June 2010 at Istanbul University Cerrahpasa

Medical School and Acibadem Kozyatagi Hospital were prospectively entered to a database and the data were retrospectively reviewed. All the operations were carried out by a single surgeon (M.E.) who is well experienced in laparoscopy. Written informed consent was taken from each patient after the patients were informed of the details of the TEP procedure. The inclusion criteria were all patients who were diagnosed to have unilateral or bilateral inguinal hernia, femoral hernia, incarcerated hernia, including recurrences after primary hernia repair, and previous lower abdomen or pelvic surgery. The medical records were analyzed to document demographic features, type of hernia, operative time, hospital stay, intra- and postoperative complications, conversions, outpatient follow-up and recurrence.

Operative technique

Under general anesthesia, the patient is placed in a supine position and a single prophylactic dose of antibiotic is administered. Urinary catheterization is not used in most patients. The surgeon and the camera holding surgeon are positioned on the opposite side of the hernia. A midline, three-port technique is routinely employed. A 1.5-cm laterally located transverse skin incision is made at the inferior edge of the umbilicus and the anterior rectus sheath is incised, exposing the rectus abdominis muscle. The rectus muscle is retracted and a channel between the muscle and the posterior sheath is created using S-shaped retracters. After dissecting the preperitoneal space with a balloon tip cannula (Spacemaker™ Dissection Balloon, Covidien, CT, USA), a 10-mm blunt trocar with fixation screw (The Bluntport™ Plus trocar, Covidien, CT, USA) is placed in a horizontal direction, and carbon dioxide gas is

insufflated to maintain a pressure of 12 mmHg. Then, a 30° - 10mm laparoscope is introduced and two 5-mm working trocars are subsequently placed in the preperitoneal space under direct vision: one at 1/3 and the other one at 2/3 of the distance between the umbilicus and the pubic symphysis. In some cases, preperitoneal dissection is performed with the laparoscope without a balloon. Blunt graspers are used to dissect the preperitoneal areolar tissue from the Hasselbach's triangle, indirect ring, femoral triangle and obturator ring, exposing all potential hernia defects. The anatomical landmarks (Cooper's ligament, the iliopubic tract and inferior epigastric vessels) are identified. No dissection is performed over the psoas muscle. Next, the hernia sac is gradually reduced back into the abdominal cavity to remain freely 3 cm from the deep inguinal ring. This is accomplished by stripping the peritoneum down from the spermatic cord structures. Cord lipoma is accepted as a pre-hernia lesion, and if present, it is also reduced off the cord. In cases with large scrotal hernias where complete reduction is impossible, the sac is separated from the cord and transected with its distal part left in situ. A direct or femoral hernia is reduced by simple traction. In cases with large direct hernia, the attenuated transversal fascia is inverted and fixed it to the pubic bone in order to reduce the risk of seroma formation. In the treatment of incarcerated femoral hernia, the sac is reduced after the iliopubic tract is incised upward with scissors or electrocautery ensuring that no bowel is entrapped within the sac.

After adequate space is created around the cord structures, a 15x10 cm polypropylene mesh is used to reinforce the myopectineal orifice. The mesh is prepared with a 7-cm-long slit from its lateral edge, it is rolled and introduced through the 10-mm trocar into the Bogros space. Then, the mesh is unrolled and its medial edge is fixed at one point on pubic bone, two points on the Cooper's ligament with tacks (ProTack™ 5mm Fixation Device, Covidien, CT, USA). The lower border the mesh is placed 2 cm over the Cooper's ligament and laid down toward to the obturator foramen. Then, the free lower lateral leg of the mesh are passed under the cord and extensively overlapped on the free upper lateral edge creating a new internal ring (more than 3 cm overlap). These two legs are fixed each other using two more tacks. These tacks are applied only on the mesh with care not to place tacks on structures lateral to the cord. This positioning gives the mesh an anatomically conical shape which allows it to fit inguinal floor properly (Figs. 1 and 2). If the size of hernia defect is larger than 4 cm, the mesh is fixed on the transverse aponeurotic arch using three more tacks. At the lateral side of the cord, placement of tacks below the iliopubic tract is avoided. On the basis of clinical suspicion of bilateral hernia, the contralateral inguinal region is routinely explored, and if present, the tacked slit technique is performed in the same fashion. In cases with a large hernia defect, in order to prevent recurrences, a second same-sized mesh with a medial slit is prepared, and it is fixed on the first mesh in the opposite direction. In the

event of any gas leakage into the abdominal cavity, a Veress needle is inserted into the peritoneal cavity from the left upper quadrant and the tap leaves open to evacuate the gas and reexpansion of the preperitoneal space. Desufflation is performed under visual control to confirm that the edges of the mesh are not displaced from their intended positions. The trocars are removed, and the anterior rectus sheath and the skin incisions are closed with 2/0 vicryl and 3/0 polypropylene sutures, respectively. No drains are placed.

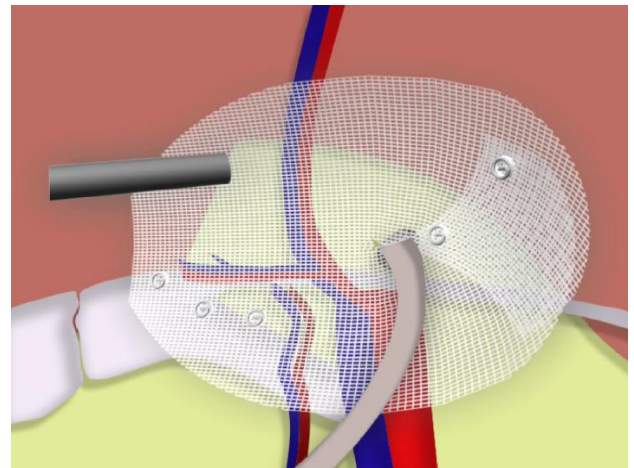


Figure 1. Appearance of the cony-shaped mesh after its fixation in the inguinal floor.



Figure 2. Intraoperative view.

After surgery, pain control is provided by intramuscular nonsteroidal anti-inflammatory agents upon demand. Patients are allowed to resume a normal diet 6 hours postoperatively, and discharged from the hospital with no restriction of daily activities however any strenuous physical exercise was discouraged during the first postoperative month. On discharge, male patients are instructed to wear suspensory underpants for 10 days in order to reduce the risk of scrotal edema. Patients were visited and physically examined at the outpatient clinic within 8 days and after a month, and subsequently on an as-needed basis. Follow-up was discontinued at 2 years.

Results

In the period June 1993-June 2010, a total of 1766 laparoscopic TEP hernia repairs were performed in 1380 patients. There were 1150 male and 230 female patients with a male:female ratio of 6:1. The mean age of the patients was 46.8 years (range, 18-82 years). Unilateral hernia repair was performed in 994 patients and bilateral repairs in 386 patients. Patient demographic data and hernia characteristics are provided in Table 1. Incomplete indirect hernia was the most common, followed by direct, complete (scrotal) and then femoral hernia. 354 hernias (20%) were recurrences, all of which had been previously repaired by the open technique. Ten percent of the patients had a history of previous lower abdominal surgery such as appendectomy, prostatectomy and gynecologic surgery. Of the 1766 repairs, 15 required emergency surgery due to incarceration (9 indirect and 6 femoral).

Table 1. Patient demographic data and hernia characteristics.

Variable	No. (%)
Number of patients	1380
Number of hernias	1766
Age, mean	46.8 years (range, 18-82)
Sex	
Male	1150 (83%)
Female	230 (17%)
Types of hernias	
Indirect	613
Direct	318
Femoral	31
Recurrent	354 (20%)
Site of hernias	
Bilateral	386 (28%)
Unilateral	994 (72%)

The overall operative time recorded was 23 min (range, 7-47 min) for unilateral hernia and 36 min (range, 24-98 min) for bilateral hernia. The mean length of hospital stay was 1 day (range, 1-2).

Intraoperative and postoperative complications are listed in Table 2. One patient in our series has been admitted with re-forming of seroma after the drainage. This patient carry on his life on the active follow-up without significant problem. In 4 patients after TEP, large scrotal hematoma formation has been seen. 3 out of 4 of these patients were under anti-coagulant treatment with acetyl salisilic acid (Aspirin) which was stopped preoperatively. Conservative measures such as scrotal elevation with suspansory underwear have been used and hematoma gradually disappeared in 4 months. There were two major intraoperative complications in this serie, including one case of hemorrhage and another case of urinary bladder injury. Hemorrhage resulted from damage to inferior epigastric artery, which could be controlled by converting to open surgery to ligate the retracted bleeding artery in the rectus abdominis muscle. Hernia repair in this case was

completed with Lichtenstein procedure. In the other case, the defect in the bladder was succesfully closed by laparoscopic suturing.

Table 2. Intra- and postoperative complications.

Intraoperative complications	
Inferior epigastric injury	1 (0.05%)
Urinary bladder injury	1 (0.05%)
Total	2 (0.1%)
Conversion	
Open	1 (0,05%)
TAPP	18 (1,01%)
Postoperative complications	
Seroma	152 (8,5%)
Hematoma	4 (0.22%)
Urinary retention	6 (0,43%)
Trocar site infection	-
Chronic pain	0
Mesh infection	0
Trocar site hernia	0
Total	162 (9,17%)
Recurrence	4 (0.22%)

There were a total number of 18 repairs that required conversion to TAPP, with a rate of 1%. 18 repairs were converted to TAPP procedure due to dissection difficulties in the preperitoneal space. Because of wide tearings of peritoneum. When a peritoneal tear occurred, no attempts were made to repair the tear. In all the cases who developed pneumoperitoneum, TEP repair was succesfully completed after the insertion of a Veress needle into the intraperitoneal cavity. In 172 cases (9,7%), a peritoneal gas leakage was observed and managed by the veress needle insertion and the TEP repair was completed succesfully

The most common postoperative complication was seroma, followed by scrotal hematoma and urinary retention. No documented case of chronic groin pain or mesh infection was encountered. Urinary retention in 6 patient was managed with urinary catheterization (24 hour). All the other complicated cases were treated with conservative measures. There was no mortality.

Seroma formation has been seen in 152 (8,6%) and it has been regressed without any specific treatment. Of the patients who developed seroma, percutaneous aspiration was needed in one patient.

3 patients suffered from pain which lasted 3 months . In one of these patients, pain was on the lateral thigh along the trajection of nervus cutaneous femoris lateralis and has been treated with nerve-block. Rest 2 patients were managed with anti-inflammatory medications and pain was completely resolved at the end of the three months.

After the surgical procedure, all patients were followed up at 8th day (day of the suture removal) and 1, 3, 6, 12 months by examination and at 2 year by phone-call. Patients were reached 87% and 72% at 1 and 2 years, respectively. In all study group, 4 patients were found to be recurred. 3 out of 4 these patients were our early cases. Only one patient was in the advanced period of the

operating surgeon. This patient was in very advanced age with co-morbid associated diseases. Therefore, anesthesia had to be terminated early in this patient due to unstable general condition under anesthesia. This resulted the insufficient Cooper fixation in this particular patient. All recurrences were technical failure and occurred in the first three months after repair. All these recurrences were subsequently repaired with Lichtenstein procedure.

Discussion

TEP repair is presently the preferred approach over TAPP for laparoscopic hernia repair since it is less invasive, is associated with fewer complications and it preserves the peritoneal integrity. [1-2] We started using the TEP technique in patients with groin hernia in 1993 and since then, have been performing this procedure in our institutes for over than 17 years. In the present study, we examined our own experience of TEP procedure in 1766 repairs.

There are some technical key points to perform this procedure successfully. Regarding the infraumbilical skin incision site, contrary to the midline incision technique reported by some authors. [3-4] We prefer to make this incision slightly lateral to the umbilicus. This lateral approach prevents inadvertent entry through the linea alba into the peritoneal cavity thus it provides secure dissection in the extraperitoneal space.

Seroma formation is sometimes inevitable result of hernia repair. Patients, particularly patients with direct hernia, should be informed before the operation about this result since most of the patients thought that this bulging is the recurrence of hernia. In physical examination, this bulging should not be mistaken for recurrence of the hernia which can appear clinically similar. In palpation, these lesions gives firm and hard bulging sensation even harder than the irreducible hernia. They usually resolves within 2 weeks and generally do not require treatment unless they give rise to symptoms or persist for more than 6-8 weeks. One patient in our series has been admitted with re-forming of seroma after the drainage. This patient carry on his life on the active follow-up without any problem.

In 4 patients after TEP, large scrotal hematoma formation has been seen. 3 out of 4 of these patients were under anti-coagulant treatment with acetyl salicylic acid (Aspirin) which was stopped preoperatively. Conservative measures such as scrotal elevation with suspansory underwear have been used.

The mesh should be properly placed to the inguinal floor. In order to achieve this, we first fixate the mesh to just over the pubic bone and Cooper's ligament and then overlap its free lateral legs around the cord in order to give the mesh a conical shape. This mesh configuration perfectly fits the anatomy of the inguinal floor. Of note, our approach to inguinal hernia repair in patients who have previous lower abdominal or pelvic surgery does not vary from the approach for patients without previous surgery.

Another important point is that we avoid dissection anterior to the psoas muscle since several important nerves (genitofemoral and lateral femoral cutaneous nerves) are

located in this area. Dissection in this area, when performed, may damage these nerves and subsequently result in chronic postoperative pain. Chronic pain is one of the most serious long-term complications following groin hernia repair. Groin pain reduction has been an important goal for improving outcome in TEP herniorrhaphy. [5] As seen from our results, there was no chronic pain in this series and this is attributed to; anchoring of the mesh with laparoscopic tacks just above the upper border of Cooper's ligament. Therefore, tacking was not performed in the bony structures. In our technique, we do not use anchoring other than the Cooper's ligament. Two legs of the mesh are fixed each other using two more tacks. We never perform any dissection or fixation in the pain zone (Area). Thus, there were no patients suffering from chronic pain. Since we have used standart mesh (100 gr/m²) in our early cases, patients reported "fullness" sensation. This sensation disappeared within the last 6 years after we started to use light weight mesh (40 gr/m²). Schopf et al. reported that the role staples in chronic pain following inguinal hernia repair may be overestimated and reducing the material load from 35 to 16 g/m² seems to further improve clinical outcome by reducing pain to a rare event [8].

In two of the early cases, pain on the lateral thigh along the trajection of nervus cutaneous femoris lateralis has been occurred which was managed with pain treatment lasted 2 and 3 months.

Complications following laparoscopic repair can be considered as occurring in the intra- or postoperative period. In the present study, apart from two intraoperative complications (hemorrhage from the inferior epigastric artery and bladder perforation), no other serious intraoperative morbidity was observed. This low intraoperative complication rate compares favorably with other series. [4] Inadvertent pneumoperitoneum was noted in 172 patients. However, we did not make any attempt to close the hole in the peritoneum. In such a situation, a veress needle should be introduced into the peritoneal cavity to remove the peritoneal CO₂.

The overall success rate for TEP repair was 95%, with conversion in only 19 repairs with a rate of 1,07%. (1,01% TAPP and 0.05% open). The conversion rate of up to 1.6% from TEP repair has been reported in different series. [1-3-7]

In the reported series, the common postoperative complications of TEP repair include seroma, hematoma, infection [3-4]. Seroma in 8,6%, hematoma in 0.05%, visceral injury in 0.05%, and major infection in none in the present series are within acceptable limits and compared favorably with these series. Seroma formation is sometimes inevitable result of hernia repair. Patients, particularly with direct hernia, should be informed before the operation about this result since most of the patients thought that this bulging is the recurrence of hernia. In physical examination, this bulging should not be mistaken for recurrence of the hernia which can appear clinically similar. In palpation, these lesions gives firm and hard bulging sensation even harder the irreducible hernia. They usually

resolves within 2 weeks and generally do not require treatment.

Long term follow up is a debatable issue since recurrences after 2 years from surgery has to be regarded as a disease caused by different factors such metabolic disturbances caused by co-existed diseases. Follow-up was ended at 2 years since the recurrences after this point can be regarded as the new hernia formation due to predispositional factors which were new added on lately. The recurrence rate after TEP repair has been reported to be up to 3,4%. The recurrence was only 0,22% over a mean follow-up of about two years in the present study.

Conclusion

In conclusion, laparoscopic TEP repair provides lower recurrence rates, shorter operating times and less postoperative morbidity and carries the advantages of minimally invasive surgery. The present study confirms previous reports of the favorable results of TEP repair. We believe that our very low recurrence rate is mainly due to surgery of the patients by single surgeon and also the application of same surgical method as it is defined. Surgeons experience gained by the large number of patients has also resulted the very good success rate. Surgeon has not changed the defined technique and almost strictly adhered standard steps in the defined method in every case. Thus, this approach has facilitated gaining experience of the surgeon.

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