

Laparoscopic Totally Extra Peritoneal Inguinal Hernia Repair with Endoscope Preperitoneal Dissection and No Mesh Fixation – How I Do It

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ABSTRACT

Background: Laparoscopic or robotic TEP hernia repair represents a minimally invasive surgical technique used in treatment of inguinal or femoral hernia in male or female patients.

Surgical technique: We describe the operative steps of the TEP hernia repair technique with the particularities of endoscope dissection of the extra-peritoneal space and no-fixation of the mesh after placement.

Discussions: The description of the trocar's positioning and the particularities of the technique are important, especially for young surgeons and are utterly for orientation but depends on the intraoperative findings. The correct space dissection, mesh placement and non-fixation of the mesh can reduce the risk of hernia recurrence and chronic postoperative chronic pain.

Conclusion: Due to the regular anatomy, TEP hernia repair operative technique can be standardized. The thorough comprehension of the anatomical landmarks and the surgical steps are important for the good outcome of the surgery.

Key words: Inguinal hernia repair, Totally Extra Peritoneal, operative technique

INTRODUCTION

Laparoscopic or robotic TEP hernia repair represents a minimally invasive surgical technique used in treatment of inguinal or femoral hernia in male or female patients. Over the time the worldwide experience with this technique allows multiple tips and tricks to be revealed and to facilitate the learning process. The advantages of TEP technique compared to open surgery are revealed by limited wound complications, rapid recovery, and decreased incidence of chronic pain. The learning curve of the TEP procedure is longer than Transabdominal Preperitoneal (TAPP) repair. The thorough comprehension of the anatomical landmarks and the various surgical steps are extremely important for the success of this surgery (1,2).

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We present a detailed step-by-step TEP operative technique, with the presentation of extraperitoneal space dissection, hernia sac treatment and mesh positioning.

SURGICAL TECHNIQUE

Operating room setup:

- General anesthesia with endotracheal intubation;
- Patient in supine position with the arms along the body;
- Bladder catheter (optional);
- 30° degree Trendelenburg, after the placement of the trocars;
- Operator on the opposite side of hernia;
- The assistant in front of the operator;
- The second assistant or nurse on the same side with the operator;
- Laparoscopy tour at the patient's feet;
- Instruments table on the same side with the assistant.

Instruments:

Basic instruments:

- Standard laparoscopic set;
- 0° endoscope;
- 10 mm trocar 10 mm;
- 5 mm trocar (2);
- Two laparoscopic atraumatic graspers;
- A pair of monopolar coagulating scissors.

Perioperative treatment:

- Prophylactic antibiotherapy (related to the mesh placement, but the subject is controversial).

Anatomical landmarks

The external anatomical reference is the anterior superior iliac spine and the pubic bone. 1 cm above the midpoint on the line between the anterior superior iliac spine and the pubic bone represent the projection of the deep inguinal ring where the indirect hernia can occur.

The indirect inguinal hernia is situated laterally to the inferior epigastric vessels. The direct hernia occurs medially to the epigastric vessels in the Hesselbach's triangle (delimited by the inguinal canal, inferior epigastric vessels and the rectus abdominis muscle).

The femoral hernia occurs near the iliac vessels,

inferiorly to the inguinal canal. It is fundamental to recognize the anatomical planes and to identify the appropriate space for the correct mesh placement.

Operative steps

Trocar positioning

- 10 mm trocar in periumbilical position;
- 5 mm trocar on the midline at 3 fingers or 4-5 cm below the periumbilical incision;
- 5 mm trocar on the midline at 3 fingers or 4-5 cm below the previous incision (if the trocar is placed too close to the pubic bone, the use of the grasper may be difficult for the mesh positioning).

Dissection of the Retzius space

For the placement of the optic trocar, a periumbilical incision is performed. The incision is placed on the right side in case of a left inguinal hernia is on the left side in case of a right inguinal hernia. In case of a bilateral hernia, the preferred periumbilical incision is on the left side. The skin incision is performed, the sub-cutaneous plane is dissected and the anterior sheath of the rectus abdominis muscle is identified. The aponeurosis is presented using two forceps and the incision is performed progressively using scissors to avoid muscle fiber section and secondary bleeding. A 10 mm trocar is placed under the muscular layer in the direction of pubic symphysis.

The extra-peritoneal space dissection can be performed using a 0-degree endoscope which allows a blunt dissection of the plane and decreases the risk of peritoneal sheet breach.

For the confirmation of the correct plane of dissection, is useful the identification of some white thin fibers, called "angel's hair". The presence of these structures will confirm the presence of the avascular plane of dissection and will allow the complementary pneumo-dissection of the CO₂ insufflation.

The extraperitoneal space dissection is performed in the direction of the pubic symphysis parallel to the rectus abdominis muscle. The dissection is conducted by advancing and retracting the endoscope, to allow CO₂ gas insufflation and to create the work space (*fig. 1*). Close dissection and contact with the pubic branch can expose to lesions of corona mortis vein. The dissection is conducted below the pubic bone.

The anatomical landmarks after the Retzius space dissection are: inferiorly urinary bladder and the pubic bone, anteriorly the rectus abdominis muscles and laterally the iliac vessels.

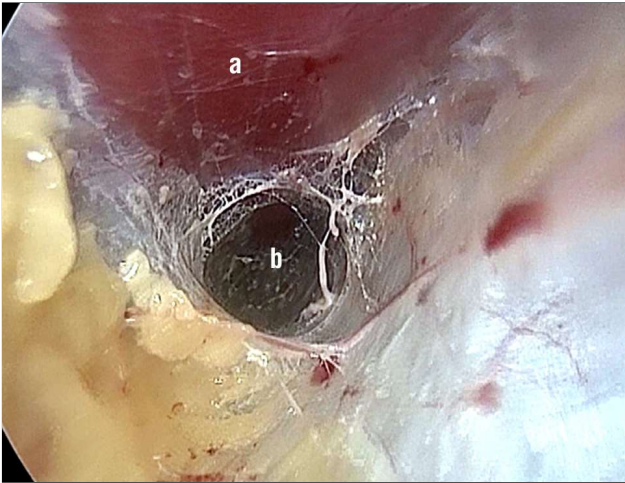


Figure 1 - Intraoperative image with the initial phase of the endoscope Retzius plane dissection. (a) - Rectus abdominis muscle, (b) - Extra-peritoneal space with Angel's hair structures

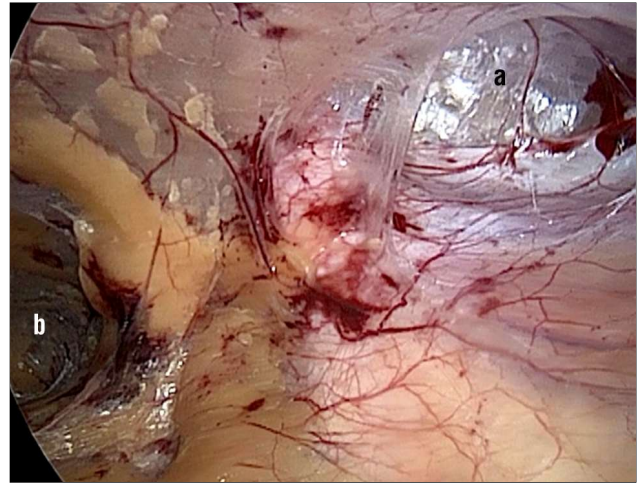


Figure 2 - Intraoperative image that presents the transition from Retzius to Bogros space. (a) - Bogros space; (b) - Retzius space.

Bogros space dissection

By gentle lateral movements of the laparoscope, the dissection is performed laterally. This space is accessed under the epigastric vessels between the transversalis fascia and the umbilico-vesical fascia (*fig. 2*). The lateral dissection of the extraperitoneal space is performed below the Douglas arcade, due to the increased risk of peritoneal sheet breach. It is important to identify inferiorly the iliac vessels and anteriorly the inferior epigastric vessels to avoid vascular injuries. At the end of this operative step, the two trocars of 5 mm are introduced in the midline.

Psoas muscle dissection

The lateral dissection of the spermatic cord in male patients and of the round ligament in female patients allows the visualization of the psoas muscle. The nerve fibers running through this muscle are identified (*fig. 3*).

Lateral abdominal wall dissection

The dissection is continued laterally between the peritoneal layer from the deep leaflet and the fascia transversalis until the anterior iliac spine. This space is avascular, and the dissection is facilitated by the insufflation of CO₂ gas.

Hernia sac dissection

In male patients in case of an indirect hernia, the sac is separated from the spermatic elements and in female patients from the round ligament, which are usually on the posterior side (*fig. 4*). In case of an indirect hernia in a male patient, the hernia sac is lifted, and spermatic

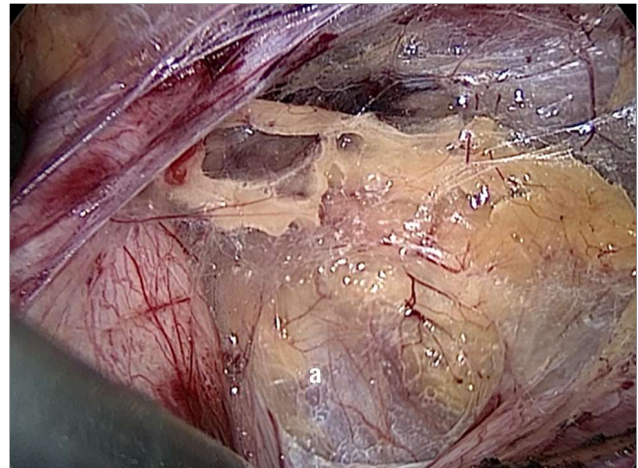


Figure 3 - Intraoperative image that presents the lateral dissection and the psoas muscle. (a) - Psoas muscle.

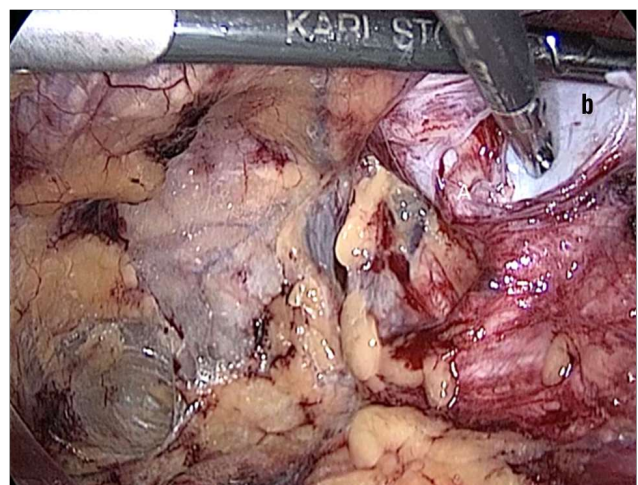


Figure 4 - Intraoperative image that presents the hernia sac dissection from the spermatic cord. (a) - spermatic cord, (b) - hernia sac.

elements are dissected gently in a downward direction. The peritoneum is reflected proximally and the cord structures are skeletonised. This step is called parietalisation of the spermatic cord. Once the spermatic elements are liberated, the complete access to the hernia sac is accessible. A complementary dissection of the spermatic cord vessels could be necessary.

In case of inguinoscrotal hernias, the hernia sac is longer and if the sac reduction is difficult due to distal adhesions can be sectioned and ligated. This is not ideal, but can be a valid option in complex cases. The most effective technique represents a progressive dissection of the sac and gentle reduction until gaining the distal part.

In case of a direct hernia, a hernia may have been reduced during the initial dissection and at the exploration will be visible only the parietal defect. Sometimes the sac must be dissected from the fascia transversalis. This dissection is usually very accessible and can be compared to the peeling of an orange.

A complementary Retzius space dissection is performed laterally and below the pubic branch, to prepare the mesh positioning.

Mesh placement

A nonabsorbable macroporous monofilament polypropylene textile mesh of at least 10 x 15 cm is used. We prefer a lightweight mesh for small or indirect hernias and heavyweight mesh in case of direct or large hernia. The mesh is rolled and introduced through the 10-mm trocar. Routinely, the mesh contains marks to facilitate the orientation but additional stitches to facilitate the orientation and the manipulation of the mesh can be placed. The mesh is placed, medially, under the pubic bone in front of the urinary bladder, and laterally the mesh covers the abdominal wall, to reflect on the ilio-pubic ligament and cover the psoas by several centimeters (*fig. 5*).

DISCUSSIONS

Advantages of TEP over TAPP technique includes the preservation of integrity of the peritoneal leaflet with lower incidence of visceral injuries and no intra-abdominal adhesions. (1,2) The exclusive intraparietal dissection and no intraabdominal access limits the impact on the hemodynamic and respiratory functions. (3) Other advantages includes a lower incidence of umbilical hernia due to intraparietal placement of the umbilical trocar and reduced cost of the surgery and lesser operative time (3,4,5).

Indications:

- Direct and indirect inguinal hernia and crural hernia;
- Interstitial or sliding inguinal hernia;
- Crural hernia;
- Bilateral hernia (6,7).

Contraindications:

Absolutes

- Incapacity of the patient to support general anesthesia;
- Incarcerated or strangulated hernia (8).

Relatives

- Patient under anticoagulation or antiplatelet medication;
- Large inguinoscrotal hernia;
- Recurrence after TEP, TAPP or previous hernia treatment by laparotomy;
- Previous laparotomies or retropubic prostatic surgery (9,10).

Due to the constant anatomy, TEP hernia repair technique can be standardized. The description of trocars placement and the placement timing are important, especially for unexperienced surgeons, but are merely for orientation and depends on the intra-operative findings. If the extraperitoneal space is difficult to dissect with the endoscope, the peritoneal breach is significant, or the hernia sac is unusually large, the conversion to TAPP is always possible.

We describe the endoscope dissection of the extraperitoneal space as an alternative to balloon

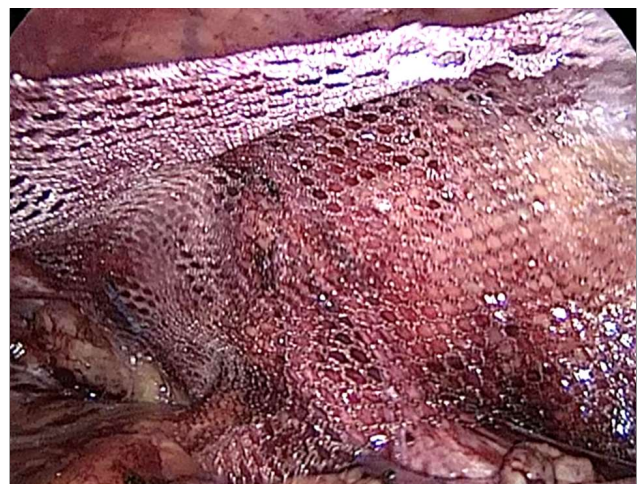


Figure 5 - Intraoperative image with the mesh placement

dissection (BD). The use of a balloon can be more adapted for the unexperienced surgeons who need to accommodate with the plane of dissection. Bringman et al. in a study on 23 patients that were operated with the use of a balloon for the Retzius dissection and 21 patient for whom the dissection was performed with the endoscope, found that in bilateral hernias, the use of a balloon adds costs to the procedure, but do not provide safety of a faster recovery of the patients (11). Other studies found equally that at 3 months, follow-up balloon dissections is not superior to endoscope dissection in term of postoperative pain and recovery (12). Astaldi et al. in a study on 207 patients where hypothesized that the use of BD does not consistently result in time saving and its use is not necessary in the experienced hands (13).

Multiple studies in literature have not observed any difference in hernia recurrence between mesh fixation and non-mesh fixation in TEP repair of an inguinal hernia. The mesh fixation with tackers or suture might expose to the risk of entrapment of the nerve and the apparition of chronic postoperative inguinal pain (14-16). If the fixation is necessary, in exceptional cases, non-traumatic techniques as the use of surgical glue can be a feasible option.

CONCLUSION

Due to the regular anatomy, TEP hernia repair operative technique can be standardized. The thorough comprehension of the anatomical landmarks and the various surgical steps are important for the good outcome of the surgery.

Conflicts of interest and source of funding

No conflict of interest to declare.

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Authorship

Sorin Cimpean: conception or design of the work, Nicolas Barriol: acquisition, analysis, or interpretation of data for the work, Hugo Steyaert: Drafting the work, Guy-Bernard Cadiere: Final approval of the version to be published.

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