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Ventral Hernia Repair by Laparoscopic Approach, how to do it

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Abstract

Background: Laparoscopic approach for ventral hernias is associated with decreased hospital stay, reduced risk of infection and low recurrence rate compared with the open repair techniques. However, these good outcomes depend of several surgical techniques related key points.

Aim: The aim of this paper is to present and highlight these "critical" key points.

Method: The paper presents the procedure in a step-by-step manner; operative room set-up, peritoneal access and trocars placement, abdominal wall defect exploration, accurate mesh placement with a minimum 4 to 5 cm mesh overlap of the hernia defect and an adequate mesh fixation. The different key points as mesh insertion and unrolling as well as mesh placement and fixation are highlighted. Several data from literature were also discussed.

Conclusion: The laparoscopic ventral hernia repair is a feasible and safe procedure. The respect of procedure's "critical" key points allows the best outcomes in term of hospital stay, postoperative pain and morbidity.

Keywords: Ventral Hernia; Laparoscopy; Mesh Repair

Background

Laparoscopic Ventral Hernia Repair (LVHR) is associated with decreased hospital stay, low rate of postoperative infection and low rate of recurrence compared with open repair techniques [1,2]. To achieve these better outcomes several key points were described: adequate patients' selection, choice of the peritoneal cavity entry and capnopneumo-peritoneum creation, trocars placement, adhesiolysis, abdominal wall exploration with careful inspection of parietal defect(s) (site(s), dimensions), mesh insertion, deployment and fixation [3-6]. Furthermore, these key points were the subject of several guidelines [7-9].

The aim of this video is to highlight these key points that allow "reliable outcomes" [5].

Patients' Selection

LVHR has to be the first choice for all the patients with primary or incisional hernias, even for the small parietal defects (smaller than 2 cm) [7]. The technique is especially preferred for medium size parietal defects (less of 10 cm in diameter) in obese patients because it reduces the wound infection rate as well as overall morbidity [7,10,11]. However there are several relative contraindications as large parietal defects (over 10 cm in diameter) and severe comorbidities (contraindication for laparoscopy and general anesthesia) [7]. Even the LVHR appear to be a "straightforward technique" an adequate training is mandatory [9]; in this way it is important to carefully select the first 10 to 20 cases in term of parietal wall defect diameter, BMI (body mass index), comorbidities and "estimated" adhesiolysis.

Surgical Technique Data

Operating room set-up

The procedure is performed under general anesthesia. The patient is in supine position. It is preferred to put both arms in adduction along the body to allow the cure of eventual occult inguinal hernia diagnosed during laparoscopy.

Trocars and instruments

Usual laparoscopic instruments are used: fenestrated graspers, hook, monopolar scissors, bipolar grasper, disposable taker (absorbable tacks). Usually 4 trocars are used: 1×10 mm; 2×5 mm; 1×15 mm. The use of 15 mm trocar is mandatory to allow the mesh abdominal insertion in order to avoid the mesh to skin contact (risk factor for postoperative wound infection [7]). The standard classical instruments include Kelly and Kocher graspers, Farabeuf retractors, Metzenbaum scissors, Hegar needle holder. A Reverdin needle is also necessary for the placement of expandable meshes or transfascial sutures.

Capto pneumoperitoneum creation and gaining access to peritoneal cavity

The peritoneal access has to be tailored with patient's and hernia's characteristics. In this way, for the median hernias with a parietal defect smaller than 2 cm a direct access through the hernia sac is generally used, placing a 15 mm trocar. For larger median parietal defects, an open access several centimeters afar from hernia site is preferred. For the lateral hernia a midline open access is used. A "direct view" 15 mm trocar can be also used as alternative to open

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access. The use of Veress needle should be avoided because the high risk of small bowel injuries which may preclude mesh placement, because these patients usually have previous surgery and adhesions [5-7,12].

After the capto pneumoperitoneum creation in function of hernia site, the patient is placed in a 15 to 30° Trendelenburg (or anti Trendelenburg) and a lateral right or left side tilt.

Trocars placement

After patient lateral tilt placement, the other three trocars are adequately inserted, under laparoscopic view control, in the right (or left) flank as far as possible from hernia site. The 10 mm trocar is placed to the mid distance between costal margin and Anterior Superior Iliac Spine (ASIS); the other two 5 mm trocars are placed 2 cm under the costal margin and respectively 2 to 5 cm from ASIS, in order to allow triangulation, adhesiolysis, mesh placement and fixation. Additional 5 mm trocars can be placed to complete adhesiolysis or to perform the concomitant inguinal hernia repair.

Adhesiolysis

The adhesions have to be carefully divided by sharp dissection and monopolar coagulation to avoid intestinal injuries. In the same time the herniated viscera are re inserted in the abdomen and carefully checked for ischemia or coagulation injuries.

Abdominal wall exploration

After the complete adhesiolysis a complete exploration of the abdominal wall including inguinal arias is performed. I prefer to divide the liver round ligament and the hernia sac to clearly view the aponeurosis to diagnose the occult white line hernias ("swiss cheese parietal defect") [5].

Parietal defect(s) assessment

For the concomitant groin hernia a Transabdominal Pre-Peritoneal (TAPP) procedure is performed during the same operation.

The ventral abdominal wall defects are carefully assessed and measured to choose the adequate mesh size. The external defect measurement on insufflated abdomen is usually performed even it overestimates the defect size [5]. It is very important to choose a mesh size which overlaps with a minimum 5 cm in all directions the parietal defect(s), to avoid postoperative mesh shrinkage and recurrence [1-9].

Mesh preparation and insertion

Two-side faces meshes are used to avoid visceral adhesions. An expanded polytetrafluoroethylene [ePTFE] mesh coated with polydioxanon is generally used [9]. However, from several months a new generation of meshes, which are expandable, is used in our surgical department: lightweight monofilament polypropylene mesh coated with a hydrogel barrier based on Sepra® technology. For the non-expandable meshes, 4 cardinal sutures are placed 1 cm from the edges and the sites of transfascial sutures are marked.

The mesh is rolled and inserted into the abdomen through the 15 mm trocar, avoiding the skin contact.

Mesh deployment and fixation

After the mesh is brought into the peritoneal cavity, it is unrolled and placed in the proper position, to overlap 5 cm in all directions the parietal defect using cardinal sutures (no expendable mesh) or inflated balloon (expendable mesh).

For no expendables meshes the cardinal sutures are passed through the abdominal wall using a Reverdin needle; then, the sutures are pulled up and tied (transfascial suture). A circumferential fixation by absorbable tacks placed every 5 cm along the mesh edge and 1 cm from the mesh edge is then performed; another line of tacks is placed circumferentially 2 to 3 cm from the first tacks line.

For the expendables meshes, the fixation is performed only by tacks placed circumferentially in double crown as described above. The balloon is then removed by a 5 mm trocar.

For the suprapubic hernia, the peritoneum is opened and a wide dissection is performed in Retzius space to expose the pubic bone, bilateral Cooper's ligaments, and the femoral vessels, like in TAPP procedure. The mesh is then fixed to pubic bone and Cooper using tacks. Peritoneum is also closed using tacks.

Exsufflation and closure

After complete mesh fixation, a careful inspection of the mesh and abdominal wall is performed to verify the hemostasis; the pneumoperitoneum is progressively exsufflated. It is important to remove the pneumoperitoneum under laparoscopic view control to check the hemostasis and mesh deployment.

The parietal defects smaller than 2 cm are generally closed by a monofilament non absorbable running suture. Trocars sites are infiltrated with long lasting local anesthetics.

Postoperative Care

The patients receive analgesics and anti-inflammatory therapy (Paracetamol 1 g×4/day; Nefopam 20 g×4(6)/day; Ketoprofene 100 mg×2/day) as well as thrombotic prophylaxis (low weight heparin). The patients are generally discharged at day 2.

Discussion

The LVHR is not a gold standard procedure even its advantages, in term of length of hospital stay; postoperative morbidity and recurrence rate were demonstrated.

The operative time seems to be longer for LVHR especially during the learning curve and when mesh fixation is performed by transfascial sutures; in this way, new technologies like expandable meshes decreases operation time [13].

The postoperative morbidity rate is variable and depends of parietal defect size, BMI and comorbidities [7-9]. The postoperative acute pain is more intense when transfascial sutures are performed [7-9]; in the same time the postoperative pain depends of number of tacks and is apparently less important when absorbable tacks have been used [7-9].

The average recurrence rate for LVHR is less of 4% and depends of defect type (primary or incisional) and size, mesh defect overlap and type of mesh fixation (apparently transfascial sutures have an advantage in term of recurrence) [7-12]. However a recent meta-

analysis about mesh fixation devices failed to demonstrate the advantages of transfascial sutures [14].

LVHR was found cheaper than open techniques in term of total costs especially due to lower readmission rate and rapid return to daily activities/work [7-9].

Probably the most important disadvantage of LVHR is the higher direct costs then open techniques [8]; this is especially important for developing countries. In this way, different alternative non validated techniques (e.g. intraperitoneal poly-propylene mesh on a greater omentum "bed") are considered cheaper but total costs (wound infection, visceral injuries due to mesh direct contact, intestinal obstruction, recurrences, readmissions, longer hospital stay etc.) are far to be correct estimated.

Conclusions

LVHR is a well-accepted option in the treatment of hernias. The respect of procedure's "critical" key points allows the best outcomes in term of hospital stay, postoperative morbidity and recurrence.

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