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SURGICAL TECHNIQUE

Laparoscopic intra-peritoneal ventral hernia repair associated with traditional parietal closure (hybrid technique)

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Introduction

Laparotomy has been considered the standard approach for ventral and incisional hernia repair for several years. This technique requires wide and extensive dissection of musculofascial planes that expose the patient to the risk of infection, postoperative pain and prolonged hospital stay [1].

The major contribution of laparoscopy is to reduce the ''invasiveness'' of the procedure. In comparison to laparotomy, the laparoscopic approach has several advantages: reduced complication rate, fewer surgical site infections, and shorter hospital stay [2,3]. The classical laparoscopic IPOM (Intra-Peritoneal Onlay Mesh) procedure, however, has some limitations. Effectively, simple bridging the defect by application of an intra-peritoneal prosthetic mesh does not constitute a physiological and anatomical restoration of the defect. Moreover, postoperative seroma occurs frequently because of the non-resected peritoneal sac. Tension on the mesh fixation sutures can cut through the fascia leading to disinsertion of the mesh (and ballooning of the mesh) and can be a source of recurrence when the mesh progressively ''slips'' into the defect.

To conteract these potential complications, a double approach or hybrid technique can be envisioned (called augmented IPOM or IPOM-Plus repair) [4]. The defect is closed on the outside of the abdomen and this procedure is combined with laparoscopic insertion of an intra-abdominal mesh.

Although the current recommendations do not clearly define what constitutes a ''large'' defect, defects larger than 4 cm seem to be a risk factor for recurrence when treated by the laparoscopic approach alone [5]; thus, the hybrid technique seems adapted to hernia where the neck is $\geq$ than 4 cm irrespective of the site of the hernia (midline, flank or iliac fossa).

We describe a hybrid technique for ventral or incisional hernia repair which includes three steps: 1st step: adhesiolysis through an initial laparoscopic approach; 2nd step: minilaparotomy for resection of the sac, introduction of the mesh and myorraphy; 3rd step: the mesh is fanned out over the defect by laparoscopy.

Of note, the procedure can begin directly by the second step where the adhesiolysis is performed *via* the mini-laparotomy; the risk, however, is that there may be a need to enlarge the laparotomy incision and in our opinion, adhesiolysis is better controlled *via* laparoscopy.

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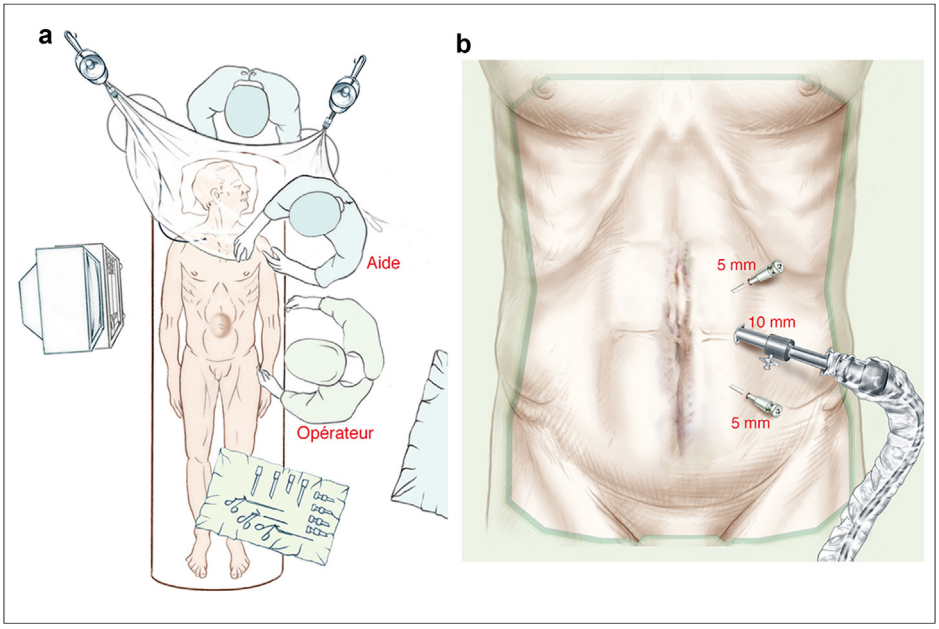
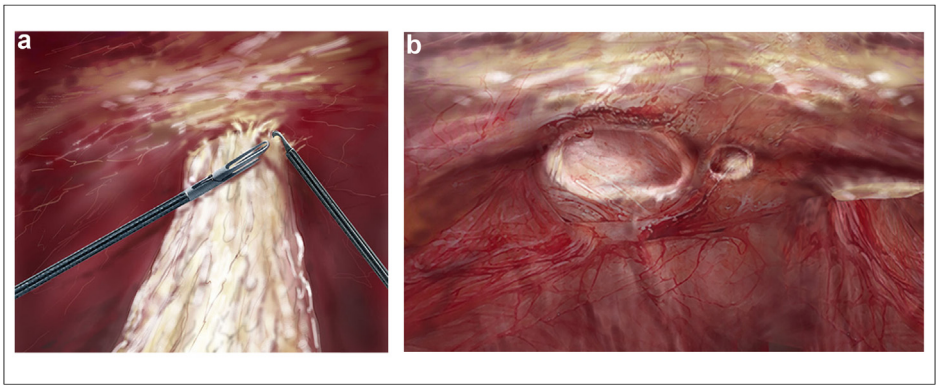


1 Patient position and insertion of trocars

For repair of a midline ventral hernia, the patient is positioned supine, the left arm tucked alongside on the side of the operator, while the right arm is abducted at 90° on the opposite (screen) side. The surgeon and assistant stand on the left of the patient (or the side opposite the hernia in case of lateralized right-sided hernia).

The pneumoperitoneum can be created via an ''open'' technique; however, use of a Veress needle allows a lateral insertion of the optical trocar.

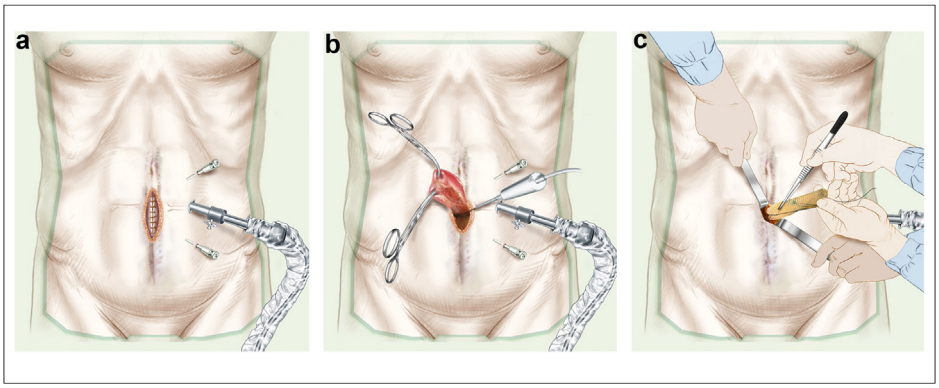
The optical trocar (10 mm) is inserted at the level of the umbilicus, as far laterally in the flank as possible. Two 5 mm trocars are placed in triangulation. A 30° scope is preferred over a 0° scope to visualize the abdominal wall.



2 Adhesiolysis and reduction of the abdominal hernia contents

Intra-abdominal adhesiolysis is often necessary: adhesions between the hernia contents and the anterior abdominal wall are released progressively while the contents are re-integrated into the abdominal cavity. Next, the round ligament is divided to facilitate spreading the mesh on the abdominal wall. If adhesiolysis proves difficult *via* laparoscopy, it may then be performed or completed *via* laparotomy.

The boundaries of the neck of the hernia are marked on the skin to adapt the size of the mesh to the size of the defect. The mesh should overlap the limits of the neck by at least 5 cm.



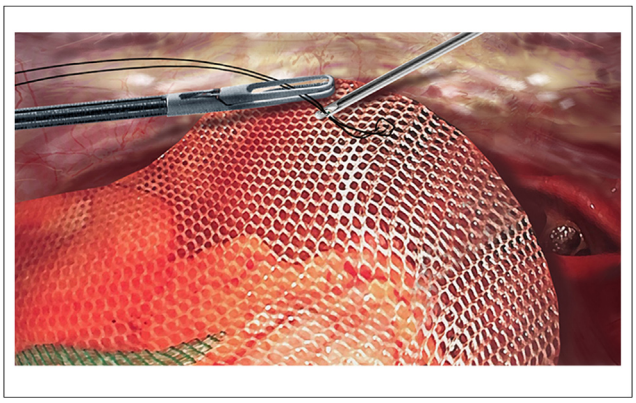
3 Mini-laparotomy for resection of the sac and myorraphy

A mini-laparotomy is performed at the level of the hernia, the size of the incision depending on the size of the defect, and not on the size of the sac. Preservation of the pneumoperitoneum is useful to demonstrate the defect boundaries and insure safe penetration into the abdominal cavity.

The hernia sac can now be dissected and resected. The fascial margins are freed but not dissected further. Resection of the sac prevents seroma formation and ensures better muscular healing.

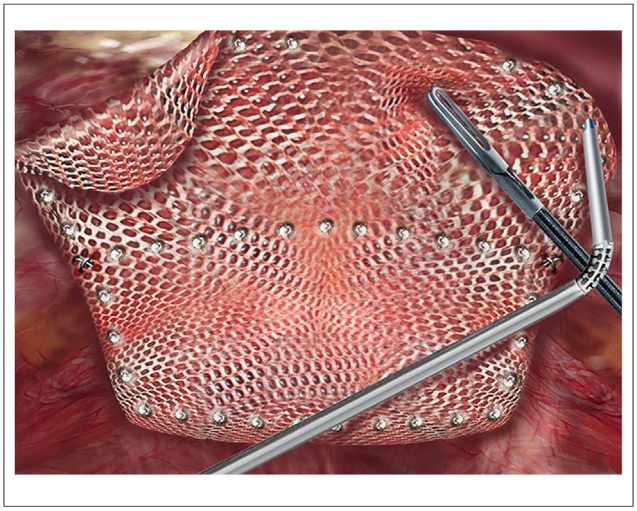
The biface mesh is introduced into the abdominal cavity *via* this mini-laparotomy, thus facilitating the possibility of using of a large size mesh. The mesh is rolled up, with the anti-adherential face toward the abdominal organs, thus facilitating the spread of the mesh *via* laparoscopy. Some meshes are marked in their center, thus guiding the central placement. If not, the center of the mesh can be marked manually before insertion.

The fascial defect is closed with non-absorbable suture material.



4 Positioning the mesh *via* laparoscopy

The last laparoscopic step begins by visualizing the myorrhaphy from the inside and determining the position of the mesh. Centering the mesh on the myorrhaphy is essential. Some meshes have preinserted monofilament sutures at the edges of the mesh to facilitate the positioning. A Reverdin needle or Endo-Close™ (Medtronic) can be used to pull on the mesh to center it on the defect.



5 Fixation of the mesh and locoregional anesthesia

The mesh is fixed in place with absorbable clips. Placing the stapler perpendicular to the abdominal wall ensures adequate penetration of these clips. Use of an articulated stapling instrument is useful, particularly when the mesh is large. Counter-pressure on the outside of the abdominal wall can also be helpful.

To ensure perfect positioning of the mesh, it is indispensable to start the fixation in the middle of the mesh. Often one has a tendency to start from the opposite side, but this can lead one to exaggerate the overlap on the opposite side and therefore thereby not leaving enough overlap on the side of the operator.

The edge of the mesh is fixed circumferentially in a simple peripheral (''crown'') fashion. Mesh fixation can be delicate when the mesh is large. A potentially useful trick is to add a 5-mm optical trocar on the opposite side and place the monitor above the patient's head.

The traction sutures are cut at the level of the skin. The greater omentum is placed over the intestines.

At the end of the procedure, postoperative analgesia can be anticipated by a transverse abdominal plane block, or alternatively, by pre-peritoneal infiltration of local anesthesia (e.g. ropivacaine, 3 mg/kg) along the periphery of the mesh under laparoscopic control.

Disclosure of interest

The authors declare that they have no competing interest.

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