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Laparoscopic Treatment of Ventral Abdominal Wall Hernias: Preliminary Results in 100 Patients

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ABSTRACT

Objective: The laparoscopic treatment of eventrations and ventral hernias has been little used, although these hernias are well suited to a laparoscopic approach. The objective of this study was to investigate the usefulness of a laparoscopic approach in the surgical treatment of ventral hernias.

Methods: Between January 1994 and July 1998, a series of 100 patients suffering from major abdominal wall defects were operated on by means of laparoscopic techniques, with a mean postoperative follow-up of 30 months. The mean number of defects was 2.7 per patient, the wall defect was 93 cm^2 on average. There were 10 minor hernias (<5 cm), 52 medium-size hernias (5-10 cm), and 38 large hernia (>10 cm). The origin of the wall defect was primary in 21 cases and postsurgical in 79. Three access ports were used, and the defects were covered with PTFE Dual Mesh measuring 19 x 15 cm in 54 cases, 10 x 15 cm in 36 cases, and 12 x 8 cm in 10 cases. An additional mesh had to be added in 21 cases. In the last 30 cases, PTFE Dual Mesh Plus with holes was employed.

Results: Average surgery time was 62 minutes. One procedure was converted to open surgery, and only one patient required a second operation in the early postoperative period. Minor complications included 2 patients with abdominal wall edema, 10 seromas, and 3 subcutaneous hematomas. There were no trocar site infections. Two patients developed hernia relapse (2%) in the first month after surgery and were reoperated with a similar laparoscopic technique. Oral intake and mobilization began a few hours after surgery. The mean stay in hospital was 28 hours.

Conclusions: Laparoscopic technique makes it possible to avoid large incisions, the placement of drains, and produces a lower number of seromas, infections and relapses. Laparoscopic access considerably shortens the time spent in the hospital.

Key Words: Laparoscopy, Incisional hernia, Abdominal wall hernia, Hernioplasty, Mesh.

INTRODUCTION

The surgical treatment of large abdominal wall defects, be they primary or postsurgical, gives rise to technical problems that are not always easy to solve. The complexity and difficulty of repair of these defects accounts for the substantial number of surgical methods that exist in open surgery, high postoperative morbidity, and, frequently, the recurrence of the hernia (14%-50%) with conventional surgery.[1-3]

The first reference to the laparoscopic treatment of abdominal wall incisional hernias was published in 1993.[4] Since then, the use of a laparoscopic route for managing abdominal wall defects has been justified by the advantages of avoiding large incisions and the placing of drainage tubes, a lower risk of postoperative wound and mesh infections, and infection of seromas. Furthermore, there are the benefits of a reduction in pain, shorter hospitalization and quicker return to normal activity after surgery.[5-8]

Nowadays, we are in a position to suggest that not only minor (<5 cm) and medium-size (5-10 cm) abdominal wall hernias can by treated by laparoscopy, but also large (>10 cm) and multicavity abdominal wall defects.[9]

Moreover, because of the lack of prospective and randomized studies which define the role of a laparoscopic technique in the treatment of abdominal wall defects with respect to conventional surgery, we offer data to support the idea that laparoscopy is feasible, and is associated with a reduction in morbidity, operating time, and hospital stay.[10]

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MATERIALS AND METHODS

Between January 1994 and July 1998, a series of 100 patients with incisional and primary ventral hernias were treated by laparoscopic methods.

The origin of the wall defect was primary in 21 cases and postsurgical in 79 cases. The average age of the group was 59 years (range 22-86) with a predominance of female patients (72). The average number of hernia defects that required repair was 2.7 per patient (range 1-9), and the mean surface area of the defects was 93 cm^2 (range 20-385 cm^2). In 17 cases, there were two abdominal wall defects in different areas. Nineteen patients had previous surgery (between one to five procedures) for incisional hernia. The mean rate of previous abdominal surgery for the complete series was 2.5 (range 1-9).

In **Table 1** and **Table 2**, we can see the anatomical location and the hernia classification for the defect area.

Three access ports were normally used. A 30° laparoscope was placed in the left subcostal space (10-mm trocar), with the two working trocars on the same side (5-mm trocar). In the first 5 patients of our series, one of these ports was 12 mm in diameter so that the articulated endostapler could be inserted. Currently, we employ a 5-mm helicoidal tacker, so that the two working trocars are of 5-mm diameter.

In any case, supplementary 5-10 mm trocars on the opposite side may be necessary. In the case of left flank hernias, trocars must be situated on the opposite side.

Pneumoperitoneum was achieved by means of a Veress needle placed in the right subcostal space, where the laparoscope would later be situated. With an intra-abdominal pressure of 14-mm Hg, the entire abdominal cavity was explored under direct vision. Examination was made of the abdominal wall defects, hernia sac content, and adhesions. Search was made for possible undiagnosed defects. The abdominal wall defects were freed of peritoneal and visceral adhesions by means of electrosurgical dissection or ultra-sound scalpels (Ultra-Shears USSC). In every case, a minimum of 4-5 cm was cleared from the border of the wall defect. The hernia sac was left in place **(Table 3)**.

The mesh was inserted in cigarette-like form through the 10-mm trocar and opened intra-abdominally. It was not necessary to place inner sutures nor external fixing.

Table 1.
Size of abdominal wall defect.

Minor/small hernia (<5 cm)	10
Medium-size hernia (5-10 cm)	52
Large hernia (>10 cm)	38

Table 2.
Anatomic location of hernia.

Epigastric hernia	30
Ventral hernia	33
Umbilical hernia	35
Right paramedian hernia	10
Right subcostal hernia	4
Left subcostal hernia	2
Lumbar hernia	3

Table 3.
Hernial sac content.

Omentum	39
Small bowel + Omentum	30
Colon + Omentum	9
Small bowel + Colon	4
Without content	18

Once the mesh was placed under the wall defect and all of the defect covered by the adherent side of the mesh, staples or tacks were applied circumferentially. A second staplers crown is positioned inside the first one, close to the abdominal wall defect. The degree of penetration and correct placement of the staplers or tacks were controlled during application by counter traction utilizing the free hand of the surgeon. It is important that the staple's crown be placed at least at 4-5 cm from the border of the defect in order to prevent hernia recurrence. If there are several defects connected by a fascial bridge, this bridge may be used to fix additional staples.

In areas where the mesh is in direct contact with the skin, an external compressive pad is used to improve adherence and to prevent the development of seromas. If the wall defect is massive, additional mesh should be employed until the defect is completely covered. All repairs were performed with PTFE Dual-Mesh wall prostheses, measuring 19 x 15 cm in 54 cases, 10 x 15 cm in 36, and 12 x 8 cm in 10. An additional mesh had to be added in 21 cases to cover the whole wall defect.

In the last 30 cases of this series, the PTFE Dual-Mesh Plus with holes was employed because it includes two new advantages: a multiperforated design that limits the development of seromas between skin and mesh, and the antiseptic effect of a clorhexidine and silver sulfate cover.

Two different procedures were used for fixing the prostheses. In the first 18 cases, the meshes were inserted with knotted PTFE suture, and an external fixation was carried out using the Gore Suture Passer Instrument or Endo-Close (USSC), with circular stapling using the Roticulator Endo-Universal 65° (USSC) and 4.8-mm staples.

In the last 82 cases, fixation was totally intracorporeal utilizing helicodial tacks (Tacker, Origin or Protac, USSC).

Associated surgery during hernia repair included seven cholecystectomies, seven inguinal hernia repairs and four liver biopsies.

RESULTS

The mean follow-up period was 30 months (range 12-66), and all patients were monitored on a quarterly basis during the first two years, and once a year thereafter.

Mean operative time, including associated procedures, was 62 minutes (range 20-180). Only one procedure was converted to open surgery, due to an iatrogenic bowel lesion in a patient with severe intestinal incarceration.

Major complications included a case of intestinal obstruction caused by the incarceration of small intestine between the prosthesis and abdominal wall due to a technical failure in anchoring the prosthesis; this problem, which required a further operation, occurred at the beginning of the series and, in our opinion, was due to the limited degree of penetration through the Goretex mesh of the 65° Roticulator stapler. Follow-up surgery confirmed a 5-cm unanchored length of mesh with an internal small bowel hernia. This problem has not been noted with the use of helicodial tacks.

Minor complications included two cases of abdominal wall edema, ten seromas and three subcutaneous hematomas. No infections were observed at the entry points. All seromas were managed with external aspiration.

Two patients had a hernia recurrence, in both cases in the first weeks after surgery. Both underwent a second operation by the laparoscopic approach, which confirmed incomplete securing of the mesh. The "second look" procedure enabled us to confirm the complete peritonealization of the mesh and a lack of visceral adhesions. The hernia recurrence was solved by means of adding a new mesh to cover the residual defect.

Excluding the two cases in which open surgery was necessary, the average postoperative hospitalization period was 28 hours (range 12-72). Patients were able to return to normal activity after one week.

DISCUSSION

Laparoscopy has made it possible to introduce new surgical techniques for the repair of major abdominal wall defects, thereby avoiding the extensive degree of tissue trauma involved in classic surgery. There is no longer need for extensive fascial dissections, tension sutures and postoperative drainages.[11]

The placing of mesh in open surgery adds a risk of infection with contamination of the prosthetic material, which has to be removed in the event of bacterial contamination. The obligatory placing of aspiration drains prolongs the postoperative period and increases the risk of mesh infection.[12]

Postoperative pain and immobilization are inevitable in major abdominal wall repairs performed by open surgery, regardless of the surgical technique used. These factors contribute to a high rate of local complications that prolong the postoperative period and increase the risk of associated systemic problems.[13]

The utilization of Dual-Mesh PTFE mesh with laparoscopic techniques makes it possible to carry out direct fixation of the prosthesis to the solid elements of the abdominal wall. The use of this material dramatically limits the amounts of visceral adhesions and renders reperitonealization unnecessary.[14-16]

We have been able to confirm the lack of adhesions associated with this prosthetic material. Additional laparoscopic surgery carried out on the two patients in the series who suffered partial hernia recurrence permitted us to observe that there were no visceral or omental adhesions to the mesh, although there were slight adherences at the edge where the staples had been placed. Biopsies of the mesh prosthesis showed that it had a fibrous layer on the "rough" side and an epithelial layer on the "smooth" side.[17]

In this regard, the use of Marlex mesh covered with omentum[18] does not strike us as being a good solution, because this maneuver prolongs the procedure, adds technical difficulties, and is difficult when large (19 x 15 cm) meshes have to be covered.

Moreover, laparoscopic exploration of the abdominal cavity is more comprehensive, and allows evaluation of hernia topography and the presence of adhesions about the hernia. There is, therefore, less risk of iatrogenic injury to incarcerated intestinal loops closely bound to the laparotomy scar.

The procedure used to fix the prosthesis to the abdominal wall involves technical difficulties when external knotting is used and prolongs surgery time. This fixation can lead to intramural hematoma and increased postoperative pain. Similarly, the use of articulated endostaplers requires the insertion of a second 12-mm trocar to make introduction feasible.

Our experience led us to replace the endostapler with fixation by means of helical tacks, which can be applied via a 5-mm trocar. Furthermore, the secure fixation of mesh with helical tacks allowed us to discontinue the use of external sutures.

Our last 82 cases, with total intraperitoneal fixing of the mesh and without external sutures, show that this option is feasible and safe even in very difficult instances, reducing surgery time by approximately 50% and being free of intraoperative and postoperative complications; this represents, in fact, our personal contribution to the development of this technique.

The technique is a new one, with few references in the literature and an 'as yet' scant follow-up time for establishing a definitive appraisal. Nevertheless, both the experiences which have already been mentioned[6,8,19,20] as well as our own, suggests that the laparoscopic route offers advantages with respect to open surgery in major abdominal wall defects. Laparoscopic repair as described reduces the rate of immediate complications, recurrence, mesh sepsis, and long-term complications, as well as reducing surgery time with respect to conventional surgery, making it one of the procedures that reduces hospital stay.

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