Laparoscopic ventral hernia repair. Our experience of 61 consecutive series: Prospective study

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ABSTRACT

Background: Ventral hernia is commonly repaired by the open mesh method. However, since the introduction of the laparoscopic technique, it is increasingly becoming the method of choice of treating ventral hernia. The aim of this study is to evaluate our initial experience of 61 consecutive laparoscopic ventral hernia repairs.

Methods: Laparoscopic ventral hernia repair was performed for 61 consecutive patients. All operations were performed by a single consultant surgeon through a period of 16 months. Different types and sizes of hernias were repaired using a suitable mesh size. A 0° 5 mm scope, two other 5 mm ports and a single 10–15 mm port were used. The follow-up was by outpatient visits.

Results: Thirty-two men (52.45%) and 29 women (47.54%) were included in this study. The mean age was 53.42 years (range 39–80 years). The mean hospital stay for 34 (54.74%) patients was 1.67 days (range 1–9 days), while 27 (44.26%) patients were discharged within 23 hours of the time of admission. The mean body mass index (BMI) was 26.59 (range 21–47). The morbidity rate was 16.39% (10 complications).

Conclusion: Laparoscopic ventral hernia repair is feasible, safe and associated with an acceptable rate of complications. Laparoscopic ventral hernia repair can be performed as short stay surgery.

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1. Introduction

Ventral hernia is an anterior abdominal wall hernia (excluding groin hernia). Ventral hernia repair has seen a progressive development. It was initially performed by the open technique to restore the anatomical layers without mesh insertion. Recurrence rate after such a repair ranges from 31% to 54%.1,2 The introduction of different types of meshes has reduced the recurrence rate of ventral hernia repair but caused a new problem of mesh complications including infection. However, with the introduction of new mesh types, laparoscopic ventral hernia repair LVHR is gaining increasing acceptance3 and a recurrence rate as low as 0–3% was reported.4,5

The main challenge associated with large ventral hernia is the requirement for soft tissue dissection to accommodate the mesh. Unfortunately, this carries the risk of wound complications.6,7 Modifications of the techniques and the use of different types of meshes were explored to reduce the incidence of complications associated with LVHR. Nevertheless, LVHR is being established as the preferred method of ventral hernia repair in many centers8–10 with all the advantages of the laparoscopic technique. In our study, we are evaluating the...
outcomes of the initial experience of LVHR in our NHS district hospital.

2. Patients and methods

All patients who were admitted and underwent laparoscopic tension free mesh repair for ventral hernia between February 2006 and July 2007 were included in this study. A single consultant performed all operations. In our study, all abdominal wall defects of more than 2 cm were repaired using a mesh. Other defects of less than 2 cm were closed primarily and were not included in this study. A prospective assessment was carried out to evaluate the outcome. The proforma included the patient’s gender and age, body mass index BMI, ASA grade, morbidity; mesh size, emergency or elective procedure and the follow-up.

3. Technique

Supine position and one arm is abducted (non-operator side). A single shot of Cefuroxime 1.5 g was administered intravenously with induction of anaesthesia. Pneumoperitoneum of 14 mmHg is usually achieved using a Veress needle, which is inserted away from abdominal wall scarring or incisions. A bladeless optical port is always used as the primary port in all cases.

At least two 5 mm trocars were used and positioned according to the size and site of the ventral hernia. We always use a 0° 5 mm scope and a single 10–15 mm port over the center of the hernia defect for introduction of the mesh. Adhesiolysis of the abdominal wall is performed using scissors. After identifying the hernia edge, we deliver the mesh through the 10–15 mm port through the center of the hernia. The mesh is deployed and then fixed by 5 mm tackers (Tyco healthcare, Autosuture and Salute ONUX Medical/USA) in the majority of cases (see Fig. 1). The ePTFE mesh (Cousin-Biotech/France) was inserted in 58 patients. In only three patients owing to the small defects, the peritoneum and the sac was dissected and the polypropylene mesh (Ethicon/USA) was inserted in the preperitoneal space to cover the hernia and the peritoneum was sutured using a 2-0 vicryl suture. For large hernias, we prefer to use two (10 × 15 cm) meshes overlapping instead of one large mesh, which is difficult to manipulate inside the peritoneal cavity. A 10 × 15 cm mesh can be introduced easily through the 10–15 mm port which is usually inserted through the hernia defect. We usually try to pull the sac away from the center of the hernia and to fix it to the adjacent intact abdominal wall as we believe this will reduce the incidence of seroma collection within the sac. We make sure of the position of the mesh, covering and overlapping the hernia defect by at least 3 cm before we start tacking. The omentum is brought to underlie the mesh before the release of the pneumoperitoneum. In cases of large hernias we routinely use an abdominal support for 2 weeks.

4. Results

Laparoscopic ventral hernia repair was performed for 61 consecutive patients between February 2006 and July 2007 by a single consultant surgeon in our NHS district general hospital. Patients’ data, setting of the operation and the types of hernias are recorded in Tables 1 and 2.

Thirty-two men (52.45%) and 29 women (47.54%) were included in this study. LVHR was performed for 26 (42%) incisional hernias following laparotomy (17 midline incisions, 4 grid iron incisions and 5 gynecological operations), 24 (39.34%) umbilical and paraumbilical hernias, 4 (6.55%) spigelian hernias, 4 (6.55%) epigastric hernias and 3 (4.9%) port site incisional hernias. The mean hospital stay was 1.67 days (range 1–9 days). The mean age was 53.42 years (range 39–80 years). The mean body mass index BMI was 26.59 (range 21–47). The ASA grading was 3 for five patients, 2 for 15 patients and 1 for 41 patients.

The morbidity rate was 16.39% (10 complications). Three patients developed major complications of infected mesh, infected seroma and recurrence. This constitutes 4.8% of 16.39%, the total morbidity rate. Five patients (8.19%) developed significant postoperative pain after 48 hours of operation and needed treatment with morphine and hence they were

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**Table 1 – The types of the ventral hernia**

<table>
<thead>
<tr>
<th>Type</th>
<th>Number (Percentage)</th>
</tr>
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<tbody>
<tr>
<td>Incisional hernia following laparotomy</td>
<td>26 (42)</td>
</tr>
<tr>
<td>Port site incisional hernia</td>
<td>03 (4.9)</td>
</tr>
<tr>
<td>Umbilical and paraumbilical hernias</td>
<td>24 (39.34)</td>
</tr>
<tr>
<td>Spigelian hernia</td>
<td>04 (6.55)</td>
</tr>
<tr>
<td>Epigastric hernia</td>
<td>04 (6.55)</td>
</tr>
<tr>
<td>Total</td>
<td>61 (100)</td>
</tr>
</tbody>
</table>

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*Fig. 1 – Inpatient, within 23 hours service.*
not discharged within 48 hours of the operation. The mean operative time was 45 min (range 28–92 min). A 10 × 15 cm ePTFE is used in all patients. Eight (13.11%) patients needed two 10 × 15 meshes. No operation was converted to open surgery. The mean follow-up period was 8 months (range 1–17 months). Postoperative pain was the commonest complication. One patient developed mesh infection 4 weeks following repair for incisional hernia after caesarean section and was treated by vacuum suction. Laparoscopy was performed for one patient who developed abdominal pain and vomiting which was difficult to explain and was reported as normal and further conservative management was successful to resolve the symptoms. Postoperative pain was reported in five patients and lung consolidation and pleural effusion was confirmed in one patient. No mortality was reported for our patients.

5. Discussion

Early studies to describe laparoscopic repair of incisional hernia were published in 1993. However, recent years have witnessed increasing reports describing the different aspects of the technique, instruments and types of meshes used. LVHR is gradually replacing the open ventral hernia repair OVHR in many centers throughout the world, especially in western countries.

The published literature indicates fewer wound-related and overall complications and a lower rate of hernia recurrence for LVHR compared to OVHR. Other advantages of laparoscopic repair such as shorter operative time and hospitalization, a faster return to work; in addition to a lower incidence of wound infections and major complications, are well documented in the literature.

In this study, the pneumoperitoneum is created using a Veress needle which is inserted through the abdominal wall, away from any previous scarring, and the first port was always a bladeless optical Excel port. We believe this approach will dramatically reduce the incidence of visceral injury.

The commonest cause of hernia in our study was the incisional hernia following laparotomy (including six caesarean sections) in 42% of patients. This was followed by paraumbilical and umbilical hernia in 39% of patients. The size of the hernia defects varied from 4 to 225 cm² with an average of 80.91 cm². We always use a 0° 5 mm scope which can be introduced through any port to view the defect from different angles which will help our dissection. The other advantage of using a 5 mm scope is the complication of port site hernia at the 5 mm port will be negligible. A large ventral hernia is a challenging problem because it needs extensive dissection and insertion of a large mesh through the port. We found it is difficult to use and manipulate a single large mesh. Instead two (10 × 15 cm) overlapping meshes were used in eight (13.11%) patients who had an average hernia defect of 225 cm². The mesh is usually inserted through a 10–15 mm port at the center of the hernia and fixed in position (see Fig. 2). This will avoid the common problem of port site incisional hernia as the port site will be supported by the underlying laid mesh.

Generally, the operative time of LVHR is longer than the OVHR, although some authors reported no difference in the operative time when comparing the two techniques. Others reported even a shorter operative time for LVHR. Shorter operative time depends mainly on the experience of the surgeon, use of tackers, bowel or omental adhesions, site, size and the number or multi-loculality of the hernia defect.

In comparison to other techniques, there is no time wasted by opening the lower flap, stitching the mesh, inserting a drain and closing the wound.

The use of two overlapping meshes for a large hernia is not a standardised and widely accepted technique. We used this approach because of the difficulty in manipulating a single large mesh within the peritoneal cavity. We have followed the same standard principle of overlapping the edge of the hernia defect by at least 3 cm. The two meshes overlapped each other more than 3 cm in the middle of the hernia defect and each mesh overlapped 3 cm or more of the edge of the hernia defect. In our hands, this technique of inserting two meshes has shortened the operative time and given us more flexibility in handling the mesh to ensure a satisfactory position.

Our morbidity rate of 16.39% (including 8.19% of protracted postoperative pain, which persisted for more than 48 hours

<table>
<thead>
<tr>
<th>Table 2 – Patients’ characteristics</th>
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<tbody>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>ASA 1</td>
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<td>ASA 2</td>
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<tr>
<td>ASA 3</td>
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<tr>
<td>BM1 average</td>
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<tr>
<td>Recurrent hernia</td>
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<td>Types of previous laparotomy</td>
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<tr>
<td>Midline</td>
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<tr>
<td>Appendectomy</td>
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<tr>
<td>Gynecological operations</td>
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<tr>
<td>No previous abdominal surgery</td>
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and needed hospitalization) (see Fig. 3) is less than the morbidity rate of 22.7% of a recent meta-analysis of 4582 LVHR reported by Olmi et al.20 All protracted abdominal pain had resolved by the 10th postoperative day and we believe this pain was related to the type of tacker we used because of the depth of penetration of the tacker. Later on in the series, we changed the tacker we had been using and we did not experience this problem. Less postoperative pain is expected after LVHR and has been confirmed in the literature.21–23 The pain severity is different and reflected by the type of analgesia. However, the five patients who had considerable postoperative abdominal pain required morphine after the first postoperative day. The other 56 patients received one or two doses of morphine on the day of the operation only, and all of them had paracetamol and nonsteroidal anti-inflammatory medications, when feasible, regularly for 48 hours, after which analgesic intake was optional.

We believe that the severity of postoperative pain is related to the depth of penetration of the tacker into the abdominal wall including the muscle layer.

Another patient developed vomiting in addition to the pain at the hernia site. Diagnostic laparoscopy was performed and revealed no abnormality.

Seroma is commonly reported after hernia operations by open or laparoscopic techniques. This complication is usually treated by conservative measures and shows a complete resolution after a certain period of wait and see, although drainage is indicated in certain cases.24 We usually try to pull the sac away from the dome of the hernia and fix it to the intact adjacent abdominal wall. We believe this will reduce the seroma and postoperative ‘bulge’. We do not dissect the sac to avoid bleeding. Although infection of seroma is rare, it was reported in one patient in our series. This problem was managed successfully with percutaneous drainage of the seroma and suitable antibiotics.

We did not use a drain in our series as we did not believe it was required and could increase the likelihood of infection. However, we acknowledge that a recent Cochrane analysis showed that tube drain could be safely used in patients undergoing LVHR.

Infection of the mesh was a challenging complication. Although removal of the infected mesh is generally accepted, authors reported success with conservative management.25 We managed our single case of mesh infection by vacuum suction and antibiotics and she had a progressive course.

One non-surgical complication was reported. This was a pleural effusion and lung consolidation. Conservative treatment was successful to achieve full recovery of this patient.

Failure of the LVHR is manifested by recurrence of the hernia and therefore this parameter is considered the most important factor in evaluation of the technique. However, the recurrence rate is varied and depends on several factors such as the period of follow-up, the size of the hernia, the area of overlap between the mesh and tissue and the accurate delineation of the hernia edge. In our series, one patient (1.6%) who had extensive adhesion of the bowel and omentum developed early recurrence at one site of multilocular hernia.

Pooled data analysis of LVHR vs. OVHR confirmed that injury to the bowel is more common in LVHR (2.9% vs. 1.2%).12 This dangerous complication could be discovered during the procedure when it can be managed accordingly. Late diagnosis of bowel injury carries a high risk. Therefore, any patient with signs of peritonitis, sepsis or increased abdominal pain after LVHR must promptly be investigated.26

Several factors are involved in the iatrogenic enterotomy during LVHR; the most important are the extent of bowel adhesions, the surgeon’s experience and the use of diathermy to release the bowel. Our approach for adhesiolysis is to use a scissors without diathermy near the bowel or alternatively an ultrasound dissector is used. This contributed to the fact that no bowel injury was reported in our series. If the omentum was stuck through the abdominal wall defect, we found that trying to dissect the omentum off the abdominal wall defect using diathermy tools took time and caused bleeding. In these circumstances we used an ultrasound dissector which saved time and avoided bleeding. The residual omentum within the hernia sac is usually excised by anterior incision where the 10 mm port was inserted through the hernial defect. We must stress at this point that the ultrasound dissector is not used in all patients but is used only in the situations mentioned above.

We believe that the economic cost of LVHR can be balanced by the advantages of laparoscopic surgery in this particular procedure. In comparison to the OVHR, the LVHR is performed with less operative time, less morbidity, shorter length of stay in the hospital (see Fig. 1) and there is virtually no need for a drain. The wound infection rate will be less and we are optimistic that the future series will prove less recurrence rates for LVHR. All these points make LVHR a cost effective procedure.

There were three major complications (see Fig. 3) during the mean follow-up period of 8 months (range 1–17 months). These are single recurrence (1.6%), infected mesh (1.6%) and infected seroma (1.6%). All patients apart from three (4.8%) who developed major complications were very pleased with the conclusion of the operation.

![Fig. 3 – LVHR complications (value, percentage).](image-url)
The question of the best mesh for LVHR is difficult to answer. We use a polypropylene mesh when it is laid in the preperitoneal space and the peritoneum is closed to prevent contact with the bowel, while a dual mesh of ePTFE and polypropylene is used when the mesh laid will be in direct contact with the bowel wall.

Burger and co authors after studying eight types of commonly used meshes on animal models recommended the use of polypropylene with a carboxymethylcellulose-sodium hyaluronate coating (Sepramesh) and polyester with collagen-polyethylene glycol-glycerol coating (Parietex Composite). These combine minimal adhesion formation with maximum mesh incorporation and tensile strength for hernia repair in which direct contact with the abdominal viscera cannot be avoided.  

In conclusion, Laparoscopic ventral hernia repair is feasible, effective and can be performed as short stay surgery. Adherence to the safety precautions in dissection and the identification of the hernia edge are important in reducing the incidence of complications.

Conflict of interest
None declared.

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Ethical approval
Nil.

Supplementary data
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