Laparoscopic totally extraperitoneal inguinal hernia repair: A personal experience and learning curve

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ABSTRACT

Background: Even though laparoscopic hernia repair has been shown to be an efficient method with the benefits of minimally invasive surgery, it is poorly accepted in general surgical practice. Aims: To evaluate the safety, complications and recurrence rates of laparoscopic totally extraperitoneal (TEP) repair and reflect on the learning curve. Setting: Single surgeon series from Princess Royal Hospital, Telford, United Kingdom. Materials and Methods: Prospectively collected data of laparoscopic TEP repairs performed by a single surgeon (JDP) between January 2001 and February 2006 were analyzed. 134 patients in the age range of 19 to 86 years had laparoscopic TEP repair for 209 inguinal herniae. Herniae were classified according to the type and Nyhus grades. A 10 mm reusable and two 5 mm ports were placed in the midline subumbilically. A large 12 x 15 cm polypropylene mesh was used with a lateral fish tail slit around the cord structures. No mesh fixation was employed and the rectus sheath at the umbilical port was closed in only 27% of the patients. Operating times, intraoperative and postoperative complications were recorded. The majority of the patients stayed overnight in the hospital. Overall morbidity was 13% with no wound or mesh infections. Overall recurrence rate was 2.4% and recurrence rate for primary hernia repair was 1.85%. Follow-up period was 6 months to 66 months with a median of 24.5 months. Conclusions: Laparoscopic TEP repair is a safe and efficient method of hernia repair with low morbidity but with a long learning curve.

Key words: Extraperitoneal, hernia

How to cite this article:

Laparoscopic repair of groin hernia was first reported in 1979 by P. Fletcher, where he closed the neck of the hernia sac.[1] Since then laparoscopic repairs of groin herniae have evolved and been standardised into two main approaches: transabdominal preperitoneal (TAPP) or totally extraperitoneal (TEP). Despite having the advantages of minimal access surgery with reduced postoperative pain, early return to full activity and less frequent chronic groin pain, laparoscopic repairs have been poorly taken up in general surgical practice.

Approximately 70,000 hernia repairs are carried out annually in the United Kingdom of which only 4.1% are performed by laparoscopic surgery.[2] About 15-20% of hernia repairs in the United States are performed laparoscopically.[3]

Laparoscopic surgery is recommended as one of the treatment options for the repair of inguinal hernia in the recently revised NICE (National Institute of Clinical Excellence, UK) guidelines. NICE also recommends that patients should be fully informed of all the risks and benefits of open and laparoscopic surgery by either TAPP or TEP approaches, to enable them to choose between the procedures.[2]

OBJECTIVE

The objective of the present study is to evaluate the safety,
complications and recurrence rates of laparoscopic TEP repair and reflect on the learning curve.

**MATERIALS AND METHODS**

Prospectively collected data of laparoscopic TEP repairs performed by a single surgeon (JDP) between January 2001 and February 2006 were analyzed. Patient demographics, clinical and Nyhus type of hernia, operating time, intra- and postoperative complications and recurrences were recorded.

Operating time was recorded as the time from the first incision to the closure of the last wound. Hematoma was defined as tender / painful swelling due to accumulation of blood clots in the tissue planes in the groin or scrotal areas. Seroma was defined as the collection of sterile serous fluid presenting as a nontender, cystic swelling overlying the previous hernia site. Wound infection was defined as the presence of suppuration in the port site wounds or a delayed formation of sinus. Groin pain was defined as pain of any severity including testicular pain at the first clinic follow-up or thereafter.

A learning curve is defined as the number of completed procedures required to stabilize the operating time and the recurrence rate.

Patients were followed up in the surgical clinic 6-12 weeks postoperatively and were advised to contact the general practitioner for re-referral if they developed symptoms of groin pain or recurrence.

**Operative technique**

A 10 mm subumbilical transverse incision is made under general anaesthesia with the patient in a supine position with no tilt. The anterior rectus sheath is exposed. A transverse incision along the direction of the aponeurotic fibres is made to one side of the midline. In the case of bilateral herniae, this incision is usually made towards the side with the larger hernia or the side of the clinically indirect hernia. The rectus muscle is retracted laterally and a 10 mm blunt port is inserted in the rectus aponeurotic tube posterior to the muscle. CO₂ insufflation at 12 mm Hg and blunt telescopic dissection are used to create a preperitoneal space. Nondisposable instruments are used. Two further 5 mm midline ports are used, one just above the symphysis and the other about the midpoint between the umbilicus and the symphysis.

Direct and small indirect sacs can be reduced and large indirect sacs ligated with an endoloop and transected. The peritoneum is widely mobilized laterally and about 4.5 cm posterior to the deep ring to clearly expose the triangle of Vas (between the Vas deferens, spermatic vessels and the peritoneal reflection).

We used a 12 × 15 cm Prolene mesh with a lateral fish tail slit around the cord structures [Figure 1]. The mesh is folded in pleats with two vicryl ties around it and introduced via the 10 mm optical port. After it has been placed in a satisfactory position, it is opened up by cutting the vicryl ties. Mesh anchoring devices are not used. We believe that lateral fish tailing and wrapping around the cord structures prevents mesh migration. This method also converts a flat mesh into a broad-based cone, which conforms to the inner concavity of the parietal wall [Figure 2]. With good peritoneal mobilization, inadvertent peritoneal tears causing pneumoperitoneum do not require decompression with a Verre’s needle.

As the 10 mm incision at the umbilical port is made along the direction of the fibres of the anterior rectus sheath with an intact posterior sheath / peritoneal layer, we selectively close the anterior sheath incision with sutures only if the sheath is weak.

**RESULTS**

One hundred and thirty-eight patients were planned for laparoscopic TEP repair.
elective laparoscopic TEP hernia repair out of which 134 underwent a successful procedure, with conversion to open repair in the remaining four patients. These patients were probably unsuitable for this technique as two had incarcerated omentocoeles and the other two were large bilateral herniae.

One hundred and twenty-three of the 134 patients were males. Age range was 19 years to 86 years with a median of 56.5 years. TEP was completed in 134 patients who had 209 herniae.

Seventy-three patients had bilateral herniae and 61 had unilateral herniae. There were two coincidental femoral herniae detected during the operation. Herniae were also classified according to the type and Nyhus classification [Table 1]. The majority were primary direct herniae with 43 recurrent herniae.

Eight patients with a right-sided hernia also had an appendicectomy scar but this did not prevent the successful completion of the procedure. Fifteen associated cord lipomata were reduced.

In the first case of the series, a 6 × 11 cm size prolene mesh was used after which, a 12 × 15 cm prolene mesh was utilized in all subsequent cases. The anterior rectus sheath incision at the umbilical port was closed in 37/134 of the patients (27%).

Intraoperatively, two patients had minor retropubic vein bleeding which was controlled with diathermy. Fifteen patients developed pneumoperitoneum due to minor peritoneal tears of whom only two required decompression with a Verre’s needle. There were no visceral or major vascular injuries during the procedures.

Operating times for the unilateral repairs ranged between 25 minutes to 115 minutes, with a median of 45 minutes. In cases of bilateral repairs, operating time ranged between 45 minutes to 150 minutes, with a median of 80 minutes. The overall mean operating time per hernia was 40 minutes. One hundred and twenty patients remained overnight in the hospital and 12 were operated on as day cases. Only one patient had to stay in the hospital for more than one day as a result of urinary retention.

Postoperative complications are shown in Table 2. Hematoma and seroma were treated conservatively with the exception of one seroma, which was aspirated at six weeks. There were no wound or mesh infections. Overall postoperative morbidity was 13%.

There were five recurrences of which two were recurrences. Three of the recurrences were noted after three months, one at six months and the other eight months after the operation. All the recurrences were electively repaired by open tension-free hernioplasty. Interestingly, four of these recurrences were of an indirect type. The first operation in the series where a small mesh had been used, developed a recurrence and possible causes are discussed later for the other four. Overall recurrence rate was 2.4% and the recurrence for primary hernia repair was 1.85%. The follow-up period varied between six and 66 months with a mean of 25 months.

**DISCUSSION**

The first laparoscopic repair of inguinal hernia was reported in 1979.[1] Unlike laparoscopic cholecystectomy, laparoscopic hernia repair has failed to evoke similar enthusiasm amongst surgeons all over the world. Early reports suggested high recurrence and morbidity.[4] This, combined with a perceived long learning curve, along with serious complications and increased cost, were reasons cited by many surgeons for not adopting the technique.[5]

Systematic review of randomized, controlled trials comparing laparoscopic repairs with open techniques has shown benefits of the minimally invasive approach to be less postoperative pain and morbidity and earlier recovery.[8] Other randomized, controlled trials have shown recurrence rates following laparoscopic TEP repairs similar to open conventional anterior repairs.[7-12] Operating time is generally found to be longer in the laparoscopic groups but with experience, as shown in our learning curve, this can approach that of the open techniques.

<table>
<thead>
<tr>
<th>Type</th>
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<tr>
<td>Direct</td>
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<tr>
<td>Indirect</td>
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<tr>
<td>Femoral</td>
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<td>Type III</td>
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<td>Port site bleeding</td>
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<tr>
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</tr>
<tr>
<td>Groin pain / discomfort</td>
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</table>

No mesh or wound infections

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**Table 1: Hernia types and Nyhus classification**

**Table 2: Postoperative complications**
Re-recurrence following repair of recurrent herniae by conventional anterior approaches can be as high as 35%. The totally extraperitoneal approach avoids the scarred planes and reduces risks of ischaemic orchitis and chronic groin pain. The re-recurrence rates following this approach are less than 2% in some series although we report 4.6%.

Case selection is important and patients with incarcerated herniae or large herniae should be dealt with by an open approach, particularly in the early phase of the learning curve.

It is our opinion that previous experience with the open Stoppa repair helps to acquaint one with the endoscopic preperitoneal anatomy.

Use of disposable equipment and mesh anchoring with staples or clips adds to the cost with little evidence of better results.

We did not find appendicectomy scars to be a reason for conversion unlike other reports. However, the threshold for conversion to alternative methods should be low in patients with previous abdominal scars.

The learning curve can be defined as the time necessary to stabilize the duration of the operation or to reach a stable level of recurrence. Learning curve with regard to its two components: time necessary to stabilize the operating time and to reach a stable level of recurrence rate, varies between individual surgeons. This is influenced by proficiency of the surgeon in the laparoscopic procedures and the surgeon's age as shown in a multicenter, randomized trial comparing open and laparoscopic herniorrhaphies.

The number of operations required to stabilize the operating time is generally quoted to be around 50 operations and this is also reflected in our experience.

However, to reduce the complication rates and recurrence rates, further experience is essential. In a prospective study of 1227 hernia repairs using the TEP technique over a period of seven years, it was noted that 42% of the complications and 61% of the recurrences appeared in the first 100 cases. To stabilize the recurrence rate, the learning curve has been estimated at 200 to 250 cases.

From our study, the first 50 operations bring the operating time comparable to an open procedure and the recurrence rate stabilizes during the second hundred repairs. It is also our view that experience of about 200 repairs is required to reach the end of the learning curve.

Laparoscopic totally extraperitoneal repair is a safe and efficient method for inguinal hernia with a low morbidity. Fish tail slit of the mesh and wrapping around the cord structures may obviate the need for mesh-anchoring devices and reduce the cost. Recurrence rates are low and these are unlikely to increase further as most recurrences in preperitoneal repairs occur before six months due to technical failures. They may be a result of inadequate spreading of the mesh, mesh migration or mesh contraction. The learning curve for the operation is long and in our view, case selection is important to reduce the conversion rate.

REFERENCES

10. Fleming WR, Elliott TB, Jones RM, Hardy KJ. Randomised clinical

Table 3: Learning curve

<table>
<thead>
<tr>
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