Five-year prospective follow-up of 430 laparoscopic totally extraperitoneal inguinal hernia repairs in 275 patients

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ABSTRACT

INTRODUCTION Favourable short-term results, with respect to less postoperative pain and earlier return to physical activity, have been demonstrated with laparoscopic totally extraperitoneal (TEP) hernia repair compared with open mesh repair. However, there is limited data regarding long-term results.

PATIENTS AND METHODS The study cohort consisted of 275 consecutive patients undergoing TEP repair between 1996 and 2002. Patient demographics, details of surgery, postoperative complications, recurrence and chronic pain were collected from patient records and from a prospective database. All patients were seen at 6 weeks and then annually for 5 years following surgery.

RESULTS A total of 430 repairs were performed in the 275 patients (median age, 56 years; range, 20–94 years; men, 97.5%). Bilateral repair was performed in 168 patients (61.1%) and recurrent hernia repair in 79 patients (28.7%). Two patients were converted to an open procedure. Five-year follow-up was achieved in 72% of patients. Eleven patients (4%) died during the follow-up period due to unrelated causes. Hernia recurrence rate at 5 years was 1.1% per patient (three repairs). Recurrences were noted at 7 months, 2 years and 4 years following surgery. Chronic groin pain was reported by 21 patients (7.6%), seven of whom required referral to the pain team.

CONCLUSIONS TEP hernia repair is associated with a recurrence rate of 1% at 5 years in this series. Chronic groin symptoms are also acceptably few. This recurrence rate following TEP repair compares extremely favourably with open mesh repair, particularly as it includes a high proportion of recurrent repairs. As well as the proven early benefits, TEP repair can be considered a safe and durable procedure with excellent long-term results.

KEYWORDS

Inguinal hernia – Laparoscopic surgery – Follow-up studies

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Laparoscopic inguinal herniorrhaphy gained recognition as a viable alternative to the open approach in the early 1990s.¹ It was based upon the principles of pre-peritoneal herniorrhaphy with a mesh being used to cover the myopectineal orifice following reduction of the hernial sac.

Two laparoscopic techniques were popularised: the transabdominal pre-peritoneal (TAPP) and the totally extraperitoneal (TEP). Debate still remains over which technique is the superior. The popularity of TEP is growing, as many surgeons have become wary of the potential for complications when entering the peritoneal cavity using the transabdominal approach. TEP has demonstrated favourable short-term results, with regards to reduced post-operative stay, pain and earlier return to physical activity in

comparison with open mesh repairs.² Studies have also demonstrated low rates of recurrence, particularly in the first few years following surgery,^{3,4} but most have failed to achieve a dedicated long-term follow-up in a series of sufficient magnitude. In a large multicentred trial, a recurrence rate of 4.9% at 4 years following TEP repair was reported.⁵ A recurrence rate of 2% at 5 years has been reported in the TEP arm of a randomised controlled trial comparing TEP with open repair,⁶ whilst a smaller case series reported a rate of 1%.⁷ However, both studies involved relatively few patients.

There is little data regarding the incidence of chronic pain by means of long-term follow-up after TEP repair. A multicentre trial assessing pain by postal follow-up, in

which the predominant operation was TEP, pain was reported in 18.1% at 5 years.⁸ The studies with 5-year follow-up from TEP, reported overall incidences of chronic pain of 9.4%⁶ and 14%,⁷ respectively.

This prospective study focuses upon the 5-year follow-up of a large case series undergoing TEP repair by a single surgeon, with recurrence and incidence of chronic pain being taken as primary outcome measures.

Patients and Methods

This was a prospective study of 275 consecutive patients who underwent 430 TEP repairs between January 1996 and December 2002. Patients with primary bilateral inguinal hernia, recurrent inguinal hernia and those with suspected Gilmore's groin, were included within this cohort. Surgery for suspected Gilmore's groin was reserved for those with a typical set of features and a failed trial of conservative management. Mesh repair was undertaken on the affected side, irrespective of the presence of a hernia. Patient demographics, details of surgery, postoperative complications, recurrence and chronic pain were collected from a prospective database and patient records.

Chronic pain was defined as pain persisting beyond 3 months⁹ and classified as being either mild, moderate or severe on a 3-point verbal scale. All patients were reviewed in the out-patient clinic at 6 weeks following surgery and then annually for 5 years. Patients who failed to attend their 5-year appointment were contacted by telephone.

Surgery was performed under general anaesthesia using a standard operative technique. The senior author was present as either lead surgeon or first assistant in all cases. The pre-peritoneal space was entered lateral to the umbilicus and was enlarged by the use of an extraview and then structural balloon (Covidien UK Commercial Limited). Pressure was maintained at 12–14 mmHg by continuous insufflation of carbon dioxide. A 5-mm port was inserted in the midline below the umbilicus and another 5-mm port adjacent to the anterior superior iliac spine (ASIS) on the side undergoing repair. A further port was placed adjacent to the ASIS on the contralateral side if a bilateral repair was undertaken. After reduction of the hernial sac, a 15 × 10 cm polypropylene mesh was used to cover the myopectineal orifice and fixed in place by titanium tacks (Pro Tac, Covidien, UK). An L-shaped slit in the inferior border of the mesh was passed from lateral to medial beneath the spermatic cord and fixed to the pectineal ligament. Further tacks were placed anteriorly on the under surface of rectus abdominus and the fascia transversalis laterally. Patients who required conversion to an open procedure underwent a pre-peritoneal repair as described by Stoppa and Warlmount.¹⁰

The senior author's technique of TEP repair was developed following initial experience with laparoscopic

Table 1 Total number of hernia repairs

Findings at operation	Patients (n)	Hernias repaired (n) ^a
Unilateral	94	94
Bilateral	168	336
Posterior wall weakness ^b	9	0
No data available	4	0
Total	275	430

^aIncidental hernia identified on the ipsilateral side were not counted as extra repairs.

^bGilmore's groin cohort – of the 10 patients who underwent surgery only one had an identifiable hernia.

extraperitoneal dissection in the early 1990s. Prior to the first repair being undertaken in this series, the senior author had already performed 40 cases in the preceding 2 years.

Results

A total of 430 pre-peritoneal repairs were performed in 275 patients (Table 1). The median age was 56 years (range, 20–94 years) and 268 (97.5%) patients were men. Bilateral hernia repair was performed in 168 patients (61.1%) and recurrent hernia repair in 79 patients (28.7%).

Ten patients (3.6%) underwent repair for suspected Gilmore's groin, of which only one patient required repair of a hernia that was detectable at operation. The remaining nine repairs performed in the absence of a hernia were excluded from the analysis of recurrence. Two of these patients continued to experience pain, with one patient requiring referral to the pain team for nerve blockade. Both were included within the analysis of chronic pain.

Surgery was undertaken either by a specialist registrar or an equivalent grade trainee in 34 patients (12.4%) under direct supervision of the senior author. Two patients (0.7%) required conversion to an open pre-peritoneal repair. Incidental hernias were detected in 27 patients (9.8%) and repaired simultaneously. Of these, 14 were femoral, seven contralateral direct, three Spigelian, two contralateral recurrent and one contralateral indirect (Table 2). The in-hospital mortality rate was zero and no patient experienced any major complications. Early complications were reported in 53 (19.3%) patients (Table 3). These were 15 wound infections, 10 urinary retentions, eight seromas and seven haematomas (none of which required evacuation). Early postoperative pain (less than 6 weeks after surgery) was

Table 2 Patient characteristics

Age (years)	56 (range, 20–94 ^a)
Male:female	268:7 (97.5)
Recurrent:primary	79:196 (28.7)
Bilateral:unilateral	168:94 (61.1)
Conversion	2 (0.7)
Hernia type at surgery	
Direct	217 (50.5)
Indirect	165 (38.4)
Pantaloon	46 (10.7)
Femoral	2 (0.4)
Incidental hernia repaired	27 (9.8)
Femoral	14 (5.1)
Contralateral direct	7 (2.5)
Spigelian	3 (1.1)
Contralateral recurrent	2 (0.7)
Contralateral indirect	1 (0.4)

All values given as *n* (%) unless otherwise specified.

^aThe 94-year-old patient had no medical co-morbidities and was otherwise active. The patient was keen to undergo a laparoscopic repair and deemed suitable for a general anaesthetic.

reported in five patients, all of whom had experienced pain pre-operatively. Two patients reported sensory disturbance in the distribution of the lateral femoral cutaneous nerve, suggestive of meralgia parasthetica, but did not require any specific treatment.

Five-year follow-up was achieved in 198 (72%) patients, of whom 146 (73.7%) attended their final clinic appointment and 52 (26.3%) were contacted by telephone. Eleven (4%) patients died during their follow up-period from unrelated causes. There were three recurrent hernias identified, giv-

Table 3 Early complications

Wound infection	15 (5.5)
Urinary retention	10 (3.6)
Seroma	8 (2.9)
Haematoma	7 (2.5)
Early postoperative pain (< 6 weeks)	5 (1.8)
Hydrocoele	4 (1.5)
Meralgia paraesthetica	2 (0.7)
Urinary tract infection	1 (0.4)
Pneumonia	1 (0.4)
Total	53 (19.3)

All values given as *n* (%) unless otherwise specified.

ing a recurrence rate at 5 years of 1.5% per patient for all patients seen or questioned at 5 years. Review of the notes of the patients who did not complete 5-year follow-up identified no additional recurrences, giving an overall recurrence rate for the cohort of 1.1% per patient (Table 4). Recurrences were noted at 7 months, 2 years and 4 years following surgery.

Chronic inguinal pain was reported by 21 patients (7.6%), of whom 16 had experienced pain prior to surgery. Seven patients required referral to the pain team, five of whom received ilio-inguinal and genitofemoral nerve blocks with Triamcinolone 40 mg and Bupivacaine 0.5% 20 ml. Only two patients reported severe pain that restricted daily physical activity with genitofemoral nerve entrapment being implicated in both instances. Complete symptom resolution was achieved with nerve blocks and the application of topical capsaicin. Amongst the 14 patients who were not referred to the pain team, symptoms had either resolved without treatment or were well controlled with simple analgesia.

Table 4 Five-year recurrence rate

	Recurrence rate at 5 years			
	All patients		Complete follow-up	
	Per patient	Per repair	Per patient	Per repair
Primary	2/196 (1.0)	2/343(0.6)	2/137 (1.5)	2/248 (0.8)
Recurrent	1/79 (1.3)	1/87(1.1)	1/61 (1.6)	1/66 (1.1)
Overall	3/275 (1.1)	3/430 (0.7)	3/198 (1.5)	3/314 (1.0)

All values given as *n* (%) unless otherwise specified.

Discussion

The long-term outcome following TEP hernia repair in this series compares extremely favourably with the results achieved from other studies looking at both laparoscopic and open methods of repair.^{5,7,10–14} A recurrence rate of 1.1% at 5 years is one of the lowest reported for TEP repair in the literature to date. This is particularly significant as almost one-third of patients underwent repair of a recurrent hernia.

The success of any hernia repair is determined by the recurrence rate and the incidence of chronic pain. Most recurrences after laparoscopic repair occur within the first year and are attributable to technical error.^{7,15} Only one recurrence within a year was noted in the study and this occurred in a patient having repair of a recurrent direct hernia. An indirect recurrence was noted at subsequent repair. The recurrences amongst the primary repairs were seen at 2 years and 4 years following surgery. One patient had undergone repair of a direct hernia and the other an indirect hernia. Both recurrences were noted to be direct. Previous reports have suggested that recurrences have occurred after repair of direct hernias because of mesh migration¹⁶ or using an inadequately sized mesh to allow for shrinkage.¹⁷ There is much debate surrounding the need for mesh fixation in TEP repair, although the method employed in this series would suggest that fixation provides an effective means of repair.

The incidence of chronic groin pain was acceptably low and comparable to previously reported figures following laparoscopic repair.^{5,7,8,10,12,15} The majority of patients who developed chronic pain had experienced pain prior to surgery. Previous studies have demonstrated pre-operative inguinal pain to be a risk factor in developing chronic pain,⁵ highlighting the complex aetiology of this condition. In all but two patients, symptoms were rated as mild or moderate in nature. The results from this series lends support to a growing body of evidence that the laparoscopic approach, either TEP or TAPP, is associated with less chronic pain than open repairs.^{18,19}

Accurate long-term follow-up can be difficult to achieve, as many patients undergoing hernia repair are often lost to follow-up. A comparatively high 5-year follow-up of 72% was achieved, with the majority of these patients attending for clinical examination. The 4% of patients who died during the follow-up was in keeping with the expected death rate for a population of the same age.²⁰ Despite a review of the notes in patients who did not complete 5-year follow-up identifying no further recurrences, it is possible that additional recurrences were missed as patients sought treatment elsewhere.

Pre-peritoneal dissection of both hernial orifices, even in patients with a unilateral hernia, allowed for the detection of incidental hernias in almost 10% of patients. Previous

studies have quoted this figure to be as high as 19%.²¹ Even though the laparoscopic approach may provide superior visual access compared to the open approach, dissection in the absence of a hernia may produce scarring that makes any further surgery on the contralateral side more troublesome. Dissection in the extraperitoneal plane has also been associated with bladder and bowel injuries,²² but no major complications were encountered. Only two patients required conversion to an open procedure and in both instances this was as a result of hernial incarceration. Early postoperative complications were comparable to other studies,^{4,25} with wound infection and urinary retention being the most commonplace. There were two cases of meralgia parasthetica, most probably as a result of tack impingement on the lateral femoral cutaneous nerve, but both resolved without treatment. It is important to remember that excessive lateral tacking can lead to the entrapment of this nerve.

Conclusions

Despite the proven short-term benefits of TEP repair, there is limited data regarding the long-term results. This series has achieved a dedicated follow-up of 430 repairs, demonstrating TEP repair to be a safe and durable procedure with rates of long-term recurrence comparable to those of specialist hernia centres undertaking open repair.^{24,25}

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