# Laparoscopic ventral hernia repair: local experience

K Kannan, C Ng, T Ravintharan


## ABSTRACT

**Introduction: Laparoscopic ventral hernia repair (LVHR) is a recent development that has been shown to be an effective way of treating ventral hernias. We present the first local series of LVHR with a review of the literature on laparoscopic ventral herniorrhaphy.**

**Methods: We retrospectively reviewed all our patients who underwent laparoscopic surgery for ventral hernias from December 1998 to May 2002. Results of LVHR such as operative time, length of hospital stay, complications and recurrence rates were evaluated.**

**Results: Twenty patients underwent LVHR. There were 16 female and four male patients. The average age was 54 years. The mean fascial defect was 46 square cm. An ePTFE Mesh was used in all the patients except for one patient who had a prolene mesh. The mean operative time was 117 minutes and the hospital stay was two days. There were two minor complications and no major complications. With a mean follow-up period of 14.9 months, the recurrence rate was 5.0 percent with a single recurrence at four months.**

**Conclusion: Our initial experience with this modality shows that LVHR a feasible option with great potential in both treatment success and reduction of surgical morbidity.**


**Keywords: herniorrhaphy, laparoscopic surgery, laparoscopic ventral hernia repair, ventral hernia**

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**Department of General Surgery**
**Changi General Hospital**
**2 Simei Street 3**
**Singapore 529889**

K Kannan, MBBS
Medical Officer

C Ng, MBBCh, FRCS
Associate Consultant

T Ravintharan, MBBS, FICS, FRCS
Senior Consultant

**Correspondence to:**
Dr Ravintharan Tharmalingam
3 Mt Elizabeth #14-15
Mt Elizabeth Medical Centre
Singapore 228510
Tel: (65) 6738 0328
Fax: (65) 6738 0128
Email: ravit@starhub.net.sg
or
drkannansg@yahoo.com.sg

## INTRODUCTION

The goals of a new technique for ventral hernia repair should be to decrease the high recurrence rates and the associated problems of conventional open hernia repair. The recurrence rates after open ventral herniorrhaphy range from 25% to 52%[1]. The use of prosthetic material in open ventral herniorrhaphy has decreased this recurrence rate but with it comes complication of the mesh such as infection[2,3]. There have been several well-received series that have reported comparatively lower infection and recurrence rates in the laparoscopic approach to ventral hernia repair[4-6]. In this study, we share our initial experience with laparoscopic ventral hernia repair.

## METHODS

There were a total of 20 patients who underwent LVHR between the period of December 1998 to May 2002. These were performed by two general surgeons who have a special interest in laparoscopic hernia repair. All patients with ventral wall, incisional and recurrent hernias were selected for LVHR. Patients who had inguinal hernias, obstructed or strangulated hernias, and those with intra-abdominal sepsis were excluded from the laparoscopic repair. The patient's age, sex, hernia type and co-existing medical problems were noted. The hernia defect size, prosthetic material used in the repair, and method of fixation of the prosthesis were recorded. The above data together with length of postoperative stay, peri-operative and post-operative complications were all recorded in a database and analysed.

Both surgeons employed a similar operative technique in the study. The angled (30 degrees) 10mm laparoscope was used in all cases. Pre-operative prophylactic antibiotics were given in all cases. All patients were catheterised to decompress the urinary bladder. Gastric decompression was achieved by placement of a naso-gastric tube. The patients were given general anaesthesia and placed in a supine position. Access to the abdomen was accomplished by means of either the open technique or guided entry with a visiport. Adhesiolysis was done using only sharp dissection with minimal use of diathermy. This was to avoid inadvertent thermal injury to the bowel. The hernia contents were reduced but the peritoneal sac was left in-situ. The margins of the hernia defect were delineated and measured.

Expanded polytetrafluoro-ethylene (ePTFE) mesh (Gore-Tex Dual Mesh Biomaterial, WL Gore, Flagstaff, Arizona, USA) was used. The ePTFE Mesh was tailored

**Table I. Hernia characteristics in patients who underwent LVHR.**

| | |
|---|---|
| Incisional hernia | 12 |
| Paraumbilical hernia | 12 |
| Recurrent hernia | 2 |
| Previous open repair | 2 |
| Single abdominal wall defect | 13 |
| Multiple abdominal wall defects | 7 |
| *2 defects* | 4 |
| *3 defects* | 3 |
| Mean hernia size ($cm^2$) | 46 (2-252) |
| *Contents of hernia sac | |
| *Nil* | 6 |
| *Omentum* | 13 |
| *Bowel* | 2 |
| Number of patients with incarcerated hernias | 3 |

*One patient had omentum and bowel within the hernia sac.

such that it would overlap the defect by 3cm to 4cm on all sides. Non-absorbable Gore-Tex sutures were placed at the upper and lower ends of the ePTFE mesh to achieve secure attachment to the anterior abdominal wall. The mesh was then introduced into the abdominal cavity via the 10mm port. A larger port was used for the very large mesh. After the mesh was positioned intra-peritoneally, the sutures were passed through the anterior abdominal wall using a laparoscopic suture passer (Gore Suture Passer Instrument, WL Gore, Flagstaff, Arizona, USA). The sutures were tied down and secured at two points. The circumference of the mesh was then tacked to the posterior fascia at intervals of 1cm. Drains were not inserted. The wound was infiltrated with a long-acting local anaesthetic agent post-operatively in all patients.

## RESULTS

The 20 patients in our data analysis were 16 women and four men, with a mean age of 54 (range 35-78) years. There were nine Indian, four Malay, three Chinese and four Caucasian patients. In our series, hypertension, diabetes, asthma and hypothyroidism were the most common co-existing medical conditions. They bore no co-relation to the presence of hernia in these group of patients.

Of the hernia types, there were 12 incisional and 12 paraumbilical hernias in our 20 patients (Table I). About 65% (n=13) of the patients had a single abdominal wall defect, and the rest had multiple defects. There were three incarcerated hernias, all of which were successfully reduced after establishment of pneumoperitoneum.

All the patients in the series were operated on as elective cases, with successful completion of the procedure laparoscopically in all cases. No additional

**Table II. Reported small and large series on LVHR (in chronological order).**

| | Year of study | No. of patients | Complication rate (%) | Length of hospital stay (days) | Mean period of follow up (months) | Recurrence rate (%) |
|---|---|---|---|---|---|---|
| Saiz et al[30] | 1996 | 10 | 20 | <1 | 13.5 | 0 |
| Costanza et al[5] | 1998 | 15 | 13.3 | 2.0 | 18 | 6.7 |
| Park et al[19] | 1998 | 56 | 18 | 3 | 24 | 11 |
| Toy et al[18] | 1998 | 144 | 24 | 2 | 7 | 4 |
| Franklin et al[31] | 1998 | 112 | 5.1 | 6.5 | 30 | 1.1 |
| Ramshaw et al[10] | 1999 | 79 | 19 | 1.7 | 21 | 2.5 |
| Sanders et al[32] | 1999 | 11 | 0 | – | 12.5 | 8.3 |
| Koehler and Voeller[33] | 1999 | 32 | 15.6 | 1.9 | 20 | 9.4 |
| Kyzer et al[34] | 1999 | 53 | 11.3 | 3.3 | 17 | 1.9 |
| Heniford and Ramshaw[4] | 2000 | 100 | 14 | 1.6 | 23 | 3 |
| Heniford et al[6] | 2000 | 407 | 13 | 1.8 | 23 | 3.4 |
| Nguyen et al[35] | 2000 | 16 | 0 | <1 | 5.9 | 0 |
| Chowbey et al[36] | 2000 | 202 | 2.4 | 1.8 | 34.8 | 1 |
| LeBlanc et al[18] | 2001 | 96 | 4.1 | – | 51 | 9.3 |
| Moreno-Egea et al[37] | 2001 | 20 | 0 | – | 10 | 0 |
| Current series | 2003 | 20 | 10.0 | 4.0 | 14.9 | 5 |

procedures were carried out during the herniorrhaphy. Intraoperative blood loss was negligible. The mean operative time was 117 minutes (range 55-260 minutes). The mean size of the ePTFE mesh was 206 $cm^2$ (range 9-432 $cm^2$). The mean post-operative length of stay was 4.0 days (range 1-10 days). In our series, the overall complication rate was 10.0%. There were no major complications. Four patients had seromas that lasted less than six weeks, one patient had prolonged suture site pain lasting more than eight weeks, and one patient had a flank haematoma. The seromas were not aspirated and allowed to resolve spontaneously.

During a mean follow-up period of 14.9 months (range 3 to 45 months), there was a single recurrence at four months, giving a recurrence rate of 5.0%. This patient initially had a laparoscopic repair, following which she experienced prolonged suture site pain especially on standing. Computed tomography showed that the mesh had been partially pulled out of the peritoneal space into the hernia defect by the large abdominal apron of fat due to traction whenever she stood. She subsequently had the mesh refixed during an open surgery.

## DISCUSSION

An incisional hernia develops in 3% to 13% of patients following a laparotomy, and is the most common long-term complication following abdominal surgery[7]. A lasting surgical correction of a ventral hernia thus remains a challenge. Open primary suture repair has led to extremely high recurrence rates. For a fascial defect equal to or more than 4cm in size, the recurrence rate exceeds 40%. For a fascial defect less than 4cm in size, the recurrence rate can be as high as 25%[8]. The use of prosthetic mesh came into popularity after it was shown that the long-term failure rate could be reduced to 11% to 21%[8-10]. However, the placement of mesh typically required extensive soft tissue dissection, raising of flaps and insertion of drains. This in itself increased the incidence of wound infections and local wound complications[4,11,12].

The laparoscopic repair of ventral hernia utilises the principles of the open technique popularised by Stoppa, Rives et al, and Wantz[9,13,14]. These principles include using a large mesh prosthesis, adequate overlap of the hernia defect, and eliminating tension. In the laparoscopic technique, the mesh is placed intraperitoneally and extensive soft tissue dissection is eliminated. It has been shown, based on widely-quoted comparative studies, that with LVHR wound complication rate, patient discomfort, length of hospital stay, time to return to normal activities and recurrence rates are all reduced[10,15,16]. LVHR has also been established as a cost-effective procedure, with total facility costs for the laparoscopic repair being significantly lower than that for the open repair[17].

Intra-abdominal placement of a large mesh with wide overlap of defects, use of smaller incisions, laparoscopic adhesiolysis to uncover small unpalpable defects that may go unnoticed with open repair, and use of large non-absorbable sutures for stronger patch fixation could account for the greater success of the laparoscopic operation[5]. In our series, the patients as a group had a good outcome. Despite an early experience with this technique, there were no conversions to open surgery. The mean operative time was about 117 minutes, with a single case taking about 260 minutes due to dense intra-abdominal adhesions. This time is longer than most mean operative times reported in other series, which range from 82 to 97 minutes[5,7,10,18]. This is attributable to the more careful and meticulous approach adopted by the surgeons in the execution of a new procedure.

There were also no operative mortalities or major complications in our series. Seroma formation was the most common post-operative complication, which was defined as any bulge at the operation site observed by the surgeon or the patient. It is considered significant if it lasts more than six weeks. We found that all of them resolved without treatment within six weeks. Heniford et al recommend aspirating seromas in patients who are symptomatic, and allowing the others to resolve spontaneously[6].

We also observed that seroma at the site of hernia repair and suture site pain were the most common minor complications reported in other series as well[7,15,19]. The suture site pain experienced may have originated from tissue or nerve entrapment during placement of sutures or tacks through the full thickness of the anterior abdominal wall. It could also have resulted from traction of the transabdominal sutures fixing the mesh to the anterior abdominal wall. However, suture placement is vital to the long-term durability of the mesh repair and we do not advocate any change in the technique. Suture site pain can be managed conservatively but the possibility of traction on the mesh from a large, heavy abdominal apron of fat and subsequent detachment must be borne in mind, as was the case in one of our patients.

The major complications following LVHR are well documented. These include enterotomy, mesh infection, skin breakdown, intra-abdominal abscess and mortality. The overall complication rates range from 0% to 24% (Table II). The recurrence rate in our series was 5.0%, with a single recurrence at four

months. Given that 66% to 90% of recurrences occur within two years after operation, our mean follow-up of about 15 months is acceptable, and we do not expect the recurrence rate in this series to change markedly[8,20]. Recurrence rates following laparoscopic repair in other series range from 0% to 11% (Table II).

95% of the hernias in our series were repaired with ePTFE mesh, with one repair utilising prolene mesh placed in a preperitoneal position for a small hernia early on in our series. Both polypropylene and polyester mesh have been observed to cause severe bowel adhesions, with subsequent intestinal erosion and fistulisation[4,19-25]. ePTFE also appears to be less easily infected than other biomaterials[26]. It is therefore recommended that mesh materials be separated from the intestine, whenever possible[15,20,27].

For this purpose, we found the Gore-Tex Dual Mesh to be well suited. The smooth side placed directly adjacent to the bowel has a pore size of 3μm, resulting in minimal tissue attachment; while the other side has an average size of 22μm, allowing tissue ingrowth and attachment to the anterior abdominal wall. There have been no reported cases in the literature of erosion or fistulation with the use of the Dual Mesh. However, ePTFE biomaterial costs more and is opaque, making laparoscopic work slightly harder.

LVHR can essentially be extended to any patient who is a candidate for open repair and with an acceptable risk for general anaesthesia[28]. As experience increases, LVHR can be safely extended to patients with multiple prior abdominal procedures and atypically-located hernias. Incarceration is not a contraindication as onset of anaesthesia, muscle relaxation and introduction of pneumoperitoneum make reduction easy. The procedure should however be generally avoided in children.

The data derived from our first 20 patients represents the first local series on laparoscopic ventral hernia repair in Singapore. In our series, we have found this procedure to be technically feasible, safe and effective, with good clinical outcome for our patients. The possible limitations in our series are the relatively small study group and the short mean follow-up period. The concept of LVHR has developed considerably since it was first described by LeBlanc in 1993[29]. This paper serves to share our experience and it is hoped that by doing so, there will be better awareness and acceptability of the procedure.

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## REFERENCES

1. Paul A, Korenkov M, Peters S, Kohler L, Fischer S, Troid H. Unacceptable results of the Mayo procedure for repair of abdominal incisional hernias. Eur J Surg 1998; 164:361-7.
2. Temudom T, Siadati M, Sarr MG. Repair of complex giant or recurrent ventral hernias by using tension-free intrapariteal prosthetic mesh (Stoppa technique): lessons learned from our initial experience (fifty patients). Surgery 1996; 120:738-44.
3. Leber GE, Garb JL, Alexander AL, Reed WD. Long term complications associated with prosthetic repair of incisional hernias. Arch Surg 1998; 133:378-82.
4. Heniford BT, Ramshaw BJ. Laparoscopic ventral hernia repair: a report of 100 consecutive cases. Surg Endosc 2000; 14:419-23.
5. Costanza MJ, Heniford BT, Arca MJ, Mayes JT, Gagner M. Laparoscopic repair of recurrent ventral hernias. Am Surg 1998; 64:1121-5.
6. Heniford BT, Park AE, Ramshaw BJ, Voeller G. Laparoscopic ventral and incisional hernia repair in 407 patients. J Am Coll Surg 2000; 190:645-50.
7. Mudge M, Huges LE. Incisional hernia: a 10-year prospective study of incidence and attitudes. Br J Surg 1985; 72:70-1.
8. Hesselink VJ, Luijendijk RW, de Wilt JH, Heide R, Jeekel J. An evaluation of risk factors in incisional hernia recurrence. Surg Gynecol Obstet 1993; 176:228-34.
9. Stoppa RE. The treatment of complicated groin and incisional hernias. World J Surg 1989; 13:545-54.
10. Ramshaw BJ, Esartia P, Schwab J, Mason EM, Wilson RA, Duncun TD, et al. Comparison of laparoscopic and open ventral herniorrhaphy. Am Surg 1999; 65:827-32.
11. White TJ, Santos MC, Thompson JS. Factors affecting wound complications in repair of ventral hernias. Am Surg 1998; 64:276-80.
12. Schumpelick V, Conze J, Klinge U. Preperitoneal mesh repair of incisional hernias: A comparative retrospective study. Chirurgie 1996; 67:1028-35.
13. Rives J, Pire JC, Flament JB, Palot JP, Body C. Treatment of large eventrations. New therapeutic indications apropos of 322 cases. Chirurgie 1985; 111:215-25.
14. Wantz GE. Incisional hernioplasty with Mersilene. Surg Gynecol Obstet 1991; 172:129-37.
15. Park AE, Birch DW, Lovrics P. Laparoscopic and open incisional hernia repair: a comparison study. Surgery 1998; 124:816-22.
16. Holzman MD, Purut CM, Reintgen K, Eubanks S, Pappas TN. Laparoscopic ventral and incisional hernioplasty. Surg Endosc 1997; 11:32-5.
17. DeMaria EJ, Moss JM, Sugerman HJ. Laparoscopic intraperitoneal polytetrafluoroethylene (PTFE) prosthetic patch repair of ventral hernia. Prospective comparison to open prefascial polypropylene mesh repair. Surg Endosc 2000; 14:326-9.
18. LeBlanc KA, Booth WV, Whitaker JM, Bellanger DE. Laparoscopic incisional and ventral herniorrhaphy in 100 patients. Am J Surg 2000; 180:193-7.
19. Toy FK, Bailey RW, Carey S, Chappuis CW, Gagner M, Josephs LG, et al. Multicenter prospective study of laparoscopic ventral hernioplasty: preliminary results. Surg Endosc 1998; 12:955-9.
20. Linden van der FT, Vroonhoven van TJ. Long term results after surgical correction of incisional hernia. Neth J Surg 1988; 40:127-9.
21. Amid PK, Shulman AG, Lichtenstein IL.An experimental evaluation of a new composite mesh with selective property of incorporation to the abdominal wall adhering to the intestines. J Biomed Mater Res 1994; 28:373-5.
22. George CD, Ellis H. The results of incisional hernia repair in a 12-year review. Ann R Coll Surg Engl 1986; 68:185-7.
23. Heniford BT, Iannitti DA, Gagner MG. Laparoscopic inferior and superior lumbar hernia repair. Arch Surg 1997; 132:1141-4.
24. Law NW. A comparison of polypropylene mesh, expanded polytetrafluoroethylene and polyglycolic acid mesh for the repair of experimental abdominal wall defects. Acta Chir Scand 1990; 156:759-62.
25. Law NW, Ellis H. Adhesion formation and peritoneal healing on prosthetic materials. Clinical Mater 1988; 3:95-101.
26. Brown GL, Richardson JD, Malangoni MA, Tobin GR, Ackerman D, Polk Jr HC. Comparison of prosthetic materials for abdominal wall reconstruction in the presence of contamination and infection. Ann Surg 1985; 210:705-11.

27. Soler N, Verhaeghe P, Essomba A. Treatment of postoperative incisional hernias by composite prosthesis (polyester-polyglactin 910). Clinical and experimental study. Ann Chir 1993; 47:598-608.
28. LeBlanc KA. Current considerations in laparoscopic incisional and ventral herniorrhaphy. J Soc Laparoendosc Surg 2000; 4:131-9.
29. LeBlanc KA, Booth WV. Laparoscopic repair of incisional abdominal hernias using expanded polytetrafluoroethylene: preliminary findings. Surg Laparosc Endosc 1993; 3:39-41.
30. Saiz AA, Willis IH, Paul DK, Sivina M. Laparoscopic ventral hernia repair: a community experience. Am Surg 1996; 62:336-8.
31. Franklin ME, Dorman JP, Class JL, Balli JE, Gonzalez JJ. Laparoscopic ventral and incisional hernia repair. Surg Laparosc Endosc 1998; 8:294-9.
32. Sanders LM, Flint LM, Ferrara JJ. Initial experience with laparoscopic repair of incisional hernias. Am J Surg 1999; 177:227-31.
33. Koehler RH, Voeller GR. Recurrences in laparoscopic incisional hernia repairs: a personal series and review of the literature. J Soc Laparoendosc Surg 1999; 3:293-304.
34. Kyzer S, Alis M, Aloni Y, Charuzi I. Laparoscopic repair of post operation ventral hernia. Early post operation results. Surg Endosc 1999; 13:928-31.
35. Nguyen NT, Lee SL, Mayer KL, Furdui GL, Ho HS. Laparoscopic umbilical herniorrhaphy. J Laparoendosc Adv Surg Tech A 2000; 10:151-3.
36. Chowbey PK, Sharma A, Khullar R, Mann V, Baijal M, Vashistha A. Laparoscopic ventral hernia repair. J Laparoendosc Adv Surg Tech A 2000; 10:79-84.
37. Moreno-Egea A, Liron R, Girela E, Aguayo JL. Laparoscopic repair of ventral and incisional hernias using a new composite mesh (Parietex): initial experience. Surg Laparosc Endosc Percutan Tech 2001; 11:103-6.

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