The THAI Journal of SURGERY 2016;37:62-67.
Official Publication of the Royal College of Surgeons of Thailand

Original Article

Comparative Outcomes of Laparoscopic Total Extraperitoneal Hernia Repair Versus Open Lichtenstein Hernia Repair: Priest Hospital's Experiences

Prawit Tantiwattanasirikul, MD
Department of Surgery, Priest Hospital, Bangkok, Thailand

Abstract

Background: **Laparoscopic repair of inguinal hernia is increasingly performed. Many studies demonstrated that laparoscopic repair had benefits of less postoperative pain, faster recovery and no difference in complications and recurrence rate. Priest Hospital, with its unique patients' characteristics and hospital policy, has never studied the outcomes of this surgery.**

Objective: **To compare laparoscopic total extraperitoneal hernia repair (TEP) with Lichtenstein hernia repair (LT).**

Patients and Methods: **From June 2012 - June 2015, 275 patients underwent elective inguinal hernia repair at Priest Hospital. A retrospective review of demographic data, operative outcomes and complications were analyzed.**

Results: **There were 116 patients in LT group and 117 patients in TEP group (42 patients were excluded from the study). This study demonstrated significantly less postoperative pain score in TEP group at 4 hrs. ($p < 0.001$) and 24 hrs. ($p = 0.043$) after surgery but not significantly different at 48 hrs. ($p = 0.094$). The patients in LT group significantly needed more intravenous opioid drugs ($p < 0.001$). The operative time was longer in TEP ($p < 0.001$) while the length of stay was shorter in TEP ($p < 0.001$). For postoperative pain at 1 week and 1 month of follow up, there were more patients with pain in LT group ($p < 0.001$ and $p = 0.017$, respectively) but not significantly different in terms of chronic pain ($p = 0.983$), numbness ($p = 0.079$) and recurrence rate ($p = 0.369$). Overall complications were not different ($p = 0.296$).**

Conclusion: **TEP had advantage of less postoperative pain, faster recovery, shorter hospital stay but had longer operative time. It can be done safely with no difference in complication and recurrence rate.**

Keywords: **Inguinal hernia, laparoscopic total extraperitoneal hernia repair, Lichtenstein**

INTRODUCTION

Inguinal hernia repair is the most common surgical procedure performed worldwide[1-5]. Development of surgical technique was changed from tissue repair to tension free repair with superior outcomes and reduced recurrence rate[6-9]. Among many tension free hernia repair techniques, Lichtenstein technique (LT) is the most widely performed and has been used as the standard technique for a long time[4,5,8]. Nowadays, minimally invasive hernia surgery is increasingly performed. There are two common techniques, namely total extraperitoneal repair (TEP) and transabdominal preperitoneal repair (TAPP). Many studies demonstrated that laparoscopic repair had benefit of less pain, faster recovery and no difference in complications and recurrence rate but the procedure had some disadvantages of time consuming, more expensive cost and steep learning

Correspondence address: *Prawit Tantiwattanasirikul, MD, Department of Surgery, Priest Hospital, 445 Sri Ayuthaya Road, Ratchathewi, Bangkok 10400, Thailand; Telephone: +66 2640 9537; Fax: +66 2354 4287; E-mail: prawit_tan@hotmail.com*

curve[3-5,8-11]. At Priest Hospital, inguinal hernia is the most common procedure performed in General Surgery Department and both open and laparoscopic techniques are used. Due to different patients' characteristics and hospital policy than other hospitals, for example, all monk patients are male, most of them stay single, living far away from hospitals or medical services and the hospital is a non-profit organization without charges for any medical services, the outcomes of hernia repair between two techniques have never been studied. This study aims to compare the outcomes of unilateral hernia repair by TEP versus LT at our hospital.

Patient and Methods

From June 2012 - June 2015, 275 patients underwent elective inguinal hernia repair at Priest Hospital. Data was retrospectively collected from medical records and phone interviews. Inclusion criteria was age of 18-80 years old. Exclusion criteria were bilateral inguinal hernias, other repair techniques and patients with multiple procedures. The patients' demographic data was recorded including age, ASA classes, BMI and hernia types. The operative data comprised of repair techniques, operative times, outcomes, complications, postoperative pain scores at 4, 24 and 48 hrs. after surgery (based on visual analogue score range 0-10), intravenous opioid drugs (morphine or meperidine doses on patient body weight, recorded number of doses). Postoperative pain at one week and one month of follow up was recorded as pain or no pain and chronic pain, defined as significant pain, pain that needs medications or affects normal activity after three months following surgery. Seroma was diagnosed clinically when a palpable cystic lesion of any size was found in the inguinal area. Orchitis was diagnosed when a tender swelling testis was found. Fever was defined as persistent fever after 24 hrs. postoperatively without definite source of infection.

Surgical technique

All patients were routinely prescribed preoperative intravenous 1 gm of cefazolin.

Laparoscopic TEP

Most procedures were performed under general anesthesia; urinary catheter was routinely inserted and removed mostly in the evening, postoperatively. Three ports were used: one 10 mm optical port was placed just below the umbilicus, two 5 mm ports were placed at midline- the first was placed about 2 FB above pubic symphysis and the second at midway between them. Preperitoneal space was created with balloon dissector. CO_2 was insufflated under pressure 10-12 mmHg. Dissection of the hernia sac and parietalization of the cord structures were performed. For large hernia sac, transection of sac was done and ligated with pretied silk or nylon loop. A 10 × 15 cm polypropylene mesh was fixed to Cooper ligament, superomedial and superolateral abdominal wall with four tacks (Protack). No drain was placed.

Open Lichtenstein

Most procedures were performed under spinal anesthesia. A polypropylene mesh of 8 × 12 cm was fixed over inguinal floor with 2/0 or 3/0 polypropylene suture as described by Lichtenstein et al.[12].

Statistical analysis

Continuous data was reported as mean ± SD while ordinal data was reported as median (range). Unpaired Student's *t*-test or Chi-Square test was used to test between the groups. A *p*-value of less than 0.05 was considered statistically significant.

Results

There were 275 patients who underwent elective inguinal hernia repair from June 2012 - June 2015. Forty-two patients were excluded from the study (29 patients of bilateral hernia, 5 patients of other repair techniques eg. tissue repair, 8 patients of co-procedure e.g. TUR-P) (Figure 1). Demographic data and hernia characteristics were summarized in Table 1. The mean age of patients was significantly higher in LT (64 ± 15 vs 52 ± 16; $p<0.001$). ASA class was significantly higher in LT ($p < 0.001$). BMI and hernia sides were not significantly different between the two groups (p = 0.464 and 0.256, respectively). The mean follow up time was significantly longer in LT [21.3 (12.3) vs 18.1 (10.3); $p = 0.025$]. In 117 TEP, 4 patients (3.4%) were converted to other repair techniques due to severe adhesion between hernia sac and abdominal wall (3 patients were converted to LT and 1 patient was converted to TAPP), the converted cases were excluded

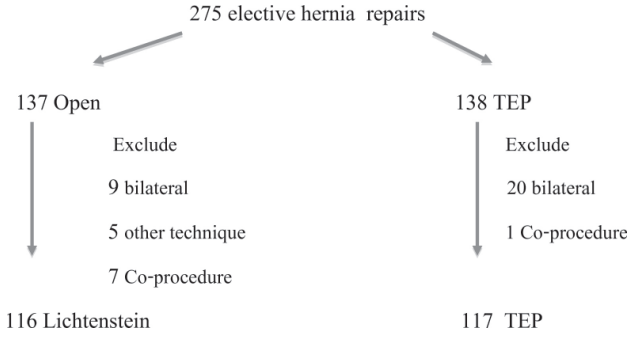

Figure 1 Patient flow

Table 1 Demographic data and hernia characteristic

Variables	Lichtenstein (n=116)	TEP (n=117)	*p*-value
Age (year): mean (SD)	63.7 (14.9)	50.7 (15.9)	<0.001
range	(18-80)	(18-80)	
BMI (kg/m^2): mean (SD)	22.8 (3.7)	23.2 (3.7)	0.464
range	(16.1-36.6)	(16.5-44.2)	
ASA class: median (range)	2 (1-3)	2 (1-3)	<0.001
Hernia side: n (%) right	64 (55.2)	74 (63.3)	0.256
Left	52 (44.8)	43 (36.7)	
Follow up time (month)	21.3 (12.3)	18.1 (10.3)	0.025
range	(3-39)	(3-39)	

Table 2 Outcomes

Variables	Lichtenstein (n=116)	TEP (n=113)	*p*-value
Operative time (min): mean (SD)	42.8 (18.2)	75.1 (31.2)	<0.001
range	(20-90)	(35-200)	
Pain score median(range) 4-hr	4 (0-10)	2 (0-8)	<0.001
24-hr	2 (0-6)	2 (0-5)	0.043
48-hr	2 (0-5)	1 (0-4)	0.094
IV Opiod drug (dose): median (range)	0 (0-3)	0 (0-2)	<0.001
LOS(day): mean (SD)	7.9 (3.8)	5.0 (2.2)	<0.001
(range)	(2-16)	(2-20)	
Pain 1 week: n (%)	116 (100)	75 (66.4)	<0.001
Pain 1 month: n (%)	45 (38.8)	24 (21.2)	0.017
Chronic pain: n (%)	8 (6.9)	7 (6.2)	0.983
Numbness: n (%)	6 (5.2)	1 (0.9)	0.079
Recurrence (n)	0	1 (0.9)	0.369

from analysis.

Comparison between LT and TEP demonstrated significantly less postoperative pain scores in TEP group at 4 hrs. [4 (0-10) vs 2 (0-8); $p < 0.001$] and 24 hrs. [2 (0-6) vs 2 (0-5); $p = 0.043$) after surgery but not different at 48 hrs. after surgery [2 (0-5) vs 1 (0-4); $p = 0.094$]. Patients in LT group significantly needed more intravenous opioid drugs [0 (0-3) vs 0 (0-2); $p < 0.001$]. The operative time was significantly longer in TEP group [42.8 (18.2) vs 75.1 (31.2); $p < 0.001$]. The length of stay was significantly shorter in TEP group [7.9 (3.8) vs 5.0 (2.2); $p < 0.001$].

For postoperative pain at 1 week and 1 month of follow-up, there were significantly more patients still had pain in LT group when compared to TEP group [116 (100%) vs 75 (66.4%); $p < 0.001$, 45 (38.8%) vs 24 (21.2%); $p = 0.017$] but there was no significant difference in chronic pain [8 (6.9%) vs 7 (6.2%); $p = 0.983$], numbness [6 (5.2%) vs 1 (0.9%); $p = 0.079$] and recurrence rate [0 vs 1 (0.9%); $p = 0.369$] (Table 2).

Operative complications were significantly different between the two groups ($p = 0.001$), but when urinary retention was excluded from the analysis, overall complications were not significantly different ($p = 0.296$) (Table 3). There was no major intraoperative complication in both groups. Three patients in LT group had wound infection and two patients needed open wound for drainage and wound dressing as inpatients. One patient in TEP had wound infection and was treated with oral antibiotics and wound dressing as an outpatient. All patients with orchitis were managed with analgesics. Two patients in LT had seroma. One could be managed conservatively but another developed in scrotum and persisted, this patient underwent hydrocelectomy. In TEP group, there were six patients who developed seroma and did not resolve after 4 - 6 weeks of follow-up. Aspiration of seroma was performed in all patients. Five patients had fever after 24 hrs. postoperatively with no definite cause; these patients were managed conservatively and discharged after the fever subsided. One patient in TEP group had inferior epigastric vessel injury and was managed by

Table 3 Complications

Variable	Lichtenstein	TEP	*p*-value
Wound infection (%)	3 (2.6)	1 (0.9)	0.001
Seroma (%)	2 (1.7)	6 (5.3)	
Urinary retention (%)	19 (6.4)	0	
Orchitis (%)	1 (0.9)	3 (2.7)	
Fever (%)	3 (2.6)	2 (1.8)	
Vessel injury (%)	0	1 (0.9)	

*excluded urinary retention $P = 0.296$

electrocautery. In TEP group, one patient had recurrent hernia diagnosed after two weeks of surgery, and underwent LT repair later.

Discussion

Inguinal hernia repair technique was changed from tissue repair to tension free repair; Lichtenstein technique (LT) is the most popular technique performed worldwide[4,5,8]. LT results in less pain and lower recurrence rate. Nowadays, minimally invasive hernia surgery is increasingly performed due to benefits of less postoperative pain, faster recovery and not different in complications and recurrence rate but the procedure was not popular due to some disadvantages of time consuming, more expensive cost and steep learning curve[3-5,8-11]. There are two popular techniques, TAPP and TEP; the overall results were not different[1,7,13,14]. TEP has some benefits over TAPP in terms of shorter operative time, less intraabdominal organ injury, shorter hospital stay and lower rates of port site hernia[15,16]. At Priest Hospital, inguinal hernia is the most common procedure performed in general surgery. We repair most cases with LT or TEP technique. For the general hospital, day case surgery is the most cost effective treatment for unilateral hernia but for Priest Hospital where the patients' characteristics and hospital policy were different from other hospitals in terms of free medical services due to charity, all patients are monks, most patients stay single, living far away from hospitals or medical services, they do not have to work for a living, we admitted all of them. The results of hernia repair between TEP and LT at our hospital has never been studied before. In this study, the age of patients in LT was significantly older than TEP. ASA class was also higher in LT group. This is because TEP is not a gold standard technique for hernia repair at present, so most of the old age and high ASA class patients still underwent LT due to shortest operative time and avoidable general anesthesia.

The patients in TEP group demonstrated significantly less postoperative pain at 4 hrs. ($p < 0.001$) and 24 hrs. ($p = 0.464$) but not different at 48 hrs. ($p = 0.094$). The patients in LT group needed more intravenous opioid drugs ($p < 0.001$). At 1 week and 1 month postoperatively, there were significantly more patients still have pain in LT group when compared to TEP group ($p < 0.001$, $p = 0.017$). The results were similar to other previous studies[1-4,9-10]. Moreover, this study showed that TEP caused less pain but this benefit appeared most in early period and decreased by time, similar to previous study[1]. The length of hospital stay was significantly longer in LT group. When compared to other hospitals, the length of hospital stay at Priest Hospital was longer than others, because of the difference in patients' characteristics and hospital policy as mentioned previously. Most of the patients needed to stay at the hospital and discharge after they could ambulate well; it meant that in TEP group, the patients got faster recovery and could early return to work. In this study, there was no significant difference in chronic pain ($p = 0.983$), similar to the previous study[17], although most studies reported that chronic pain was significantly less common after TEP than LT but the definition of chronic pain was not explicit[3,18-20]. There was no difference in recurrence rate ($p = 0.369$) between the two groups similar to the previous studies[3,12,17]. For numbness, although it was not statistically different, it favored TEP ($p = 0.079$).

The operative complications were significantly different between the two groups ($p = 0.001$), however, when urinary retention was excluded from analysis, overall complications were not significantly different ($p = 0.296$) because Foley catheter was retained in all the patients in TEP group and removed in the evening as aforementioned. Wound infection was not different between the two groups, but a small wound in TEP was easier to manage and the patient didn't need admission in contrast to patient in LT group which two out of three patients needed open wound drainage and admission. The most common complication in TEP was seroma, but not statistically different from LT. The result was different from previous study which showed that seroma was more common after TEP[3].

Conclusion

TEP has advantage of less postoperative pain, faster recovery, shorter hospital stay but has longer operative time. It can be done safely with no difference in complication and recurrence.

Acknowlegement

The author would like to thank Assistant Professor Kamthorn Tantivitayatan, MD, Medical Division,

Golden Jubilee Medical Center, Mahidol University and Suthat Chottanapund, MD, Department of Surgery, Bamrasnaradura Infectious Diseases Institute for their assistance in preparing the manuscript.

REFERENCES

1. Poelman MM, Van den Heuvel B, Deelder JD, et al. EAES consensus development conference on endoscopic repair of groin hernias. Surg Endosc 2013;27:3505-19.
2. Lomanto D, Cheah WK, Faylona JM, et al. Inguinal hernia repair: toward asian guideline. Asian J Endosc Surg 2015; 8:16-23.
3. McCormack K, Scott NW, Go PM, Ross SJ, Grant A, EU Hernia Trialists Collaboration. Laparoscopic techniques versus open techniques for inguinal hernia repair. Cochrane Database Syst Rev 2008;1:CD001785.
4. Awad SS, Fagan SP. Current approaches to inguinal hernia repair. Am J Surg 2004;188:9S-16S.
5. Pavlidis TE, current opinion on laparoscopic repair of inguinal hernia. Surg Endosc 2010;24:974-76.
6. Scott NW, McCormack K, Graham P, Go PM, Ross SJ, Grant AM. Open mesh versus non-mesh for repair of femoral and inguinal hernia. Cochrane Database Syst Rev 2002;4: CD002197.
7. EU Hernia Trialists Collaboration Mesh compared with nonmesh methods of open groin hernia repair: systematic review of randomized controlled trials. Br J Surg 2000;87: 854-859.
8. Fitzgibbons RJ, Forse RA. Groin hernia in adults. N Engl J Med 2015;372:756-63.
9. Simons MP, Aufenacker T, Bay-Nielsen M, et al. European hernia society guidelines on the treatment of inguinal hernia in adult patients. Hernia 2009;13:343-403.
10. Grant A. Laparoscopic compared with open methods of groin hernia repair: systematic review of randomized controlled trials. Br J Surg 2000;87:860-7.
11. Memon MA, Cooper NJ, Memon B, Memon MI, Abrams KR. Meta-analysis of randomized clinical trials comparing open and laparoscopic inguinal hernia repair. Br J Surg 2003; 90:1479-92.
12. Lichtenstein IL, Shulman AG, Amid PK, Montllor MM. The tension-free hernioplasty. Am J Surg 1989;157:188-193.
13. Wake BL, McCormack K, Fraser C, Vale L, Perez J, Grant A. Transabdominal pre-peritoneal (TAPP) vs totally extraperitoneal (TEP) laparoscopic techniques for inguinal hernia repair. Cochrane Database Syst Rev 2005;1:CD004703.
14. Bansal VK, Misra MC, Babu D, et al. A prospective, randomized comparison of long-term outcomes: chronic groin pain and quality of life following totally extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) laparoscopic inguinal hernia repair. Surg Endosc 2013;27:2373-82.
15. Bittner R, Arregui ME, Bisgaard T, et al. Guidelines for laparoscopic (TAPP) and endoscopic (TEP) treatment of inguinal hernia (International Endohernia Society: IEHS). Surg Endosc 2011;25:2773-843.
16. Bittner R, Montgomery MA, Arregui E, et al. Update of guidelines on laparoscopic (TAPP) and endoscopic (TEP) treatment of inguinal hernia (International Endohernia Society). Surg Endosc 2015;29:289-321.
17. Miserez M, Peeters E, Aufenacker T, et al. Update with level 1 studies of the European hernia society guidelines on the treatment of inguinal hernia in adult patients. Hernia 2014; 18:151-63.
18. Puri V, Felix E, Fitzgibbons RJ. Laparoscopic vs conventional tension free inguinal herniorrhaphy: 2005 Society of American Gastrointestinal Endoscopic Surgeons (SAGES) annual meeting debate. Surg Endosc 2006;20:1809-16.
19. Singh AN, Bansal VK, Misra MC, et al. Testicular functions, chronic groin pain, and quality of life after laparoscopic and open mesh repair of inguinal hernia: a prospective randomized controlled trial. Surg Endosc 2012;26:1304-17.
20. Eklund A, Montgomery A, Bergkvist L, Rudberg C. Chronic pain 5 years after randomized comparison of laparoscopic and Lichtenstein inguinal hernia repair. Br J Surg 2010;97:600-8.

บทคัดย่อ **ผลเปรียบเทียบผลการผ่าตัดไส้เลื่อนที่ขาหนีบโดยวิธี Laparoscopic Total Extraperitoneal กับวิธี Lichtenstein ประสบการณ์ของโรงพยาบาลสงฆ์**

ประวิทย์ ตันติวัฒนาศิริกุล พ.บ.

แผนกศัลยกรรม โรงพยาบาลสงฆ์ กรุงเทพฯ

ภูมิหลัง: การผ่าตัดไส้เลื่อนที่ขาหนีบโดยวิธีส่องกล้องนิยมทำกันมากขึ้น จากหลายการศึกษาแสดงให้เห็นข้อดีของการส่องกล้องได้แก่ เจ็บน้อยกว่า ฟื้นตัวเร็วกว่าโดยที่ภาวะแทรกซ้อนและอัตราการเป็นซ้ำไม่แตกต่างกัน โรงพยาบาลสงฆ์ซึ่งเป็นโรงพยาบาลที่มีลักษณะของผู้ป่วยและนโยบายแตกต่างจาก โรงพยาบาลอื่นยังไม่มีการศึกษาผลของการผ่าตัดนี้มาก่อน

วัตถุประสงค์: เพื่อเปรียบเทียบผลการผ่าตัดไส้เลื่อนวิธี Total Extraperitoneal (TEP) กับวิธี Lichtenstein (LT)

วิธีการศึกษา: ระหว่างเดือนมิถุนายน 2555 ถึง เดือนมิถุนายน 2558 ผู้ป่วยที่เข้ารับการผ่าตัดไส้เลื่อนที่โรงพยาบาลสงฆ์จำนวน 275 รูป ถูกทบทวนและวิเคราะห์ผลการรักษาแบบย้อนหลัง จากข้อมูลพื้นฐาน ผลการผ่าตัดและภาวะแทรกซ้อนต่างๆ

ผลการศึกษา: มีผู้ป่วยในกลุ่ม LT116 ราย และกลุ่มTEP 117 ราย (42 รายถูกคัดออกจากการศึกษา) ผลการศึกษานี้พบว่าคะแนนความปวดหลังผ่าตัดในกลุ่ม TEP น้อยกว่าอย่างมีนัยสำคัญที่ 4 ชั่วโมง ($p < 0.001$) 24 ชั่วโมง (p=0.043) แต่ไม่พบความแตกต่างกันที่ 48 ชั่วโมง ($p = 0.094$) ผู้ป่วยในกลุ่ม LT ต้องได้รับยาแก้ปวด (opiod) ทางหลอดเลือดดำมากกว่าอย่างมีนัยสำคัญ ($p < 0.001$) TEP ใช้ระยะเวลาผ่าตัดนานกว่า ($p < 0.001$) ขณะที่ระยะเวลานอนโรงพยาบาลสั้นกว่า ($p < 0.001$) เรื่องความปวดหลังผ่าตัดที่ 1 สัปดาห์ และ 1 เดือนพบผู้ป่วยในกลุ่ม LT ที่ยังคงมีความปวดอยู่เป็นจำนวนมากกว่า ($p < 0.001$ และ $p = 0.017$ ตามลำดับ) แต่ไม่พบความแตกต่างในเรื่องอาการปวดเรื้อรัง ($p = 0.983$) อาการชา ($p = 0.079$) และอัตราการเป็นซ้ำ ($p = 0.369$)รวมทั้งภาวะแทรกซ้อนต่างๆ ($p = 0.296$)

สรุป: การผ่าตัด TEP ให้ผลดีคือ เจ็บน้อยกว่า ฟื้นตัวเร็วกว่า ระยะเวลานอนโรงพยาบาลสั้นกว่าแต่ใช้เวลาผ่าตัดนานกว่า วิธีนี้สามารถทำได้อย่างปลอดภัย โดยที่ภาวะแทรกซ้อนและอัตราการเป็นซ้ำไม่แตกต่างกัน

คำสำคัญ: **ไส้เลื่อนที่ขาหนีบ การผ่าตัดส่องกล้อง**