

Original Research Article

Laparoscopic Inguinal Hernia Repair (TAPP): Early and Medium-Term Results

Gurung KB¹, Adhikari B², Thapa GS³, Upadhyay P⁴

¹Clinical faculty, Trinity school of medicine, Saint Vincent and the Grenadines; ²Consultant General Surgeon, Government of Nepal; ³Assistant Professor, Department of Surgery, ⁴Chief Consultant surgeon, Government of Nepal, Professor, Department of Surgery, National Academy of Medical Sciences (NAMS), Bir Hospital, Kathmandu, Nepal, Director, National Trauma Center, NAMS, Kathmandu, Nepal

Corresponding Author: Komal B. Gurung

ABSTRACT

Background: Laparoscopic inguinal hernia surgery is becoming a routine surgery in most of the tertiary centers around the globe. The aim of this study was to investigate the intraoperative and postoperative outcome of laparoscopic inguinal hernia repair.

Patients and Method: All patients admitted for transabdominal preperitoneal inguinal hernia repair were prospectively documented for two years. Data collected included patient demographics, past medical history, previous surgeries. Intraoperative and postoperative variables were recorded in prestructured proforma.

Results: A total of 39 TAPP inguinal hernia repairs were performed in 31 patients, under the inclusion criteria, by a single surgeon during March 2014 to March 2015 A.D. None of the procedure required conversion to open. Port-site bleeding was reported in five patients and peritoneal tear occurred in eight repairs. The mean operative time for unilateral and bilateral TAPP repair was 65.5 ± 9.21 min (range, 55-90 min) and 87.0 ± 9.58 min (range, 75-110 min) respectively. One patient had cord hematoma. Two patients had skin ecchymosis. Five patients had scrotal edema. The average time to return to work or normal physical activity was six days and 10 days for unilateral and bilateral repairs respectively. Eight patients had inguinal discomfort or mild inguinal pain that lasted for two months. Follow-up rate after 18 months was 80.6%. There was no recurrence and chronic groin pain.

Conclusion: Laparoscopic hernia repair (TAPP) can be safely and routinely performed by general surgeons with low rates of complications.

Key words: Inguinal hernia, Laparoscopic inguinal hernia repair, TAPP.

INTRODUCTION

Inguinal hernia repair is one of the most commonly performed operations. About 20 millions of inguinal hernias are repaired annually. ^[1, 2] Over the past few decades, there has been immense progress and improvisation in the techniques of surgical repair for inguinal hernia to reduce the intra-operative and post-operative complications. Currently, laparoscopic inguinal hernia repair has gained widespread acceptance and is routinely

performed all over the world. ^[3] The concept of "Hernia Centers" has gained popularity and the number of a hernia specific center around the globe has been increasing. ^[4]

The principle of laparoscopic inguinal hernia repair is tension-free repair. These techniques are transabdominal preperitoneal (TAPP), totally extraperitoneal (TEP), and intraperitoneal only methods (IPOM). ^[5] This study was conducted to assess the intra-operative

events along with early and medium-term results achieved during TAPP inguinal hernia repair.

PATIENTS AND METHODS

A prospective study was conducted in a single unit of the Department of General Surgery at National Academy of Medical Sciences (NAMS), Bir Hospital, Kathmandu. Patients under the inclusion criteria who underwent TAPP inguinal hernia repair between March 2014 and March 2015 were enrolled for the study. Ethical approval was obtained from the institutional review board. Written consent was taken from the patients. All repairs were performed by a single general surgeon who had a good laparoscopic experience with formal short-course training on laparoscopic inguinal hernia repair. All patients were admitted a day before surgery. A single dose of intravenous cefazoline was administered preoperatively. The procedure was performed under general anesthesia. All patients were catheterized with No. 14F Foley catheter after intubation. The position of the patient was supine with both arms by the side of the patient.

TAPP repair technique

Pneumoperitoneum was created with carbon dioxide by open method. Standard three ports were used: a supraumbilical 10 mm, ipsilateral 10 mm at the mid-clavicular line about 2.5 cm above the level of the umbilicus and contralateral 5 mm port about 2.5 cm below the level of the umbilicus at mid-clavicular line. A diagnostic laparoscopy was done and the hernia was identified. The peritoneum was opened at the level of the anterior superior iliac spine and continued medially about 1-1.5 cm above the hernial opening and up-to-the medial umbilical ligament. A complete anatomical dissection of the pelvic floor was carried out to ascertain the placement of a flat and wrinkle-free mesh. The extent of dissection was continued medially 1-2 cm beyond the symphysis pubis to the contralateral side, cranially 3-4 cm above the transversalis arch or any direct hernia

defect, laterally to the anterior superior iliac spine, caudally 4-5 cm below the iliopubic tract at the level of the psoas muscle and 2-3 cm below cooper's ligament at the level of the superior arch of the pubic bone. The abdominal wall was dissected all along the anatomical landmarks (epigastric vessels, rectus muscle, transversalis fascia, pubic bone). By doing so, vas difference was seen to turn medially and the triangle of doom was clearly visualized. A polypropylene flat mesh (12×15 cm) was placed into the resulting preperitoneal space, without an opening or a slit for spermatic cord. The mesh was fixed at two places: medially at symphysis pubis and laterally above the iliopubic tract. At last, peritoneum was closed with an absorbable running suture. The fascia of umbilical port site was approximated with interrupted absorbable suture.

Intraoperative complications such as a peritoneal tear, visceral injuries, and injuries to the blood vessels, nerves and vas deferens, if any, were documented in a prestructured proforma immediately after the operation. The operative time was recorded. It was defined as the time from the skin incision to the beginning of skin closure. Conversion, if any, was recorded. Complications following surgery such as seroma formation, hematoma, scrotal swelling, and wound infection were recorded.

Patients were followed up after one week and then 1, 3, 6, 12, 18, and 24 months. Follow-up at six months onwards was done by a telephone call. The following questions were specifically asked: time to return to work or physical activity, and occurrence of any medical or surgical complications that led to medical treatment. The recurrence of a hernia was defined by the presence of visible swelling that should be confirmed by physical and ultrasound examination.

RESULTS

A total of 39 TAPP hernia repairs for uncomplicated primary inguinal hernia

were performed in 31 patients (Table 1). Most of the patients less than 40 years of age (61%) (Table1). Five patients (16.1%) had a history of open operation in contralateral site. Six patients (19.3%) had a history of benign prostatic hyperplasia (BPH) and two patients (6.4%) were under medication for chronic obstructive pulmonary disease (COPD). Unilateral hernias were 74.1%. Majority of them were right-sided (70.9%).

Table1. Demographics and hernia characteristics

No. of patients	31
Mean age in years	41.5 (range, 19-68)
Sex (male/female)	30/1
Indirect	32 (81%)
Direct	7 (18%)
Unilateral	23 (74.1%)
Bilateral	8 (25.9%)

Table2. Intraoperative events

	No.
Port-site bleeding	5 (16.1%) [n=31]
Peritoneal tear	8 (20.5%) [n=39]

Table3. Postoperative complications of 39 TAPP repairs

	No.
Skin ecchymosis	2 (5.1%)
Cord hematoma	1 (2.5%)
Scrotal edema	5 (12.8%)
Inguinal discomfort or mild pain	12 (30.7%)

Table4. Comparison of operating time with other similar studies

	No.	Time (min.); U/L & B/L
Current study	39	65.5 ± 9.2 & 87 ± 9.5
Bansal et al.	2016	32 64.5 ± 21.7
Bökeler et al.	2013	254 59
Barry et al.	1998	206 64 & 87
Fitzgibbon et al.	1995	562 70 & 90.6

Time calculated as a mean ± standard deviation. U/L= unilateral. B/L= bilateral.

Table5. Comparison of time to return to work after TAPP repair

Study	Year	Average time (days)	
		Unilateral repair	Bilateral repair
Current		6	10
Barry et al.	1998	7	12

Intraoperative events and postoperative complications are shown in table 2 and 3. The mean operative time for unilateral TAPP repair was 65.5 ± 9.21 min (range, 55-90 min) and for bilateral TAPP repair was 87.0 ± 9.58 min (range 75-110 min). There was no conversion to open repair. Eighty seven percent patients were discharged in the next morning of the

operation day when the patients were able to pass the urine after removing the Foley catheter. Four patients were discharged in between second to fourth post-operative day. Patients returned to work or normal physical activity six days (range, 3-15 days) after unilateral and 10 days (range, 5-21 days) days after bilateral TAPP repairs.

Follow-up of at least eighteen months was obtained (range, 18-24 months). Early groin pain, scrotal swelling, seroma, scrotal or cord hematoma, chronic groin pain, and recurrence were evaluated and documented at seven days, 1, 3, 6, 12, 18, and 24 months. Scrotal edema noted immediately after surgery were found either in a resolving state or completely resolved in seven days follow-up. One patient presented with cord hematoma. One patient had a superficial surgical site infection at the umbilical port. Twelve patients complained of mild pain: pain on the visual analog score (VAS) = 1-3 during one month of follow-up. No patient reported with chronic pain and recurrence during the follow-up period.

DISCUSSION

The advancement in different types of open hernia repairs followed by minimally invasive surgery came into play to reduce intraoperative as well as postoperative complications. Chronic pain and recurrence are the main concerns after inguinal hernia repair surgery. Moreover, return to work following inguinal hernia repair is an important aspect to be considered. In a search for lowering these complications, different techniques of repairs have been developed and practiced since long. The “gold standard” repair is still in the making. The Lichtenstein tension-free open mesh repair has been the standard repair since 1980 until different minimal invasive surgical repair techniques evolved. [6] Minimally invasive surgery for inguinal hernia repair is widely practiced and well accepted these days. Well trained general surgeons and even the trainees, under supervision, can also perform these

surgeries with comparable results in terms of complication rates and recurrence rates. Only the difference remains in the operative time. [7] This study demonstrates the transabdominal preperitoneal repair (TAPP) for primary inguinal hernia.

A well-established fact to the prevention of the hernia recurrence after laparoscopic hernia repair is the size of the mesh in relation to the size of the hernial defect. This statement is validated by the fact that the preperitoneal repair for inguinal hernia works according to the physical principle of Pascal. [8] Mesh size of at least 10 cm × 15 cm is recommended. [9,10] Umbilical port site bleeding was documented in five patients (16.1%) while creating port. Bleeding was controlled either by applying direct pressure or by using electrocautery. None of the bleeders affected the operation. We encountered with the peritoneal tear in eight TAPP repairs. Six of the tears were tiny holes that occurred during the dissection of the sac. Two were the tears at the lower flap of the peritoneum. None of them were repaired. The peritoneal tear did not hinder the operative procedure. Shpitz et al [11] did not observe any intra- or postoperative complications that could be attributed to peritoneal tear if they are left unrepaired. We did not encounter adhesive complications supposed to be related to the unrepaired peritoneal tear. Bansal et al. [14] reported the peritoneal tears in 25.4 % TAPP repairs. There was no visceral or vascular injury in this study. Though the conversion in laparoscopic hernia repair is known fact, there was no conversion to open repair in the current study. However, conversion to open has been reported in one of the large series as 0.23% for TAPP repair. [12]

The duration of surgery in laparoscopic inguinal hernia repair mainly depends upon the expertise and experience of the operating surgeon and size of the hernial sac. Mechanical problems related to the laparoscopic tower and hand instruments can also be taken into consideration. In the current study, the mean operating time was

65.5 min. (± 9.2) for unilateral and 87 min. (± 9.5) for bilateral TAPP repair. The operating time of our study is comparable to other studies by Barry et al. [13] and Bansal et al. [14] it is also consistent with the operating time documented by Bökeler et al. [7] and Fitzgibbon et al. [15] (Table 4)

Early complications such as skin ecchymosis, seroma, edema, and hematoma in the inguinoscrotal area are the matter of concern for both the operating surgeon and the patients as they mimic recurrence of a hernia. In the present study, scrotal edema was noted in five repairs (12.8%) and skin ecchymosis was noted in two repairs (5.1%). Both of the conditions were managed conservatively. We encountered with cord hematoma in one repair (2.5%). It was a size of approximately 2 cm × 2 cm. Therapeutic needle aspiration was done. Studies have shown seroma, as a complication of TAPP repair, ranging from 1.9% to 11%. [15-20] Krishna et al. [21] reported the incidence of seroma as high as 17%. However, a prospective study conducted in 1010 TAPP repairs for an inguinal hernia by Muschalla et al. [22] documented 0.2% incidence of seroma. There are certain factors associated with high incidence seroma and scrotal edema. These are old age, a large hernia defect, an extension of a hernia into the scrotum, and the presence of a distal indirect hernia sac. [23] Scrotal edema and cord edema following laparoscopic inguinal hernia repair is a common complication. Although there are wide variations in reports regarding scrotal edema, we had lower incidence in comparison to Krishna et al. [21] (34%) and higher incidence than that reported by Muschalla et al. [22] (0.2%). Krishna et al. [21] noted skin ecchymosis in 2.1% TAPP repairs. The incidence of hematoma has been reported in the range of 1.2% to 10%. [15,24-26] The lower incidence of early complications such as seroma and hematoma in our study could be due to all being primary hernia repairs, patient selection, and the standard technique of surgery.

In this study, patients returned to work or normal physical activity in a mean of six days (range, 3-15 days) after unilateral and ten days (range, 5-21 days) after bilateral TAPP repair. Barry et al. [13] have also reported the comparable report. (Table 5)

Recurrence is the most important end-point of any hernia surgery. [27] Thorough knowledge of surgical anatomy and standard technique of repair are the prerequisite to minimize the recurrence. [17, 28] For many years, the quality of a hernia repair was measured by the recurrence as a sole criterion. [21] In the earlier studies on laparoscopic hernia, the recurrence rates have been reported as high as 25%. [29] Over the time, the recurrence rate has been decreasing considerably. The recurrence rate has been stated to be 0-3%. [30] Some other studies have shown no recurrence even when performed by junior surgeons. [11] Bostanci et al. [31] and Kawji et al. [32] found no recurrences in their laparoscopic hernia repair series. Another prospective randomized study by Krishna et al. [21] also reported no recurrence in mean duration of follow-up of 29.5 months. In the current study, there was no recurrence in the mean follow-up of 18 months. No recurrence in the present study could be because of relatively younger patients, all primary inguinal hernias, patient selection, use of larger mesh, and the standard technique of repair. However, the sample size and the follow-up period are the limitations.

Chronic groin pain is a common complication following inguinal hernia repair. Less incidence of chronic groin pain has been considered as one of the major advantages of laparoscopic inguinal hernia repair over open repair. Chronic groin pain has the greatest impact on patient satisfaction, societal cost, and quality of life. [33] Chronic postsurgical pain (CPSP) has been defined as pain that develops after surgical intervention and lasts for at least two months, other causes of pain excluded. [34] In the case of chronic post-herniorrhaphy inguinal pain (CPIP), 3-6 months is usually

the definition of chronicity (considering the postoperative inflammatory process). The reported frequency of chronic groin pain following laparoscopic inguinal hernia repair varies among studies. However, the estimated risk of moderate to severe chronic groin pain is 0-12%. [7, 32, 35-38] In the current study, twelve patients had inguinal discomfort to mild pain in four weeks of follow-up. The severity of the pain did not hamper their work or activities of daily living. The groin pain was managed conservatively with an oral non-steroidal anti-inflammatory agent. The pain was subsided after two to four weeks. Based on the present findings, no patients reported with chronic pain. Fixing the mesh only at two places may be one of the factors associated with the less pain postoperatively and the absence of chronic groin pain in this study. However, further studies with larger sample size are necessary to strengthen the aforementioned statement.

CONCLUSION

Laparoscopic inguinal hernia repair (TAPP) can effectively and safely be performed by general surgeons with consistent results in terms of low rates of complications, provided that the surgeons have the prior experience of laparoscopic surgery and follow the standard technique of repair.

Conflict of Interest

The authors report no conflict of interest. No financial support was taken for this research project.

ACKNOWLEDGEMENT

We would like to thank all the patients who gave consent for the study, hospital staffs, and the Department of Surgery for their help and support.

REFERENCES

1. Kingsnorth A, LeBlanc K. Hernias: inguinal and incisional. *Lancet*. 2003;362:1561-1571
2. Rutkow IM. Demographic and social aspects of hernia repair in the United States

- in 2003. *Surg Clin North Am.* 2003;83:1045-1051
3. Ger R. The management of certain abdominal hernia by intra-abdominal closure of the neck of the sac: preliminary communication. *Ann R Coll Surg Engl.* 1982;64:342-244
 4. Ozyaylali I, Ersoy E, Yazicioglu D, et al. founding the first hernia center in Turkey. *Hernia.* 2008;12:117-120
 5. Memon MA, Rice D, Donohue JH. Laparoscopic herniorrhaphy. *J Am Coll. Surg.* 1997;184:325-335
 6. Lichtenstein IL, Shulman AG, Amid PK, et al. The tension-free hernioplasty. *Am J Surg.* 1989;157:188-193
 7. Bökeler U, Schwarz J, Bittner R, et al. Teaching and training in laparoscopic hernia repair (TAPP): impact of the learning on patient outcome. *Surg Endosc.* 2013;27:2886-2893
 8. Stopa RE, Rives JL, Warlaumont CR, et al. The use of Dacron in the repair of hernias of the groin. *Surg Clin North Am.* 1984;64:269-285
 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. Bittner R, Arregui ME, Bisgaard T, et al. Guidelines for laparoscopic (TAPP) and endoscopic (TEP) treatment of inguinal hernia (international endohernial society [IEHS]). *Surg Endosc.* 2011;25:2773-2843
 11. Shpitz B, Lansberg L, Bujayev N, et al. should peritoneal tears be routinely closed during laparoscopic total extraperitoneal repair of inguinal hernias? A reappraisal. *Surg Endosc.* 2004;18:1771-1773
 12. Baca I, Schultz C, Gotzen V, et al. Laparoscopic inguinal hernia repair. A review of 2500 cases. In: Lomanto D, Kum CK, So JBY, Goh PMY (eds) *Proceedings of 7th world congress of endoscopic surgery; 2000 June 1-4; Singapore.* Monduzzi editore, Bologna, Italy, 2001. P. 425-430
 13. Barry MK, Donohue JH, Harmsen WS, et al. Transabdominal preperitoneal laparoscopic inguinal herniorrhaphy: assessment of initial experience. *Mayo Clin Proc.* 1998;73:717-723
 14. Bansal VK, Krishna A, Mishra MC, et al. Learning curve in laparoscopic inguinal hernia repair: experience at a tertiary care center. *Indian J Surg.* 2016;78(3):197-202
 15. Fitzgibbon RJ jr, Camps J, Cornet DA, et al. Laparoscopic inguinal herniorrhaphy: results of the multicenter trial. *Ann Surg.* 1995;221(1):3-13
 16. Camps J, Nguyen N, Annabali R, et al. Laparoscopic inguinal herniorrhaphy: transabdominal technique. *Int Surg.* 1995;80:18-25
 17. Leibl BJ, Schmedt CG, Ulrich M, et al. Laparoscopic hernia therapy (TAPP) as a teaching operation. *Chirurg.* 2000;71:939-942
 18. Chandra P, Phalgune D, Shah S. Comparison of clinical outcome and complications in laparoscopic hernia repair of inguinal hernia with mess fixation using fibrin glue v tacker. *Indian J Surg.* 2016;78(6):464-470
 19. Mishra MC, Kumar S, Bansal VK. Total extraperitoneal (TEP) mess repair of inguinal hernia in the developing world: comparison of low-cost indigenous balloon dissection versus direct telescopic dissection: a prospective randomized controlled study. *Surg Endosc.* 2008;22:1947-1058
 20. Lepere M, Benchetrit S, Debaert M, et al. A multicentric comparison of transabdominal versus totally extraperitoneal laparoscopic hernia repair using PARIETEX meshes. *JLS.* 2000;4:147-153
 21. Krishna A, Mishra MC, Bansal VK, et al. Laparoscopic inguinal hernia repair: transabdominal preperitoneal (TAPP) versus totally extraperitoneal (TEP) approach: a prospectively randomized controlled trial. *Surg Endosc.* 2012;26:639-649
 22. Muschalla F, Schwarz J, Bittner R. Effectivity of laparoscopic hernia repair (TAPP) in daily clinical practice: early and long term result. *Surg Endosc.* 2016;30:4985-4994
 23. Lau H, Lee F. Seroma following endoscopic extraperitoneal inguinal hernioplasty. *Surg Endosc.* 2003;17:1773-1777
 24. Pramod S. Fibrin sealant versus use of tackers for fixation of mesh in laparoscopic inguinal hernia repair. *World J Laparosc Surg.* 2009;2(1):42-48
 25. Fine AP. Laparoscopic repair of inguinal hernia using mesh and fibrin sealant. *J Soc LaparoscSurg.* 2006;10(4):461-465
 26. Tolver MA, Rosenberg J, Juul P, et al. Randomized clinical trial of fibrin glue versus tacked fixation in laparoscopic groin

- hernia repair. Surg Endosc. 2013;27(8):2727-2733
27. Bringman S, Ek A, Haglind E, et al. Is a dissection balloon beneficial in totally extraperitoneal inguinal hernioplasty (TEP)? A randomized prospective multicenter study. Surg Endosc. 2001;15:266-270
 28. Dalessandri KM, Bhoyrul S, Mulvihill SJ. Laparoscopic hernia repair and bladder injury. JSLS. 2001;5:175-177
 29. Neumayer L, Giobbie-Hurder A, Jonasson O. Open mesh versus laparoscopic mesh repair of inguinal hernia. N Engl J Med. 2004;350:1819-1827
 30. Weiser HF, Klinge B. Endoscopic hernia repair- experiences and characteristic features. Viszeralchirurgie. 2000;35:316-320
 31. Bostanci BE, Tetik C, Özer S, et al. Posterior approaches in groin hernia repair with prosthesis: open or closed. Acta Chir Belg. 1998;98:241-244
 32. Kawji R, Feichter A, Fuchsjager N, et al. Postoperative pain and return to activity after five different types of inguinal herniorrhaphy. Hernia. 1999;3:31-35
 33. Bjurstrom MF, Nicol AL, Amid PK, et al. Pain control following inguinal herniorrhaphy: current perspective. Journal of pain research. 2014;7:277-290
 34. Macrae WA, Davies HTO. Chronic postsurgical pain. In: Crombie IK, Croft Pr, Linton SJ, LeResche L, Von Kroff M, editors. Epidemiology of pain; 1999; Seattle. IASP, 1999. P. 125-142
 35. Shah NR, Mikami DJ, Cook C, et al. A comparison of outcomes between open and laparoscopic surgical repair of recurrent inguinal hernias. Surg Endosc. 2011;25:2330-2337
 36. Hamza Y, Gabr E, Hammadi H, et al. Four-arm randomized trial comparing laparoscopic and open hernia repairs. Int. J. Surg. 2010;8:25-28
 37. Sinha R, Sharma N, Dhobal D, et al. Laparoscopic total extraperitoneal versus anterior preperitoneal repair for inguinal hernia. Hernia. 2006;10:187-191
 38. Ozmen MM, Ozalp N, Zulfikaroglu B, et al. The evolution of peak flow velocity and cross-sectional area of the femoral artery and vein following totally extraperitoneal vs open repair of inguinal hernias. Hernia. 2004;8:332-335

How to cite this article: Gurung KB, Adhikari B, Thapa GS et al. Laparoscopic inguinal hernia repair (tapp): early and medium-term results. Int J Health Sci Res. 2017; 7(12):68-74.
