

OUTCOME AND COST COMPARISON OF LAPAROSCOPIC TRANSABDOMINAL PREPERITONEAL HERNIA REPAIR VERSUS OPEN LICHTENSTEIN TECHNIQUE

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ABSTRACT

Objectives: To compare the outcome and cost of laparoscopic inguinal hernia repair versus open repair.

Methodology: This was a randomized controlled study conducted on 100 patients from January 2011 till April 2012, in Surgical 'A' unit, Lady Reading Hospital, Peshawar. A total of 100 patients were randomized and were allocated into two groups i.e. open repair (Lichtenstein procedure) & laparoscopic repair (Trans-abdominal pre-peritoneal mesh repair, TAPP) group using lottery method. Type of hernia, type of procedure done, total cost of surgery, duration of hospital stay, post operative pain rating by visual analogue score and post operative complications were assessed.

Results: Significant difference was observed between the two groups in relation to the perioperative complications. Mean operative time was short in open repair 55.40±10.73 minutes compared to TAPP 87.10±11.60 minutes but the mean length of hospital stay was less in TAPP (2.78±0.64 days) compared to open (3.5±0.67 days). Regarding postoperative complication, urinary retention was 22% and 10%, wound discharge was 20% and 08%, recurrence was observed in 12% and 06% in open repair and TAPP respectively. The difference was statistically insignificant. Laparoscopic repair showed significantly less post operative surgical pain compared to open repair.

Conclusion: This trial showed no statistical difference between the open and laparoscopic procedures regarding post operative complications but laparoscopic repair showed statistically lower post surgical operative pain and hospital stay with greater operative time and cost. This study supports the use of the laparoscopic repair techniques for the treatment of inguinal hernia.

Key Words: Laparoscopic inguinal hernia, Transabdominal preperitoneal repair, Lichtenstien repair, Wound infection, Urinary retention, Postoperative pain, Recurrence, Hospital stay, Cost of procedure.

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INTRODUCTION

Hernias are common health problem. Approximately 10-15% of all surgical procedures, performed

in a general surgical unit, are related to hernia repair and about 80% of these operations are done for inguinal hernias^{1,2,3}. It is estimated that 20 millions of inguinal hernia repairs are performed globally every year¹. Inguinal hernias affect 0.14 per cent of the population and account for 70 000 operations per year in the UK⁴. Incidence of hernia and its different complications is difficult to establish even in the developed countries. In Pakistan the incidence is likely to be even higher because common people present late due to of lack of facilities, poverty, social taboos and lack of a health education programme and usually come to doctor when disease get complicated⁵.

Operative procedures for inguinal hernia are grouped into open repair and the laparoscopic repair. In open repair there is a list of traditional suturing techniques such as Bassini's, Darning, Shouldice, in

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its modified versions and tension-free mesh repair such as Lichtenstein repair^{6,7}. Lichtenstein repair is considered as the method of choice.⁸

Ger, in 1982, performed the first laparoscopic inguinal herniorrhaphy⁹. There are three laparoscopic techniques for repair of inguinal hernias which include the transabdominal preperitoneal, intraperitoneal onlay and totally extraperitoneal methods of repair^{10,11}.

The open Lichtenstein and laparoscopic inguinal hernia procedures are recommended as the best evidence-based options for the repair of a primary unilateral hernia, depending upon the surgeon's experience in the specific procedure.¹² Several studies have showed advantage of laparoscopic repair over open repair with regard to reduced post-operative pain and earlier return to work and normal activities^{13,14}.

There are conflicting views among the surgeons regarding the choice of open versus laparoscopic repair of inguinal hernia. The aim of this study was to compare the early outcome between laparoscopic transabdominal preperitoneal inguinal repair and open Lichtenstein repair in Lady reading hospital, Peshawar.

METHODOLOGY

This was a randomized controlled study conducted over a period of 15 months, from January 2011 till April 2012 in Surgical 'A' unit, Lady Reading Hospital, Peshawar. Approval of the study was obtained from the medical ethical committee of the hospital. In this duration 100 patients were received through the out-patient department with diagnosis of inguinal hernia. Inclusion criteria included all elective cases with inguinal hernia, patient's age above 18 years. Exclusion criteria excluded patient's age less than 18 years, obstructed or strangulated hernia and with co morbidities.

Following admission a detailed history and examination was performed. Base line investigations were done which were mandatory pre-operatively. A total of 100 patients were randomized into two groups. Patients were randomly allocated into two groups open repair (Lichtenstein procedure) & laparoscopic repair (Transabdominal pre-peritoneal mesh repair) group using lottery method before the procedure. Final assessment was confirmed by the attending anaesthetist. A detailed explanation about the participation in the study was given to the patient and a written informed consent was obtained explaining the risks and benefits of the both procedure in detail. A day before surgery the patients were subjected to

clear fluid diet and were advised nil per oral regimen from the midnight before surgery day. All the patients were operated under general anesthesia by a single consultant surgeon having minimum of 5 years of experience and well versed with both laparoscopic and open hernia repair. Half of the selected patients were operated laparoscopic TAPP procedure (group A) while the other half (group B) operated by Lichtenstein technique. Laproscopic procedure was performed through standard three port technique, pneumoperitonuem was created through open technique and pressure kept at 12mmHg. An intravenous antibiotic was administered intraoperatively in all cases and received further doses on decision by the attending surgeon. The patients were evaluated daily during their stay in the hospital. Analgesics were initially given through the parenteral route according to the severity of pain analyzed by a visual analogue score. Later oral analgesia was provided as diclofenac sodium 50mg (twice daily). Limited mobilization 4–6 hours following surgery was advised.

The follow-up schedule was explained to the patient at the time of discharge and was scheduled after 6 weeks. A questionnaire containing relevant demographic data, type of hernia, type of procedure done, total cost of surgery, duration of hospital stay, and post operative pain rating by visual analogue score. During follow up data regarding the development of complications postoperatively was recorded. Data collected included complications recorded after 6 weeks postoperatively. Surgical complications were listed as having postoperative pain, urinary retention, recurrence and wound infection.

Data analysis was performed with SPSS 17.0 All data are expressed as mean, median \pm standard deviation or as the absolute number of patients (%). Visual analogue scale values were expressed as range, median, and first and third quartile. Chi square test and independent T test was used to compare the results between the two groups. All two sided p values less than 0.05 were accepted as statistically significant.

RESULTS

From January 2011 through April 2012, we took 100 patients who underwent inguinal hernia repair at our institution by randomization. 50 of them were operated through open method (Lichtenstein method) and 50 through TAPP (transabdominal preperitoneal repair).

In table 1 we compared the demographic features and hernia characteristics between the open and laparoscopic groups. Right-sided recurrent inguinal hernias were more common than the left-sided hernias

in both groups. Indirect hernias were more common among our patients than direct and combined hernias both.

In Table 2, we summarized the perioperative factors, which were considered in the study. The mean operative time was short in open repair compared to TAPP but the mean length of hospital stay was less in TAPP compared to open. TAPP procedure was having more cost compared to open repair.

The postoperative complications are arranged in Table 3. Post operative complications are much more common in open hernia repair compared to TAPP.

Overall complications did not differ significantly between the two groups. Urinary retention, wound discharge and recurrence were more common among open group compared to laparoscopic group.

In the median scores on the VAS significant differences were apparent with greater levels of pain in the open repair group compared with the laparoscopic group.

In Table 4, we summarized the visual analogue score of pain between both groups. Laparoscopic repair showed significantly low post surgical acute pain compared to open repair.

Table 1: Data expressed as median ± standard deviation or as the absolute number of patients (%)

	Open Repair n (%)	TAPP Repair n (%)	p value
Number of patients	50 (50)	50 (50)	---
Age	35.0 ± 11.07	39.50 ± 9.43	0.01
Gender			0.42
Male	40 (80)	43 (86)	
Female	10 (20)	07 (14)	
Side of hernia			0.75
Right	32 (64)	32 (64)	
Left	12 (24)	14 (28)	
Bilateral	6 (12)	4 (8)	
Type of Hernia			0.36
Direct	14 (28)	20 (40)	
Indirect	29 (58)	26 (52)	
Combined	07 (14)	04 (08)	

Table 2: Data expressed as mean ± standard deviation

	Open Repair	TAPP Repair	p value
Operative time (min)	55.40 ± 10.73	87.10 ± 11.60	<0.001
Length of hospital stay	3.5 ± 0.67	2.78 ± 0.64	<0.001
Total cost of procedure (in PKR)	6180 ± 1409.73	13040 ± 2166.15	<0.001

Table 3: Data expressed as an absolute number of patients (%)

	Open Repair n (%)	TAPP Repair n (%)	p value
Urinary retention	11 (22)	05 (10)	0.10
Wound discharge	10 (20)	04 (08)	0.08
Recurrence	06 (12)	03 (06)	0.29

Figure 1: VAS pain scores of open inguinal hernia repair. Values are expressed as range, median, and first and third quartile

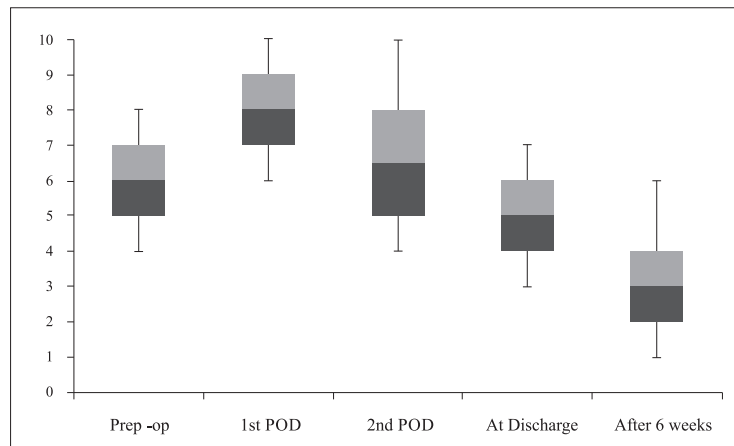


Figure 2: VAS pain scores of laparoscopic transabdominal preperitoneal hernioplasty (tapp) hernia repair. Values are expressed as range, median, and first and third quartile

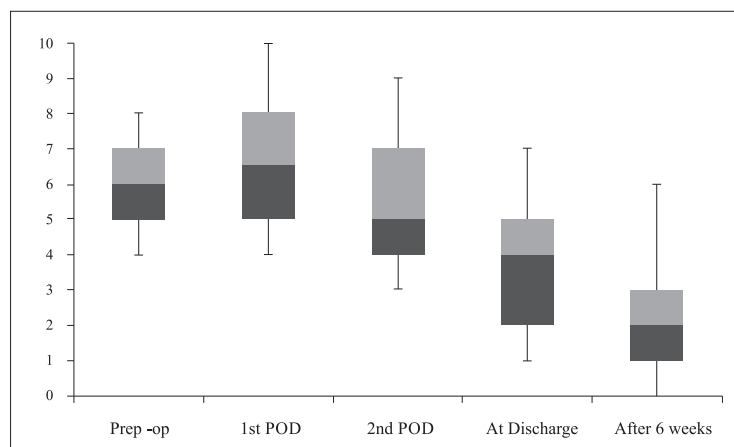


Table 4: Data expressed as an absolute number of patients (%), mean ± standard deviation

	Groups	Number	Mean ± SD	p value
Pre-operative pain	Laprosopic	50	5.7200 ± 1.61675	0.004
	Open	50	6.8600 ± 2.19471	
1st POD	Laprosopic	50	6.6400 ± 1.97701	<0.001
	Open	50	8.3600 ± 1.42514	
2nd POD	Laprosopic	50	5.2800 ± 2.01058	<0.001
	Open	50	6.9000 ± 2.22463	
3rd POD	Laprosopic	50	3.7000 ± 1.56818	<0.001
	Open	50	5.2200 ± 2.18800	
After 6 weeks	Laprosopic	50	2.0800 ± 1.60153	<0.001
	Open	50	2.9800 ± 1.85703	

POD = Post Operative Day

DISCUSSION

Laparoscopic repair of inguinal hernias has not only gained worldwide acceptance but it is also getting popularity in Pakistan. 28.6% of surgeons recommended the laparoscopic approach to hernia repair, which was perhaps expected as laparoscopic surgery in Pakistan. Surgeons are now considering this minimally invasive surgery technique seriously for such a common problem in our society. But still the open inguinal repair is the preferred choice here¹⁵.

Randomized trials comparing the laparoscopic and open approaches have shown better outcome and results by laparoscopic hernia repair over open repair, with less postoperative pain, a shorter hospital stay and improved quality of life^{12-14, 16, 17}.

In our study, a significant difference in operating time was noted between the open and laparoscopic procedures. Analysis of four randomized trials by Karthikesalingam et al¹⁸ also showed a significantly increased operating time in the laparoscopic group. The learning curve has a significant effect on the laparoscopic repair technique. This technique is challenging and requires a longer learning time compared with open repair. However, Niley R Shah et al¹⁹ noted no significant difference in operating between the open and laparoscopic procedures.

The hospital stay differs significantly between the two groups. This finding is consistent with a study conducted in Ankara, which also observed statistical difference regarding post operative length of hospital stay¹⁴. This may be because of less post operative pain and hence quicker recovery. Although few studies found no significant difference^{17, 19}.

We observed that, laparoscopic repair is significantly costly compared to open repair because of the usage of complicated instruments, liga clips and teachers (Laparoscopic instrument to fix the mesh) while open repair does not require special instrumentation. Same was noted in other studies^{14, 17, 20}.

Postoperative complications did not differ significantly between the open and laparoscopic groups.

In this study, wound infection, urinary retention and recurrence were noticed in the open group, and port-site infection, urinary retention, and recurrence in the laparoscopic group. None of these complications were significantly different between both groups. In a present multicenter study, no significant difference was observed in recurrence and complications between laparoscopic and open hernia repair was found²¹.

In our study, the recurrence rate was 12% in the open group and 6% in the laparoscopic group. Other studies have reported comparable recurrence rates varying from 0 to 18% for open repair and from 0 to 19% for laparoscopic repair^{17, 19, 22-24}. In accordance with other studies^{17, 19, 21}, we found no significant difference in the recurrence rates between open and laparoscopic repair of inguinal hernia. Niley R. Sah et al¹⁹ also found no statistical difference in the re-recurrence rates between the open and laparoscopic procedures during early follow-up evaluation but found lower re-recurrence rate in laparoscopic group than the open technique during long-term follow-up evaluation. Beets et al²⁵ showed significant difference regarding recurrent inguinal hernia repair in laparoscopic group. Although a recent meta-analysis of earlier randomized controlled trials showed no significant difference in the rate of recurrence between laparoscopic and open techniques used for recurrent inguinal hernia repair¹⁸. But laparoscopic repair for recurrence should be restricted to highly experienced laparoscopic surgeons²⁶ and to highly specialize laparoscopic centers^{22, 27}.

Neumayer et al²² showed that the recurrence rate among patients whose surgeons had performed more than 250 laparoscopic operations was about half of that among patients whose surgeons had performed 250 or fewer such procedures. A retrospective study noted that an experienced surgeon has a better outcome for a laparoscopic repair than an inexperienced surgeon¹⁹. Pokorney et al²¹ also suggested supporting the development of specialized hernia centers with specialized training in laparoscopic hernia repair. Our sample of patients was relatively small, and our follow-up period was not considered to be very long.

A Cochrane review comparing laparoscopic and open repairs revealed no apparent difference in recurrence²⁸.

Our study noted a significantly low postoperative surgical pain compared to open repair. Many researchers have shown repeatedly that the laparoscopic repair is significantly better than the open repair for acute postsurgical pain. Dissection and the suturing of the tissues are probably the main sources of postoperative pain after open hernia repair¹³. The methods and materials used to fix meshes in open and laparoscopic repairs may also be of importance for late discomfort²⁹.

The limitation of this study included less number of cases, short follow up period. Laparoscopic procedure depends a lot on the experienced surgeon. But we have not analyzed the data on the experience of a surgeon. We recommend a large multicenter prospective trial to confirm our findings.

CONCLUSION

This Prospective trial showed no statistical difference between the open and laparoscopic procedures regarding urinary retention, wound discharge and recurrence during short-term follow-up evaluation. It was also noted that laparoscopic repair showed statistically lower post surgical operative pain and hospital stay but with greater operative time and cost.

Greater efforts should be undertaken to make laparoscopic repair easier, safer, and less expensive. Consequently, we encourage the use of the laparoscopic repair techniques by the experienced laparoscopic surgeons for the treatment of inguinal hernia. However, we think open tension-free mesh-plug repair still can be a good alternative surgical procedure judging by its lower cost, short learning curve, and need for no special equipment.

REFERENCES

- Kulacoglu H. Current options in inguinal hernia repair in adult patients. *Hippokratia* 2011;15:223-31.
- Ahmad H, Nadeem A, Malik AM. Inguinal hernia repair: a comparison of Lichtenstein and Darn techniques. *Pak Armed Forces Med J* 2007;57:23-7.
- Rehman QU, Shah TA, Latif U. Inguinal hernia: lichtenstein and darn repair a comparative study. *Professional Med J* 2010;17:50-4.
- National Institute for Health and Clinical Excellence (NICE). Laparoscopic surgery for inguinal hernia repair. London: NICE; 2004.
- Abbas MH. Outcome of strangulated inguinal hernia. *Pak J Med Sci* 2005;21:445-50.
- Naeem M, Khan N, Aman Z, Nasir A, Samad A, Khattak A. Pattern of breast cancer: experience at Lady Reading Hospital, Peshawar. *J Ayub Med Coll Abbottabad* 2008;20:22-5.
- O'Reilly EA, Burke JP, O'Connell PR. A meta-analysis of surgical morbidity and recurrence after laparoscopic and open repair of primary unilateral inguinal hernia. *Ann Surg* 2012;255:846-53.
- Pokorny H, Klingler A, Scheyer M, Függer R, Bischof G. Postoperative pain and quality of life after laparoscopic and open inguinal hernia repair: results of a prospective randomized trial. *Hernia* 2006;10:331-7.
- Ger R. The management of certain abdominal hernias by intra abdominal closure of the neck of the sac. Preliminary communication. *Ann R Coll Surg Engl* 1982;64:342-4.
- 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.
- McCormack K, Scott NW, Go PM, Ross S, Grant AM. Laparoscopic techniques versus open techniques for inguinal hernia repair. *Cochrane Database Syst Rev* 2003;(1):CD001785.
- Simons MP, Aufenacker T, Bay-Nielsen M, Bouillot JL, Campanelli G, Conze J, et al. European hernia society guidelines on the treatment of inguinal hernia in adult patients. *Hernia* 2009;13:343-403.
- Pokorny H, Klingler A, Scheyer M, Függer R, Bischof G. Postoperative pain and quality of life after laparoscopic and open inguinal hernia repair: results of a prospective randomized trial. *Hernia* 2006;10:331-7.
- Anadol ZA, Ersoy E, Taneri F, Tekin E. Outcome and cost comparison of laparoscopic transabdominal preperitoneal hernia repair versus open lichtenstein technique. *J Laparoendosc Adv Surg Tech A* 2004;14:159-63.
- Shamim SM, Shamim MS, Jaffary SA, Faruqui N, Hameed K, Shamim M. Trends in the management of inguinal hernia in Karachi, Pakistan: a survey of practice patterns. *Singapore Med J* 2006;47:512-7.
- Barrat C, Surlin V, Bordea A, Champault G. Management of recurrent inguinal hernias: a prospective study of 163 cases. *Hernia* 2003;7:125-9.
- Gong K, Zhang N, Lu Y, Zhu B, Zhang Z, Du D, et al. Comparison of the open tension-free mesh-plug, transabdominal preperitoneal (TAPP), and totally extraperitoneal (TEP) laparoscopic techniques for primary unilateral inguinal hernia repair: a prospective randomized controlled trial. *Surg Endosc* 2011;25:234-9.
- Karthikesalingam A, Markar SR, Holt PJ, Praseedom RK. Meta-analysis of randomized controlled trials comparing laparoscopic with open mesh repair of recurrent inguinal hernia. *Br J*

- Surg 2010;97:4-11.
19. Shah NR, Mikami DJ, Cook C, Manilchuk A, Hodges C, Memark VR, et al. A comparison of outcomes between open and laparoscopic surgical repair of recurrent inguinal hernias. *Surg Endosc* 2011;25:2330-7.
 20. Papachristou EA, Mitselou MF, Finokaliotis ND. Surgical outcome and hospital cost analyses of laparoscopic and open tension-free hernia repair. *Hernia* 2002;6:68-72.
 21. Pokorny H, Klingler A, Schmid T, Fortelny R, Hollinsky C, Kawji R, et al. Recurrence and complications after laparoscopic versus open inguinal hernia repair: results of a prospective randomized multicenter trial. *Hernia* 2008;12:385-9.
 22. Neumayer L, Giobbie-Hurder A, Jonasson O, Fitzgibbons R Jr, Dunlop D, Gibbs J, et al. Open mesh versus laparoscopic mesh repair of inguinal hernia. *N Engl J Med* 2004;350:1819-27.
 23. Feliu X, Jaurieta E, Vinas X, Macarulla E, Abad JM, Fernandez-Sallent E. Recurrent inguinal hernia: a ten-year review. *J Laparoendosc Adv Surg Tech A* 2004;14:362-7.
 24. Eklund A, Rudberg C, Leijonmarck CE, Rasmussen I, Spangen L, Wickbom G, et al. Recurrent inguinal hernia: randomized multicenter trial comparing laparoscopic and lichtenstein repair. *Surg Endosc* 2007;21:634-40.
 25. Beets GL, Dirksen CD, Go PM, Geisler FE, Baeten CG, Kootstra G. Open or laparoscopic preperitoneal mesh repair for recurrent inguinal hernia? A randomized controlled trial. *Surg Endosc* 1999;13:323-7.
 26. Feliu-Pala X, Martin-Gomez M, Morales-Conde S, Fernandez-Sallent E. The impact of the surgeon's experience on the results of laparoscopic hernia repair. *Surg Endosc* 2001;15:1467-70.
 27. Neumayer L, Jonasson O, Fitzgibbons R. Laparoscopic hernia in the light of the veterans affairs cooperative study 456: more rigorous studies are needed. *Surg Endosc* 2006;20:1144-5.
 28. McCormack K, Scott NW, Go PM, Ross S, Grant AM. Laparoscopic techniques versus open techniques for inguinal hernia repair. *Cochrane Database Syst Rev* 2003;(1):CD001785.
 29. Berndsen FH, Petersson U, Arvidsson D, Leijonmarck CE, Rudberg C, Smedberg S, et al. Discomfort five years after laparoscopic and Shouldice inguinal hernia repair: a randomised trial with 867 patients. A report from the SMIL study group. *Hernia* 2007;11:307-13.

CONTRIBUTORS

NK conceived the idea, planned and wrote the manuscript of the study. TSB, MA, ZA & LAS assisted in the analysis and interpretation of data and gave input in the write-up of the manuscript. All the authors contributed significantly to the research that resulted in the submitted manuscript.