Int Surg 2011;**96:**233–238

Comparison of Lichtenstein and Laparoscopic Transabdominal Preperitoneal Repair of Recurrent Inguinal Hernias

Z. Demetrashvili[1], V. Qerqadze[1], G. Kamkamidze[2], G. Topchishvili[1], L. Lagvilava[1], T. Chartholani[3], V. Archvadze[4]

[1]*Department of Surgery, Tbilisi State Medical University and Kipshidze Central University Hospital, Tbilisi, Georgia*

[2]*Department of Microbiology and Immunology, Tbilisi State Medical University and NeoLab, Tbilisi, Georgia*

[3]*Thoracoabdominal Clinic Ltd, Tbilisi, Georgia*

[4]*Department of Surgery, Tbilisi State Medical University and Aladashvili Clinic, Tbilisi, Georgia*

The aim of our study was the comparative analysis of the results of two surgical methods: tension-free repair by the Lichtenstein technique and laparoscopic transabdominal preperitoneal (TAPP) repair. In total 52 patients with recurrent inguinal hernia were randomly assigned to the two groups: Lichtenstein (28 patients) and TAPP (24 patients). Comparisons between these groups were done by several preoperative, intraoperative, and postoperative factors. For postoperative factors both short-term and long-term results were considered. Average operation time for Lichtenstein group was 59.6 ± 9.9 minutes, compared with 64.4 ± 8.4 minutes for TAPP patients ($P = 0.068$). In TAPP patients there was less pain in the postoperative period ($P = 0.002$) and fewer sick-leave days (13.4 ± 1.7 versus 17.5 ± 2.6 days; $P < 0.001$) and, correspondingly, faster recovery. In the Lichtenstein group a total of 4 postoperative complications (infection, hematoma, seroma, urinary retention) were observed, compared with 8 in the TAPP group ($P = 0.19$). Statistically significant difference was only by urinary retention (0 for Lichtenstein, 4 for TAPP; $P = 0.039$). There were no cases of hernia recurrence observed during the follow-up. Chronic pain developed in 5 patients from the Lichtenstein group (17.9%) and 2

Reprint requests: Zaza Demetrashvili, MD, PhD, Assistant Professor, Department of Surgery, Tbilisi State Medical University, 33 Vazha-Pshavela Ave., Tbilisi 0177, Georgia.
Tel.: +995 99 21 77 33; Fax: +995 32 39 28 03; E-mail: zdemetr@yahoo.com

patients from the TAPP group (8.3%; $P = 0.28$) more than 1 year after the operation; 4 Lichtenstein patients (14.3%) and 1 TAPP patient (4.2%; $P = 0.23$) more than 2 years after the operation; and 3 Lichtenstein patients (10.7%) and 1 TAPP patient (4.2%; $P = 0.36$) more than 3 years after the operation. For the treatment of recurrent inguinal hernias, which are developed after use of conventional (nonmesh) methods, the first choice should be given to the laparoscopic method, especially for young, physically active, nonobese patients, and if there are any contraindications for the laparoscopy, the Lichtenstein approach should be recommended.

Key words: Recurrent inguinal hernia – Lichtenstein method – Laparoscopic transabdominal preperitoneal method

Inguinal hernia repair is one of the most frequently performed operations in general surgery. Among these repair operations, the frequency of surgical intervention performed for recurrent hernia varies between 8% and 16%.[1–6] Despite achievements in the field of treating hernias, the problem remains in the failure to master the appropriate surgical technique, leading to the high rate of recurrence. Repair of recurrent inguinal hernia is frequently associated with increased technical difficulty, higher morbidity, and greater risk for further recurrence.[7]

Nowadays there is no doubt that recurrent inguinal hernia should be treated only by the application of meshes.[6,8,9] Although it is still disputable which approach, open or endoscopic, is more preferable, both methods have positive and negative characteristics.[10–20]

The aim of our prospective randomized trial was the comparison of the results of two methods of treatment of recurrent inguinal hernia: tension-free repair by the Lichtenstein technique, and one of the two most widely used laparoscopic methods—transabdominal preperitoneal (TAPP) repair.

Materials and Methods

From January 1, 2002, to October 31, 2006, a total of 54 consecutive patients who underwent elective surgery for recurrent inguinal hernias were enrolled in the study. The inclusion criteria were a unilateral recurrent inguinal hernia requiring operative treatment and the patient's approval to participate in the study. The exclusion criteria were bilateral hernia, scrotal hernia, a patient's preference for either operative technique, or a patient's refusal to participate in the study. The patients were assigned to one of the two groups: the Lichtenstein group or the laparoscopic TAPP group. The randomization (by simple random sampling) of patients to each of the two groups described above was done before the surgical intervention. Lichtenstein hernioplasty was performed by two skilled general surgeons, whereas TAPP was performed by one general surgeon with extensive experience in performing laparoscopic operations. The Lichtenstein hernioplasty was performed according to the original description of the technique.[21] The laparoscopic TAPP procedure was performed as described by Payne *et al*[22] and Fitzgibbons.[23] For both surgical interventions, polypropylene monofilament meshes were used (Prolene, Ethicon, Somerville, New Jersey). For Lichtenstein operations the mesh size was 8×12 cm, whereas for TAPP it was equal to 10×15 cm. During Lichtenstein operations, the mesh was attached by 2-0 polypropylene monofilament sutures, whereas in instances of TAPP the mesh was fixed by an endoscopic stapler (EMS Endo Multifeed Staplegun, Ethicon Endo-Surgery, Mexico City, Mexico) on the Cooper ligament. All laparoscopic TAPP operations were performed under general anesthesia, whereas Lichtenstein operations were done using local anesthesia.

Several preoperative factors were studied, which included sex, age, body mass index, occupation, tobacco use, risk groups by American Society of Anesthesiologists and comorbidities, type of first hernioplasty, and time after the first operation. Patients from American Society of Anesthesiologists risk groups 4 and 5 were excluded from the study. Those patients who had any previous abdominal operations were also excluded from the study. This was a first-recurrence episode in all 54 patients. In all instances, primary hernia repair had been performed by different methods of nonmesh tissue plastics by different techniques (Marcy, Bassini, Halsted, McVay, Shouldice).

Among the intraoperative factors, the following were evaluated: type of recurrence, anesthesia method (local, general), and duration of the opera-

tion. Prophylactic antibacterial treatment was not used in all patients. We were using it only in patients with concurrent disorders. In these instances, 1.5 g of cefuroxime was used intravenously during the operation.

Among the postoperation factors, the following were studied: postoperative days at the ward, analgesic doses, sick-leave days, and complications. The latter were divided into two groups: early and late complications. The early complications included wound infection, hematoma, seroma, urinary retention, and visceral and vascular disorders. The late complications included chronic pain in the inguinal region and recurrence of the hernia. For postoperative analgesia, 1 mL of 3% ketorolac tzomethamine was used. The number of ampoules and the dosage of analgesics were calculated. For the evaluation of chronic pain, the Visual Analogue Scale was applied. The pain was considered mild when the Visual Analogue Scale was lower than 3, moderate when lower than 5, and severe when higher than 5.

After discharge from the hospital, all patients were examined after 1 week, 20 days, and 1.5 months at the outpatient department by the same surgeon who performed the operation on the patient. Also, these patients were examined more than 1, 2, and 3 years after the operation date. The examinations were performed by surgeons who had not been participating previously in this study. They were paying attention to the pain in the inguinal region and the presence of hernia recurrence. Those patients who participated in the study in November–December 2009 were contacted by phone and were asked about the presence of chronic pain as well as characteristic symptoms of the hernia. Those patients who had any of the symptoms were admitted to the outpatient department for a checkup. The total follow-up time was calculated based on the last visit to the outpatient clinic or contact via telephone. The follow-up time for the Lichtenstein group was 3 to 7.5 years (5.2 ± 1.2 years), whereas for TAPP it was 3.5 to 7 years (4.9 ± 1.0 years).

Results

Of the 54 patients, data from 52 were analyzed. A total of 28 patients from the Lichtenstein group and 24 from the TAPP group were included in the analysis. In 1 patient from the Lichtenstein group, presence of femoral hernia was found during the operation, whereas in 1 patient from the TAPP group, presence of contralateral hernia was also found intraoperatively. Presence of these hernias was not found before the operation.

Table 1 Preoperative factors in two treatment groups[a]

Characteristics	Lichtenstein	TAPP	*P*
Sex			
Male	26	22	0.63
Female	2	2	
Age, y	63.7 (12.9)	58.7 (9.1)	0.12
BMI, kg/m^2	25.0 (1.5)	24.9 (1.6)	0.91
Current smoker	17	15	0.88
Occupation			
Light work	13	13	0.78
Physical work	15	11	
Comorbidities			
Cardiovascular	10	9	0.88
Respiratory system	3	3	0.58
Diabetes	2	1	0.56
ASA risk group			
1	10	12	0.57
2	13	9	
3	5	3	
Time from the first hernia repair, y	9.2 (3.7)	9.0 (3.5)	0.80
Primary repair technique			
Bassini	16	11	0.60
Shouldice	3	2	
Marcy	2	1	
Halsted	6	9	
McVay	1	1	

ASA, American Society of Anesthesiologists; BMI, body mass index.

[a]Data are expressed as mean (SD) or absolute number of patients.

Both groups were similar by preoperative factors (sex, age, body mass index, tobacco use, American Society of Anesthesiologists risk groups, comorbidities, type of first hernioplasty, and time after the first operation). No statistically significant differences were found between the groups by these factors (Table 1).

Analysis of intraoperative factors showed that there was no statistically significant difference ($P = 0.81$) between groups by type of recurrence (medial, lateral, combined). Significant difference ($P < 0.001$) between groups was found by type of anesthesia. This is explainable by the fact all 28 Lichtenstein operations were performed using local anesthesia, whereas all TAPPs were done using general anesthesia. Prophylactic antibiotic therapy was administered only to those patients who had comorbidities. There was no statistically significant difference ($P = 0.78$) by this factor as well. Average operation time was 59.6 ± 9.9 minutes for the

Table 2 Intraoperative factors in two treatment groups[a]

Characteristics	Lichtenstein	TAPP	*P*
Recurrence type			
Medial	12	9	0.81
Lateral	13	11	
Combined	3	4	
Anesthesia			
Local	28	0	<0.001
General	0	24	
Prophylactic antibiotic	14	12	0.78
Operation time, min	59.6 (9.9)	64.4 (8.4)	0.068

[a]Data are expressed as mean (SD) or absolute number of patients.

Lichtenstein group and 64.4 ± 8.4 minutes for the TAPP group. TAPP operation time showed a trend toward increasing in comparison with Lichtenstein time, but this difference did not reach statistical significance ($P = 0.068$; Table 2).

Regarding the postoperative factors, no statistical difference has been found ($P = 0.6$) between groups by postoperative time spent at the ward. Because of postoperative pain, the TAPP patients got significantly fewer analgesics than the Lichtenstein patients (2.4 ± 1.0 versus 3.5 ± 1.3 doses, respectively; $P = 0.002$). TAPP patients needed significantly fewer sick-leave days than Lichtenstein patients (13.4 ± 1.7 versus 17.5 ± 2.6 days, respectively; $P < 0.001$). In the Lichtenstein group, 4 early complications (superficial infection, hematoma, seroma, and urinary retention) were observed (14.3%), whereas in the TAPP group, the number of complications was higher (8; 33.3%). This difference did not reach statistical significance ($P = 0.19$). Among the complications, only urinary retention showed statistically significant difference: 0 for the Lichtenstein group and 4 for the TAPP group ($P = 0.039$). It is noticeable that in the TAPP group there were no cases of visceral or vascular injuries; also, no cases of conversion were observed.

The difference between the groups by follow-up period also was not statistically significant ($P = 0.31$). There were no cases of hernia recurrence observed during the follow-up. More than 1 year after the operation date, 5 patients from the Lichtenstein group (17.9%) developed chronic pain (1 severe, 3 moderate, and 1 mild). At that time point, chronic pain had developed in 2 patients from the TAPP group (8.3%; $P = 0.28$). After 2 years, chronic pain developed in 4 Lichtenstein patients (14.3%; 2 moderate and 2 mild) and in 1 TAPP patient (4.2%; moderate; $P = 0.23$); after 3 years, chronic pain developed in 3 Lichtenstein patients (10.7%; 1 moderate and 2 mild) and in 1 TAPP patient (4.2%; mild; $P = 0.36$). These figures did not change after this time point. Differences between the groups for all 3 years were not statistically significant (Table 3).

Table 3 Postoperative factors in two treatment groups[a]

Characteristics	Lichtenstein	TAPP	*P*
Analgesic doses	3.5 (1.3)	2.4 (1.0)	0.002
Postoperative time at ward, d	1.9 (0.9)	1.8 (1.0)	0.60
Sick leave, d	17.5 (2.6)	13.4 (1.7)	<0.001
Primary complications	4	8	0.19
Infection	1	0	0.53
Hematoma	1	1	0.71
Seroma	2	3	0.42
Urinary retention	0	4	0.039
Recurrence	0	0	-
Chronic pain			
First year	5	2	0.28
Second year	4	1	0.23
Third year	3	1	0.36
Follow-up time total, y	5.2 (1.2)	4.9 (1.0)	0.31

[a]Data are expressed as mean (SD) or absolute number of patients.

Discussion

Treatment of recurrent inguinal hernias remains a problematic issue, and it is far more complex than the treatment of primary hernias. This is because of the presentation of latter cases by the combinations of hernias. It is necessary to use tension-free procedures, close all potential hernia entrances, perform complex dissection of the scar tissue, and take into account the intrinsic and age-related connective tissue weakness, and frequently diverse anatomic presentations.[10,12,24]

Several methods are proposed to solve this problem, including application of open anterior (sutured/mesh-based), open preperitoneal, and endoscopic methods. Although currently there is a consensus that only meshes should be used for recurrent inguinal hernias, there are still debates about the indications of these methods.

The aim of our prospective randomized trial was to perform a comparative analysis of the immediate and long-term results of two surgical approaches, an open anterior tension-free method (Lichtenstein) and a laparoscopic method (TAPP), and also to analyze our data from the perspective of the international experience. No such studies have been done in Georgia to date.

Our study has shown that operation time is shorter in the Lichtenstein group (59.6 ± 9.9 minutes) than in the TAPP group (64.4 ± 8.4 minutes), although because of the small sample size, this trend did not reach a statistical significance ($P = 0.068$). Our data are similar to the data from several other investigations,[15,19,25] although Eklund *et al*[16] found no difference in the operation time between the laparoscopic and Lichtenstein methods.

Patients from the TAPP group are characterized by significantly fewer episodes of postoperative pain, and as a consequence by lower use of analgesic drugs ($P = 0.002$), less sick-leave days ($P < 0.001$), and faster recovery. The same advantages of the laparoscopic method in comparison with the Lichtenstein approach are documented also by other authors.[14–16,19,25]

There were no differences found in the total number of early complications between the open and laparoscopic methods (33.3% versus 14.3% for TAPP and Lichtenstein, respectively; P = 0.19). Authors of some previous studies have shown that laparoscopic methods are characterized by fewer postoperative complications than Lichtenstein operations.[16,25] Based on their investigations, Neumayer *et al*[14] came to the opposite conclusion—that open surgical interventions have fewer postoperative complications than laparascopy. Schmedt *et al*[15] conducted a meta-analysis in which they showed that wound infection and hematoma are less frequent in cases of endoscopic surgery, whereas seroma is less frequent in cases of the Lichtenstein method. Our data on the structure of the postoperative complications show that frequencies of wound complications (infection, hematoma, seroma) are almost equal in both groups. A statistically significant difference was found for urinary retention (4 versus 0 for TAPP and Lichtenstein, respectively; $P = 0.039$). The Schmedt *et al*[15] meta-analysis and data from several other randomized trials indicate that this complication is equally frequent for both methods.[14,25] Different patterns in our study can be explained by the fact that all laparoscopic operations were done under general anesthesia, whereas for the Lichtenstein approach, all 28 operations were performed using local anesthesia. The impact of general anesthesia on the development of urinary retention is reviewed by Jensen *et al*.[26]

As mentioned above, all Lichtenstein operations were performed using local anesthesia. We think that this is an advantage of this type of surgical intervention compared with endoscopic methods. In several studies it has been documented that local anesthesia is not characterized by those complications, which generally accompany general and spinal analgesia, and does not complicate long-term treatment effects of the recurrent inguinal hernia.[3,27]

In none of patients has recurrence of the hernia been observed. Regarding chronic pain, there were no statistically significant differences between the groups ($P = 0.36$). By this factor our investigation corresponds to the data by Eklund *et al*,[16] although it should be mentioned that larger studies have shown that laparoscopic methods are characterized by fewer chronic pain episodes than instances of Lichtenstein approach.[15,19]

Taking into the consideration the characteristics of the recurrent inguinal hernia, it is important to emphasize that the correction of this disorder should be done by an experienced hernia surgeon who will take into consideration the specific features of each individual patient and who will make a decision regarding which type of surgical intervention should be chosen in each specific case according to the patient's characteristics (age, comorbidities, and other risk factors, especially those related to anesthesia, physical activity, etc).[6–8,11,17] It is apparent that in all cases of hernioplasty, meshes must be used.

According to our results it may be concluded that for the treatment of recurrent inguinal hernias that are developed after the application of the conventional (nonmesh) methods, the first choice should be given to the laparoscopic method, which is especially appropriate for young, physically active, nonobese patients. This is due to the fact that the laparoscopic method is characterized by less postoperative pain and a quicker return to work. If there are any contraindications for the laparoscopy, Lichtenstein surgical intervention would be highly recommended in such cases.

References

1. Campanelli G, Pettinari D, Nicolosi FM, Cavalli M, Contessini Avesani E. Inguinal hernia recurrence: classification and approach. *Hernia* 2006;**10**(2):159–161
2. Aufenacker TJ, de Lange DH, Burg MD, Kuiken BW, Hensen EF, Schoots IG *et al.* Hernia surgery changes in the Amsterdam region 1994–2001: decrease in operations for recurrent hernia. *Hernia* 2005;**9**(1):46–50
3. Nordin P, Haapaniemi S, van Der Linden W, Nilsson E. Choice of anesthesia and risk of reoperation for recurrence in groin hernia repair. *Ann Surg* 2004;**240**(1):187–192
4. Kehlet H, Bay-Nielsen M. Nationwide quality improvement of groin hernia repair from the Danish Hernia Database of 87,840 patients from 1998 to 2005. *Hernia* 2008;**12**(1):1–7

5. Hair A, Duffy K, McLean J, Taylor S, Smith H, Walker A *et al.* Groin hernia repair in Scotland. *Br J Surg* 2000;**87**(12):1722–1726
6. Barrat C, Surlin V, Bordea A, Champault G. Management of recurrent inguinal hernias: a prospective study of 163 cases. *Hernia* 2003;**7**(3):125–129
7. Schumpelick V, Fitzgibbons RJ, eds. *Recurrent Hernia Prevention and Treatment*. Heidelberg, Germany: Springer, 2007
8. Simons MP, Aufenacker T, Bay-Nielsen M, Bouillot JL, Campanelli G, Conze J *et al.* European Hernia Society guidelines of the treatment of inguinal hernia in adult patients. *Hernia* 2009;**13**(4):343–403
9. Haapaniemi S, Gunnarsson U, Nordin P, Nilsson E. Reoperation after recurrent groin hernia repair. *Ann Surg* 2001; **234**(1):122–126
10. Tantia O, Jain M, Khanna S, Sen B. Laparoscopic repair of recurrent groin hernia: results of a prospective study. *Surg Endosc* 2009;**23**(4):734–738
11. Champault G, Bernard C, Rizk N, Polliand C. Inguinal hernia repair: the choice of prosthesis outweighs that of technique. *Hernia* 2007;**11**(2):125–128
12. Katri KM. Open preperitoneal mesh repair of recurrent inguinal hernia. *Hernia* 2009;**13**(6):585–589
13. Kouhia STH, Huttunen R, Silvasti SO, Heiskanen JT, Ahtola H, Uotila-Nieminen M *et al.* Lichtenstein hernioplasty versus totally extraperitoneal laparoscopic hernioplasty in treatment of recurrent inguinal hernia–a prospective randomized trial. *Ann Surg* 2009;**249**(3):384–387
14. Neumayer L, Giobbie-Hurder A, Jonasson O, Fitzgibbons RJ, Dunlop D, Gibbs J *et al.* Open mesh versus laparoscopic mesh repair of inguinal hernia. *N Engl J Med* 2004;**350**(18):1819–1827
15. Schmedt CG, Sauerland S, Bittner R. Comparison of endoscopic procedurs vs Lichtenstein and other open mesh techniques for inguinal hernia repair: a meta-analysis of randomized controlled trials. *Surg Endosc* 2005;**19**(2):188–199
16. 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**(4):634–640
17. Memon MA, Feliu X, Sallent EF, Camps J, Fitzgibbons RJ Jr. Laparoscopic repair of recurrent hernias. *Surg Endosc* 1999; **13**(8):807–810
18. Amid PK (2005) Groin hernia repair: open techniques. World J Surg **29**(8):1046–1051
19. McCormack K, Scott NW, Go PM, Ross S, Grant AM; EU Hernia Trialists Collaboration. Laparoscopic techniques versus open techniques for inguinal hernia repair. *Cochrane Database Syst Rev* 2003;**1**:CD001785
20. Feliu X, Jaurrieta 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**(6):362–367
21. Lichtenstein IL, Schulman AG, Amid PK, Montllor MM. The tension-free hernioplasty. *Am J Surg* 1989;**157**(2):188–193
22. Payne JH Jr, Grininger LM, Izawa MT, Podoll EF, Lindhal PJ, Balfour J. Laparoscopic or open inguinal herniorrhaphy?: a randomized prospective trial. *Arch Surg* 1994;**129**(9):973–981
23. Fitzgibbons RJ Jr. Transabdominal preperitoneal laparoscopic inguinal herniorrhaphy. American College of Surgeons video CC-1871. Woodbury, CT: Ciné-Med, 1997. Available at: http://cine-med.net/library/library.php. Accessed February 1, 2010
24. Deysine M. Recurrent inguinal herniorrhaphy: the centripetal approach utilizing a pre-formed polypropylene plug. *Hernia* 2008;**12**(3):271–275
25. Dedemadi G, Sgourakis G, Karaliotas C, Christofides T, Kouraklis G, Karaliotas C. Comparision of laparoscopic and open tension-free repair of recurrent inguinal hernias: a prospective randomized study. *Surg Endosc* 2006;**20**(7):1099–1104
26. Jensen P, Mikkelsen T, Kehlet H. Postherniorrhaphy urinary retention-effect of local, regional, and general anesthesia: a review. *Reg Anesth Pain Med* 2002;**27**(6):612–617
27. Gianetta E, Cuneo S, Vitale B, Camerini G, Marini P, Stella M. Anterior tension-free repair of recurrent inguinal hernia under local anesthesia: a 7-year experience in a teaching hospital. *Ann Surg* 2000;**231**(1):132–136