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Comparative study of totally extra-peritoneal hernia repair versus open Lichtenstein hernioplasty for the treatment of primary inguinal hernia

Primer kasık fıtığı tamirinde total ekstraperitoneal yöntemle açık Lichtenstein yönteminin karşılaştırmalı çalışması

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Abstract

Aim: There is still controversy over which inguinal hernia repair technique has the best postoperative results. Totally extra-peritoneal hernia (TEP) repair was compared with conventional open Lichtenstein (OL) herniorrhaphy in terms of postoperative pain, return time to work, recurrence rates and complications.

Methods: In this predesigned comparative study, total number of 97 patients who underwent TEP or Lichtenstein herniorrhaphy in Health Sciences University, Kanuni Sultan Süleyman Education and Research Hospital, in between January 2018 and September 2018 were evaluated and compared. Patients were divided in two groups as TEP group (n:50) and OL group (n:47). Demographic properties (age, sex), operation time, postoperative pain, hospital stay, return to work, recurrence rates and/or complications were analyzed and compared with each other.

Results: The mean operation time was 55.7 (19.90) minutes in TEP group, while it was 39.44 (10.69) minutes in OL group (P=0.001). Postoperative pain with VAS in TEP group on the first postoperative day was 3.2 (1.12) (range: 2-6), while it was 5.6 (1.02) (range: 2-8) in the OL group (P=0.001). The average time return to their routine work ranged from 6-18 days (mean 9.2 (2.03) in TEP group while it was 7-26 days (mean 14.8 (3.1)) in OL group (P=0.001). Postoperative complications as urinary retention, seroma, hematoma formation and paresthesia sensation were higher in OL group.

Conclusion: In our study, TEP repair was superior to OL repair in terms of postoperative pain, early return to work, chronic pain, postoperative urinary retention, seroma formation and postoperative paresthesia sensation. More studies with large case series and longer follow-up periods are still needed to judge the role of laparoscopy in repairing inguinal hernias.

Keywords: TEP, Lichtenstein, Recurrence rate, Pain, Postoperative complications

Öz

Amaç: Kasık fıtığı onarımda hangi tekniğin ameliyat sonrası daha iyi sonuçlar verdiği konusunda hala tartışmalar devam etmektedir. Laparoskopik total ekstraperitoneal herni (TEP) onarımı ameliyat süresi, postoperatif ağrı, işe dönüş zamanı, nüks oranları ve komplikasyonlar açısından konvansiyonel açık Lichtenstein (AL) yöntemle ile karşılaştırıldı.

Yöntemler: Bu önceden tasarlanmış karşılaştırmalı çalışmasında, Sağlık Bilimleri Üniversitesi, Kanuni Sultan Süleyman Eğitim ve Araştırma Hastanesi'nde, 2018 Ocak-2018 Eylül tarihleri arasında TEP veya Lichtenstein herniorafisi yapılan toplam 97 hasta değerlendirildi ve birbirleriyle karşılaştırıldı. Hastalar TEP grubu (n: 50) Açık Lichtenstein (AL) (n: 47) olmak üzere iki gruba ayrıldı. Demografik özellikleri (yaş, cinsiyet), ameliyat süresi, ameliyat sonrası ağrı, hastanede kalış, işe dönüş süreleri ve komplikasyonlar analiz edildi.

Bulgular: Çalışmamızda TEP grubunda ortalama operasyon süresi 55.7 (19.90) dakika iken, OL grubunda 39.44 (10.69) dakika idi (P=0.001). Ameliyat sonrası ilk gün visual analog skoru (VAS) TEP grubunda 3.2 (1.12) (dağılım: 2-6) iken OL grubunda 5.6 (1.02) (dağılım: 2-8) (P=0.04) idi. TEP grubundaki işe dönme süresi 6-18 gün (ortalama 9.2 (2.03) iken OL grubunda 7-26 gün (ortalama 14.8 (3.1)) (P=0.001) idi. OL grubunda, idrar retansiyonu, seroma, hematom oluşumu, kronik ağrı ve parestezi hissi gibi postoperatif komplikasyonlar daha yüksek bulundu.

Sonuç: Çalışmamızda TEP onarımı postoperatif ağrı, erken işe dönüş, kronik ağrı, postoperatif idrar retansiyonu, seroma oluşumu ve postoperatif parestezi hissi açısından OL tamirinden daha üstündü. Laparoskopinin inguinal herni tamirindeki etkinliğini değerlendirmede daha uzun takip süreli ve geniş vaka serili çalışmalara ihtiyaç bulunmaktadır.

Anahtar kelimeler: TEP, Lichtenstein, Nüks oranı, Ağrı, Postoperatif komplikasyonlar

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Introduction

While the inguinal hernia (IH) remains to be a serious health problem affecting community, IH repair is one of the most common surgeries in general surgery practice, performed on more than 20 million people annually throughout the world [1]. Although advanced techniques have been adopted in IH repair parallel to those in developing medical technologies, currently no consensus has been reached on the best method among all existing methods [1]. A Lichtenstein type tension free operation has now become the method of choice in the majority of countries around the world [1]. But the trends have changed in the last few decades with the introduction of laparoscopic inguinal herniorrhaphy (LIHR) with same or better outcomes. Nowadays in many hernia centers, LIHR is mainly applied by two operative techniques as totally extra-peritoneal (TEP) and transabdominal preperitoneal (TAPP) [2].

Opponents of LIHR proposed the possibility of a laparoscopic accident resulting in fatal complication such as bowel perforations or fatal vascular injuries, potential adhesive complications at sites where the peritoneum has been breached or prosthetic material has been placed, and the need for general anesthetics [2].

Nowadays controversy persists regarding the most effective IH repair. The aim of this study was to compare the open Lichtenstein (OL) and the TEP repairs in terms of operation time, hospital stay, postoperative pain, early and late complications and recurrences.

Materials and methods

In this predesigned comparative study, IH patients who were treated with TEP or OL herniorrhaphy techniques from January 2018 to September 2018 in our single tertiary center were evaluated and compared with each other in terms of operation time, postoperative and chronic pain, return time to work, early and late complications and/or recurrences.

A hundred and eighty five IH repairs were performed during the study period, 64 (34%) of which had TEP repair and 127 (66%) had OL. Patients operated with recurrent IH, conversion from TEP to OL repair and operation in emergency settings together with ones with incomplete data were excluded from the study. Among these cases, fifty TEP repairs were matched with forty seven OL repairs. Inclusion criteria were age over 18 years, primary IH, elective operation, with availability of data on 6 months follow-up.

Patients were divided into two groups as TEP group (n=50) and OL group (n=47). Data were obtained from patient files, polyclinic visits, phone calls and electronic hospital records which were included in the hospital archive. Ethics committee approval for the study was received from the local ethical committee. Study was carried out according to the principles of the Helsinki Declaration. All the patients were routinely informed and provided their written consent.

Patients were seen and parameters were recorded at 1th, 2nd, 4th, and 6th weeks, and 3th, and 6th months of operation. Postoperative pain was graded by using visual analogue score (VAS score). Patients were given VAS forms and asked to grade the severity of pain on 0-10 on the first, second day and first week of surgery. Operation time was noted as the time elapsed between first incision and last suturing and taken from anesthesia follow charts. Apart from VAS score, pain was graded as follows: level 1= no pain, 2= mild pain, 3= moderate pain, 4= severe pain, and 5=intolerable pain. Chronic pain was defined as level 4-5 pain lasting 3 months after the operation. Intraoperative complications (e.g., epigastric or testicular vascular bleeding, peritoneal, testicular, or nerve damages) and postoperative complications (e.g., hematoma, seroma, urinary retention, paresthesia, wound infection and recurrence) were recorded. An independent surgeon in the hospital saw the patients with any complaints, such as pain or a lump in the groin. Seroma or hematoma was defined as a collection of blood or serous fluid of more than 5 ml detected via ultrasonography in the subcutaneous tissues, inguinal canal, preperitoneal space or scrotum. Wound site infection was defined as presence of redness and pain with or without drainage from the incisions. The recurrence was defined as a bulge or weakness in the inguinal area exacerbated by a valsalva maneuver and necessitating further operation. Hospital stay time was the number of days in the hospital after the surgery.

TEP technique

Operations were performed with general anesthesia. Patients were in supine with slight trendelenburg position and both arms were tacked. Surgeon stands at the opposite side of hernia. Once infraumbilical is done, external fascia is opened and rectus muscle retracted laterally and a handmade balloon was used to open preperitoneal working space. Pressure was maintained at 10–12 mmHg by continuous insufflation of carbon dioxide. Midline two 5 mm working trocars were entered under direct vision of laparoscope. Symphysis pubis and Cooper ligament were made apparent by clearance of preperitoneal adhesions. Bogros space was opened and any cord lipoma was excised. Then direct, indirect, femoral and obturator spaces are examined to see any herniations. Triangles of death and pain are seen and no tacker is used at this places. Indirect hernias were retracted from inguinal channel to preperitoneal space and five cm below deep ring, direct herniation in Hasselbach's triangle peritoneum pulled back and transversalis fascia was tacked at the iliopubic tract to eliminate death space. Then potential hernia spaces were covered with 15x10 cm polypropylene mesh (Prolene; Ethicon, Inc., Somerville, NJ, USA) which anchored with 5 mm titanium spiral tacks (Tyco Healthcare, Norwalki CT, USA) to symphysis pubis, Cooper ligament routinely and occasionally further tacks were placed anteriorly on the under surface of rectus abdominus and the fascia transversalis laterally. Under direct camera vision, following a final inspection, desufflation was performed and trocars were removed.

Open Lichtenstein Technique

All Operations were performed under either spinal or general anesthesia. After the division of cremasters, the hernia sac was prepared to permit digital examination for the presence of a pantaloon hernia. The sac was then high ligated. A polypropylene mesh measuring 6x11 cm (Ethicon Inc., Somerville, NJ, USA) was placed with a interrupted 2/0 polypropylene suture overlapping the pubic tubercle by 2 cm. Laterally, a slit in the propylene mesh permitted passage of the spermatic cord and the ilioinguinal nerve.

Statistical analysis

SPSS 20.0 program was used for statistical evaluation. Absolute frequencies or mean (standard deviation) were used in data presentation. Student's t-test was used to determine whether a statistically significant difference exists between the groups regarding age and surgery duration. Fisher Exact test was used to examine the relationship between the categorical variables. ANOVA test was used for comparison of length of hospital stay between the TEP and OL groups. $P<0.05$ was considered to be statistically significant.

Results

Median age was 48.8 (range: 25-76) in TEP group and 52 (range: 19-81) in OL group ($P=0.117$). Of 50 cases, 49 were male and one was female with a ratio of 49/1 in TEP group and 43 were male and 4 were female with a M/F ratio of 11/1 in OL group ($P=0.022$). In TEP group, hernia types were Nyhus type 2 (44.2%), Nyhus type 3a (36.5%) and Nyhus type 3b (19.2%), on the other hand in OL group Nyhus type 2 (43.1%), Nyhus type 3a (43.1%) and Nyhus type 3b (13.8%). A total of 62 hernia defects were repaired in the TEP group and 58 hernias in the OL group.

The duration of surgery for the OL group was 39.44 (10.69) minutes (range: 25-70), a significantly lower value than for TEP group in which mean operation time was 55.7 (10.90) minutes (range: 35-110). Difference was statistically significant as $P=0.001$ (Table 1).

Complications in TEP and OL groups consist of hematoma (n:1, 2% vs n:3, 6.38%) ($P=0.01$), seroma (n:1, 2% vs n:12, 25%) ($P=0.001$), urinary retention (n:3, 6% vs n:10, 21%) ($P=0.001$), wound infection (n: 2, 4% vs n:3, 6.38%) ($P= 0.4$), paresthesia (n:9, %18 vs n:17, 36%) ($P=0.001$) in the distribution of the lateral femoral cutaneous nerve, suggestive of meralgia parasthetica, but did not require any specific treatment, recurrence (n: 2, 4% vs n:3, 6.38%) ($P=0.40$). Chronic inguinal pain was reported by 2 patients (4%) in TEP group. One patient required referral to the pain team and in other it is well controlled with simple analgesia. In OL group, 4 patients (8.5%) had suffered from chronic pain which had either resolved without treatment or were well tolerated with simple analgesia ($P=0.04$) (Table 2, 3).

Patients were followed for average 11 months (range: 6-13) in TEP group and average 10 months (range: 7-13) in OL group ($P=0.26$). Mean hospital stay did not differ significantly between two groups although it is slightly lower in TEP group ($P=0.112$). Hospital stay time was 22.6 (4.7) hours in TEP group and 25 (6.4) hours in OL group (Table 1).

Postoperative first day VAS was 3.2 (1.12) in TEP group and 5.6 (1.02) in OL group ($P=0.001$). At the second day, VAS score was 2.5 (0.75) in TEP group and 4.2 (0.85) in OL group ($P=0.03$) (Table 4). Bilateral repair patients reported more pain and reduced physical function versus unilateral repairs in both groups.

The average time in TEP group to return to their routine work ranged from 6-18 days (mean 9.2 (2.03)) while in OL group it was 7-26 days (mean 14.8 (3.1)) ($P=0.001$) (Table 5).

Table 1: Demographics, mean hospital stay, mean duration of operations and follow-up time in two groups

Characteristic	TEP	OL	*P*-value
Gender			
Male n (%)	49 (98)	43 (91.5)	** 0.02
Female n (%)	1 (2)	4 (8.5)	
Mean age of patients, years (range)	48.8 (25-76)	52 (19-81)	* 0.12
Mean hospital stay, mean (SD)	22.6 (4.7)	25 (6.4)	* 0.11
(range)	(15-27)	(17-36)	
Operation time (minutes), mean (SD)	55.68 (10.90)	39.44 (10.69)	* 0.001
(range)	(35-110)	(25-70)	
Mean follow-up time, months (range)	11 (6- 13)	10 (7-13)	* 0.26

SD: Standard deviation, * Student's t-test, ** Fisher's Exact test, TEP: Laparoscopic total extra-peritoneal herniorrhaphy, OL: Open Lichtenstein repair

Table 2: Early and late complications in TEP group

	24th hour n (%)	1st week n (%)	1st month n (%)	3rd month n (%)	6th month n (%)	*P*-value *
Chronic pain	-	-	-	2 (4)	1 (2)	0.04
Paresthesia	9 (18)	7 (14)	3 (6%)	1 (2)	1 (2)	0.001
Seroma	0	1 (2)	0	0	0	0.001
Hematoma	0	1 (2)	0	0	0	0.01
Urinary retention	3 (6)	0	0	0	0	0.001
Wound infection	0	2 (4)	0	0	0	0.40
Recurrence	0	1 (2)	0	1 (2)	0	0.40

TEP: Laparoscopic total extra-peritoneal herniorrhaphy, * Fisher's Exact test

Table 3: Early and late complications in OL group

	24th hour n (%)	1st week n (%)	1st month n (%)	3rd month n (%)	6th month n (%)	*P*-value *
Chronic pain	-	-	-	4 (8.5)	3 (6.38)	0.04
Paresthesia	17 (36)	11 (23.4)	4 (8.5)	2 (4)	1 (2)	0.001
Seroma	0	12 (25)	0	0	0	0.001
Hematoma	0	3 (6.38)	0	0	0	0.01
Urinary retention	10 (21)	0	0	0	0	0.001
Wound infection	0	3 (6.38)	0	0	0	0.4
Recurrence	0	0	0	3 (6.38)	0	0.4

OL: Open Lichtenstein repair, * Fisher's Exact test

Table 4: Comparison of VAS scores at postoperative 1st, 2nd day and 1st week

VAS scores	Technique	n	Mean	Min	Max	SD	*P*-value *
Postoperative 1st day	TEP	50	3.2	2	6	1.12	0.001
	OL	47	5.6	2	8	1.02	
Postoperative 2nd day	TEP	50	2.5	1	4	O.75	0.03
	OL	47	4.2	2	6	0.85	
Postoperative 1st week	TEP	50	0.8	0	3	0.3	0.01
	OL	47	2.5	1	5	0.8	

Min: Minimum, Max: Maximum, SD: Standard deviation, *Student's t-test, VAS: Visual analogue scale, TEP: Laparoscopic totally extra-peritoneal herniorrhaphy, OL: Open Lichtenstein

Table 5: Return to normal work in days

Group	≤1 week	≤ 2 weeks	≤3 weeks	≤4 weeks	Mean (SD) days
TEP (n=50)	15 (30%)	28 (56%)	7 (14%)	0	9.2 (2.03)
OL (n=47)	3 (6.3%)	12 (25.5%)	26 (55.3%)	6 (12.6%)	14.8 (3.1)
P-value *	0.001	0.001	0.001		0.001

*Student's t-test, TEP: Laparoscopic totally extra-peritoneal, OL: Open Lichtenstein

Discussion

The usage of prosthetic mesh materials was responsible from the abrupt decrease in the rate of recurrence after herniorrhaphy from 35-40% to less than 2%. OL technique is considered the "gold standard" for IH repair and is gained wide acceptance all over the world [3]. Usage of laparoscopy in hernia surgery has been increased tremendously with the introduction of new operating techniques during the past three decades. Nowadays, two laparoscopic operative techniques as TEP and TAPP have been used widely in many centers. Prolonged hospital stay and post-operative pain are of more concern for patients immediately after surgery. In many studies, surgeons performing laparoscopic hernioplasty pointed out that there is decreased post-operative pain and short postoperative hospital stay as compared to OL repair [4]. In our single tertiary center, laparoscopic herniorrhaphy (TEP, TAPP) have been applied for six years. Open Lichtenstein repair constitutes the 70% of all IH operations in our institute.

Myers et al. [5] in their prospective study comparing open Lichtenstein and Laparoscopic TEP repairs reported that TEP group had significantly increased operation time, higher recurrence rate but lower incidence of chronic pain and wound infection. In our study group, in TEP group, two (4%) of 50

cases developed recurrence one of which early at first week and other at third month following surgery. They were indirect and direct hernias and recurrences were guessed to be due to inadequate dissection and reduction of indirect hernia sac and slipping of the polypropylene mesh into the direct hernia pouch. In OL group, recurrence was seen in three (6.38%) at third month of follow-up. The difference between two groups were statistically insignificant (P=0.40). Choi et al. [6] reported that scrotal extension of the hernia, large hernia defects and male gender were major risk factors of seroma formation after laparoscopic TEP repair. In our study group, minor complications as seroma (2%), hematoma (2%) and wound infection (4%) were detected in TEP patients. Seromas all resolved spontaneously before the last office visit. Patients operated with OL technique had 12 (25%) seroma, 3 (6.38%) hematoma, 3 (6.8%) wound infection. Compared with the TEP group, OL group had more seroma, hematoma seroma formation (P=0.001, P=0.01). The choices of operations for the treatment of recurrences in TEP group and OL group were open Lichtenstein herniorrhaphy and TEP repair respectively.

Sevinç et al. [7] in their comparative prospective study, stated that TEP repair had belter outcomes than open Lichtenstein in terms of chronic pain as 3.4% to 25.2%, respectively (P=0.001). In laparoscopic IH repairs, limited or no use of tucker or any fixating devices has been recommended to avoid postoperative or chronic pain in numerous studies [8]. In some investigations, less chronic pain has been reported for hernia repairs that did not use tacks; but there is a controversy in literature at this subject. Tam et al. [9] in their series concluded those no-fixation methods significantly decrease operative time, operation costs, and hospital stay time, but no difference between mesh fixation and no-fixation methods in terms of postoperative pain, complications, and hernia recurrence. In our TEP group, the VAS score on the first postoperative day was 3.2 (1.12), on the second postoperative day it was 2.5 (0.75) and 0.8 (0.3) on the seventh postoperative day. In OL group, the score on the first postoperative day was 5.6 (1.02), on the second postoperative day it was 4.2 (0.85) and 2.5 (0.8) on the seventh postoperative day. VAS scores were found to be lower in TEP group compared to OL group, the differences were statistically significant (P=0.001, 0.03 and 0.01, respectively). In accordance with literature, chronic pain was higher in OL group compared to TEP group (8.5% vs. 4%) (P=0.04). We have selectively used tacks or fixation devices with a minimum number just to the two or three areas as cooper ligament and over the symphysis pubis. In TEP group, one patient required referral to the pain team and in other it was well controlled with simple analgesia. In OL group, 4 patients (8.5%) suffered from chronic pain either resolved without treatment or were well tolerated with simple analgesia.

Koning et al. [10] reported higher recurrence rates in TEP repairs. Langeveld et al. [11] reported similar recurrence rates with a follow-up of 49 months. The recurrences after TEP repair are more commonly seen at the beginning of learning curve (LC) [11]. Hasbahceci et al. [12] in their study with 39 cases reported that at least 20 cases are required to learn anatomical knowledge and surgical pitfalls for performing TEP without conversion in early phase. In the guidelines of the European Hernia Society, the required range of LC of each surgeon is reported to be between 50 and 100 patients [13]. In our series, the surgeons were experienced with at least 100 cases but two (4%) recurrences were encountered. We can say that as the surgeon gets experience to get self-confidence about discrimination of anatomy and dissection plans, the recurrence rates of TEP procedure may decrease.

In our study, operating time was higher in TEP group when compared to OL group, the difference was statistically significant (55.68 (10.90) vs 39.44 (10.69) (P=0.001). However, it is clear that the operation time not only depends upon the surgical technique applied but also surgeon's experience, types and size of hernia, availability of laparoscopic instrumentations and currently available materials for repair. It is apparent that there is a controversy about this subject in literature. Khury et al. [14] reported that the operating time for TEP repair was longer than OL. While Bracale et al. [15] in their meta-analysis attributed this increased time to the need of dissection to create the preperitoneal working space. However, Sevinc et al. [7] stated that the mean operation time was shorter in TEP group with 49.2 (15.5) min vs 54.3 (14.6) min in OL group (P=0.004).

Choi et al. [6] in their study comparing laparoscopic TEP repair with OL technique reported that mean hospital stay is lower in TEP repairs (1.6 days in TEP, 3.2 days in OL). In our series, although statistically insignificant, mean hospital stay was lower in TEP group when compared to OL (22.6 (4.7) vs. 25 (6.4)) (P=0.11). However, hospital stay may be affected not only from patients' physical condition but also the hospital's turnover rate, psychological factors and traditional beliefs.

The study of TEP patients conducted by Reiner et al. [16] (n=783) showed that 583 patients (74.7%) returned to normal work ≤3 days with a median 3 days (range:1-41 days). In their prospective randomized long term study, Bansal et al. [17] reported that convalescence times of LIHR were shorter than conventional Lichtenstein repair. In our study group, the average time in TEP group to return to their routine work was 9.2 (2.03) (ranged: 6-18 days) while in OL group it was 14.8 (3.1) days (range: 7-26 days). In TEP group, 30% of patients returned to work within the 1th week. Our study showed that patients operated with TEP technique had early return to work compared to OL patients, the difference was statistically significant (P=0.001). TEP patients have better postoperative outcomes in terms of postoperative pain, early return to work.

Small sample size, short follow up period and usage of different types of anesthesia (General or spinal) in both groups were limitations of our study.

Conclusion

In terms of return time to work, postoperative pain, chronic pain, postoperative urinary retention, seroma formation and postoperative paresthesia sensation, laparoscopic TEP repair was found to be superior to the OL herniorrhaphy. More studies with large series and longer follow-up periods are still needed on the role of laparoscopy in repairing inguinal hernias.

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