

A Simple Technique to Close Peritoneal Tears in Laparoscopic Totally Extraperitoneal Hernioplasty: Extracorporeal Peritoneal Knotting

Laparoskopik Ekstraperitoneal Herni Tamirinde Periton Defektlerinin Kapatılmasında Kolay Bir Teknik: Ekstrakorporeal Periton Düğümleme

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ABSTRACT

Introduction: Peritoneal tear (PT) is a common surgical challenge in laparoscopic totally extraperitoneal (TEP) hernioplasty and the most common reason for conversion surgery. It prolongs the operation time and may cause serious complications. Therefore, rapid closure of PTs is essential.

Methods: This is a retrospective study of patients with PTs during TEP hernioplasty and PT closure using the extracorporeal peritoneal knotting (ECPK) technique. Patient demographics, operative findings, and the success of the technique were evaluated.

Results: The technique was successful in eight of the 10 patients. In two patients with a high body mass index (BMI), the technique failed, so an additional closure technique was required. No complications occurred, and conversion surgery was not required.

Conclusion: ECPK is an easy technique and does not require wide surgical experience and additional laparoscopic surgical devices. The success rate is high in patients with low BMI and may reduce the operation time compared with other peritoneal closure techniques.

Keywords: Extracorporeal peritoneal knotting, inguinal hernia, TEP, peritoneal tear, laparoscopy

ÖZ

Amaç: Periton defektleri (PD), laparoskopik total ekstraperitoneal (TEP) herni onarım cerrahisinde yaygın görülen problemlerdir ve açık cerrahiye geçişin en sık nedenidir. Ameliyat süresinin uzamasına ve ciddi komplikasyonların oluşmasına neden olabilirler. Bu nedenle PD'lerin hızlı bir şekilde kapatılması önemlidir.

Yöntemler: Bu çalışma TEP herni onarımı prosedürü sırasında oluşan PD'leri ekstrakorporeal peritoneal düğüm (EKPD) ile onarılan hastaları içeren retrospektif bir çalışmadır. Hastaların demografik özellikleri, reoperatif bulguları ve yöntemin başarısı değerlendirilmiştir.

Bulgular: EKPD tekniği 10 hastanın 8'inde başarılı olmuştur. Yüksek vücut kitle indeksi (VKİ) olan 2 hastada teknik başarısız olmuştur ve defektin kapatılması için ek yöntem gerekmiştir. Hiçbir hastada komplikasyon ve açık cerrahiye dönüş gözlemlenmemiştir.

Sonuç: EKPD tekniği ciddi bir cerrahi deneyim gerektirmeyen ve ek laparoskopik cerrahi aletlere ihtiyaç duyulmayan basit bir tekniktir. Düşük VKİ olan hastalarda daha başarılıdır ve diğer periton kapatma teknikleriyle karşılaştırıldığında ameliyat süresini kısaltabilir.

Anahtar Kelimeler: Ekstrakorporeal peritoneal düğümleme, inguinal herni, TEP, peritoneal defekt, laparoskopi

Introduction

Peritoneal tear (PT) is a frequent surgical problem, with an incidence of 47% in patients undergoing laparoscopic totally extraperitoneal (TEP) inguinal hernioplasty. Large scrotal hernias, history of inguinal region surgery, and surgical inexperience are risk factors (1). PT may

result in pneumoperitoneum. The loss of the surgical view prevents extensive peritoneal mobilization, which is the primary technical step of TEP inguinal hernioplasty (2). It is the most common reason for the conversion of TEP inguinal hernioplasty to other hernioplasty procedures (3). Most surgeons consistently have recommended the routine closure of



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PTs whenever feasible to prevent potential postoperative complications, such as bowel herniation and obstruction (1). However, there has not been a consensus about the location or size of peritoneal defects that require repair. Pretied suturing, loop ligation, endoscopic stapling, and endoscopic suturing are techniques for closing PTs. All methods are equally successful without complication. However, they prolong the operation time and require surgical experience. Thus, it is fundamental to initiate PT management with a laparoscopic approach to complete TEP inguinal hernioplasty successfully (3). In this study, we aimed to describe a new extracorporeal peritoneal knotting (ECPK) technique to close PTs during TEP inguinal hernioplasty.

Methods

This retrospective study enrolled patients who underwent elective TEP inguinal hernioplasty at the University of Health Sciences Turkey, İstanbul Training and Research Hospital, Clinic of Surgery between 2015 and 2019. The study included patients who developed PTs during surgery that were closed with the ECPK technique. Patient demographics, body mass index (BMI), perioperative findings, PT size, and procedure success were documented. Hernia types were identified intraoperatively according to the European Hernia Society (EHS) groin hernia classification system (4).

The study was approved by the Ethics Committee of University of Health Sciences Turkey, İstanbul Training and Research Hospital and was performed in accordance with the Declaration of Helsinki (approval number: 2569, date: 30.10.2020). Written informed consent was obtained from all patients.

Surgical technique

A standard technique of laparoscopic TEP procedure was performed, as previously described by Bittner et al. (1). Routine urinary catheterization was not performed, as the patients were asked to urinate before the surgery to empty the bladder. Moreover, 1 gram of cefazolin was given intravenously on the induction of general anesthesia. A 10 mm trocar was inserted into the preperitoneal space with a direct open access technique. Blunt dissection was performed with a 30° telescope to create an extraperitoneal space. Two 5 mm trocars were inserted at the midline between the first trocar and pubis under direct vision. Extensive preperitoneal dissection was performed by a combination of blunt stripping and dissection using sharp scissors. In female patients, the round ligament was preserved routinely.

When a peritoneal defect occurred, the defect site was clamped by a laparoscopic grasper (Figure 1a, b). The dissection was continued to provide adequate free space around it. If there was progressive loss of the working space, a Veress needle was inserted through the subumbilical incision into the peritoneal cavity to decrease the intraperitoneal pressure. Nevertheless, the whole pelvic floor dissection was as meticulously completed as possible. After sufficient free space was provided around the defect, gas insufflation was stopped and the preperitoneal area was desufflated. While the preperitoneal space was closing, the grasper holding the PT has removed gently into the skin from the nearest trocar incision (Figure 1c). The peritoneum was held under the defect with a mosquito forceps and knotted with 3-0 vicryl

stitch (Figure 1d). While the preperitoneal space was insufflated, the repaired peritoneum was pushed back into the operation field with a grasper (Figure 1e, f). Endoscopic stapling or suturing was performed when the ECPK technique failed. A polypropylene 12x15 cm mesh was placed and stapled with tacker clips to Cooper's ligament and the anterior abdominal wall. Suction drains were not used routinely.

Statistical Analysis

In the descriptive statistics of the data, mean, standard deviation, median, lowest value, highest value, frequency, and ratios were used. Statistical analyses were performed using SPSS Statistics for Windows (version 21.0, IBM Corp., Armonk, NY).

Results

The ECPK technique was performed on 10 patients (male: 7, female: 3). The mean age and BMI of the patients were 43.9 ± 3.3 years and 26.4 ± 1.6 kg/m², respectively. None of the patients had a history of inguinal hernia surgery. All had a unilateral inguinal hernia, with five on the right and five on the left side. The x groin hernia classification system was LII in three patients, LIII in four patients, and MclII in three patients. The median peritoneal defect size was 1 cm, which ranged from 1 cm to 3 cm. PT occurred during the dissection of the hernia sac from the spermatic cord or the round ligament. The technique was successful in eight patients. In two patients with BMI >30 kg/m², the peritoneal defect did not reach the extracorporeal area (Table 1). However, none of them required conversion to either transabdominal preperitoneal hernioplasty or open hernioplasty, in which PTs could be repaired with the endoscopic stapling technique. No significant postoperative surgical complications were recorded. All patients were discharged the day after the surgery.

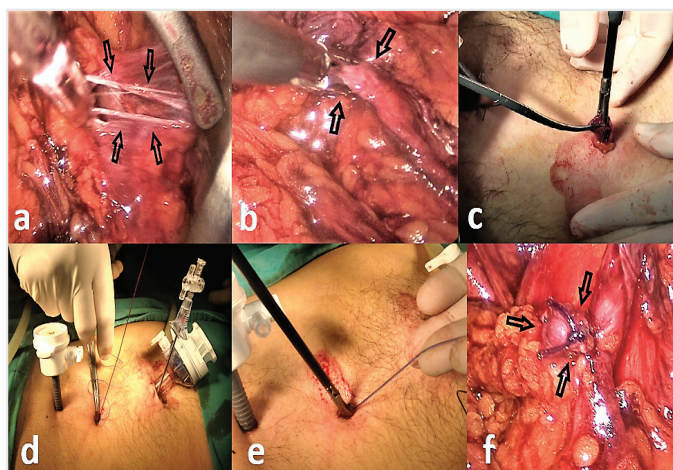


Figure 1. Surgical stages of the extracorporeal peritoneal knotting technique. a) Black arrows indicate a peritoneal defect. b) The peritoneal defect site was clamped by a laparoscopic grasper (black arrows). c) The peritoneal tear was removed gently into the skin from the nearest trocar incision. d) The peritoneum was held under the defect with a mosquito forceps and knotted with 3-0 vicryl stitch. e) While the preperitoneal space was insufflated, the repaired peritoneum was pushed back into the operation field with a grasper. f) Peritoneal tear after closing with extracorporeal peritoneal knotting technique

Discussion

Although reported rarely, PT is not a rare condition during hernioplasty procedures. Its incidence ranged from 0.4% to 67% and considered intraoperative complication, especially in TEP. It is the only disadvantage of the TEP procedures relative to open surgery (5) and is the most common reason for the conversion (3). It is two times more common in recurrent inguinal hernia surgery (2).

Three types of PTs are defined: Type I is a large tear that occurred early at the start of surgery and caused by balloon insufflation. Type II, which is the most common, is a small tear caused by blunt dissection of the hernia sac and peritoneum from the spermatic cord. Type III is created intentionally in congenital hernias. Conversion surgery is necessary for type I defects. More often, a type II defect does not affect the operative course, and the procedure is mostly completed with/without peritoneal decompression and closure of the PT (2). In a randomized multicenter trial, pneumoperitoneum developed in 7% of the patients with PT (1).

No consensus about the routine closure of PT that does not affect the operative course has been established. Some surgeons have reported that routine closure of PT is technically challenging and significantly prolonged the operation time. They believe that after desufflation, the redundant peritoneum folds upon itself and seals the PT quickly. In addition, they had not observed any intraoperative or postoperative complications during the early and long-term follow-up when they left it open in their series (2,6-8). By contrast, current guidelines (1) recommended closure of PTs whenever feasible to prevent potential complications such as adhesion and internal herniation. Meyer et al. (9) reported a laparoscopic pelvic exploration to repair a suspected PT (8).

Performing meticulous blunt traction and counter-traction with minimal use of sharp dissectors is the most crucial point to prevent PTs, especially during dissection of the hernial sac from the spermatic cord. Balloon dissection is considered during the learning period. However, the balloon is placed away from the scar tissue and distended with much less than the standard air volume or with saline in patients with the history of inguinal region surgery (1,10).

Surgical techniques for the closure of PTs are pretied suturing, loop ligation, endoscopic stapling, and endoscopic suturing. Lau et al. (3) found that all these techniques were equally successful without complication. Pretied suturing and loop ligation are safer than endoscopic suturing. However, it may be inadequate to close large defects and may need repeated interventions or an additional closure method (3). Endoscopic stapling is the fastest technique, but it is not suitable for large defects. Protrusion of staples into the peritoneal cavity may lead to visceral complications. Endoscopic suturing is the slowest to perform but the most effective method in patients with large defects. Nevertheless, laparoscopic suturing in a limited surgical space needs surgical experience and poses a minimal intraoperative complication such as vascular and visceral injury. Although an Endo stitch is a useful device for suturing within a minimal extraperitoneal space, it needs an additional 10 mm trocar and has a high cost (8) (Table 2).

The ECPK is a straightforward technique for repairing PTs and does not require surgical experience. In this technique, the PT is pulled out into the extracorporeal area and tied with simple knotting or per string method and then pushed into the preperitoneal area again. It did not have any complications. By contrast, it was more secure due to the removal of the peritoneal region with tears from visceral and vascular

Table 1. Patients with intraoperative peritoneal tear closed with the extracorporeal peritoneal knotting technique

Case	Age/sex	BMI	Side of hernia	Type of hernia*	Defect size (cm)	Success of technique
1	34/M	24	R	L2	1	+
2	36/M	26	L	Mc3	1	+
3	42/M	36	R	L3	1	-
4	26/M	34	R	L3	2	-
5	46/M	30	L	Mc3	1	+
6	56/M	24	L	Mc3	1	+
7	60/M	22	R	L2	2	+
8	41/F	20	L	L3	1	+
9	44/F	23	R	L2	1	+
10	54/F	25	L	L3	3	+

*European Hernia Society groin hernia classification, BMI: body mass index, M: male, F: female

Table 2. Comparison of peritoneal closing techniques during totally extraperitoneal hernioplasty

	Endoscopic stapling	Pretied suturing	Endoscopic suturing	Endo stitch suturing	ECPK
Easy	Yes	Yes	No	Yes	Yes
Quick	Yes	Yes	No	Yes	Yes
Cost-effective	No	No	Yes	No	Yes
Complication	Yes	No	Yes	No	No
Obesity	Yes	Yes	Yes	Yes	No

ECPK: Extracorporeal peritoneal knotting

structures during the repairing procedure. Moreover, there is no need for any additional expensive surgical tools. However, this technique has a low success rate among obese patients. The thickness of subcutaneous adipose tissues prevents adequate peritoneal displacement into the extracorporeal area (Table 2).

Conclusion

ECPK is a useful peritoneal closing technique, especially in patients with low BMI and minimal abdominal subcutaneous adipose tissue thickness. Surgeons even without experience can efficiently perform it without complications. The rapid application of the technique and non-requirement of additional surgical devices may provide a cost-effective solution to PTs during TEP procedures without increasing the operation time.

Ethics Committee Approval: The study was approved by the Ethics Committee of University of Health Sciences Turkey, İstanbul Training and Research Hospital and was performed in accordance with the Declaration of Helsinki (approval number: 2569, date: 30.10.2020).

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References

1. Bittner R, Arregui ME, Bisgaard T, Dudai M, Ferzli GS, Fitzgibbons RJ, et al. Guidelines for laparoscopic (TAPP) and endoscopic (TEP) treatment of inguinal hernia [International Endohernia Society (IEHS)]. *Surg Endosc* 2011; 25: 2773-843.
2. Shpitz B, Lansberg L, Bugayev N, Tiomkin V, Klein E. Should peritoneal tears be routinely closed during laparoscopic total extraperitoneal repair of inguinal hernias? A reappraisal. *Surg Endosc* 2004; 18: 1771-3.
3. Lau H, Patil NG, Yuen WK, Lee F. Management of peritoneal tear during endoscopic extraperitoneal inguinal hernioplasty. *Surg Endosc* 2002; 16: 1474-7.
4. Miserez M, Alexandre JH, Campanelli G, Corcione F, Cuccurullo D, Pascual MH, et al. The European hernia society groin hernia classification: simple and easy to remember. *Hernia* 2007; 11: 113-6.
5. Zhu X, Cao H, Ma Y, Yuan A, Wu X, Miao Y, et al. Totally extraperitoneal laparoscopic hernioplasty versus open extraperitoneal approach for inguinal hernia repair: a meta-analysis of outcomes of our current knowledge. *Surgeon* 2014; 12: 94-105.
6. Voeller GR, Lau H. Management of peritoneal tear during endoscopic extraperitoneal inguinal hernioplasty. *Surg Endosc* 2003; 17: 1335-6.
7. Ng WT. Should peritoneal tears be routinely closed during total extraperitoneal repair of inguinal hernias?. *Surg Endosc* 2006; 20: 1928-9.
8. Ng J, Cheng D. Management of peritoneal tear during endoscopic extraperitoneal inguinal hernioplasty. *Surg Endosc* 2003; 17: 1683.
9. Meyer A, Blanc P, Balique JG, Kitamura M, Juan RT, Delacoste F, et al. Laparoscopic totally extraperitoneal inguinal hernia repair: twenty-seven serious complications after 4565 consecutive operations. *Rev Col Bras Cir* 2013; 40: 32-6.
10. Ramshaw B, Shuler FW, Jones HB, Duncan TD, White J, Wilson R, et al. Laparoscopic inguinal hernia repair: lessons learned after 1224 consecutive cases. *Surg Endosc* 2001; 15: 50-4.