Real-World Experience of Totally Extraperitoneal Laparoscopic Inguinal Hernia Repair Using the Two-Port Technique

Ghassan Almaimani, MBBS, Facharzt (AC)*,**

ABSTRACT

Background and Aims: As an alternative to standard three-port laparoscopic totally extraperitoneal (TEP) hernia repair, a two-port technique has been developed to improve cosmetic outcomes and reduce port-related morbidities. The aim of this study was to describe real-world operative outcomes of patients treated with two-port TEP.

Design: This was a retrospective observational study.

Setting: Tertiary care center.

Methods: This was a single-center study. The charts of 90 patients undergoing laparoscopic TEP repair between January 2021 and January 2022 via the two-port method were reviewed. Operative time, hernia type, postoperative complications, hospital stay, and days taken to resume regular activity were recorded. Patients were followed up to one year. Data were analyzed using descriptive statistics.

Results: The mean total operative time was 38.7 (SD 5.5) minutes. No significant procedural blood loss was observed in any case. One case converted to the TAPP technique but there were no conversions to open surgery. All patients were discharged on the day of operation. Two patients died from COVID-19 between 6 and 12 months, but otherwise there were no recurrences nor chronic pain in any patient.

Conclusion: Two-port TEP is safe, effective, and can be performed with minimal recurrences and chronic pain. Obtaining excellent results using this technique requires adequate surgical experience and expertise, careful patient selection, and precise knowledge of the anatomy.

Keywords: Inguinal hernia, laparoscopic TEP, mesh repair, two-port

INTRODUCTION

There have been several advances in inguinal hernia repair over the last few years, and laparoscopic repair is still evolving. The advantages of laparoscopic hernia repair over conventional open repair are now established and include reduced postoperative pain and earlier recovery. Despite the description of a variety of laparoscopic techniques for the management of inguinal hernias [1, 2], totally extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) repairs are the most widely accepted approaches [3, 4], with a mesh prosthesis inserted dorsal to the transversalis fascia in the preperitoneal space in both. However, there is continuing interest in lessening surgical trauma and enhancing the esthetic result by reducing the number and size of portal incisions. Classical TEP requires three skin incisions for placement of three trocars [5]. *Nevertheless, the reported "two-port" technique has the added advantage of being* less invasive than classical TEP, producing a better cosmetic result and less postoperative pain. Here we report our experiences of performing laparoscopic TEP repair using a two-port technique.

METHODS

Study design and clinical cohort

This was a retrospective study of ninety laparoscopic TEP repairs conducted by the same surgeon between January 2021 and January 2022. Data were collected from the hospital's electronic medical records. Hernias were diagnosed based on the clinical history and examination together with ultrasound examination of the abdomen. The exclusion criteria were patients with bilateral or recurrent inguinal hernias. All patients provided informed consent. This study was conducted in compliance with the ethical standards of the responsible institution on human subjects as well as with the Helsinki Declaration. The biomedical research ethics committee approved the study protocol (number: HAPO-02-K-012-2024-02-1982).

Operative time, type of hernia, postoperative complications, hospital stay, and days taken to resume regular activity were recorded. All patients were offered the two-port technique using polypropylene mesh. All patients were seen in clinic at two weeks and six months, followed by phone follow-up at one year. During follow-up, patients were asked about hernia recurrence symptoms and chronic pain. Those who expressed concerns were requested to make a follow-up outpatient appointment for additional assessment.

Surgical technique

Patients were placed in the supine position with monitors placed at the end of the bed. The surgeon was positioned on the opposite side of the hernia. A second-generation cephalosporin was administered intravenously. After general endotracheal anesthesia, the abdominal skin was sterilized and draped. A 1 cm sub-umbilical incision was made and subcutaneous fat was dissected to expose the anterior rectus sheath (fascia). The fascia was then incised and rectus muscle fibers split to expose the posterior rectus sheath. This plane was then maintained, and a space was created inferiorly towards the pubic symphysis. A 10 mm Hasson's trocar was then introduced in this plane, followed by the

* Consultant Surgeon, Assistant Professor
Department of Surgery, Faculty of Medicine, Umm Al-Qura University
Makkah, Saudi Arabia, Email: dr.gaam@gmx.de

** Bergman Clinics Mathilden-Hospital, Büdingen, Germany.

optic (30° laparoscope) to confirm the plane, which was subsequently insufflated with carbon dioxide gas at 10 mmHg. Blunt telescopic dissection was performed under direct vision to create preperitoneal space. After developing the space, a second 5 mm port was placed under direct vision through the midline approximately 5 cm inferior to the first trocar (**Figure 1**). Gentle and meticulous dissection was performed to accurately identify all cord structures. Diathermy was used sparingly. Following reduction of the hernia sac, an appropriately sized polypropylene mesh (size: 15 × 10 cm) was chosen to cover the hernia defect, including the direct and indirect spaces. No mesh fixation was performed. Carbon dioxide was desufflated while the mesh was visualized to maintain proper alignment. The facial defects were closed. The skin incision was closed with absorbable sutures. All port sites were anesthetized with 0.5 % ropivacaine.

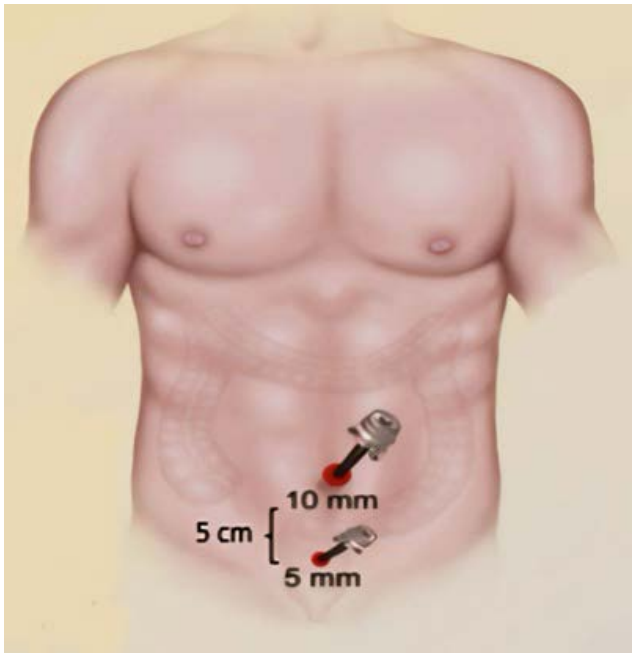

Figure 1. Ports placement on the midline below the umbilicus and spaced approximately 5 cm apart

RESULTS

The clinical characteristics of the study population are shown in **Table 1**. Ninety patients underwent elective primary laparoscopic TEP repair of inguinal hernias via the two-port technique. The study population consisted of 55 males and 35 females, none of whom had any previous abdominal surgery, with a mean age of 43.5 years (range 29-60 years). No patients had evidence of strangulation during preoperative examination.

Table 1. Clinical characteristics of the study population

Characteristic		Mean (SD) or N (%)
Age		43.5 (10.1)
	29-39	39 (43.3)
	40-49	20 (22.2)
	50-60	31 (34.4)
Sex	Male	55 (61.1)
	Female	35 (38.9)
Primary repair		90 (100)
Unilateral hernia		90 (100)
Direct		50 (55.6)
Indirect		32 (35.5)
Combined		8 (8.9)

The majority (55.6%) of hernias were direct inguinal hernias. No patient required additional ports, and there were no conversions to open surgery. One case converted to the TAAP technique because of an inadvertent peritoneal tear. The mean operating time was 38.7 min (range 32-50 min). There was no iatrogenic injury (bladder, vascular, or nerve injury) nor significant procedural blood loss in any case. All patients were discharged on the day of the operation. At discharge, all patients who were directly questioned stated that they were content with their quick and comfortable recovery. In addition, patients were pleased with the cosmetic results because the scars were barely noticeable.

The average time to resume normal activities was 5 ± 1 days. Only minor complications were noted postoperatively: three seroma cases, none of which required drainage and all of which resolved within two weeks of surgery after conservative management.

Of the 90 cases, all were followed up at 2 weeks and 6 months and 98% at 1 year (2 patients died following COVID-19 infection). No recurrences were reported at 2 weeks, 6 months, or 1 year. There were no reports of chronic pain up to 1 year in any patient.

DISCUSSION

The optimal procedure for inguinal hernia repair is still debated [6]. There are two standard techniques for laparoscopic groin hernia repair, TEP and TAPP. TEP has the advantage that the abdominal cavity remains intact, hence reducing the risk of intraabdominal injuries and adhesions [7]. Advantages of two-port TEP repair (compared with the three-port technique) have been reported in terms of patient acceptance, pain, and cosmesis. While several methodological variations are reported, they all follow the same common steps, as described here, which is safe but has some limitations. In cases where technical difficulties are anticipated or encountered, the two-port technique should not be used, so a feasibility assessment for the two-port technique is advisable, and difficult cases should routinely revert to the three-port method or even the

Table 2. Reports of laparoscopic TEP repair using two-port technique.

Author	Cases	Mean age	Operating time for unilateral repair	Additional port	Conversion	Early complication	Chronic pain	Hernia recurrence
Current study	90	43.5	38.7	Nil	1	3	Nil	Nil
Anandaravi et al (2019) [17]	45	45.4	48.5	3	1	5	Nil	1
Fuglestad et al (2016) [18]	336	47	38.7	20	2	17	3	11
Iuamoto et al (2015) [19]	9	Not mentioned	29.9	Nil	Nil	Nil	Not mentioned	Not mentioned

open technique. Also, in case of intraoperative bleeding, there should be a low threshold to convert to the standard three-port technique.

Gentle instrument handling and meticulous dissection are essential for safe and successful completion of the procedure. Mesh fixation in the preperitoneal space is a widely debated issue [3], with several methods described. Some surgeons prefer to use titanium tacks to reduce the surgical time and postoperative pain, while others prefer to use tissue glue to fix the mesh in place. Suture fixation of the mesh is technically more challenging and time-consuming in such a small space, and several studies have recommended no mesh fixation due to concerns about persistent pain [8, 9]. Also, mesh fixation in TEP is associated with increased operative cost [10]. In our study, it was decided not to fix the mesh to reduce the risk of chronic pain and recurrence, and no mesh migration was apparent in our cohort since there were no reports of recurrence nor chronic pain at 12 months. A crucial factor for ensuring the success of TEP is successful insufflation of the preperitoneal space. If the peritoneum is breached during this procedure, gas enters the peritoneal cavity, bulging the peritoneum into the operative field and narrowing the field of vision and surgery, a common reason for TEP failure. However, in such cases, inserting a Veress needle at Palmer's point helps to deflate the peritoneum and facilitate the remaining surgery [3, 11]. However, this can be associated with other complications including gastric or transverse colon puncture and omental injury. In this study, because pneumoperitoneum was accidentally created in one case, we chose to use the TAPP approach instead of inserting a Veress needle at Palmer's point to decompress the pneumoperitoneum to avoid these issues.

The recurrence rate after TEP repair is generally low, ranging from 1 to 5% over 5 to 10 years of follow-up [12-14]. However, some studies have reported higher recurrence rates, particularly in patients with recurrent or complex hernias [15]. Recurrence rates are a favored outcome factor for evaluating surgical technique for inguinal hernia repair [16].

Several studies have examined laparoscopic TEP repair using the two-port technique (**Table 2**) [17-19]. Overall, our results were comparable with previous studies. Luamoto et al. [19] reported the first two-port laparoscopic TEP repairs in nine cases in 2015. Anandaravi et al. [17] reported a series of 45 patients treated via two access ports by a single surgeon, in which technical success was 93.4% with three conversions to the three-port procedure, and recurrences occurred in 2.2% of patients within a minimum follow-up time of 3 months. Another study assessing long-term outcomes from single surgeon in 336 patients using the two-port technique reported a 2.3% recurrence rate at 10 years [18]. While we detected no recurrences after 12 months, follow-up was relatively short, and Barbaro et al. [20] demonstrated that 33% of TEP recurrences occur after 10 years. An inexperienced surgeon, inadequate myopectineal orifice dissection, insufficient mesh size, type of mesh used, a failure to cover unidentified hernia defects, mesh folding permitting peritoneal slippage, and mesh dislodgement secondary to hematoma formation are well-defined factors that contribute to recurrence [21]. While there is no evidence that fixing the mesh affects recurrence rates [2], creating a space wide enough for the mesh to overlap all potential herniation sites with complete coverage of the myopectineal orifice is essential for preventing recurrence. While recurrence rates have significantly improved with TEP, it is still unknown whether these gains result in improved long-term recurrence rates.

Because the two-port TEP technique does not require a second surgeon, its costs are lower than other techniques. In comparison to the classical technique, TEP also spares trocars, suture material, and wound dressings [19], further positively impacting financial and cosmetic outcomes.

This study has a several limitations. As noted above, the follow-up was relatively short, so we cannot comment on recurrences occurring over the longer term. This was also a single-institution, retrospective study, so the results may not be generalizable. The decision to exclude patients with bilateral or recurrent inguinal hernias was based on: (1) the potential to introduce confounding variables, (2) their treatment approaches often differ from those for single, primary hernias, leading to less comparable outcomes, and (3) the often complex medical histories and surgical needs also introduce significant heterogeneity that would limit the interpretability of the findings. Nevertheless, future, larger-scale studies could consider an extended patient population.

CONCLUSION

The laparoscopic TEP approach using a two-port technique is safe and effective with negligible complications and recurrences. Obtaining excellent results using this technique requires adequate surgical technique, surgical experience and expertise, careful patient selection, and precise knowledge of the anatomy.

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