The effect of transverse fascia inversion on postoperative seroma in direct hernias treated with laparoscopic TAPP procedure

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AIM: *This study aims to reveal the results of the transverse fascia inversion technique applied in laparoscopic transabdominal preperitoneal (TAPP) procedure to reduce the risk of seroma in direct hernias.*
MARIAL AND METHODS: *Patients who underwent elective inguinal hernia repair with the laparoscopic TAPP procedure were retrospectively evaluated. Indirect inguinal or femoral hernias and emergency operations were excluded, and only patients with direct or indirect + direct inguinal hernia were included in the study. The patients were divided into two groups as those with and without transverse fascia inverted. Operative and postoperative clinical features were compared.*
RESULTS: *Sixty-two patients with 75 inguinal hernias were included in our study. Six of the patients were women. Thirty-one patients had a right inguinal hernia, 18 patients had left, and 13 patients had a bilateral inguinal hernia. The operation time was longer in the inversion group, but this was not statistically significant. One-day postoperative pain and postoperative hospital stay were similar in the two groups. In the inversion group, the peritoneal breach occurred in 4 patients, and gonadal vessel injury occurred in 1 patient (p = 0.435, p = 0,376, respectively). When postoperative complications are examined, there was no statistical difference between subcutaneous emphysema, urinary retention, and hematoma development (p>0.005); however, seroma formation was lower in the inversion group (p = 0.031).*
CONCLUSION: *Inversion and fixing the direct hernia pouch to the cooper ligament reduces the risk of seroma formation in the laparoscopic TAPP procedure.*

KEY WORDS: Direct hernia, Laparoscopy, Seroma, Transabdominal preperitoneal procedure

Introduction

Inguinal hernia repair remains one of the most common operations performed by general surgeons. Inguinal hernia repair techniques such as the reduction and resection of the hernia sac and the reinforcement of the inguinal canal's posterior wall by approximating its muscles and facial components have been used since the 16th century [1]. After that, many hernia repair procedures have been described. The tension-free repair with prosthetic mesh utilization commenced in the 20th century [2]. Minimally invasive inguinal hernia repair techniques, another treatment modality, were first applied in the early 1980s and entered the scientific literature. These are the laparoscopic transabdominal preperitoneal (TAPP) and totally extraperitoneal (TEP) techniques, which are still widely used today [2].
Although open Lichtenstein repair is still the most common procedure, current literature has shown no difference in safety or efficacy for the treatment of inguinal hernias between TAPP, TEP, and Lichtenstein procedures [2]. The most crucial advantage of laparoscopic techniques is reducing the number of return-to-work days [1]. However, several studies suggest that minimally invasive inguinal hernia repair techniques have a higher postoperative incidence of seroma than Lichtenstein repair [3,4].

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The most troubling problem with postoperative seroma is that patients and physicians perceive this as representing the hernia's early postoperative recurrence [5]. Therefore, it is essential to prevent the development of this annoying seroma formation. This article retrospectively examined whether transverse fascia inversion during laparoscopic TAPP repair reduces the risk of seroma in direct hernias.

Material and methods

Patients

The patients who underwent laparoscopic TAPP procedure between December 2018 to September 2020 at Selahaddin Eyyubi State Hospital and Cukurova University Balcalı Hospital were retrospectively analyzed. The results of direct hernia repair with/without transverse fascia inversion in laparoscopic TAPP procedure were compared by examining the patients' medical records.

Open repaired hernias, hernias repaired as part of another procedure, and emergency surgeries were excluded from the study. Also, all femoral hernias and indirect hernias were excluded. Only the patients with direct or indirect+direct (mixt) inguinal hernia were included in the study. The patients were diagnosed with inguinal hernia using clinical examination and ultrasonography.

The demographic and clinical characteristics of the patients were analyzed.

ASA scores have been determined from the patient files. Hernia diameters were determined according to preoperative ultrasonography. We classified the complications of inguinal hernias according to the European Hernia Society [6]. Postoperative one-day pain was evaluated according to the visual analog scale [7]. Postoperative seroma diagnosis was made by physical examination and pain based on direct questioning when the patients came to move stures. Ultrasonography was also performed in patients with pain or suspicion of seroma. Long-term follow-up data such as recurrence and chronic inguinal pain were collected from clinical examinations at a later visit to our policlinic.

Technical Details

A 10 mm supraumbilical toracar for scope and two 5 mm sub-umbilical trochars were placed at the outer edge of the right and left rectus abdominous muscle. In unilateral hernias, the working trocar on the hernia side was placed slightly above the navel level, and the trocar on the opposite side approximately 2 cm below the navel. In bilateral hernias, the working trocars were placed symmetrically. Later, the patient was placed in the reverse Trendelenburg position of about 20 degrees and 15-20 degrees on the hernia's opposite side. After that, visceral organs, if any, were returned to the abdomen.

Peritoneal Incision and Pre-Paration of the Preperitoneal Region

Superior anterior iliac spine (SIAS) level was checked outside the abdomen. The peritoneum was held at SIAS level with the curved grasper in the surgeon's left hand, and the peritoneum was opened with the hook in the right hand of the surgeon. The peritoneum was opened approximately 3-4 cm above the hernia in an "S" shape as far as the median umbilical ligament. At this stage, care was taken not to injure the epigastric vessels. Peritoneal dissection was performed laterally up to the external iliac vessels and medially, approximately 2 cm below and 2 cm medial to the cooper ligament. Finally, the central compartment was dissected. The hernia sac was removed from the inguinal canal structures by blunt and sharp dissection with scissors or energy devices.

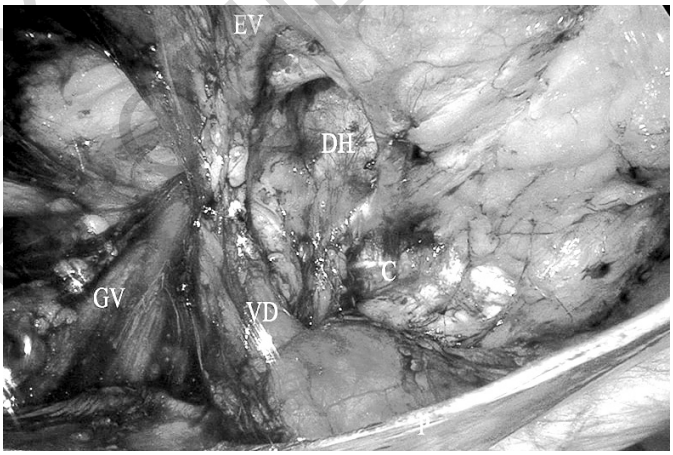

Fig. 1: Intraoperative image of the direct hernia defect. C: Cooper's ligament, DH: Direct hernia, EV: Epigastric vessels, VD: Vas deference, P: Peritoneum.

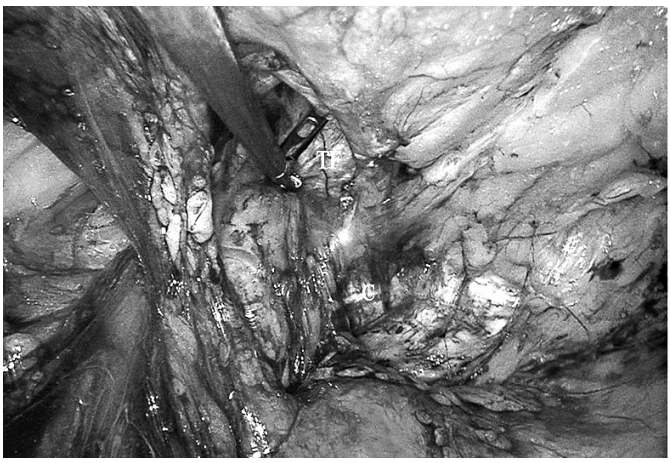

Fig. 2: Intraoperative image of keeping the transversalis fascia with grasper. TF: Transversalis fascia, C: Cooper's ligament.

Peritoneal dissection was performed inferiorly until the ductus deferens angled towards the pelvic cavity until the reverse "V" image made by the gonadal vein and ductus deferens in the medial compartment was fully revealed (Fig. 1).

Transverse Fascia Invertion

The transverse fascia was held on with a grasper in the hernia sac (Fig. 2); It was inverted and fixed to the cooper ligament with tucker (Figs. 3, 4). In some cases, we applied externally, pushing the hernia sac into the abdomen to facilitate the transverse fascia's inversion.

Preparation of the Mesh, Mesh Fixation, and Peritoneal Closure

A 15×15 prolene mesh was used to close the myopectineal orifice. The mesh that will come to the medial side was cut as 14 cm, and the region coming to the lateral detachment was cut as 11 cm. The mesh was fixed to the cooper ligament with tuckers. The mesh fixation was completed by inserting tucker (Fig. 5). Then the peritoneum was closed. If there was a peritoneal breach, we close it with an energy device or sew it with a Vicryl suture.

Fig. 3: Intraoperative image shows the inversion of the transversalis fascia.

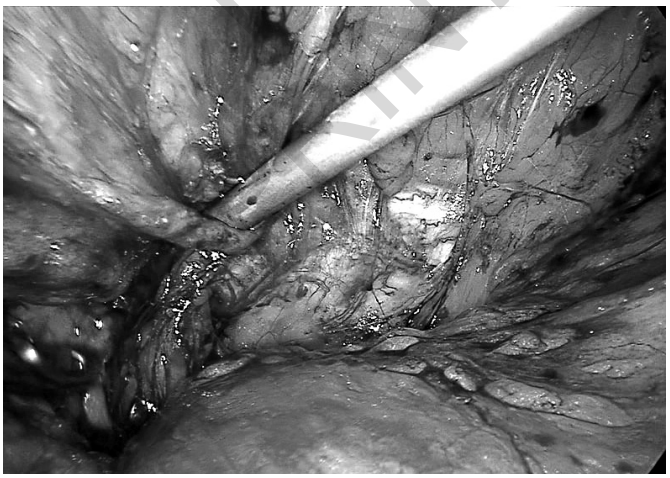

Fig. 4: Fixation of transversalis fascia to Cooper's ligament with tucker.

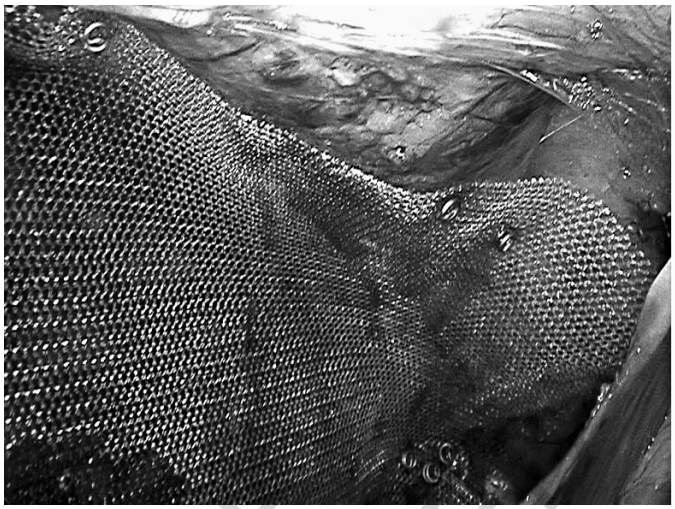

Fig. 5: Representation of mesh placement.

Statistical Analysis

SPSS 24.0 package program (Statistical Package for the Social Sciences, IBM Corp., Armonk, NY, USA) was used to analyze the data. Categorical measurements were summarized as numbers and percentages, and continuous measurements as mean and standard deviation (median and minimum-maximum where necessary). Shapiro-Wilk test was used as a normal distribution test. Chi-square and Fisher Exact tests were used to compare categorical parameters. Mann-Whitney u test was used in binary variables for parameters that did not show normal distribution. The statistical significance level was taken as 0.05 in all tests.

Results

Sixty-two patients with 75 hernias were included in our study. Six of them were women. The patients' demographic characteristics are given in Table I. Thirty-one patients had a right inguinal hernia, 18 patients had left, and 13 patients had a bilateral inguinal hernia. Forty-two patients had a direct hernia, 20 patients had a mixed hernia. Hernia diameters varied between 20 mm and 34 mm in preoperative ultrasonography.

While laparoscopic TAPP hernia repair was performed in 27 patients, the transverse fascia was not inverted

TABLE I - *Demographic Features of patients*

Variables		Group 1 (n:27)	Group 2 (n:35)	p
Age (Med) (%95CI)		61 (45-68)	58 (48-63.5)	0.495
Sex	Male	25 (92.6%)	31 (88.6%)	0.689
	Female	2 (7.4%)	4 (11.4%)	
ASA classification	ASA I	8 (29.6%)	13 (37.1%)	0.383
	ASA II	18 (66.7%)	18 (51.4%)	
	ASA III	1 (3.7%)	4 (11.4%)	
Lateralisation	Right side	13 (48.1%)	18 (51.4%)	0.394
	Left side	10 (37.0%)	8 (22.9%)	
	Bilateral	4 (14.8%)	9 (25.7%)	
Hernia type	Direct hernia	19 (70.4%)	23 (65.7%)	0.788
	Direct+indirect	8 (29.6%)	12 (34.3%)	
Defecet size mm (Med) (%95CI)		28 (20-32)	28 (25-34)	0.312

TABLE II - *Clinical Features of patients*

Variables		Group 1 (n:27)	Group 2 (n:35)	p
Procedure time (Med) (%95CI)		65 (55.06-75)	75 (67.5-85)	0.062
One-day postoperative pain (Med) (%95CI)		2 (1-2)	2 (2-2)	0.384
Postoperative hospital stay (Med) (%95CI)		1 (1-1)	1 (1-1)	0.443
Operative complication	Inferior epigastric arterial injury	1 (3.7%)	0 (0%)	0.435
	Peritoneal breach	2 (7.4%)	4 (11.4%)	0.689
	Gonadal vessel injury	0 (0%)	1 (2.9%)	0.376
	Conversion	0 (0%)	0 (0%)	NA
Pooperative complication	Subcutaneous emphysema	2 (7.4%)	2 (5.7%)	0.788
	Urinary retention	3 (11.1%)	2 (5.7%)	0.645
Chronic groin pain		1 (3.7%)	0 (0%)	0.435

TABLE III - *Comparison of seroma-hematoma and recurrence rates between groups (n:75)*

Variables	Group 1 (n:31)	Group 2 (n:44)	p
Seroma	4 (12.9%)	0 (0%)	0.031
Hemoatoma	2 (6.4%)	0 (0%)	0.186
Recurrence	2 (6.4%)	0 (0%)	0.186

(Group 1). In 35 patients, it was inverted and fixed to the Cooper ligament with tucker (Group 2). There was no difference in demographic characteristics between the two groups (Table I).

The operation time was longer in the inversion group, but this was not statistically significant. One-day postoperative pain and postoperative hospital stay, and chronic groin pain were similar in the two groups. None of the patients had a conversion to open surgery (Table II). During the operation; In group 1, 1 patient had an inferior epigastric arterial injury, and two patients had peritoneal breach. In group 2, the peritoneal breach occurred in 4 patients, and gonadal vessel injury occurred in 1 patient (all p>0.005). Also, there was no statistically significant difference between the two groups in terms of subcutaneous emphysema and urinary retention (p = 0.788, p = 0.645, respectively) (Table II).

Of the 75 hernias, seroma was seen in 4 and hematoma in 2, all of which were in group 1 (p = 0.031 and p = 0.186, respectively). In a total of 14 months of follow-up, recurrence was seen in 2 patients, and both patients were in group 1 (p = 0.186) (Table III).

Discussion

The postoperative seroma rate reported after inguinal hernia repair ranges from 0.5 to 12.2% [8,9]. Some meta-analyses have noted higher seroma formation following minimally invasive procedures than open hernia repair [3,10,11]. In the study conducted by Zanghi *et al.,* seroma developed in 8.8% of TAPP procedures and in 8.2% of TEP procedures [12]. In two recent randomized controlled trials, significantly more seroma was reported following TEP repair versus TAPP [13,14]. According to some authors, in patients undergoing laparoscopic repair, the seroma rate can be detected in >50% of cases when ultrasound scanning is used [15-17]. They suggest that the remaining tissue spaces after dissection of the hernia sac are filled with fluid secretion. HerniaSurge Group stated that surgeons should only accept seroma as a postoperative complication when it is symptomatic and only symptomatic seromas need to be treated [2]. Similarly the

literature, in our study, we considered postoperative collections as seroma when it was symptomatic or detected by physical examination.

Larger hernia defects and direct hernias were significant risk factors of seroma [17]. Many techniques such as vacuum drains, subcutaneous sutures, fibrin glue, and compression bandages have been reported to reduce postoperative seroma incidence. However, most of these methods are generally insufficient [18]. A randomized controlled trial comparing TAPP repair with lightweight mesh versus heavyweight mesh found significantly lower seroma rates in the lightweight group [19]. We would like to state that we use standard prolene mesh (heavyweight) for all of our patients. Besides, we did not use drains or do physical compression to the location of the hernia.

As expected, small inguinal hernias have a lower risk of seroma rate. Indirect inguinal hernia shows a curtain-like closure after the hernia sac is removed from the inguinal canal. In contrast, a direct hernia defect will persist in the transverse fascia after mesh reinforcement. The presence of this cavity may cause seroma formation. Various technical modifications have been reported in the literature to prevent. Reddy *et al.* recommend the inversion of the extended transverse fascia and fixation with tacks to the pubic bone to reduce seroma formation. The authors found the rate of postoperative seroma on direct hernias was 4.17% after the TAPP procedure which the transverse fascia has inverted [5]. In contrast, they found this rate as 14.29% in the group without inversion. In another study, Berney recommends using a Röder loop [20]. The author reported that the Röder loop connected the inverted transverse fascia. In this way, the entrance to the medial hernia sac can be closed, and the sac may close wholly reduced. Alternatively, the inverted transverse fascia can be fixed to Cooper's ligament with a suture and the hernia sac wholly reduced in the same manner [21]. Likewise, Usmani *et al.* found that seroma rates were lower in patients who underwent TAPP and TEP in patients whose transverse fascia was inverted and fixed to the cooper ligament [22].

In a recent article by Pini *et al.*, all 51 patients who operated on robotic surgery and whose direct hernia pouch was closed did not develop seroma [23]. Using these techniques, seroma formation can be prevented entirely for a large medial inguinal hernia in both TEP and TAPP [17]. In our study, the transverse fascia was fixed to the cooper ligament with tacker. The inversion was performed in 44 hernias, it was not performed in 31 hernias, and no seroma development was observed in the inverted group. We found that this fixation can safely reduce the risk of postoperative seroma.

There may be concern about the painful consequences of attaching the transversalis fascia to the pubic bone. Some studies have reported a high incidence of chronic postoperative inguinal pain (9.8% to 22.5%) after laparoscopic direct hernia repair [24,25]. Generally, the cause of chronic postoperative pain is due to neural injury due to the suture or tucker used while mesh fixation is performed. It is unclear whether this incidence of pain will increase with transverse fascia inversion or not. Pini *et al.* found no chronic pain developed in their series with transverse fascia inverted [23]. None of the patients developed chronic pain in the laparoscopic transverse fascia inversion technique with the Rödar loop performed by Berney [20]. We would like to declare that only one of our patients had chronic pain, and this patient was in group 1 (non-fixation group). Also, one-day postoperative pain values were similar in both groups. This shows us that this inversion does not cause severe complications as feared.

The large direct hernia is associated with a higher incidence of recurrence after laparoscopic repair due to insufficient overlap of the mesh, and it has been suggested that mesh fixation is required during TAPP and TEP repair in large inguinal hernias [26]. Mesh contraction of the herniated defect and inadequate prosthesis overlap are among the main causes of hernia recurrence, and this is particularly important in large direct inguinal hernia repair [27]. With large direct defects, the risk of a mesh protrusion increases [26]. Therefore, we think transverse fascia inversion and fixation effectively prevent mesh protrusion and make mesh fixation easier and permanent. Li *et al.* find that the hernia sac was directly inverted and fixed to the Cooper ligament, and no recurrence or chronic pain developed in any of the patients [18]. In our study, we would like to state that although it was not statistically significant, no recurrence occurred in the inversion group.

Conclusion

It is essential to explain the possibility of postoperative seroma to the patient before surgery to prevent anxiety. In conclusion, closing the direct hernia pouch with transverse fascial inversion reduces postoperative symptomatic seroma formation.

Acknowledgments

We would like to thank Professor Doctor Yusuf Yagmur for teaching us about advanced laparoscopic techniques.

Riassunto

Scopo dello StudiO: Questo studio mira a controllare i risultati della tecnica di inversione della fascia trasversale applicata nella procedura laparoscopica transaddominale preperitoneale (TAPP) per ridurre il rischio di sieroma nelle ernie dirette.

Materiale e Metodi: I pazienti sottoposti a riparazione elettiva dell'ernia inguinale con la procedura laparoscop-

ica TAPP sono stati valutati retrospettivamente. Sono state escluse le ernie inguinali o femorali indirette e gli interventi di emergenza e sono stati inclusi nello studio solo i pazienti con ernia inguinale diretta o indiretta + diretta. I pazienti sono stati divisi in due gruppi come quelli con e senza fascia trasversale invertita. Le caratteristiche cliniche operative e postoperatorie sono state confrontate. RISULTATI: Sessantadue pazienti con 75 ernie inguinali sono stati inclusi nel nostro studio. Sei dei pazienti erano donne. Trentuno pazienti avevano un'ernia inguinale destra, 18 pazienti avevano un'ernia inguinale bilaterale e 13 pazienti avevano un'ernia inguinale bilaterale. Il tempo di intervento era più lungo nel gruppo di inversione, ma questo non era statisticamente significativo. Il dolore postoperatorio di un giorno e la degenza ospedaliera postoperatoria erano simili nei due gruppi. Nel gruppo di inversione, la rottura peritoneale si è verificata in 4 pazienti e la lesione del vaso gonadico si è verificata in 1 paziente (p = 0,435, p = 0,376 rispettivamente). Quando vengono esaminate le complicanze postoperatorie, non c'era differenza statistica tra enfisema sottocutaneo, ritenzione urinaria e sviluppo di ematoma (p> 0,005); tuttavia, la formazione di sieroma era inferiore nel gruppo di inversione (p = 0,031).
CONCLUSIONE: L'inversione e il fissaggio della sacca per ernia diretta al legamento di rame riduce il rischio di formazione di sieroma nella procedura TAPP laparoscopica.

References

1. Lyu Y, Cheng Y, Wang B, Du W, Xu Y: *Comparison of endoscopic surgery and Lichtenstein repair for treatment of inguinal hernias: A network meta-analysis.* Medicine (Baltimore), 2020; 99: e19134.

2. HerniaSurge Group: *International guidelines for groin hernia management.* Hernia, 2018; 22: 1-165.

3. Schmedt CG, Sauerland S, Bittner R: *Comparison of endoscopic procedures vs Lichtenstein and other open mesh techniques for inguinal hernia repair: A meta-analysis of randomized controlled trials.* Surg Endosc, 2005; 19: 188-99.

4. Grant AM: *Laparoscopic versus open groin hernia repair: meta-analysis of randomised trials based on individual patient data*. Hernia, 2002; 6: 2-10.

5. Reddy VM, Sutton CD, Bloxham L, Garcea G, Ubhi SS, Robertson GS: *Laparoscopic repair of direct inguinal hernia: A new technique that reduces the development of postoperative seroma.* Hernia, 2007; 11: 393-6.

6. 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.

7. Bodian CA, Freedman G, Hossain S, Eisenkraft JB, Beilin Y: *The visual analog scale for pain: clinical significance in postoperative patients.* Anesthesiology, 2001; 95: 1356-61.

8. Bhangu A, Singh P, Pinkney T, Blazeby JM: *A detailed analysis of outcome reporting from randomised controlled trials and meta-analyses of inguinal hernia repair.* Hernia, 2015; 19: 65-75.

9. 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.

10. 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.

11. Bittner R, Sauerland S, Schmedt CG: *Comparison of endoscopic techniques vs Shouldice and other open nonmesh techniques for inguinal hernia repair: A meta-analysis of randomized controlled trials.* Surg Endosc, 2005; 19: 605-15.

12. Zanghì A, Di Vita M, Lo Menzo E, Castorina S, Cavallaro AS, Piccolo G, et al.: *Multicentric evaluation by Verbal Rate Scale and EuroQoL-5D of early and late post-operative pain after TAPP and TEP procedures with mechanical fixation for bilateral inguinal hernias.* Ann Ital Chir, 2011; 82: 437-42.

13. Bansal VK, Misra MC, Babu D, Victor J, Kumar S, Sagar R, et al.: *A prospective, randomized comparison of long-term outcomes: Chronic groin pain and quality of life following totally extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) laparoscopic inguinal hernia repair.* Surg Endosc, 2013; 27: 2373-82.

14. Krishna A, Misra MC, Bansal VK, Kumar S, Rajeshwari S, Chabra A: *Laparoscopic inguinal hernia repair: transabdominal preperitoneal (TAPP) versus totally extraperitoneal (TEP) approach: a prospective randomized controlled trial.* Surg Endosc, 2012; 26: 639-49.

15. Berney CR: *The Endoloop technique for the primary closure of direct inguinal hernia defect during the endoscopic totally extraperitoneal approach.* Hernia 2012; 16:301-05.

16. Köckerling F: *Die evidenzbasierte TEP-Technik [Evidence-based TEP technique].* Chirurg, 2017; 88: 288-95.

17. Usmani F, Wijerathne S, Malik S, Yeo C, Rao J, Lomanto D: *Effect of direct defect closure during laparoscopic inguinal hernia repair ("TEP/TAPP plus" technique) on postoperative outcomes.* Hernia, 2020; 24: 167-71.

18. Pini R, Mongelli F, Proietti F, Cianfarani A, Garofalo F, Di Giuseppe M, et al.: *Suture and Fixation of the Transversalis Fascia during Robotic-Assisted Transabdominal Preperitoneal Hernia Repair to Prevent Seroma Formation after Direct Inguinal Hernia Repair.* Surg Innov, 2020; 16: 1553350620960976.

19. Hindmarsh AC, Cheong E, Lewis MP, et al.: *Attendance at a pain clinci with severe chronic pain after open and laparoscopic inguinal hernia repairs*. Br J Surg, 2003; 90: 1152:154.

20. Kumar S, Wilson RG, Nixon SJ, et al.: *Chronic pain after laparoscopic and open mesh repair of groin hernia*. Br J Surg, 2002; 89: 1476-479.

21. Bittner R, Schwarz J: *Inguinal hernia repair: Current surgical techniques.* Langenbecks Arch Surg, 2012; 397:271-82.

22. Silvestre AC, Mathia GBD, Fagybdes DJ, Medeiros LR, Rosa MI: *Shrinkage evaluation of heavyweight and lightweight polypropylene meshes in inguinal hernia repair: A randomized controlled trial. Hernia.* 2011; 15:629-34.