



# The effect of absorbable vs. non-absorbable fixation on early complications in laparoscopic transabdominal preperitoneal (TAPP) inguinal herniorrhaphy

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## Abstract

**Aim:** This study has compared the postoperative pain, scrotal edema, seroma, bleeding or other complications between two patient groups getting laparoscopic transabdominal preperitoneal (TAPP) herniorrhaphy and where absorbable and non-absorbable fixations (3/0 prolene suture) were used in mesh fixation compared with such complications as hematoma, urinary retention, and recurrence.

**Materials and Methods:** 44 male patients getting laparoscopic TAPP herniorrhaphy method were included in this study. According to the material used for mesh fixation, they were divided into two groups getting absorbable or non-absorbable fixations. The age, gender, hernia type and direction according to the Nyhus Classification, and the fixation material used intraoperatively were all recorded for patients. 1<sup>st</sup> week, 1<sup>st</sup> month and 6<sup>th</sup> month postoperative checks were made. Early complications at the postoperative period were compared between groups. Patients gave written and informed consent before surgery.

**Results:** Of the 44 patients, absorbable fixation devices were placed in 27 and non-absorbable ones in 17. At the 1<sup>st</sup> week follow-up, scrotal edema was diagnosed in 3 patients in the absorbable group and in 2 in the non-absorbable; seroma in 5 patients in the absorbable group and in 2 in the non-absorbable; mild pain in 3 patients in the absorbable group and in 5 in the non-absorbable. A significant relationship was not statistically found between the presence or absence of scrotal edema, or of seroma, pain intensity and the fixation material used ( $p>0.05$ ).

**Conclusion:** A significant difference was not found when early complications were statistically compared between the patients getting laparoscopic TAPP herniorrhaphy and having used absorbable and non-absorbable fixation devices. It seems both fixation materials can be used safely.



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## Introduction

Inguinal hernia, the protrusion of internal organs or intra-abdominal fatty tissue or femoral canal due to a congenital or acquired defect, is observed in lifetime frequencies ranging from 27 to 43% in men and 3 to 6% in women. Its repair is one of the most common surgical procedures globally performed on more than 20 million people [1]. Clinically, inguinal hernias present in most of the patients, and surgical therapy is definitive [2]. A small proportion of patients are asymptomatic, but even with clinical observation, 70% of these patients undergo surgery within five years [2-3].

Early postoperative complications of hernia surgery include pain, scrotal edema, ecchymosis, bleeding or hematoma. When compared with open surgery, the laparoscopic technique results in shorter hospital stays.

As yet, a variety of techniques have been used for repairing inguinal hernia. Initially, open repair techniques were common, but advanced surgical techniques and prosthetic devices led to the adoption of laparoscopic techniques in the early 1990s to reduce recurrence and complications [4]. Over the past several years, hernia repair via laparoscopy has become the most preferred choice because of very low recurrence rates, less than 1% [5].

TAPP and TEP repairs are the most frequently used techniques in repairing hernia by laparoscopy. These methods use a preperitoneal space for mesh placement. The fixation device used to secure the mesh is an area of research,

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and there is still no "gold standard method" [6-9]. Non-absorbable fixators are commonly used to secure the mesh; however, various studies have reported the use of such absorbable fixators as sutures, clips, fibrin glue, and n-butyl-2-cyanoacrylate [10-11].

This study has compared early postoperative complications like pain, scrotal edema, seroma, bleeding or hematoma, urinary retention, and recurrence between the patient groups getting TAPP inguinal hernia repair with absorbable and non-absorbable fixations (3/0 prolene suture). Due to the limited number of studies done on this topic, this study aims at shedding light on the discussion regarding the impact of using non-absorbable and absorbable sutures for mesh fixation on early complications.

## Materials and Methods

This study received approval from the Ethics Committee of Clinical Research at Süleyman Demirel University, Faculty of Medicine, with the decision numbered 352 and dated December 29, 2023. The study was conducted at the General Surgery Clinic at Isparta City Hospital.

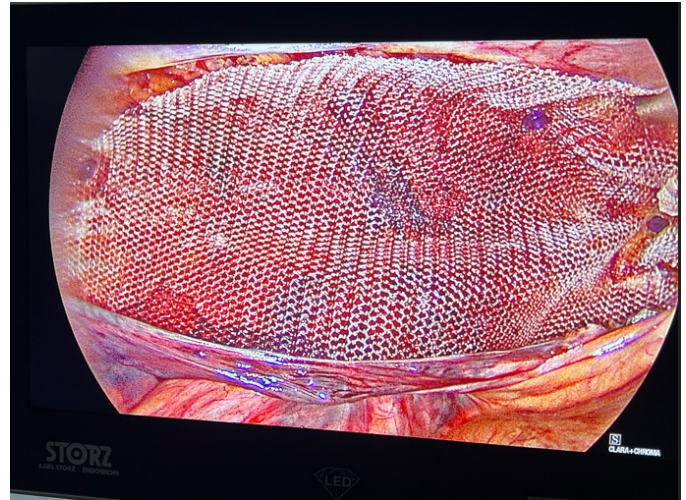
Forty-four male patients having presented with an inguinal hernia and applied to the General Surgery Clinic at Isparta City Hospital between March 2023 and November 2023 were included in this retrospective study, and underwent laparoscopic Transabdominal Preperitoneal (TAPP) inguinal hernia repair. Patients were divided into two groups vis-a-vis the fixation material used for mesh fixation; absorbable tackers or non-absorbable sutures. The age, gender, hernia type and direction (according to the Nyhus Classification), and the intraoperative fixation material used were recorded for all patients. Postoperative follow-ups were conducted through direct face-to-face outpatient examinations at the 1<sup>st</sup> week and 1<sup>st</sup> month, and via telephone calls at the 6<sup>th</sup> month. Complication rates were recorded. Pain was evaluated by using the Visual Analog Scale (VAS), where 0 point represented no pain, and 10 points represented the most severe pain. According to this scale, 0 points no pain, 1-3 points have represented the mild pain, 4-7 points the moderate pain, and 8-10 points the severe pain. Of the 44 patients, 36 reported no pain at the 1-week follow-up, while 8 patients rated their pain between 1 and 3 (mild pain) on the VAS scale. Early postoperative complications (pain, scrotal edema, seroma, bleeding or hematoma, urinary retention, and recurrence) were compared between two groups. The study included postoperative follow-ups at 1<sup>st</sup> week, 1<sup>st</sup> month, and 6 month. All patients provided written informed consent before the operation.

Inclusion criteria for the patients with unilateral inguinal hernia, getting elective surgery, and with an American Society of Anesthesiologists (ASA) score of I or II as evaluated by anesthesiologists were to be from 20 to 85 years.

Exclusion criteria were patients with recurrent or bilateral inguinal hernias, incarcerated or strangulated hernias, systemic or local infections, known ascites, heart or kidney failure, hypoalbuminemia, and contra-indications for general anesthesia or laparoscopy.

*Surgical procedure: Laparoscopic transabdominal preperitoneal (TAPP) herniorrhaphy*

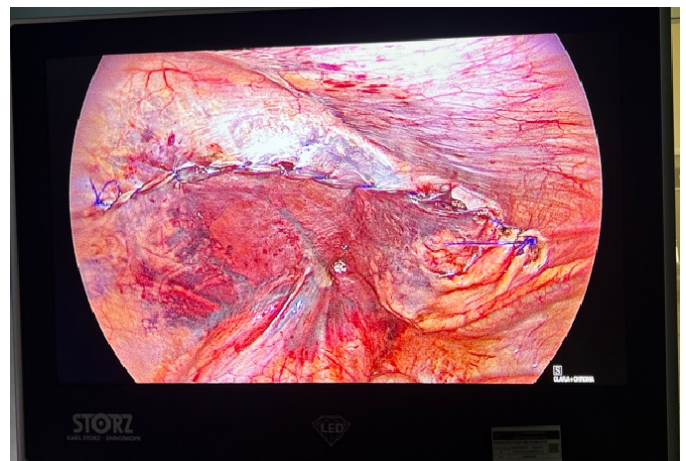
All patients underwent the same standard surgical procedure. Following the induction of standard general anesthe-



**Figure 1.** Fixing the mesh with absorbable material.



**Figure 2.** Fixing the mesh with non-absorbable material.



**Figure 3.** Repair of the peritoneum with prolene.



sia, a urinary catheter to be removed after the postoperative day was routinely placed in patients. After the routine laparoscopic surgical preparations, it was entered into the abdomen by using a Veress needle at the Palmer point, and pneumoperitoneum was created with CO<sub>2</sub> up to 14 mm Hg. A small incision of 1 cm was given below the umbilicus, and a 10 mm trocar was inserted into the abdomen together with a 10 mm 30° laparoscopic camera. The patient was placed in the Trendelenburg position. Two 0.5 cm incisions were given on both sides of the umbilicus, 4-5 cm lateral to the rectus muscles, one on the contralateral side in line with the optical port and the other with the ipsilateral port 2 cm above the optical port. Additionally, two 5 mm trocars were inserted into the abdomen. The peritoneal flap was prepared starting 2 cm superomedial to the anterior superior iliac spine, passing 4 cm proximally from the hernia sac medially. The hernia sac was dissected from the surrounding tissues and reduced into the abdomen. Such anatomical structures as symphysis pubis, Cooper’s ligament, and inferior epigastric vessels were identified. After the reduction of the hernia sac, vas deferens and other cord structures were protected. After the satisfactory anatomical boundaries and control of potential hernia sites, a 15 x 10 cm polypropylene mesh (Prolene; Supro mesh Istanbul, Turkey) was prepared and introduced into the abdomen through the subumbilical camera trocar. The mesh was adequately placed to cover all hernia margins and the entire myopectineal orifice. In some patients, it was fixed with absorbable fixation (AbsorbaTack 5 mm Covidien, USA) (Figure 1) and in others with non-absorbable one at three points (3/0 polypropylene Prolene; Filaprop Meril Gujarat, India) (Figure 2) above the symphysis pubis, to the anterior abdominal wall, and 2 cm superomedial to the anterior superior iliac spine. The peritoneal opening was closed in all patients by using a continuous suture technique with 2/0 polypropylene suture (Prolene; Filaprop Meril Gujarat, India) (Figure 3). After releasing the intra-abdominal CO<sub>2</sub> and removing all trocars, the fascial layer at the 10 mm trocar site was closed with routine 1 Vicryl suture (Nevolactine; Betatech Istanbul, Turkey). Postoperatively, all patients received the same analgesics: 1 g paracetamol three times a day and 100 mg tramadol hydrochloride twice a day. All patients were discharged on the second postoperative morning. 50 mg dexketoprofen trometamol tablets were recommended to take once a day until the third postoperative day.

*Statistical analysis*

According to the output of the G\*Power 3.1.9.7 used for power analysis, when the effect size is taken as 0.8, the number of samples to be collected is 42 and the power of the study is calculated as 81.7%.

Data were transferred to IBM SPSS.23 (IBM Inc., Chicago, IL, USA) for statistical analysis. Before the statistical analysis, checks were performed to ensure that there were no data entry errors and the parameters were within the expected range (Assumption 1 for the Independent Samples T). Descriptive statistics like mean and standard deviation were carried out for continuous variables, while categorical variables were given as counts (n) and percentages (%). The Chi-square test was applied for the

comparison of categorical variables. The Shapiro Wilk’s test was used to check out normal distribution of continuous variables (Assumpiton 2 for the Independent Samples T) , and Levene’s test was used to measure the variance homogeneity (Assumpiton 3 for the Independent Samples T). Comparisons were carried out between two the groups (Assumpiton 4 for the Independent Samples T) by using the Independent Samples T test for normally distributed data. A significance level of p<0.05 was considered for all analyses.

**Results**

A total of 44 male patients were included in the study. Nine patients had right direct hernias, 14 with right indirect hernias, 3 with right pantaloon hernias; 6 patients had left direct hernias, 6 with left indirect hernias, and 6 with left pantaloon hernias. Absorbable fixation was used in 27 patients, and non-absorbable fixation in 17 patients.

At the 1-week postoperative check-up, 5 patients were found to have scrotal edema, and 7 patients had seroma. No recurrences, bleeding, hematoma, or urinary retention were detected. 8 patients reported mild pain, while 36 reported no pain.

At the 1-month and 6-month check-ups, no complications were detected in any of the patients. The symptoms of the 5 patients with scrotal edema and 7 patients with seroma at the 1-week check-up resolved without any intervention by the 1-month check-up. The pain symptoms in 8 pa-

**Table 1.** General information about patients; hernia type and direction, fixation material used, total number of complications.

| Hernia Type and Direction | n  | %    |
|---------------------------|----|------|
| Right- Direct             | 9  | 20.5 |
| Right- Indirect           | 14 | 31.8 |
| Right- Pantaloon          | 3  | 6.8  |
| Left- Direct              | 6  | 13.6 |
| Left- Indirect            | 6  | 13.6 |
| Left- Pantaloon           | 6  | 13.6 |
| Absorbable/Non-absorbable |    |      |
| Absorbable                | 27 | 61.4 |
| Non-Absorbable            | 17 | 38.6 |
| Scrotal Edema             | 5  | 11.4 |
| Pain Severity             |    |      |
| Mild                      | 8  | 18.2 |
| None                      | 36 | 81.8 |
| Seroma                    | 7  | 15.9 |

**Table 2.** Age information of patients.

| Patient age |       |        |     |     |                         |
|-------------|-------|--------|-----|-----|-------------------------|
| Mean        | SD    | Median | Min | Max | Confidence Interval 95% |
| 53.36       | 15.63 | 56.5   | 21  | 83  | 48.61-58.12             |

(SD: Standard Deviation, Min: Minimum, Max: Maximum).

**Table 3.** Comparison of early postoperative complications between groups.

| Early Postoperative Complications n(%) | Group          |            | p                  |
|--|----------------|------------|--------------------|
|  | Non-Absorbable | Absorbable |                    |
| Scrotal Edema n(%)                     | 2(11.8)        | 3(11.1)    | 0.947 <sup>a</sup> |
| Pain Severity n(%)                     |                |            |                    |
| Mild                                   | 5(29.4)        | 3(11.1)    | 0.227 <sup>a</sup> |
| None                                   | 12(70.6)       | 24(88.9)   |                    |
| Seroma n(%)                            | 2(11.8)        | 5(18.5)    | 0.689 <sup>a</sup> |
| Patient Age (Mean±SD)                  | 48.59±14.13    | 6.37±16.03 | 0.100 <sup>b</sup> |

<sup>a</sup>: Chi-Square Test <sup>b</sup>: Independent. Samples T test. (SD: Standard Deviation, p : p values).

tients resolved completely without the need for analgesic medication by the 1-month check-up (Table 1).

The average age of the patients was 53.36±15.63 years. The youngest was 21, and the oldest was 83 years old (Table 2).

When the complications observed in the early postoperative period were examined, no significant difference was statistically found between the groups in terms of scrotal edema, pain severity, and seroma rates ( $p>0.05$ ) (Table 3).

## Discussion

Statistically, significant differences were not found In this study between patients getting Laparoscopic Transabdominal Preperitoneal (TAPP) inguinal hernia repair with absorbable and non-absorbable fixation devices in terms of early complications (pain, scrotal edema, seroma, bleeding or hematoma, urinary retention, and recurrence), demonstrating that both fixation devices can be safely used for mesh fixation.

The fundamental principle of inguinal hernia repair is to dissect and reduce the hernia sac, ligate it, and place a mesh to reinforce the posterior wall layer of the abdomen. The high levels of pain following the traditional open inguinal hernia repair detained the return to daily activities, and cosmetic issues led to the emergence of minimally invasive surgical procedures [12-13].

Since the introduction of the laparoscopic inguinal hernia repair in the 1990s, the results have been promising, especially in terms of reduced postoperative pain and earlier return to daily activities, making closed techniques more preferred among surgeons and patients [14-15].

TAPP and TEP repairs are the worldwide-used laparoscopic techniques for inguinal hernia repair. After the dissection of the hernia sac, both techniques used the preperitoneal space for mesh placement. The mesh is then secured to the surrounding tissues using various fixation devices [16-17].

In this study, we applied the Laparoscopic TAPP hernioplasty technique to 44 patients who presented to the outpatient clinic with inguinal hernia.

The fixation of the mesh associated with significant vascular and neurological complications postoperatively is the most crucial step in inguinal hernia repair [16-17].

In order to secure the mesh to the anterior abdominal wall, such different devices as the transabdominal sutures (absorbable or non-absorbable), titanium tacks, fibrin glue, synthetic sealants, and absorbable tacks were used, each with its own advantages and disadvantages [18-20]. The strongest fixation technique was to use the sutures among these. However, surgical tacks have been used more frequently as they provide sufficient fixation strength [6-9,21-22].

Moreover, various studies Express that tacks have lower infection rates and intra-abdominal adhesion formation compared to sutures [6,22].

Adhesive mesh has been suggested as a non-invasive fixation technique. However, it is significantly associated with lower fixation strength and more intense inflammatory reactions compared to tacks [23-24].

In this study, we also compared early complications between patient groups who underwent mesh fixation with non-absorbable suture material and absorbable tacks.

Titanium is biologically compatible with humans but is not absorbable by tissues; therefore, titanium tacks remain in the body after fulfilling their function. They have also been associated with nerve entrapment, erosions in the bowel and other hollow organs, and dense adhesions [25]. A few studies have reported chronic pain in 14 % of the cases following the use of titanium tacks for mesh fixation [26-27].

It seems that nerve injury is the most common cause of pain during laparoscopic repair, most frequently affected nerves being the lateral femoral cutaneous nerve of the thigh in approximately 0.1%-10% of the cases, and less frequently the genitofemoral nerve, iliohypogastric nerve, and ilioinguinal nerve [28]. Nerve damage typically occurs due to the nerve entrapment resulting from the placement of the tack [29].

One of the most significant complications of the laparoscopic hernia repair is the acute and chronic pain to be developed postoperatively following mesh fixation. Non-fixation of the mesh has been tried to reduce costs, but the risk of mesh migration has increased as it is reported in various cases in the literature [30].

In this study, pain levels were compared between patient groups getting TAPP hernia repair and mesh fixation with absorbable fixation versus non-absorbable fixation, and statistically found no significant relationship between pain severity and the fixation material used.

Like this, studies comparing the suture and the tack fixations for mesh in ventral hernias have shown no difference in postoperative pain between suture and tack fixation [9,31].

In literature, the rate of seroma-hematoma development after inguinal hernia surgery has been reported to be 16.2 % in the first week postoperatively, 1.9% in the first month, and 0% in the third month [32].

A few meta-analyses have reported that the incidence of seroma formation is significantly higher after endoscopic

and laparoscopic TAPP/TEP repairs compared with the open hernia repair [33-36].

One of the studies has suggested that hematoma or seroma formation following TAPP hernioplasty is usually due to multiple sutures, penetrating trauma, and incomplete hemostasis. While a small hematoma can resolve on its own, a large hematoma or seroma may require reoperation or drainage if it becomes infected [11].

Another study has found that seromas were the most common complication following TAPP repair of scrotal hernias [37].

A recent meta-analysis comparing the mesh fixation with tissue glue versus tack fixation for laparoscopic inguinal hernia repair has reported no difference in seroma formation [38].

In our study, no hematomas were detected at the 1-week follow-up, and seromas were observed in a total of 7 patients, 2 of whom had non-absorbable fixation and 5 had absorbable fixation. All seromas resolved spontaneously by the 1-month follow-up without any intervention. Although more patients in the absorbable fixation group had seromas, there was statistically no significant relationship between the presence of seromas and the fixation material used.

Urinary retention has been reported in 2-7% of cases following laparoscopic inguinal hernia repair in various publications [39-40]. In our study, no patients experienced urinary retention. We attributed this to routinely inserting a urinary catheter for patients preoperatively after they were anesthetized on the operating table and removing it on the first postoperative day.

Reported recurrence rates after laparoscopic inguinal hernia repair range from 0 % to 4 % [41]. One of the studies involving the use of different materials for peritoneal closure has also reported no recurrences [39]. In this study, no recurrences of inguinal hernia were observed in any of our patients after 6 months of follow-up.

## Conclusion

This study has shown that there is no significant difference in early postoperative complications between patients getting Laparoscopic Transabdominal Preperitoneal (TAPP) inguinal hernia repair with absorbable and non-absorbable fixation materials. Both fixation methods seem to be safe and effective with low rates of such complications as pain, scrotal edema, and seroma.

For further research with larger populations of the patients and longer follow-up periods, it is necessary to validate these findings and guide the clinical practice in choice of fixation materials for laparoscopic inguinal hernia repair.

## Ethical approval

This study was approved by the Ethics Committee of Clinical Research at Süleyman Demirel University, Faculty of Medicine, with the decision dated December 29.2023 and numbered 352.

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