# Laparoscopic Total Extraperitoneal (TEP) Inguinal Hernia Repair Using 3-dimensional Mesh Without Mesh Fixation

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**Background:** Approximately one fifth of patients suffer from inguinal pain after laparoscopic total extraperitoneal (TEP) inguinal hernia repair. There is existing literature suggesting that the staples used to fix the mesh can cause postoperative inguinal pain. In this study, we describe our experience with laparoscopic TEP inguinal hernia surgery using 3-dimensional mesh without mesh fixation, in our institution.

**Materials and Methods:** A total of 300 patients who had undergone laparoscopic TEP inguinal hernia repair with 3-dimensional mesh in VKV American Hospital, Istanbul from November 2006 to November 2015 were studied retrospectively. Using the hospital's electronic archive, we studied patients' selected parameters, which are demographic features (age, sex), body mass index, hernia locations and types, duration of operations, preoperative and postoperative complications, duration of hospital stays, cost of surgery, need for analgesics, time elapsed until returning to daily activities and work.

**Results:** A total of 300 patients underwent laparoscopic TEP hernia repair of 437 inguinal hernias from November 2006 to November 2015. Of the 185 patients, 140 were symptomatic. Mean duration of follow-up was 48 months (range, 6 to 104 mo). The mean duration of surgery was 55 minutes for bilateral hernia repair, and 38 minutes for unilateral hernia repair. The mean duration of hospital stay was 0.9 day. There was no conversion to open surgery. In none of the cases the mesh was fixated with either staples or fibrin glue. Six patients (2%) developed seroma that were treated conservatively. One patient had inguinal hernia recurrence. One patient had preperitoneal hematoma. One patient operated due to indirect right-sided hernia developed right-sided hydrocele. One patient had wound dehiscence at the umbilical port entry site. Chronic pain developed postoperatively in 1 patient. Ileus developed in 1 patient.

**Conclusions:** Laparoscopic TEP inguinal repair with 3-dimensional mesh without mesh fixation can be performed as safe as repair with tack fixation.

**Key Words:** laparoscopic, TEP, 3-dimensional mesh, mesh fixation

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Laparoscopic surgery is a surgical technique with increasing popularity due to the current preference of the majority of patients for minimally invasive procedures. In hernia surgery, the major advantage of laparoscopic technique is less postoperative pain. These advantage provide a shorter period of convalescence and better cosmetic results.[1–3] Hernia repair with laparoscopic transabdominal preperitoneal and total extraperitoneal (TEP) techniques increase the quality of life by reducing nerve damage and consequent chronic pain.[4–6] The European Hernia Society recommends TEP technique instead of transabdominal preperitoneal due to a lesser risk of visceral injury, port site hernia, and ileus.[7] Approximately one fifth of patients suffer from inguinal pain after laparoscopic TEP inguinal hernia repair.[6,8,9] Even though this pain is usually mild, in some patients it may be severe enough to warrant algology consultation and to limit their professional activities.[10] There is existing literature suggesting that the staples used to fix the mesh can cause postoperative inguinal pain. There is an association between the area of the staples and that of inguinal pain. In a study, after the removal of staples inguinal pain subsides.[11] In this study, we describe our experience with laparoscopic TEP inguinal hernia surgery using 3-dimensional mesh without mesh fixation, in our institution.

## MATERIALS AND METHODS

A total of 300 patients who had undergone laparoscopic TEP inguinal hernia repair with 3-dimensional mesh in VKV American Hospital, Istanbul from November 2006 to November 2015 were studied retrospectively. Using the hospital's electronic archive, we studied patients' selected parameters, which are demographic features (age, sex), body mass index, hernia locations and types, duration of operations, preoperative and postoperative complications, duration of hospital stays, cost of surgery, need for analgesics, time elapsed until returning to daily activities and work. In this article, the duration of surgery is defined as the time elapsed between the first incision and the last suture; the duration of hospital stay represents total number of night stays in the hospital in the postoperative period; the need for analgesics is defined the number of tablets used after discharge.

## RESULTS

Demographic characteristics of the patients are depicted in Table 1. Mean duration of follow-up was 48 months (range, 6 to 104 mo). Ninety-seven of patients had right sided, 66 had left sided, and 137 had bilateral inguinal hernia. Perioperative data are summarized Table 2. In total there were 437 inguinal hernia in 300 patients; of those 4 (0.92%) of all hernia were incarcerated and all of them were right sided. Patients who had recurrent inguinal hernia, had previously undergone open surgery. All surgeries were performed under general anesthesia. There was no conversion to open surgery. In none of the cases the mesh was fixated with either staples or fibrin glue. In 7 patients (2.3%) peritoneum was incised accidentally during surgery; these operations continued laparoscopically after peritoneal

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**TABLE 1.** Demographics

| | Data [n (%)] |
|---|---|
| No. patients | 300 |
| No. hernias | 437 |
| Age [mean (range)] (y) | 50.5 (19-96) |
| Sex | |
| Male | 268 (89.4) |
| Female | 32 (10.6) |
| ASA risk class | |
| 1 | 100 (33.3) |
| 2 | 150 (50) |
| 3 | 50 (16.7) |
| BMI (kg/m$^2$) | |
| Underweight | 5 (1.6) |
| Normal weight | 126 (42) |
| Overweight | 140 (46.7) |
| Obesity | 29 (9.7) |

ASA indicates American Society of Anesthesiologists; BMI, body mass index.

**TABLE 2.** Perioperative Characteristics

| | Data |
|---|---|
| Type of hernia [n (%)] | |
| Right indirect | 112 (25.63) |
| Right direct | 85 (19.46) |
| Right pantaloon | 25 (5.73) |
| Right femoral | 5 (1.14) |
| Right recurrent | 7 (1.6) |
| Left indirect | 107 (24.48) |
| Left direct | 74 (16.93) |
| Left pantaloon | 13 (2.97) |
| Left femoral | 1 (0.23) |
| Left recurrent | 8 (1.83) |
| Mean operative time (min) | |
| Bilateral hernia | 55 |
| Unilateral hernia | 38 |
| Length of stay (d) | |
| 0 | 30 |
| 1 | 270 |

incisions were sutured with vicryl sutures. No urinary catheter was placed during surgery and urinary retention did not develop in any of the patients postoperatively. Routine first generation cephalosporin prophylaxis was applied to all patients preoperatively and no antibiotic was given postoperatively. There was no infection in any of the patients postoperatively. At the end of the operations, 100 mg bupivacain hydrochloride was injected into the preperitoneal area through the trocars, in all patients. Postoperatively 6 patients (2%) developed seroma that were treated conservatively; they were all resolved in 6 months. One patient had inguinal hernia recurrence 3 years after the operation and was treated Liechtenstein hernia repair. One patient who was on Coumadin due to chronic atrial fibrillation developed preperitoneal hematoma 2 days after surgery and treated with open drainage. One patient operated due to indirect right-sided hernia developed right-sided hydrocele 3 months after surgery and subsequently was treated with hydrocelectomy. One patient had wound dehiscence at the umbilical port entry site and was treated primary saturation. A 78-year-old female patient with a history of abdominal surgery who was operated due to right-sided incarcerated femoral inguinal hernia developed ileus due to adhesions and laparoscopic bridotomy was performed. One patient who was operated due to right-sided femoral and left-sided direct inguinal hernia developed chronic right-sided inguinal pain; patient's electromyography showed mild partial denervation of right femoral nerve; patient's pain-related complaints were resolved in 9 months. The mean number of total analgesic tablets patients used after discharge was 10 (range, 0 to 40). Postoperatively the time elapsed until returning to daily activities was 1.2 days (range, 0 to 3 d) and to work was 4.2 days (range, 1 to 20 d). The cost of mesh used in surgery to patient was $380. The cost of tucker used for fixation of the mesh to patient was $680 in our hospital.

## DISCUSSION

In this retrospective review of 437 hernia repair of 300 patients we found that our patients had less chronic pain, shorter operative time, shorter hospital stay, rapid return to daily activities and work and low cost compared with the literature.

The incidence of chronic pain ranges from 9% to 22% in patients after laparoscopic TEP repair with mesh fixation.[11–14] The Guidelines of International Endohernia Society reported that the risk of acute and chronic pain after staple mesh fixation is higher than nonfixation.[15] In a meta-analysis, Sajid et al[16] showed that nonfixation of mesh decreased the potential risk of nerve entrapment. A randomized clinical trial by Taylor et al[17] found that mesh fixation was associated with a higher incidence of pain. According to our experience using anatomically contoured 3-dimensional mesh without fixation has a very low risk of neuropathic problems. In our study only 1 patient with right femoral hernia has chronic pain. We identified mild partial right femoral nerve denervation at electromyography test. Complete resolution of the pain was observed 9 months but the patient needed painkillers only 20 days after surgery.

Hernia recurrence rate is one of the most important parameters for evaluating different types of techniques. Our recurrence rate (0.3%) is significantly lower than previously reported series.[1,2,18,19] The recurrence developed on only 1 patient after 3 years from surgery and was repaired by open (Lichtenstein) hernia repair technique. The patient was 67 years old and had benign prostatic hyperplasia. Many factors such as inadequate dissection, missed hernias, surgeon's inexperience, insufficient mesh size, insufficient mesh overlap of hernia defects, improper fixation, folding or twisting of the mesh, mesh lifting may lead to the recurrence.[20] We suggest that preperitoneal $CO_2$ deflation must be under direct visualization to avoid mesh migration at the end of laparoscopy.

Mean hospital stay was 0.9 day in our study. Ten percent (30 patients) of the operations being performed as outpatient surgery because of the patients' choice. Twenty of the outpaient surgeries was performed for unilateral hernias and others for bilateral hernias. Hospital stay actually depends on many factors other than the surgical technique or results, like local traditions, health care finance, and the patient factors like reliable attendant and distance from hospital.[21]

It should be stated that the authors were experienced in laparoscopic TEP hernia surgery. This may lead to the lower recurrence rate and complication rate of our study.

In conclusion, laparoscopic TEP inguinal repair with 3-dimensional mesh without mesh fixation can be performed as safe as repair with tack fixation.

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