

# Necrotizing appendicitis after transabdominal preperitoneal (TAPP) inguinal hernia

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## ABSTRACT

Inguinal hernia repair is one of the most common surgical procedures in general surgery. In the treatment of inguinal hernia, the transabdominal preperitoneal (TAPP) laparoscopic approach appears to be a suitable alternative to open inguinal hernia repair, provided that it is performed by a classic experienced surgeon. Although it has many advantages over open inguinal hernia repair, laparoscopic surgery has complications. Laparoscopic appendectomy was performed in a patient who had undergone bilateral inguinal hernia repair 4 months earlier due to intermittent sub-ileus complaints, which resulted from the development of clinical appendicitis during general surgery for clinical sub-ileus; during laparoscopic exploration, necrotic distal part of the appendix cleaved into the mesh. Although closure of the peritoneum with tacker in TAPP hernioplasty saves time, it requires much attention because incomplete closure may cause cleaving of intra-abdominal organs into the mesh.

**Keywords:** Appendicitis; hernia; inguinal; laparoscopic.

## Introduction

The frequency of inguinal hernia ranges between 3% and 8%. High incidence of this disease makes the inguinal hernia repair one of the most common surgical procedures.<sup>[1]</sup> Inguinal hernia surgery gained a different aspect with the implementation of laparoscopic surgery in this field. Besides, laparoscopic methods are accepted worldwide and implemented in many centres with success. In laparoscopic inguinal hernia repair, the defect in inguinal region and all potential hernia regions is supported with a prosthesis material (mesh) without causing any tension. There are various advantages of inguinal hernia repairs. For instance, it

is a laparoscopic approach, postoperative pain and infection risk is lower, patients may return back their daily activities in shorter time, and cosmetic appearance is better.<sup>[2]</sup>

There are two methods, which are used widely in laparoscopic inguinal hernia repair. One of them is total extra-peritoneal preperitoneal (TEP), and the other is transabdominal preperitoneal (TAPP) hernia repair. Although it has many advantages over open inguinal hernia repair, laparoscopic surgery also has complications. According to many studies, which compare open and laparoscopic inguinal hernia repair, laparoscopic inguinal hernia repair is a suitable alternative primarily in repeating



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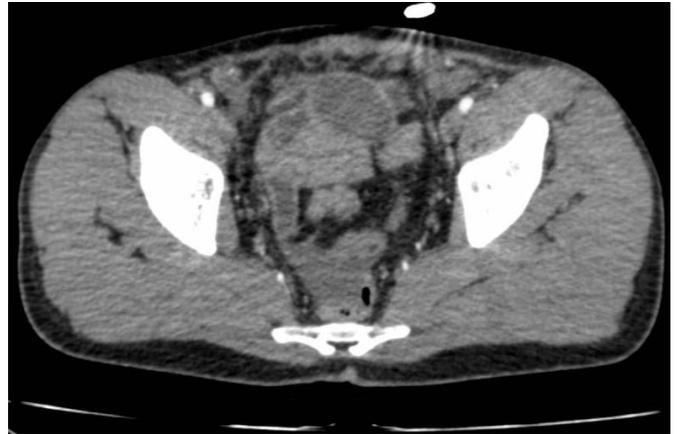
hernia, bilateral hernia, femoral hernia, and contralateral hidden hernia. In TAPP technique, the closure procedure of peritoneum, which is seen as causing time loss and challenges, may be carried out with titanium tacker, stapler and intra continuous suture technique. The importance of peritoneumeal closure after a TAPP application is well-documented. It is required to protect intraabdominal viscera from mesh.<sup>[3]</sup> In this study, a rare appendicitis case, which has developed in a patient that TAPP hernioplasty was performed due to bilateral inguinal hernia, shall be presented.

### Case Report

The male patient of 29-year age, applied due to bilateral inguinal hernia. The patient has a height of 160 cm, weight of 66 kg, and was athletic. The swelling in bilateral inguinal regions in the last 4 months, was causing challenges particularly in patient's daily works. The patient had never had any surgical operation before. He had not any chronic diseases. Standard bilateral transabdominal preperitoneumeal (TAPP) hernia repair was carried out on the patient. Three dimensional 15x10 cm mesh (3D Max-TM Mesh, Bard, Warwick, USA) was used in the operation. Peritoneum was closed with the help of absorbable tacker (AbsorbaTack, Covidien Corp, Norwalk, CT).

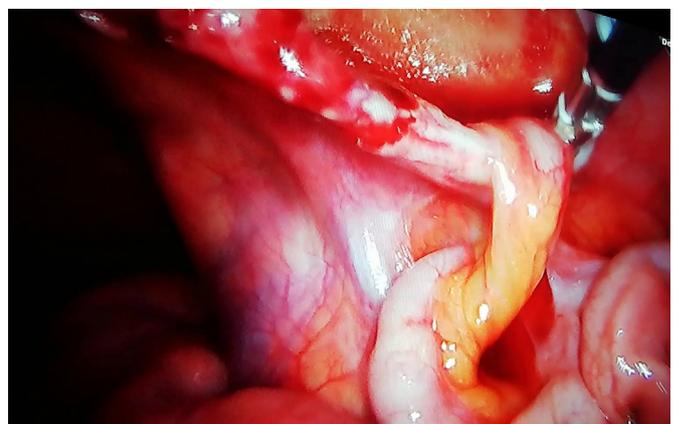
While TAPP repair, which was applied in the left inguinal region of the patient, was uneventful in the postoperative period, hematoma was formed in the right inguinal region. Hematoma was regressed spontaneously approximately 2 weeks later. However, the patient applied with subileus attacks from time to time, after being discharged from the hospital. Operation was not considered upon responding nasogastric decompression treatment in these periods, by considering that there may be adhesion depending on the operation. During the last hospitalization of the patient (approximately 5 months after the operation), it was determined that the distal part of the appendix was extended to the aponeurotic area and thickened as a result of inflammation, in the abdomen tomography (Fig. 1), which was taken as a result of the replacement of the stomach-ache, which did not respond to the nasogastric decompression treatment, particularly towards the right inguinal region of the patient.

Abdomen was entered with 12 mm trocar, by entering into the abdomen via Veress needle over the navel, while the patient was under intratracheal anaesthesia, and by inserting CO<sup>2</sup>. Then, abdomen was entered with 5 mm trocar through the suprapubic region and left lower quadrant paramedi-



**Figure 1.** In IV contrast abdominal tomography, it was found that the distal part of the appendix extends to the aponeurotic region and thickened as a result of inflammation.

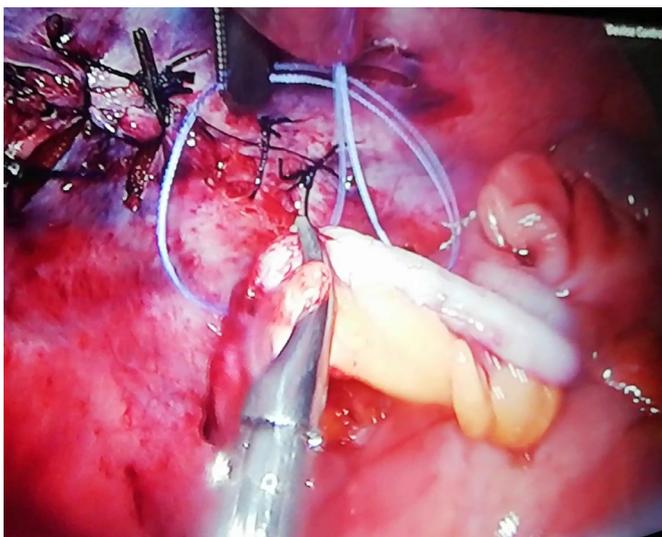
an line. It was determined in the exploration that the left inguinal region was ordinary, peritoneum lateral edge was not closed completely in the right inguinal region, and the appendix progressed towards the inguinal region aponeurotic area from this region, and cleaved into the mesh, and the distal part was necrotized but did not form an abscess (Fig. 2). It was determined that small bowel loops have formed adhesion in this area, but have not formed ileus. The adhesions were removed via blunt dissection, and the necrotized distal part of appendix was recovered from this area by opening the peritoneum within the right inguinal region, and it was seen that it formed a necrotized appendicitis (Fig. 3). Peritoneum was closed by using absorbable suture. Radix part was connected via appendicitis intracorporeal suture, and laparoscopic appendectomy was performed with the help of electrical vein closure device (LigaSure AtlasTM, Covidien, Norwalk, CT) (Fig. 4). Trocar locations were closed, and the operation was ended.



**Figure 2.** In laparoscopic exploration, it was determined that the lateral part of the mesh was opened in the right inguinal region and the appendix adhered to this area.



**Figure 3.** Laparoscopically, the appendix was separated from the area where it was attached and the distal part of the appendix was necrosis.



**Figure 4.** The opening in the inguinal region was closed with intracorporeal sutures and laparoscopic appendectomy was performed.

## Discussion

Laparoscopic hernia repair is efficient particularly in the treatment of repeating hernia, bilateral defects, and hidden contralateral hernia. A fixation method involving stapler, titanium spiral tacker, or sutures, is generally used in order to fix the mesh on the miopectineal gap in also laparoscopic inguinal herniorrhaphy such as the transabdominal preperitoneal (TAPP) and completely extra-peritoneal (TEP) approaches. However, this problem may be eliminated by the auto-implanted mesh, but it is not used frequently due to its cost.<sup>[4]</sup>

Titanium spiral tackers are being used widely since the end of 1990s, and continues to be one of the most common methods of peritoneum flap closure due to involving adherence to a deep abdominal wall and a shearing force resistance up to four times of the mesh. Laparoscopic tackers are generally safe, because there are only a few complications related with the tacker, which are report-

ed in the literature till today. Isolated nerve entrapment cases, small bowel volvulus from adhesions to the tacker, and small bowel perforation were reported.<sup>[5]</sup>

Even the use of absorbable tackers is effective on postoperative pain and adhesion formation, any studies, which assesses the use of absorbable tackers as peritoneal closure method, have not been conducted. Nevertheless, the potential complications related with the fixation of mesh using a tacker prompted the researchers to investigate the use of surgical adhesives. Many studies reported that the surgical adhesives have improved the early postoperative results after TAPP, when compared with mechanic fixation (stapler, tacker, sutures). Although the fibrin glues, which is a surgical adhesive being widely used, provide a sufficient mesh fixation to the abdomen walls, local inflammatory response and foreign body reaction are seen frequently, and they are not used frequently due to the cost.<sup>[6]</sup>

In many randomized controlled studies, which open and laparoscopic repair was performed, recurrence and complications were compared, and recurrence and complication rates were found to be similar in experienced hands (>250 cases). Time of complication occurrence is important.<sup>[7]</sup> While in the complications, which have occurred after 4-6 months, technical incompetence may not be mentioned, in our case a pathology was occurred 5 months later, and the operational experience of the surgeon, who has carried out the operation, is more than 250 cases.

A fundamental mechanism responsible for affecting and strengthening the hernia repair is that Mesh induces a localised inflammatory response. This inflammatory response may subsequently result in fibrinous adhesions to adjacent organs such as the greater omentum, small and large bowel, the appendix, and the fallopian tubes and ovaries in females. While it is often recognised that serosal appendicitis may be induced by the inflammation of neighbouring tissues, for example, sigmoid diverticulitis, it is not known whether the inflammation of the appendix is induced by Mesh, either directly or as a result of local adhesions, leading to purulent appendicitis. It is conjectured that the inflammatory reaction resulting from the exposure of a small area of imperfectly covered Mesh, or the inflammation associated with healing that occurs along the line of the peritoneal overlap in a TAPP repair may induce acute or chronic serosal inflammation of the appendix that results in luminal occlusion, bacterial overgrowth and subsequent purulent appendicitis.

Alternatively, appendiceal adhesions may result in a fixed conformation that may predispose to luminal obstruction, such as, at a site of kinking of the appendix.<sup>[8]</sup>

Long-term complications of laparoscopic hernia repair may be seen lately. The most frequent complications after TAPP repair, including postoperative haematomas, seroma, urinary retention, trocar injuries, herniation of port region, and neuropathy caused by misplaced tackers, are well-known. The importance of peritoneumeal closure after TAPP application is well-documented. It is required to protect the intraabdominal organs from mesh. It is known that mesh may cause significant bowel morbidity towards intraabdominal organs, in case the mesh is not closed via peritoneumeal flap. Ileus was described most frequently in the complications, which are seen rarely after TAPP repair, and determined in relation with the peritoneumeal closures, herniation of trocar region, or adhesions.<sup>[9]</sup>

It was suggested that closing the peritoneum flap with sutures is safe and effective. In the study conducted by Kapiris et al.<sup>[10]</sup> on 3530 patients, which TAPP repair was performed, they have found that incidence of small bowel obstruction was decreased to 0.1% from 0.8%, when peritoneal closure technique was performed with continuous sutures.

Acute signs or symptoms of appendicitis, even after many months or years after laparoscopic herniorrhaphy should be taken seriously, and diagnostic laparoscopy should be considered early as a first-line investigation. Laparoscopic approach is a procedure required to determine primarily intraabdominal hernia recurrence, and in addition potential appendicitis, and the presence of abscess formation in relation with it.<sup>[11]</sup> In our case, appendectomy was allowed laparoscopically without the necessity to remove the mesh, as abscess formation was not determined, and the defected tissues in peritoneum were closed via suturation method without using tacker, as they were oedematous.

## Conclusion

It is necessary to close the peritoneum flap completely during TAPP repair, in order to prevent herniation due to the peritoneumeal defects of bowel. It is known that mesh may cause significant mesh-oriented complications on the intraabdominal organs, in case the mesh is not closed via peritoneumeal flap. It must be noted that it may lead to appendix necrosis rarely, and form appendicitis.

## Disclosures

**Informed Consent:** Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** None declared.

**Authorship Contributions:** Concept – T.A.; Design – T.A.; Supervision – M.L.; Materials – T.A.; Data collection and/or processing – T.A.; Analysis and/ or interpretation – M.L.; Literature search – M.L.; Writing – T.A.; Critical review – M.L.

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