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## Original research

## An alternative anterior tension free preperitoneal patch technique by help of the endoscope for femoral hernia repair

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## ABSTRACT

**Background:** Femoral hernias are relatively uncommon and have a higher risk for strangulation and incarceration. We introduce an alternative anterior tension free inlay patch technique by help of the endoscope for femoral hernia repair.

**Method:** Characteristics of patients undergoing femoral hernia repair between March 2006–April 2011 and description of the surgical technique is presented.

**Results:** We analyzed our experience with this technique in 26 consecutive patients with femoral hernias (1 bilateral, 15 right, 10 left femoral hernia) in 5 year period. Seven of these 26 femoral hernias were recurrent and 2 of them were concomitant with inguinal hernia. Mean operation time was  $30.0 \pm 12.1$  min. Seroma was seen in 2 patients at postoperative 1st week. There were no; hematoma, wound infection and separation of wound edges and early recurrence at postoperative 1st week and 1st month. The mean follow up period was  $41.8 \pm 18.2$  months. All of 22 patients who were contacted were satisfied with the operation. There was no recurrence, chronic pain and foreign body feeling in any patient at the end of the follow-up period.

**Conclusion:** This feasible and safe alternative anterior inlay patch repair might be used in all femoral hernias with the exception of the ones requiring intestinal resection.

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## 1. Introduction

Femoral hernia is the protrusion of a peritoneal sac through the femoral ring in to the femoral canal. It is less common than inguinal hernias and is seen most frequently in females with an older median age.<sup>1,2</sup> It is associated with higher rates of acute complications such as incarceration and strangulation.<sup>3</sup> It was shown that femoral hernias and their complications are related to increased morbidity including higher recurrence rate, wound infection, bowel resection and mortality.<sup>2,4</sup>

Several approaches have been described for repair of femoral hernias such as transinguinal, infrainguinal, preperitoneal and transperitoneal with and without mesh with various success rate.<sup>1,5,6</sup> The recurrence rate of femoral hernia without mesh is relatively high as in all hernia types and fixation of the onlay mesh is difficult on the side of the femoral vessels. Placement of mesh preperitoneally increases the success rate of the femoral hernia

repair. Laparoscopic surgery or other open preperitoneal approaches is needed for this purpose. However these surgical techniques require advanced experience, extra equipment, general anesthesia and longer operation time.<sup>7–9</sup> We hypothesized that our method has the advantage of placement of the mesh preperitoneally by help of the endoscope without other requirements of laparoscopic surgery and other open preperitoneal approaches. Our aim is to present an alternative anterior tension free preperitoneal mesh technique in femoral hernia repair.

## 2. Material and method:

The study was designed as retrospective and descriptive. The data of consecutive patients with femoral hernia undergoing alternative patch repair between March-2006 and April-2011 were retrospectively analyzed and followed up in cross-sectional manner. They were contacted by telephone in June 2012.

The characteristics of femoral hernias (primary, bilateral, recurrent, irreducible or reducible) approach to hernia repair, (femoral or inguinal) were also recorded. Duration of surgery, anesthetic method, length of hospital stay, postoperative complications (seroma formation or hematoma, cord edema, wound infection) were analyzed. The patients were controlled for recurrence, foreign body feeling at postoperative 1st week and 1st month and for recurrence. The patients were questioned for recurrence, chronic pain, foreign body feeling and patient satisfaction

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by telephone at the end of the follow up. Pain was assessed by VAS (Verbal Analogue Scale). Follow up time for each patient was also recorded.

### 2.1. Surgical technique

All the operations were performed by the same surgeon under regional or general anesthesia. Antibiotic prophylaxis with ceftazidime 1 g was given to all cases. An oblique incision just below and parallel to the ileoinguinal ligament through skin and subcutaneous tissue was made. Femoral canal was medialized through this incision (Fig. 1). Hernia sac was exposed, isolated and dissected. Its contents were controlled. If there is any doubt of strangulation or incarceration, strangulated tissue was explored by enlarging the femoral canal and opening the hernia sac. Afterward contents of hernia sac were returned to the abdominal cavity by peanut. If the surgeon was not satisfied by this exploration in patients with suspicion of strangulation, a 5 mm trocar was inserted through femoral hernia sac into the abdominal cavity and peritonea of femoral hernia sac was ligated around the trocar to prevent escape of insufflated gas. The operation was performed under general anesthesia in these cases. CO<sub>2</sub> was insufflated until intraabdominal pressure became 12–14 mmHg. Approximately 15° Trendelenburg and 10° lateral position to the contralateral side of the femoral hernia was given to the patient. The surgeon was on the ipsilateral side of the hernia and monitor was on the contralateral side of it. Abdominal cavity was explored by inserting endoscope (30°/5 mm in diameter) (Fig. 2). Pneumoperitoneum was ended after exploration of the abdominal cavity and hernia sac was ligated. Peritonea was pushed inward with peanut and blunt dissection with index finger was done in preperitoneal space, including all potential hernia sites till to the rectus abdominal muscle medially, iliac vessels laterally and the Cooper ligament inferiorly. The endoscope inserted through the femoral canal was used only for localization of inferior epigastric, corona mortis and femoral vessels in order not to harm these vascular structures (Fig. 3). Potential direct and indirect inguinal hernia spaces were controlled by index finger in the mean time. If there is a concomitant inguinal hernia, aponeurosis of the external oblique muscle was opened and hernia sac was dissected. Then, high ligation was applied to hernia sac and it was pushed inwards.

### 2.2. Preparation of mesh

A standard propylene mesh was used. A + sign was drawn just in to center of the mesh prepared suitable for preperitoneal space to provide the centralization of the mesh during placement. A,B,C,D notches were made by the help of the sutures located in each quadrant of the mesh to control its movement to each side (Fig. 4). By this way, folded mesh was inserted through femoral canal and placed to the prepared preperitoneal space gently and smoothly. Mesh was pushed inwards by the help of the peanut. The placement of the mesh in the preperitoneal space was controlled by index finger and it was placed after outgrowth of the mesh was cut, lateral side was placed at first and medial side later. Then it was sutured by 3-0 prolene to anatomical landmarks described as X,Y,Z conventionally from the outside in Fig. 5. Intestinal resection was required in none of the cases.

## 3. Results

Demographical data of the patients and hernia characteristics were summarized in Table 1 and Table 2 respectively. The mean

duration of surgery was 30.0 ± 12.1 min. Mean length of hospital stay 1.15 ± 0.4 days. Intestinal resection was not required in any of the patients. There was no mortality. Complications such as hematoma, wound infection and separation of wound edges were not seen in any of the patients. Seroma was seen in 2 patients and reabsorbed spontaneously at postoperative 1st week and 1st month controls. There is no recurrence, pain, foreign body feeling and all of 26 patients were satisfied with the operation at the postoperative 1st week and 1st month controls. We were able to contact with 22 (84.6%) patients at the end of the follow-up. All of the contacted patients were satisfied with the operation; recurrence, chronic pain and foreign body feeling were not seen in any patients. The median follow up time was 41.8 ± 18.2 months.

## 4. Discussion

The femoral canal, located between the lacunar ligament laterally and femoral vein medially is the predisposing anatomical feature for femoral hernia. Femoral hernia is relatively uncommon and the incidence is between 2 and 8%.<sup>1</sup> On the other hand, it is the most common incarcerated abdominal hernia and the most common cause of strangulation requiring urgent operative intervention.<sup>10,11</sup> The probability of strangulation for femoral hernias and for inguinal hernias is 22% and only 3%, three months after diagnosis respectively.<sup>3</sup>

In classical McVay repair, suturing of conjoint tendon and Cooper ligament produces high tension on the approximated tissues. Cooper ligament is very strong and lacks elasticity. Sutures may break through tissues eventually resulting in higher recurrence.<sup>12</sup> Therefore, various tension free techniques have been developed using polypropylene mesh.<sup>10,12,13</sup> Open tension free repairs have the advantage of low recurrence and complication rates, minimal postoperative pain and minimal restriction of activity at postoperative period. The plug technique to femoral hernia repair was first introduced by Lichtenstein and improved further by Gilbert and Rutkow.<sup>13</sup> Different versions of the plug technique have been described in literature.<sup>14,15</sup> Unfortunately, it has been reported that shrinkage of plugs may cause recurrence in patients with larger hernias.<sup>16</sup> Some major complications associated with mesh migration such as bowel obstruction, perforation and external migration of mesh to scrotum have also been reported.<sup>17,18</sup>

Gönüllü et al. reported the results of their 28 patients with femoral hernia undergoing an open tension free Cooper ligament repair. The described technique in this study is a good alternative for the repair of femoral hernia and concurrent femoral hernia with inguinal hernia.<sup>19</sup> Reyes-Devesa et al. also defined a new anterior tension free onlay patch technique for inguinofemoral hernia repair. In this technique, precut sheet of polypropylene mesh with its triangular extension was configured to match the medial corner of the inguinal canal, the posterior wall and the femoral area.<sup>20</sup> Although both techniques have the advantages of open tension free repairs, they necessitate the opening of external oblique aponeurosis. In our technique external oblique aponeurosis was opened only in 2 patients, one with direct and the other with indirect hernia concomitant with femoral hernia. Remaining 25 femoral hernia were operated by femoris approach. Development of chronic pain was prevented by minimizing the risk of injury to the iliohypogastric nerve, ilioinguinal nerve and genitofemoral nerve by femoris approach.<sup>12</sup>

Schouten et al. emphasized that a preperitoneal (endoscopic) approach covers the whole myopectineal orifice with a mesh. It gives the opportunity for treatment of all hernia types especially for women who have a high risk of strangulation and higher risk of recurrence than in men.<sup>21</sup> We used an endoscope especially in patients with difficulty of preperitoneal dissection only to localize

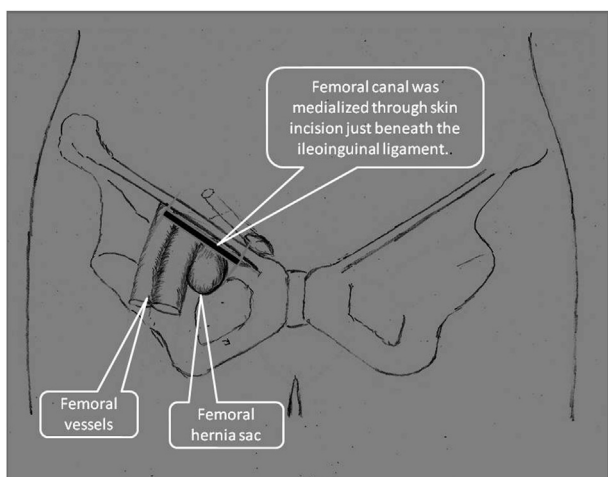
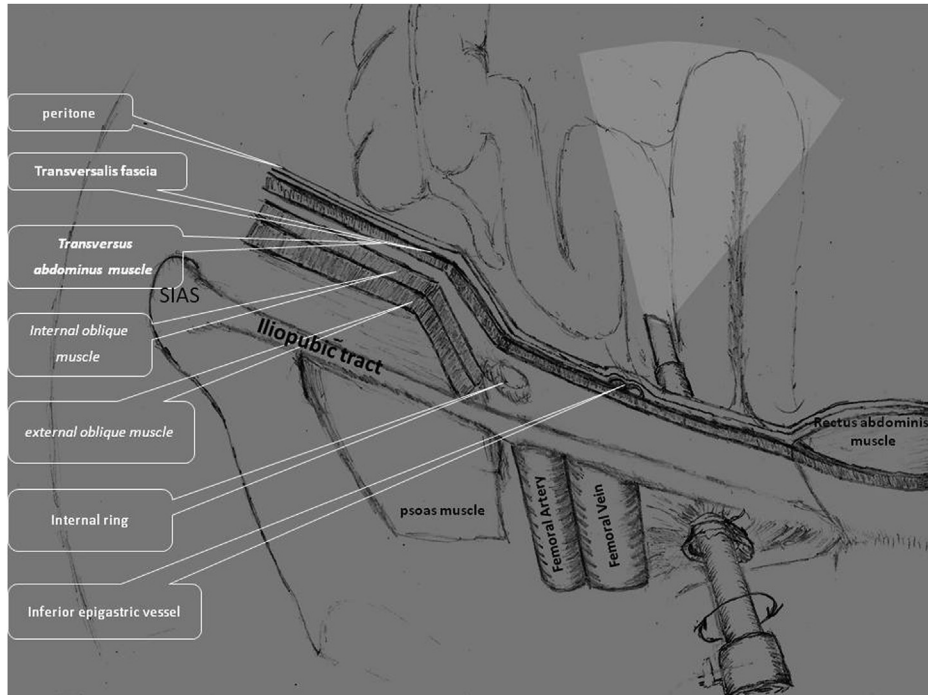


Fig. 1. The localization of skin incision.



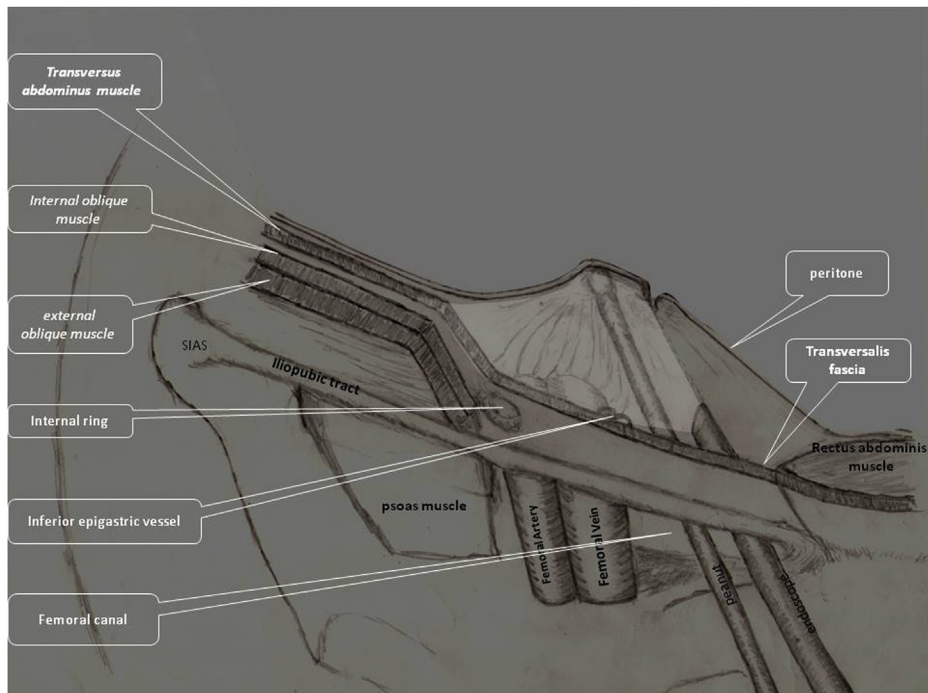
**Fig. 2.** A 5 mm trocar was inserted through femoral hernia sac into the abdominal cavity. Abdominal cavity was explored by inserting endoscope.

the vascular structures and important anatomical landmarks. Since dissection was made anteriorly with conventional method, extra requirements of laparoscopic surgery such as advanced experience, extra equipment and general anesthesia were less needed. A 5 mm trocar was inserted in only 5 patients requiring intraabdominal dissection and only 8 patients were operated under general anesthesia.

Kugel herniorraphy was described by Kugel as a noninvasive, suture less preperitoneal technique.<sup>22</sup> But application of this

approach has been limited because of its technical difficulty for femoral hernia repair. Li et al. introduced modified Kugel technique characterized by placement of the mesh in to the preperitoneal space through direct and indirect hernia sites.<sup>23</sup> But this site of insertion is not appropriate for the primary femoral hernias and transversalis fascia should be cut.

Lei et al. have emphasized that 3-d (diamond shaped device) patch inserted into the preperitoneal space from the outlet of the femoral canal, using a femoris approach is not appropriate in the



**Fig. 3.** Insertion of endoscope and peanut from femoral canal. Visualization of preperitoneal space with endoscope while pushing peritone inward with peanut.

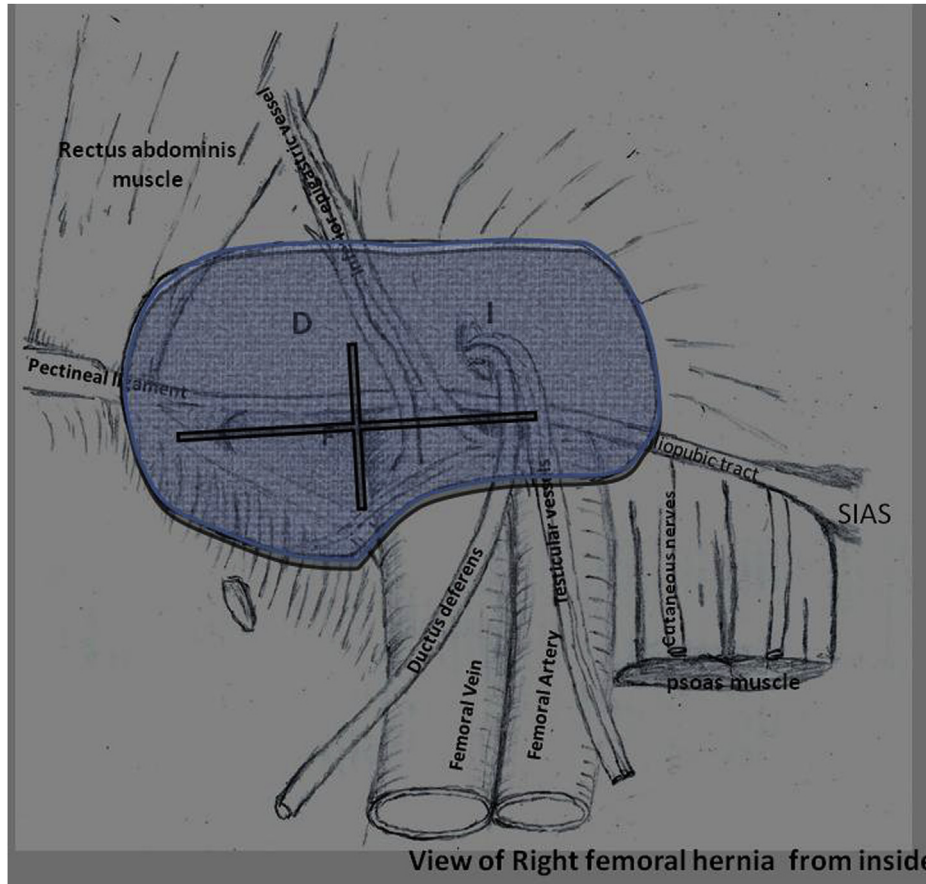


Fig. 4. The inside view of the preperitoneal mesh covering all myopectineal orifices. D: Direct Hernia Site I: Indirect Hernia Site F: Femoral Hernia Site.

repair of femoral hernias of patients who has leucocytosis and clinical signs of peritonitis or if the hernia sac includes dark or bloody fluid.<sup>12</sup> On contrary to our technique, the mesh used in this study can not cover all potential sites for other hernia types.

It has been speculated that there is a 15 fold greater incidence of femoral hernias after previous inguinal herniorraphy compared with spontaneous incidence.<sup>20</sup> Kulaçoğlu et al. have presented a modified patch repair of femoral hernia after inguinal herniorraphy.<sup>16</sup> The medial edge of the mesh is configured to correspond to

the pubic corner and lacunar ligament. The lateral edge of the mesh is cut to form several free petals for inversion of the mesh above and medial to femoral vein to prevent prevascular herniation in their technique. Since this technique can not close all myopectineal orifices, it should only be used in femoral hernias after a primary repair of inguinal hernias. Cristaldi et al. also reported that polypropylene plugs for repair of prevascular type of femoral hernias should be carefully considered because of the possibility of mesh plug to stimulate the local fibrotic reaction, when concomitant or future arterial grafting is needed.<sup>24</sup> Sulaimanov et al. have showed that placement of mesh graft on femoral blood vessels increased the inflammation and fibrosis in rats, but did not change the histological structure of the vessel. Arterial and venous circulation was decreased due to pressure of the graft in this study.<sup>25</sup> Our technique could also be applied to femoral recurrence after an inguinal herniorraphy. It combines the advantages of laparoscopic repair with open tension free femoral hernia repairs. The inlay patch closes the outlet of the femoral canal and substantially reduces the recurrence rate of femoral hernias. It might also close the opening of inguinal canal, potentially preventing against direct and indirect inguinal hernias. In our technique addition of endoscope is advantageous especially in patients requiring abdominal exploration.

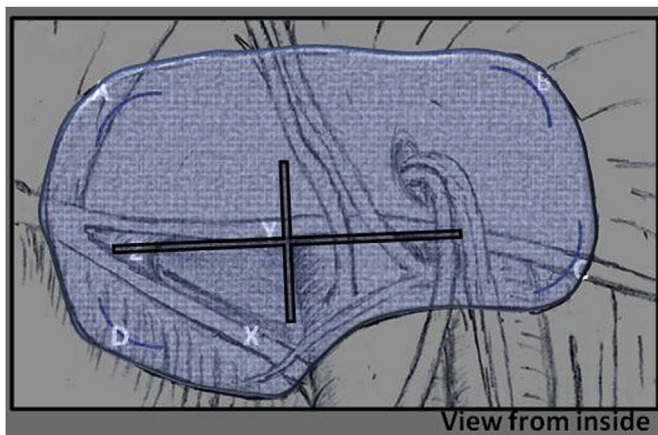


Fig. 5. The anatomical points of placement and fixation of the mesh. X,Y,Z: Mesh was attached with 3-0 prolene suture to Cooper, Lacunar and Ileoinguinal ligament respectively. A,B,C,D: Notches made by prolene suture.

Table 1  
Demographical characteristics of patients.

Male/female	6/20
Age	59.6 ± 11.7
BMI	27.7 ± 4.2
ASA I/II/III	4/16/6

**Table 2**  
Characteristics of femoral hernias.

Incarcerated/not incarcerated	22/5
Intestinal content in hernia sac	2
Fat in hernia sac	20
Recurrent cases	7
Repair with mesh	3
Repair without mesh	4
Bilateral femoral hernia	1
Right femoral hernia	15
Left femoral hernia	10
Concurrent hernias	2
Direct inguinal hernia	1
Indirect inguinal hernia	1
Type of approach	
Femoris approach	25
Classical inguinal approach	2
Type of anesthesia	
Spinal	18
General	8
Mean of operation time (min)	30.0 ± 12.1

## 5. Conclusion

In spite of the fact that no technique is appropriate for all clinical situations, this technique may be a safe and feasible alternative in a diverse clinical settings of femoral hernia and provides potential protection for others with the exception of the ones requiring intestinal resection. Further prospective randomized studies are required to determine longer term outcomes and recurrence rates.

### Ethical approval

None.

### Funding

None.

### Author contribution

Fahri Yetişir – Study design, data collection and analysis and writing.

A.Ebru Salman – Data analysis and writing.

Mehmet Kiliç – Data analysis.

### Conflict of interest

None.

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