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ORIGINAL ARTICLE

Preperitoneal femoral hernioplasty: an "umbrella" technique

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Abstract
Introduction Tension-free inguinal mesh-plug hernioplasty is well established. However, femoral hernia repair remains challenging and controversial. We aimed to evaluate a preperitoneal approach of tension-free hernioplasty for femoral hernia upon the anatomy rationality.
Methods A prospective study of 62 patients between October 1999 and June 2011 received femoral hernioplasty in our hospital. This repair method involved a preperitoneal approach accomplished under regional or local anesthesia with mesh and plug; the emphasis was put on fulfilling the abdominal defect, i.e., the myopectineal orifice, with the plug flattened like an "umbrella", above the femoral ring but not to fill the femoral ring.
Results All cases receiving preperitoneal tension-free hernioplasty had a smooth recovery. There were no severe complications, and no recurrences were detected within a 0.5- to 4-year follow-up. No specific restrictions with regard to activity were placed on the patients after surgery. All cases were able to return to normal life, including work, within 2 weeks.
Conclusions The preperitoneal tension-free hernioplasty may be a more effective method of femoral hernia repair; meanwhile, we must re-understand the anatomy of femoral hernia correctly so as to restore the anatomic and physiologic functions at this region optimally.

Keywords Femoral hernia · Mesh-plug repair · Preperitoneal repair · Myopectineal orifice

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Introduction

As a particular type of abdominal hernia, femoral hernia is different from the other common direct and indirect inguinal hernias, and the repair technique also differs. And the femoral hernia repair remains challenging and controversial [1]. Many progresses have been made in the last 30 years of hernia surgery since the use of prosthetic-based techniques [2].

A number of operations for femoral hernioplasty have been described. Classically three approaches are described to open femoral hernia repair: Lockwood's infra-inguinal approach, Lotheissen's trans-inguinal approach and McEvedy's high approach [3]. All of these operations have the same objective, which is to reduce the hernia, excise the sac and close the ring to prevent subsequent recurrence.

The mesh-plug method has been well established and widely used for its simplicity and good clinical results [4]. And other mesh repair techniques for femoral hernia were also reported [5]. Here, we present the results of a series of femoral hernia repair. Our method involved the placement of the plug into the preperitoneal space like an umbrella and our data support the use of mesh-plug in femoral hernia as a safe, effective operation that offers many advantages over the procedures described previously.

Patients and methods

Between October 1999 and June 2011, 62 patients (2 men, 60 women, mean age 56 years, range 37–78 years) with symptomatic femoral hernias were involved in this study. Repairs were performed under local ($n = 42$, mean age 59 years) and epidural ($n = 20$, mean age 54 years) anesthesia. Sixty patients received elective

repairs, and two received emergency surgery, but no intestinal resection was necessary. All patients received a single bolus of prophylactic antibiotic 30 min before the operation. They were routinely discharged from hospital within 5 days after surgery. No specific restrictions were placed on the patient activities and all patients returned to their normal activities within 2 weeks. All patients were assessed clinically 6 months post-operatively and yearly thereafter, with a maximum follow-up of 4 years.

This "umbrella" technique involved an oblique skin incision from the midpoint 2 cm above the inguinal ligament at the internal ring to the pubic tubercle. The dissection was carried down to the external oblique aponeurosis. The underlying spermatic cord or the round ligament of uterus was separated from the posterior wall. The inferior epigastric vessels were identified and an incision was made on the transverse fascia between the vessels and the pubic tubercle to enter the preperitoneal space (Fig. 1). The hernia sac neck could be identified easily. With persistent traction and gentle blunt and sharp dissection, the sac was pulled from the femoral canal through the femoral ring. The neck of the sac was separated thoroughly. After the whole sac was pushed back, the plug (mesh PerFix plug; Bard) was inserted into the preperitoneal space and fully flattened like an "umbrella", which should be sufficiently large to cover the entire myopectineal orifice zone (Fig. 2). Then the "umbrella" was fixed with a single interrupted stitch to the internal layer of transverse fascia adjacent to inferior epigastric vessels, the Cooper's ligament, Henle's ligament and the site just behind the pubic tubercle. The patient was encouraged to cough to test if the repair was effective. The transverse fascia was closed if possible or made the "umbrella" entirely behind the fascia and the mesh was placed beyond the fascia if it was too weak or there was an obvious defect on it. A prehernial lipoma was dissected if present (Figs. 1, 2, the arrow).

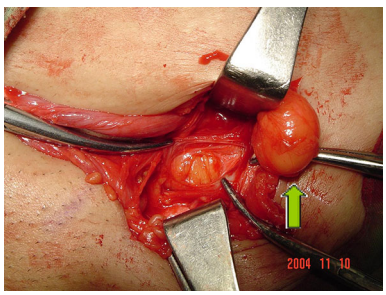


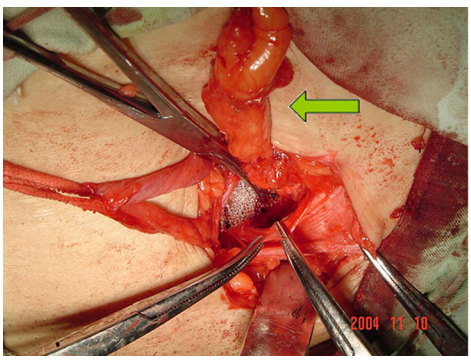
Fig. 1 The inferior epigastric vessels were identified and an incision was made on the transverse fascia between the vessels and the pubic tubercle to enter the preperitoneal space

Results

During the study period, 62 patients with femoral hernia underwent the "umbrella" repair. All patients had the adequate medical records and were all primary hernias. The male to female ratio was 2:60 (3.2 %:96.8 %). The median age of patients was 56 years, with age range 37–78 years. After operation, the patients were followed by personal examination by the operating surgeon for 0.5–4 years (mean 2.5 years).

Mesh was used in all the patients to enhance the tension of transverse fascia, and thus to prevent the occurrence of direct or indirect hernia. There was no recurrence identified in this series. The operation lasted 30–45 min with the median time of 36.8 min. No patient needed urinary catheterization and only eight cases needed oral analgesics. Thirteen patients complained of hard lumps at the repair region, which disappeared within 6 months. No wound infection or severe seroma was found in this series. The mean duration of hospitalization was 3.34 days (range 1–5 days).

All patients were reviewed in the out-patient clinic 6 months after being discharged, and then at yearly intervals for another 3 years. During this period, no patient had



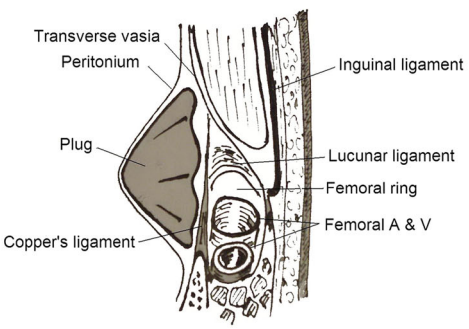


Fig. 2 The plug was inserted into the preperitoneal space and fully flattened like an "umbrella", covering the entire myopectineal orifice zone

presented with recurrence, and there had been no clinical evidence of femoral vein compression, deep vein thrombosis or inguinal hernia occurrence.

Discussion

All hernias in the groin begin within a well-defined weak area, called "myopectineal orifice" [5]. This orifice is bound superiorly by the internal oblique and transverse abdominal muscles, laterally by the iliopsoas muscle, medially by the rectus muscle and inferiorly by the pecten of the pubis. This region is crossed by femoral vessels as well as the spermatic cord in male or the uterine round ligament in female. This region is divided into two halves by the inguinal ligament and covered on its inner surface by the transverse fascia. The femoral canal is located below the inguinal ligament on the lateral aspect of the pubic tubercle. It is bounded by the inguinal ligament anteriorly, pectineal ligament posteriorly, lacunar ligament medially, and the femoral vein laterally. It normally contains a few lymphatics, loose areolar tissue and occasionally a lymph node called Cloquet's node [6]. The space of this canal appears to be to allow for the expansion of the femoral vein when venous return from the lower limbs is increased or when increased intra-abdominal pressure (Valsalva maneuver) causes a temporary stasis in the venous flow [7].

It is well established that an indirect hernia is due to a congenital defect of the processus vaginalis, which fails to close, resulting a herniation in inguinal canal, and a direct hernia is the result of an acquired tissue deficiency in the transverse fascia which is medial to the inferior epigastric vessels, but the etiology of femoral hernia is still controversial. Femoral hernia is generally considered to be a result of increased intra-abdominal pressure. McVay et al. [8] hypothesized that a congenitally narrow posterior inguinal wall attachment onto Cooper's ligament with a resultant enlarged femoral ring is the important factor predisposing to the formation of a femoral hernia in response to increased abdominal pressure. Consistent with this hypothesis, the incidence of femoral hernia in women is relatively higher because of the larger femoral ring.

Femoral hernia is prone to being incarcerated because of narrow neck and unyielding boundaries of the neck, the repair is necessary. But what is the ideal surgical approach remains debated. There are various procedures defined for treating femoral hernias, consisting of high and low inguinal/femoral approaches (McVay, Bassini, Nyhus, simple repair of the femoral ring) [9]. Prosthetic mesh in the form of a plug has been used extensively in adults to repair femoral hernias and has rapidly gained popularity because of its simplicity, safety and relatively lower recurrence [10]. However, in the mesh-plug repair procedures, the boundaries of the femoral defect are used to hold the plug in place. The femoral vein expansion is restricted and constriction upon the vein may happen. Our approach differs from those of previous reports of femoral mesh-plug hernioplasty [1, 11]. We consider that the plug should be placed deeper, i.e., in the preperitoneal space, the so-called myopectineal orifice. By suturing the plug onto the abdominal wall just above the peritoneum, the "umbrella-like" plug could completely cover the myopectineal orifice, preventing any hernia occurrence and recurrence from this area. Meanwhile, the femoral vein dilation space would also be reserved because of the exclusion of femoral canal and femoral ring.

Here, we describe an "umbrella" repair technique which, in addition to the repair advocated by other authors [4, 12], involves the placement of an "umbrella-like" plug into the preperitoneal space with the mesh being placed above the transverse fascia. This technique is similar to the so-called modified Nyhus–Condon repair, which offers an alternative approach to femoral hernia repair, especially in the emergency setting [13].

Local anesthesia was adopted in most patients in this series. Although epidural or general anesthesia could also be used in inguinal hernia repair, local anesthesia for groin hernia repair has been introduced since the very beginning of the last century [14], which causes less postoperative pain, requires less analgesic consumption, avoids nausea, vomiting, and urinary retention. After the "umbrella-like" plug was placed and fixed, the patient was usually asked to cough to test the surgeon's repair and help to identify the uncommon case of concomitant hernia, which is impossible under epidural or general anesthesia. We recommended using a mixture of 40 ml of 2 % Lidocaine with 10 ml of 0.75 % Bupivacaine for the rapid anesthetic effect of Lidocaine and enduring action of Bupivacaine. This solution was used routinely in our center.

Summarizing the results in this series, we conclude that "umbrella" hernioplasty shows good results in treatment of femoral hernia and prevents the occlusion of femoral vein through exclusion of femoral canal and femoral ring. Local anesthesia is recommended. We consider the technique described here as an appropriate choice of femoral hernia repair.

Conflict of interest JSK declares no conflict of interest. FQ declares no conflict of interest. LN declares no conflict of interest. YW declares no conflict of interest. SWH declares no conflict of interest. BW declares no conflict of interest.

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