New minimally invasive technique for repairing femoral hernias: 3-D patch device through a femoris approach

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Background: Femoral hernias are less common than inguinal hernias. The use of preformed mesh to repair femoral hernias without tension has become increasingly common. We sought to investigate the safety and feasibility of repairing femoral hernias with a Prolene 3-dimensional (3-D) patch using a femoris approach.

Methods: We identified all consecutive patients with femoral hernias treated at our centre with a Prolene 3-D patch using a femoris approach in our institution over a 5-year period (2004–2009). We assessed duration of surgery, length of stay in hospital, recurrence, postoperative pain and complications.

Results: We repaired 73 hernias with this technique during the study period. The mean duration of surgery was 13.1 minutes, most patients were discharged in less than 24 hours, no recurrence was noted, and only minor complications occurred.

Conclusion: This technique has not only the same advantage of other tension-free repairs, but also the advantages of convenience and shorter duration of surgery.

Contexte : Les hernies fémorales sont moins courantes que les hernies inguinales. On utilise de plus en plus des filets préformés pour réparer les hernies fémorales sans tension. Nous avons voulu vérifier l'innocuité et la faisabilité des réparations d'hernies fémorales à l'aide d'une prothèse tridimensionnelle (3D) de type Prolene par approche fémorale.

Méthodes : Nous avons recensé tous les patients consécutifs atteints d'hernies fémorales traités au moyen d'une prothèse 3D de type Prolene par approche fémorale dans notre établissement sur une période de 5 ans (2004–2009). Nous avons évalué la durée de la chirurgie, la durée du séjour hospitalier, les récurrences, la douleur postopératoire et les complications.

Résultats : Nous avons réparé 73 hernies au moyen de cette technique au cours de la période de l'étude. La durée moyenne de la chirurgie a été de 13,1 minutes, la plupart des patients ont reçu leur congé en l'espace de moins de 24 heures, aucune récurrence n'a été notée et seules des complications mineures sont survenues.

Conclusion : Non seulement cette technique procure les mêmes bienfaits que les autres techniques de réparation sans tension, mais elle comporte en outre les avantages et la commodité d'une durée d'intervention plus brève.

Femoral hernias are less common than inguinal hernias. The incidence of femoral hernias has been reported to be 2%–8% in adults.^{1,2} The use of preformed mesh to repair inguinal hernias without tension has become increasingly common since it was described by Lichtenstein and colleagues.³ Advantages of a tension-free technique include the ability to provide ambulatory care with local/regional anesthesia for several types of hernias, minimal postoperative pain, low complication and recurrence rates, and minimal restriction of activity after surgery.^{3–6} Therefore, tension-free repair for femoral hernias has become generally accepted in hernia surgery. The prostheses mainly include mesh, mesh plugs and the Prolene Hernia System (PHS).^{7–11} In 2004, we adopted a new tension-free herniorrhaphy technique using a Prolene

3-dimensional (3-D) patch device through a femoris approach to prevent femoral hernia recurrence, and our preliminary results have been encouraging. We describe our 5-year experience and follow-up using this technique.

METHODS

We identified all consecutive patients who underwent herniorrhaphy under local anesthesia with the 3-D patch at our centre from March 2004 to June 2009. Because of the possibility of strangulation, an incarcerated, painful or tender hernia usually requires an emergency operation, but in this series, all patients underwent elective operations performed by the same surgical team.

The Prolene 3-D patch comprises 3 parts: the inferior 3-D device (diamond-shaped device), upper oval patch and retention suture. When the retention suture is pulled tightly, the inferior 3-D device will extend to form a round patch with a maximum diameter of 5 cm, which will protect the femoral area and prevent organs in the abdominal cavity from dropping into the femoral canal.

Operative technique

Local anesthesia and a femoris approach were used for all patients. The surgeon made a longitudinal incision of about 3 cm through the skin and subcutaneous tissue to

expose the hernia sac. The hernia sac was then anatomically isolated, dissected from the peritoneum and ligated or replaced into the abdominal cavity. For irreducible hernias, the femoral ring was enlarged by partially slitting the inguinal ligament. The femoral vein and artery should be carefully protected during the operation. Once the hernia sac was ligated or replaced, the inferior part of the Prolene 3-D patch was inserted into the preperitoneal space from the outlet of the femoral canal. Then the retention suture was pulled tightly, and the redundant upper oval patch retention sutures were trimmed off. The surgeon then sutured the upper patch to the inguinal ligament, pectineal ligament and pubic tubercle.

Data abstraction

We assessed duration of surgery, length of stay in hospital, postoperative complications, recurrences and pain severity after surgery. Patients had follow-up assessments, including history and physical examination, every 6 months. Some patients were assessed daily for 7 days using a visual analogue scale (VAS). The results were measured (from 0 to 100 mm) on the scale by the investigator.

RESULTS

A total of 73 hernia repairs were performed in 72 patients during our study period. Patient demographic and clinical characteristics are summarized in Table 1.

Most patients ($n = 67$) were discharged the same day of admission, and none died. We were able to contact 68 patients for follow-up (11 patients were followed for 5 yr, 10 for 4 yr, 16 for 3 yr, 14 for 2 yr and 17 for 1 yr). The median follow-up was 39 months. No recurrences were noted. Thirty-five patients were assessed daily for 7 days using the VAS. The results of pain assessment are summarized in Table 1. The mean duration of surgery in our series (13.1 min) is compared with that of other current techniques in Table 2.

DISCUSSION

A weakness or defect in aponeurosis is the major source of groin hernias.¹⁴ A femoral hernia passes beneath the ilio-pubic tract and inguinal ligament into the upper thigh.

Table 1. Demographic and clinical characteristics of patients presenting with a femoral hernia ($n = 72$)

Characteristic	No. (%) [*]
Age, mean (range) yr	65 (32–78)
Sex, no. male:female	13:59
Hernia	
Primary	73 (101.4)
Bilateral	1 (1.4)
Recurrent	0
Irreducible	65 (89.0)
Reducible	8 (11.0)
Duration of surgery, min	13.1 (10–19)
Diameter of hernia ring, cm	1.3 (0.5–2.5)
Hospital stay	
< 24 h	67 (93.0)
24 h	4 (5.6)
> 24 h	1 (1.4)
Complication	
Seroma	0
Wound infection	0
Cord edema	0
Recurrence	0
Postoperative pain, mean (range) VAS score	
Day 0	18.9 (9–65)
Day 3	12.7 (5–60)
Day 7	6.3 (0–40)

^{*}Unless otherwise indicated.

Table 2. Mean duration of surgery for current techniques of femoral hernia repair

Technique	Duration of surgery, mean min.	<i>p</i> value
Prolene 3-dimensional patch, femoris approach	13	
Bard mesh, infrainguinal approach ¹²	40	< 0.001
Prolene Hernia System, inguinal approach ¹³	27	< 0.001
Lichtenstein mesh, inguinal approach ¹³	37	< 0.001

The predisposing anatomic feature of femoral hernias is a small empty space between the lacunar ligament medially and the femoral vein laterally — the femoral canal.

Thus, the principle of femoral hernia repair is to eliminate the peritoneal sac and to close the femoral canal.¹⁵ In the McVay repair, suture of the unyielding Cooper ligament and the conjoined tendon results in high tension. The Cooper ligament and inguinal ligament are strong enough, but they lack elasticity; therefore, sutures may break or cut through tissues, eventually resulting in recurrence. According to a report by Schumpelick and colleagues,¹⁶ the recurrence rate associated with this type of herniorrhaphy could be as high as 10%–15%.

The well-known advantages of tension-free hernia repair led to the development of new techniques for femoral hernia repair, for which various techniques using polypropylene mesh or the PHS have been described. However, owing to the narrowness of the femoral ring (mean diameter of 1.3 cm in our trial), it can be difficult to place the PHS and polypropylene mesh. They must be placed through an inguinal approach. This technique requires exposure of the groin from the transversalis fascia to the peritoneum via a lower abdominal incision to close the fascial defect. It requires more initial dissection and is associated with higher complication and recurrence rates when performed by less experienced surgeons. For example, injury of the iliohypogastric nerve, ilioinguinal nerve or genitofemoral nerve will result in postoperative numbness or pain.

A femoral hernia has the greatest associated risk of incarceration and strangulation of all groin hernias, and in our series irreducible hernias accounted for 89.0% (65 of 73) of all cases. For irreducible hernias, the hernia sac is difficult to replace, thus partially incising the inguinal ligament is necessary to enlarge the femoral ring. In these cases it could be handier to use a femoris approach rather than an inguinal approach.

The femoris approach was used in our series and proved to be convenient. After skin and subcutaneous tissue incision, the hernia sac was exposed, with no need to incise the external oblique aponeurosis and transverse fascia. Meanwhile, the iliohypogastric nerve, ilioinguinal nerve and genitofemoral nerve could be well protected. The mean duration of surgery in our series (13.1 min) was comparable to that of other current techniques, but was significantly shorter. Surgical trauma was trivial, with no complications of seroma or cord edema occurring in the series. The postoperative pain was minimal and equal to that reported with other current techniques.^{17,18} All 68 patients who were available for follow-up felt comfortable and had no pain at 1 year.

Before being extended, the inferior 3-D patch device is diamond shaped and easy to insert, even when the hernia ring is narrow. Once extended, it can form a patch with a maximum diameter of 5 cm, which can effectively close the

femoral ring. The upper plain film also closes the outlet of the femoral canal. Thus, a dual repairing effect is achieved, thereby substantially reducing the recurrence rate of femoral hernias.

CONCLUSION

The 3-D patch using a femoris approach is the most logical method of closing the femoral canal with a prosthetic material and repairing femoral hernias. Various techniques using polypropylene mesh or the PHS have been described, whereas, to our knowledge, the use of a Prolene 3-D patch to achieve herniorrhaphy through a femoris approach has not previously been studied. In the present trial, satisfactory results of 73 hernia repairs proved that this technique has the same advantages of open, tension-free repairs: minimal postoperative pain, low complication and recurrence rates, and minimal restriction of activity after surgery. Even more advantageous is the convenience of the procedure and its shorter duration.

Because its borders are distinct and unyielding, a femoral hernia has the highest risk of incarceration and strangulation of all groin hernias. At the time of the procedure, the surgeon must decide whether to explore the abdomen to ensure the intestine is viable. If the patient has leukocytosis or clinical signs of peritonitis, or if the hernia sac contains dark or bloody fluid, the abdomen should be explored; however, the 3-D patch using a femoris approach is not convenient for such exploration. If it is discovered during the operation that the patient has a strangulated bowel, we recommend making another incision to allow the bowel to be explored carefully and immediately.

Competing interests: None declared.

Contributors: W. Lei designed the study. C. Luoshang acquired the data, which J. Huang analyzed. J. Huang wrote the article, which all authors reviewed and approved for publication.

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