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The femoral hernia

An ideal approach for the transabdominal preperitoneal technique (TAPP)

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Abstract
Background: We designed a study to determine the rate of intra- and postoperative complications as well as the rate of recurrences in elective operated femoral hernias treated via the laparoscopic technique.
Methods: Between 1993 and 1998, we performed 1,097 operations in our department using the laparoscopic transabdominal preperitoneal (TAPP) technique. Femoral hernias amounted to only 4.6% (51 cases) of these patients. The male/female ratio was 1:2. The data concerning the operations and pre- and postoperative treatment were recorded prospectively. The patients were followed up at 2 weeks and 1 year after the operation.
Results: We encountered one intraoperative bladder lesion, one subcutaneous port site infection, two postoperative hematomas that required reoperation, and two nerve irritation syndromes, which disappeared spontaneously after 6 months. Two patients developed an ileus; one required laparoscopic reintervention, and the other was treated with conventional open reoperation and intestinal resection. There were no recurrences.
Conclusions: The application of the laparoscopic approach to the treatment of femoral hernias using the TAPP technique in nonemergency situations is highly effective. To date, we have seen no recurrences. Although the rate of major complications is low, current surgical techniques need to be perfected to avoid the type of complication recognized in this study.

Key words: Coexisting hernia — Femoral hernia — Laparoscopic hernioplasty — Recurrence — Transabdominal preperitoneal technique (TAPP)

The femoral site is a very rare location for a hernia. Of a total of 1,097 operations performed by our department using the laparoscopic TAPP technique, only 51 procedures (4.6%) were carried out for the repair of femoral hernias. The aim of the present study was to determine the rate of complications and especially the rate of recurrences following the repair of femoral hernias in elective cases using this method. We also established the rate of incidental femoral hernias—i.e., those that had not been detected preoperatively on clinical examination but were only discovered during the laparoscopic procedure. In cases of preoperatively diagnosed incarceration, we generally elected to perform an open procedure.

Koontz [7] and Glassow [5] have published review articles describing the poor results in terms of complications and rate of recurrences generally associated with conventional anterior hernia repair. However, in 1987, Bendavid [1] reported a series of 30 patients who had undergone alloplastic repair of a femoral hernia using the anterior approach, a technique that seems to be more successful in terms of the rate of recurrence. A similar rate of success has been achieved with the Lichtenstein plug repair, also using the anterior approach [10]. Herein we report our results with the laparoscopic tension-free alloplastic repair of femoral hernias in elective cases using the TAPP technique.

Materials and methods

Between June 1993 and November 1998, the transabdominal preperitoneal (TAPP) technique represented the standard treatment of inguinal hernias at our department. A total of 1,097 operations were carried out, and 51 of them entailed the elective repair of a femoral hernia. This amounts to 4.6% of the repairs.

During the same period, 435 hernia repairs were made using various conventional techniques. Twenty-eight of them were femoral hernias, and seven of them were incarcerated and treated on an emergency basis. This open group has been excluded from consideration in this study.

Surgical technique

The operation is carried out under general anesthesia. The patient is placed in the Trendelenburg position on the operating table. Following the estab-

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Table 1. Demographic data of patients undergoing TAPP procedure for femoral hernias (n = 51)

	n	%
Primary	31	75.6
Recurrent	9	17.6
Rerecurrent	5	9.8
Total	51	100

lishment of a pneumoperitoneum, a 10-mm optic trocar is introduced through the umbilicus. After inspection of the abdomen, the hernia orifice is identified. A 5-mm and a 12-mm port are introduced pararectally at the level of the umbilicus. The 12-mm trocar is introduced ipsilateral to the hernia.

In the first step, we make a curved incision of the peritoneum from the lateral abdominal wall to the medial umbilical plica. In cases of lateral hernia, the hernial sac is completely dissected from the spermatic cord. In cases of direct hernia, the pseudohernial sac is completely dissected, and the hernial orifice is completely freed from the tissue. The preperitoneal fatty tissue is dissected away from Cooper's ligament, the ileopubic tract, and the transverse fascia, so that the transverse abdominal muscle and the posterior aspects of both rectus muscles are clearly visualized.

In cases of indirect hernia, we use a mesh measuring at least 13 × 10 cm; in cases of direct hernia, we use a 15 × 10 cm polypropylene mesh. At 6 cm from the lateral border, we make a vertical mesh incision that runs parallel to the lateral margin, at a depth of 7 cm. At the lowest point, a small hole is cut that forms the new profound inguinal ring. The mesh is brought into the inguinal region, and passed beneath the spermatic cord, so that the broader part of the mesh comes to lie medial and the narrower part lies lateral to the spermatic cord.

In order to carry out this procedure, it is important to have dissected the spermatic duct and testicular vessels free from the peritoneum, so that the mesh can lie flat on the ventral abdominal wall and the retroperitoneal structures. The vertical mesh incision is closed with singly placed staples. The mesh is fixed with these staples to the ventral abdominal wall at 2 cm above Cooper's ligament; it is also fixed to Cooper's ligament. Although the mesh incision may be the source of some later complications, it ensures a correct positioning and is part of the standard protocol at our department. The mesh is always positioned so that all potential hernial orifices are widely overlapped.

Following fixation of the mesh, the peritoneal incision is closed with singly placed titanium staples. After deflation of the abdomen, the ports are removed and the 12-mm and 10-mm port sites are closed with fascial sutures.

All data concerning the operation and pre- and postoperative treatment were recorded prospectively. The patients were followed up at 2 weeks and 1 year after the operation.

Results

In all, 33 (64.7%) of our patients were female, and 18 (35.3%) were male. Thirty-seven (70.6%) were primary hernias, nine (17.7%) were operated on as primary recurrences, and five (9.8%) were multiple recurrences (Table 1). In 13 cases (25%), the herniation was bilateral. In seven instances (13.7%), a simultaneous laparoscopic intervention was carried out. Six of those operations were done laparoscopically; five of them entailed adhesiolysis, one was a laparoscopic cholecystectomy, and one was a conventional repair of an incisional hernia using the technique of Mayo. Eleven cases presented with an additional indirect or direct inguinal hernia.

Physical reexamination of the patients was performed in all cases at 2 weeks, and 72% (n = 37) were seen at 1-year follow-up by a surgeon at our department who had not performed the operation. Another 10% (n = 5) were reexamined by their own general practitioners. The overall rate of follow-up after 1 year was 82%.

Complications were classified as intraoperative, minor, or major. In addition, reoperations were documented.

Intraoperative complications (n = 1)

In one case, a 47-year-old woman operated on for a right-sided recurrent femoral hernia incurred an intraoperative complication. A 15 × 10 cm polypropylene mesh was used to repair the femoral hernia according to the standard technique. The intraoperative and early postoperative course was initially uneventful. But because of increasing postoperative pain a cystoscopic examination was carried out by consulting urologists. Migration of the mesh with, concomitant fistula formation to the bladder was detected. Thereafter, the pain subsided, and the patient was free from complaints. There were no urinary tract or mesh infections. Until now, at >1 year after the procedure, no reoperation has been performed. We consider an operative revision, however, to be indicated and intend to carry it out together with the consulting urologists.

Minor complications (n = 4)

In two cases, relevant hematomas developed, requiring reintervention.

The first case was a 50-year-old patient who was treated for a multiple recurrent femoral hernia on the left side with a 13 × 8 cm polypropylene mesh. At 381 days after the laparoscopic hernia repair, a painful, partially organized hematoma was removed from the inguinal region using an anterior approach. The postoperative course following the reintervention was uneventful. It was striking that the patient had had only minor complaints during reexamination 1 year after the operation.

The second case was a 52-year-old patient who presented with a right-sided primary femoral hernia. She was treated with a 13 × 8 cm mesh. Three weeks after the operation, a hematoma was removed at another surgical department. Thereafter, the patient developed a nerve irritation syndrome that was traced to the genital branch of the genitofemoral nerve. A detailed questioning of the patient revealed that the pain had developed after the second operation.

Another 72-year-old patient who had been treated for a primary femoral hernia on the right side with a 15 × 10 cm mesh developed an obstruction due to an intestinal adhesion to the mesh. Seven days following the operation, she had a conventional reoperation. Later on, this patient also developed nerve compression syndrome of the ileo-inguinal nerve. She was unable to remember whether the pain had appeared after the first or second operation. It therefore remains unclear whether the nerve irritation was a consequence of the laparoscopic procedure. At the 1-year control examination, a hypesthesia in the area of the nerve was detected. The patient is otherwise free from complaints.

One other patient developed a subcutaneous port site infection, but there were no serious consequences (Table 2).

Table 2. Patients (n = 6) with complications after TAPP procedure for femoral hernia repair (n = 51)

	Intraoperative	Minor			Major
Patients	Bladder lesion	Hematoma	Port site infection	Nerve irritation	Ileus
1	x				
2		x			
3		x		x	
4			x		
5				x	x
6					x

Severe complications (n = 2)

There were two cases of severe complications.

A 43-year-old patient had been treated with a 15 × 10 cm polypropylene mesh for a left-sided primary femoral hernia. On the 7th postoperative day, a conventional reoperation was required for intestinal obstruction. A small intestinal loop was found to be adherent to the mesh. The adherent intestinal segment was resected. The postoperative course was uneventful.

A 72-year-old patient—the same one who developed the nerve irritation syndrome—who had been treated for a right-sided primary femoral hernia with a 15 × 10 cm Surgipro mesh developed an intestinal obstruction. The patient had already been discharged and needed to be readmitted to the clinic on the 15th postoperative day. She presented with all the classical signs of ileus. Conventional reoperation was required. A small intestinal loop had slipped through the medial aspect of the peritoneal incision into the preperitoneal space between the peritoneum and the mesh. It was incarcerated there. After we freed the loop, the peritoneal incision was closed with sutures. This complication was a direct consequence of the laparoscopic procedure. The subsequent postoperative course was complicated by the nerve irritation syndrome of the ileoinguinal nerve. At 1-year follow-up, the condition of the patient was considered satisfactory, since she was free from pain (Table 2).

Additional results

There were no deaths and no early recurrences. Six patients were operated on for incarcerated femoral hernias, which were easily reduced via the laparoscopic technique.

Diagnostic laparoscopy

Four female patients presented with inguinal pain but without the clinical signs of herniation. These patients agreed to a diagnostic laparoscopy, which led to the detection of femoral hernias with a small hernia orifice. A subsequent mesh repair was carried out in all cases.

Discussion

The laparoscopic repair of femoral hernias using the TAPP technique yields excellent results in terms of early recurrences and a low rate of complications. These complications, however, were quite serious.

A comparison of femoral hernia patients operated on using the TAPP technique with those receiving the conventional technique would not be useful, for the following reasons: At our department, only a limited number of surgeons (20%) are qualified in the TAPP procedure, and those who can perform this technique operate in a standardized fashion. Femoral hernia repair using the TAPP technique was only applied in to nonemergency cases. The repair of femoral hernias in the conventional group was not done in a standardized fashion (Shouldice, Bassini, Kirschner, McVay, Lichtenstein), and 25% of these patients were operated on in an emergency situation. The six (11.8%) femoral hernias treated laparoscopically for incarceration were small and discovered incidentally during the procedure. They were easily reduced with manual assistance after relaxation.

For cases of preoperatively diagnosed large incarcerated femoral hernias, especially when intestinal strangulation is suspected, an open procedure is performed. The attempt to free an incarcerated intestinal loop laparoscopically may be dangerous, because the hernial orifice has to be widened. In the process of cutting the rim of the orifice, lesions to the gut may occur because preparation takes place in a craniocaudal direction, and it may be impossible to judge the thickness of the tissue that can still be cut safely before the intestinal loop is reached. In addition, there may be strangulation, with bacterial translocation across the intestinal wall contaminating the surgical site. Both situations would preclude the implantation of alloplastic mesh. Therefore, in cases of incarceration, especially when strangulation of an intestinal loop may have occurred, a conventional anterior approach seems to be the safer option.

The development of femoral hernias seems to be more of a problem in women than in men. In accordance with earlier reports[7], we also found a sex distribution of two to one in favor of women.

Complex herniation involving several hernial orifices may sometimes escape clinical detection. Koontz [7] found a coexisting indirect herniation in eight (5.7%) of 139 conventionally operated femoral hernias by the anterior approach. In our laparoscopically treated patients, this percentage was four times as high. We found the combination of a femoral and an inguinal hernia in 11 cases (21.5%). In our review of the literature, we could not find any reports describing the laparoscopic treatment of femoral hernias, so there seem to be no comparative data available. Even in our patient group, the reason for the laparoscopic intervention in most cases was the inguinal hernia, and the femoral hernia was detected incidentally. The reason for the improved detection of complex herniation may be the improved overview of the inguinal region afforded by the laporoscopic posterior approach.

Intraoperative complications related to lesions of the intraabdominal or preperitoneal organs are one of the strong arguments against the laparoscopic repair of hernias. We also encountered one complication of that type. During the dissection of the inguinal region in a female patient who developed this condition following hysterectomy and conventional repair of a femoral hernia, an intraoperatively undetected lesion of the bladder occurred. Whether this lesion

was caused by the electric current, with secondary necrosis of the bladder wall, or by direct incision, or even by the stapling process, remains unclear. Several days after the operation, the patient developed pain. Two weeks later, the mesh could be seen cystoscopically.

The development of fistulas following the alloplastic repair of hernias has been described previously [12, 17]. In the majority of cases, direct contact between the mesh and an intestinal loop was found on reoperation. Others investigators, such as Hofbauer et al. [6], have observed a delayed mesh rejection in the absence of bacterial contamination. We, however, do not believe that our case with the bladder fistula had its cause in a delayed rejection to the alloplastic material. However, in this case, no bacterial contamination could be detected. Mesh rejection due to bacterial infections has also been described by Bittner et al. [2]. Our patient with the bladder fistula has been free of complaints for >1 year and will not consent to reoperation, which we consider to be necessary.

The development of hematomas seems to be a problem that is often associated with the endoscopic repair of hernias. Furtschegger et al. [4] have described the sonographic detection of hematomas in 10% of their patients. Presumably, the development of hematomas is associated with the extensive dissection required in laparoscopic hernia repair. It may in fact be due to the very loose tissue of the preperitoneal space. The inability to apply adequate compression to the surgical site postoperatively may be another factor contributing to this phenomenon. Stoppa et al., who were the first surgeons to place tension-free meshes into the preperitoneal space, always used drains [18]. Symptomatic hematomas are dealt with by puncture drainage under sterile conditions. Unfortunately, both of the patients in our series who presented with this problem were surgically treated in other departments. In the case of the 52-year-old female patient, the surgical treatment of the hematoma caused a nerve irritation syndrome of the genital branch of the genitofemoral nerve. Puncture drainage in this case may have prevented the development of this complication.

Nerve irritation syndromes were a common problem during the early days of laparoscopic hernia repair, until anatomical studies defined the areas where surgical dissection and the placement of staples had to be omitted, such as the so-called triangle of doom and quadrangle of disaster [11]. Recently, we have avoided the placement of staples into the iliopubic tract and 2 cm above this anatomical landmark.

Both nerve irritation syndromes encountered in our patients occurred following operative revisions—in one case following the surgical treatment of a hematoma, and in the other case, following surgical revision for intestinal obstruction. In both cases, however, the pain subsided, and 1 year after the operation both patients are free from complaints. So we conclude that the nerve irritation syndromes in our series were not a result of the inappropriate placement of staples.

A similar experience was described by Kraus [9]. Rosen and Halevy [15] discussed some possible variations in the course of the genitofemoral nerve and pointed out that lateral to the profound inguinal ring, coagulation and the placement of staples should be omitted. We therefore think it is of major importance to respect these anatomically dangerous zones and to avoid the use of staples in these regions. Should a nerve irritation syndrome be detected postoperatively, it makes sense to wait, treating the patient conservatively for a period of 6–12 weeks, because the pain may disappear, as was observed in the patients of our series. Other investigators have explored the possibility of extensive radical surgery for the treatment of nerve irritation syndromes. Krähenbühl et al. [8] reported a technique of retroperitoneal endoscopic neurectomy and described laparoscopic revisions with mesh removal.

One complication that is practically never seen following the treatment of hernias with the anterior approach is the postoperative ileus as mentioned by others [13], [14]. However, we encountered this serious complication in two cases. Both patients were treated via laparotomy. In one case, the resection of a bowel segment was required. Happily, the course of both patients following the revision was uneventful. The cause of both complications was insufficient closure of the peritoneal incision. We must emphasize that it is of critical importance to be meticulous in carrying out this simple final step in the repair.

Other authors have also encountered major complications due to insufficient closure of the peritoneal incision and concomitant development of fistulas between the small intestine and the mesh [2]. These complications, such as bladder lesions, hematomas, nerve irritation syndromes, are technical errors that can be avoided if meticulous surgical technique is followed. However, they are not only characteristic of the laparoscopic procedure, but can also occur following conventional procedures using the anterior approach. In a series of 128 patients treated via a conventional anterior technique, Waddington [19] reported one case of intestinal obstruction requiring reoperation and one case of bladder lesion.

The very low rate of recurrences following alloplastic hernia repair according to the endoscopic technique is the major advantage of this new approach. This advantage is clearly evident in our series: We had no recurrences at 1-year follow-up. The excellent results associated with the transabdominal preperitoneal technique were also achieved in the treatment of inguinal hernias at our department: Our recurrence rate was only 0.7% (eight of 1,097 cases, with a follow-up of 80%). Although this follow-up period seems rather short, we do not anticipate more recurrences after longer follow-up. Other authors have expressed a similar opinion [18]. Following alloplastic hernia repair, recurrences seem to occur either early or not at all. This result becomes apparent when looking at the work of Stoppa et al., who encountered recurrences in their series of tension-free preperitoneal mesh repairs via the open technique only 6–12 months following the operation. In conventional hernia repair, however, recurrences may occur 10, 15, or even 25 years after the procedure [10]. Glassow [5] reported recurrence rates of 2–8.5% [3, 5] when using the suture technique and the conventional anterior approach. Bendavid [1] had similar results with the same technique (7–10%); however, none of his 30 patients in whom the alloplastic material had been implanted by the anterior approach developed a recurrence. These excellent results are supported by the data presented by Sanchez-Bustos et al. [16]. With a median follow-up of 64 months, they had only one recurrence in 93 patients repaired via the plug technique (developed by

Lichtenstein). In emergency situations and strangulated as well as incarcerated hernias, given the danger of bacterial contamination of the hernial sac, alloplastic repairs should not be done.

In conclusion, there were no early recurrences among our series of 51 elective cases of femoral hernias treated with the TAPP technique. The rate of serious complications was not high, but the complications themselves were relatively severe as a result of the transabdominal route and the use of alloplastic materials. In 1,097 standardized TAPP operations, we encountered three cases of postoperative ileus and three cases of bladder lesions. As we found out during the follow-up, three of these six complications occurred in patients with femoral hernias. We consider these most severe complications to be somewhat overrepresented. However, they resulted from technical errors and therefore should be avoidable in the future. Special care needs to be taken in patients who have had previous operations in the prevesical space.

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