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SURGICAL ENDOSCOPY
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Polyester (Parietex) mesh for total extraperitoneal laparoscopic inguinal hernia repair

Initial experience in the United States

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Abstract. Polypropylene mesh is the most commonly used mesh for open and laparoscopic hernia repair in the United States. A variety of newly developed polyester mesh products have recently become available. This is the first U.S. multiinstitutional study evaluating the initial experience of polyester mesh use for total extraperitoneal (TEP) laparoscopic inguinal hernia repair.

Between January 2000 and June 2001, 337 patients underwent 495 TEP laparoscopic inguinal hernia repairs using polyester mesh. There were 309 men and 28 women in the study, whose average age was 45 years (range, 17–80 years). The average operative time for all cases was 54.3 min (range, 18–157 min). There were no conversions to open repair and no mortality. Complications included 12 seromas/hematomas (six aspirated), chronic pain in three patients, urinary retention in two patients, and one incidence each of the following: epididimitis, prostatitis, hydrocele, and port-site cellulitis. Additionally, one patient had carbon dioxide (CO_2) in the Foley bag at the end of the surgery, but a normal cystogram showed no identified bladder injury. There has been one recurrence (0.2%), occurring 4 months after surgery, which was repaired using a transabdominal laparoscopic approach. The mean follow-up period was 11 months (range, 2–22 months). There have been no documented infections of the mesh, and no mesh has been removed.

This study documents a favorable initial experience with polyester mesh for TEP laparoscopic inguinal hernia repair. There were no complications related to the mesh. There may be technical and long-term advantages with the use of polyester mesh for laparoscopic inguinal hernia repair. Longer follow-up evaluation and additional studies are warranted to evaluate these potential advantages.

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Key words: Inguinal hernia — Laparoscopic hernia repair — Polyester mesh

Polyester mesh, popularized by Stoppa [13], has been widely used in Europe for the repair of inguinal hernias. Others around the world have reported the use of polyester mesh, including surgeons in the United States [6, 15]. However, reports of high infection rates with the use of polyester for open hernia repair led to increased interest in alternate mesh products [4]. Polypropylene was introduced in the 1950s by Francis Usher [17, 18]. Its use for tension-free inguinal hernia repair was popularized in the 1980s with the Lichtenstein technique [9]. Since that time, there has been a trend away from primary suture repair. Currently, the great majority of adult inguinal hernias in the United States are repaired with some type of polypropylene mesh. Static hernia repair models have further validated the use of mesh for inguinal hernia repair [3].

Recent experience in Europe with a new type of polyester mesh (Parietex) has yielded favorable results with an extremely low rate of infection [5]. This study examined the early experience with polyester mesh use in the United States by surgeons at two teaching hospitals for total extraperitoneal (TEP) laparoscopic inguinal repair.

Methods

Beginning January 2000, polyester mesh (Parietex, Sofradim, Floreane Trevoux, France) was used for laparaoscopic TEP inguinal hernia repair at two teaching institutions (Fig. 1). All the patients undergoing laparoscopic TEP inguinal hernia repair by the authors were studied prospectively with evaluation of intraoperative and postoperative results. Hospital and office chart reviews were used to evaluate the short-term outcomes in this study.

The technique for laparoscopic TEP inguinal hernia repair has been described in previous publications [12]. Briefly, a 10-mm incision

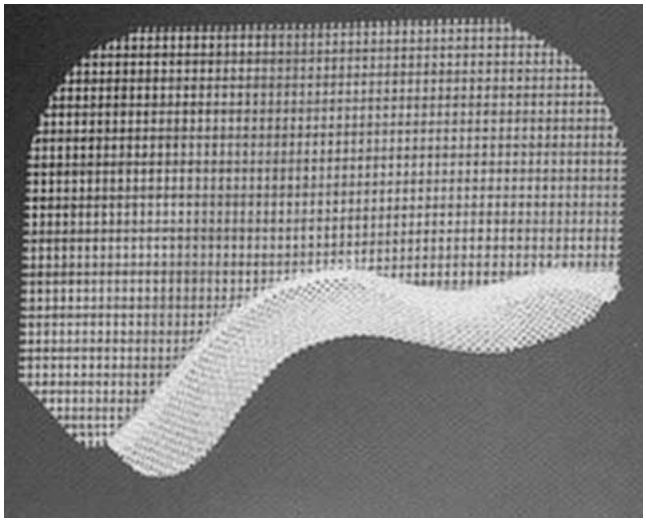

Fig. 1. External view of a right-side Parietex anatomic mesh.

is made in the inferior umbilicus. After balloon dissection, a 10-mm blunt-tip trocar is placed, and the extraperitoneal space is insufflated with CO_2 to a maximum pressure of 10 to 12 mmHg. Two 5-mm trocars are placed in the low midline. Blunt graspers are used for blunt dissection of the inguinal fascial planes and for exposure all potential hernia defects. In the repair of a unilateral hernia, the contralateral side is explored unless scar tissue from previous lower abdominal surgery prevents safe groin dissection.

After reduction of all hernia contents, a large polyester mesh (6×4 in.) is fashioned to cover the groin widely. A flat mesh with a slit may be used, with the mesh passed behind the cord and overlapped at the slit, or an anatomic mesh may be used to cover the myopectineal orifice, with no mesh slit. If a slit has been used, the mesh overlap is tacked first.

Next, one or two tacks are placed high and laterally; two to three tacks are placed on the anterior aspect of Cooper's ligament; and one to three tacks are placed anteriorly, medial to the inferior epigastric vessels. Tack placement is similar for the anatomic mesh, but no tacks are required to overlap a slit. The mesh placement for either unilateral or bilateral repair then is evaluated to ensure secure fixation and wide coverage of all potential hernia defects. Additional pieces of flat polyester mesh are used if additional coverage is required medially, laterally, or superiorly to the mesh. To prevent recurrence at the internal ring when a slit is used, the mesh slit is overlapped 1 to 2 cm around the cord at the internal ring. If sufficient overlap is not obtained, an additional piece of flat polyester mesh is placed anteriorly to cover the slit in the original mesh. To prevent a recurrence under the mesh when the anatomic, three-dimensional mesh without a slit is used, care is taken to ensure that the peritoneal reflection is completely reduced off the cord and lateral abdominal wall to the level of the umbilicus. This allows the mesh to lie flat posteriorly without the peritoneum protruding under the mesh. The mesh crosses the midline medially, approaches the level of the umbilicus laterally, covers the obturator foramen posteriorly, and rises to cover the inferior trocar site anteriorly. The mesh is then fixed with spiral tacks, with care to avoid tack placement at or posterior to the iliopubic tract lateral to the cord. The trocars are removed, and CO_2 is pushed out of the extraperitoneal space. The anterior fascia of the umbilical incision is closed, and the skin incisions are closed using subcuticular sutures. Patients are discharged on the day of surgery if the operation is tolerated, then are seen 1 to 3 weeks and 6 to 8 weeks later.

Results

Between January 2000 and June 2001, 337 patients (309 men and 28 women) underwent 495 laparoscopic TEP inguinal hernia repairs. A polyester mesh prosthesis was used in each repair. The mean age of the patients was 45 years (range, 17–80 years). There were 158 bilateral and 179 unilateral hernia repairs. The anatomic mesh with a slit was used in 233 repairs, and the flat mesh with a slit was used in 262 repairs.

The mean operative time was 54.3 min. There were no intraoperative complications. However, one patient who had previous lower abdominal surgery did have CO_2 in the Foley bag at the end of the surgery. A cystogram was negative, and the patient recovered without incident. There were no conversions to open repair or deaths in this series. Postoperative complications included 12 seromas/hematomas (6 were aspirated), chronic pain in 3 patients, urinary retention in 2 patients, and 1 incidence of each of the following: epididimitis, prostatitis, hydrocele, and port-site cellulitis. There was one documented recurrence (0.2%) during a mean follow-up period of 11 months (range, 2–22 months). The mesh was displaced anteriorly off Cooper's ligament, allowing for this recurrence. It was repaired using, a laparoscopic transabdominal approach.

Discussion

The optimal approach and technique for performing inguinal hernia repair is still being debated. Laparoscopic TEP hernia repair is documented as an excellent choice for inguinal hernia repair in numerous studies, especially when the surgeon is experienced [2, 5, 12]. In the United States, the type of mesh used for this repair has been almost exclusively polypropylene. There are numerous reports of mesh migration, erosion, chronic pain, and infection with polypropylene mesh used for inguinal hernia repair [1, 8, 16]. Chronic infection from polypropylene mesh used for inguinal hernia repair has been reported to occur at a rate exceeding 1 per 1,000 [14]. In our series, chronic pain occurred in three patients (0.9%), and there were no mesh infections or major complications. With open techniques, the incidence of chronic pain is reported to be as high as 30% [11].

One potential advantage of polyester over polypropylene is improved compliance. Polypropylene has been shown to have poor compliance after placement in the abdominal wall [10]. Shrinkage of polypropylene mesh by more than 50% has been documented in animal models [7]. Improved compliance may lead potentially to less long-term shrinkage, less scaring, and subsequently, less long-term pain.

Another advantage of polyester is its softness without loss of memory, making laparoscopic placement easier. In contrast, most types of polypropylene mesh are stiffer as memory increases. The softer polypropylene mesh products have less memory, making laparoscopic handling much more difficult. An additional characteristic of the polyester mesh noted by the authors is its lack of tendency to stick to fat in the extraperitoneal space, as compared with polypropylene. This is especially beneficial when mesh is handled laparoscopically.

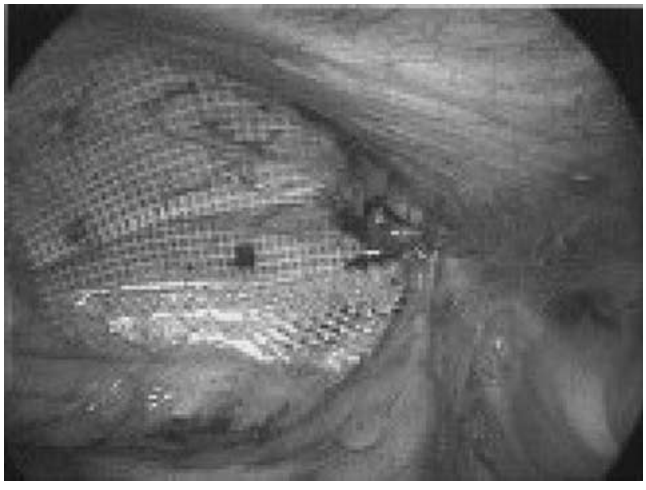

Fig. 2. Laparoscopic view of polyester mesh (Parietex anatomic) placed several months previously for a left inguinal hernia repair.

One previously documented potential drawback of multifilament polyester mesh is a higher incidence of infection associated with its use, as compared with other types of mesh [4]. This report evaluated an older type of polyester in open incisional hernia repairs. It is documented that infection occurs more frequently in open than in laparoscopic incisional hernia repairs. When the current polyester mesh is placed laparoscopically, there is an extremely low infection rate [5]. There were no infections in this study.

The local tolerance and ingrowth of polyester and polypropylene types of mesh seem similar. There is marked fast ingrowth of tissue into the mesh. This ingrowth suggests that polyester, like polypropylene mesh, should not be placed inside the abdominal cavity to avoid its direct contact with the abdominal viscera. The TEP technique allows for a completely extraperitoneal placement of polyester mesh. Placement in the extraperitoneal space minimizes the risk of erosion and scarring of the abdominal contents. A repeat laparoscopy several months after left inguinal mesh placement showed the polyester mesh in good position without adhesions or shrinkage of the mesh (Fig. 2). Incorporation of mesh in the extraperitoneal space may lead to good local tolerance because it minimizes problems with chronic pain, nerve irritation, testicular atrophy or ischemia, and spermatic granuloma that are reported with anterior mesh placement. Although there were three patients with chronic pain, it is difficult to determine whether the source was the mesh, the tacks, or generalized scar response.

Although most surgeons now agree that the laparoscopic approach is a viable option for inguinal hernia repair, especially for bilateral and recurrent hernias, many have not adopted this technique, largely because of the long learning curve. Because of a complex anatomy in an unfamiliar space, this laparoscopic procedure is more difficult to learn than most other advanced laparoscopic procedures, including open hernia repair techniques. The ease of using polyester mesh for laparoscopic repair may help to shorten the learning curve by making the mesh placement portion of the procedure less cumbersome. This was noted by the authors when residents or fellows participated as the surgeon. Nevertheless, ongoing improvements in laparoscopic training and education are needed to promote the safe adoption of this and other advanced laparoscopic techniques.

Conclusion

This article presents our early experience with TEP laparoscopic inguinal hernia repair using polyester mesh. Although polyester mesh is unfamiliar to most U.S. surgeons, it offers potential advantages for surgeons who perform tension-free hernia repair. Advantages such as better compliance, excellent laparoscopic handling characteristics, and good local tolerance were identified by surgeons in this study. Increased infection associated with polyester mesh used in open ventral hernia repair is not apparent with the current types of polyester mesh placed laparoscopically. Longer follow-up periods and larger studies should help in further evaluation of polyester and polypropylene mesh use for tension-free hernia repairs.

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