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LAPAROSCOPIC TOTAL EXTRAPERITONEAL REPAIR OF INGUINAL HERNIA WITH SWING-CONTACT MESH

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Abstract

Introduction: The treatment of inguinal hernia has been a great problem of surgery until now. Both open and laparoscopic methods are used for treatment of this disease. The local experience of laparoscopic total extraperitoneal inguinal hernia repair in a major clinical hospital has been reviewed.

Aim: To evaluate the technique of laparoscopic total extraperitoneal repair with Swing-Contact prosthesis (mesh) and its initial results.

Patients and Methods: Between March 2014 – May 2015, 25 patients underwent 30 total extraperitoneal hernia repairs for inguinal hernia in the Clinic of Surgery at Armenia Republican Medical Center. Twenty patients had unilateral hernia and 5 patients had bilateral hernias. All patients were male. Their age ranged between 23 and 65 years, with an average of 38.2 years. All operations were performed by the same surgeon with the patients under general anesthesia. Swing-Contact mesh was used in all cases.

Results: The laparoscopic approach was successful in 25/27 patients (82.3 %). The overall mean operative duration was 70 minutes (50 to 140 minutes) for unilateral hernias and a mean of 90 minutes (80 to 150 minutes) for bilateral hernias. The mean length of follow-up period was 10 months (1 to 14 months). The only intraoperative complication observed was two episodes of pneumoperitoneum. There were two cases of postoperative complications: retention of urine – 1, testicular swelling – 1.There were no recurrent hernias and recurrent groin pain. There was no mortality.

Conclusion: Total extraperitoneal repair using the Swing-Contact mesh is an excellent alternative to traditional mesh that may require additional mechanical fixation. It is a safe method with a few complications, acceptable operative times and a low learning curve. Advantages for patients may include less tissue disruption that results in less pain and complications, and a quicker recovery.

Keywords: *laparoscopic surgery, inguinal hernia, laparoscopic hernia repair, mesh, Swing-Contact mesh, TEP, total extraperitoneal surgery.*

Introduction

Inguinal hernias accounts for a lifetime risk of 27% in men and 3% in women [*Jenkins JT, 2008*]. Inguinal hernia repair reaches approximately 15% of all elective general surgical interventions, it is one of the most common operations being performed today [*Scheuerlein H et al., 2003*].

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The treatment of inguinal hernias remains a significant burden for health care service [*Jacobs VR, Morrison JE, 2008*]. About 700,000-800,000 operations for inguinal hernias are performed in the United States annually, approximately 140,000 of which are performed laparoscopically by either the transabdominal preperitoneal (TAPP) or total extraperitoneal (TEP) approaches [*Filipovich-Kugura J et al., 2009; Pavlidis TE, 2009*].

There were two main periods in the history of treatment of inguinal hernias: the traditional period

of autoplasty (Bassini, Shouldice, McVay, Kukudjanov, Postempski methods or "anatomic repairs") and the period of synthetic mesh repair started in the 1970s [*Voeller GR, 2009; Masukawa K, Wilson SE, 2010*]. All the previous history of inguinal hernia surgery showed that results get better with mesh placement. However, chronic pain is possible after both methods of treatment. Chronic groin pain is a great problem after all this methods of hernioplasty. There are descriptive terms as "inguinodynia" and "chronic post-surgical pain syndrome" [*Masukawa K, Wilson SE, 2010*]. The incidence of chronic pain syndrome with inguinal hernia repair varies from 9% to 27.7% in a large series. Investigators who have studied the etiology of chronic pain postulate injury or compression of the genitofemoral, lateral femoral cutaneous, ilioinguinal, or iliohypogastric nerves [*Lichtenstein IL et al, 1989; Masukawa K, Wilson SE, 2010*]. Sensory nerve damage can result in myelin degeneration, fibrosis, axonal loss, and edema that may contribute to peripheral neuropathy [*McKernan JB, Laws HL, 1993*].

In a comparison of open repair with laparoscopic total extraperitoneal patch repair, Eklund et al found that 5 years postoperatively, 1.9% of patients who had undergone laparoscopic repair continued to report moderate or severe pain compared with 3.5% of those in the open repair group [*Damor S et al., 2013*]. And the main cause of chronic pain are the sutures, connecting tissues to each other or the mesh to tissues. In laparoscopic operations, methods of mesh fixation have a great influence on the manifestation of chronic pain. Many types of mesh and fixation methods exist in TEP method of hernioplasty. Complications of open and laparoscopic repairs with fixation have been well described, which include nerve, vascular, bladder and bowel injuries, as well as chronic pain and hernia recurrence [*Erbella J, Erbella A, 2013*].

Usher described in 1958 a hernia repair using Marlex mesh. That was the first description of "tension-eliminating" or what we now call "tension-free" method [*Damor S et al., 2013*].

The "gold standard" in open hernia repairs in the treatment of inguinal hernias is Lichtenstein method. In Lichtenstein method the mesh is sutured onlay from the transversus arch to the shelving edge of the inguinal ligament creating a "tension-free" repair [*Lichtenstein IL et al., 1989*].

Main laparoscopic procedures used for inguinal hernia repair are transabdominal preperitoneal and total extraperitoneal methods. Many surgeons consider intraperitoneal onlay mesh (IPOM) method an experimental procedure, which has a limited use [*Brunicardi FC et al., 2005*].

The first laparoscopic inguinal hernia repair was performed by Ger, who made a high ligation of the sac without mesh placement [*Ger R et al., 1990*].

McKernan and Laws reported in 1993 about laparoscopic TEP approach. Total extraperitoneal repair was developed because of concern for possible complications associated with intraabdominal access, which was a required preperitoneal approach [*McKernan JB et al., 1993; Messaris E, Laws HL 2010*]

While the indications and contraindications for laparoscopic method have yet to be described, the use of SILS™ techniques to perform laparoscopic inguinal hernia repairs is already being described [*Filipovich-Kugura J et al., 2009; Jacob BP et al., 2009*].

In recent years, many different hernia barriers have been developed for use with open and TEP techniques. The mainstay has been polypropylene based mesh. Although most references advocate fixation of the mesh, there have been some successful reports of using these traditional barriers without fixation. The new technologies of meshes make it possible to avoid fixation by hernia staplers. New generation of meshes are self-fixating [*Kapischke M et al., 2010*]. A new, partially absorbable, and self-gripping mesh (ProGrip, Covidien, Norwalk, Connecticut, USA) has been engineered for open and laparoscopic techniques, which may eliminate the need for any fixation. TEP repair using the ProGrip mesh is considered an excellent alternative to traditional mesh that may require additional mechanical fixation. [*Erbella J, Erbella A, 2013*].

But recurrence rate after laparoscopic procedures is still high. Recurrence after TEP was up to 4.9% [*Damor S et al., 2013*].

A preformed polyester mesh (Parietex; Covidien, Mansfield, Massachusetts, USA) was used for the repair without any fixation [*Messaris E et al., 2010*]. The polyester meshes Swing-Contact (THT Bio-science, France) are used for hernia repair without fixation as well.

Materials and Methods

In the period of March 2014 – May 2015, twenty five patients with inguinal hernia underwent total extraperitoneal repair with Swing-Contact meshes in the Clinic of Surgery at Armenia Republican Medical Center. Our learning curve of TEP procedures passed at the Clinic of Surgery of Memmingen Hospital (Memmingen, Bayern, Germany). This is the first report of the use of Swing-Contact mesh for TEP repairs in Armenia.

Data on patient demographics, types of hernia, operative aspects (duration of surgery), postoperative recovery (post-operative pain, duration of hospital stay), complications were collected, recorded and prospectively reviewed.

Patients with primary unilateral or bilateral reducible inguinal hernia were included in the study. Patients with recurrent, irreducible, strangulated inguinal hernias, not fit for general anesthesia, previous lower abdominal (hypogastric) operations, or other forms of laparoscopic hernia repair (IPOM and TAPP) were excluded. In such cases open repair using Lichtenstein method was performed.

All patients were male. Their age ranged between 23 and 65 years, with an average of 38.2 years. There were 20 patients with unilateral hernias (15 indirect and 5 direct hernias) and 5 patients with bilateral hernias (3 indirect and 2 direct hernias). All hernias were primary. All patients were examined clinically and their history and examination findings were filled in the proforma. All patients underwent routine investigations like blood account, urine analysis, biochemical analysis, blood urea, serum creatinine, chest X-ray, ultrasound of abdominal cavity, electrocardiography.

Preoperative preparation, general anesthesia and preoperative antibiotics were similar in all cases. All patients were given one day of prophylactic injectable antibiotic followed by parenteral or oral antibiotics for 3 postoperative days.

The same surgeon performed all surgeries. General anesthetics with muscle relaxation were administered. The first 2cm infraumbilical incision was made, the anterior rectus sheath was incised, and the rectus muscle was retracted to expose the posterior rectus sheath. A balloon dissection device (AutoSuture, Tyco) in 5 cases was inserted over the posterior rectus sheath, guided to the pubic symphysis and inflated, resulting in the separation of the peritoneum from the rectus muscle. This creation of the extraperitoneal space allows for laparoscopic dissection to take place. The balloon device was then removed and replaced with a 10mm Hasson cannula or blunt-tip trocar (Spacemaker Plus, Coviden, Norwalk, CT) and a standard length, 0-degree, 10mm laparoscope (Karl Storz, Tuttulingen, Germany) in it. In 20 cases preperitoneal space was entered just below the umbilicus and enlarged using gentle blunt dissection with a laparoscope. In these cases we did not use dissecting balloon trocar for tissue dissecting in inguinal region. We used a Karl Storz laparoscopic set (Karl Storz, Tuttulingen, Germany).

Carbon dioxide was insufflated to a pressure not exceeding 15 mm Hg. Two additional 5 mm ports (cannulae) for placement of laparoscopic graspers were inserted in the midline between umbilicus and pubic bone under direct vision, reusable cannulas and instruments were used (Fig. 1).

The first step was to identify key anatomical landmarks such as the pubic bone, Cooper's ligament, spermatic cord, inferior epigastric vessels running superiorly, and the type of hernia (direct hernia medial to and indirect hernia lateral to inferior epigastric vessels). The next step was to reduce the hernia sac from the inguinal wall. The indirect hernia sac was separated from the spermatic cord and reduced (Fig. 2).

A rectangular shaped 10×15 cm Swing-Contact mesh (THT Bio-science, France) was chosen for the reconstruction. The mesh was folded in half like a "taco" and introduced via the umbilical port (Fig. 3).

It was inserted in the extraperitoneal space covering the hernia orifices. It was unfurled medially to laterally, beginning at the pubic tubercle to cover the hernia defect and encircle the cord structures. Fixation was used sometimes only in bilateral hernias, for each mesh a tack was deployed medially to pubic bone (AbsorbaTack, Coviden, Norwalk, CT). In each case, the hernia sac was held posterior to the mesh upon desuflation. Through two wounds in the site of 5mm trocars tubes were placed behind mesh for drainage and active aspiration. The gas was released and the umbilical wound was closed with nonabsorbable sutures.

Postoperatively, analgesics was given "on demand" basis in the form of Diclofenac tablet. Patients were discharged on the 3rd or 4th postopera-

tive days. After that they were followed up for one month and further follow-up was done with questionnaires about pain at the operative site, any discomfort, analgesics use, activity level, wound complication, and recurrence.

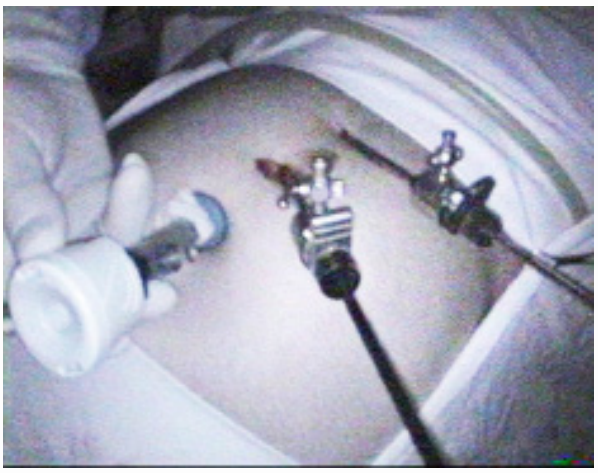

Figure 1. *Location of trocars.*

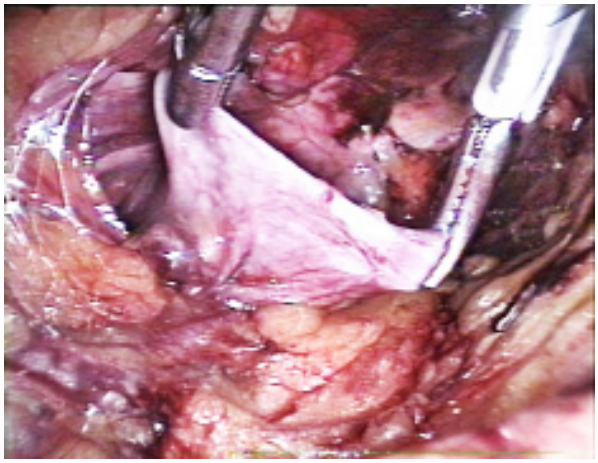

Figure 2. *The hernia sac.*

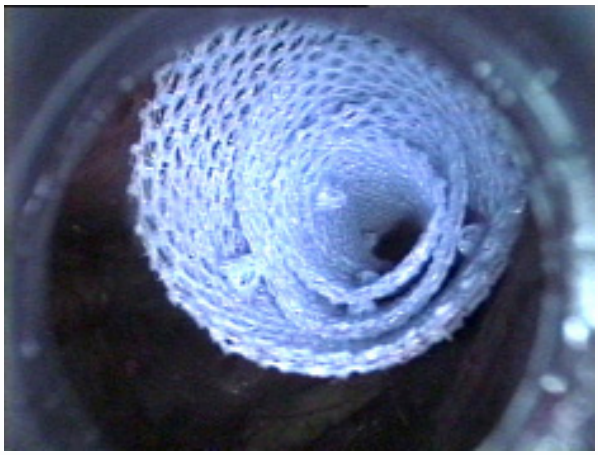

Figure 3. *The hernia mesh Swing-Contact introduced into preperitoneal space via the umbilical port.*

Results

Twenty seven patients with inguinal hernias were selected for TEP repair with Swing-Contact meshes, and 25 of them underwent the procedure successfully. Two patients underwent conversion to the open technique because of complications in the process of mobilizing the hernia sac.

The overall mean operative duration was 70 minutes (50 to 140 minutes) for unilateral hernias and a mean of 90 minutes (80 to 150 minutes) for bilateral hernias.

The Swing-Contact mesh was used in all 25 hernias, without additional mechanical fixation in 20 patients with unilateral hernias and with fixation in 5 patients with bilateral hernias.

In the present study, there were no major intraoperative complications like bowel or urinary bladder injury, damage of inferior epigastric vessels. The only intraoperative complication observed was two episodes of pneumoperitoneum. There were two cases of peritoneal tear (breach in the peritoneum), that resulted in the escape of gas into the peritoneal cavity. In both cases we sutured the site of injury and continued the laparoscopic procedure.

All patients did not require any narcotics. Nineteen patients returned to normal activity within a week. There were no major complications in the following postoperative period. There were two cases of postoperative complications – one patient suffered from postoperative urinary retention and required urinary catheterization in two postoperative days. Testicular swelling was seen in another patient. Scrotal edema was not seen in any patient. No patients had paresthesia or hyperesthesia. All patients fully recovered. There was no mortality.

The mean length of follow-up period was 10 months (1 to 14 months). There were no recurrent hernias and recurrent groin pain. Twenty four patients were either satisfied or extremely satisfied with their repair and would or had recommended TEP to a friend. They noted that their TEP repair was associated with less pain and shorter time to return to usual activities.

The mean inpatient hospital stay was 2.4 days. The average time for return to normal activity was 15 days (10 to 25 days).

Discussion

Inguinal hernia repair is one of the most commonly performed surgical procedures. Various types of operative approach to it have been described. Laparoscopic inguinal hernia repair is a relatively new approach in the long history of groin hernia repair and it remains an alternative and feasible method for open hernia surgery.

Patients with primary, unilateral hernia who require rapid recovery from surgery to resume normal activities and work can also benefit from endoscopic repair. Early forms of laparoscopic repairs, such as IPOM, enter the peritoneal cavity to secure the mesh over the inguinal floor. Sometimes it results in intestinal obstruction due to adhesions between bowel and exposed mesh. This is clearly an undesirable complication.

One of the major advantages of laparoscopic hernia repair is that it can offer a minimal access approach to preperitoneal hernia repair. Total extraperitoneal hernia repair is a well-described technique for inguinal hernia reconstruction. The TEP approach allows for mesh placement within the preperitoneal space, without entering the abdominal cavity. The benefit of this approach is the avoidance of the incision and closure of the peritoneum typically required in the TAPP approach [*Brunicardi FC et al., 2005*]. In our series we used only TEP method to avoid the abovementioned disadvantages of TAPP method.

Laparoscopic TEP hernia repair has several advantages like reduction of postoperative pain, mesh placement in the preperitoneal space, bilateral repair with a single access. Some series of TEP repair demonstrated that this method over one year period can be achieved with minimum morbidity [*Cheah WK et al., 2004*]. Only two episodes of intraoperative (pneumoperitoneum) and four episodes of postoperative (retention of urine – 2, wound infection – 1, testicular swelling – 1) complications were observed in our study.

At the present time, the authors prefer the TEP procedure for smaller, simpler, initial reducible hernias, while patients with large hernias and those with previous lower abdominal incisions or any other complicating situation usually undergo a TAPP herniorrhaphy or open procedure [*Brunicardi FC et al., 2005*]. Probably the most difficult stage in TEP procedure, even for experienced hands, is the reduction of a chronic large indirect sac that is often adherent to the cord and surrounding structures. Reduction of the indirect sac can add several minutes and may necessitate conversion to an open approach for the surgeon early in the learning curve. Another barrier is the variability of the initial presentation of the anatomy. Significant preperitoneal fat, presence of an unreduced direct hernia, bleeding from the balloon dissection, and previous lower abdominal surgery, can obscure the anatomy [*Ayman H, 2007*]. In our series only one patient underwent TEP for bilateral inguinal hernia after median laparotomy. There were technical difficulties at the stage of accessing through the sheath of rectal muscles.

Probably the most dangerous portion of the operation is the lateral dissection, where dissecting too far posteriorly can increase the risk of inadvertent iliac vessel injury and inadvertent breaches of the peritoneum. In some cases breaches of the peritoneum and subsequent capnoperitoneum required conversion to open surgery [*Cheah WK et al., 2004; Ayman H, 2007*]. In our series we sutured the site of tear of the peritoneum in two cases and avoided conversion. We must note that capnoperitoneum dramatically reduced the working space in TEP procedure.

Several randomized controlled trials and systematic reviews, which compare laparoscopic repair to open repairs, showed that laparoscopy produced the following benefits: (a) less postoperative pain, less analgesic consumption, earlier return to normal activities and work in the early post-operative period; (b) less long term complications of groin pain and permanent paresthesia; and (c) fewer recurrences than sutured herniorrhaphy, but with comparable efficacy to open mesh repairs [*Cheah WK et al., 2004; Chowbey PK et al., 2006; Ayman H, 2007; Hoque S et al., 2013*].

In TEP repair there are difficulties with tissue dissection in small preperitoneal space of inguinal region. In some cases the patient's constitution matters very much. Another barrier to learning the operation is the mesh manipulation. The small working space of inguinal region results in serious difficulties in manipulation with mesh. The difficult part of using Swing-Contact mesh is unfurling the mesh within the preperitoneal space.

Many mesh materials are available and varying fixation methods have been reported including

glues, sutures, staples, and tacks. As with all hernia repairs, surgeons strive for a technique that is efficient with biomaterials that are safe, easy to use, and produce the highest patient satisfaction with low recurrence rates. Although chronic pain rates trended higher with mesh repair, and were not statistically significant, it does point to a potential role of mesh in the etiology of chronic postoperative pain [*Masukawa K, 2010*]. Our small experience shows that abovementioned connection of TEP method and self-fixing Swing-Contact mesh provides less chronic postoperative pain.

The Swing-Contact mesh has three-dimensional light "honeycomb" knitted structure with "grips"; its polyester multifilaments are impregnated with aliphatic polyurethane. Swing-Contact mesh is unlike any mesh material that has self-gripping or self-fixating properties along its entire surface that is designed for both open and laparoscopic deployment. No need to employ another device for additional fixation of the mesh also makes it very appealing for economic reasons. It has also shown superior strength properties compared to additional fixation methods such as fibrin adhesives and stapling [*Hollinsky C et al., 2009*].

The learning curve in adopting the Swing-Contact mesh method was low, with operative times declining significantly after the first 10 cases.

Conclusion

The total extraperitoneal approach for laparoscopic inguinal hernia repair can be utilized for adult inguinal hernias. The TEP method reduces the risk of visceral injury, adhesion formation and the development of port site hernias. TEP hernioplasty with mesh is a safe and efficacious method with a low rate of recurrence and chronic pain. It has become the preferred technique of laparoscopic repair of inguinal hernias.

TEP repair using the Swing-Contact mesh is an excellent alternative to traditional mesh that may require additional mechanical fixation. As we have demonstrated, it is a safe procedure with few complications and acceptable operative times and a low learning curve. Advantages of the method include less tissue disruption, less pain, complications, and quicker recovery.

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