

Clinical Study

Laparoscopic Umbilical Hernia Repair: Technique Paper

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Objective. Laparoscopic umbilical hernia repair has largely replaced open method. The purpose of this study was to document the laparoscopic umbilical hernia repair using two port, combined herniorrhaphy with intraabdominal mesh fixation with transabdominal absorbable suture technique and demonstrate that it is feasible, efficient, and safe. **Methods.** Thirty-two patients with umbilical hernia underwent laparoscopic repair by combined herniorrhaphy and intraabdominal mesh. Two-port technique was used and the umbilical defect was closed using transabdominal PDS suture, composite polypropylene, and PTFE mesh was placed intra-bdominally and fixed to abdominal wall using transabdominal PDS suture. **Results.** Thirty-two patients underwent laparoscopic repair. The operating time ranged from 45 min to 100 min (mean 64 min). Early postoperative complication was seen in five patients with two having ileus for 4 days and one patient each developed urinary retention, wound infection and seroma. Late postoperative complication was seen in 6 patients with five complaining of persistent abdominal pain which resolved without treatment and one case of keloids at port sites. None of the patients developed chronic pain or had recurrence over the follow-up period. **Conclusion.** Laparoscopic umbilical hernia repair with combined herniorrhaphy and intraabdominal mesh fixation using absorbable sutures offers an efficient, safe, and effective repair for umbilical hernia.

1. Introduction

As with inguinal hernia the umbilical hernia repair has undergone various developments with laparoscopic repair of umbilical hernia (LRUH) is gaining increasing popularity due to its low recurrence rate, short hospital stay, and low complication rate [1]. Inguinal hernia repair evaluation of outcome of surgeries has gradually changed from recurrence to chronic pain development. With laparoscopic repair of ventral and incisional hernia becoming the standard treatment attention has gradually shifted to chronic pain as the outcome for comparing various methods. Some issues need to be addressed in LRUH fixation of the prosthesis with single-crown or double-crown helical tackers and transabdominal sutures (TASs), number of ports required, seroma formation, incidence and management of chronic pain. This paper reports our experience with laparoscopic umbilical hernia repair with modification of current procedure to address the above issues.

2. Method

Between February 2009 to July 2011, 32 consecutive patients underwent attempted laparoscopic umbilical hernia repair using herniorrhaphy with mesh repair technique and were studied prospectively. Exclusion criteria were very large hernias and severe comorbid conditions with high risk for general anesthesia. This series represents the experience with this technique for a single consultant surgeon.

2.1. Laparoscopic Repair Technique. The patient is placed in the supine position with the left arm tucked alongside the patient. Monitors are placed at either side of the foot of the bed. A first-generation cephalosporin is administered intravenously. After general endotracheal anesthesia is induced, the abdominal skin is sterilized and draped. An orogastric tube is placed for stomach decompression. A pneumoperitoneum is achieved with a Veress needle insertion; the most preferred site for initial access is the Palmer's point, a point

3 cm below the left costal margin in the midclavicular line as one is least likely to encounter intra-abdominal adhesions at this point [2]. Alternative sites include the right hypochondrium and the right and left iliac fossae. A 10 mm port is then placed percutaneously at a point along the anterior axillary line. One additional 5 mm port is placed under direct vision the left side of the abdomen. A 30° laparoscope is placed through the 10 mm port. Laparoscopic examination of the abdomen is performed, and any abnormalities are noted. If there is no contraindication to proceed, the incarcerated contents are reduced. This can be accomplished with a combination of blunt and sharp dissection with scissors. Occasionally, the harmonic scalpel is useful if the adhesions are particularly vascular. No attempt is made to remove the hernia sac. The abdominal wall is inspected for additional hernias. If none are found, the umbilical fascial defect is sized by passing a spinal needle transabdominally. It is easy to overestimate the size of the defect when there is pneumoperitoneum; thus, insufflation pressure should be reduced to 8 to 10 mmHg for this step. The undersurface of the abdominal wall is cleared of any fatty deposits that would inhibit smooth flat application of the mesh. A 2–5 mm incision is placed within the umbilical skin fold depending on the defect size. A suture passing instrument like Carter-thomason/Gore device was used for closure of umbilical defect. Using the device, and under direct vision, PDS suture was introduced into the abdominal cavity on one side of the defect and retrieved back on the other side of the defect after once more passing the suture passing instrument. At least 3 sutures were placed across the fascial defect, and the sutures were then tied. The suture knots were buried under the skin, and the incision was closed with a subcutaneous suture. This technique, previously described by Carter [3] for closure of trocar sites, is relatively easy to perform. The technique is no different from that involved in the closure of 10-mm port sites and adds no more than 5 minutes to 10 minutes to the procedure. An appropriate size mesh is chosen to adequately close the defect with an overlap of 3 cm circumferentially. We use the Proceed (ETHICON Johnson-Johnson) dual layer mesh, but many others are available. It is important to have 3 to 5 cm overlap over the entire fascial defect. Four sutures of 2-0 polydioxonesulphate (PDS) placed through the polypropylene side of the mesh at the corners. These are tied to the mesh with three square knots. The mesh is then rolled and inserted through the 10 mm port into the abdominal cavity. Larger pieces of mesh require removal of the port and placement directly through the skin opening. The mesh is unrolled inside the abdomen and positioned with the polypropylene side against the abdominal wall and the polytetrafluoroethylene side down toward the abdominal contents. The pneumoperitoneum is again decreased to 10 mmHg and with a suture-passing instrument the corresponding pairs of sutures are individually pulled transabdominally through appropriately placed 2 mm skin incisions. The sutures are pulled tight, and the mesh is raised to the abdominal wall. A 3 to 5 cm overlap is once again confirmed, and the anchoring sutures are tied in the subcutaneous tissues. Additional sutures were placed if any sagging of mesh was found. No tackers were used for further

fixation of mesh. Pneumoperitoneum was released and ports sites were closed.

3. Results

Thirty-two patients underwent laparoscopic umbilical hernia repair—twenty-five were females and 7 males. Mean age was 44 years (range 28 to 63). Two hernias involved divarication of recti muscles. The average defect size was 10 cm² (range 1 cm² to 24 cm²). The average mesh size was 110 cm² (range 32 cm² to 225 cm²). Twenty-six of them were operated with two-port techniques 6 patients required additional port, 4 due to dense adhesions it was difficult to dissect the contents of hernia sac, and 2 required additional 3rd port due to difficulty unrolling the large mesh intraabdominally. The operative time ranged from 45 min to 100 min (average 64 min). The average hospital stay was 2.6 days (range 2 to 7 days). Follow-up surveillance for complications and recurrence of hernia was performed in an outpatient clinic at the 6th week and by telephonic conversation every 6 months. Mean follow-up period was 26.5 months. Eight patients were lost to followup 5 at 12 months and 3 at 18 months as they could not be contacted for telephonic interview using the contact details available. No early complications (<4 weeks postoperative) were observed in 27 of the 32 patients. Of the remaining 5 (15.6%) patients, one (3.1%) developed urinary retention requiring catheterization, two (6.2%) developed ileus which resolved spontaneously by 4th day. One (3.1%) developed seroma at umbilicus with discharge from suture site which resolved in 2 weeks with regular dressing. One (3.1%) developed infection at umbilicus which was treated successfully with antibiotics. Late postoperative complication (>4 wk) occurred in six (18.7%) patients. Five (15.6%) patients complained of abdominal pain which resolved over 2–4 months without further treatment. One (3.1%) patient developed keloids at post site and at transabdominal suture fixation sites. No patients presented with chronic pain or recurrence over the follow-up period.

4. Discussion

4.1. Rationale for Laparoscopic Repair. In the laparoscopic technique, the mesh is placed in an intraperitoneal location and less often in the preperitoneal location, where the rise in the intra-abdominal pressures is totally diffused along each square inch of the mesh and not along a tenuous suture line, as happens in conventional suture repairs. An increase in the intra-abdominal pressures thus helps to keep the mesh in place rather than displace it, as is the case in conventional overlay repairs. The laparoscopic approach affords the surgeon the ability to clearly and definitively define the margins of the hernia defect and to identify additional defects that may not have been clinically apparent preoperatively. One of the key determinants to a high recurrence rate following conventional repairs is the phenomenon of occult hernias. These are the hernias liable to be missed during an open repair.

Finally, it stands to reason that a wide overlap of the defect with mesh would help to prevent the intra-abdominal

forces from displacing the mesh into the defect. The laparoscopic approach allows for easier placement of a larger prosthesis with good overlap. In the open approach, attaining an overlap of 3 to 5 cm requires extensive soft tissue dissection, with resultant increase in wound complications. This advantage is more prominent in obese patients and those with larger defects.

4.2. Mesh Fixation. The preferred method of mesh fixation during laparoscopic umbilical hernia is controversial. The physics of mesh fixation during laparoscopic ventral hernia repair does not support the sole placement of tacks/other fixation devices. The majority of the meshes used for laparoscopic umbilical hernia repair are roughly 1 mm thick and the spiral tacks are 4 mm long and take up a 1 mm profile on the surface of the patch. A perfectly placed tack can be expected to penetrate only 2 mm beyond the mesh; hence tacks will likely not give the same holding strength as a full thickness abdominal wall suture. Because many candidates presenting for laparoscopic umbilical hernia repair are obese (having a substantial amount of preperitoneal fat), the 2 mm penetration of the tack will not reach the fascia in most cases. Experimental studies have confirmed the superior strength of sutures versus tacks alone in mesh fixation to the abdominal wall [4, 5]. They have concluded that suture fixation of the mesh in laparoscopic umbilical hernia repair is imperative, especially during the early period of mesh incorporation. Many proponents of the use of transabdominal sutures cite lower recurrence rates due to higher tensile holding strengths of sutures in comparison to tacks [6]. Other authors argue that the use of tacks reduces surgical time considerably while maintaining similar recurrence rates [7]. Recently it has been shown that Mesh fixation with Fibrin Sealant in LUHR was associated with less acute postoperative pain, discomfort, and a shorter convalescence than tack fixation or transabdominal suture without compromising on the recurrence rate [8].

4.3. Recurrence. Numerous studies using the laparoscopic approach have reported a recurrence rate of 10% [9, 10]. Mechanisms of recurrence of umbilical hernia described in the literature, in decreasing order of frequency are infection, lateral detachment of the mesh, inadequate mesh fixation, inadequate mesh, inadequate overlap, missed hernias, increased intra-abdominal pressure, and trauma [11]. We observed that the combined technique of herniorrhaphy with intraabdominal mesh in umbilical hernia repair reduced the chances of recurrence to minimum.

4.4. Seroma Formation. Seroma formation is not unique to the laparoscopic approach. Most seroma develop above the mesh and within the retained hernial sac. The rate of seroma formation in reported series varies depending on when investigators evaluated it. The mean incidence of seroma at 4 to 8 weeks is 11.4% in large reported series. In the largest multi-institutional trial, seroma that were clinically apparent more than 8 weeks postoperatively were considered a complication and occurred in 2.6% cases [12]. The incidences of seroma are higher where the mesh is fixed by single or

double crown technique where the hernial defect is not obliterated. To reduce this we adopted the technique of port site closure developed by Carter to close the umbilical defect or at least reduce the defect size using absorbable suture. Regardless of whether they are aspirated under sterile conditions or allowed to resolve, seroma rarely result in long-term problems. Aspiration is recommended for seroma that enlarge or persist before they reach large sizes, when rarely they can give rise to necrosis of the overlying skin. The patients should be counseled preoperatively regarding the possibility of seroma formation after laparoscopic repair.

4.5. Chronic Pain. Some authors argue that the use of tacks significantly reduces postoperative pain. Pain is generally worse after repair with sutures than with tacks. Sutures penetrate through the full thickness of abdominal wall musculature and fascia. This has been theorized to cause local muscle ischemia resulting in severe pain postoperatively [13]. Cobb et al. [14] has also proposed that intercostal nerves may become entrapped within the transabdominal sutures causing chronic, persistent neuropathic pain. Series of repairs using transfascial sutures report persistent pain and discomfort in 1% to 6% of patients [15]. None of our patient presented with persistent pain beyond 6 months. We preferred to use synthetic absorbable suture PDS for mesh fixation of mesh and closure of umbilical defect as these provide adequate fixation till ingrowth of fibrous tissue into mesh and also prevent accidental long-term entrapment of nerves in sutures. Most authors feel that oral anti-inflammatory medications or injections of a local anesthetic can alleviate the symptoms in the majority of cases [16]. Others have reported reexplorations for persistent pain, finding immediate relief after the release of a suture from the site of symptoms [17].

4.6. Number of Ports. The usual 3-port technique for ventral hernia repair is being replaced by 2-port [18] and single-port technique with similar operative time and results. We observed that 2-port technique was adequate for dissection of sac contents and adhesions in cases of difficulty; additional ports can be used.

4.7. Postoperative Morbidity. Causes of postoperative morbidity, apart from those mentioned above, are unrecognized enterotomy, wound infection, intraperitoneal abscess bowel obstruction due to adhesion to mesh and respiratory failure. Such complications often increase the hospital stay and the cost of treatment; however, the frequency of these complications is comparable to the open technique [19].

4.8. Cost Outcomes. There are encouraging results being reported in comparative studies regarding the cost analysis of laparoscopic versus open repair of ventral hernias. In a recent series, laparoscopic umbilical hernia repair using a dual-layer polypropylene mesh and transfascial sutures significantly reduced surgical site infections, length of hospital stay, and costs as compared to open mesh repair [20]. However, types of mesh used and fixation device can make sizeable differences in cost calculations. We used transabdominal

suture for fixation of mesh with closure of umbilical defect in comparison to tackers to reduce the cost of procedure.

5. Conclusions

Laparoscopic umbilical hernia repair with combined herniorrhaphy and intraabdominal mesh fixation using absorbable sutures offers the ideal outcome with low recurrence, and lesser complication of infection seroma formation, and chronic pain with reduced cost of procedure.

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