

Original Research Article

Laparoscopic totally extraperitoneal repair of inguinal hernia using three-dimensional mesh: a 5 years experience at a tertiary care hospital in Kashmir, India

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ABSTRACT

Background: Inguinal hernia repair by laparoscopy is gaining acceptance worldwide. A flat mesh used in laparoscopic inguinal hernia repair is associated with more complications especially early and late postoperative pain owing to the need of mechanical fixation of this mesh. A three-dimensional mesh in this context is an emerging alternative which needs no or minimal fixation.

Methods: A retrospective study of 123 patients was carried out from July 2012 to August 2017. All patients who underwent TEP by a single surgical team using three-dimensional mesh were included in the study. Data collected was analysed retrospectively.

Results: Out of a total of 123 patients, 114 patients had unilateral hernia and 9 had bilateral hernia. A total of 132 laparoscopic hernia repairs were done using three-dimensional mesh. All the patients were male aged 29 to 75 years with a mean age of 51.5 years. Indirect hernias were more common comprising of 87.7%. The mean operative time was 46.9 minutes. The average mesh fixation time was 12.6 minutes. No major intraoperative complications were noted in any of the patients. Three patients (2.45%) experienced severe postoperative pain. Most of the patients 117 (95.12%) were discharged within 24 hours of surgery. Mean hospital stay in our study was 1 day. The mean length of follow-up was 12 months. Mild persistent groin pain was found in four patients (3.25%). Seroma was noted in five patients (4.06%). Hematoma and wound infection was noted in none. One patient (0.81%) had recurrence after completion of follow up. We found use of 3D mesh costly.

Conclusions: Laparoscopic inguinal mesh hernioplasty using 3D mesh is a viable alternative of hernioplasty with minimal post-operative pain and recurrence and using 3D mesh has a technical advantage of easy insertion in an anatomically correct position with minimal fixation.

Keywords: Hernia, Mesh fixation, TEP

INTRODUCTION

Repair of inguinal hernia is performed in all general surgery departments. Approximately 20 million repairs are performed annually worldwide and hence is the most common elective surgical procedure performed.¹ Marlex

mesh for repairing tissue defects in incisional and inguinal hernias was first introduced by Usher in 1958.² This is a landmark in the history of hernia surgery. Since then, the use of mesh has become essential in the repair of all hernias. Arnaud, defined the necessary qualities of

prostheses, which were established by Cumber Land and Scales. These are:

- It should be strong, pliable and easy to handle
- It should be inert, non-allergic, non-biodegradable and non-carcinogenic
- It should have optimum thickness
- It should stimulate adequate fibroblastic activity and get rapidly incorporated in the tissues
- It should be biocompatible
- It should achieve early, rapid and optimum ingrowth of fibrocollagenous tissue to prevent dislocation or migration
- It should preferably be macroporous, monofilament, transparent and should resist infection.
- It should provide a barrier to adhesions in the intra-abdominal placement

So far, no single mesh fulfils all the criteria and the search for an ideal mesh still continues.

Laparoscopic hernia repair was first reported by Ralph Ger and colleagues in 1982. Since then laparoscopic hernia repair has undergone revolutionary advances in technique of repair, types of meshes used and various methods of fixation of mesh.³ Among endoscopic hernioplasty, totally extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) approach are widely accepted alternatives to open surgery, both providing less postoperative pain, hospital length of stay and early return to work.^{4,5}

The measures of success for any type of hernia repair is based on its outcome. When the results of open mesh repair and laparoscopic inguinal hernia repair are compared, the incidence of complications decreased in laparoscopic inguinal repair.⁶ The choice of the type of the mesh in hernia surgery is often left to the surgeon's preference and cost factor.⁷ In international studies, it has been mentioned that choice of the prosthesis in hernia repair is far more important than technique as a determinant of outcome.⁸

PPM has been widely used for last 50 years. It is described that polypropylene meshes, as a hydrophobic material, cause some degree of contraction and scar formation in the long-term follow-up. The authors conclude that polypropylene meshes give risk of recurrence, owing to overall decrease in the size of mesh, as well as an increased subjective foreign body feeling from contracture and scarring.⁹

After years research, Dr. Pajotin in 1998, came to the realization that a flat sheet of mesh may not be the ideal configuration for a laparoscopic repair. The inguinal anatomy was viewed only as two dimensional image on the monitor. So, after careful cadaver research, Dr. Pajotin developed what he believed to be the ideal prosthetic. He developed the three dimensional mesh which conformed better to the inguinal anatomy.³

Key benefits

- Anatomically Designed
- Easy Positioning
- Fixation-Free Repair
- Reduced Patient Pain
- Compatible with Various Laparoscopic Approaches
- TAPP
- TEP
- Robotic TAPP

Warnings

- The use of any permanent mesh or patch in a contaminated or infected wound lead to fistula formation and/or extrusion of the prosthesis.
- If an infection develops, treat the infection aggressively. Consideration should be given regarding the need to remove the mesh.

Precautions

- Do not cut or reshape the 3D mesh as this may affect its effectiveness.
- If fixation is used, care should be taken to ensure that the mesh is adequately fixed to the abdominal wall. If necessary, additional tacks or sutures should be used.
- If sutures are used, non-absorbable monofilament sutures should be used.

METHODS

Authors present their experience of a 5 year retrospective study of totally extraperitoneal repair (TEP) of inguinal hernia repair using three dimensional mesh at Government Medical College, Srinagar. This study was conducted during July 2012 and August 2017. The study enrolled a total of 123 patients who underwent TEP using three dimensional mesh (BARD 3D Max LIGHT Mesh). 113 patients had unilateral inguinal hernia and 9 patients had bilateral inguinal hernia. Incidentally all patients in the study were male and majority of patients belonged to the age group of 29-75 years. All patients had clinically diagnosed inguinal hernia and were admitted from the outpatient department one day before surgery. After anaesthetic clearance, patients were operated by standard technique of totally extraperitoneal repair using three dimensional mesh in accordance with recommended guidelines. A total of 132 TEP repairs were performed by a single surgical team. Operative time was recorded from the time of skin incision to closure of ports at the end of the procedure. Mesh fixation time was recorded from the time of insertion of mesh to placement and fixation of mesh. Any intraoperative complications were noted.

Postoperatively patients were monitored in the general ward. For postoperative pain parenteral analgesics were given. Early ambulation was encouraged and oral diet was started 06 hours after surgery in all patients. Patients

were discharged from the hospital as soon as possible depending upon the ambulation and diet. Patients were followed-up in outpatient department at 1 week, 2 weeks, 4 weeks, 3 months, 6 months and then yearly. Parameters which were recorded on each follow up visit were; postoperative pain as assessed by VAS scale, postoperative complications, seroma, hematoma or wound infection, duration of hospitalization, recurrence and cost. Data analysed was expressed as average, percentage and mean \pm SD, median (range) as appropriate.

RESULTS

A total of 123 patients included in the study were reviewed retrospectively from July 2012 to August 2017, out of which 114 patients had unilateral hernia and 9 had bilateral hernia. A total of 132 TEP repairs were done using three dimensional mesh. All the patients were male aged 29 to 75 years with a mean age of 51.5 years. Indirect hernias were more common comprising of 87.7%. The mean operative time was 46.9 minutes ranging from 31 to 76 minutes.

Table 1: Intraoperative and postoperative complications.

Complications observed	Percentage
Intra-operative complications	0.00
Severe postoperative pain	1.62
Seroma	4.06
Hematoma	0.00
Wound infection	0.00
Recurrence	0.81

Table 2: Intraoperative and postoperative parameters observed.

Parameters	Duration
Mean operative time (in minutes)	46.9 minutes
Average mesh fixation time (in minutes)	12.6 minutes
Mean hospital stay (in days)	1.00 day
Mean length of follow up (in months)	12.00 months

The average mesh fixation time was 12.6 minutes. No major intraoperative complications were noted in any of the patients. Two patients (1.62%) experienced severe postoperative pain which was managed by parenteral analgesics. Most of the patients 117 (95.12%) were discharged within 24 hours of surgery. Mean hospital stay in this study was 1 day. The mean length of follow-up was 12 months. Mild persistent groin pain was found in four patients (3.25%) after 3 months of follow up which resolved overtime. Seroma was noted in five patients (4.06%) which resolved with assurance and conservative management. Hematoma and wound infection was noted in none of these patients. 01 patients (0.81%) had recurrence after completion of follow up. In

this study authors found three dimensional mesh to be slightly costly. Most of this patient returned to normal activities within one month (Table 1 and Table 2).

DISCUSSION

The repair of an inguinal hernia has been an area of controversy in general surgical practice ever since it was conceived.¹⁰ The fact that countless procedures are in use reflects the complexity of inguinal hernia repair. The goal of a hernia repair is to strengthen the weak abdominal wall. In the laparoscopic procedure, the repair is accomplished by placement of a prosthetic mesh to cover the entire groin area, including the sites of direct, indirect, femoral and obturator hernias. The totally extraperitoneal procedure (TEP) combines the advantages of tension-free mesh reinforcement of the groin with those of laparoscopic surgery.⁵ The establishment of this technique by Dulucq in Europe may be considered a logical further development of transabdominal preperitoneal hernia repair (TAPP).^{11,12} The surgeon can use the endoscopic inguinal hernia technique for the repair of a primary hernia, providing the surgeon is sufficiently experienced in the specific procedure.¹² Laparoscopic hernia repair has many advantages over open methods as shown by prospective randomized trials comparing laparoscopic to tension-free open herniorrhaphy.¹³ The major advantages include less postoperative pain, earlier return to normal activities and work, better cosmetic results and cost effectiveness.^{14,15}

Laparoscopic inguinal hernia repair is a technically demanding procedure. A learning curve of at least 40 cases is necessary to reduce the rate of complications and recurrences.¹⁶ It is currently thought that all recurrences appear within the first 2 years of follow-up. One of the ways to shorten the learning curve and minimize the recurrence rate is to refine the techniques in a major centre. Historically, cost analysis favoured open hernia repair over laparoscopy. However, with more than a decade of experience in laparoscopic hernia repair and the dissemination of knowledge to all centres, costs have fallen and are now comparable to open repair.^{17,18}

Intraoperative major complications are rarely seen in hernia surgery unless the surgeon is not well oriented to inguinal anatomy. A more common intraoperative complication encountered with TEP/TAPP is injury to the bladder (0%-0, 2%), mainly in patients with previous suprapubic surgery. Studies on TEP/TAPP report intraoperative bowel injury in 0% to 0,3% of cases, with rates of 0% to 0,06% in large investigations involving considerably more than 1000 patients, and damage to major vessels at rates of 0% to 0,11%.¹⁹ In this study authors did not encounter any major intraoperative complications.

The mean operative time in this study was 46.9 minutes ranging from 31 to 76 minutes. Initially in the first 40 cases, the operative time was slightly longer. With

increasing experience, the mean operative time was reduced. Authors attribute the reduction in the mean operative time to increasing surgeon experience and easy handling of the 3D mesh. The mean duration of surgery was 55 minutes for bilateral hernia repair, and 38 minutes for unilateral hernia repair.²⁰

Average mesh fixation time in this study was 12.6 minutes. Lacking a standard definition, authors defined mesh fixation time in this study as the time from insertion to the placement of mesh over the defect. The 3D mesh because of its configuration was found to be easier to handle thereby reducing intraoperative time, after all a flat sheet of mesh is not an ideal configuration for laparoscopic repair as the inguinal anatomy is anything but the two-dimensional image as seen on the monitor thus the 3D configuration of the mesh which is anatomically formed and shaped to the inguinal anatomy is ideal thus making us recommend the 3D mesh to be used by surgeons especially beginners to minimize the stress.²¹ Also a major advantage of laparoscopic hernia repair is in cases of bilateral inguinal hernias, where laparoscopy allows for both hernias to be repaired in a single operation without need for additional ports or incisions.²²

Severe postoperative pain was noted in 1.62% of patients in this study as assessed by VAS scale. The lower incidence of severe post-operative pain in this study can be attributed to the fact that pain is a subjective feeling, as the pain thresholds varies among various subjects, so what can be a painful stimulus for one individual may not be perceived as painful by the other.²³ A 3D mesh eliminates the need to fix the mesh either with sutures or tacks in TEP as is needed with a flat mesh thereby avoiding nerve entrapment.²⁴ The reduced post-operative pain noted in this study has been verified by studies.^{25,26}

Mean hospital stay in this study was 1 day. The shorter hospital stay in this study was found to be because of less postoperative pain and early ambulation. Almost all the patients in this study were discharged from the hospital on 1st postoperative day that is comparable to the study found 88.67% patients were discharged within 24 hours of surgery.²⁷

Seroma developed in 4.06% patients in this study. In the study, it was using 3D mesh in laparoscopic hernia repair found seroma of 3.77% of patients.²⁷ Results of this study were comparable with this study. All patients who developed seroma postoperatively in this study were managed successfully with conservative management.

Authors did not encounter any wound infection or hematoma formation in this study. There was no mortality in this study after 12 months of mean follow up.

The best outcome factor for any hernia repair is the recurrence. In this study authors found recurrence in 01 (0.81%) patient after 12 months of mean follow up. Mir

IS et al. in their study found a recurrence rate of 0% after 3 months of follow up.²⁷ Bell et al. in their study found a recurrence rate of 0.42% after 23 months of follow up.²⁸ The results of this study are not truly comparable to previous studies as recurrence is a late phenomenon which can be best determined by further long term follow-up studies.^{27,28}

Lastly, 3D mesh was found to be slightly costly in this study as is evident by the fact that 3D mesh costs twice as that of the flat mesh. However, elimination of tacks for fixation and shorter hospital stay may compensate for the increased cost of the 3D mesh.

CONCLUSION

Laparoscopic inguinal mesh hernioplasty using 3D mesh is a viable alternative of hernioplasty with minimal post-operative pain and recurrence and using 3D mesh has a technical advantage of easy insertion in an anatomically correct position with minimal fixation. However due to lack of long term data, further studies are needed to recommend 3D mesh as a potential ideal mesh for laparoscopic inguinal hernia repairs. Further, the cost of hernia repair using 3D mesh could be brought down by the elimination of fixation devices.

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