



A RETROSPECTIVE ANALYSIS OF LAPAROSCOPIC REMOVAL OF INFECTED MESH FOLLOWING LAPAROSCOPIC INGUINAL HERNIA REPAIR.

General Surgery

Dr Sharik Pervej Khan*	Resident, Department of Surgery, Sri Aurobindo Institute of Medical Sciences and Post Graduate Institute, Indore, MP, India *Corresponding Author
Dr Apoorv Gupta	Associate Professor, Department of Surgery, Sri Aurobindo Institute of Medical Sciences and Post Graduate Institute, Indore, MP, India
Dr Manoj Kela	Professor, Department of Surgery, Sri Aurobindo Institute of Medical Sciences and Post Graduate Institute, Indore, MP, India
Dr Sanjay Datey	Professor, Department of Surgery, Sri Aurobindo Institute of Medical Sciences and Post Graduate Institute, Indore, MP, India
Dr Shubh Narayan Ghanghoriya	Resident, Department of Surgery, Sri Aurobindo Institute of Medical Sciences and Post Graduate Institute, Indore, MP, India

KEYWORDS

INTRODUCTION

Now a days, Laparoscopic repair is the preferred method for repair of inguinal hernia owing to its safety and reliability. Use of meshes has been adopted as standard procedure in hernia repair surgery.¹ Laparoscopic approach which involves closure of hernia with mesh placement² is associated with reduced chronic postoperative pain and numbness, fast return to normal activities, and decreased incidence of hematoma and wound infection.³ Two approaches to perform laparoscopic repair include Transabdominal Preperitoneal (TAPP) approach and the Totally Extraperitoneal (TEP) approach.⁴

In some cases, post laparoscopic surgery, infection of the patch/mesh may occur which may lead to sepsis.⁴ Even an infinitesimal breach in asepsis provides a favourable environment for bacterial proliferation and form a 'biofilm' near the mesh which gives rise to chronic discharging sinus at the port site, abscess formation around mesh and even sepsis, increasing morbidity and cost of treatment.⁵ Reported incidence of mesh infection is 1%–8% according to different series, and factors influencing development of mesh infection includes underlying co-morbidities, the type of mesh, the surgical technique and the strategy used to prevent infections.¹

Treatment of infected mesh is possible by local debridement, irrigation and systemic antibiotics.⁵ However, in cases with persistent infection, removal of mesh is practiced.⁴ Sometimes removal of infected mesh often leads to recurrence of hernia, pain and morbidity. Explantation of infected meshes after repair of hernia using laparoscopic approach has been reported to result in less scarring and faster recovery. Although sufficient research to provide adequate evidence is lacking. Thus, this study was undertaken to evaluate efficacy of laparoscopic explantation of infected mesh after laparoscopic hernia repair.

MATERIALS AND METHOD

Study design, study population, sample size, sampling technique

This observational study was conducted in the department of General Surgery, Sri Aurobindo Institute of Medical Sciences, Indore (M.P.), India. The study was conducted amongst subjects diagnosed to have mesh infection after laparoscopic surgery (TAPP or TEP) for hernia repair. Total of 10 subjects visited the hospital over a period of 2 years (July 2019 to July 2021) and were included in the study.

All these patients were previously treated outside except for one for laparoscopic inguinal hernia repair.

Methodology

The study was initiated after obtaining approval from the institutional ethics committee. The permission to procure data from the hospital records was granted from the head of the institution.

The secondary data included records of the subjects till 6 months follow up after the explantation of infected mesh. The information gathered included age, gender, history of type of hernia which had been

treated laparoscopically, duration of post-operative signs and symptoms indicative of mesh infection, presenting complaints, history of guided aspiration, type of pus, type of mesh recovered on explantation, duration of placement of drain, duration of operative procedure, any difficulty faced intra-operatively, duration of hospital stay, severity of pain experienced, need for re-exploration and post-operative scarring. All except one patient included in the present study had been treated for hernia repair at facilities other than our hospital. One patient who had undergone hernia repair at our facility had been treated conservatively for mesh infection by other physicians/surgeons. He was administered Antitubercular therapy for 6 months along with IM streptomycin for 56 days based on AFB positivity although cultures were negative, infection did not resolve completely and patient was taking macrolides since a week. This patient presented with pain in Left iliac fossa and low-grade fever. On clinical examination, induration in Left iliac fossa and fluid collection at left paraumbilical region was found. There was tenderness on right side, 5 mm from port site. [Figure 1]

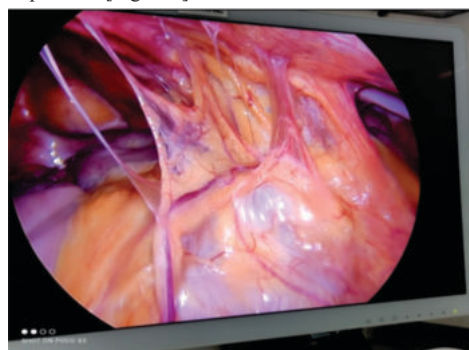


Figure 1. Explantation of mesh

An USG was performed in all subjects for the assessment of infected mesh and presence of any infected fluid. If present, the fluid was aspirated to obtain a sample for smear, culture, and antibiotic sensitivity. In subjects showing presence of large amount of fluid, aspiration was done using pigtail catheter.

Samples of pus/infected material were obtained for initial examination. Discharge or aspirate was subjected to microbiologic analysis using Gram stain, Ziehl-Nielsen stain, and with fluoro-chrome dyes staining (such as Auramine-Rhodamine stain for acid-fast bacilli).

For culture sensitivity testing the specimens were cultured on Lowenstein-Jensen medium and Middlebrook 7H9 broth in the automated BacT/Alert 3D culture system. To examine for Mycobacterium tuberculosis complex, the specimens were treated with AccuProbes. The negative isolates were further subjected to analysis using a set of tests.

The administration of antibiotics was based on the culture sensitivity reports.

A decision to perform mesh explantation was made on the basis of USG and CT abdomen findings and clinical condition of the patient. Before performing re-exploration CT abdomen and diagnostic laparoscopy was done to rule out any erosion to bowel and bladder wall. In order to perform diagnostic laparoscopy a virgin peritoneal site was chosen and peritoneal cavity is entered remotely from expected adhesions so as to have complete look and better assessment of adhesion. The removal of mesh was done using TAPP.

Statistical analysis

The data collected was entered into the excel sheet. Data was analysed using SPSS (Statistical Package for Social Sciences) 21.0 version, IBM, Chicago. Descriptive statistics was performed.

Ethical clearance

Ethical clearance was obtained from the Institutional Ethics committee of Sri Aurobindo Institute of Medical Sciences, Indore (M.P.), India (Registration number- ECR/748/Inst/MP2015/18RR). Confidentiality of patient's information was maintained.

RESULTS

The study included 10 subjects with the mean age of 57.6 ± 13.680 years (age range- 32-75 years.). The commonest presenting complaint was pain 10 (100.0%). [Table 1]

Table 1. Presenting complaints of subjects presenting with infected MESH.

Presenting complaint	Number of subjects (%)
Pain	10 (100.0%)
Fever	8 (80.0%)
Swelling	7 (70.0%)

The number of subjects presenting with direct and indirect inguinal hernia was 5 (50.0%) each. The number of subjects with unilateral and bilateral hernia was 6 (60.0%) vs 4 (40.0%) respectively. The distribution of subjects based on comorbidities has been presented in table 2.

Table 2. Comorbidities present in subjects with infected MESH.

Presenting complaint	Number of subjects (%)
Diabetes mellitus	4 (40.0%)
Asthma	1 (10.0%)
Tuberculosis	1 (10.0%)
Psoriasis	1 (10.0%)

Seven (70.0%) and 3 (30.0%) subjects were treated with TAPP and TEP respectively for repair of inguinal hernia. All of the subjects received prolene mesh. Description of duration of previous surgery, duration to develop infection, duration of surgery for mesh removal and duration of hospital stay has been presented in table 3.

Table 3. Description of duration of previous surgery, duration to develop infection, duration of surgery for MESH removal and duration of hospital stay.

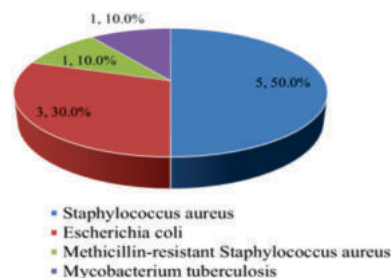
Duration	Mean $\pm$ standard deviation	Range
Duration of previous surgery (in minutes)	70.5 ± 10.916	60-90
Duration to develop infection (in months)	5.1 ± 2.998	1-11
Duration of surgery for MESH removal (in minutes)	84.5 ± 11.413	70-110
Duration of hospital stay (days)	7.3 ± 2.790	4-12

Aspiration was performed in 5 (50.0%) subjects, amongst them in 2 (20.0%) subjects pig tailed guided aspiration was performed.

Bacteriological examinations of the materials that were removed was positive in all the 10 subjects. Amongst majority of the subjects, *Staphylococcus aureus* was the microorganism isolated from the pus procured from the infected site [Graph 1].

Intra-operatively, densely adhered mesh was found in 4 (40.0%) subjects [Figure 2] whereas in 6 (60.0%) subjects free floating mesh was found in abscess cavity.

MICROORGANISM ISOLATED FROM PUS



Graph 1. Distribution of subjects based on the microorganism isolated from pus in greatest number.

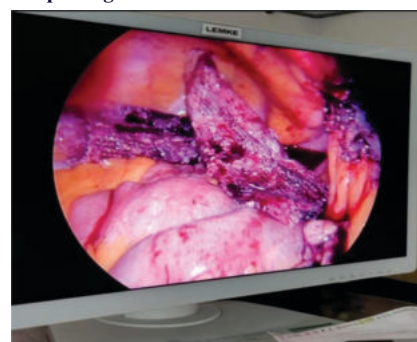


Figure 2

It was found that after the hernia repair surgery, tacker and sutures were placed in 4 (40.0%) 6 (60.0%) patients respectively for the closure of peritoneal incisional wound. The re-exploration was comparatively easy in patients having history of suture placement compared to tacker placement. No other intra-operative complications were experienced by the surgeons. Hemostasis was achieved and peritoneum was closed using vicryl suture. [Figure 3]

After removal of the mesh, drain was placed in 5 (50.0%) subjects. All the subjects had better cosmesis, were free from pain and develop no complications. One of the subjects needed re-exploration in the follow up visits because of presence of persistence sinus. [Figure 3]



Figure 3.

DISCUSSION

The gold standard for the management of inguinal hernia includes hernia repair using mesh. However, the use of prosthetic mesh in hernia repair is associated with the risk of complications, such as chronic infection. In patients with infected mesh not responding to conservative management, removal of mesh is performed.⁶ In the present study feasibility, safety, and effectiveness of laparoscopic mesh removal in subjects with chronic infection/pain after hernia repair has been assessed. Laparoscopic approach provides several advantages, including less postoperative pain, a shorter hospital stay, and earlier rehabilitation.⁷

This study included 10 subjects reporting to the hospital with infected

mesh at mean duration of 5.1 ± 2.998 (minimum 1 month to maximum 11 months) months after hernia repair. Avtan L *et al.* in their case series reported that time taken to develop infection could be as short as 15 days to as long as 10 months.⁴ In the present study, all the subjects complaint of pain (100.0%), fever was recorded in 8 (80.0%) subjects and swelling was present in 7 (70%) subjects.

The organisms associated with mesh infection are *Staphylococcus* spp., especially *S. aureus*, *Streptococcus* spp. (including group B streptococci), gram-negative bacteria (mainly enterobacteriaceae) and anaerobic bacteria (including *Peptostreptococcus* spp.).⁵ Akyol C *et al.* isolated *Staphylococcus aureus* and methicillin resistant *Staphylococcus aureus* from the cultures of infected mesh.⁶ Yang H *et al.* also identified *Staphylococcus aureus* as the causative organism for mesh infection.⁸ In the present study also the most common organism responsible for mesh infection was found to be *Staphylococcus aureus*. Other organisms isolated from pus were methicillin resistant *Staphylococcus aureus*, *Escherichia coli* and *Mycobacterium tuberculosis*.

Obesity, smoking, diabetes, immune-compromised state or bowel injury have been identified as the common risk factors associated with mesh infection.^{5,9} In this study, the most common comorbid condition observed amongst subjects was diabetes (40.0%).

In this study, intra-operatively, few subjects [4 (40.0%)] were found to have deeply adhered mesh. Deeply adhered mesh could be a sequence of foreign body reaction towards implanted mesh which often manifest as adhesions, migration of mesh, seroma, rejection and pain.¹

In our study, removal of mesh was performed using TAPP approach which is safe, technically feasible, reproducible and allows early ambulation.¹⁰ The choice of TEP was based on the evidence provided by previous studies which revealed that TEP is associated with reduced post-operative pain and greater patients' satisfaction compared to TAPP.¹¹

The surgical procedure to remove mesh was performed over a mean duration of 84.5 ± 11.413 minutes which was lesser than the time reported by the Slooter GD *et al.* (median operating time- 103 minutes).¹² The reason behind this finding could be the difference in the surgical experience, operating skills and operating facilities.

The mean duration of hospital stay for the subjects in this study was reported to be 7.3 ± 2.790 days (range= 4-11 days). Chowbey PK *et al.* reported mean duration of hospital stay to be 2.2 days (1-9 days).¹³ Findings of the present study revealed no intraoperative or postoperative complications after the removal explantation of infected mesh. Similar to our study, Slooter GD *et al.* reported no intraoperative or postoperative complications.¹² The cosmetic outcome after laparoscopic removal was reported as 'better'. According to study done by Chowbey PK *et al.* laparoscopic removal resulted in less scarring and early recovery.¹³

Our study revealed 90% success rate of mesectomy when followed over the period of 6 months. Akyol C *et al.* also reported resolution of infection amongst all subjects after mesh removal. However, they reported recurrence of hernia in one patient.⁶ Zwaans WA *et al.* also reported high success rates with 64% excellent/good long-term results over the period of 18 months.¹⁴ The difference in the success rate can be attributed to the difference in the duration of follow up between the two studies. Kanwal SF *et al.* in their study including 80 subjects reported low rates (5%) of recurrence of hernia after laparoscopic mesh removal.¹⁵

Looking at the high success rate and no peri-operative or postoperative complications on performing laparoscopic removal, it has been advised that in hernia patients with implanted mesh having deep infection, there should be no unnecessary delay in removing an infected mesh so as to allow resolution of chronic groin sepsis.¹⁶

Limitations of the study

Smaller sample size was the biggest limitation of the study. Owing to the good operators skills and effective infection control practices, the rate of mesh infection was low and thus sample size was small.

CONCLUSION

Based on the findings of the study, it can be concluded that

Laparoscopic mesh removal is a feasible, safe, and effective option in subjects with pain after hernia repair surgery.

Conflict of interest

None

Funding and resource

No external source of funding

Acknowledgement

None

REFERENCES

1. Falagas ME, Kasiakou SK. Mesh-related infections after hernia repair surgery. *Clinical microbiology and infection*. 2005 Jan 1;11(1):3-8.
2. Hope WW, Pfeifer C. Laparoscopic Inguinal Hernia Repair. [Updated 2022 Jul 4]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK430826/>
3. Cavazzola LT, Rosen MJ. Laparoscopic versus open inguinal hernia repair. *Surg Clin North Am*. 2013 Oct;93(5):1269-79.
4. Avtan L, Avci C, Bulut T, Fourtanier G. Mesh infections after laparoscopic inguinal hernia repair. *Surg Laparosc Endosc*. 1997 Jun;7(3):192-5.
5. Narkhede R, Shah NM, Dalal PR, Mangukia C, Dholaria S. Postoperative Mesh Infection-Still a Concern in Laparoscopic Era. *Indian J Surg*. 2015;77(4):322-6.
6. Akyol C, Kocaay F, Orozakunov E, et al. Outcome of the subjects with chronic mesh infection following open inguinal hernia repair. *J Korean Surg Soc*. 2013;84(5):287-291.
7. Chihara N, Mishima K, Suzuki H, Watanabe M, Toyoda T, Uchida E. Totally Extraperitoneal (TEP) Removal of an Infected Mesh by Laparoscopy after Open Preperitoneal Repair: Initial Case Report. *J Nippon Med Sch*. 2017;84(1):45-48.
8. Yang H, Xiong Y, Chen J, Shen Y. Study of mesh infection management following inguinal hernioplasty with an analysis of risk factors: a 10-year experience. *Hernia*. 2020 Apr;24:301-5.
9. LeBlanc KA, Whitaker JM, Bellanger DE, Rhynes VK. Laparoscopic incisional and ventral hernioplasty: lessons learned from 200 patients. *Hernia*. 2003 Sep;7(3):118-24.
10. Kishor RJ, Kuppan CT, Dhanasekaran NC, Sekar V. Laparoscopic management of mesh migration into urinary bladder following laparoscopic totally extraperitoneal inguinal hernia repair—A case report. *International Journal of Surgery Case Reports*. 2021 Jan 1;78:401-4.
11. Krishna A, Misra MC, Bansal VK, Kumar S, Rajeshwari S, Chabra A. Laparoscopic inguinal hernia repair: transabdominal preperitoneal (TAPP) versus totally extraperitoneal (TEP) approach: a prospective randomized controlled trial. *Surg Endosc*. 2012;26(3):639-649.
12. Slooter GD, Zwaans WAR, Perquin CW, Roumen RMH, Scheltinga MRM. Laparoscopic mesh removal for otherwise intractable inguinal pain following endoscopic hernia repair is feasible, safe and may be effective in selected subjects. *Surg Endosc*. 2018;32(3):1613-1619.
13. Chowbey PK, Khullar R, Sharma A, et al. Laparoscopic management of infected mesh after laparoscopic inguinal hernia repair. *Surg Laparosc Endosc Percutan Tech*. 2015;25(2):125-128.
14. Zwaans WA, Perquin CW, Loos MJ, Roumen RM, Scheltinga MR. Mesh Removal and Selective Neurectomy for Persistent Groin Pain Following Lichtenstein Repair. *World J Surg*. 2017;41(3):701-712.
15. Kanwal SF, Bazai AK, Bukhari S, Latif A, Khattai SN. Evaluation of Mesh Infection in Patient with Laparoscopic Inguinal Hernia Repair: A Retrospective Study. *Pakistan Journal of Medical & Health Sciences*. 2022 Aug 27;16(06):898-.
16. Fawole AS, Chaparala RP, Ambrose NS. Fate of the inguinal hernia following removal of infected prosthetic mesh. *Hernia*. 2006;10(1):58-61.
17. Wilson RB, Farooque Y. Risks and Prevention of Surgical Site Infection After Hernia Mesh Repair and the Predictive Utility of ACS-NSQIP [published correction appears in *J Gastrointest Surg*. 2023 Jan;27(1):211]. *J Gastrointest Surg*. 2022;26(4):950-964.