VOLUME - 11, ISSUE - 12, DECEMBER - 2022 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Surgery

LAPAROSCOPIC MESH EXPLANTATION FOR MESH INFECTIONS FOLLOWING INTRA PERITONEAL ON-LAY MESHPLASTY (IPOM): A CASE SERIES

Dr Sneha Lad	MS General Surgery, Dept of General and Laparoscopic Surgery, Zen Multispeciality Hospital, Mumbai, India.
Dr Pratik Biswas	DNB General Surgery, FMAS, Dept of General and Laparoscopic Surgery, Zen Multispeciality Hospital, Mumbai, India.
Dr Vishakha Kallikar	DNB General Surgery, FMAS, Dept of General and Laparoscopic Surgery, Zen Multispeciality Hospital, Mumbai, India.
Dr Advait Patankar	MBBS, Residency (MS General Surgery, D.Y.Patil Medical college.
Dr Roy Patankar	MS General Surgery, PhD gastroenterology, FRCS, Dept of General and Laparoscopic Surgery, Zen Multispeciality Hospital, Mumbai, India.

ABSTRACT The introduction of synthetic mesh has become the standard of care in the management of abdominal wall hernias [1,2]. However, the slightest of breach in the sterility chain can lead to mesh infection and biofilm formation which often requires a prolonged stay in hospital with long term use of antibiotics and need for multiple interventions. Incidence of mesh infection is dependent on both Intra-operative events as well as pre-existing modifiable risk factors in the patient. Mesh infection can present as abscess, chronic discharging sinus and sepsis [1] However, in most cases, mesh explantation is required. In this paper, we present a series of 5 patients who underwent laparoscopic mesh explantation following IPOM mesh infection with good outcomes.

KEYWORDS :

INTRODUCTION –

Ventral hernia repair surgeries are very commonly performed procedures with various studies proving that the usage of mesh significantly reduces the chances of recurrences [2,3,4]. Recent data shows the incidence of mesh infection following Laparoscopic ventral hernia repair to be 0.7 to 2 % as compared to open surgeries which is upto 6-10% [1,5]. The incidence of mesh infection is influenced by factors relating to patient, surgery and type of mesh used [1,2,6,7]. The offending organisms in most cases are Staphylococcus Aureus (most common), Group B Streptococci, Mycobacteria, Enterobacteriaceae and Peptostreptococcus [1,8]. The treatment options include mesh salvage and mesh explantation techniques which are mostly described in open literature. Here we present a series of 5 patients who underwent laparoscopic mesh explantation following IPOM mesh infection.

PATIENT DETAILS -

- All 5 patients were operated elsewhere and were given trial of mesh conservative approach by their primary surgeons following sonographic guided aspiration of fluid and iv antibiotics started based on culture and sensitivity. One patient was started on empirical anti-Kochs treatment for 3months based on growth of Mycobacteria.
- Patient Details:
- Age of patients was 34-60yrs.
- Body Mass Index (BMI) of the patients with median of 32. (range of 26-40).
- Most common presentation - Anterior abdominal wall abscess (for which 2 patients had undergone Incision and Drainage by the primary Surgeon)
- Time of presentation following first IPOM surgery –1- 3 years.

	AGE (in years) / SEX	BMI	PRESENTATION	NUMBER OF YEARS SINCE IPOM SURGERY
Patient 1	58 / MALE	32	Abdominal wall abscess	1
Patient 2	44 / FEMALE	40	Discharging sinus	1.5
Patient 3	60 / FEMALE	34	Abdominal wall abscess	3
Patient 4	34 / FEMALE	26	Abdominal wall abscess	1.5
Patient 5	58 / MALE	28	Discharging sinus + Local swelling	2

- After pre-operative work up and imaging patients were posted for laparoscopic surgery.
- All primary surgeons used glutaraldehyde for scope and instrument disinfection. None has used sterilization strips based on telephonic interview.
- All the patients were given pre-operative mechanical bowel preparation with Polyethylene Glycol.
- Chances of the hernia recurring and requiring elective repair in the future were explained to all the patients.

Images:

Figure 1: *Arrow head showing cellulitis in anterior abdominal wall.*

Figure 2: *Arrow head showing infra-umbilical chronic discharging sinus.*

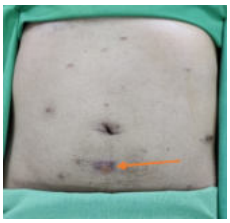


Figure 3: *Arrow showing chronic discharging sinus from the umbilicus*

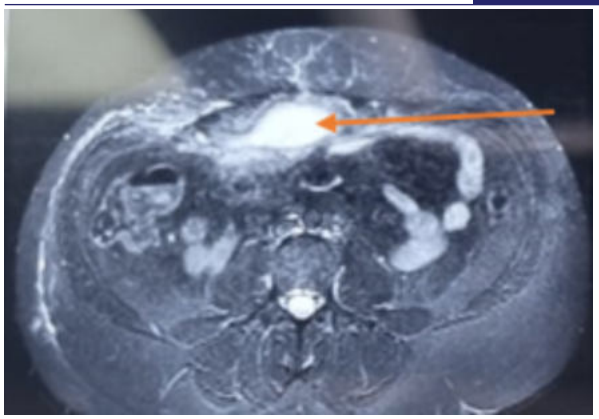
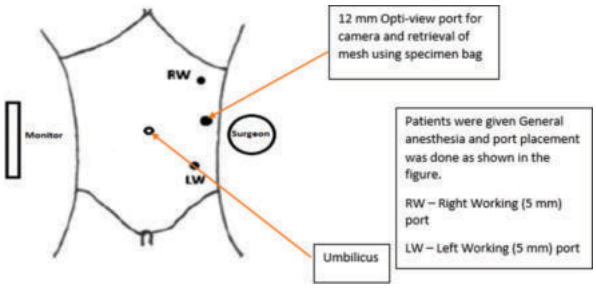


Figure 4: *Magnetic Resonance imaging showing hyperintense collection between layers of anterior abdominal wall with surrounding subcutaneous fat*

OPERATIVE STEPS –



PATIENT'S LEG END

Figure 5: *Shows Position Of Patient And Placement Of Ports*

Intra-operative Images:

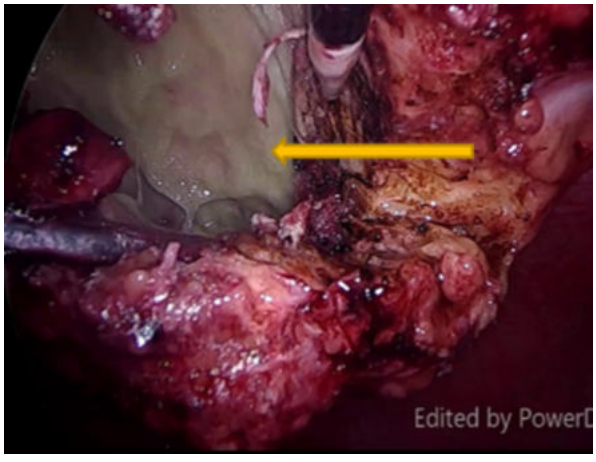


Figure 6: *Arrow shows pus in the cavity around the mesh*

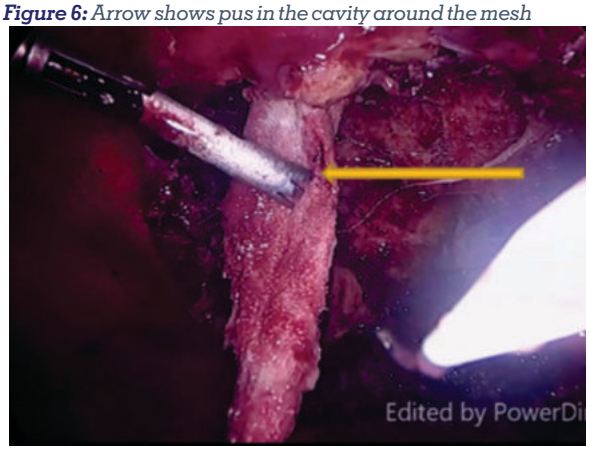


Figure 7: *Arrow points to the infected mesh being explanted*

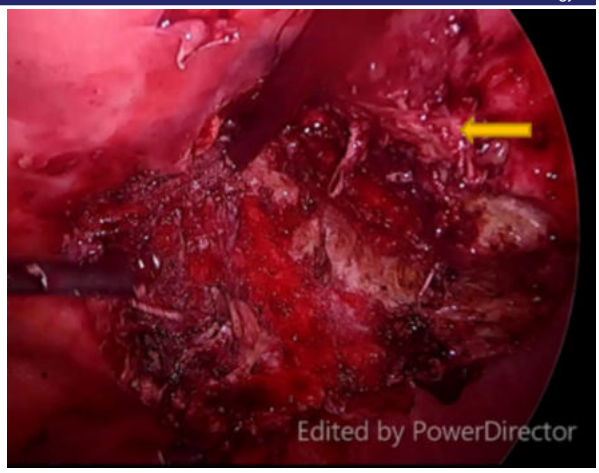


Figure8: *Arrow showing raw surface of the anterior abdominal wall after mesh explantation.*

RESULTS –

1. Intraoperative:

- The mesh was excised, the abscess cavity drained, and complete mesh excision done using a specimen extraction bag.
- Time of surgery – 70 minutes (60-170minutes)
- Blood loss ~75ml(50-150ml)

2. Post-operative:

- Patients were discharged in 2days (3-6days).
- Return to work in 8-14days.
- Histopathology in all mycobacterial infected patients showed caseous necrosis and giant cells while non-mycobacterial histopathology showed necrosis with palisading of epithelioid histocytes.
- Follow up period was 1 – 4 years.
- 1 out of the 5 patients developed a recurrent hernia at 2yrs which was dealt with IPOM Plus repair.

	Mesh excised	Organism isolated	Antibiotics sensitive	Treatment duration	Follow-up period	Recurrent hernia
Patient 1	Yes	Mycobacterium fortuitum	Clarithromycin + levofloxacin	6 months	4yrs	No
Patient 2	Yes	Klebsiella Pneumoniae	Linezolid	6 months	3.5yr	Yes
Patient 3	Yes	Mycobacterium chelonae	Clarithromycin + levofloxacin	6 months	2yrs	No
Patient 4	Yes	Staphylococcus aureus	Linezolid+ other antibiotic	6 months	2.2yrs	No
Patient 5	Yes	Mycobacterium fortuitum	Clarithromycin + levofloxacin	6 months	1 year	No

DISCUSSION –

Synthetic mesh for hernia repairs have reduced the rates of recurrence remarkably, but the risk of mesh infection despite aseptic techniques is one major drawback requiring multiple surgical interventions [1] Mesh infection is dictated by patient

related factors such as smoking, poorly controlled Diabetes mellitus, obesity, ASA > 3, use of steroids and Immunomodulator therapy [9]; surgical factors which increase mesh infection rates include field contamination, enterotomy, emergency surgery, suboptimal sterilization of instruments, open on-lay meshplasty technique, post-operative surgical site infection, lack of tissue coverage [1,6]; and the type of mesh used. Lighter meshes have less infection rates than heavier meshes [10]. Polytetrafluoroethylene (PTFE) mesh is reported to have 10% infection rate following hernia repair [11]. Multifilament meshes like polyester and hydrophobic meshes significantly increase bacterial persistence or spreading in infected area [12,13,14]. Microporous meshes are considered to be at increased risk since small pores (\10 lm) are permeable to bacteria[15].

Infections that occur early in the post-operative period are more likely to be associated with an enterocutaneous fistula (ECF) or a superficial incisional SSI which are the primary indications for explantation [13]. In a study by Hawn et al. patients with a history of SSI have more than a seven-fold increase and concomitant procedures through the same incision resulted in a six-fold increase in the need for mesh explantation.[9]

Preventive measures like meticulous surgical technique, avoiding dead spaces, using suction drains, manipulating the prosthesis as little as possible, preventing direct contact between the prosthesis and the skin, changing gloves when inserting the prosthesis, preventing foreign bodies, and monitoring the state of the wound edges. It remains clear that bacterial contamination of the prosthesis happens during its initial implantation[16].

Mesh infections are deep incisional (DIS) surgical site infections that involve the mesh prosthesis [9]. The Centres for Disease Control and Prevention (CDC)/National Healthcare Safety Network (NHSN) defines DIS as an infection occurring within 1 year of operation with a prosthesis [17]. The usual causative organism associated with mesh infection is staphylococcus species (which forms a biofilm on synthetic meshes) [18], gram-negative bacteria, and anaerobic bacteria [19].

Optimal sterilization is a prerequisite before undertaking any hernia surgery. Laparoscopic instruments are more vulnerable to the lodging of bioburden (micro-organisms and debris) within their crevices and hence the basic steps of sterilization for laparoscopic instruments should be followed.

Sterilization with steam at 135 °C at 30 PSI pressure for 60 min or with cold ethylene oxide (EO) gas at 80 °C for 4 h and 30 min or warm EO gas at 145 °C for 2 h and 30 min and storage should be done to ensure optimal sterilization. The use of formalin for sterilization of instruments is not recommended as the vapor of formalin acts for 1 week and although known to destroy spores, it is rarely used because it takes from 12 to 24 hours to be effective.

The commonly used sterilization procedure has been a 20-minute exposure to 2.0 2.5% glutaraldehyde. At the current exposure time, these solutions act only as high-level-disinfectants thus allowing bacterial endospores and mycobacteria to survive [20]. Its tuberculocidal activity has been documented to be relatively slow [21].

If M fortuitum is identified, appropriate antibiotic coverage followed by curettage and drainage and removal of periprosthetic material should be considered if infection persists [22].

The treatment can be with mesh salvage or mesh explantation techniques. Mesh salvage / conservative techniques include an oral and parenteral antibiotic cover (as guided by culture reports), local debridement, percutaneous drainage [23], and Negative Pressure Wound Therapy (NPWT) using reticulated open cell foam [24]. Mesh explantation can be partial or total and can be done via laparoscopic or open surgery. The available data on mesh salvage techniques do not provide convincing evidence of its advantage over mesh explantation techniques [25,26,27]. The laparoscopic approach was associated with lower surgical site infection rates with fewer infections requiring mesh removal[28,29]. Studies have shown 0.7-2% infection rates in laparoscopic ventral hernia repair compared to 6-10% in open surgeries [30,31].

Open mesh explantation is accompanied by complications like tissue damage/defects as the inflamed tissues will be entered seroma and wound infections with increased chances of recurrences of hernia with an overall recurrence rate of 47.9% [6] Till date there exists no data on laparoscopic infected IPOM mesh removal. All our five cases of infected mesh underwent laparoscopic complete mesh excision with no postoperative seroma or wound infection with only one recurrence based on imaging.

CONCLUSION:

With infection becoming one of the important causes of hernia repair failure, effective sterilization of laparoscopic instruments is the key with disinfection techniques like glutaraldehyde for sterilization being suboptimal. In patients with atypical mycobacterial infection, clarithromycin with levofloxacin were effective antibiotics with the minimum duration of treatment being 6 months. Laparoscopic Mesh explanation can not only be done safely but is also associated with decreased chances of wound-related complications and shorter length of hospital stay and probable lower recurrence.

REFERENCES –

1. Narkhede R, Shah NM, Dalal PR, Mangukia C, Dholaria S. Postoperative mesh infection-still a concern in laparoscopic era. Indian journal of surgery. 2015;77:322–6.
2. Augenstein V, Arnold M, Kao A, Gbozah K, Heniford B. Optimal management of mesh infection: Evidence and treatment options. Int j abdom wall hernia surg [Internet]. 2018;1(2):42. Available from: http://dx.doi.org/10.4103/ijawhs.ijawhs_16_18
3. Luijendijk RW, Hop WC, van den Tol MP, de Lange DC, Braaksma MM, IJzermans JN, et al. A comparison of suture repair with mesh repair for incisional hernia. N Engl J Med [Internet]. 2000;343(6):392–8. Available from: http://dx.doi.org/10.1056/NEJM200008103430603
4. Burger JWA, Luijendijk RW, Hop WCJ, Halm JA, Verdaasdonk EGG, Jeekel J. Long-term follow-up of a randomized controlled trial of suture versus mesh repair of incisional hernia. Ann Surg [Internet]. 2004;240(4):578–85. Available from: http://dx.doi.org/10.1097/01.sla.0000141193.08524.e7
5. LeBlanc KA, Whitaker JM, Bellanger DE, Rhynes VK. Laparoscopic incisional and ventral hernioplasty: lessons learned from 200 patients. Hernia [Internet]. 2003;7(3):118–24. Available from: http://dx.doi.org/10.1007/s10029-003-0117-1
6. Bueno-Lledó J, Torregrosa-Gallud A, Sala-Hernandez A, Carbonell-Tatay F, Pastor PG, Diana SB, et al. Predictors of mesh infection and explantation after abdominal wall hernia repair. Am J Surg [Internet]. 2017;213(1):50–7. Available from: http://dx.doi.org/10.1016/j.amjsurg.2016.03.007
7. Paton BL, Novitsky YW, Zerey M, Sing RF, Kercher KW, Heniford BT. Management of infections of polytetrafluoroethylene-based mesh. Surg Infect (Larchmt) [Internet]. 2007;8(3):337–41. Available from: http://dx.doi.org/10.1089/sur.2006.053
8. Mavros MN, Athanasiou S, Alexiou VG, Mitsikostas PK, Peppas G, Falagas ME. Risk factors for mesh-related infections after hernia repair surgery: a meta-analysis of cohort studies. World J Surg [Internet]. 2011;35(11):2389–98. Available from: http://dx.doi.org/10.1007/s00268-011-1266-5
9. Hawn MT, Gray SH, Snyder CW. Predictors of mesh explantation following incisional hernia repair. J Am Coll Surg.
10. Cobb WS, Carbonell AM, Kalbaugh CL. Infection riskof open placement of intraperitoneal composite mesh. Am Surg. 2009;75:762–8.
11. Leber GE. Long-term complications associated with prosthetic repair of incisional hernias. Arch Surg [Internet]. 1998;133(4):378. Available from: http://dx.doi.org/10.1001/archsurg.133.4.378
12. Horan TC, Andrus M, Dudeck MA. CDC/NHSN surveillance definition of health care-associated infection and criteria for specific types of infections in the acute care setting. Am J Infect Control [Internet]. 2008;36(5):309–32. Available from: http://dx.doi.org/10.1016/j.ajic.2008.03.002
13. Halaweish I, Harth K, Broome A-M, Voskerician G, Jacobs MR, Rosen MJ. Novel in vitro model for assessing susceptibility of synthetic hernia repair meshes to staphylococcus *aureus* infection using green fluorescent protein-labeled bacteria and modern imaging techniques. Surg Infect (Larchmt) [Internet]. 2010;11(5):449–54. Available from: http://dx.doi.org/10.1089/sur.2009.048

14. Sanchez VM, Abi-Haidar YE, Itani KMF. Mesh infection in ventral incisional hernia repair: Incidence, contributing factors, and treatment. Surg Infect (Larchmt) [Internet]. 2011;12(3):205–10. Available from: http://dx.doi.org/10.1089/sur.2011.033
15. Sohail MR, Smilack JD. Hernia repair mesh-associated Mycobacterium goodii infection. J Clin Microbiol [Internet]. 2004;42(6):2858–60. Available from: http://dx.doi.org/10.1128/JCM.42.6.2858-2860.2004
16. Mann DV, Prout J, Havranek E, Gould S, Darzi A. Late-onset deep prosthetic infection following mesh repair of inguinal hernia. Am J Surg [Internet]. 1998;176(1):12–4. Available from: http://dx.doi.org/10.1016/s0002-9610(98)00094-4
17. Mavros MN, Athanasiou S, Alexiou VG, Mitsikostas PK, Peppas G, Falagas ME. Risk factors for mesh-related infections after hernia repair surgery: a meta-analysis of cohort studies. World J Surg. 2011 Nov;35(11):2389-98. doi: 10.1007/s00268-011-1266-5. PMID: 21913136
18. An YH, Friedman RJ. Concise review of mechanisms of bacterial adhesion to biomaterial surfaces. J Biomed Mater Res [Internet]. 1998;43(3):338–48. Available from: http://dx.doi.org/10.1002/(sici)1097-4636(199823)43:3<338:aid-jbm16>3.0.co;2-b
19. Ramesh H, Prakash K, Lekha V, Jacob G, Venugopal A, Venugopal B. Port-site tuberculosis after laparoscopy: report of eight cases. Surg Endosc [Internet]. 2003;17(6):930–2. Available from: http://dx.doi.org/10.1007/s00464-002-9057-6
20. Cooke RPD, Goddard SV, Whymant-Morris A, Sherwood J, Chatterly R. An evaluation of Cidex OPA (0.55% ortho-phthalaldehyde) as an alternative to 2% glutaraldehyde for high-level disinfection of endoscopes. J Hosp Infect [Internet]. 2003;54(3):226–31. Available from: http://dx.doi.org/10.1016/s0195-6701(03)00040-9
21. Matthews MR, Caruso DM, Tsujimura RB, Smilack JD, Pockaj BA, Malone JM. Ventral hernia synthetic mesh repair infected by Mycobacterium fortuitum. Am Surg. 1999;65(11):1035–7.
22. Avtan L, Avci C, Bulut T, Fourtanier G. Mesh infections after laparoscopic inguinal hernia repair. Surg Laparosc Endosc. 1997;7(3):192–5.
23. Ahmad S, Mufti TS, Zafar A, Akbar I. Conservative management of mesh site infection in ventral hernia repair. J Ayub Med Coll Abbottabad. 2007;19(4):75–7.
24. Aguilar B, Chapital AB, Madura JA II, Harold KL. Conservative management of mesh-site infection in hernia repair. J Laparoendosc Adv Surg Tech A [Internet]. 2010;20(3):249–52. Available from: http://dx.doi.org/10.1089/lap.2009.0274
25. Stremitzer S, Bachleitner-Hofmann T, Gradl B, Gruenbeck M, Bachleitner-Hofmann B, Mittlboeck M, et al. Mesh graft infection following abdominal hernia repair: risk factor evaluation and strategies of mesh graft preservation. A retrospective analysis of 476 operations. World J Surg [Internet]. 2010;34(7):1702–9. Available from: http://dx.doi.org/10.1007/s00268-010-0543-z
26. Sadava EE, Krpata DM, Gao Y, Novitsky YW, Rosen MJ. Does presoaking synthetic mesh in antibiotic solution reduce mesh infections? An experimental study. J Gastrointest Surg [Internet]. 2013;17(3):562–8. Available from: http://dx.doi.org/10.1007/s11605-012-2099-8
27. Amid PK. Classification of biomaterials and their related complications in abdominal wall hernia surgery. Hernia [Internet]. 1997;1(2):70–70. Available from: http://dx.doi.org/10.1007/bf02427664
28. Forbes SS, Eskicioglu C, Mcleod RS, Okrainec A. Metaanalysis of randomized controlled trials comparing open and laparoscopic ventral and incisional hernia repair with mesh. Br J Surg. 2009;96:851–8.
29. Sauerland S, Walgenbach M, Habermalz B, Seiler CM, Miserez M. Laparoscopic versus open surgical techniques for ventral or incisional hernia repair. Cochrane Database Syst Rev [Internet]. 2011;(3):CD007781. Available from: http://dx.doi.org/10.1002/14651858.CD007781.pub2
30. LeBlanc KA, Booth WV, Whitaker JM, Bellanger DE. Laparoscopic incisional and ventral herniorrhaphy: our initial 100 patients. Hernia [Internet]. 2001;5(1):41–5. Available from: http://dx.doi.org/10.1007/bf01576164