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A case report

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Combined approach with negative pressure wound therapy and biological mesh for treatment of enterocutaneous fistula after synthetic mesh repair of incisional hernia. A case report.

AIM: *Enterocutaneous fistula is a rare but severe complication of prosthetic incisional hernia repair. Management requires re-exploration with intestinal repair/resection and mesh removal. Repair of the parietal defect in this contaminated field is challenging.*
MATERIAL OF STUDY: *A 58-years male patient presented to our department one year after synthetic mesh repair of large incisional hernia with mesh infection and enterocutaneous fistula. The diagnosis was confirmed by ultrasound guided drainage and CT scans with oral contrast. A multiple-step surgical approach has been adopted: first, the mesh was removed, intestinal resection performed and posterior fascial closure obtained by bilateral transversus abdominis release (TAR) and supra-fascial NPWT (negative pressure wound therapy) was positioned and maintained for one week; second, a definitive repair was obtained by a biological prothesis fixed to posterior fascia and covered by anterior fascia closure. Then, new NPWT was positioned and maintained for 6 days on the skin closure. At 18-months follow-up, the patient showed no clinical or radiological signs of recurrence or reinfection.*
DISCUSSION: *Surgical strategies to face enterocutaneous fistula after prosthesis ventral hernia repair are not standardized. After bowel fistula treatment and mesh removal, the challenge of abdominal wall closure stay unsolved because of the high rate of complication and failure of a new prosthetic repair. A case-by-case management plan, often with the use of a multi-step strategy, may be an option.*
CONCLUSION: *This is a single recovery multiple-step strategy combined approach using NPWT and biological prothesis to manage a case of mesh infection by an enterocutaneous fistula. This unique approach has revealed safe and effective for the treatment of parietal defect in infected field resulting from a mesh removing procedure.*

KEY WORDS: Biological prosthesis, Bowel mesh erosion, Enterocutaneous fistula, Negative Pressure Wound Therapy, Open incisional hernia repair,

Introduction

Mesh infection is the most concerning complication of open prosthetic repair of ventral incisional hernia, with a reported incidence ranging from 6 to 10% [1-3]. Infected mesh often needs to be removed although some evidence exists for attempting conservative management first, in the form of limited debridement, associated to the use of NPWT[4]. Prior incisional hernia repair, inadvertent intra-operative enterotomy, performance of a concomitant same-site abdominal procedure, use of polytetrafluoroethylene (PTFE) mesh, development of a postoperative surgical site infection, are all conditions associated with greater hazard of mesh explantation[5]. Mesh-related enterocutaneous fistula is a rare cause of mesh infection;

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in these cases, surgical strategy includes removal of the infected mesh, take down of the fistulae and bowel resection but, at the end of this demolitive step, a large fascial defect could remain. There is little publishing literature evaluating the outcomes of various surgical approaches in these challenging patients. A case-by-case perioperative management plan using combined procedures in a single or multiple stage may offer an effective strategy. Herein we report a case of enterocutaneous fistula occurred 12 months after prosthesis ventral hernia repair, successfully treated by multiple-step strategy combined approach, using NPWT and biological prosthesis in a single recovery setting. The technical details and the reasons of our choices are highlight in the discussion.

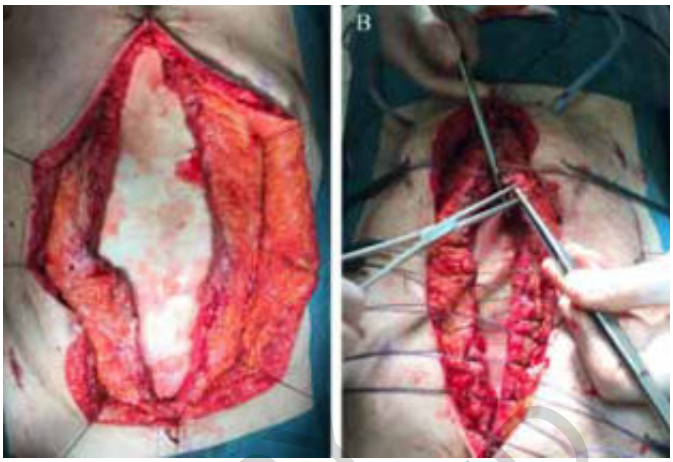

Fig 2: A)Mesh positioning; B)Anterior rectus muscles sheat suturing.

Case Report

A 58-years male patient presented to our Department one year after synthetic mesh repair of large incisional hernia with signs of wound infection: fever (38.5 °C), significant abdominal pain, localized swelling with signs of inflammation and tenderness. Computed Tomography (CT) with contrast, reveal fluid collection with air level just above the mesh suggesting mesh infection with supra-prosthetic abscess. The previous ventral hernia repair was performed also in our Institution for a large median defect developed after a Hartman reversal procedure. The procedure was an intraperitoneal repair by a polypropylene and expanded polytetrafluoroethylene (ePTFE) bilayer patch, fixed to abdominal wall by a full-thickness, transfascial stitch, followed by anterior abdominal wall closure. The ultrasound guided percutaneous sample revealed enteric material in the fluid collection. A second CT with oral-contrast showed a small bowel loop just above the mesh with clear communication with the subcutaneous abscess confirming the clinical suspect of an enterocutaneous fistula produced by the mesh bowel erosion (Fig. 1). We proposed to the patient a multiple-step surgical approach in a single recovery setting; the patient, informed of the risks and advantages of the therapeutic approach, provided fully informed consent. Intra-operatively dense adhesion between a small bowel loop and the anterior abdominal wall in the right flank was evident. After careful adhesionlysis, we found a lateral flap of the mesh folded medially, with the polypropylene layer in contact with a 20 cm portion of the small bowel. In the first step the prothesis was completely removed and the involved small bowel loops resected. The infected portion of the parietal wall was also removed. A latero-lateral hand-sewn ileo-ileal anastomosis was done. At the end of the demolitive step, a large fascial defect in a clearly contemned field was present. Bilateral transversus abdominis release (TAR) was

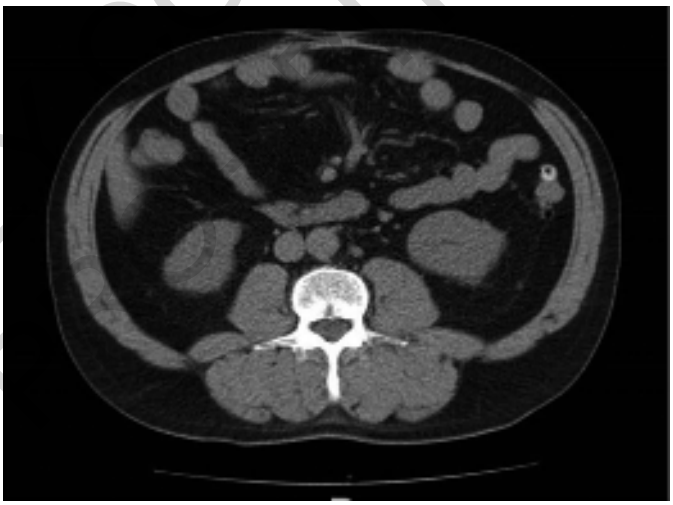

Fig 3: CT scan 36-months after surgery no showed radiological signs of recurrence or mesh infection.

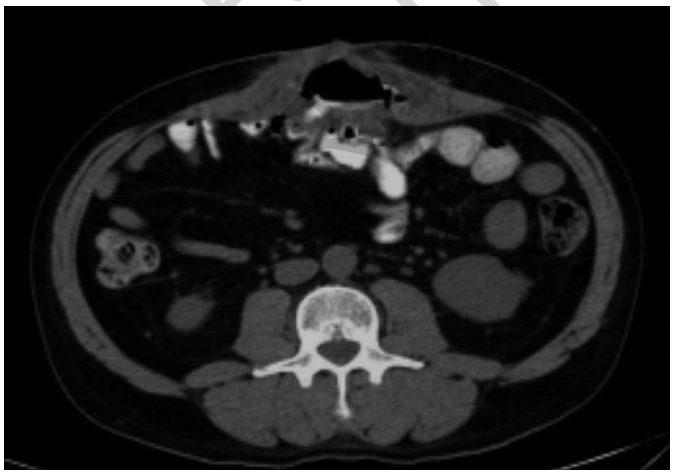

Fig 1: Pre-operative CT scan with oral-contrast showed a small bowel loop just above the mesh with clear communication with the subcutaneous abscess.

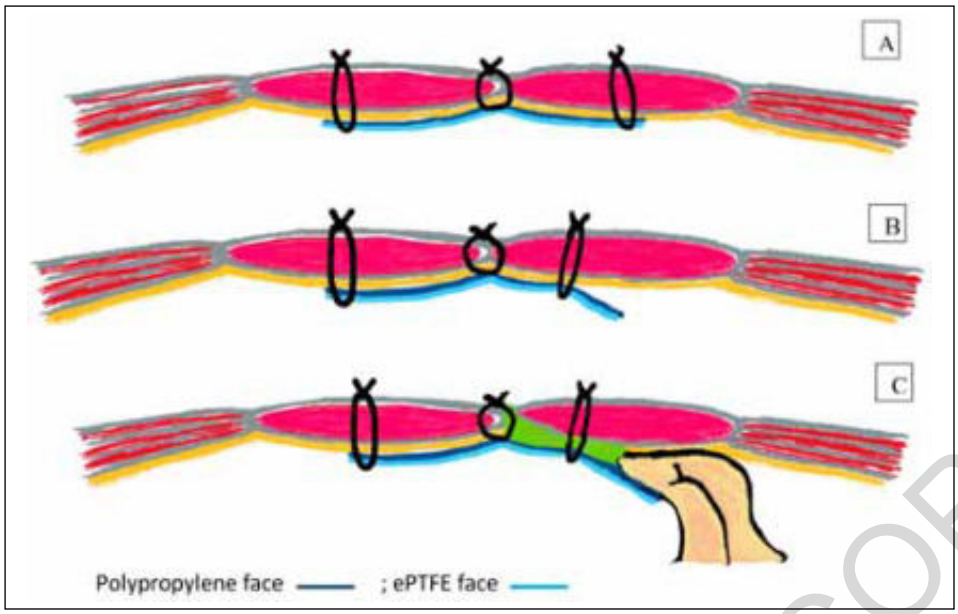

Fig. 4: A)The correct way to put multiple vertical full-thickness, transfascial mattress type stitch all around the border of the mesh; B)The wrong stitch positioning (too medially) that leaves a space between the upper side of the mesh and the abdominal wall;C)The contact from polypropylene face and bowel can lead the mesh erosion and the enterocutaneous fistula formation.

then performed to permit posterior rectus sheaths approximation in the midline without excessive tension; finally, a supra-fascial NPWT was positioned. In the second step, 7 days after the first procedure, a large biological mesh (cross-linked porcine dermal implant, Parmacol, Covidien, Medtronic Parkway, Minneapolis, MN, US) was anchored laterally to the previous closed posterior fascia by absorbable stitch to reinforce the midline fascial closure that, despite TAR, showed some tension in the central portion (Fig. 2A). The anterior fascia is subsequently approximate with an interrupted non-absorbable suture to separate the mesh from the subcutaneous tissue (Fig. 2 B). Two suction drainages were positioned (above and over the mesh). At the end of the procedure, to reduce the risk of wound infection and seroma, we positioned for 6 days NPWT to closed surgical wound.
Postoperative recovery was uneventful. The drainages were removed 7 day after the second surgical procedure and the patient was discharged 15 days after the first procedure. At 36-months follow-up, the patient showed no clinical or radiological signs of recurrence or mesh infection (Fig. 4).

Discussion and Comments

Mesh infection is one of the main complications after abdominal hernia repair [6], increasing both patient morbidity rate and ventral hernia repair overall cost. Conservative managements often fail and only complete mesh removal provides a definitive treatment [4]. A particularly rare condition is when the mesh infection is sustained by an enterocutaneous fistula, which onset could have a bimodal distribution, occurring immediately after operation due to unrecognized intra-operative enterotomy[7], or lately, many months or even years after mesh implantation, like expression of an intestine erosion by the mesh [8,9]. This late event has been documented in literature and it seems related to the use within the peritoneal cavity of an unprotected polypropylene mesh, promoting dense surrounding fibrosis, adhesions to the bowel, erosion and fistulization [8-12] . To prevent bowel from adhering to the intra-peritoneal mesh, different biocompatible polymers have been tried, using rearranged old materials as well as totally new materials [13]. Several studies have shown that biface and barrier-coated composite meshes are effective at reducing adhesion[14,15]. Expanded polytetrafluoroethylene (ePTFE) have been shown to exhibit a low adhesion rate due to better integration and less foreign body reaction and was used alone or for the peritoneal side of biface mesh [16]. At our knowledge, only few cases of enterocutaneous fistula has been reported with the use of dual layer mesh [17-20]. Our patient was submitted one year before to a ventral hernia repair, for a large median defect, using a polypropylene and expanded polytetrafluoroethylene (ePTFE) bilayer mesh positioned intraperitoneally and fixed to abdominal wall by a vertical mattress type stitch; this was followed by a defect of closure. In our center we treat routinely ventral hernias by open or, especially in obese patients, by laparoscopic approach [21-27]. During the last seven years we performed almost 50 ventral hernia repairs, positioning intraperitoneally a polypropylene/ePTFE bilayer mesh, often with anterior fascia closure, and without high grade of complications. In all cases the mesh was fixed to the abdominal wall by multiple vertical full-thickness, transfascial mattress type stitch, all around the border of the mesh (Fig. 4A). In our opinion, this technical expedient is important because guarantees that the polypropylene side was closely linked to the abdominal wall, without contact with

the bowel. In the present case report, the most plausible reason of the small bowel erosion could be a wrong stitch positioning (too medially), living a space between the upper side of the mesh and the abdominal wall, which have allowed the contact from polypropylene and bowel (Fig. 4 B, C).

When enterocutaneous fistulae develop after hernia repair, due to the high degree of contamination, is mandatory to remove the infected mesh, take-down the fistulae, surrounding the infectious tissue and providing a bowel resection. After the demolitive step, surgeon face on reconstruction of an abdominal wall with large defect in a contaminated field. In the absence of any evidence-based guide to help the decision-making process, a case-by-case management plan based on dimension of derived parietal defect, the segment of bowel involved, the level of contamination, the patient general condition and surgeon expertise should dictate the strategy. In our patient we chose to proceed with the repair by two steps. In the first step, we performed a component separations technique (CST) by bilateral TAR to approximate the posterior rectal sheath and close the abdomen; then a supra-fascial NPWT was positioned to decrease edema and bacterial burden of the rectus and subcutaneous tissue. The use of NPWT to temporary treat infected field has been reported in literature because its use seems to stimulate healing by removal of excessive interstitial fluid, increasing tissue blood perfusion and oxygenation, accelerating formation of granulation tissue and reducing bacterial load [28,29]. In our patient, the NPTW setting was continuous vacuum at suction pressure of 100mmHg. The dressing was changed after 72 h and the pression suction reduced to 80 mmHg; after 7 days, the volume of fluid suctioned decreased from 260 ml (first day) to 10 ml, so that we decided to remove NPTW. At exploration we founded a macroscopically decontaminated field, with consistent edema reduction of the muscular layer and cutaneous tissue.

The second stage of the procedure was performed when the field showed favorable condition in terms of tissue edema and bacterial contamination but, despite bilateral posterior component separation, some tension, especially in the median part, was clearly evident. In this situation two options were available: trust the direct closure obtained by TAR or use a new mesh to reinforce the primary repair. Direct repair of large ventral hernias using only CST have shown ineffective with a high recurrence rate [30]. Furthermore, it is a well-accepted concept that prior high contaminated field increases the likelihood of hernia recurrence. Trusting in the advantage of mesh reinforcement after complex defect wall closure by bilateral TAR, the choose of the ideal mesh in a contaminated field setting is still controversial. The use of permanent synthetic material is historically considered contraindicated given the risk of postoperative infective complications and need for mesh removal [31,32]. In the last few years, the introduction of biologic or absorbable synthetic meshes has provided an alternative to manage these challenging cases and their use have become the method of choice in many institutions across Europe and the United States [33]. Biologic prostheses, derived from the collagen-rich tissues (human, porcine, or bovine), represent a decellularized yields matrix of collagen, elastin, and laminin, that serves as supporting strattice for cellular repopulation and neovascularization [34]. Its potential use in contaminated fields without the fear of infection, could drift from its vascular ingrowth allowing host immune system to fight infection, as opposed to synthetic meshes where no true ingrowth occurs [35]. Both acceptable incidence of recurrence rate (12%), especially when bridging repairs were performed, and wound infection rate (15%) has been reported when biological mesh was used to reinforce CST repair in high complex parietal defect[3] [6,37]. In the present case, we chose a dermal porcine cross-linked mesh (Permacol, Covidien), located in retro-rectus plane. In our opinion, both sublayer allocation as well as specific biological mesh properties, like cross-linking that improve mesh straight, may offer advantage in terms of recurrence rate.

Conclusion

Despite unfrequent, an enterocutaneous fistula may develops following sublayer mesh ventral hernia repair, also when a composite mesh has been used. Technical attention to achieve a complete adhesion of the polypropylene fold to the peritoneal face is essential to avoid a dangerous contact between polypropylene and bowel that may generate erosion and fistula formation. In case of enterocutaneous fistula, bowel resection with complete mesh removal is the only reasonable solution, although the closure of the residual wall defect could be challenging, often requiring a tailored approach.

Our proposal of a two-step combined approach with CST, NPWT and biological mesh augmentation in a fairly short interval and in a single recovery setting seems a reasonable, effective and reproducible way to solve this surgical challenge.

Riassunto

La fistola enterocutanea è una complicanza rara ma assai temuta legata all'utilizzo di reti per la plastica del laparocele. Non essendoci ancora una tecnica standardizzata, abbiamo descritto un caso clinico di rilevanza: maschio, 58 anni, a distanza di 1 anno dall'essere stato sottoposto a plastica per un voluminoso laparocele con utilizzo di rete sintetica, mostrava segni e sintomi clinici di infezione della protesi con presenza di una fistola enterocutanea. La diagnosi veniva confermata da ecografia, col drenaggio dell'ascesso e TC con mdc per os.

Data la complessità del caso, abbiamo adottato una strategia multi-step: in primo luogo, rimozione della protesi, resezione intestinale e chiusura della fascia posteriore dei muscoli retti con associata TAR (transversus abdominis release) e posizionamento di dispositivo NPWT soprafasciale per 1 settimana; successivamente, chiusura definitiva con protesi biologica fissata tra la fascia posteriore ed anteriore dei muscoli retti, ancora con NPWT a protezione della cute per ulteriore 6 giorni.
Il decorso postoperatorio è stato privo di eventi avversi e il paziente, ad un follow-up clinico-radiologico di 18 mesi, non presenta segni di recidiva o reinfezione.
Questo approccio multi-step si è rivelato sicuro ed efficace nel nostro caso, e data la mancanza di standardizzazione per una patologia poco frequente, rappresenta una concreta possibilità terapeutica.

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