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A case report on management of synergistic gangrene following an incisional abdominal hernia repair in an immunocompromised obese patient

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ABSTRACT

INTRODUCTION: We present a case on conservative management of salvaging the mesh in an immunocompromised morbidly obese patient, who developed a synergistic gangrene infection following a primary open mesh repair of an incisional hernia.
PRESENTATION OF CASE: Our patient presented with a surgical wound infection, comorbidities were Chronic Lymphoblastic Leukemia (CLL), Body Mass Index (BMI) of 50, hypertension and diet controlled type-2 diabetes. In surgery, wide necrotic wound debridement, early and repetitive wound drainages with the use of a large pore polypropylene mesh and a detailed surgical follow up was required. High dose intravenous broad-spectrum antibiotic treatment and Negative Pressure Wound Therapy (NPWT) was administrated in combination with adopting a multidisciplinary approach was key to our success.
DISCUSSION: Stoppa Re et al. complied a series of 360 ventral hernia mesh repairs reporting an infection rate of 12% that were managed conservatively. However, our selective case is unique within current literature, being the first to illustrate mesh salvage in a morbid obese patient with CLL. Recent modifications in mesh morphology, such as lower density, wide pores, and lighter weight has led to considerable improvements regarding infection avoidance.
CONCLUSION: This case has demonstrated how a planned multidisciplinary action can produce prosperous results in a severely obese immunocompromised patient with an SSI, following an incisional hernia repair.

1. Introduction

Magill et al. described a study whereby 31% of healthcare-associated infections within hospitalised patients were due to Surgical Site infections (SSIs); infections that occur in a wound created by an invasive surgical procedure. [1] Naturally, this resulted in prolonged ward admission, increase in morbidity and mortality.

Within our case, an immunocompromised morbidly obese patient developed a synergistic gangrene infection following a primary open mesh repair of an incisional hernia. With conservative management, the patient was successfully treated, resulting in the complete healing of the wound infection and the salvaging of the mesh.

2. Presentation of case

A 42-year-old immunocompromised Caucasian male, presented with a post-operative wound infection on 30th October 2014. The patient had undergone an emergency open exploratory laparotomy for abdominal peritonitis in 2012, followed by an elective open abdominal incisional hernia repair on 10th October 2014, with an uneventful outcome. The patient's status was characterised by Chronic Lymphoblastic Leukemia (CLL), Body Mass Index (BMI) of 50, hypertension and diet controlled type-2 diabetes.

An experienced colorectal surgeon had performed an 'Inlay Technique' of polypropylene mesh with extensive undermining of the extra-peritoneal layer in a difficult incisional hernia operation. Large porous mesh of 20 by 20 cm (centimetre) was used, therefore, seroma formation was expected and as such, the high risk of infection may have been anticipated. The post-operative event was uneventful and upon discharge, the patient's condition was deemed satisfactory.

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Fig. 1. Vacuum dressing is used at one stage of management.

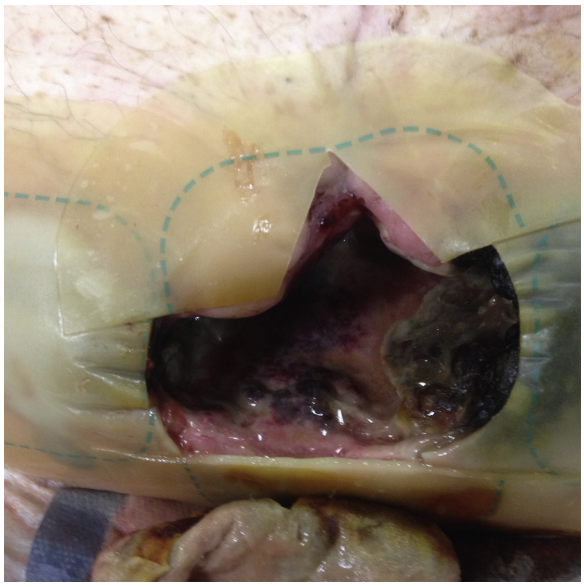

Fig. 2. 1.5 kg of necrotic wound.

Despite being well upon discharge on 10th October 2014, the patient presented with non-specific abdominal pain, lethargy and shivers, 20 days post-surgery. Upon examination, overlying erythematous cellulitis along his recent surgical scar was noted, in addition to white blood cells (WBC) of 31,000 per cubic millilitre (4–10 109/L) and C Reactive Protein (CRP) of 298 milligrams per decilitre (<1.0 mg/dL). He was treated with conservative intravenous antibiotics and open abdominal wall drainage. A small amount of purulent discharge was drained and the wound was left open to heal by secondary intention. The mesh was covered with granulation tissue on the background of infection. He was admitted for 5 days and discharged with a detailed outpatient wound dressing management plan.

The patient re-attended after a further 2 weeks with lower abdominal pain. Intravenous antimicrobial therapy was administered on the recommendation of the microbiology team. Second open abdominal wall drainage revealed an abscess. Vacuum Assisted Closure Therapy (VAC) was used to promote wound healing by removing reactive serous fluid and actively promoting granulation through Negative Pressure Wound Therapy (NPWT) as shown in Fig. 1. Microscopy, culture and sensitivity (MC&S) were a mixed aerobic-anaerobic picture of micro-aerophilic streptococci, acting synergistically with aerobic staphylococci with negative Methicillin-resistant Staphylococcus aureus (MRSA) swabs and no antibiotic resistance. The patient was discharged after a week and was given oral antibiotic cover in addition to continuing to have his wound dressed as an outpatient.

Within 15 days, the patient represented with severe abdominal pain and worsening cellulitis. The wound was revisited, revealing a deep-seated infection with necrosis of the abdominal wall flap. In surgery, debridement of 1.5 kg (kilogram) of dead necrotic tissue was excised with drainage to the abdominal wall, illustrated in Figs. 2 and 3 Surgical procedure was revisited within 48 h with no further necrotic tissue found with adequate wound excision in Fig. 4. The mesh was secure and covered in healthy granulation tissue in Fig. 5. NWPT was introduced as an auxiliary therapy for 4 weeks with regular dressing foam change. Throughout the patient's hospital stay, the case was discussed with the microbiology team and high dose intravenous broad-spectrum antibiotic treatment was administrated in combination with the surgical approach for synergistic gangrene infection.

Fig. 3. Flap necrosis.

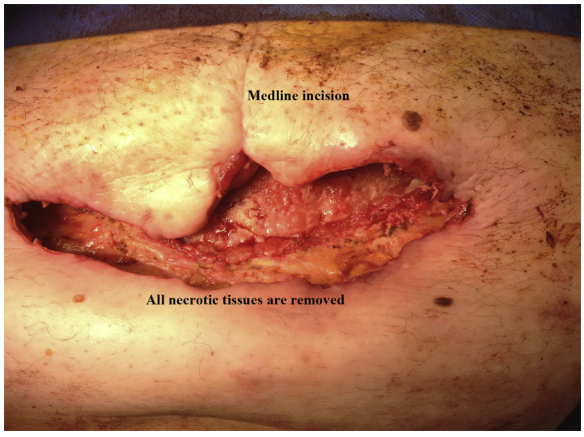

Fig. 4. Clean wound, ready for closure.

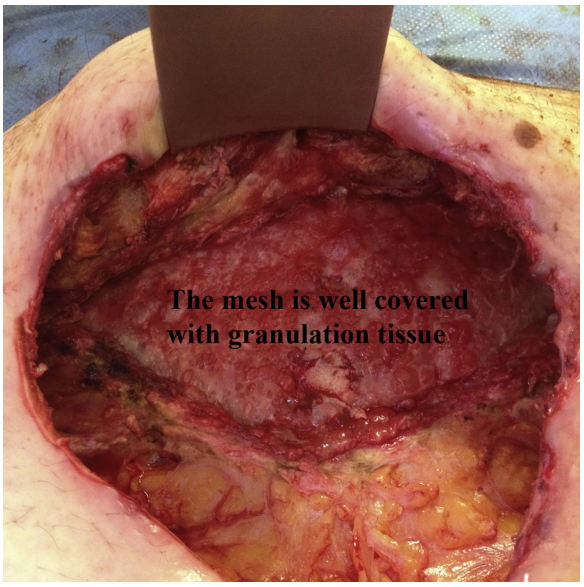

Fig. 5. Healthy granulation tissue covering the mesh.

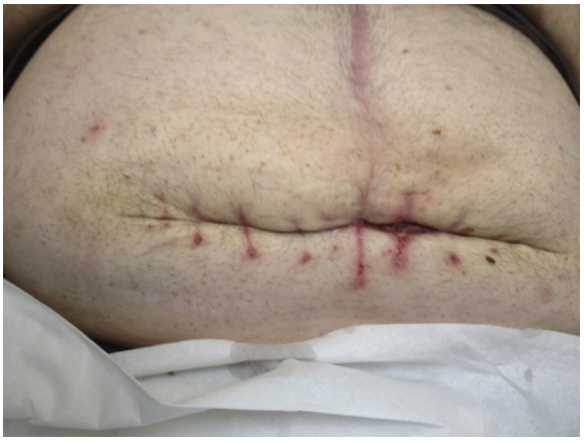

Fig. 6. Healed wound, the final stage.

Over the following 4 weeks, there was a significant reduction in inflammatory markers and resolution of the wound infection. The post-operative course was uneventful and primary intention sutures were removed. A follow-up report at 2, 4 and 12 weeks following discharge revealed he was clinically well, the wound had healed and there was no evidence of recurrence shown in Fig 6.

3. Discussion

SSI has been identified as a consistent risk factor for recurrence after a ventral hernia repair [2]. Luijendijk et al. demonstrated the rate of recurrence among patients with postoperative infection was 80%, compared with 34% for those without [3]. Additionally, seroma, wound dehiscence and the formations of enterocutaneous fistulae have been noted. The presence of individual comorbidities increases the risk for postoperative infection as much as 4-fold [4]. The use of corticosteroids, smoking, ischaemic heart disease, chronic obstructive lung disease, pre-operative low serum albumin, age, and immunocompromised and poor nutritional state are examples [5]. Our patient had chronic lymphoblastic Leukemia, an immunocompromised state prone to poor wound healing and vulnerable to infection. Being a diabetic increased the risk of cell hypoxia, dysfunction in fibroblasts and impaired angiogenesis resulting in neovascularisation and poor wound healing. Sugerman et al. described morbid obesity as an independent risk factor for wound complications due to poor vascular supply to the skin and subcutaneous tissues [6], leading to an increased risk of an incisional hernia. Such in our case, a large abdominal incision with excess subcutaneous fatty tissue created 'further dead space' producing an atmosphere for thriving bacterial proliferation and deep seated infection.

For many years it was advocated to have an infected mesh wound promptly removed. The removal of the prosthetic materials is often technically difficult when there is good tissue incorporation and can increase the risk of subsequent enterocutaneous fistula formation and recurrence. [7] Reports have recommended that infections involving non-absorbable mesh warrant early surgical removal [8]. However current literature and findings from our unique case have illustrated conservative treatment is a viable option. Stremitzer et al. have demonstrated 55% of mesh salvage after antibiotic therapy associated with percutaneous drainage and saline irrigation for partially absorbable meshes. [9] Recent modifications in mesh morphology, such as lower density, wide pores, and lighter weight has led to considerable improvements regarding infection avoidance. Wider mesh pores permit tissue ingrowth and migration of macrophages to control bacteria colonies. Thus, better integration between tissue and mesh is achieved. Berrevoet et al. have demonstrated a 100% success rate for treatment of deep SSI incisional hernia wounds repaired with large pore (2–5 mm) polypropylene meshes. [10] Additionally, it was revealed that microporous and multifilament meshes carry a superior affinity for persistent bacterial contamination. [11]

A critical stage in mesh salvage is the initial wound debridement and a subsequent re-look. Debridement involves removal of non-viable and contaminated tissue. It is essential as devitalised tissue in the wound bed creates concealed dead spaces that harbor bacteria and increase the risk of infection. Necrotic tissue can mask the signs of a local wound infection, as well as acting as a physical barrier to healing. Synergistic gangrene is generated from bacterial colonies present in necrotic tissues. Within our case, continual removal of the necrotic burden was essential in wound bed preparation, reducing contamination and tissue destruction.

Intravenous antimicrobial therapy is an important component of our mesh salvage plan. The more common agents associated with mesh infection are *Staphylococcus* species (SPP) Streptococcus (SPP.) gram-negative bacteria (Enterobacteriaceae), and anaerobic bacteria (*Peptostreptococcus* spp.) [12,13]. The duration of antibiotics is not clearly defined in literature, however, expert opinion from a microbiologist is advised. In a study by Luijendijk et al., 3 out of 84 patients developed a wound infection following polypropylene mesh repair. Intravenous antibiotics successfully treated all without removing the mesh [14]. Moreover, Negative Pressure Wound Therapy (NPWT) has been used in wound management, with good outcomes. The aforementioned has been particularly evident in cardiovascular and diabetic patients [15]. Benefits such as reduced odour, fewer dressing changes and fewer leakages are observed. The NPWT optimises tissue granulation, increases local blood perfusion, expands tissue nutritional supply, and decreases pathogen presence [16,17]. Intriguingly, new data verified that synthetic mesh has the ability to clear infections in the setting of MRSA [18].

Numerous cases of mesh salvage have been described. Stoppa RE et al. complied a series of 360 ventral hernia mesh repairs reporting an infection rate of 12% that were managed conservatively [19]. However, our selective case is unique within current literature, being the first to illustrate mesh salvage in a morbid obese patient with chronic lymphoblastic leukaemia. Adopting a multidisciplinary approach was key to our success as the endocrinologist

and oncologist controlled comorbidities and the microbiologist recommended antibiotics and NPWT. In surgery, wide necrotic wound debridement, early and repetitive wound drainages with the use of a large pore polypropylene mesh with a detailed surgical follow up is recommended.

4. Conclusion

This case has demonstrated how a planned multidisciplinary action can produce prosperous results in a severely obese immunocompromised patient with an SSI, following an incisional hernia repair. The importance of wide necrotic debridement, in conjunction with abdominal drainage and NWPT, should initially be attempted to secure mesh salvage. For patients with limited prosthetic contamination or mesh exposure, local management should be the first line of treatment, thereby avoiding abdominal wall defect recurrences, persistent inconveniences (sinus, fistulas) and destabilisation of pre-existing diseases.

Conflicts of interest

The authors have no financial and personal relationships with other people or organizations that could inappropriately influence (bias) this submission.

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Ethical approval

None.

Consent

Written informed consent was obtained from the patient for publication of this case report and its accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Authors contribution

Nabeel Merali and Ricardo Augusto Ribeiro de Almeida were the contributors in writing the case report and involvement in the acquisition and analysis of literature review.

Abdulzahra Hussain provided clinical care of the patient during his treatment and further follow-up as well as supervising the writing of the case report.

Surgical images were courtesy of the Surgical Department with patient's consent.

Guarantor

All authors read and approved the final manuscript with Abdulzahra Hussain giving the final approval of the manuscript for submission.

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