

## Rejection of Permacol® mesh used in abdominal wall repair: A case report

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### INTRODUCTION

Abdominal wall closure in the presence of overt sepsis is associated with a high failure rate. Biological prostheses are often used to reduce the risk of sepsis and ensure a trouble-free recovery. This is a case report of an experience involving the use of Permacol® mesh in abdominal wound dehiscence following an emergency laparotomy for caecal perforation. This patient later exhibited a severe foreign body reaction to the implant requiring its removal. Below, we outline an overview of the case followed by a review of the literature (using PubMed and Medline keywords: Permacol; porcine dermis collagen, abdominal wall repair; hernia repair), and resulting conclusions.

### CASE REPORT

This case describes a 72-year-old man who was admitted as an emergency with acute abdominal pain and vomiting. On examination he had a distended rigid abdomen with reduced bowel sounds. He underwent an emergency laparotomy and right hemicolectomy for a perforated caecum, with localised abscess and generalised peritonitis. The wound was closed with “0” loop Polydioxanone (PDS) single layer with staples to the skin. Postoperatively he was admitted to the High Dependency Unit (HDU) but discharged to the ward the next day as he was making good progress. He developed a wound infection, manifested as discharge, on the 7th postoperative day. Some skin staples were removed to allow wound drainage and a vacuum assisted closure (VAC) dressing was applied on the 14th postoperative day. Two days after this, he was taken back to theatre to deal with a full thickness dehiscence of the abdominal wound. Following a thorough lavage, a Permacol® mesh was used to close the abdominal wound, partly as a bridge prosthesis as the fascial edges could not be approximated. This second operation was complicated by superficial wound dehiscence of the wound seven days later. A VAC dressing was reapplied

### Abstract

Permacol® mesh has shown promise when used in abdominal wall repair, especially in the presence of a contaminated surgical field. This biomaterial, derived from porcine dermis collagen, has proposed advantages over synthetic materials due to increased biocompatibility and reduced foreign body reaction within human tissues. However, we present a case report describing a patient who displayed rejection to a Permacol® mesh when used in the repair of abdominal wound dehiscence following an emergency laparotomy. Review of the English language literature using PubMed and Medline, showed only two previously published cases of explanation of Permacol® due to sepsis or wound breakdown. The authors believe this is the first case of severe foreign body reaction leading to rejection of Permacol®. Both animal and human studies show conflicting evidence of biocompatibility. There are several reports of successful use of Permacol® to repair complex incisional herniae or abdominal walls in the presence of significant contamination. It appears from the literature that Permacol® is a promising material, but as we have demonstrated, it has the potential to evoke a foreign body reaction and rejection in certain subjects.

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**Key words:** Abdominal wound closure; Permacol rejection; Foreign body reaction; Biocompatibility

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and the patient was discharged into the community. After sometime, the infection was controlled and there was pink granulation tissue formation in the wound. However, there was no demonstrable wound contraction or attempt at skin cover. He had application of silver nitrate to areas of over-granulation without significant response. Four months later, he underwent an elective exploration of the wound. At the time of surgery there was macroscopic evidence of rejection of the Permacol® mesh with nodular foreign body reaction and no attempt at wound healing at the level of the skin. The Permacol® mesh was excised and replaced with a Surgipro® mesh, with an uneventful postoperative period. Review of the wound 11 wk post-exchange of Permacol® with Surgipro® revealed evidence of wound healing in the superior section, although there remained an area (about 3 cm × 2 cm) of non-healing in the inferior section with the suspicion of a small piece of Permacol® remaining in the wound. An elective excision of abdominal wound sinus was carried out. Histology revealed features of acute and chronic inflammation superficially and granulomatous inflammation in the deep layer consistent with a “stitch granuloma”.

## DISCUSSION

Permacol® (Tissue Science Laboratory, Covington, USA) is a biomaterial that has been used across a variety of surgical specialties since the 1980s, for urological, plastic, and gynaecological procedures<sup>[1,2]</sup>. It was reported to have encouraging results when used in the form of a mesh for the repair of abdominal wall defects, and parastomal and inguinal hernias<sup>[3]</sup>. Permacol® is derived from porcine skin and undergoes the removal of cellular components and genetic material before cross-linking the remaining extracellular matrix. The aim of this process is to produce a material that induces minimal foreign body reaction in tissues and is resistant to biodegradation by native collagenases. This is in contrast to Surgipro® (Cook Surgical, USA) which comprises monofilament fibres of polypropylene polymers to form a strong non-absorbable mesh, inducing a fibrous reaction which is the mainstay for the current repair of abdominal wall herniae and fascial defects<sup>[3]</sup>.

The proposed advantages of using a biomaterial over non-biomaterials are reduced infection; reduced risk of adhesion and fistula formation; and less rejection and erosion<sup>[2,3]</sup>. Also, it is claimed that Permacol® is more suitable for use in contaminated surgical fields, where the risk of infection with a non-absorbable prosthesis is high<sup>[2-4]</sup>. Permacol® initially takes on a structural role before becoming vascularized, followed by the incorporation of host cells, leading to remodeled tissue similar to that of the host. However, it has been proposed that there is a higher associated risk of hernia recurrence with biomaterials when compared to synthetic materials<sup>[2,4]</sup>.

This is an unusual case of extensive tissue reaction leading to rejection of a bioprosthesis (Permacol®). Animal studies (in a rat model) have demonstrated only a

minor chronic inflammatory response, limited evidence of collagen deposition or vascular ingrowth, and no foreign body reaction<sup>[5,6]</sup>. However, Petter-Puchner *et al*<sup>[7]</sup> who studied tissue responses to porcine cross-linked collagen implants in 10 rats at 17 d and three months showed extensive signs of foreign body inflammatory reaction, with three rats requiring euthanasia due to the migration of implants transcutaneously, and concluded that porcine dermal collagen shows suboptimal biocompatibility. Human studies revealed conflicting evidence of biocompatibility, lack of fibroblast penetration into the graft due to cross-linking of the porcine collagen matrix, absent acute polymorph cellular reaction, and occasional chronic foreign body reaction<sup>[8-10]</sup>. Although the prosthesis had to be removed in this case, several studies have reported the successful use of Permacol® in abdominal wall or hernia repair<sup>[2,11]</sup>. Hsu *et al*<sup>[11]</sup> successfully used Permacol® in the reconstruction of incisional hernias or open abdomens in 28 patients with none requiring the prosthesis to be removed.

The decision to use Permacol® in this case is supported by others<sup>[12,13]</sup> who described successful repair of complicated incisional herniae involving contaminated or uncontaminated surgical fields, with no post operative complications, wound infections or recurrence of herniae. Furthermore, Jehle *et al*<sup>[14]</sup> described a case of complete wound dehiscence post elective panproctocolectomy where Permacol® was used to reconstruct the abdominal wall defect, and combined it with topical negative pressure dressing to achieve wound healing at five months. In another case where an emergency Hartmann's procedure for a sigmoid stercoral perforation was complicated by wound dehiscence and polyglactin absorbable mesh reconstruction of the abdominal wall resulted in an enterocutaneous fistula, resection and abdominal wall closure was achieved with Permacol® mesh.

Permacol® was used to repair complex abdominal wall defects in nine patients with incisional hernias following the removal of infected mesh, excision of abdominal wall tumour, wound infections and strangulated hernia repair. Despite the contaminated surgical field, five out of the nine patients had no complications due to infection. Two reported cases of explantation of Permacol® involved a patient who developed an abdominal wall abscess seven months after surgery<sup>[15]</sup>. A paediatric renal transplant patient required Permacol® insertion as an adjunct to abdominal wall closure following transplantation, but suffered skin dehiscence 23 d postoperatively<sup>[16]</sup>.

In conclusion, our report provides the third reported case of Permacol® removal but for a very different reason-rejection. There was no sign of infection but the wound would not heal. Histology showed a mixture of acute and chronic inflammation, and foreign body inflammation. We believe this is the first documented case of Permacol® rejection in humans. Review of the literature has revealed the proposed biocompatibility of Permacol®, which is substantiated by the reported successes of its use in the repair of

incisional hernia and abdominal wall repair, including those with a contaminated surgical field. Most common complications include seromas, wound dehiscence or infection with only two reported cases in the literature where Permacol® was required to be removed. It would appear that Permacol® is a promising biomaterial but, as we have reported, it has the potential to induce severe foreign body reaction or rejection in certain subjects.

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