Infection of PTFE mesh 15 years following pedicled TRAM flap breast reconstruction: mechanism and aetiology

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ABSTRACT

The pedicled transverse rectus abdominis myocutaneous (TRAM) flap procedure is still widely used for breast reconstruction. The repair of the flap harvest site in the transverse rectus abdominis muscle and sheath is often assisted by the use of prosthetic meshes. This decreases the risk of abdominal wall weakness and herniation but, being a foreign body, it also carries the risk of infection. In this report, we describe the case of a 63-year-old patient who, whilst receiving chemotherapy for metastatic breast cancer, presented with an infected polytetrafluoroethylene mesh 15 years after pedicled TRAM flap immediate breast reconstruction. This necessitated mesh removal to treat the infection. Following a thorough review of the English literature, this is the longest recorded presentation of an abdominal prosthetic mesh infection. The mechanism and aetiology of such a late complication are discussed.

KEYWORDS

Plastic surgery – Hernia repair – Breast reconstruction – Surgical mesh – Surgical wound infection – Complications

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Introduction

The pedicled transverse rectus abdominis myocutaneous (TRAM) flap remains a well-recognised breast reconstruction method following mastectomy for the treatment of breast cancer. Its advantages include complete autologous reconstruction with durable long-term results while avoiding the use of an implant and improving the abdominal contour. However, it is associated with considerable donor site morbidity and has the potential to develop an incisional hernia following damage to the rectus sheath and muscle during its harvest.¹

Pedicled TRAM flap harvest often requires the reinforcement of the rectus sheath with a synthetic mesh such as polypropylene (Marlex) or polytetrafluoroethylene (PTFE; Gore-tex®) meshes or, more recently, biological meshes such as the acellular dermal matrices to provide support and prevent weakness of the anterior abdominal wall muscles at this site.^{2,3} The use of a synthetic non-absorbable mesh provides a long-term solution with a lesser risk of degradation

and subsequent hernia recurrence. However, as with any foreign body, meshes carry a risk of infection which often require surgical removal [Falagas and Kasiakou 2005]. In this case report, we present an unusually late PTFE mesh infection, 15 years following its insertion to repair the abdominal wall donor site at the time of a pedicled TRAM flap breast reconstruction.

Case history

A 47-year-old woman underwent a right simple mastectomy, axillary lymph node clearance and immediate reconstruction with an ipsilateral pedicled TRAM flap for right breast carcinoma in October 2000. She required neoadjuvant chemotherapy but no radiotherapy. The full thickness rectus abdominis muscle and fascial defect was repaired with a 15 × 21 cm PTFE mesh (BARD Medical). On postoperative day 5, she suffered partial flap necrosis loss, which necessitated further reconstruction with a right latissimus dorsi flap

eight weeks later, with no further early complications. She remained disease free and asymptomatic from her abdominal incision until 2013 when she developed liver, bone and renal metastases from her breast carcinoma. In March 2016, 15 years following her TRAM flap breast reconstruction, she noted abdominal pain and swelling with purulent discharge from her umbilicus but was systemically well. This discharge was treated conservatively with dressings and intravenous antibiotics, as the collection was self-discharging and she remained well. Her weekly chemotherapy (paclitaxel) continued.

In May 2016, while on the chemotherapy, the patient was admitted with non-neutropenic sepsis with a suspected intra-abdominal cause, because of the persistent umbilical discharge. This discharge was treated with intravenous meropenem and vancomycin and the umbilical wound swabs on admission grew sensitive *Staphylococcus aureus*. Following admission, repeat abdominal computed tomography demonstrated that the seroma had actually decreased in size but fat stranding was noted around the collection (Figs 1 and 2). There was no evidence of an intra-abdominal collection.

Following the trial of intravenous antibiotics, a multidisciplinary review recommended that the mesh be removed in part or totally as indicated. The patient was then referred to the plastic surgical service for further management. At exploration via an extended periumbilical incision it was found that there was seropurulent fluid (Fig 3) emanating from a discharging sinus, which was also excised. Disintegrated PTFE mesh that had been sutured in place with Ethibond (green suture) was identified in the sinus (Fig 4) and extended to the groin. The mesh was totally removed, together with the surrounding scar tissue (Fig 5).

Figure 1 Computed tomography of the abdomen 15+ years after right (pedicled) TRAM flap harvest demonstrating a well-demarcated right-sided anterior abdominal wall seroma communicating with the umbilicus.

Figure 2 Computed tomography of the abdomen showing the mesh within the right abdominal wall with surrounding fat stranding.

Figure 3 Intraoperative image of the seropurulent fluid emanating from a discharging sinus at the periumbilical incision area (© Addenbrooke's Hospital).

After removal of the mesh, the transverse periumbilical wound was dressed with a vacuum dressing and the wound was closed directly six days later. Histology of the excised sinus demonstrated no malignant metastases, indicating only inflamed granulation tissue and surrounding fibrous scarring with focal foreign body granulomatous reaction. The patient was reviewed four weeks later with no further infections and a well-healed scar.

Figure 4 Intraoperative image of the disintegrated PTFE mesh, Ethibond sutures and scar tissue identified in the sinus and extended to the groin (© Addenbrooke's Hospital).

Figure 5 Intraoperative photograph of excised PTFE mesh measuring 15 cm in length. The mesh was tightly adhered to surrounding tissue within the described fluid collection.

Discussion

After a careful review of the literature in English, we believe this to be the longest documented case of mesh infection, occurring over 15 years after mesh insertion. Mesh infection usually occurs due to local factors (pre-existing surgical-site contamination, poor localised blood supply), patient or systemic factors (immunosuppression, diabetes mellitus, smoking status, malnutrition) or surgical factors (non-sterile handling of the implant, lack of prophylactic antibiotics at induction, emergency versus elective surgery). These infections occur soon after surgery, within weeks or months at the latest. Infections presented many years after the abdominal wall mesh insertion are extremely uncommon.

One author (CMM) has previously reported such an infection in a 39-year-old woman who presented 6.5 years following pedicled TRAM flap breast reconstruction. Similarly, a PTFE (Gore-Tex®) mesh was used and the donor site was closed in a similar fashion. The patient later presented with abdominal pain and a urinary tract infection and subsequently developed recurrent lower abdominal sinuses, which were excised in addition to removal of the PTFE mesh. Removal of the mesh and antimicrobial treatment for a proven *Escherichia coli* infection led to a complete resolution of symptoms in this particular case.

Delayed infections are unlikely to be related to any intraoperative factors, since these would have manifested at a much earlier stage. Atypical causes should therefore be explored. One of the mechanisms to be considered is the haematogenous spread of an infection and late wound breakdown, which would allow its introduction. Another potential or possible cause is percutaneous drainage of a reactive seroma, which may develop around a longstanding foreign body. Percutaneous drainage could introduce skin flora organisms into a deeper cavity where the mesh is located. Thus, it is important to maintain strict aseptic technique, as well as minimising the number of attempts to drain the fluid. Our patient did not undergo any percutaneous drainage of their seroma.

The presence of a discharging periumbilical sinus in this case is a possible cause, as a sinus can result in the mesh communicating with the external environment. The presence of *S. aureus* supports an external infection through a skin breach, as it is a common skin commensal which may have spread into the tract and result in a deep infection. However, the precedence of a periumbilical sinus is unlikely, as the umbilical discharge and subsequent sinus formation followed the occurrence of localised abdominal pain. A discharging sinus may have gradually formed in the presence of ongoing inflammation secondary to a seroma or collection. However, the immunosuppressive effect of some chemotherapeutic agents used in the treatment of metastatic breast cancer is the most likely predisposing factor accounting for the mesh infection in our patient. Immunosuppression can cause a transient bacteraemia and this can seed on to a mesh anywhere in the body, resulting in a secondary infection. An immunosuppressed patient such as ours is likely to have developed a haematogenous infection of the mesh leading to peri-implant seroma formation. The seroma fluid subsequently followed the lowest resistance path, thus discharging around the umbilicus.

Whatever the precipitating cause of the mesh infection, its treatment involves complete removal, as we undertook with our patient. Prosthetic mesh is a foreign body, stimulating a localised tissue reaction and inflammatory response. Soft-tissue infection in the presence of a foreign body (mesh), as was demonstrated in this case, is usually difficult to treat with antibiotics alone and is often impossible to eradicate. This infection was therefore resolved only with removal of the foreign material. Conroy *et al.* reported a similar case with a 39-year-old patient reporting infection of a synthetic

mesh 6.5 years following its insertion and resolved with removal.⁴ However, that patient did not receive any chemotherapy, further supporting the theory that chemotherapy played a role in allowing an opportunistic bacteraemia to spread via a haematogenous route to the implant in an immunocompromised patient.

The deep inferior epigastric flap, a rectus-muscle sparing technique for breast reconstruction, has largely superseded the practice of using a TRAM flap in our department. This in turn has significantly reduced the need of a mesh for abdominal wall reinforcement and thus the rate of weakness when compared to TRAM flap reconstruction.

Long-term mesh infections are very uncommon. Chen *et al.*, for example, describe a series of eight patients, with a late onset of mesh infection (range 3-60 months).⁵ Seven of these patients had resolution of symptoms only when the mesh was removed. Samee *et al.*⁶ reported a case of an infected mesh seven years after a laparoscopic inguinal hernia repair and Foschi *et al.*⁷ report a similar case in a 48-year-old with a three-year delay.

Conclusion

We believe that this is the longest delayed mesh infection following any insertion of a synthetic implant in the current

literature. These late infections are extremely rare and usually associated with other factors such as immunosuppression or longstanding inflammatory responses. In the case of a suspicion of deep infection, the current best treatment is removal of the infected implant as it is unlikely to respond to antimicrobial therapy alone.

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