CASE REPORT

Failure to obtain microbiological culture and its consequence in a mesh-related infection

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SUMMARY

This report describes a case of a delayed diagnosis of a late-onset mesh infection due to an unexpected enteric pathogen, *Enterobacter cloacae*. A 62-year-old woman with a history of prior incisional hernia repair with a prosthetic mesh presented to the emergency room with signs of an abscess with surrounding cellulitis of her abdomen over a year after her hernia repair. The patient manifested minimal response to 1 month of oral antibiotics. She underwent a complicated yet successful treatment course including surgical mesh removal (with a peri-operative complication), implantation of a biological mesh for the ventral hernia defect and ultimately, antibiotics tailored to the offending pathogen identified by postoperative culture of the infected mesh.

BACKGROUND

Mesh infections are considered a challenging complication of hernia repairs and oftentimes, due to having a late-onset presentation, are not clinically suspected in the outpatient setting. Different types of prosthetic meshes have been developed with inherent protective properties versus opportunistic factors associated with mesh infections. The most commonly identified pathogen of an infected prosthetic mesh is *Staphylococcus aureus*. This case demonstrates the insight provided by a thorough history (including surgical history with the type of mesh used) and physical examination, along with the importance in obtaining a wound culture to direct antibiotic therapy during the management of suspected mesh infections. The successful treatment of mesh infections requires the appropriate identification of the culprit pathogen since enteric pathogens, though uncommon, could be implicated as the source of the infection as demonstrated in this case report.

CASE PRESENTATION

A 62-year-old woman presented to the emergency room (ER) with a 1-week history of redness, pain and swelling in the right-upper quadrant of the abdomen. The patient denied any fevers, chills or night sweats, but described 20 lb. weight loss since a hernia repair 13 months prior. Her medical history included diet-controlled diabetes mellitus, asthma and obesity. Her surgical history was significant for acute cholecystitis, gallstone pancreatitis and cholangitis necessitating percutaneous biliary drainage followed by an open cholecystectomy. Four months after the surgery, she developed an incisional hernia addressed with subsequent laparoscopic repair using a polyester

composite mesh (Parietex; Covidien, Mansfield, Massachusetts, USA).

At the time of ER evaluation (1 year after the hernia repair), the patient had a temperature of 36.2°C, pulse rate of 99 bpm, respiratory rate of 16 breaths/min and a blood pressure of 125/82 mm Hg. Physical examination was significant for a 3×3 cm area of erythema, warmth and induration with a central 1 cm-sized fluctuant mass noted at the right-upper quadrant incision site consistent with an abscess. Her body mass index was 36 kg/m². Initial laboratory studies were unremarkable including a white cell count of 9.7/mm³ and normal renal and liver function. Seventeen millilitres of purulent material were aspirated and discarded. No wound culture was obtained. The patient was discharged on empirically chosen oral antibiotics—cephalexin with trimethoprim sulfamethoxazole (TMP-SMX)—with recommendations to follow-up with her primary care physician.

The following day, the patient returned to the ER due to excessive drainage from the abdominal wall wound (figure 1). She was started on intravenous ampicillin/sulbactam and vancomycin and CT of the abdomen was performed (figure 2), showing an 8×3.9 cm enhancing soft tissue collection compatible with a phlegmon. She was admitted for 3 days of intravenous antibiotics and discharged on oral TMP-SMX with general surgery follow-up arranged.

Figure 1 Abscess with surrounding cellulitis 1 day after percutaneous drainage. The blue arrow shows the orientation of the patient's upper torso and head.

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Figure 2 Contrast-enhanced CT scan of the abdomen revealing phlegmon formation at the site of the abscess overlying the mesh, with evidence of mesh eventration.

The patient was subsequently referred to an infectious diseases specialist where attempts at obtaining a wound culture were unyielding. A follow-up CT scan (figure 3), 1 month later, revealed an abscess just superficial to the mesh, with a fistulous tract extending to the skin.

TREATMENT

The patient subsequently underwent mesh removal with the placement of a biological mesh (Permacol; Covidien, Mansfield, Massachusetts, USA) approximately 4 weeks after initial presentation. The surgery required careful explanation of the original prosthetic mesh due to the degree of mesh incorporation and was complicated by a spontaneous intraoperative pneumothorax necessitating chest tube insertion. The resected prosthetic mesh was sent for culture and sensitivity. The patient was started on intravenous vancomycin, cefepime and metronidazole in the intensive care unit, but the antibiotic regimen was changed to intravenous ertapenem postoperatively when the sensitivities from the mesh culture revealed a gram-negative rod, *Enterobacter cloacae*, resistant to TMP-SMX. This represented a 5-week delay since the initial presentation to the time of pathogen identification. After an 8-day hospitalisation, a peripherally inserted central catheter was placed and she was transferred to rehabilitation. Therapy was converted to

Figure 3 Contrast-enhanced CT scan of the abdomen performed after a 1-month course of oral antibiotics revealing an abscess anterior to the prosthetic mesh.

levofloxacin upon discharge, completing a 6-week course of antibiotics following mesh removal.

OUTCOME AND FOLLOW-UP

Approximately 2 years after removal of the infected mesh, the patient is doing well without evidence of infection or ventral hernia recurrence.

DISCUSSION

Surgical site infections (SSIs) are the most common type of surgical complication ranging from 200 000 to 500 000 cases annually.^{1 2} The use of synthetic meshes is a standard procedure for ventral and inguinal hernia repair surgeries due to the decreased risk of hernia recurrence;³ however, prosthetic meshes are often implicated in delayed SSIs. The risk factors associated with mesh-related infections are comorbid conditions such as diabetes, obesity, smoking, chronic obstructive pulmonary disease and immunosuppression.^{4 5} The reported prevalence of mesh infections for open repairs range from 6% to 10%,^{6 7} while for laparoscopic repairs, the prevalence is lower, at 0–3.6%.⁸

The use of synthetic mesh is considered the standard of care in uncomplicated hernia repair cases, but is also associated with the development of mesh infections and is specific to the type of mesh being used. The trend has been the use of lightweight (large pore) mesh with a plant extract non-adhesive barrier. The large pores provide ample space to promote tissue in growth along with migration of white blood cells and macrophages. These meshes are inherently more resistant to infection than the firm, smaller pore, heavyweight predecessor meshes.^{7 9 10} Mesh-related complications are clinically significant occurrences that include seroma formation, adhesions, mesh migration with hernia recurrence, bowel obstruction and mesh-related infections.⁴ Though higher in cost than synthetic meshes, biological meshes are better suited in contaminated surgical fields since they confer protective factors such as resistance to infection, non-adhesiogenicity to bowel and high biocompatibility when implanted.⁹

Mesh infections tend to occur within a year of the hernia repair.¹¹ The most commonly isolated organism of mesh infections are *Staphylococcus* species (especially *Staphylococcus aureus*).^{12 13} Our case described the complications of a late-onset prosthetic mesh infection with an enteric pathogen, *E cloacae*, in which the lack of standard wound culture and susceptibility analysis at time of initial presentation delayed pathogen identification. Previously reported enteric pathogens causing mesh infections have included *Enterococcus faecalis* and *Escherichia coli*.¹⁴

The management of complex mesh-related abdominal wall infections is challenging and requires an individualised strategy with combined medical and surgical approaches—the most prudent being the early identification of the culprit pathogen by standard culture and sensitivity analysis. Recent clinical trials have demonstrated that in certain instances, non-operative strategies with conservative management have been successful for salvaging a mesh.¹⁵ For example, placement of a percutaneous drain with 1 month of antibiotic irrigations has resulted in clearance of the infection.^{14 16} Non-operative strategies are particularly attractive for high-risk patients who may experience significant morbidity associated with mesh removal.

Occasionally, long-term antibiotics have been used as suppressive therapy for patients who are deemed prohibitive surgical risks. However, these approaches have the risks of *Clostridium difficile* infection, antimicrobial resistance and adverse medication effects. The success of a non-operative approach requires

the early acquisition of a wound culture specimen to identify and tailor the antibiotic regimen. When a mesh infection is clinically suspected, especially in the setting of a delayed SSI, pus should be aspirated promptly and sent for gram stain and culture.¹⁷ In this particular case, the patient was presumptively treated with broad-spectrum antibiotics without the benefit of a wound culture. As a result, the patient had a prolonged treatment course without success. An operative strategy had to be undertaken with the complete removal of the infected mesh (with a peri-operative complication and prolonged recovery period) in which the final selection of an appropriate antibiotic regimen was finally determined by deep culturing of the infected surgical mesh. Empiric antibiotic use should be discouraged as illustrated in this case study.

Learning points

- ▶ Mesh infections tender to occur within a year of hernia repair; however, they have been reported to occur up to 3 years after mesh placement.
- ▶ The use of prosthetic mesh and risk of infection are associated with comorbid conditions, such as diabetes, obesity, immunosuppression, chronic obstructive pulmonary disease and smoking.
- ▶ Different types of prosthetic meshes have been developed and have inherent protective properties versus opportunistic factors associated with mesh infections, while biological meshes are suitable in contaminated fields.
- ▶ Avoid empiric antibiotic use, especially when a prosthetic implant may be the source of the infection—obtaining culture and sensitivities early on is strongly encouraged.

Contributors With the exception of DEP, all of the authors were involved in the direct clinical care and coordination of care for this patient as a multidisciplinary treatment team. DEP assisted with the editing of this manuscript and helped formulate the final discussion.

Competing interests None.

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