Late-onset Deep Mesh Infection: A Study of Eight Cases Detected from 2666 Consecutive Patients with Abdominal Wall Hernia Repairs

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Introduction

Meshes have been applied in abdominal hernia repair for lower recurrence rate and less postoperative pain. According to several guidelines, tension-free repair has been considered the gold standard for hernia repair.[1] However, complications related to mesh implantation still exist, such as late-onset deep mesh infection. This rare complication was first defined by Mann *et al*. in 1998.[2] Since then, similar cases have been reported.

Late-onset mesh infection is defined as acute inflammatory response in surgical area within months or years after operation. It is diagnosed by the presence of infection symptoms and imaging examinations. Classic symptoms include chronic pain, visible operation scars, and red and swollen skin with tenderness. In some situations, pus is visible and fistulas were accessible via physical examination. In ultrasound imaging, a mixed echogenic mass is located between muscle layers even deeper. Computed tomography reveals abnormal density of soft tissue with fuzzy space appearance around the patch site. In cases with fistulas, fistulography can be used. In this report, we analyzed eight cases of late-onset deep mesh infection from 2666 consecutive patients with abdominal wall hernia repairs. This is one of the largest reported series since 1998. A further comprehensive discussion on the diagnosis and treatment of late-onset deep mesh infection is also included.

Case Report

A total of 2666 patients who received inguinal or incisional hernia repair from January 2010 to January 2014 in our department were enrolled in this retrospective study. The protocol and statement of informed consent were approved by the Ethics Committee of Renji Hospital. In all the patients, 156 patients underwent elective incisional hernia repair and 2510 underwent elective inguinal hernia repair. No prophylactic antibiotics were used.

Eight cases were diagnosed as late-onset deep prosthetic infection. The characteristics of the patients are shown in Table 1. The incidence was 0.30% in total with 0.24% of inguinal hernia repair and 0.78% of incisional hernia repair. For the six inguinal hernia repairs, five underwent Lichtenstein mesh repair (mesh was placed in front of the transverse fascia) and one underwent preperitoneal space mesh repair (mesh was placed in the preperitoneal space). For the two incisional hernia cases, meshes were placed in the deep side of the rectus abdominis. The median time between hernia repair and mesh infection was 17 months (from 3 to 43 months). Physical examination showed that all cases had visible operation scars and red and swollen skin with tenderness. Six cases had foul-smelling pus outflow and extruded fistulas. The results of

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bacterial culture of the pus were *Staphylococcus aureus* in four cases, *Enterobacter cloacae* in one case, and *Pseudomonas aeruginosa* in one case.

All eight patients received at least 2-week conservative management (from 2 to 4 weeks), including consistent wound drainage, systemic antibiotic therapy using cefotetan, and abscess puncture if necessary. Aztreonam was used if patients were allergic to cephalosporins. In patients with visible pus, antibiotics were used according to the bacteriological culture results. Only one patient completely recovered. Seven patients finally underwent debridement for mesh removal.

In all seven cases requiring debridement, the mesh was visible [Figure 1]. The meshes were shrunk and formed a local abscess in six cases. In case 2, the plug had adhered to the intestinal lining and caused a fistula. Pathological examinations revealed that there was nonspecific inflammation in all the cases. The formation of granuloma, infiltration of inflammatory cell, purulent inflammation of soft tissue, and fibrosis with degeneration were seen in the surrounding tissue of mesh. Bacterial culture of the mesh showed that *S. aureus* was detected in four cases, *E. cloacae* in two, and *P. aeruginosa* in one. An at least 12-month follow-up showed that all patients had good outcomes without recurrence or reinfection after treatment.

Discussion

Nowadays, tension-free hernia repair is the most common surgical approach for patients with hernia. Late-onset deep prosthetic infection is a relatively rare complication. However, with the increasing use of synthetic materials in hernia repair, the number of patients with late-onset deep prosthetic infection is rising. The overall incidence of late-onset deep prosthetic infection in our study was 0.30% (8/2666), which is similar to previously published data.[3]

Late-onset deep prosthetic infection is related to aseptic technique, antibiotic prophylaxis, previous superficial wound infection, the type of mesh inserted, and/or the fixation material.[4] According to our experience, the presence of bacteria does not inevitably lead to late-onset deep prosthetic infection. The likelihood of infection might be affected by the following factors: bacterial number, bacterial virulence, and wound microenvironment. It is not difficult to diagnose late-onset deep mesh infection by its typical symptoms and imaging examination. Differential diagnosis includes local skin infections (furuncle, carbuncle, or cellulitis), superficial wound infection after hernia repair, and infection caused by intestinal leakage.

By abscess puncture and antibiotic therapy, one patient in our reported series was cured without mesh removal. Seven patients had good outcomes after removing the mesh.

Table 1: Clinical features of patients with late-onset deep mesh infection

Cases	Gender and age (years)	Type of hernia	Surgery method	Date of onset (months after operation)	Type of bacteria	Histology	Follow-up (months)
1	Male (69)	Right groin hernia	Lichtenstein repair	60	*S. aureus*	Nonspecific inflammation	12
2	Male (67)	Left groin hernia	Lichtenstein repair	3	*E. cloacae*	Nonspecific inflammation	12
3	Female (72)	Incisional hernia	Sublay repair	24	*S. aureus*	Nonspecific inflammation	20
4	Female (54)	Incisional hernia	Sublay repair	36	*P. aeruginosa*	No pathological examination	20
5	Male (72)	Right groin hernia	Lichtenstein repair	6	*S. aureus*	Nonspecific inflammation	16
6	Male (55)	Right groin hernia	Lichtenstein repair	7	*S. aureus*	Formation of granulation tissue with inflammatory cell infiltration	16
7	Male (56)	Left groin hernia	Lichtenstein repair	6	*S. aureus*	Proliferation of fibrous tissue with inflammatory cell infiltration	24
8	Male (68)	Left groin hernia	Preperitoneal space repair	48	*E. cloacae*	Nonspecific inflammation	24

S. aureus: *Staphylococcus aureus*; *E. cloacae*: *Enterobacter cloacae*; *P. aeruginosa*: *Pseudomonas aeruginosa*.

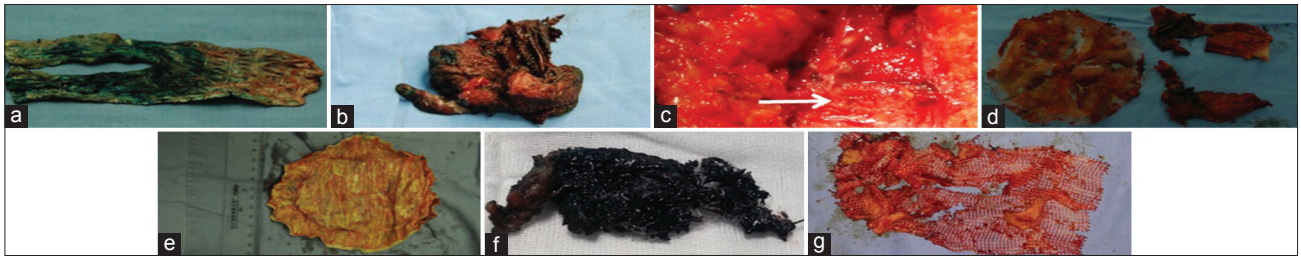

Figure 1: Removed mesh of seven patients with late-onset deep mesh infection. This picture shows the removed meshes after the failure of conservative management. (a-g) The meshes in cases 1, 2, 3, 5, 6, 7 and 8. (c) Taken during the operation. The mesh was adhered to the issue and was emphasized by the arrow. (f) Mesh was colored by methylene blue.

Greenberg[5] has reported their success in salvaging meshes by conservative treatment of deep prosthetic infection. Wound vacuum assist devices, for example, vacuum sealing drainage, have also been reported in dealing with infected wounds. However, meshes with bacteria as source of infection exist permanently in deep wounds and cannot be eliminated completely by vacuum sealing drainage. The results of our case series suggested that once the diagnosis of late-onset deep prosthetic infection is established, mesh should be removed if no improvement after a 2-week conservative management.

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Conflicts of interest

There are no conflicts of interest.

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