



Deep surgical site infection after anterior decompression and fusion with plate fixation for cervical spondylotic radiculopathy or myelopathy



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ABSTRACT

Objectives: To analyze the diagnosis and management of deep surgical site infection (SSI) with implant involved after anterior decompression and fusion for cervical spondylotic radiculopathy/myelopathy (CSR/CSM).

Patients and methods: Data of the patients who underwent anterior cervical decompression and fusion with plate fixation due to CSR/CSM were retrospectively reviewed. Cases with postoperative deep SSI with implant involved were identified and analyzed.

Results: A total of 1287 patients were finally included. Five patients (0.4%) were found to be with deep SSI. Bone fusion was not obtained when SSI was confirmed in each patient. Three cases were cured using one or two debridement and postoperative antibiotic therapy. Two cases with delayed diagnosis needed anterior implants removal, interbody fusion with autologous iliac bone and posterior lateral mass screw fixation at the first/second debridement. One of the two patients developed esophagus perforation after a second debridement and experienced one-month open drainage. All of the patients were cured without relapse of infection.

Conclusion: For early deep SSI after anterior cervical decompression and fusion, surgical debridement was effective to eradicate infection. But for cases with delayed diagnosis, anterior debridement with prophylactic implant removal and posterior reconstruction was an ideal option. Esophagus perforation complicated with multiple debridements should be paid attention to and avoided.

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1. Introduction

Spinal fusion is a common procedure performed to treat numerous spinal pathologies, including spondylolisthesis, scoliosis, stenosis, instability, trauma, and tumor. Despite a better comprehension of risk factors and the implementation of preventive measures, surgical site infection (SSI) following spinal surgery remains relatively common [1–4]. The reported rate of deep SSI after instrumented spinal fusion is 2–20% [5]. These infections can result in longer hospital stays, a 5-fold risk of hospital readmission, and a 60% higher chance of intensive care unit (ICU) admission, and are associated with a 2-fold increase in postoperative deaths [6,7].

However, the diagnosis and management of deep SSI after spinal surgery with implant involved are challengeable. And there is no firmly established protocol for the management of deep SSI in cases without solid bone fusion. Surgical debridement and prolonged administration of antibiotics are proved to be effective in the treatment of SSI following instrumented posterior spinal fusion [8–10]. However, 24–46% cases treated with irrigation and debridement require more than one irrigation and debridement procedure for successful treatment [11]. For deep SSI with implant involved after anterior surgery of the cervical spine, repeated debridement increases the risk of esophagus injury which is a rare but a life threatening lesion [12]. Therefore, it is more challengeable to treat deep SSI associated with anterior cervical decompression and fusion with plate fixation.

Currently, unfortunately, few studies specially analyze the strategy for the diagnosis and treatment of deep SSI complicated with anterior surgery of the cervical spine due to its lower infection rate than that in other parts of the spine [13]. Therefore, in this study, we reviewed our experience in the

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management of deep SSI after anterior decompression and fusion with plate fixation for cervical spondylotic radiculopathy/myelopathy (CSR/CSM), and compared it to the existing literature, aiming to help spinal surgeons to prevent, early diagnose and manage these complications.

2. Materials and methods

Data of the patients who underwent anterior cervical decompression and fusion with plate fixation due to CSR or/and CSM between January 2000 and December 2010 were retrospectively reviewed. All the operations were conducted by one senior surgeon at the same institution. Preoperative prophylactic antibiotics (e.g. cefuroxime or cefazolin) were administered 30 min prior to the initial surgery in all cases. Intraoperative antibiotics were not used if the operation time was less than 3 h. Antibiotics lasted 24 h postoperatively. Patients with postoperative SSI were identified and the medical records were analyzed. Patients who underwent anterior surgery due to cervical tumor and trauma, and patient with immune system disease were excluded.

3. Results

A total of 1287 patients were finally included in this study. Five patients were found to be with deep SSI (Table 1). Bone fusion was not obtained when SSI was confirmed in each patient. Three cases were cured using one or two debridement and postoperative antibiotic therapy, the implants of which were retained. Two cases with delayed diagnosis needed anterior implants removal, interbody fusion with autologous iliac bone and posterior lateral mass screw fixation at the first/second debridement. One of the two patients developed esophagus perforation after a second debridement and experienced one-month open drainage.

Bacterial cultures were positive in two cases, with *Candida albicans* in one case and *Escherichia coli* in another. The cultures of rest three cases are negative. The results had been presented in Table 1. Before debridement, broad-spectrum antibiotics were used in cases with early infections. It might be contributed to the negative bacterial cultures. After debridement, intravenous antibiotic therapy lasted at least one month in all cases, being followed by two-month oral antibiotics after infections being

controlled. The choice of antibiotic was according to the cultures. For cases with negative cultures, broad-spectrum antibiotics were used.

3.1. Typical case

A 65-year-old man underwent anterior cervical discectomy and fusion (ACDF) with plate fixation due to CSM at C3-6 (Fig. 1a–c). At postoperative day 20, the patient developed fever (up to 38 °C) and throat discomfort. He was diagnosed as bronchitis at the local hospital, and accepted three-day antibiotic therapy. The body temperature returned to normal but throat discomfort lasted. Electronic gastroscope revealed negative results at the throat and esophagus. Thereafter, the patient was treated according to pharyngitis. At month 3, the patient presented at our department for follow-up, complaining neck pain. Abnormal prevertebral soft tissue swelling and bone destruction were observed on plain X-rays of the cervical spine (Fig. 2a). Laboratory tests revealed normal white blood cell (WBC) count and leukocyte count. However, erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels were 51 mm/H and 50.7 mg/l, respectively. Implant infection was suspected. Computed tomography (CT) examination and magnetic resonance imaging (MRI) were conducted then (Fig. 2b and c). At two days after admission, debridement without implant removal was performed. Implant infection was confirmed by pus around the plate. After thorough debridement, the incision was closed with suction drainage and broad-spectrum antibiotics were used postoperatively. Bacterial culture grew *Candida albicans* and T-Spot test of peripheral blood was reactive. Therefore, antifungals drug and anti-tubercle drugs were used according to the advice of infectious disease physicians. However, the infection was not controlled and another debridement with implants removal was performed. In order to maintain the stability of the cervical spine, simultaneous interbody fusion with autologous iliac bone and posterior lateral mass screw fixation were conducted (Fig. 3a). At day 4 after the second debridement, foamy liquid in the suction drainage tube was observed when the patient swallowed water and food. Blue drainage was visible after oral administration of Methylene blue (Fig. 3b). Unfortunately, esophagus perforation was confirmed. The incision was opened and open drainage was done. Furthermore, supportive measures which were one of the most important parts of treatments were conducted. A nasogastric tube

Table 1
General information of the cases with deep surgical site infections (SSIs).

Case	Sex	Age (years)	Original surgery	Original surgery time (min)	Blood loss (ml)	ISD (days)	Symptoms and signs	IDD (days)	Bacterial culture	TOD	Results	Complications	Risk factors
1	Female	55	C5/6 ACDF+C4 ACCF	125	100	12	Wound drainage	3	Negative	2	Cure	No	No
2	Male	52	C5 ACCF	135	270	10	Wound swelling, fever and MIS	1	Negative	1	Cure	No	Smoking; CSF leakage
3	Male	61	C5 ACCF	110	180	21	Wound drainage	2	Negative	1	Cure	No	DM
4	Female	58	C5-7 ACDF	180	600	60	Neck pain and neurological deficit	2	<i>Escherichia coli</i>	1	Implant removal; posterior fixation	No	DM
5	Male	64	C3-6 ACDF	170	150	94	Neck pain and throat discomfort	1	<i>Candida albicans</i> , T-Spot (+)	2	Implant removal; posterior fixation	Esophagus perforation	Smoking

ISD, intervals between surgery and diagnosis; IDD, intervals between diagnosis and debridement; MIS, meningeal irritation sign; CSF, cerebral spinal fluid; TOD, times of debridement; ACDF, anterior cervical discectomy and fusion; ACCF, anterior cervical corpectomy and fusion; DM, diabetes mellitus.

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