

Anterior Spinal Implant Removal and Associated Complications

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Abstract

Anterior stabilization is a well-established technique in spine surgery. It is used in trauma care, as well as in the treatment of degenerative spine disease and spine deformities, both in conjunction with or without posterior fixation devices. Many studies have demonstrated that the use of anterior fixation proved to be superior to stand alone posterior stabilization in its ability to maintain a chosen Cobb's and kyphosis angle over prolonged periods of time. The past 10 years saw the advent of thoracoscopic anterior fixation, which leads to faster procedures, less pain, and shorter recovery time for patients. However, in about 5–10% of cases, infections arise, which necessitate revision surgery, typically with implant removal. These revision procedures can become very challenging and can lead to serious complications. This case report demonstrates some of the associated risks and difficulties involved in the removal of anterior fixation devices.

Key Words

Spondylodesis · Anterior · Interbody fusion · Complication · Infection · Implant removal

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Introduction

Anterior stabilization procedures are well-established standard procedures in spine surgery today. They are typically applied after prior posterior instrumentation, but can sometimes become necessary in acute trauma care as well [1]. In recent years, the development of

minimally invasive anterior techniques added to the widespread application we find today [2]. There are various anterior instrumentation systems available. Besides modern expandable cages for the treatment of vertebrectomy defects, anterior plate systems are implanted in increasing numbers. Anterior implants are normally fabricated from titanium or titanium alloys and are designed as permanent implants due to their good biocompatibility.

Anterior instrumentation, performed either minimally invasive or as an open procedure, can lead to serious complications, e.g., prevertebral swelling [3], esophageal lesion [4], or puncture of aorta, vertebral arteries or vena cava, as it has been reported in several publications [5, 6]. Screw-tips close to the aorta or impressing the vessel wall are documented as well as lesions of major vessels during anterior procedures [7]. While we favor keyhole over open technique for various reasons such as improved visibility and faster recovery times [8, 9], certain situations such as bleeding can be harder to control in minimally invasive technique, warranting an experienced surgical team. A large retrospective study conducted by Shapiro & Snyder [10] demonstrated a significantly lower complication rate after instrumented technique versus non-instrumented procedures. Scaduto et al. [11] compared ALIF versus PLIF procedures and found a five to sevenfold higher risk of peri- or postoperative complications in the PLIF group. Elias et al. [12] corroborated these results in their retrospective study of threaded interbody fusion cage implantations.

In some situations, removal of anterior implants is inevitable, e.g., following local infection [13–15]. These procedures are a serious challenge to any spine surgeon,

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with the surgical approach obscured by an altered anatomy (i.e., adhesions, neovascularization) and poses a high mortality in case of inadvertent large vessel lesions or sepsis. Until now, little information on anterior implant removal has been made available.

In this publication we report two cases of anterior implant removal following infection, which illustrate the dangers of this kind of revision surgery.

Patients and Methods

Two recent patient histories are presented, illustrating possible complications and pitfalls in the management of late-onset infections after anterior stabilization. The first case involves a 42-year-old male of Turkish decent; the second case a 73-year-old white Caucasian lady.

Results

Case 1: M.T., Male, 42 years

The first patient with a history of seronegative oligoarthritis and a drug regimen of 5 mg/d cortisone for several years sustained an incomplete burst-fracture TH 12 after a fall from a height of several feet. The fracture was reduced and stabilized by an endoscopic anterior procedure including resection of the disc TH 11/12 and spondylodesis by an iliac crest graft and monosegmental plate fixation (MACS™). Persisting pain, pleural exsudation, and the serological signs of a low-grade infection complicated the early postoperative period. No bacteria were found by pleural puncture. The parameters normalized under antibiotic therapy.

After 4 months the patient was seen again as an outpatient with increasing pain and serological signs of infection. The subsequent CT-imaging showed implant loosening and partial graft resorption. To create stability, an additional posterior implant was added,

bridging from TH10 to L1 (Figure 1). Furthermore, a CT-navigated puncture of the perifocal graft abscess was performed, proving an infection with MSSA. Since a contiguous drainage catheter could not be placed in the abscess by CT-navigation and signs of infection persisted, we decided to remove the anterior implant.

Surgery was planned as an endoscopy procedure, but had to be performed as open surgery due to severe adhesions. During the procedure a laceration of the lower pulmonal lobe occurred as a complication and had to be treated by suture. It was still possible to release the adherent pleura from the diaphragm and dissecting down to the plate. Plate and screws were removed and a debridement of the screw-canals was performed. The graft was inspected and appeared to be integrated in the neighboring vertebrae.

After an initial post-op improvement of his general health, the patient was readmitted 4 months later, complaining about back pain and showing signs of a low-grade infection again. The CT-scan showed a partial sequestration of the graft, so revision surgery was necessary again.

In an open surgical procedure severe adhesions were found and had to be released before reaching the graft. The graft appeared to be partially integrated, but partially sclerotic and was consequently removed. A temporary spacer filled with gentamycin bone cement was implanted.





M. T., m, 43 y			
01/05 Additional posterior fixation, 4 months after initial anterior MACS plate fixation	CT-scans showing unsuccessful spondylodesis and formation of a bony sequester	02/05 CT scan after removal of MACS plate	08/05 Implantation of an Obelisc™ interbody cage after revision in 07/05 with sequestrectomy and augmentation with antibiotic beads
			

Figure 1. Non-fusion after anterior spondylodesis Th11/12 and subsequent infection in a 43-year-old patient with oligoarthritis.

In a planned second look operation 6 weeks later we found a situation with recurred adhesions between pleura and diaphragm, which had to be released before removing the bone-cement. Inspection of the embedding tissue showed vital bone so an expandable titanium cage was implanted.

After an intermediate improvement the patient had to be admitted again after 3 months with signs of infection and sonographic proof of an abscess around the posterior implant. During the removal of the internal fixator no connection was found between the internal fixator and the anterior cage by a fluoroscopic contrast investigation, so the anterior implant was left in place.

Wound healing after the posterior implant removal was unimpaired; no signs of infection were seen until 6 months after the surgery.

Case 2: M.L., Female, 73 years

A 73-year-old female was operated on a narrow spinal canal syndrome with microsurgical decompression of L3/4, an internal fixateur, and PLIF device was implanted 3 months later (Figure 2).

Another 9 months later the patient was admitted again to the same hospital under the diagnosis of a spondylodiscitis L3/4 and spondylitis L4. An internal fixator construct L2/3 to L5 was implanted followed in a second session for 2 weeks with corporectomy of L4, implantation of a Harms cage, and additional anterior monorail internal fixation from a right lumbar approach.

Postoperatively, persisting infection and recurrent fistulation finally led to a readmission under the diagno-

sis of an abscess around the implant 3 years later. In the subsequent surgery, the Harms cage was found to be without bony fixation. The abscess was drained and the cage left in situ.

Due to persisting postoperative fistulation in the right lumbar region, the patient was transferred to our clinic. We planned to bridge the infected segments in a first step and to remove the infected anterior implants in a second operation. After opening the posterior wound we found the internal fixator bathed in pus with a connection of the posterior abscess to the anterior implant. Bacteriology showed no bacteria in the standard investigation but serologically, *chlamydia pneumonia* was detected.

In the first surgery we removed the posterior implant only. After an interval of 3 weeks, we implanted an internal fixator, bridging the infected area from Th 11/12 to S1 and the iliac crest, leaving the previously infected area untouched. Our hope to cure the infection by a solid posterior stabilization alone proved to be in vain when an increasing exudation from the posterior wound showed that the infection was still not controlled. Three weeks after the posterior surgery, anterior implant removal was planned as the next surgical step. Since the anterior monorail fixator had to be removed we had to follow the previously chosen approach.

Preparation was hampered by solid scar tissue due to the long persisting fistulation, but both the vertebral column and implant were exposed. However, implant removal turned out to be a hazardous undertaking. We were able to remove the cranial screw without problems. The loosened Harms-cage showed to be deeply impressed into the adjacent vertebrae and could only

be removed by osteotomy of major parts of L3. Exposing of L3 led to a bleeding from the V. cava which was adherent to the spinal column and was lacerated while separating the scar tissue from the bone. Bleeding was controlled by compression, but suturing of the vein was not possible due to the incarcerating scar tissue. Attempting to explant the L5 screw and the monorail connector a second bleeding from the iliac vein, also incarcerated in scar tissue, occurred. Again only compression made the control of the




M.L., f, 73y		
03/05 Patient presents with clinical signs of infection 3 years following combined postero-anterior stabilization after spinal decompression	06/05 After abscess drainage 2 weeks earlier, implantation of a bridging internal fixator Th11-S1/Os ilium in 06/05	3 weeks later removal of anterior cage and deposition of Septopal™ beads in a complicated procedure
		

Figure 2. Illustrated case history of a 73-year-old female with bacterial infection and abscess around anterior fixation device.

bleeding possible, surgery had to be interrupted, and the explantation of the remaining hardware postponed.

After an interval of 2 days, surgery was reassumed with stand-by assistance of a vascular surgeon. Removal of the second screw and the connector were possible without another bleeding complication. After curettage of the vertebral defect in the anterior column a temporarily implant containing antibiotics was inserted. Postoperatively a transient exsudation from the wound was seen but finally ceased.

Discussion

In spine surgery, infection rates following posterior procedures are reported to be about 5–10% [16]. While most post-operative infections are directly caused by surgery, some late-onset infections have been attributed to hematogenous seeding [17]. Standard treatment in these cases is implant removal, combined with local deposition of antimicrobial agents, which allows the control of most infected situations, including a prior loss of correction [18, 19]. A large retrospective study by Clark & Shufflebarger [20] reviewed late-onset infections in posteriorly instrumented adolescents and found that all were well controlled by device removal, primary skin closure, and oral antibiotics. Other reports favor a more aggressive antibiotic regimen, administered intravenously and over a period of up to 6 weeks. Muckley et al. [21] reported on six cases of psoas abscess as a special complication after spine surgery. Naderi et al. [22] reported on a case of a combined epidural and psoas abscess 10 months after posterior instrumentation in a female patient who developed severe back pain after having undergone laparoscopic cholecystectomy 1 month prior to readmission.

The use of anterior implants in spine surgery is growing since the early 1990s, first with the advent of improved implants, later in combination with minimal invasive techniques [1, 8, 23]. While it is not assumed that the infection rate in anterior spine surgery is different from posterior procedures, the surgical management of anterior spine infection can be more demanding than with posterior fixators [24, 25]. It is important to keep patients under close scrutiny for many months postoperatively, since long, clinically silent periods of spinal infections are not uncommon [26]. With anterior spine fixation becoming more popular, it is inevitable that we will have to face an increasing number of anterior spinal infections and consequent anterior implant removals, which can result in surgical procedure with

increased risk for the patients and even lethal complications.

In cases where the lateral positioning of the primary implant (e.g., MACS™ or Telefix™ plates) does not allow to choose a different approach for the revision, implant removal can lead to a high risk for complications, as the first case demonstrates.

In developing anterior implants we have to consider the possibility of implant removal and find solutions that allow safe procedures especially in problematic situations.

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