Journal of Clinical Neuroscience 22 (2015) 1111–1116

Contents lists available at ScienceDirect

Journal of Clinical Neuroscience

journal homepage: www.elsevier.com/locate/jocn

Clinical Study

Safety of instrumentation and fusion at the time of surgical debridement for spinal infection

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ARTICLE INFO

Article history:
Received 24 September 2014
Accepted 26 December 2014

Keywords:
Expandable cage
Instrumentation
Spinal fusion
Spinal infection
Surgical debridement

ABSTRACT

The present study aims to assess the results of single-stage instrumentation and fusion at the time of surgical debridement of spinal infections; vertebral osteomyelitis or epidural abscess. Nine patients with spinal infection were treated with instrumentation and fusion after radical debridement in a single-stage operation. Predisposing factors and comorbidities, pain, American Spinal Injury Association motor scores, primary pathologies, microbiology and perioperative markers were recorded. Seven patients with pyogenic and two with tuberculous spinal infection were encountered; the most common pathogen was *Staphylococcus aureus*. Five patients were predisposed to infection because of diabetes mellitus. Duration of antibiotic therapy lasted up to 12 months. Six patients had thoracic infection, two lumbar and one cervical. No post-operative complications were encountered. There was a significant reduction in pain scores compared to pre-operatively. All patients with neurological deficits improved post-operatively. Despite introduction of hardware, no patients had a recurrence of their infection in the 12 month follow up period. Single-stage debridement and instrumentation appeared to be a safe and effective method of managing spinal infections. The combination of debridement and fusion has the dual benefit of removing a focus of infection and stabilising the spine. The current series confirms that placing titanium cages into an infected space is safe in a majority of patients. Stabilisation and correction of spinal deformity reduces pain, aids neurologic recovery and improves quality of life. The small patient population and retrospective nature limit the present study.

1. Introduction

The ageing population, intravenous drug use and increasing number of people living with immunocompromise in recent decades has contributed to an increase in the number of spinal infections [1]. Despite this, vertebral infection is still a rare entity. Pyogenic vertebral osteomyelitis has a reported incidence of 2.2 per 100,000 population annually [2] and spinal epidural abscess occurs in 0.18–1.96 per 10,000 hospital admissions [3]. Patients typically present with severe pain, fever, neurological deficit or progressive spinal deformity. In the past, patients with spinal infections were frequently treated with bed rest, immobilisation, external orthoses and antimicrobials [4]. Patients are more frequently being treated with surgical debridement and stabilisation [5]. As for any infection, the goal of treatment of spinal infections is eradication of infection with the additional aim to restore spinal stability.

Infections of the spine represent a seldom encountered and challenging surgical problem. The vertebral column is often approached anteriorly for debridement and/or corpectomy [6–8]. Many patients require instrumentation at the time of or shortly after debridement for stabilisation of the spine [5,9,10]. There is controversy regarding this approach as there has been, for many years, a dogmatic belief that hardware placement in an infected space may hinder infection clearance and antimicrobial penetration [3,5,11,12]. Although there have been studies in recent years reporting outcomes of instrumentation at the time of surgical debridement [6–8,13–18], there is no consensus as to which method of treatment is deemed superior. We report in this paper, results of patients in our institution that have been treated for spinal infection with single-operation debridement and instrumentation.

2. Methods

This is a retrospective study of nine patients with vertebral osteomyelitis and epidural abscess whom underwent surgical debridement and fusion for predicted spinal instability as

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http://dx.doi.org/10.1016/j.jocn.2014.12.028
0967-5868/

determined by the treating surgeon [19]. The authors performed all operations in the Department of Neurosurgery, The Royal Melbourne Hospital from March 2012 to October 2013. Diagnosis was based upon clinical symptoms and signs including fever, back pain and neurological deficits. Laboratory markers included white cell count and C-reactive protein and radiographic appearance was determined by consultant neuroradiologists at our institution [20].

All patients had pre-operative MRI and CT scans and post-operative CT scans of the affected spinal area. American Spinal Injury Association (ASIA) impairment score was used to document neurological function and spinal cord injury status. Visual analog scale (VAS) was used to assess the level of pain before and after surgery. Pain was subclassified into severe (VAS 7–10), moderate (VAS 5–6) and mild (VAS 0–4). Primary pathologies, peri-operative complications, survival, pre and post-operative neurological functions and pain were analysed. Informed consents were obtained from all patients in accordance with institutional policy.

2.1. Surgical technique

For thoracic and lumbar patients, corpectomy and decompression was achieved via a single-stage posterolateral transpedicular approach, similar to previous descriptions [21,22]. Briefly, a midline posterior approach was used to expose the spine. Bilateral pedicle screws above and below the corpectomy level(s) were placed under fluoroscopic guidance and electromyographic monitoring. Laminectomies were performed to decompress the spinal cord at the levels of the pathology. Discectomies were performed above and below the level of corpectomy. Corpectomy was performed via a transpedicular approach using a combination of rongeurs, curettes and osteotomes.

To prepare for cage insertion in the thoracic spine, the medial part of the rib heads was partially removed to create a space fitting the diameter of the cage. A titanium expandable cage (TeCorp; Alphatec Holdings, Inc., Carlsbad, CA, USA) was placed bilaterally via the space between adjacent nerve roots, thus, allowing for preservation of all nerve roots. Bone graft substitutes consisting of β-tricalcium phosphate (βTCP) were placed around and inside the cages. Bilateral rods were placed and locked. In patients with kyphotic deformity, compression was applied over the corpectomy level to further correct the deformity. Two crosslinks were placed. Transverse processes, facet joints and laminae of the stabilised levels were then decorticated and posterolateral fusion with artificial bone graft was performed. Figure 1 represents an illustrative case.

The patient with cervical spine infection (Patient 9) was managed with an anterior approach due to the location of the abscess at C6. The same titanium expandable cage was placed between C5–C7 and the spinal column stabilised with vertebral body screws. The approach undertaken is similar to that of an anterior cervical discectomy and fusion and as previously described by Dimar et al. [23]

3. Results

3.1. Clinical data

Nine patients were included in this study, six men and three women. The age of patients ranged from 22–87 years with a mean age of 61.7. Diagnosis of spinal infection was based on radiographic appearance (consultant radiologist reports) and surgical site swabs sent for microscopy and culture to confirm the organism causing

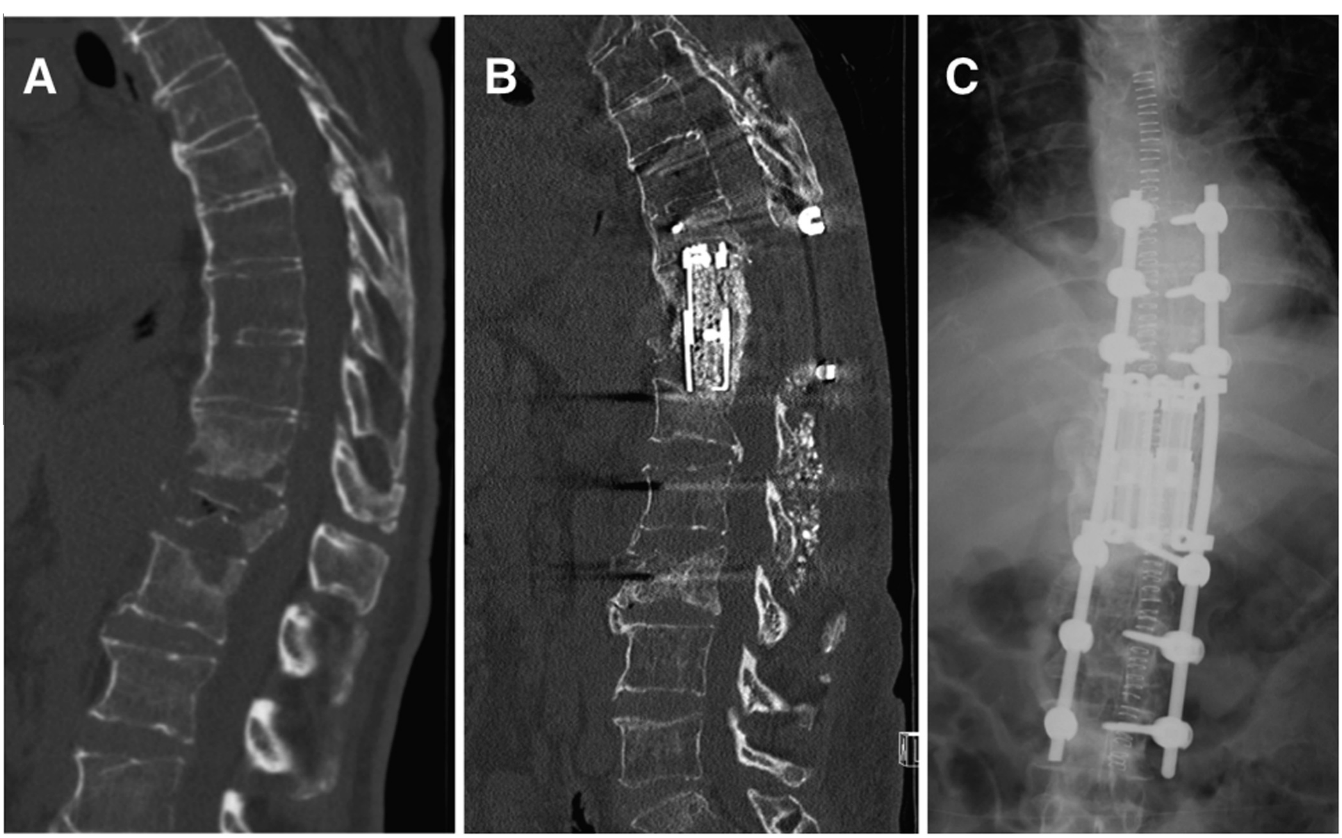

Fig. 1. (A) Midsagittal CT scan of a patient with T11–T12 pyogenic vertebral osteomyelitis both pre-operatively and (B) post-operatively. Expandable cages have been inserted after corpectomy and bone substitute packed. The spine is stabilised with pedicle screws from T8–10 and L1–3 joined by rods. (C) A post-operative anteroposterior radiograph confirming the position of the cages and screw-rod construct.