Acta Orthopaedica et Traumatologica Turcica xxx (2018) 1–6

Contents lists available at ScienceDirect

Acta Orthopaedica et Traumatologica Turcica

journal homepage: https://www.elsevier.com/locate/aott

One-stage posterior debridement and fusion combined with irrigation and drainage for the treatment of postoperative lumbar spondylodiscitis

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ARTICLE INFO

Article history:
Received 8 May 2017
Received in revised form
7 January 2018
Accepted 11 April 2018
Available online xxx

Keywords:
Postoperative lumbar spondylodiscitis
Posterior surgery
Interbody fusion
Instrumentation
Closed irrigation and drainage

ABSTRACT

Objective: The aim of this study was to evaluate the clinical outcomes of one-stage posterior debridement, interbody fusion, and instrumentation, combined with irrigation and drainage, for treating lumbar spondylodiscitis.
Methods: The study included 23 patients (13 male and 10 female, mean age: 45 years) who had posterior debridement, interbody fusion, and instrumentation, followed by continuous closed irrigation and drainage for lumbar postoperative spondylodiscitis. The visual analog scale, Oswestry disability index, and lumbar lordosis angle were assessed before and after surgery to evaluate the clinical outcome.
Results: The mean follow-up time was 27 (24–36) months. All patients tolerated the procedure well, and there were no instances of spondylodiscitis recurrence, though a dorsal dermal sinus developed in one patient after surgery. Infection was eliminated, as evidenced by the normalization of the erythrocyte sedimentation rates and C-reactive protein levels. The mean visual analog scale scores were significantly decreased after the operation. The mean lumbar lordosis angle before surgery was 21.61 ± 6.88° and the angle at the final follow-up was 31.61 ± 4.24°. The mean Oswestry disability index scores improved significantly both after the operation and at the follow-up visits ($p < 0.05$). Bone union was confirmed in all patients at a mean of 8.6 months post-operation, though this was not achieved until 2 years post-operation in one patient. All 3 patients who had neurological deficits showed great improvement at the last follow-up.
Conclusion: Surgical management using one-stage posterior debridement, interbody fusion, and instrumentation, followed by continuous closed irrigation and drainage, might be an effective treatment option for lumbar postoperative spondylodiscitis.
Level of evidence: Level IV, Therapeutic study.

Introduction

Lumbar postoperative spondylodiscitis is a relatively uncommon but severe complication after surgical intervention. It is difficult to diagnose early and is accompanied by a poor long-term prognosis, increased cost, and significant morbidity.[1] Treatment for the majority of patients with spondylodiscitis includes analgesics, long-term administration of antibiotics, and immobilization.[2] In some cases, further surgery is required, for example, in cases of failed conservative treatment, severe pain, neurological deficits, abscess formation, and vertebral destruction causing instability or deformity.[3] Surgical treatments involving transpedicular drainage, laminectomy and debridement, anterior debridement and fusion, posterior interbody grafting and instrumentation, and anterior debridement and fusion combined with posterior instrumentation have all been reported to be effective, but the optimal approach for treating postoperative spondylodiscitis is still debated.[4] The aim of this study was to report our experience and evaluate the outcomes of a series of 23

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Peer review under responsibility of Turkish Association of Orthopaedics and Traumatology.

https://doi.org/10.1016/j.aott.2018.04.004

spondylodiscitis patients treated with one-stage posterior debridement, interbody fusion, and instrumentation, followed by continuous closed irrigation and drainage.

Materials and methods

This study was approved by the local Clinical Ethics Committee (No. 200902035).

Patients

Between December 2009 and January 2013, 23 patients (13 male and 10 female, mean age 45 years old) were diagnosed with spondylodiscitis in the lumbar region and underwent surgical treatment in our department. The patients' demographic characteristics are summarized in Table 1 and all the patients were diagnosed as lumbar disc herniation during the index procedures. The diagnosis of postoperative spondylodiscitis was based on the following parameters: clinical manifestation; laboratory examination, including blood cell count analysis, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) level; and radiographic studies such as plain X-rays, computed tomography (CT), and magnetic resonance image (MRI). Once spondylodiscitis was strongly suspected, blood samples were obtained for microculture and treatment was initiated immediately, consisting of intravenous antibiotics empirically, analgesia, and complete bed rest.

Because of the seriousness of this complication, our hospital did not delay the diagnosis in any patients. However, some cases were referred from other hospitals, so the interval from presentation to definite diagnosis ranged from 3 days to 4 weeks. For all patients, the surgery indications were definite, including intolerable pain, potential instability, kyphosis caused by vertebral body destruction, progressive neurologic deficits, and unsatisfactory conservative treatment.

Surgical procedure

The operation was performed with the patient under general endotracheal anesthesia and in the prone position. Using a posterior midline approach to the spine, the pedicle screws were implanted and the entire posterior spinal elements and ligamentum flavum were excised to reveal the dura sac. When the neural structures, including the dura, descending nerve roots, and nerve root exits, were exposed, the posterior longitudinal ligament was lifted out carefully and the affected intervertebral disc was exposed. All of the inflammatory disc tissues that could be found, along with the endplate cartilage, were debrided down to healthy bleeding bone. Then, we performed the interbody fusion by inserting an appropriate iliac-bone allograft into the intervertebral disc. The deformity was corrected by installing pre-bent rods. Before closing the incision tightly, one silicone irrigation tube (diameter = 0.3 cm) was inserted into the affected disc space, and two drainage tubes (diameter = 0.5 cm) were placed in the left and right sides of the vertebral plate outside the vertebral canal. All three tubes were unthreaded from healthy skin away from the incision and fixed firmly. Tissue samples resected during the operation were sent for microbiological evaluation and pathological analysis (Fig. 1).

Postoperative procedure

The irrigation began after the operation with a flushing fluid that consisted of 500 ml normal saline and 80,000 U gentamicin (or antibiotic, according to the microbiological results). When the systemic and local symptoms disappeared, the drainage liquid was clear, and the drainage liquid culture was negative on three assessments, irrigation was suspended for 2 days. If the symptoms did not recur, the irrigation tube could be removed. The drainage tubes were removed after another 2 days of observation if there were no complications. A broad-spectrum or sensitive antibiotic was chosen based on a drug sensitivity test and was administered intravenously for 2–3 weeks until the levels of inflammatory markers decreased to normal values, followed by oral antibiotics for an additional 2–3 weeks. Patients were encouraged to mobilize after the removal of the drainage tubes.

Follow-up assessments and statistical analysis

Patients were followed up for 24–36 months (mean 27 months). The visual analog scale (VAS) was used to evaluate preoperative and

Table 1
Demographics and Characteristics of 23 patients with lumbar spondylodiscitis.

Case no.	Gender	Age	Level	Operation time (min)	Blood loss (ml)	Presumed cause	Culture Findings	Follow-up (months)
1	M	35	L5/S1	160	500	chemonucleolysis	negative	30
2	F	60	L4/5	170	400	radiofrequency ablation	E.coli	24
3	F	41	L4/5	150	500	laminectomy	MRSA	26
4	M	17	L5/S1	160	300	chemonucleolysis	negative	24
5	M	59	L3/4	150	400	minimally invasive surgery	negative	22
6	F	46	L5/S1	200	1300	radiofrequency ablation	negative	36
7	M	53	L5/S1	140	550	radiofrequency ablation	MRSA	28
8	F	61	L4/5	210	350	laminectomy	S.epidermidis	28
9	M	32	L5/S1	180	450	minimally invasive surgery	negative	26
10	M	60	L4/5	140	500	chemonucleolysis	MSSA	33
11	F	49	L4/5	140	600	radiofrequency ablation	MRSA	28
12	M	55	L4/5	120	450	minimally invasive surgery	negative	25
13	M	25	L5/S1	210	1100	laminectomy	negative	27
14	M	44	L5/S1	150	800	laminectomy	S.epidermidis	29
15	F	39	L4/5	220	650	radiofrequency ablation	negative	28
16	M	47	L5/S1	160	550	radiofrequency ablation	E.coli	25
17	M	57	L4/5	210	400	radiofrequency ablation	negative	24
18	F	36	L4/5	240	950	chemonucleolysis	MRSA	27
19	F	49	L3/4	180	800	laminectomy	negative	24
20	M	53	L4/5,L5/S1	250	650	chemonucleolysis	MSSA	26
21	M	60	L5/S1	200	1000	radiofrequency ablation	Corynebacterium	33
22	F	34	L2/3	180	700	minimally invasive surgery	S.epidermidis	26
23	F	44	L4/5	180	350	minimally invasive surgery	negative	27

M = male; F = female; MRSA = methicillin-resistant *S. aureus*; MSSA = methicillin-sensitive *S. aureus*.

Please cite this article in press as: Zhang T, et al., One-stage posterior debridement and fusion combined with irrigation and drainage for the treatment of postoperative lumbar spondylodiscitis, Acta Orthop Traumatol Turc (2018), https://doi.org/10.1016/j.aott.2018.04.004