

Short-segment fixation with a cement-augmented pedicle screw for Kummell disease

Case report

He-Xuan Di, MM^a, Feng-Yu Liu, MM^a, Si-Dong Yang, MM^a, Hui Wang, MM^a, Da-Long Yang, MD^a, Wen-Yuan Ding, MD^{a,b,*}

Abstract

Rationale: Kummell disease is described as avascular necrosis of a vertebral body that occurred in a delayed fashion after a minor trauma. Anterior, posterior, and anterior–posterior approaches have been reported. Nevertheless, there is no standard treatment for patients with Kummell disease.

Patient concerns: We reported a successful cement-augmented pedicle screw placement in a patient with Kummell disease. A 63-year-old woman with serious osteoporosis complained persistent back pain with progressive lower extremities weakness for almost 2 years.

Diagnoses: The diagnosis of Kummell disease was mainly depended on clinical symptoms and imaging examinations.

Interventions: The application of a cement-augmented pedicle screw was designed to treat this illness.

Outcomes: The operation was successful without any complications. The patient stated that symptoms were obviously improved in 1 week after operation.

Lessons: The application of a cement-augmented pedicle screw is an effective treatment option for Kummell disease.

Abbreviations: CT = computer tomography, MRI = magnetic resonance imaging, VAS = visual analog scale.

Keywords: cement-augmented pedicle screw, Kummell disease, short-segment fixation

1. Introduction

Kummell disease is a unique phenomenon that was first reported by Hermann Kummell in 1894.^[1] Kummell disease is an eponymous term used to describe avascular necrosis of a vertebral body that occurred in a delayed fashion after a minor trauma.^[2] Patients with Kummell disease often feel pain and evolve into collapse of vertebral body compression and kyphosis. In order to ease the pain and avoid relapse, surgery should be operated. Many scholars believe that kyphoplasty or vertebroplasty is the appropriate treatment for the patients with continual pain and without

neurological symptoms.^[3,4] However, both operations are reported with high risk of cement leakage especially when the peripheral walls of vertebral bodies are not complete.^[5] For patients with neurological deficits, posterior decompression with osteotomy, anterior decompression and fusion, or the combined anterior and posterior approach operations were performed. However, the anterior approach may injure the internal organs and usually involves a longer operation time.^[6] In the present research, there is no standard surgery for the treatment of Kummell disease.^[6] This paper depicted the application of a cement-augmented pedicle screw for the treatment of Kummell disease and evaluates the clinical and radiographical outcomes.

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The authors have no conflicts of interest to disclose.

^a Department of Spinal Surgery, The Third Hospital of Hebei Medical University, ^b Hebei Provincial Key Laboratory of Orthopedic Biomechanics, Shijiazhuang, China.

* Correspondence: Wen-Yuan Ding, Department of Spinal Surgery, The Third Hospital of Hebei Medical University, Shijiazhuang, China (e-mail: 734391644@qq.com).

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2. Case report

2.1. History

A 63-year-old woman with serious osteoporosis complained persistent back pain for almost 2 years. The symptoms would be worse after changing positions and would be slightly relieve after taking painkillers. The patient depicted neurological symptoms like pain or numbness in her legs. The patient had hypertension for 10 years, history of cerebral infarction, all of which were treated and well controlled.

2.2. Physical examination

Physical examination demonstrated osteoporotic thoracolumbar vertebral compression fracture. There is obvious percussion pain in back about T10 and T12 levels. The patient's general medical examination was loss of muscle force, Babinski sign (+) on both sides, and osteoporosis.

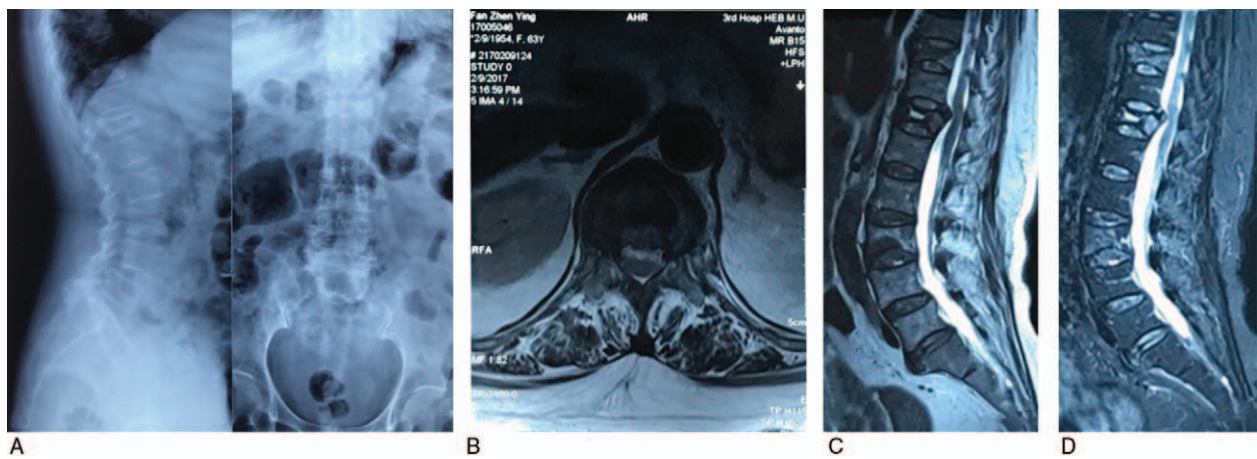


Figure 1. (A) Preoperative lateral x-ray. (B–D) Preoperative MRI. MRI = magnetic resonance imaging.

2.3. Imaging

X-ray, computed tomography (CT), and magnetic resonance imaging (MRI) were performed after the patient was hospitalized (Fig. 1). The x-ray showed obvious fractures in T10 and T12. The transverse plane of MRI showed an intravertebral vacuum sign. A decreased signal intravertebral vacuum cleft and posterior cortex breakage with cord continuous compression in T12 can be seen on sagittal T1-weighted MRI. Sagittal T2-weighted MRI showed an increased signal in the intravertebral vacuum cleft. The patient was diagnosed with Kummell disease in stage III.^[7]

2.4. Operation

The operation was performed in the prone position and with general anesthesia. A good posterior exposure of the spine was given, in the next, the fenestrated pedicle screws were inserted in objective vertebrae T10, T11, T12, and L1 under C-arm guidance.^[8] The cement-augmented pedicle screws were connected on the both sides with 2 rods bended to the desired contour. Laminectomy was performed to decompress for the treatment. Adequate hemostasis was performed and wound was thoroughly washed with sterile normal saline. Postoperative drainage tube was inserted and the surgical wound was closed layer-by-layer.^[8] The duration of operation lasted 150 minutes and estimated total blood loss was 600 mL.

2.5. Postoperative course

Postoperatively, the patient was given prophylactic antibiotics treatment for 24 hours, pain treatment and anticoagulant therapy for 8 days. The drainage tube was removed at 3 days postoperative when volume of drainage was <50 mL per 24 hours. The patient was allowed out of bed with a custom-made orthosis at 1 week after operation. The orthosis was kept for at least 3 months. The patient was allowed out of hospital at 12 days after operation when surgical suture had been removed.

2.6. Follow-up/imaging

Pain evaluations were conducted using the visual analog scale (VAS). VAS score for preoperative, 1 week after operation, and 6 months after operation was 9, 4, and 2, respectively, which showed considerable improvement. Postoperatively the muscle

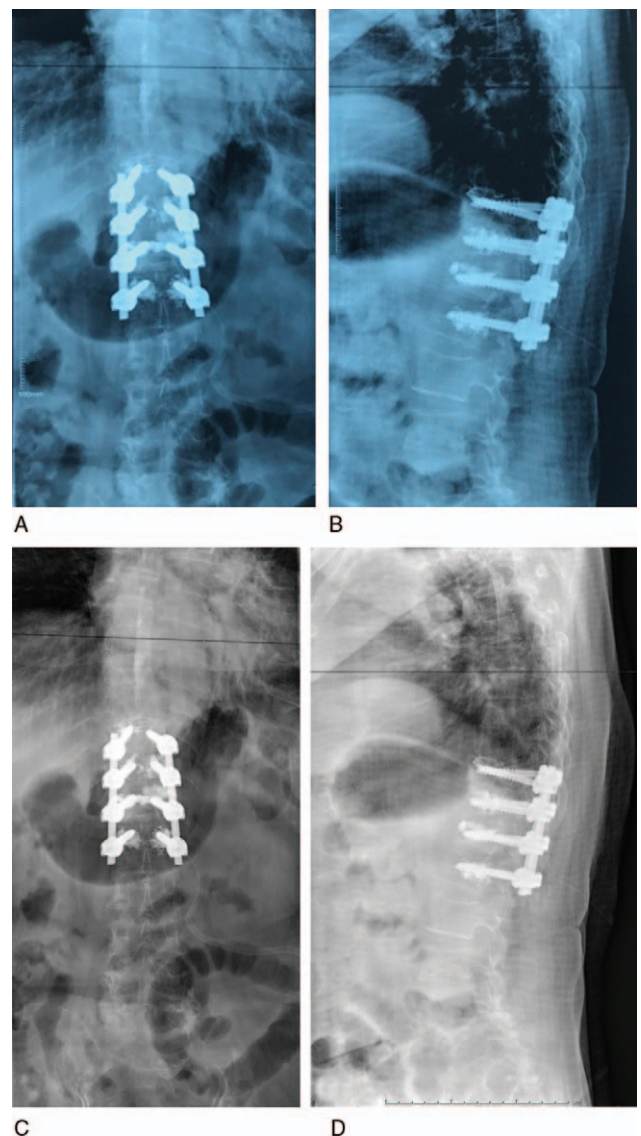


Figure 2. (A and B) Front and lateral x-rays in 1 week after operation. (C and D) Front and lateral of x-rays in 6 months after operation.

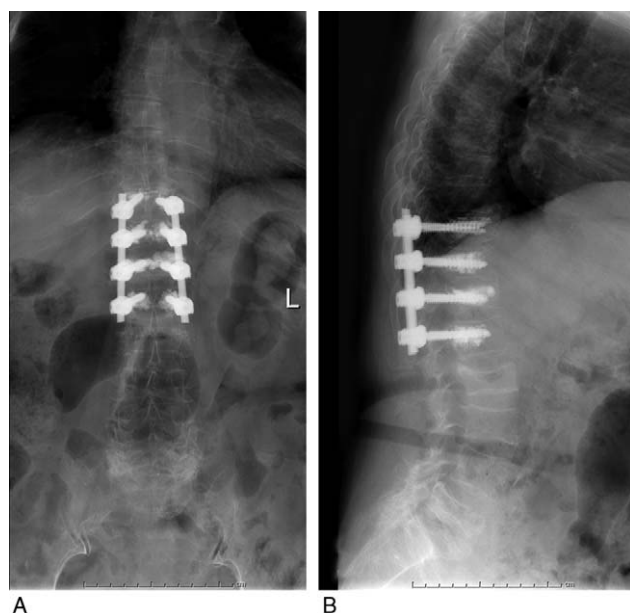


Figure 3. (A and B) Front and lateral of x-rays in 26 months after operation.

force was improved. The major muscle force of both lower limbs recovered above 3 grades and the ability of walking regained at 3 months after the operation. The patient resumed normal activities at 6 months after the operation. There were no obvious changes in lateral x-rays between 1 week and 6 months after the operation, there were no loosening and rupture of internal fixation, no obvious loss of vertebral height (Fig. 2). VAS score for 26 months after operation was 1, which showed further improvement. There were no obvious changes in lateral x-rays at 26 months after the operation (Fig. 3).

3. Discussion

We reported the application of cement-augmented pedicle screw for Kummell disease and get well curative effect. This operative approach can enhance the purchase of screws, while it has the complications such as bone cement leakage and pulmonary embolism. There have been numerous reports of surgical options for Kummell disease in the literature. Lee et al^[9] reported that cement augmented anterior reconstruction with short posterior instrumentation is a less invasive operation selection for Kummell disease with cord compression. However, anterior lumbar surgery is technically challenging due to perioperative vascular complications and sometimes with the risk of visceral injury. Zhang et al^[10] reported that modified transpedicular subtraction and disc osteotomy combined with long-segment fixation were an effective treatment option for Kummell disease with nerve injury. However, long-segment fixation usually increases the operation time and delays the recovery of the patient. Many elder patients with serious osteoporosis have weak bony purchase of screws

and this increases the risk of screw loosening. Short-segment fixation with a cement-augmented pedicle screw was performed to enhance the purchase of screws, in the meantime, rebound the vertebral body height. We found lower rates of surgical complications and medical complications in patients undergoing short-segment fixation with cement-augmented pedicle screws. The symptoms of the patient also got significant improvement.

In patients with osteoporotic compression fractures, surgical goals are neural decompression and adding spinal stability.^[11] This is because posterior decompression and screw placement for vertebral collapse in an osteoporotic spine sometimes result in loosening or pullout of the bolt. Augmentation of the pedicle screw with bone cement is a method for overcoming this problem.^[11] However, due to various reasons, there still exist several drawbacks such as the limited sample size, the insufficient coverage of some elements in the study.

Owing to the application of cement-augmented pedicle screws, there were no obvious changes in lateral x-ray 26 months after the operation, there were no loosening and rupture of internal fixation, and no obvious loss of vertebral height. However, because the patient had osteoporosis, antiosteoporosis measures should be taken.

To sum up, the application of short-segment fixation with a cement-augmented pedicle screw is an effective treatment option for patients with Kummell disease.

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