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Technical note

Cortical bone trajectory screws fixation in lumbar adjacent segment disease: A technique note with case series

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ABSTRACT

Lumbar adjacent segment disease after lumbar fusion surgery often requires surgical intervention. However, subsequent surgical treatment often needs to expose and remove all of the previous instruments. This additional surgery leads to significant post-operative pain, muscular fibrosis, poor wound healing and infection, etc. From October 2015 to March 2016, we collected six cases underwent cortical bone trajectory screws fixation with minimal invasive inter-body cage fusion for lumbar adjacent segment disease. Patients in the study all had improvement after surgery without recurrence or instruments failure during follow-up. The technique negates removal of pre-existing instruments and when combined with minimal invasive fusion surgery, the wound length, blood loss and soft tissue damage could be reduced compared with traditional surgery. We introduce the surgical procedures in detail and wish this technique could be an option for spine surgeons who encounter a similar situation.

1. Introduction

Spinal fusion is currently the standard surgical treatment for various lumbar spinal disorders. Pedicle screw fixation is the most common and reliable procedure in fusion surgery. However, solid fusion can accelerate degeneration of the adjacent unfused proximal or distal segments [1], which can lead to the development of disc herniation, degeneration, spondylolisthesis, and facet joint degeneration. This is termed lumbar adjacent segment disease (LASD). The incidence of LASD varies. Based on radiographic evidence, the prevalence of LASD is reported to be more than 40%, while the incidence of symptomatic LASD that needs subsequent surgical intervention ranges from 5.2% to 18.5% [1,2]. However, while performing LASD surgery, surgeons usually need to expose and remove the entire previous wound and all of the hardware, which leads to prolonged operation time, increased blood loss, severe post-operative pain, and even risk of infection. The cortical bone trajectory (CBT) screws can be used to avoid the disadvantages mentioned above because the trajectory screws differ from the traditional pedicle screws trajectory which is lateral to medial. Therefore, it allows two screws to be inserted into one pedicle and eliminates the need to expose all of the previous hardware.

In the article, we combined using CBT with minimal invasive inter-body fusion method in six patients with lumbar adjacent segment disease. The technique results in small incision wound, less blood loss, negation of removing previous instruments and shorter hospital stays.

2. Case illustration with surgical technique

2.1. Case illustration

A 75-year-old female underwent L2-5 pedicle screw fixation, decompression, and cage fusion in January 2012. She was able to stand well after the operation but beginning in Jan 2015 she experienced back pain and bilateral numbness in her feet. Lumbar spine MRI showed L5/S1 disc degenerative change with herniation. Because she refused to undergo exposure of the entire previous wound and resetting the hardware for fusion of the adjacent level, she received L5/S1 decompression with cage fusion without screw fixation. She recovered well after the operation and was free of symptoms. However, three months after the operation the symptoms recurred and even her lower limbs became weaker and she had mild urine incontinence. She came to our outpatient department for further evaluation. Lumbar spine X-ray revealed L5/S1 inter-body cage protrusion, and lumbar spine MRI demonstrated that the cage was directly compressing the dura sac (Fig. 1). We planned performing cortical bone trajectory screw fixation in the

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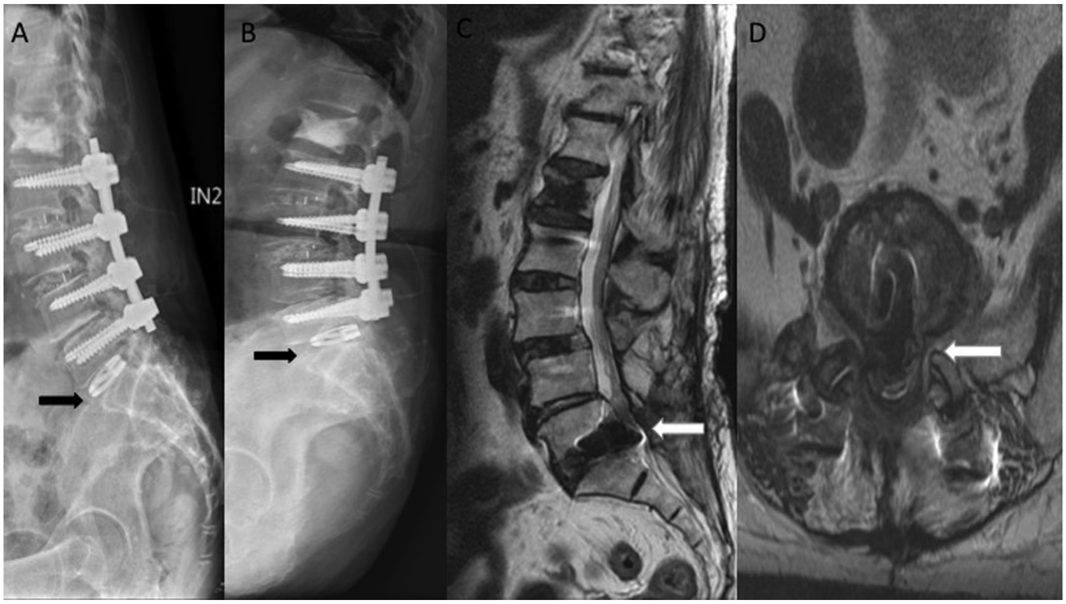

Fig. 1. (A, B) In the lateral plain film view of lumbar spine in dynamic flexion-extension view, obvious cage migration could be seen (black arrow). (C, D) In sagittal and axial view of lumbar spine MRI, we could see the cage compressed the dural sac (white arrow).

L5 and S1 vertebral bodies under C-arm guidance and re-implanted the previous cage.

2.2. Technique

For the operation, the patient was placed in prone position. A linear skin incision was made over the previous L5/S1 wound, and muscular dissection was done up to the lateral part of the pars interarticularis. We checked the insertion point of the screws by using an anterioposterior plain radiograph obtained under C-arm guided (Fig. 2A, D). An awl was used to make a pilot hole on the pars, and then the hole was progressively drilled in L5 and S1 via a medial to lateral and caudal to cranial direction under C-arm guidance. The key point was to adjust the direction of the L5 pathway to avoid attachment to previous pedicle screws. After we drilled a pathway in one pedicle, a pin was left *in situ* (Fig. 2C). After four pins were inserted, dissection of the scarred tissue to identify the L5 and S1 roots and disc level was done. We palpated the protruding cage with a dissector and re-implanted the cage. Finally, we used 4.75 mm × 35 mm cannulated screws at L5 and 5.5 mm × 40 mm cannulated screws at S1. A rod system was applied at the CBT screws of L5 and S1. Post-operative CT scanning

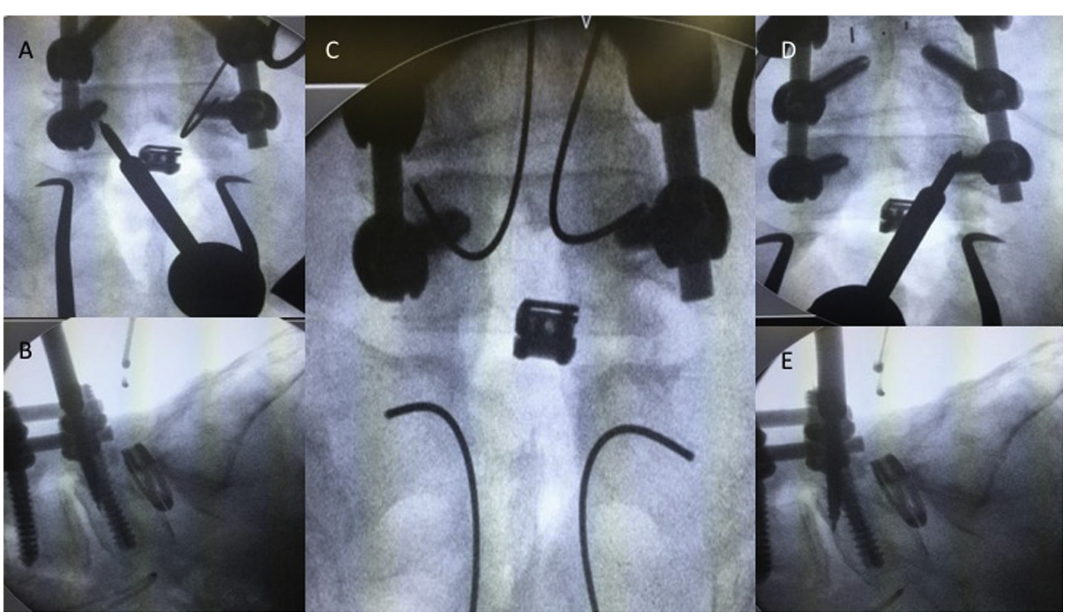

Fig. 2. (A, D) An awl was placed at L5 pars interarticularis in anterio-posterior plain film under C-arm guided where was the entry point of the screw. (B, E) Lateral view of L5 after progressively drill via a medio-lateral and cauda-cranial pathway. Take special care of the medio-lateral angle of L5 to avoid contacting the previous pedicle screws. (C) The anterio-posterior plain film after four pins left *in situ*.