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Case Report

Handmade Cement Spacer Technique for Pedicle Screw Placement in Revision Spinal Surgery

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Abstract

Transpedicle screw instrumentation is an important procedure in spinal surgery in both primary and revision procedures. Reinsertion of transpedicle screws in revision surgery is typically difficult because of scar tissue, adhesions, and loss of anatomic landmarks. Several techniques have been developed to overcome these problems, but these methods are not satisfactory and the results are unreliable. We have developed a technique using cement spacers to occupy the pedicle screw tracts while removing the pedicle screws for patients in whom reinsertion of pedicle screws is likely in later surgical stages. The screw tracts can then be easily identified. We employed this simple and effective technique in a 66-year-old woman with promising results. (*Tzu Chi Med J* 2010;22(1):39–42)

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1. Introduction

In recent decades, surgical instrumentation of the vertebral column using transpedicle screws has provided many advantages in spinal surgery, including immediate stabilization of the spine, correction of deformities, and reconstruction of the spine after decompression surgery (1,2). Posterior lumbar spine decompression and fusion with instrumentation has become a common procedure in the treatment of degenerative lumbar spine disorders.

Many patients who undergo lumbar spine decompression and fusion have had at least one previous lumbar spine surgery. In a report by DePalma and Rothman, 29% of patients had previous lumbar spine surgery (3). Revision surgery in spinal procedures is difficult because of scar tissue, adhesions, and loss of anatomic landmarks, especially when transpedicle screw reinsertion is required. Several techniques that require intraoperative fluoroscopy or navigation systems have been developed to overcome these difficulties, but have not provided a satisfactory solution.

We have developed a simple technique using handmade cement spacers to occupy the pedicle screw tracts, which addresses the technical problems of re-instrumentation.

2. Case report

Our patient was a 66-year-old woman with persistent lower back pain for several months. Plain radiography of the lumbar spine showed degenerative scoliosis and multiple-level instability. Lumbar magnetic resonance imaging showed L1 to S1 spinal stenosis (Fig. 1). The patient received posterior decompression and posterolateral fusion over L1 to S1 and posterior instrumentation with the CDM8 system (Howmedica International S. de R.L., Limerick, Ireland) (Fig. 1).

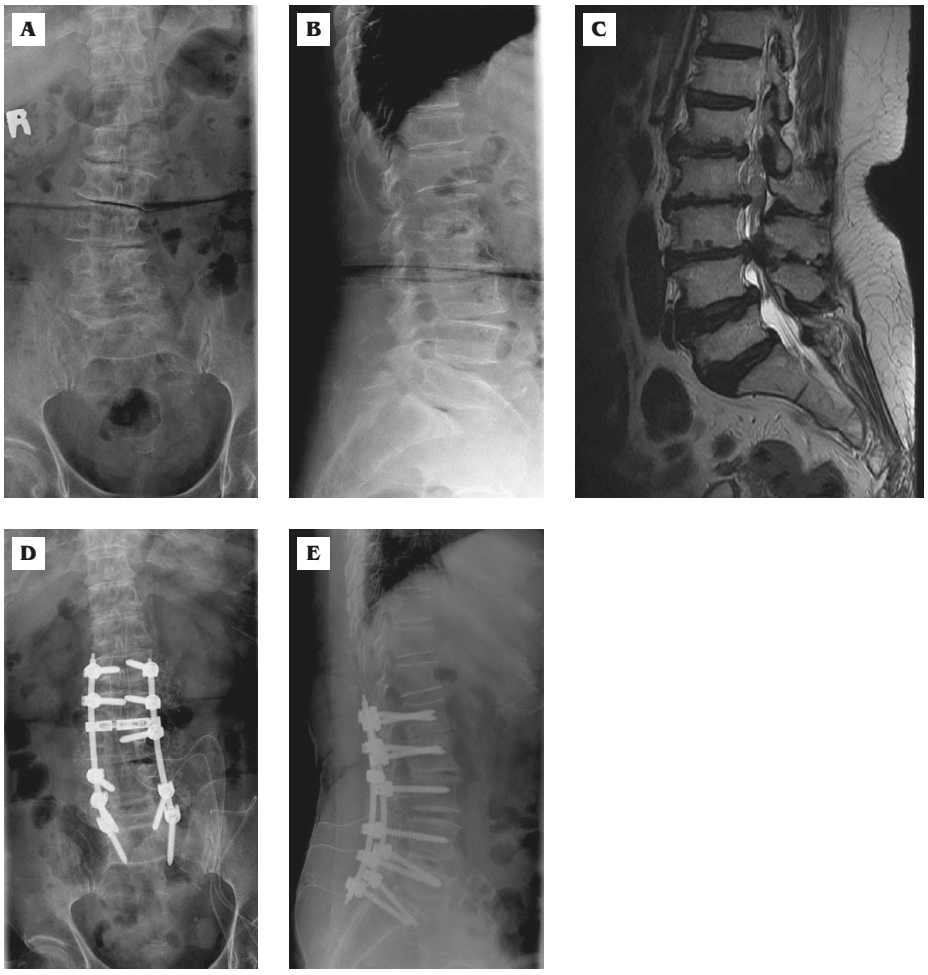

Fig. 1 — A 66-year-old woman with L1–S1 degenerative scoliosis and instability. Preoperative and postoperative images show: (A) the lumbar spine in an anteroposterior view; (B) the lumbar spine in a lateral view. (C) T2-weighted magnetic resonance imaging. (D) Postoperative lumbar spine anteroposterior view. (E) Postoperative lumbar spine lateral view.

Two weeks after surgery, a turbid, reddish discharge from the wound was observed. Under the impression of wound infection, an operation was carried out to perform debridement and remove the implants. A wound culture carried out during the procedure showed methicillin-resistant *Staphylococcus aureus* as the pathogen. We utilized cement spacers to mark the screw tracts. The depth and the diameter of the pedicle screw tracts were measured and surgical rubber tubes with an inner diameter similar to or slightly smaller than the diameter of the pedicle screw tracts was selected. The length of the rubber tubes was based on the length of the tract. Liquid monomers were then added to form the bone cement (Howmedica International S. de R.L.). The cement was poured into syringes while in the liquid state and then injected into the rubber tubes. When the temperature of the cement began to increase, the tubes were cut to the length of the previous pedicle screw tracts. After the cement set, the rubber tubes were cut longitudinally with a knife and the rubber was peeled from the cement spacers. The cement spacers were inserted into the pedicle screw tracts. For this application, the length of the cement rod should be slightly longer than the pedicle screw tract (Fig. 2). Postoperatively, the patient received intravenous vancomycin 1 g every 12 hours for 1 week, according to the wound culture and sensitivity test report. The wound began to heal well and the patient was discharged with a thoracolumbar orthosis for external support.

There was no evidence of recurrence of infection during follow-up. Pseudarthrosis with clinical symptoms of lower back pain and lower leg numbness progressed gradually over the next year (Fig. 3). The patient was admitted for one stage anterior fusion and revision posterior instrumentation. We used a standard posterior approach to expose the operative field. The previous cement sticks were easy to identify after removal of the scar tissue (Fig. 2). After removing all the cement spacers, the depth and the diameter of the previous pedicle screw tracts were measured, and the transpedicle screws were instrumented without

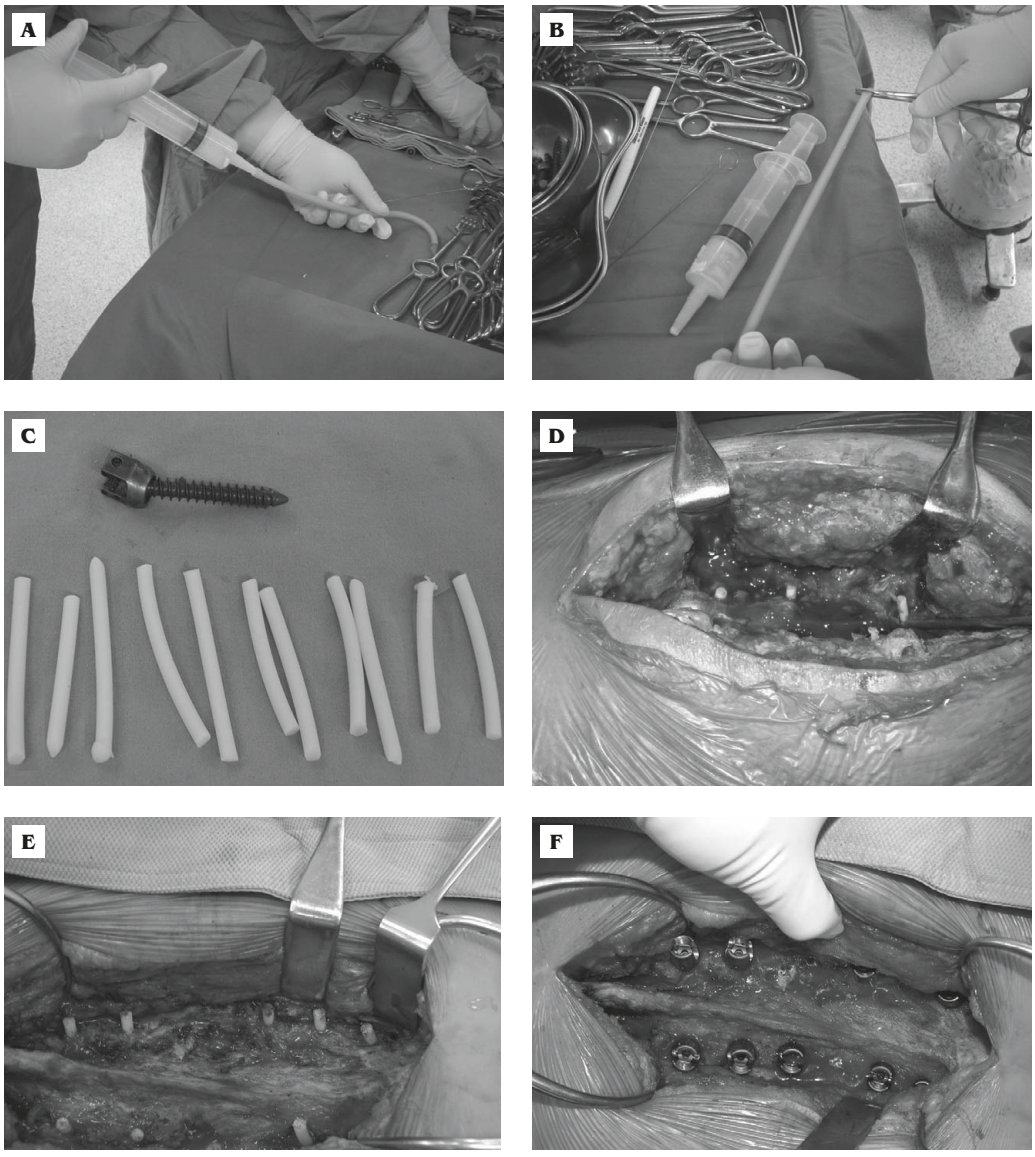

Fig. 2 — Preparation and application of the cement spacers. (A) The cement was poured into syringes in a liquid state and injected into a surgical rubber tube. (B) The rubber tube was cut to the length of the previous pedicle screw tract. (C) The rubber was cut and peeled from the cement spacers. (D) An intraoperative photograph shows that the cement spacers are slightly longer than the pedicle screw tracts. (E) An intraoperative photograph in the revision stage shows that the cement spacers are easy to find. (F) Pedicle screws are inserted after the removal of the cement spacers from the screw tracts.

any difficulty. There was no need for intraoperative imaging (Fig. 3). The wound healed well and at the 6-month follow-up visit, the patient's symptoms had subsided to a great extent.

3. Discussion

Pedicle screws may be removed for both septic and aseptic reasons (4–7). Postoperative infection is a complication of spinal surgery (4). Staged procedures may be required if deep infection has developed or antibiotic treatment has failed. Implants may need to be removed in the first stage of debridement and reinsertion of the pedicle screws will be required after infection has resolved. Soft tissue irritation is one of the aseptic reasons to remove implants. Pseudarthrosis and adjacent instability may develop after removal of pedicle screws (6,7), and reinsertion of pedicle screws at the previous instrumentation level may be needed.

Reinsertion of pedicle screws is difficult in patients who have had previous spinal surgery because of scar tissue, adhesions, and loss of bony landmarks. The bony landmarks for pedicle screw insertion may have been destroyed or changed by fusion mass or bone

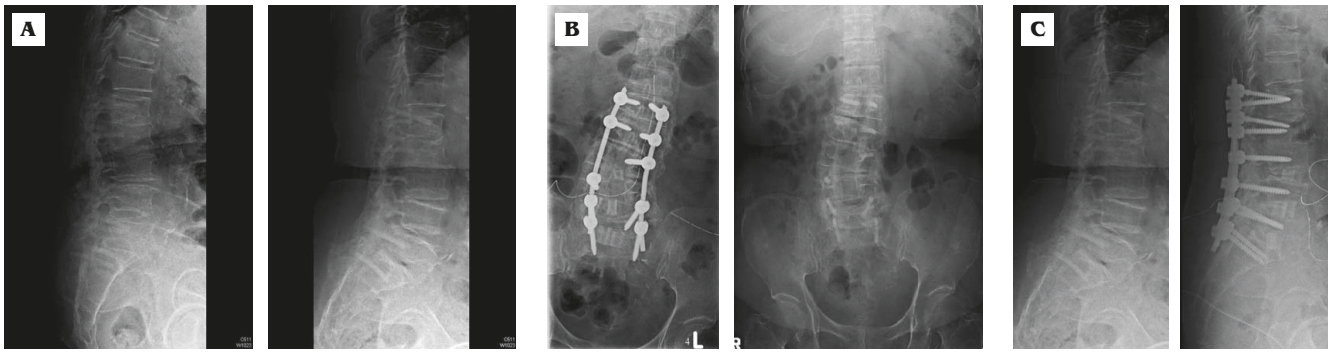

Fig. 3 — (A) Flexion-extension radiographs show L1–S1 pseudarthrosis before revision surgery. (B) Anteroposterior radiographs show the same position of the cement spacers and pedicle screws after revision surgery. (C) The same results are seen from the lateral projection.

re-growth. To carry out the operative procedure, free-hand techniques that require intraoperative fluoroscopy confirming screw placement (8) or direct visualization of the medial wall after laminectomy, and techniques that require image-guided systems (9) have been reported. Repeated intraoperative imaging to confirm pedicle screw position may prolong the surgical time. Extended surgical exposure during re-instrumentation may increase the risk of complications such as excessive blood loss, dura tears, neurological injury, and postoperative wound complications (10).

In this study, the use of handmade cement spacers to occupy the previous pedicle screw tracts is a very simple and effective surgical technique. We have used other types of spacer materials such as Kirschner wires, but there are greater advantages using cement as the spacer material. The most important advantage of the spacer is that it can readily preserve the pedicle screw tract and entry point. The shape and size of the cement can easily be modified by choosing different sizes of surgical rubber tubes to fit the pedicle screw tracts. In addition, unlike *Kirschner wires*, the cement does not interfere with magnetic resonance imaging studies. Furthermore, the cement spacer can be used as a delivery vehicle for antibiotics in cases of infection if intended (11).

In conclusion, we used handmade cement spacers to preserve the pedicle screw tracks to solve technical problems encountered during re-instrumentation, which eliminated the need for intraoperative imaging and made the spinal procedure less time consuming. This technique can be used in patients who undergo surgery for removal of pedicle screws and yet are likely to have further stabilization procedures in the future. This technique makes re-instrumentation of screws at later operative stages easier.

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