

Navigation for Tubular Decompression of the L5 Nerve Root Ganglion after Cement Leakage via a Wiltse Approach

Abstract

Osteoporotic vertebral fractures are a widespread problem in the elderly population. In experienced hands, treatment procedures are safe and can be done in a minimally invasive fashion. Nevertheless, in rare cases, severe complications may occur. We present a case report of cement leakage after vertebroplasty of L5 compressing the nerve root with neurological signs and radiculopathy. An 86-year-old female patient was introduced to our department with severe L5 nerve root radiculopathy and a foot flexion paresis after vertebroplasty of L5. Computed tomography (CT) of the lumbar spine revealed extraforaminal extravasation of cement around the nerve root causing significant compression. The patient underwent surgical revision using spinal navigation for skin incision, retractor placing, and verification of the cement extravasation. The cement plumbage was removed, and the patient improved immediately. Sufficient decompression of the nerve root after cement leakage can be achieved using a spinal navigation setup in combination with intraoperative CT.

Keywords: Cement leakage, navigation, neurological deterioration, radiculopathy, revision, vertebroplasty

Introduction

Osteoporotic vertebral fractures are a widespread problem in the elderly population.^[1] Surgical treatment, such as vertebroplasty or kyphoplasty, leads to immediate pain relief and maintains a standard therapy in osteoporotic fractures.^[2] In experienced hands, this procedure is a safe and minimally invasive technique. Nevertheless, in rare cases, severe complications may occur. Besides typical surgical complications such as infection and bleeding, cement leakage may lead to neurological deterioration ranging from pain to severe motor deficits.^[3,4] We present a case report of L5 nerve root compression after cement leakage and the successful tubular decompression through a Wiltse approach using spinal navigation.

Case Report

History and presentation

A 86-year-old female patient was treated by uniportal right vertebroplasty of a fractured L5 vertebral body in an external hospital. The day after surgery, the patient showed a foot flexion paresis on the right side. Besides the neurological

deficit, intractable L5 radicular pain (visual analog scale 8) was the major reason to transfer the patient to our department 5 days postoperatively. Computed tomography (CT) scans of the lumbar spine revealed extraforaminal extravasation of the cement around the right nerve root L5 causing significant compression [Figure 1]. The decision to do a minimally invasive decompression through a Wiltse approach was communicated to the patient and she agreed to the surgical intervention. In general, the approach is performed with the use of fluoroscopic guidance to accomplish a cranial-lateral direction to the exiting nerve root due to the iliac crest. To avoid radiation to the staff and to speed up the procedure, we used spinal navigation to introduce the tube-like retractor and to identify the cement extravasation nearby by the right nerve root L5.

The image guidance setup at our department consists of an intraoperative CT (iCT, SOMATOM Definition AS, Siemens Healthcare GmbH, Erlangen, Germany) and the Spine and Trauma 3D Navigation Software with the corresponding navigation system (Brainlab AG, Feldkirchen, Germany).

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Operative procedure

The patient was in prone position under general anesthesia. After maintaining sterile conditions, the reference array was attached to the iliac crest with two pins at the left side and a sterile drape covered the patient. The position of the patient was then referenced to the CT position. Low-dose iCT of the field of interest was made. After image acquisition, a 1-mm axial reconstruction of the affected region was sent to the navigation system. After accuracy verification, skin incision was made following the navigation monitor and according to the classic Wiltse approach [Figure 2]. After blunt transmuscular preparation, the tube-like retractor (Pipeline®, DePuy Synthes, Raynham, MA, USA) was placed, and the position was checked with navigation instead of fluoroscope. Under the microscope, sharp dissection of muscle was performed, and a small portion of the lateral aspect of the facet joint was removed with the burr and the Kerrison rongeurs. After bony facet decompression, the cement extravasation was identified, and the cement plombage was removed with additional decompression of the nerve root until the pedicle was visible [Figure 3]. Sterile iCT was performed and after good decompression was confirmed the wound was closed in typical fashion [Figure 4]. The intraoperative loss of blood accounted approximately 30 ml and the procedure lasted 35 min from incision to skin suture.

Postoperative course

Postoperatively, the radicular pain was resolved (visual analog scale 1) and the motor weakness improved significantly on the 1st day after the revision surgery. Due to the significant improvement of the symptoms, no further radiological scans except the iCT [Figure 4] were necessary. The patient was discharged 3 days postoperatively.

Discussion

Vertebroplasty is a widely used procedure to treat osteoporotic vertebral body fractures. Immediately, pain relief can be achieved and the procedure is safe and fast. Common complications such as infection, neurological deterioration, and relevant embolism are rare. Complications such as cement extravasation occur in about 54%; however, in most of the cases, these complications are asymptomatic.^[5] In case of cement leakage, the compressions of the spinal cord and/or the nerve roots may result in severe clinical deterioration. Symptoms such as hypesthesia, radicular pain, or paraplegia are found and sometimes lead to surgical revision. Three aspects are important to reduce the risk of complications.

1. Correct introduction of the Jamshidi needle through a transpedicular/extrapedicular way important
2. The viscosity of the cement is an important detail, ranging from low to high viscosity. Different factors such as chemical structure of the polymethylmethacrylate and time point of injection influence the viscosity

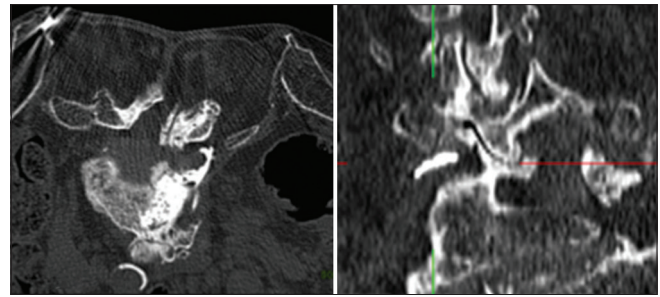


Figure 1: Intraoperative computed tomography (axial/sagittal) showing the cement leakage at the L5 nerve root

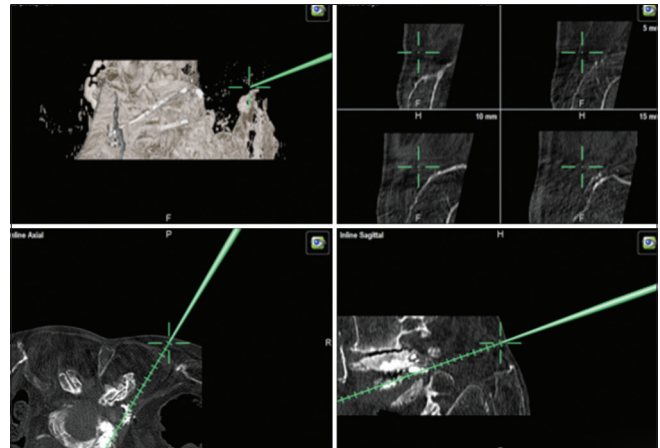


Figure 2: Multiplanar 3D navigation monitor for planning the skin incision

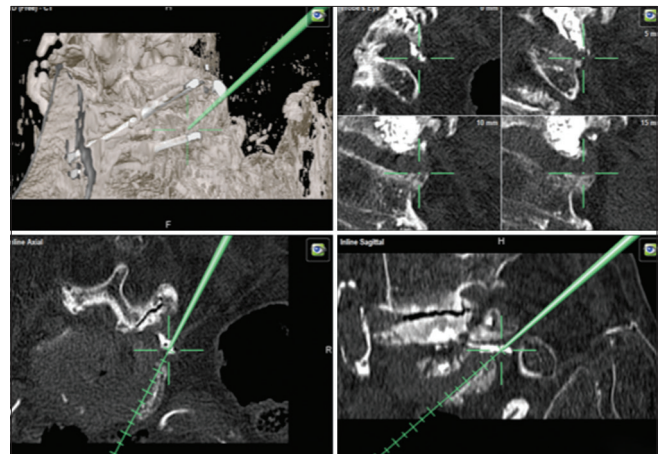


Figure 3: Multiplanar 3D navigation monitor showing the pointer on the cement plombage

3. If cement leakage is recognized, it is important to stop injection immediately. Changing and replacing the intraoperative fluoroscopic beam path might identify cement leakage sooner, for example, through the canal of the basivertebral vena.

Conclusion

We present a case of an extraforaminal cement leakage with compression of the nerve root after vertebroplasty. With the use of spinal navigation, we could identify the

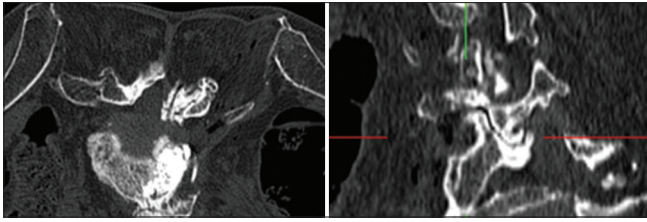


Figure 4: Postoperative computed tomography (axial/sagittal) after removal of the cement plombage

cement plombage in a minimally invasive fashion and resection and decompression was successful. The patient experienced immediate pain relief and improvement of foot flexion paresis. Low radiation dose for the operation stuff and sufficient decompression can be achieved with iCT in a safe and fast approach.

Study Design

This was an observational case study.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understand that her name

and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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