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CASE REPORT

Minimally invasive percutaneous endoscopic treatment for acute pyogenic spondylodiscitis following vertebroplasty

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Abstract

Introduction Acute pyogenic spondylodiscitis caused by percutaneous vertebroplasty is a rare complication. We present the first report of minimally invasive endoscopic treatment for acute spondylodiscitis caused by vertebroplasty.

Case presentation A 60-year-old female was transferred with the symptom of right hip flexion weakness for 1 day. The patient underwent a vertebroplasty procedure because of L3 osteoporotic compression fracture at other hospital 6 weeks ago. Physical examination, laboratory finding and magnetic resonance imaging revealed an acute pyogenic spondylodiscitis with right L2 nerve root palsy caused by compression of bone and cement after L3 body collapse. Percutaneous endoscopic procedures including needle biopsy, debridement, root decompression and drainage were performed. One week after endoscopic treatment, her symptoms of back pain and nerve palsy improved significantly. After endoscopic treatment, the patient underwent conservative treatment with appropriate antibiotics according to the bacterial culture test results. Six weeks postoperatively, she was pain free with no neurological deficits or signs of infection. Five months later, spontaneous fusion between L2 and L3 body was observed.

Conclusion We report a case treated with endoscopic procedure without open surgery for acute pyogenic spondylodiscitis following vertebroplasty.

Keywords Vertebroplasty · Spinal infection · Spondylodiscitis · Endoscopic surgery

Introduction

Percutaneous vertebroplasty is a widely used treatment for osteoporotic spinal fractures. As many vertebroplasties were implemented, they understandably caused many complications. Among them, pyogenic spondylodiscitis is one of the uncommon complications. The main line of treatment in cases of infected vertebroplasty/kyphoplasty is operative debridement and stabilization, whereas others treated their cases conservatively [1]. However, it has been reported that perioperative morbidity is high when using the invasive conventional surgeries such as anterior debridement, corpectomy and posterior spinal fusion [2]. Especially, elderly patients or those with poor general condition need to be treated with more minimally invasive surgery. We report a case of minimally invasive endoscopic treatment for pyogenic spondylodiscitis after vertebroplasty. Until now, there have been no reported cases treated with fully endoscopic treatment for acute spondylodiscitis caused by vertebroplasty.

Case presentation

A 60-year-old female was transferred with the symptom of right buttock and leg pain, and could not raise her right leg for 1 day. The patient, with medical history of rheumatoid arthritis, underwent a vertebroplasty procedure because of L3 osteoporotic compression fracture at other hospital 6 weeks ago. She complained of worsening back pain after vertebroplasty. Physical examination finding was right hip flexion weakness (Grade 2), but other motor impairment was not observed. The white blood cell (WBC) count was

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16,800 cells/μL and the C-reactive protein (CRP) level was 3.3 mg/L. Plain radiographs demonstrated destruction and collapse of the L3 body with the leaked cement (Fig. 1). magnetic resonance imaging (MRI) revealed L2 and 3 spondylitis with a left-sided psoas abscess and L2/3 discitis (Fig. 2). These findings were consistent with a diagnosis of acute pyogenic spondylodiscitis after vertebroplasty. The patient underwent endoscopic treatment because of neurological impairment with right L2 motor palsy. The procedure was performed via a posterolateral percutaneous approach using endoscopic equipment under local anesthesia and conscious sedation. As a premedication, midazolam (0.05 mg/kg) was injected intramuscularly 30 min before surgery. Dexmedetomidine (1 μg/kg during 10 min for loading dose, 0.2–0.7 μg/kg/h for maintenance dose) was intravenously administered during surgery. The patient was placed in the prone position on a radiolucent table. The skin entry point was located at the lateral edge of paravertebral back muscle (about 8–13 cm lateral to the midline, depending on the patient's waist size) and local anesthesia was administered to skin. After the sterile preparation and draping were preformed, a spinal needle was inserted directly into the targeted disc and the abscess was aspirated for microorganism cultures (Fig. 3). After the aspiration, endoscopic procedures including wide debridement of infected disc, necrotic bone and foreign body such as cement were performed (Fig. 4). Necrotic bones were removed through working cannula by piecemeal, but we could not remove large cements through working cannula. So, we pulled large cement fragment with endoscopy and sheath together. The largest cement fragment was caught in skin, so we removed that fragment with Kelly forcep (Fig. 5). Finally, a drainage tube (diameter, 3.2 mm) was inserted into the debrided disc space (Fig. 6) and connected to a negative-pressure pump (Hemovac; Zimmer). Plain radiographs and MRI were checked postoperatively 1 week (Fig. 7). One week after endoscopic treatment, her symptoms of back pain and nerve palsy improved significantly. The tube was removed 10 days after endoscopic procedure until drainage was reduced to less than 10 mL/day. Cultures grew methicillin-resistant *Staphylococcus epidermidis* (MRSE). After endoscopic treatment, the patient underwent appropriate antibiotics treatment with vancomycin and teicoplanin according to the antibiotic susceptibility test results for 6 weeks. Antibiotic treatment was initiated with vancomycin (1 g intravenously every 12 h). On day 13, vancomycin therapy was ceased after she developed a skin rash, and teicoplanin (800 mg intravenously once daily) was used for 4 weeks. We thought that spontaneous fusion would be possible during the follow-up observation, because L2 body was gradually docked in L3 body with stability. So, the surgical treatments such as anterior debridement, corpectomy, and posterior spinal fusion were not performed. Six weeks postoperatively, she was pain free with no neurological deficits or signs of infection. Five months later, spontaneous fusion between L2 and L3 body was observed (Fig. 8).

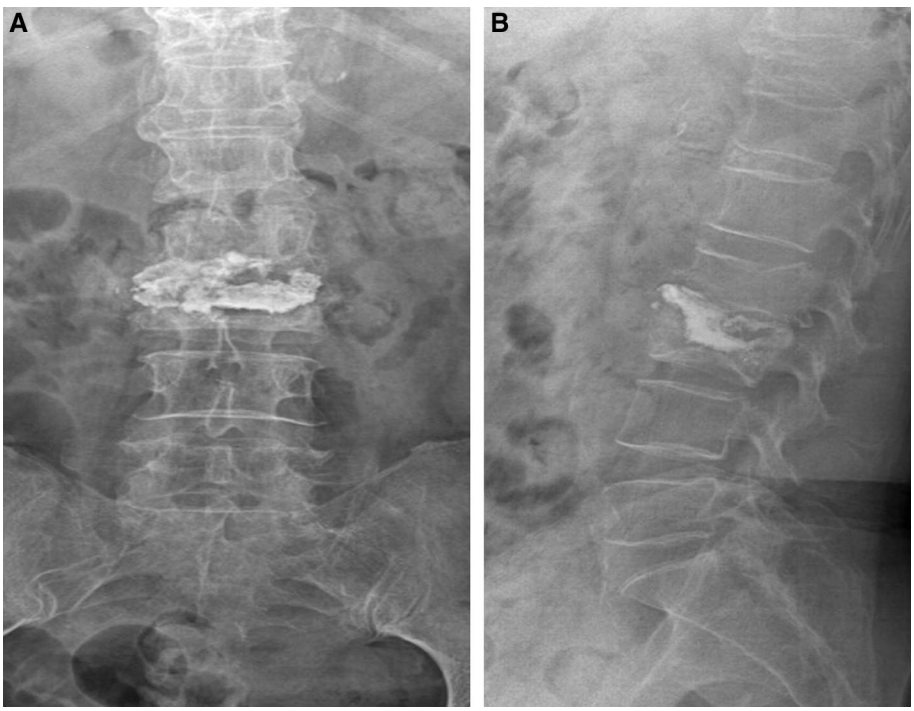

Fig. 1 Preoperative **a** anteroposterior and **b** lateral plain rediographs of the lumbar spine of a 60-year-old female demonstrated destruction and collapse of the L3 body with leaked cement

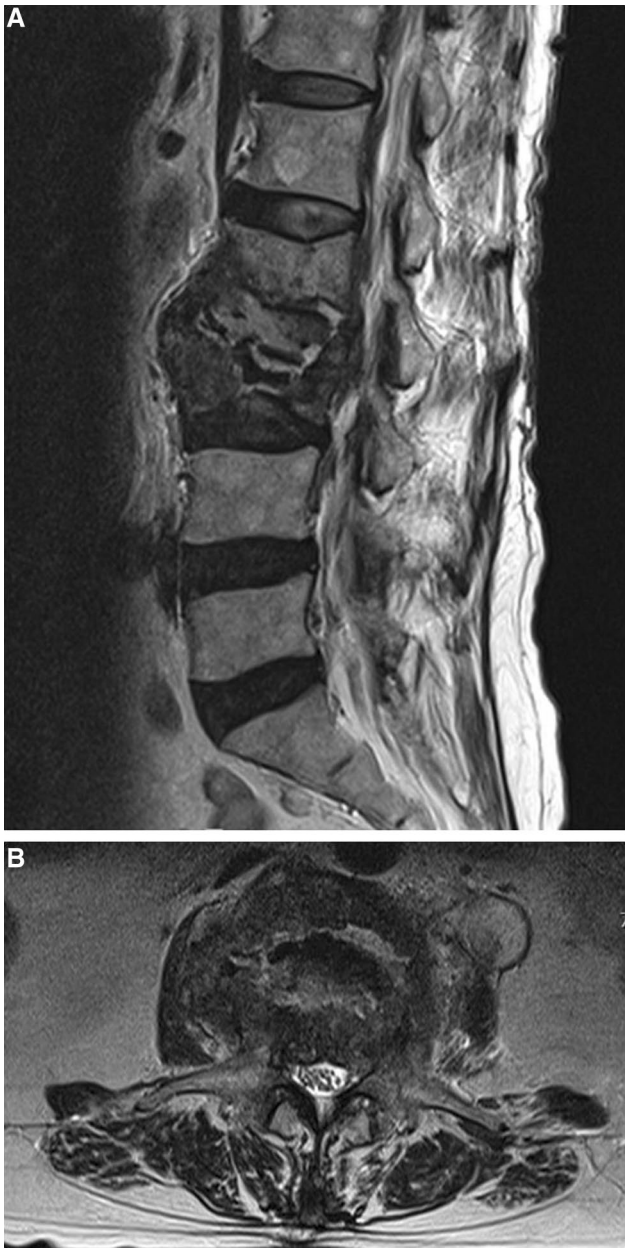

Fig. 2 **a** Sagittal and **b** transversal T2 magnetic resonance images revealed L2 and 3 spondylitis with a left-sided psoas abscess and L2/3 discitis

Discussion

The occurrence of spinal infection after vertebroplasty is not common and the incidence of spinal infection after vertebroplasty has not been specifically reported in previous studies. But the calculated incidence of infection after vertebroplasty ranges from no single case of infection in 4547 cases up to 2 cases of 104 patients (1.9%) [3, 4]. Yu et al. [5] have reported 1 infection case (0.5%) among 200 vertebroplasty cases, and Hamdan et al. [1] reported an infection rate of 0.46% in 6 out of 1307 patients who were performed vertebroplasty or kyphoplasty.

Fig. 3 Before the endoscopic procedures, a spinal needle was inserted directly into the targeted disc and the abscess was aspirated for microorganism cultures

The main line of treatment in cases of infected vertebroplasty/kyphoplasty is operative debridement and stabilization, whereas others treated their cases conservatively [1]. There have been a number of studies that reported the treatment results of spondylodiscitis after vertebroplasty using anterior debridement and accompanying bone grafting with or without supplemental instrumentation [1, 5–10]. Although this technique is a good method for definitive treatment of infections and early stabilization of the vertebrae, it is an invasive treatment method, resulting in undesired postoperative complications.

Particularly, patients receiving vertebroplasty or kyphoplasty treatment include many older and immunocompromised patients, so invasive conventional surgery increases mortality after surgery. According to a published study, the perioperative mortality rate was 33.3% after the surgery of anterior corpectomy and posterior stabilization [1].

Endoscopic spine surgery is considered to be a good way to meet the demands of the current time requiring minimally invasive surgery for the body and has made great progress in recent years. Advances in surgical instruments and camera systems have allowed endoscopic

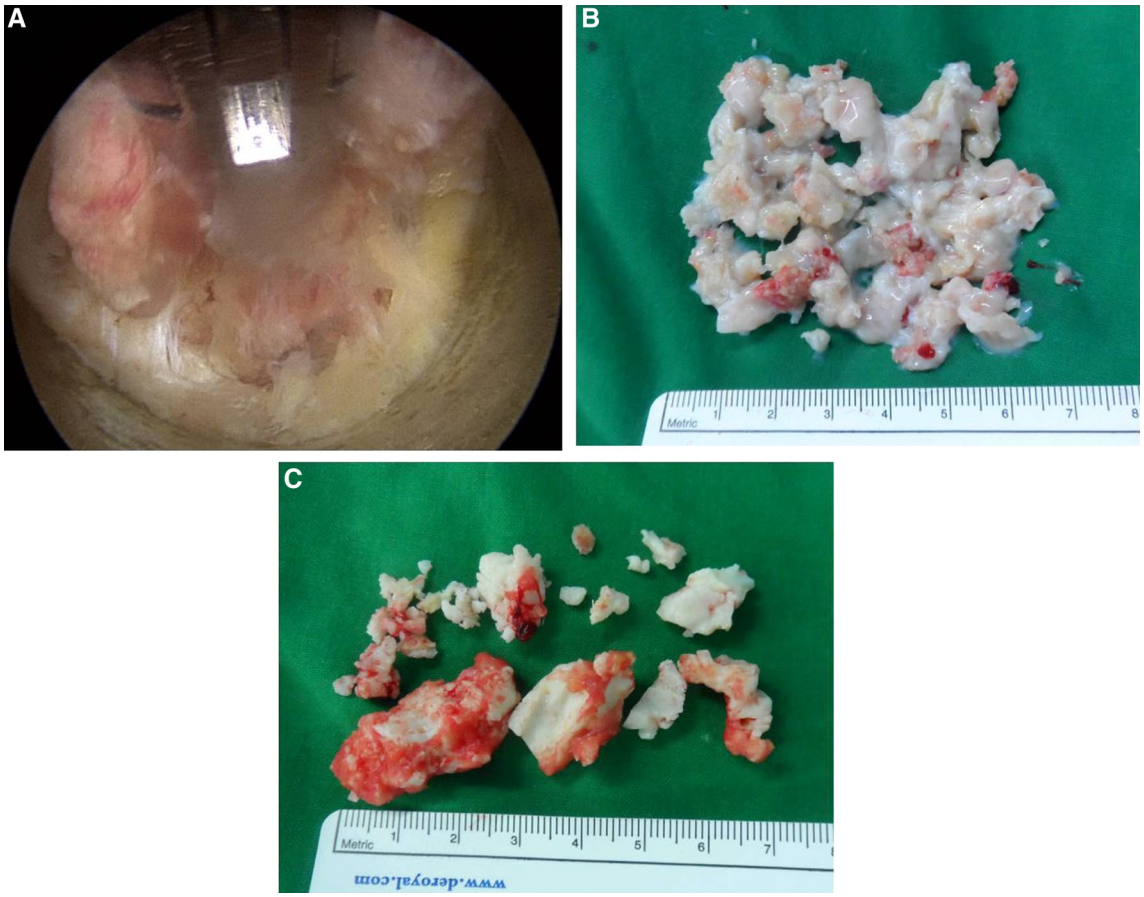

Fig. 4 **a** Intraoperative endoscopic view of the debridement procedure. **b** Removed necrotic bone and infected disc tissue. **c** Removed cement material

surgery to be applied to various areas of spinal surgery. Extensive debridement and eradication of the infected tissue are essential for the treatment of spinal infections, so conventional open surgery has been considered as a standard therapy for spinal infections. With improved endoscopic instruments and techniques, spinal infections can be successfully treated by percutaneous endoscopic debridement.

The efficacy of diagnostic and therapeutic value of percutaneous endoscopic lumbar discectomy (PELD) in spinal infections has already been reported in several studies [2, 11, 12]. Most of these studies emphasized the importance of early stage infection control, which usually leads to satisfactory outcomes. Moreover, Yang et al. [13] reported that PELD is an effective alternative to extensive open surgery for the treatment of advanced infection with paraspinal abscess and postoperative recurrent infection. Because PELD for spinal infection can provide adequate biopsy specimens for pathogen isolation, relieve the patient's symptoms, and assist in the eradication of infectious spondylitis with less morbidity than major open surgery.

There has been no case report of endoscopic treatment for spinal infection after vertebroplasty. Usually after vertebroplasty, the cement is firmly attached to the bone. It is thought to be difficult to completely remove the attached cement using an endoscopic only procedure. Lee et al. reported a case of temporary percutaneous endoscopic irrigation and debridement of a spinal infection after vertebroplasty, but this patient underwent an anterior corpectomy 3 weeks later.

There are some limitations to treat spondylodiscitis after vertebroplasty with only endoscopic method. Endoscopic treatment of spondylodiscitis after vertebroplasty may have limited debridement range compared with conventional open surgery, and reoperation may be necessary for recurrence of the infection. But recurrent spinal infection can also be effectively treated by endoscopic spine surgery through a posterolateral approach at the original incision site. The difficult

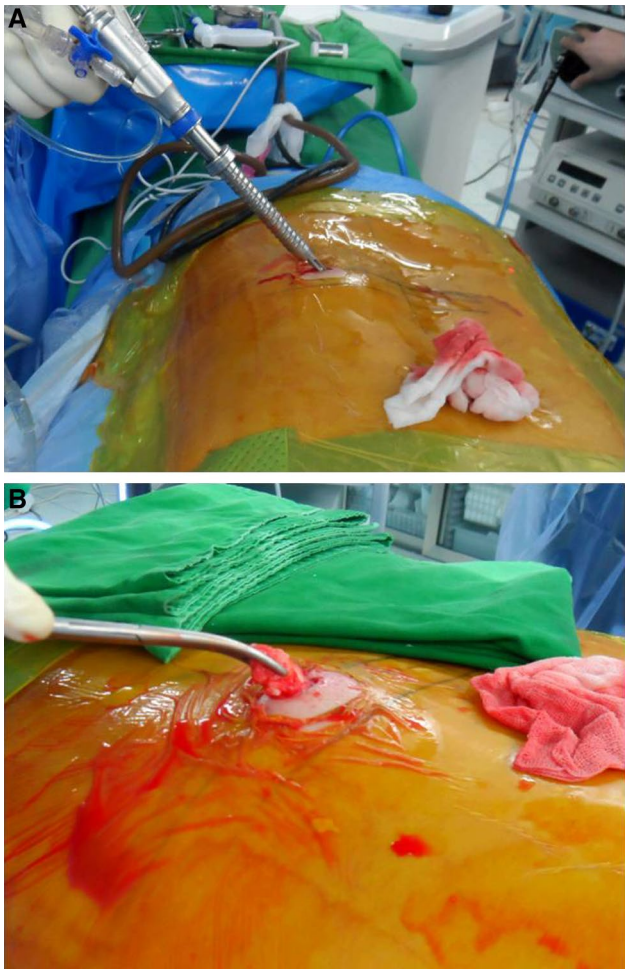

Fig. 5 **a** The technique of pulling the cement fragment with endoscopy and sheath together was used for the large cement fragments. **b** The largest cement fragment was caught in skin, so we removed that fragment with Kelly forcep

and complicated revision open surgery can be reserved for use in case of failure with simple endoscopic procedure [13].

And the success of treatment for vertebroplasty induced spondylodiscitis is largely dependent on the removal of cement and inflammatory tissue. Endoscopic only treatment requires more than a certain level of skill in endoscopic surgery, so the treatment results may vary depending on the operator's skill.

In this case, posterior fusion surgery was planned after the treatment of spinal infection. During the follow up period, L2 and 3 vertebral body were stabilized in a chevron shape and progressed to interbody fusion. The intervertebral fusion occurred naturally after the treatment for infection in this case, but it is not judged to be the case in all cases. If an unstable spinal segment is symptomatic after the endoscopic treatment for spinal infection, an additional spinal fusion surgery may be considered at any time. Although an additional surgery may be required for intervertebral fusion after the treatment for infection, the minimally invasive surgery technique using endoscope can also be applied to the fusion surgery due to the development of instruments and techniques in recent years.

Fig. 6 A drainage tube (diameter, 3.2 mm) was inserted into the debrided disc space at the end of surgery

And we could observe L2/3 mild segmental kyphosis at the final follow up in this case. But this patient did not complain any local or global symptoms due to L2/3 segmental kyphosis, so no further correction surgery was considered. If the segmental kyphosis is too large to be a problem, an open combined intervention may be required for correction.

Previously, in areas where conventional open surgery is required, it is increasingly being replaced by minimally invasive surgery. Even in the spinal infection surgical field, which requires extensive debridement, there are many good results after treatment with minimally invasive surgery. Now, even more complicated spinal infections after vertebroplasty can be treated with a fully endoscopic technique. This means that the area where the endoscopic technique can be used is widened by one more step. And this technique could be one of the good treatment options for some skilled surgeons in endoscopic surgery.

Conclusions

Based on the treatment results from this case, we propose that percutaneous endoscopic treatment is an effective minimal invasive method for the treatment of pyogenic spondylodiscitis after vertebroplasty.

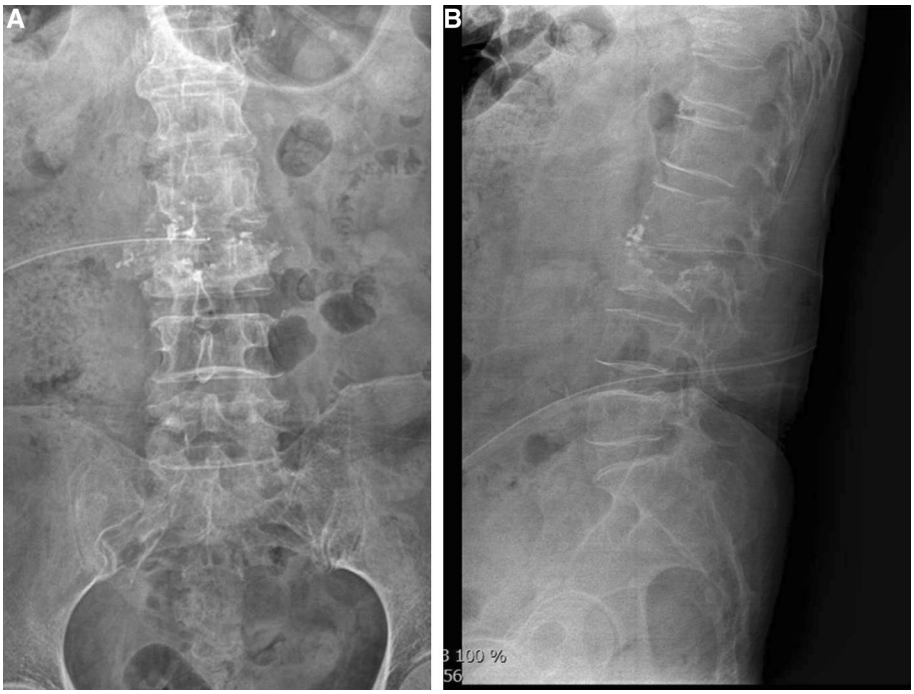

Fig. 7 Postoperative **a** anteroposterior and **b** lateral plain radiographs were checked 1 week after surgery

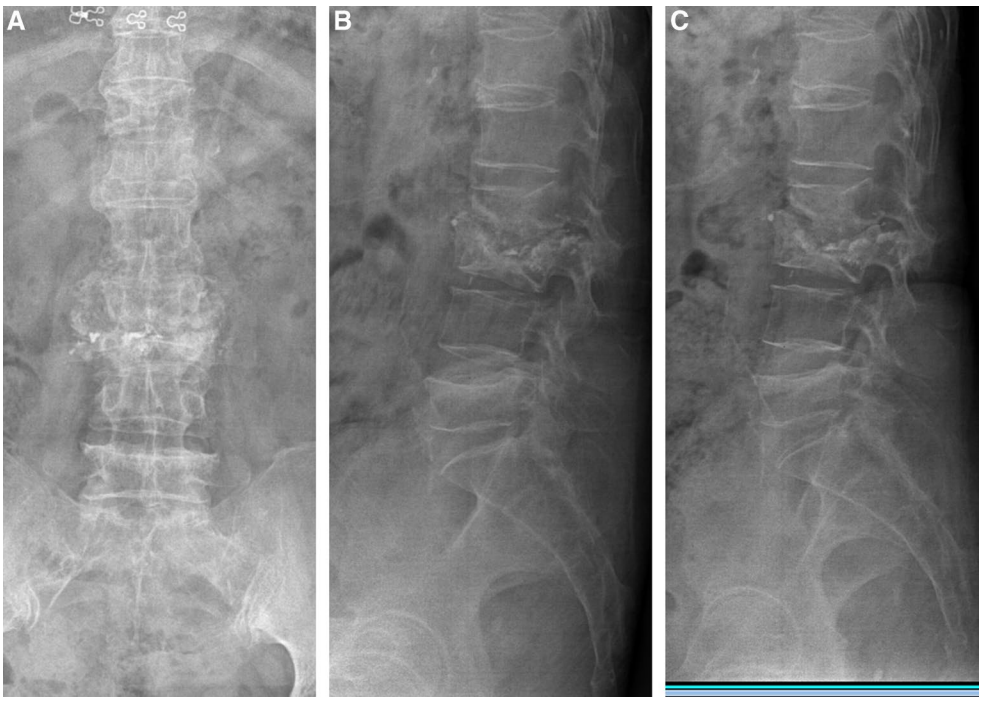

Fig. 8 Spontaneous fusion between L2 and L3 body was observed by **a** anteroposterior, **b** flexion lateral radiograph and **c** extension lateral radiograph at 5 months after surgery

Compliance with ethical standards

Conflict of interest None of the authors has any potential conflict of interest.

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