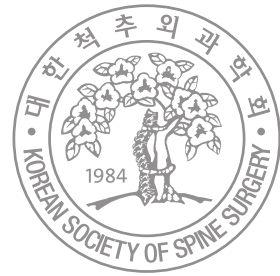


Journal of Korean Society of Spine Surgery



Delayed Paraplegia after Successful Percutaneous Vertebroplasty in a Patient with Osteoporotic Compression Fracture: A Case Report

Yong-Chan Kim, M.D., Won-Su Son, M.D., Bo-Kyung Suh, M.D., Nam-Su Chung, M.D., Suk-Woo Kim, M.D.

J Korean Soc Spine Surg 2011 Sep;18(3):169-173.

Originally published online September 30, 2011;

<http://dx.doi.org/10.4184/jkss.2011.18.3.169>

Korean Society of Spine Surgery

Department of Orthopedic Surgery, Inha University School of Medicine

#7-206, 3rd ST. Sinheung-Dong, Jung-Gu, Incheon, 400-711, Korea Tel: 82-32-890-3044 Fax: 82-32-890-3467

©Copyright 2011 Korean Society of Spine Surgery

pISSN 2093-4378 eISSN 2093-4386

The online version of this article, along with updated information and services, is
located on the World Wide Web at:

<http://www.krspine.org/DOIx.php?id=10.4184/jkss.2011.18.3.169>

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Delayed Paraplegia after Successful Percutaneous Vertebroplasty in a Patient with Osteoporotic Compression Fracture: A Case Report

Yong-Chan Kim, M.D.* , Won-Su Son, M.D.* , Bo-Kyung Suh, M.D.* , Nam-Su Chung, M.D.† , Suk-Woo Kim, M.D.*

*Department of Orthopaedic Surgery, Hallym University Sacred Heart Hospital, Medical College of Hallym University, Anyang, Korea**

Department of Orthopaedic Surgery, Ajou University School of Medicine, Suwon, Korea†

Study Design: A case report.

Objectives: We report a case of a female patient initially diagnosed as osteoporotic vertebral fracture without any noticeable injuries to posterior ligament complex, who later developed with incomplete paraplegia resulting from an unrecognized trauma after vertebroplasty.

Summary of Literature Review: Vertebroplasty remains a safe and effective procedure for osteoporotic vertebral fracture. However, there have been many reports regarding neural injury associated with cement leakage.

Materials and Methods: An 81-year old woman with a sudden motor weakness and a sensory loss on her lower extremities after an unrecognized trauma was admitted to our clinic. She had undergone a vertebroplasty twelve days before the admission. At the time of vertebroplasty, Magnetic resonance (MR) imaging showed a compression fracture at T10 vertebra without any posterior ligament complex (PLC) injury. Follow up MR imaging was taken 12 days after vertebroplasty, and it revealed posterior shift of T10 body with a fracture of spinous process, tear of left facet joint capsule, partial tear of interspinous ligament of T10-11 with retrolisthesis, and narrowing of spinal canal at T10-11 by T11 lamina.

Results: Immediate surgical treatment was performed to decompress the neural structures, and to stabilize the spinal column. However, neurological recovery was unsatisfactory.

Conclusions: Spinal surgeons should be aware of the possibility of the development of any neurologic deterioration, even if successful vertebroplasty is performed.

Key Words: Paraplegia, Vertebroplasty, Osteoporosis, Compression fracture

INTRODUCTION

Percutaneous vertebroplasty with polymethylmethacrylate (PMMA) has been proved to be a cost-effective treatment for pain relief in compression fractures secondary to osteoporosis. It can be performed under local anesthesia with a very low morbidity rate, alleviating back pain in more than 90% of the patients.

Recently, however, there have been an increased number of reports about complications after vertebroplasty as the procedure is widely performed by many spine surgeons. The most frequent complication of percutaneous vertebroplasty is the inadvertent epidural and foraminal leakage of the cement.¹⁾ Small perivertebral venous, prevertebral soft tissue and intradiscal leakages are usually not regarded to be clinically significant.²⁾ If the venous system is opacified by PMMA, the procedure

Received: May 16, 2011

Revised: July 21, 2011

Accepted: August 10, 2011

Published Online: September 30, 2011

Corresponding author: Nam-Su Chung, M.D.

Department of Orthopaedic Surgery, Ajou University School of Medicine, San 5 Wonchon-dong, Youngtong-gu, Suwon, Kyonggi-do, 443-721, Korea

TEL: 82-31-219-5220, **FAX:** 82-31-219-5229

E-mail: namsuchung@gmail.com

"This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited."

should be discontinued as massive pulmonary embolism may potentially occur. The risk of infection can be minimized by a strict sterile technique and the routine use of antibiotics. PMMA polymerization may produce transient worsening of pain and fever as well. Vertebroplasty is also associated with a small but definite risk of adjacent vertebral body fracture.³⁾

There are few, if any, reports about delayed complications at the injured level after successful vertebroplasty without any cement leakage or neurologic damage immediately after operation. We report a case of a female patient with an osteoporotic compression fracture, who later developed with incomplete paraplegia resulting from an unrecognized trauma after vertebroplasty.

CASE REPORT

1st admission

An 81-year old woman, cachexic with poor general condition and severe osteoporosis was admitted to authors' hospital via emergency room due to back pain after a pedestrian accident. Medical history showed diabetes mellitus, hypertension, and hepatitis, as well as a past history of pulmonary tuberculosis. The patient's back pain was localized around T10, and physical examination revealed midline percussion tenderness around the level. There was no neurologic sign or symptom. Radiograph revealed compression fracture at the body of T10, as well as multiple old compression fractures on thoracic and lumbar spine (Fig. 1). MRI was reported as follows: recent benign

compression fracture of T10 body, bone marrow edema of spinous process of T10 (Fig. 2). BMD showed -4.0 on L1. The authors decided to do a conservative treatment considering the patient's medical condition and the report on MRI. During admission, her back pain was aggravated that she could not tolerate the pain even on the supine position.

Percutaneous vertebroplasty was performed under local anesthesia. The procedure was successful without any leakage (Fig. 3). The pain was relieved immediately after the operation without any neurologic symptoms or signs. The patient was discharged on the 8th day postoperatively. Authors advised the patient to beware of any trauma which could injure the patient

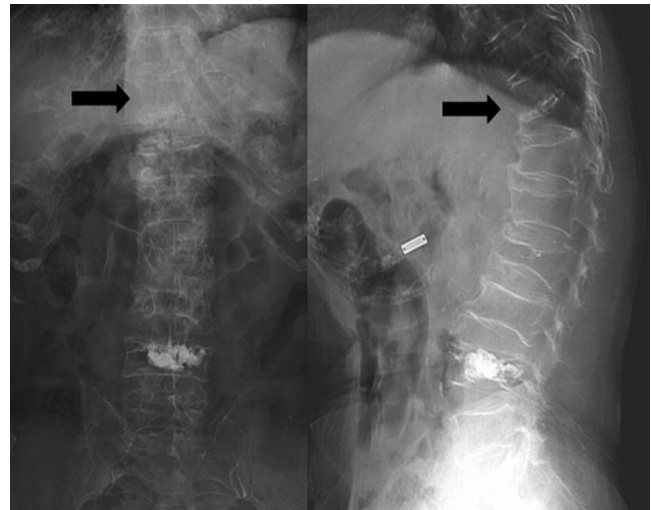


Fig. 1. Plain radiograph on 1st admission. Recent benign compression fracture of T10 body (black arrow), multiple old compression fractures of T11, T12, L1, L2, L4, and L5 with moderate kyphosis.

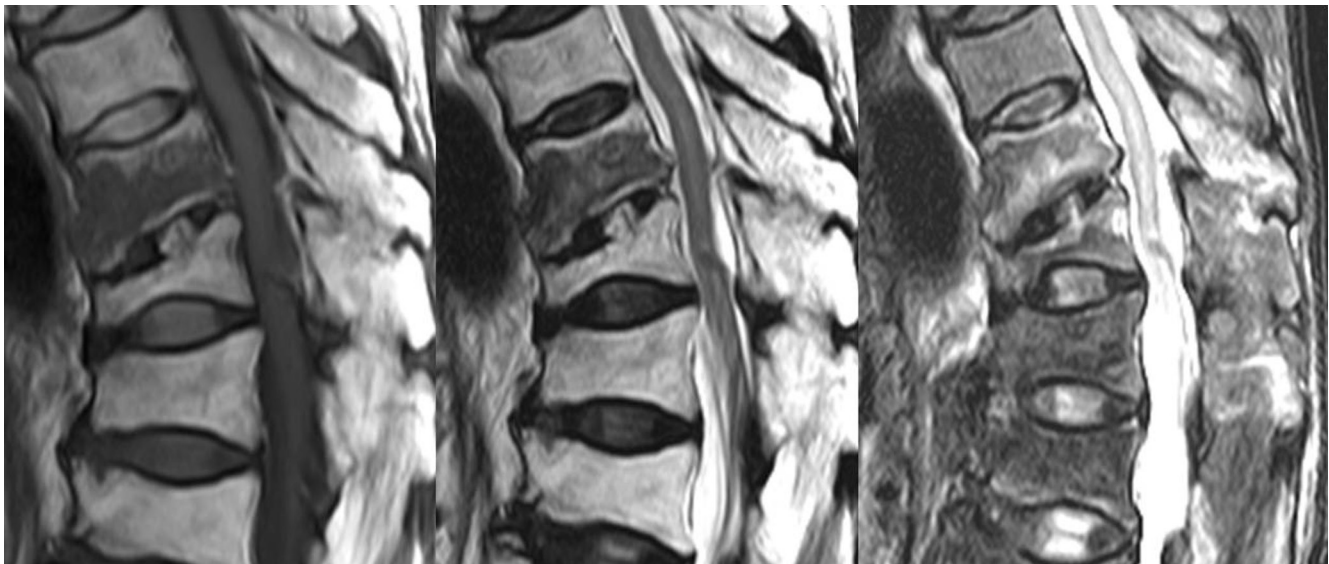


Fig. 2. MRI on 1st admission. Recent benign compression fracture of T10 body. Signal change of spinous process of T10 which suggests bone marrow edema. Multiple old compression fractures of T11, T12.

due to severe osteoporosis.

2nd admission

According to the statement by the guardian of the patient, she had her back pain injured while moving from a wheelchair to a bed, even though the patient and her guardians do not remember the exact circumstances. Motor weakness on lower extremities with voiding difficulty was noticed after the event and she visited the authors' hospital via the emergency room

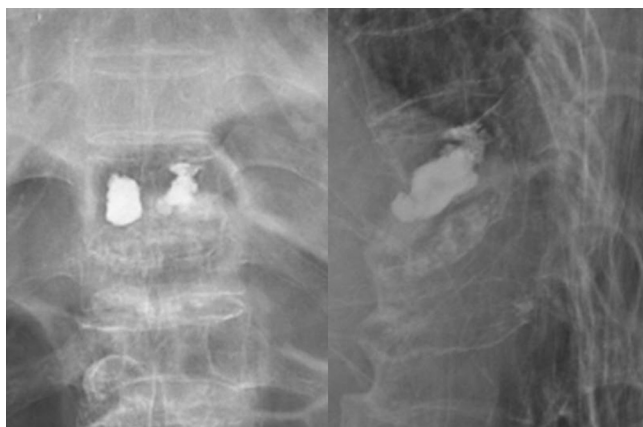


Fig. 3. Percutaneous vertebroplasty on T10 body.

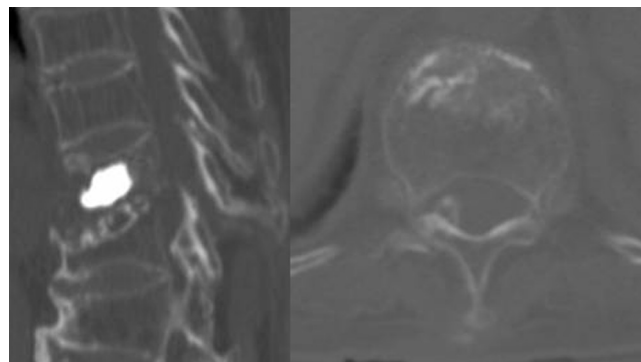


Fig. 4. CT on 2nd admission. Postoperative state of T10 body. Posterior shift of T10 segment with a fracture of spinous process. Retrolisthesis of T10-11 with rotator subluxation. Subluxation of the bilateral facet joints of T10-11. Narrowing of spinal canal at T10-11.

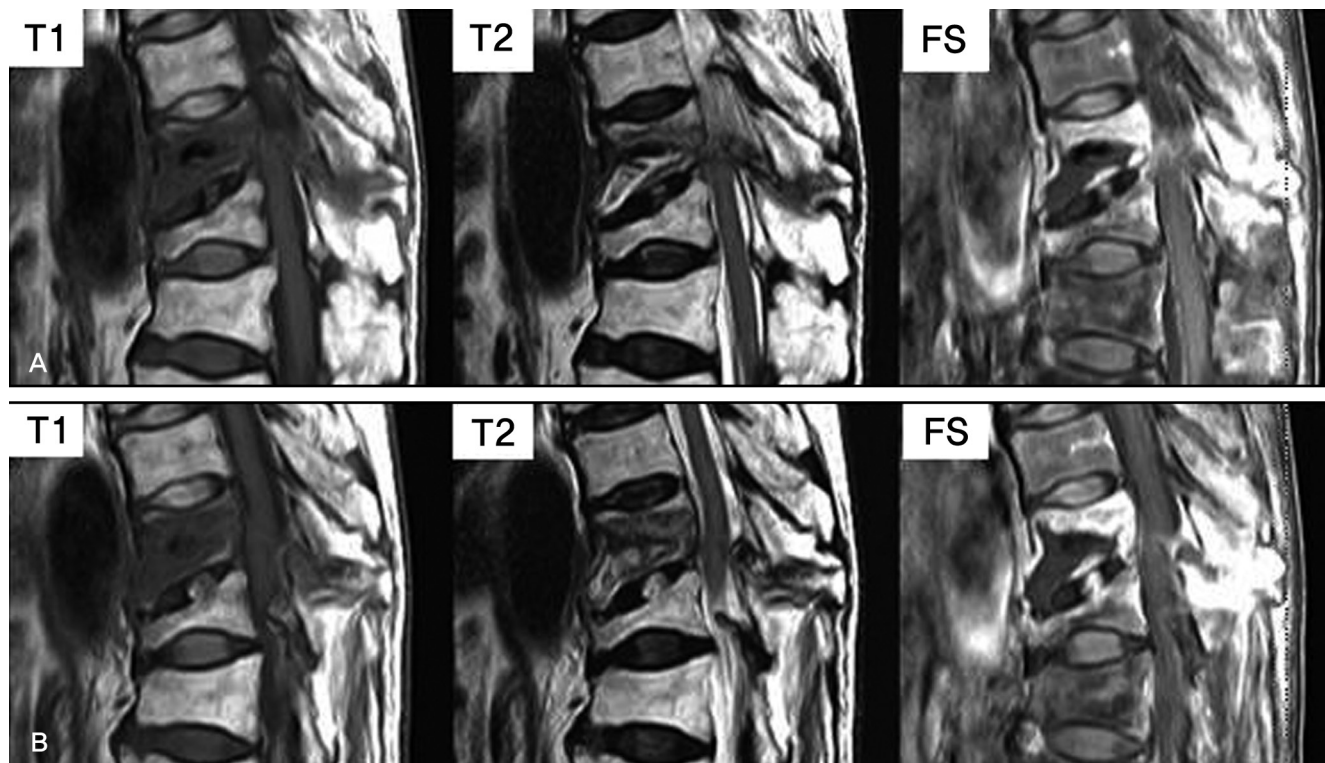


Fig. 5. MRI on 2nd admission. **(A)** Posterior shift of T10 segment with fracture of spinous process, tear of left facet joint capsule, interspinous ligament of T10-11 with retrolisthesis. Narrowing of spinal canal at T10-11 by T11 lamina. **(B)** Narrowing of the spinal canal with spinal cord compression by ossification of yellow ligament (OYL) at T11-12.

scale showed grade C: more than half of key muscles below the neurological level had a muscle grade less than 3. There was a posterior shift of T10 segment with fracture of spinous process and retrolisthesis of T10–11 with rotating subluxation. The report also revealed subluxation of the bilateral facet joints and narrowing of spinal canal at T10–11 (Fig. 4). MRI revealed posterior shift of T10 segment with fracture of spinous process, tear of left facet joint capsule, partial tear of interspinous ligament of T10–11 with retrolisthesis, and narrowing of spinal canal at T10–11 by T11 lamina. MRI also revealed narrowing of the spinal canal with spinal cord compression by ossification of yellow ligament (OYL) at T11–12 (Fig. 5). During surgery, after dissection, there was not any remarkable injury on supraspinatus ligament (Fig. 6). Decompression and laminectomy on T10, 11, and 12 and posterior instrumentation on T8, 9, 11, 12, and L1 were operated with cement augmentation on T8 and T9, due to severe osteoporosis. Follow up ASIA impairment immediate after the index surgery still showed grade C without significant difference compared with preoperative status.

DISCUSSION

Spinal stability is determined by the integrity of both bony and ligamentous elements of the spine, and injury to either of these elements may result in spinal instability.^{4,5} Therefore, determining spinal stability is essential for selecting treatment options to prevent progressive deformity, progressive neurologic deficit, and chronic pain.³ The soft tissue structures related to the stability of the spine include the supraspinous ligament (SSL), interspinous ligament (ISL), ligamentum flavum (LF), posterior longitudinal ligament (PLL), capsules of the facet, annulus fibrosus, and anterior longitudinal ligament (ALL).^{5,6} It is recognized that MRI has an increasing role in the assessment of spinal injury.⁷ Although several authors have described the usefulness of MRI in the detection of the PLC injury,^{5,8,9} its diagnostic accuracy has remained unclear. According to a report by Haba et al., the diagnostic accuracy of MR imaging for detecting injury of the SSL and ISL was 90.5% and 94.3%, respectively.⁹ This case with severe osteoporosis showed an injury to the ALL at the level of T10, but no injury on PLC was identified on the MR image. In our opinion, distraction injury developed after a minor trauma, which eventually caused spinal cord injury. Initial MRI revealed

stable osteoporotic compression fracture. But, a few days after vertebroplasty, a flexion–distraction injury was shown. There is a possibility of false negative report of the initial MRI in terms of injury to the PLC, rather than due to the minor trauma. This is an example of the counterevidence that we cannot be convinced of spinal stability even with intact PLC on MRI for a severe osteoporotic patient. It is important that we make a deliberate choice for treatment even if MRI reveals stable osteoporotic compression fracture.

Assuming the intact PLC shown on the first MRI is not a false negative, excessive loading from the inserted cement could have provoked injury to the PLC, taking into account that the trauma was unrecognizable. Incidence of adjacent subsequent fracture after vertebroplasty is higher than compression fracture at the non-adjacent segment.³ The bone marrow edema after subsequent fracture appears significantly toward the previous injected cement. Therefore, we can assume that the cement inserted during vertebroplasty could increase loading to adjacent tissue. Consequently, cement insertion may play a role to a distraction injury of the vertebral body in a severe osteoporotic bone.



Fig. 6. Intraoperative image on 2nd admission. There is no remarkable injury of Supraspinous ligament.

CONCLUSION

We still could not find out the exact mechanism of neurologic injury of this patient; our conclusion is just a speculation and patients with this condition are very rare, as it is our first experience. However, spinal surgeons should be aware of the possibility of the development of neurologic deterioration like this patient, even if a vertebroplasty is performed safely.

REFERENCES

1. Krueger A, Bliemel C, Zettl R, Ruchholtz S. Management of pulmonary cement embolism after percutaneous vertebroplasty and kyphoplasty: a systematic review of the literature. *Eur Spine J.* 2009;18:1257-65.
2. Peh WC, Gilula LA. Percutaneous vertebroplasty: indications, contraindications, and technique. *Br J Radiol.* 2003;76:69-75.
3. Han IH, Chin DK, Kuh SU, et al. Magnetic resonance imaging findings of subsequent fractures after vertebroplasty. *Neurosurgery.* 2009;64:740-4.
4. Denis F. The three column spine and its significance in the classification of acute thoracolumbar spinal injuries. *Spine (Phila Pa 1976).* 1983;8:817-31.
5. Oner FC, van Gils AP, Dhert WJ, Verbout AJ. MRI findings of thoracolumbar spine fractures: a categorisation based on MRI examinations of 100 fractures. *Skeletal Radiol.* 1999;28:433-43.
6. Lee JY, Vaccaro AR, Schweitzer KM Jr, et al. Assessment of injury to the thoracolumbar posterior ligamentous complex in the setting of normal-appearing plain radiography. *Spine J.* 2007;7:422-7.
7. Lee HM, Kim HS, Kim DJ, Suk KS, Park JO, Kim NH. Reliability of magnetic resonance imaging in detecting posterior ligament complex injury in thoracolumbar spinal fractures. *Spine (Phila Pa 1976).* 2000;25:2079-84.
8. Petersilge CA, Pathria MN, Emery SE, Masaryk TJ. Thoracolumbar burst fractures: evaluation with MR imaging. *Radiology.* 1995;194:49-54.
9. Haba H, Taneichi H, Kotani Y, et al. Diagnostic accuracy of magnetic resonance imaging for detecting posterior ligamentous complex injury associated with thoracic and lumbar fractures. *J Neurosurg.* 2003;99(1 Suppl):S20-6.

골다공증성 척추골절의 추체성형술 후 지연 발생한 하지마비 (증례보고)

김용찬* · 손원수* · 서보경* · 정남수† · 김석우*
 한림대학교 의과대학 정형외과학교실*
 아주대학교 의과대학 정형외과학교실†

연구 계획: 증례 보고

목적: 단순 골다공증성 척추 골절에 대해 추체성형술 시행 후, 후주의 손상을 동반한 탈구로 인해 불완전 하지마비를 보인 증례 1 예를 경험하였기에 보고하고자 한다.

선행 문헌의 요약: 추체성형술은 골다공증성 척추 골절에 대해 안전하고 유효한 술식이나, 신경 손상을 일으키는 합병증들이 보고되고 있다.

대상 및 방법: 내원 12일전 골다공증성 단순 압박골절에 대해 추체성형술을 시행받은 81세 여자 환자가 내원 전 특별한 외상 없이 나타난 양측 하지 운동 및 감각 마비를 주소로 내원하였다. 영상 검사상 골절 추체 후주에서 후종인대 부분 파열, 극돌기 골절, 후관절낭 손상 등을 동반한 후방 탈구 소견이 관찰되었다.

결과: 응급으로 척추경 나사를 이용한 관혈적 정복 및 척추기기 고정술을 시행하여 신경 조직의 감압을 시행하였으나, 신경학적 증상의 회복은 만족스럽지 못하였다.

결론: 정확한 기전은 알 수 없으나, 추체성형술 후 후주의 손상이 악화되었을 가능성을 배제할 수 없다.

색인 단어: 하지마비, 추체성형술, 골다공증, 압박골절

약칭 제목: 추체성형술 후 지연 하지마비