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Title: A Rare and Unusual Complication of Kyphoplasty; A Case Report of Spinal Subdural Hemorrhage

Running Head: Spinal subdural hemorrhage after kyphoplasty

Başlık: Kifoplasti sonrası gelişen nadir ve beklenmeyen bir komplikasyon; Spinal subdural kanamaya ait olgu sunumu

Kısa Başlık: Kifoplasti sonrası gelişen subdural hematom

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Öz

Vertebra kırığı tedavisinde kifoplasti en masum tedavi modalitesi olarak görünmektedir fakat kifoplasti enjeksiyonu sonrası vertebral alanda artan venöz basınç artışı ciddi komplikasyonlara da neden olabilir. Amaç; Perkütan balon kifoplastidan altı saat sonra gelişen geç başlangıçlı spinal subdural hematoma olgusunu paylaşmak. Olgu; 58 yaşında kadın hastaya akut lomber ikinci vertebra kırığı tanısı ile Kifoplasti yapıldı. Altı saat sonra, geç başlangıçlı nörolojik defisit ve ayak ağrısı gelişti. Acil lomber MR çekildi. Lomber MRda intraspinal kanama saptandı ve spinal subdural hematoma boşaltılması operasyonu yapıldı. Sonuç; Kifoplasti sonrası artan venöz basınca bağlı rüptüre olan venöz yapıların spinal subdural-epidural hematoma neden olabileceği düşünülmektedir. Bu hematomlar hızlı bir şekilde boşaltılmalıdır, aksi halde kalıcı nörolojik komplikasyon gelişebilir.

Anahtar sözcükler: Polimetilakrilat, Subdural hematoma, Kifoplasti, İntraspinal hemoraji polymethylmethacrylate cement, subdural hemorrhage, kyphoplasty, intraspinal hemorrhage
A Rare and Unusual Complication of Kyphoplasty; A Case Report of Spinal Subdural Hemorrhage

Abstract

Kyphoplasty appears to be the most innocent treatment modality in the vertebral fractures but percutaneous injection of kyphoplasty cement might cause serious complications due to increase venous pressure in paravertebral space after cement injection. Our aim is to report a case of late onset of spinal subdural hemorrhage after the six hours of percutaneous balloon kyphoplasty. A 58 year old female patient with an acute compression fracture of the second lumbar vertebrae underwent percutaneous balloon kyphoplasty. After six hours, the patient had a late onset of neurological deficits and leg pain. Emergent lumbar MR was performed. MR revealed intraspinal hemorrhage, patient was operated and spinal subdural hemorrhage was removed. Spinal subdural or epidural hemorrhage is believed to occur because of increased venous drainage pressure which leads to rupture of venous vessels after kyphoplasty. These hematomas should be evacuated emergently otherwise irreversible neurological complications can occur.

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Key words; polymethylmethacrylate cement, subdural hemorrhage, kyphoplasty, intraspinal hemorrhage

Introduction

Kyphoplasty is a minimal invasive surgical procedure for treatment of vertebral body compression fractures. Complication rate is low, 1-2% for osteoporotic fractures, 5-10% for metastatic lesions (1,2). The most common complication is temporary increase in pain following procedure. Development of acute radiculopathy was reported in 5% of cases. Cement leakage is a common complication, especially in lytic lesions and was reported between 30-70% of cases (3). Other well-known complications include fractures of the ribs or pedicle, pneumothorax, spinal cord compromise and infection. More severe complications such as pulmonary embolism and death during or immediately after vertebroplasty or kyphoplasty were also reported in the literature (3-5).

The cause for these complications have not been elucidated, but it was thought to be related to insufficient polymerization of the PMMA at the moment of injection or number of fractured vertebral bodies treated. In this article we reported a case of late onset intradural hemorrhage following single level kyphoplasty.

Case Presentation

A 58 year old female patient came to our neurosurgery outpatient clinic with severe low back pain. She stated the she fell backwards 3 days ago. **Patient's past medical history was unremarkable and she wasn't using any medications.** She was neurologically intact during physical examination and her initial evaluation routine lumbar X-ray studies revealed a L2 compression fracture. Magnetic Resonant Imaging (MRI) using Short Tau Inversion Recovery (STIR) sequences of the patient revealed an acute compression fracture of L2 with %40 loss of vertebral body height and a slight angulation toward the spinal canal at its superior end-plate (Figure 1 A-B). The patient was admitted to clinic for balloon kyphoplasty, after routine preparations she underwent a bipedicular L2 vertebral kyphoplasty (Figure 1 C-D). Following kyphoplasty patient's pain was completely resolved and she

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had no neurological deficit. 6,000 units of low molecular weight heparin was prophylactically administered to the patient in case of a pulmonary embolism that could develop postoperatively.

The patient was mobilized six hours after surgery. During mobilization, patient reported pain in her legs. She had no neurological deficit at that time. The patient was sent for lumbar computed tomography (CT) imaging for control purposes. No pathological findings were detected on the CT. Patient, then was evaluated with a lumbar MRI to find the cause of the pain. MRI showed that there was a consistent collection of acute intradural hematoma inside the dural sac approximately 8 cm in length, between L1 between L3 vertebra bodies, causing a significant compression of the dural sac fibers (Figure 2 A-B). The patient was emergently taken to operation room for decompression of the spinal canal. During surgery epidural area was observed clean without any hemorrhage or cerebrospinal fluid (CSF) leakage. Dura mater was also intact but purple colored collection was readily observed inside the sac. Durotomy thorough a **wide decompressive laminectomy** was performed, intradural hematoma was easily seen and afterwards evacuated successfully. Dural opening was closed with duraplasty. Hemostasis for a significant bleeding from an epidural vessel was achieved using application of fibrin glue and operation finished.

There was no significant neurological deficit early post-operative examination. 24 hours later she had right leg pain with paraparesis. MRI study of the patient revealed an epidural hemorrhage with dimension of 20.4 mm, 21.6 mm, 19.9 mm in the L1-L2-L3 levels (Figure 2 C-D). So we drained the epidural hemorrhage caused by an epidural vessel. It was observed that the neuromotor deficit of the patient was better, gradually decreased after the final operation. With rehabilitation program, on the eighth day, the patient began to walk independently. Then the patient was discharged to the outpatient clinic control.

Discussion

Osteoporosis has been defined as a systemic syndrome involving primarily the skeleton, characterized by low bone mass and micro architectural degeneration of bone tissue, leading to bone fragility and increasing fracture risk (6). The major clinical manifestation of osteoporosis is fracture (7). Most osteoporotic vertebral fractures are treated conservatively with a bed rest period, pain

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control with analgesics, bracing, early rehabilitation and osteoporosis treatment with bisphosphonates (8).

Percutaneous vertebroplasty is a therapeutic strategy that gained increasing popularity among the neurosurgical community for the treatment of refractory axial mechanical pain due to osteoporotic fractures, malignancy fractures and painful hemangiomas(5). With time, the indications for vertebroplasty were extended to include acute traumatic vertebral compression fractures(9). Complications reported in literature are often related to the cement extravasation into the epidural space(10). Causing spinal cord compression, or related to the cement migration through the epidural veins to the venous system leading to pulmonary embolism(11). To our knowledge only 6 cases of subdural hematoma (SDH), including our own, have been reported in literature (5, 10-12). This complication was seen rarely before. After understood that written consent had been taken from the patient to share it with the literature.

Tropean et al(5), Cosar et al(10), Mattei et al(11), Lee et al(12) reported their patients who developed spinal SDH after vertebroplasty. Time to start symptoms differed from immediate to two week. They operated their patients when neurological deficit occurred except Lee et al(12). Lee et al. didn't need a surgical treatment because their patient's didn't have a neurological deficit. All their patients recovered without neurological deficits.

When we reviewed the literature, it was found that cases of subdural hematoma developed following vertebroplasty / kyphoplasty were usually caused by slow infiltration of epidural hemorrhage into subdural space after dural injury during operation(12). Some authors also suggested that source of these subdural hemorrhages could be extra arachnoid vessels that have been identified on the inner dural surface. These vessels possibly ruptured because of elevated pressure due to venous congestion caused by cement thrombosis of vertebral venous plexus(13). In our case we were sure that we had no dural injury during the operation and the track of Jamshidi needle can be easily seen that it was only in the pedicle area with no crossing over sign at post-operative CT scans and MRI. Also we didn't find any collection of CSF or dural tear during our operation for evacuation of subdural hemorrhage.

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Conclusion

As a result, our case is a very rare postoperative complication of kyphoplasty. Subdural or epidural hemorrhage is believed to occur because of increased venous drainage pressure which leads to rupture of venous vessels. These hematomas should be evacuated emergently otherwise irreversible neurological complications can occur.

Conflict of interest

The authors certify that neither they nor a member of their immediate family has funding or commercial associations (e.g., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted article.

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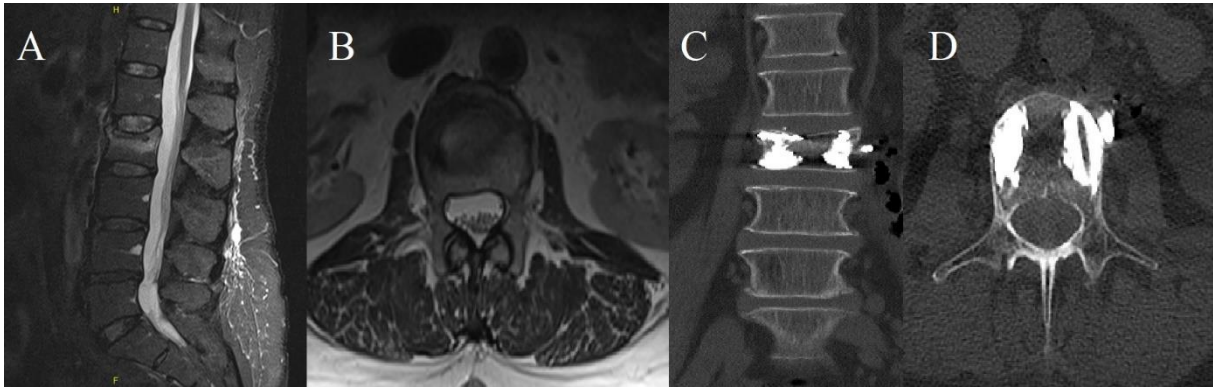
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Figure 1:



A: Preop sagittal lumbar STIR MR revealed L2 acute vertebra fracture

B: Preop axial lumbar T2 MR revealed no pathology at the level of fracture

C: Postoperative coronal CT revealed no pathology

D: Postoperative axial CT revealed normal route of jamshidi needle

Figure 2:



A: Postoperative T2 sagittal MR revealed intraspinal hemorrhage

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B: Postoperative contrast enhanced axial MR revealed subdural hemorrhage

C: After second operation T2 sagittal MR revealed epidural hemorrhage

D: After second operation T2 axial MR revealed epidural hemorrhage

UNCORRECTED

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