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Case Report

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EFFECTIVE TREATMENT OF LUMBER VERTEBRAL COMPRESSION FRACTURE WITH PEDICLE SCREW FIXATION: A CASE REPORT AND LITERATURE REVIEW

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ABSTRACT

Background: Compression fractures in the lumbar spine, known as VCFs, are frequently seen in individuals with osteoporosis and can be worsened by incidents such as road accidents. One surgical method utilized to stabilize these fractures is pedicle screw internal fixation, which offers pain relief and helps to restore proper spinal alignment. The L1 vertebra is particularly susceptible to fractures due to its location and the mechanical stress it endures. Patients with VCFs may find relief and stabilization through pedicle screw internal fixation, which can swiftly alleviate discomfort. This case study Article examines the experience of a female patient who suffered an L1 vertebral fracture as a result of a vertebral compression fracture and assesses pertinent literature to serve as a resource for clinical diagnosis and treatment.

KEYWORDS: Vertebral compression fracture, L1 vertebra fracture, pedicle screw fixation, internal fixation, spinal stabilization, case report and literature review.

CASE STUDY

A 51 years old female patient was admitted to the hospital due to multiple pain in the waist and discomfort in legs caused by a car accident. She had no history of trauma and had no working history of squatting and moving heavy objects for more than 1 year. She had no underlying disease. VAS score was 8 points. She had painful expression and unable to walk. She had numbness of both legs. No obvious abnormality in muscle strength. Emergency abdominal CT (Figure 1) showed fracture of the lumber vertebral body. Further MRI examination (Figure 2) confirmed the existence of Lumber 1 vertebral compression Fracture. For this patient, at first we carried out non-surgical conservative treatment, including bed rest, Cephalosporin antibiotics and NSAIDs. After 3 days follow up period patient's pain had not relieved compared with the admission. Then we made a decision to perform Pedicle Screw Fixation Surgery. After surgery the patient's pain was significantly relieved. At follow up visit 6 weeks after discharge, the patient complained that the pain had completely relieved.

DISCUSSION

A compression fracture of the vertebrae occurs when a vertebral bone in the spine collapses, becoming compressed and reduced in height. VCFs are the most frequent type of fractures caused by osteoporosis and have a major impact on the health and quality of life of the elderly. Because of its location in the body and the mechanical stress it undergoes, the L1 vertebra is especially susceptible to these fractures.

Medical attention is often necessary for acute back pain, decreased mobility, and deformity caused by VCFs. Conventional management strategies involve traditional approaches such as using braces, undergoing physical therapy, taking pain relievers antibiotics and NSAID. Nevertheless, these methods might not be enough for serious fractures or persistent issues. Pedicle screws for internal fixation is a surgical method that offers instant stabilization, relieves pain, and restores spinal alignment when treating traumatic VCFs.[1] This article outlines a comprehensive examination of treating an L1 vertebral compression fracture in a 51-year-old woman after a car accident, along with an analysis of existing research.

A woman aged 51 with lower back pain and discomfort was sent to the inpatient Orthopedic Department from the emergency room after a car accident. The patient

reported intense pain in the lower back and an inability to stand or walk. During the physical exam, it was found that there was tenderness in a specific area of the lumbar spine, significant pain when touched, and limited movement. Imaging test plain CT scan showed L1 vertebral body fracture and MRI confirmed a compression fracture of the L1 vertebra with bone marrow edema and spinal instability. Dual-energy X-ray absorptiometry (DEXA) scan indicated severe osteoporosis with a T-score of -3.1.

Initially, the patient received bed rest and treated by Cephalosporin antibiotics, NSAIDs for 3 days. After taking conservative treatments, the patient had denied feel better compared with admission day. After that we decided to perform a surgery with Pedicle Screw internal Fixation on her T12-L1-L2 vertebrae.

Pedicle screw internal fixation is a highly invasive surgical procedure that provides prompt spine stabilization.[2] This method consists of placing screws and rods into the pedicles of the vertebrae, offering strong mechanical support and enabling the restoration of spinal alignment. Research indicates that the use of pedicle screw fixation can greatly decrease pain, enhance functional results, and improve spinal stability for individuals with VCFs. This surgical method is especially advantageous for patients with marked instability or those who do not improve with non-surgical treatment.[3]

In the operation room, After successful general anaesthesia, the patient was placed in a prone position and placed on a pillow in the upper chest and iliac region for reduction of the Lumber 1 fracture position. After satisfactory C-arm fluoroscopy, the pedicle of the thoracic 12, lumbar 1, and lumbar 2 vertebrae were positioned and marked. After disinfection, lay sterile towels and sheets on the field. Dispose of the puncture hollow guide needle at the marked point, insert a guide wire after satisfactory fluoroscopy, make a skin incision of about 1.5cm, place an expansion sleeve to the bone, tap the nail path, and screw in a total of six pedicle screws for thoracic 12, lumbar 1, and lumbar 2 one by one. Install bilateral fixing rods after satisfactory anterio-posterior and lateral fluoroscopy during surgery, rinse the incision after satisfactory fluoroscopy, and suture the subcutaneous tissue and skin layer by layer. Cover the incision with sterile dressings, count the instruments and gauze accurately.[4] There was not much intra-operative bleeding, and the patient's vital signs were stable. The surgery went smoothly and the anesthesia was satisfactory. After the surgery the patient returned to the ward safely. After surgery, the patient felt decrease of the pain and better functional movement. The post operative imaging X- ray (Figure: 3) and CT Scan (Figure: 4) verified the correct positioning of the pedicle screws and the realignment of the spine. The patient could walk with help and stated a significant enhancement in her quality of life.

Numerous research studies have shown the effectiveness of using pedicle screw fixation for treating vertebral compression fractures, particularly in situations where trauma is involved. Magerl et al. (1994) found that pedicle screw fixation offers significant biomechanical stability and is successful in treating unstable spinal fractures. Kim and colleagues (2012) demonstrated noteworthy enhancements in pain ratings and functional results in individuals with osteoporotic VCFs through the utilization of this method. Vaccaro and colleagues (2002) highlighted the significance of selecting the right patients and using the correct surgical methods to enhance results and reduce complications. Less invasive procedures such as vertebroplasty and kyphoplasty result in faster recovery and reduced post-surgery discomfort, however, they might not offer sufficient support in instances of severe instability or fractures involving multiple levels. Even though pedicle screw fixation is more invasive, it provides better mechanical stability and is especially advantageous for complex fractures with significant vertebral body collapse or neurological compromise.[5] VCFs are a common and debilitating result of osteoporosis, particularly in the elderly demographic, impacting approximately 25% of females above 50 years old. Osteoporosis weakens bone micro architecture and reduces bone mass, leading to increased bone fragility and susceptibility to fractures. The bio-mechanical stress of the lumbar spine increase the susceptibility of the L1 vertebra. VCFs have a notable effect on quality of life, leading to pain, spinal deformity, and reduced function. Non- invasive care options are physical therapy, wearing a brace, taking pain medication, and staying in bed. Nevertheless, in severe cases of discomfort and instability, these methods frequently prove to be inadequate. Extended periods of laying in bed and not moving can result in issues such as muscle loss, blood clot formation, and reduced bone strength. When conservative interventions are insufficient, surgical treatments are necessary. Percutaneous vertebroplasty and kyphoplasty are minimally invasive treatments that require injecting bone cement into the vertebral body in order to repair fractures.[6] Nevertheless, these procedures might not be advantageous for every patient, particularly those with significant spinal instability. Pedicle screw internal fixation provides instant stability, alleviation of discomfort, and restoration of spinal alignment. Research has indicated that this method effectively decreases pain, boosts functional results, and strengthens spinal stability in patients with VCF.[7] Research needs ongoing to find ways to improve the outcomes of pedicle screw fixation, such as creating bioactive materials to strengthen bones and using advanced imaging methods for more effective preoperative preparation. Moreover, research is being conducted on combining drug therapies with surgical procedures to enhance bone health and decrease the likelihood of fractures.

In a summery, Internal fixation using pedicle screws is a

viable and effective treatment choice for dealing with lumbar spinal compression fractures caused by trauma, especially in patients with osteoporosis and substantial instability. This process provides great pain relief, spinal support, and functional recovery, serving as a beneficial option compared to conservative treatment and minimally invasive techniques. This literature reviews the use of pedicle screw fixation in complex VCF patients, emphasizing how the procedure can enhance patient outcomes and quality oflife.

Figures

Figure 1: CT plain scan, A lateral view showing L1 vertebrae fracture.

Figure 2: MRI scan, sagittal view and transverse view of lumber MRI scan showsL1 vertebrae fracture.

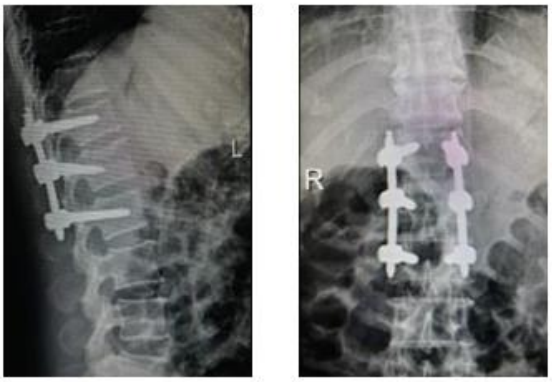

Figure 3: Post operative plain X-ray shows the correct position of the pediclescrews.

Figure 4: Post operative plain CT scan shows the correct position of the pediclescrew and CT three dimensional reconstruction shows realignment of the spine.

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