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Successful non-surgical treatment for highly unstable fracture-subluxation of the spine secondary to myeloma

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Structured Abstract

Background Context: In multiple myeloma (MM) patients may develop rapidly progressive, lytic, spinal lesions. These may result in spinal instability but instrumented stabilization may fail due to the poor bone quality. In addition, patients are immunocompromised and are therefore at increased risk of deep infection.

Purpose: The aim was to describe a patient presenting with an unstable fracture-subluxation of the thoracic spine secondary to myeloma, successfully treated with non-surgical management.

Study Design / Setting: This is a case report of a patient seen in a specialist spinal myeloma service.

Methods: A 74 year old, Caucasian female presented with destructive myelomatous lesions of T9 and T10. Greater than 50% of the T9 vertebral body was involved and there was subluxation and translation of T9 on T10 (SINS score 14). There was a single episode of transient paraesthesia of both lower limbs. The patient was in considerable pain, requiring large quantities of opioid analgesia. She was treated non-surgically in a thoracolumbar sacral orthosis for a period of 3 months (strict bed-rest for the first 3 weeks).

Results: A CT scan at 3 months demonstrated bony fusion and the brace was removed. The patient returned to her normal activities 5 months post-treatment. Her pain and patient reported outcomes scores were significantly improved.

Conclusions: We present the successful non-surgical management of an unstable myelomatous vertebral fracture without neurological deficit. However, surgical stabilization remains the treatment of choice in unstable vertebral fractures and spinal surgical opinion should be sought in all cases.

Keywords

Myeloma; vertebral fractures; non-surgical treatment; unstable fracture;

Objective:

Patients with multiple myeloma (MM) often develop numerous, lytic, vertebral lesions. These lesions may rapidly increase in size, eventually resulting in vertebral fractures. [1] Vertebral compression fractures associated with MM may be successfully managed with cement augmentation. [2] More unstable vertebral fractures are better managed with surgical stabilization. [3] The quality of bone in patients with myeloma is, however, often poor due to a combination of bone reabsorption and steroid induced osteoporosis. [4] Surgical fixation of vertebral fractures in this setting may therefore carry an increased risk of failure. [5] A recent case report suggested vertebral fractures in MM can be successfully managed non-surgically if the myeloma is adequately controlled. [6]

We present the case of a patient with an unstable thoracic fracture-subluxation, secondary to myeloma, in whom we were concerned surgical stabilization would fail. This patient was successfully managed non-surgically and returned to her pre-fracture level of function.   We discuss our management and the rationale behind our choice of treatment.

Clinical Presentation:

A 74 year old Caucasian female was referred to our specialist spinal myeloma unit in May 2015 with an unstable fracture-subluxation of T9/T10. She was diagnosed with MM (IgG Lambda subtype) 5 months prior to presentation and commenced on chemotherapy.

Our patient initially presented to her local hospital in February 2015 with severe thoracic back pain. Magnetic resonance imaging (MRI) of her spine demonstrated myelomatous infiltration of the T9 vertebra with extension of soft tissue tumour into the spinal canal. There was associated spinal cord impingement (Figure 1) but no neurological deficit. She was treated with high dose steroids, Velcade, and Melphalan but did not receive radiotherapy.

Over the next 2 months the patient’s paraprotein levels improved but her back pain significantly deteriorated. By April 2015 she required 60mg of slow-release morphine twice daily. Repeat MRI demonstrated a fracture-subluxation of T9/T10 with no residual soft tissue in the spinal canal (Figure 2). The patient experienced a single, transient episode of numbness and paraesthesia in both lower limbs, but had no other neurological deficit. The patient was referred to us emergently and we performed a computed tomography (CT) scan to assess spinal stability. This demonstrated a fracture-subluxation of T9/T10 (Figure 3). Her spinal instability neoplastic score (SINS) score was 14 indicating an unstable fracture, requiring stabilization.

At presentation to our service she had a EuroQol-5 Dimension (EQ-5D) score of 0.566, an Oswestry Disability Index (ODI) of 42 and a Roland Morris Disability (RMD) score of 12. Her medical history included hypertension, hypothyroidism, previous venous thromboembolism, and hypercholesterolemia. Prior to her diagnosis of MM she was independently mobile.

Treatment:

Our patient had no persistent neurological deficit and had recently completed high dose chemotherapy and a prolonged course of steroids. We were concerned about failure of fixation and poor wound healing and so opted to manage her fracture non-surgically.

The patient was admitted to a spinal ward and placed in a 'clam-shell' thoracolumbar sacral orthosis (TLSO). She was managed with strict bed rest and 4-man log rolls. Prophylactic low-molecular weight heparin was administered once daily and bisphosphonates were commenced. A repeat CT scan was performed after 3 weeks of immobilization. No further displacement of the fracture was seen and the patient was allowed to mobilize in her TLSO.

Outcome:

Repeat CT scan 3 months post immobilization demonstrated satisfactory evidence of bony fusion and the TLSO was removed. At 5 month follow-up a further CT scan demonstrated solid fusion of the T9 and T10 vertebrae (Figure 4). By this time the patient had returned to all her normal activities and no longer required opioids. Her EQ-5D improved to 0.744, ODI improved to 30, and RMD improved to 8.

Discussion:

The SINS score has been shown to reliably assess the stability of pathological vertebral fractures. [7] In our case of fracture-subluxation at T9/T10, the SINS score at presentation was 14 (location: 1 point, mechanical pain: 3 points, lytic lesion: 2 points, subluxation: 4 points, > 50% collapse: 3 points, unilateral posterior involvement: 1 point). The fracture was therefore classified as unstable and surgical stabilization has been shown to be effective in this patient group. [3]

However, achieving successful fusion with internal fixation in the setting of lytic deposits and osteoporotic bone is challenging. [5] Furthermore, our patient was immunocompromised following high dose chemotherapy and steroids and we were concerned with the increased risks of poor wound healing and deep infection. Minimally invasive spinal stabilization (MISS) has gained popularity in recent years with the perceived advantages of faster recovery and reduced wound complications. [8] Although the use of MISS was considered for this case, we were concerned with the potential of screw cut out due to poor quality bone.

Recently released guidelines on the management of spinal myeloma suggest unstable pathological fractures, or fractures with extensive bony destruction may be considered for treatment with a TLSO or cement augmentation. [2] In this case the fracture configuration was not suitable for cement augmentation and our patient's myeloma had responded to chemotherapy: the soft tissue mass in the spinal canal had resolved. We have previous experience of successful non-surgical management of myelomatous vertebral fractures [6] and our patient had no persistent neurological deficit. We therefore opted to manage this fracture non-surgically.

The patient was admitted to a spinal ward and immobilized with a TLSO and spinal precautions. Due to the level of the fracture cervical immobilization was not deemed necessary. Our preferred form of bracing in myeloma patients is a front-opening TLSO. In this case, however, we opted for a more rigid, thermoplastic, 'clam-shell' brace as it prevents rotation, flexion, and extension of the spine, and can be worn and removed whilst recumbent.

In MM there is an uncoupling of the balance between osteoblasts and osteoclasts leading to bony reabsorption. [4] When the disease is adequately controlled the balance is restored allowing formation of new bone. We liaised closely with the patient's hematologists to ensure her myeloma remained well controlled throughout the treatment period. By 3 months sufficient bony fusion had occurred to allow removal of the TLSO. By 5 months the patient had returned to all normal activities with minimal pain and significantly reduced analgesic requirements. The latest CT scan (Figure 4) demonstrated a vacuum phenomenon at the T8/T9 disc space, but not between the T9 and T10 vertebral bodies. This indicated sufficient stability had occurred to prevent movement between the vertebral bodies. Extra-osseous bone formation was seen between the affected and adjacent vertebrae, and conferred additional stability.

Conclusions:

We present the case of a patient with spinal myeloma and an unstable thoracic fracture-subluxation. The patient was successfully managed non-surgically. However, surgical stabilization remains the gold-standard for management of unstable spinal fractures and should be considered in all patients. Where there are concerns regarding wound healing, MISS may be considered. Good control of the myeloma is essential and aids in fracture healing and new bone formation. Further comparative studies are required to determine the role of non-operative management in unstable vertebral fractures in MM.

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Figure Captions:

Figure 1: Initial MRI (February 2015)

Initial MRI showing myelomatous involvement of the T9 vertebral body. Figure 1A shows the T1-weighted sagittal slice demonstrating involvement of the vertebral body. Figure 1B shows the T2-weighted sagittal slice demonstrating soft tissue in the spinal canal, causing impingement on the spinal cord.

Figure 2: Repeat MRI (April 2015)

Repeat MR scan showing resolution of the soft tissue spinal mass but progressive collapse of both T9 and T10 with fracture-subluxation. Figures 2A and 2B show sagittal STIR slices in the mid sagittal plane and the right para-sagittal plane. Figure 2C shows the T2-weight axial slice through the fracture site, demonstrating the inferior portion of T9 (right) and the superior portion of T10 vertebral body (left).

Figure 3: CT scan on presentation demonstrating Fracture-subluxation

CT scan showing the fractures of T9 and T10 at presentation. Figures 3A and 3B show the sagittal slices in the left and right parasagittal planes respectively. There was almost complete lytic destruction of the left side of the T9 vertebral body and pedicle with antero-lateral subluxation on T10. The T10 vertebral body had lytic destruction anteriorly. Figures 3C and 3D show the coronal reconstructions in the mid-coronal and anterior para-coronal planes respectively.

Figure 4: CT scan 5 months after treatment demonstrating fusion

CT showing fusion has occurred. Figure 4A is a sagittal view demonstrating fusion of T9 and T10 vertebral bodies. Figure 4B is a coronal slice showing fusion of the T9 and T10 vertebral bodies and also demonstrating extra-osseous bone formation, most apparent on the right hand side. Figure 4C is also a coronal view showing vacuum phenomenon in the T8/T9 disc but no vacuum phenomenon in between the T9 and T10 vertebral bodies confirming fusion.