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Case Report

DISTINGUISHING SPINAL CANCER AND DEGENERATIVE DISEASE: ENHANCING DIAGNOSIS AND TREATMENT OUTCOMES IN PLASMACYTOMA

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ABSTRACT

Introduction: Spinal lesions commonly exhibit overlapping clinical presentations and imaging characteristics, which can obscure the distinction between malignant and degenerative etiologies. This diagnostic ambiguity may lead to delayed or inappropriate treatment, particularly in uncommon neoplastic entities such as plasmacytoma, a solitary manifestation of plasma cell dyscrasia that often involves the spine.
Case Report: We report the case of a 63-year-old male presenting with one month of persistent back pain, progressive bilateral lower limb weakness, and tingling sensations radiating from the inguinal region to the toes. Imaging studies revealed bilateral pedicle destruction at the L2 and L5 vertebrae, along with significant spinal canal and foraminal stenosis. The patient underwent decompression surgery, and histopathological analysis of the lesion confirmed the diagnosis of plasmacytoma.
Discussion: Spinal plasmacytoma is a rare neoplastic condition that can clinically mimic degenerative spine disorders, often leading to delays in diagnosis and treatment. Symptoms such as chronic back pain, radiculopathy, and motor weakness are commonly attributed to more prevalent degenerative pathologies, particularly in older adults. Back pain in individuals with a history of malignancy serves as a crucial warning sign, prompting clinicians to urgently assess for potential metastatic disease in the spine.
Conclusion: Increased awareness and a high index of suspicion are crucial when evaluating spinal lesions. Pain should be considered a key red flag warranting prompt assessment for possible spinal malignancy. Early diagnosis is critical, as it directly affects therapeutic decisions and overall prognosis.

Keywords: Back pain, Spinal Cord Compression, Degenerative Disease, Plasmacytoma

INTRODUCTION

Malignant spinal cord compression (MSCC) is a frequent oncologic emergency that demands swift diagnosis and urgent intervention to alleviate pain and prevent irreversible neurological damage. It typically arises in the context of either primary or metastatic cancers. The most prevalent tumors leading to spinal metastasis and MSCC are of epithelial origin, The most common malignancies metastasising to the

spine and causing MSCC are epithelial, most frequently lung (24%), breast (21%) and prostate (20%), which account for >50% of cases. Other contributing malignancies include renal cell carcinoma, multiple myeloma, lymphoma, gastrointestinal cancers, and melanoma.[1]

Differentiating back pain of spinal cord compression from that of degenerative joint disease is critical.[2] Pain of degenerative joint disease almost always affects the low cervical or low lumbar spine, whereas pain of metastatic compression occurs at any level. Lying down improves the pain of degenerative disease but typically worsens pain due to metastatic compression. These degenerative processes lead to spinal canal narrowing, they may cause myelopathy or neurological impairments due to spinal cord compression.[2] There is significant clinical overlap between serious underlying causes of back pain ("red flags") and the potential for spinal cord compression. Key warning signs that should prompt spinal imaging include age over 65, recent onset of gait disturbances, loss of bladder or bowel control, use of corticosteroids, midline spinal pain, and evidence of spinal contusion on physical examination, particularly in trauma cases.[3,4]

Pain, whether localized or radicular, is the most common presenting symptom, affecting over 90% of patients. Because of its high incidence and early onset, back pain serves as a critical warning sign.[2] Accurately distinguishing this pain from other etiologies requires clinical expertise, particularly from neurologists, to identify early vertebral involvement in patients presenting with back pain. Failure to recognize the early signs of MSCC can lead to permanent neurologic damage making it imperative that treatment interventions are implemented early for better outcomes.

CASE REPORT

We report a case of 63-year-old man presented with a one-month history of persistent lower back pain, progressively worsening bilateral lower limb weakness, and tingling

sensations radiating from the inguinal region to the toes. The pain was described as constant, all-day, band-like in the upper back area, with a Numeric Rating Scale (NRS) of 6-7. The pain exacerbated with lying flat or walking, improved with analgesics. He had no prior history of malignancy or trauma. Neurological assessment showed paraparesis, with full motor strength in both upper limbs. In the lower limbs, motor strength was reduced to 2/2 on the right and on the left**.** Abdominal reflexes, both superficial and deep, were absent. Sensory testing revealed reduced sensation (hypesthesia) below the L2 level**.** Initially, the patient was diagnosed with lumbar degenerative disc disease based on plain radiographic findings and clinical presentation. He was managed conservatively with analgesics; however, there was no clinical improvement, and in fact, his neurological symptoms progressively worsened. Given the deterioration, an MRI was performed, which revealed multifocal bilateral pedicle lesions at L2 and left pedicle involvement at L5, accompanied by a paravertebral soft tissue mass. These findings resulted in severe spinal canal and bilateral foraminal stenosis at L2–L3**,** as well as left foraminal stenosis at L5–S1**,** raising strong suspicion of a metastatic lesion (Figure 2)**.**

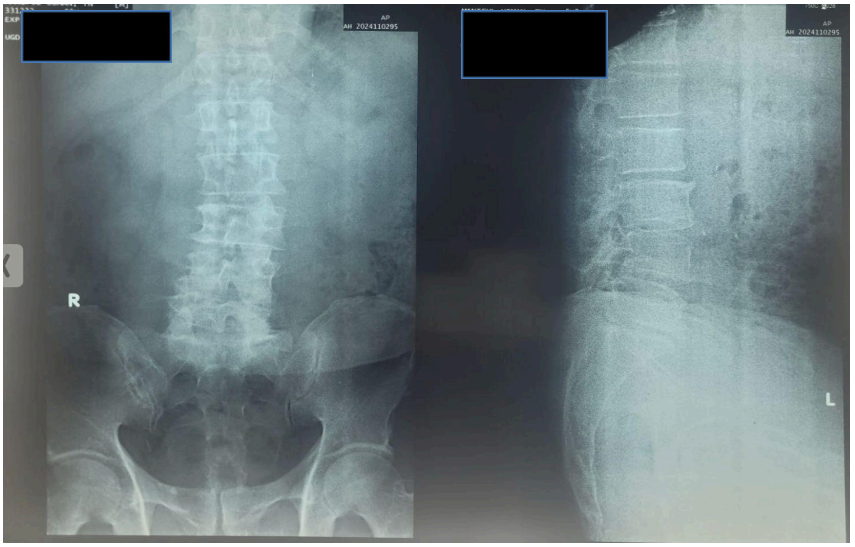

Figure 1. *Lumbosacral X-ray*

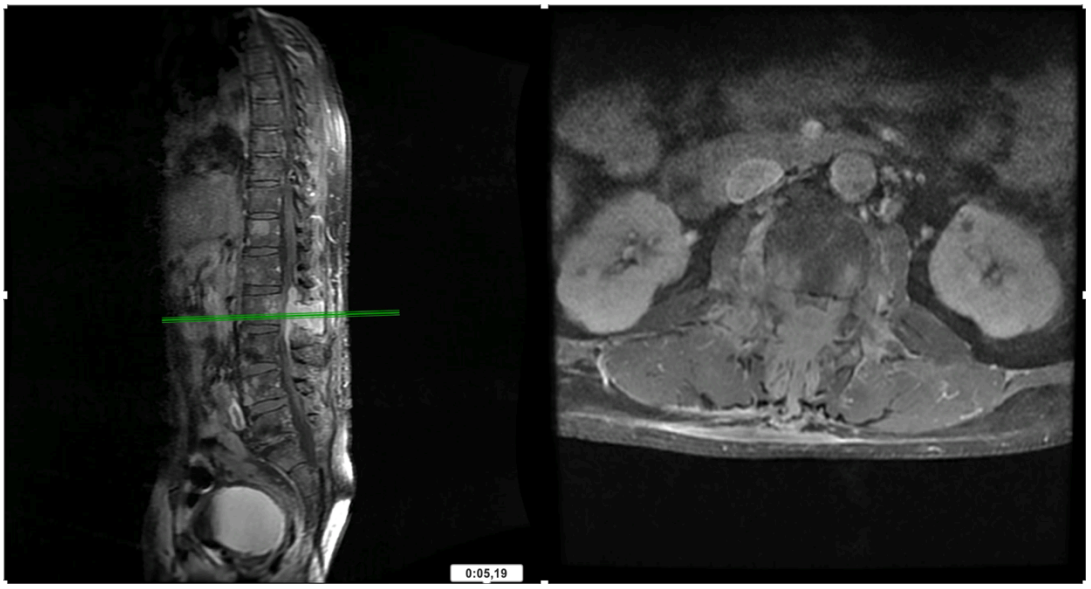

Figure 2. *Whole spine MRI*

Laboratory investigations revealed pancytopenia, raising concern for possible bone marrow involvement. Given the unusual appearance and evaluation using the Spine Instability Neoplastic Score (SINS), the patient was scheduled for decompressive laminectomy and tumor excision. Intraoperative findings showed friable tissue involving the vertebral pedicles, raising suspicion for a neoplastic process. Histopathological examination revealed features consistent with a round cell tumor, raising suspicion for plasmacytoma.

Postoperatively, the patient experienced notable improvement in lower limb weakness and back pain. Pain levels decreased significantly, with the Numeric Rating Scale (NRS) improving to 1-2 following surgery. Motor strength was significantly improved to 4/4

DISCUSSION

Back pain presentation in spinal tumor

Back pain is a non-specific symptom that can originate from various spinal and surrounding structures, including intervertebral discs, vertebrae, ligaments, nerves, muscles, and

fascia. Most cases are attributed to age-related degeneration or repetitive microtrauma.[4] However, it may also be a manifestation of systemic or visceral conditions such as musculoskeletal disorders, peptic ulcer disease, pancreatitis, pyelonephritis, aortic aneurysm, epidural abscess, ankylosing spondylitis, or other infections.[2,4]

Importantly, spinal tumour or metastasis should always be considered in the differential diagnosis for patients with persistent, unexplained back pain, especially since up to 90% of such patients report back pain as the initial symptom. A comprehensive clinical history, physical examination, and appropriate diagnostic testing are essential for accurate differentiation.[5]

Information about what provokes or alleviates the pain must be elicited. Besides providing additional clues to the diagnosis, knowing these factors guides the clinician in determining the appropriate pain control measures for the patient. The pain quality helps the provider distinguish between visceral and non-visceral pain. Well-localized pain is often an indicator of an organic process. Any associated symptoms can serve as further clues about the source of back pain.[4,5]

Pain from mechanical or degenerative spinal issues often improves with rest and worsens with physical activity, particularly those involving disc loading. It commonly affects the lumbosacral joints, lumbar muscles, and buttocks, and typically resolves within 4 to 6 weeks with conservative treatment such as NSAIDs and physical therapy. In contrast, pain due to spinal metastasis is generally continuous, progressive, and non-responsive to rest. It tends to intensify at night and may awaken patients from sleep. This pain is often localized at the level of the lesion and may present as band-like thoracic discomfort or radicular symptoms such as limb weakness or radiating pain. If the tumour or metastasis compresses the spinal cord, neurological impairments or myelopathy may ensue.[5] Identifying red flags and determining the appropriate treatment are the most important aspects of back pain management.

Plasmacytoma and spinal cord compression

Plasmacytoma is a plasma cell tumor that may arise in bone or soft tissue and can occur at various anatomical sites without evidence of systemic involvement. It may present as a single (solitary) or multiple mass and, if not properly diagnosed and treated, carries the risk of progression to multiple myeloma.[6]

Spinal cord compression (SCC) can result from posterior extension of a vertebral plasmacytoma, direct tumor growth into the spinal canal through the vertebral foramen, or from bone fragments following vertebral fractures. The interaction between malignant plasma cells and the bone marrow microenvironment stimulates the release of cytokines and growth factors such as IL-6, IL-3, VEGF, and TNF, driven by autocrine and paracrine signaling loops.[6,7,8]

These interactions increase the levels of macrophage inflammatory protein 1-alpha (MIP-1α), IL-3, IL-6, and stromal-derived factor 1-alpha (SDF-1α), promoting osteoclast activation. Concurrently, elevated expression of IL-7, IL-3, and dickkopf-1 (DKK1) by myeloma cells inhibits osteoblast function. DKK1 overexpression is strongly linked to the development of osteolytic bone lesions. Additionally, an imbalance between RANKL and osteoprotegerin (OPG) further accelerates bone resorption and suppresses bone formation. These processes collectively contribute to osteopenia, increasing the risk of pathologic vertebral fractures, particularly in elderly individuals or those using corticosteroids.[6,7,9]

The progression of SCC can lead to axonal swelling and white matter edema, which, if left untreated, may result in white matter necrosis. The development of vasogenic edema in the white matter and the release of neurotransmitter, cytokines, and inflammatory mediators has been implicated as the mechanism of damage after cord compression.[8] Spinal cord infarction and irreversible loss of neurologic function are devastating

consequences for patients if compression is not promptly treated.

Management of Plasmacytoma

Spinal cord compression (SCC) represents a medical emergency requiring urgent recognition and intervention to prevent permanent neurological deficits such as paraplegia. Optimal outcomes depend on initiating treatment within 24 hours of diagnosing cord compression. The primary therapeutic goals include halting further neurological decline, preserving motor abilities, and alleviating pain. Management typically begins with a loading dose of corticosteroids, which serves as first-line therapy.[6,8]

While radiotherapy is often the cornerstone of treatment, surgical intervention becomes necessary in cases of spinal instability or when compression results from vertebral fractures. Chemotherapy and targeted therapies may be appropriate for patients with mild neurological impairment.[6] Ultimately, treatment decisions should consider the patient's overall health status, expected survival, and individual preferences.

Corticosteroid Therapy in Plasmacytoma

Corticosteroids are widely recognized as the initial treatment in SCC to rapidly reduce inflammation and relieve neurological symptoms. These agents mitigate vasogenic edema and dampen inflammatory responses, leading to improved neural function. Dexamethasone, in particular, has both anti-inflammatory and anti-myeloma effects by inhibiting IL-6 production and NF-κB activity, two key drivers in multiple myeloma progression. Despite their widespread use, the optimal maintenance dose and duration of corticosteroid therapy remain undefined.[10]

Treatment regimens should be tailored based on the severity of spinal compression and the extent of

neurological symptoms, as delays may lead to irreversible damage.

Role of Bisphosphonates in Plasmacytoma

The role of bisphosphonate can increased osteoclast activity contributes to bone resorption, leading to osteolytic lesions and osteoporosis in patients with plasmacytoma or multiple myeloma. Bisphosphonates counterct this by suppressing osteoclast function, thereby reducing skeletal complications. Additionally, these agents may exert direct antitumor effects by modifying the bone marrow microenvironment. In multiple myeloma, bisphosphonates have been shown to lower the risk of spinal cord compression and decrease recurrence related to vertebral fractures.[11]

Surgical Intervention in Plasmacytoma

Surgical decision-making often relies on the Spine Instability Neoplastic Score (SINS) to evaluate the degree of spinal instability. Surgical management is recommended for stabilizing the spine and controlling motion-related pain in patients with instability.

Historically, laminectomy was the standard surgical approach for SCC, but evidence suggests it may be inadequate, as plasmacytomas typically arise in the vertebral body anterior to the spinal cord, and laminectomy alone may worsen spinal instability. More recently, balloonkyphoplasty and vert ebroplasty have gained popularity for treating painful vertebral compression fractures associated with myeloma, with favorable clinical outcomes.[12]

Conclusion

High clinical suspicion and heightened awareness are critical when evaluating patients with spinal lesions particularly those presenting with persistent back pain, which often represents the earliest warning sign of underlying malignancy.

Recognizing pain as a potential red flag can facilitate early diagnosis of conditions such as spinal plasmacytoma. A multidisciplinary

approach, supported by advanced imaging and histopathological confirmation, is essential to improving diagnostic accuracy and ensuring optimal therapeutic results in managing spinal plasmacytoma.

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