

CASE REPORT

Spinal Paget's disease with bilevel cord compression and ischemic non-compressive myelopathy treated with zoledronic acid

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Abstract

Cord compression and ischemic non-compressive myelopathy are a complication of spinal Paget's disease (SPD). SPD usually touches a single spine level. We report an unusual case with bilevel spinal cord compression and dysfunction which was medically treated due to resolution of the vascular steal syndrome.

KEYWORDS

osteitis deformans, Paget's bone disease, spinal cord compression, spine, zoledronic acid

1 | INTRODUCTION

Paget's disease of bone (PDB), also known as osteitis deformans, is the second most common metabolic bone disorder after osteoporosis. It affects about 2%–4% of the population over 55 years of age.

The exact etiology of the disease remains relatively unknown. It is qualified by increased osteoclastic and osteoblastic activity with abnormal bone remodeling and modeling processes. It can involve 1 bone (monostotic) or affects many skeletal segments (polyostotic).¹

When the spine is implicated, the aberrant remodeling characteristic of PDB can cause spinal cord dysfunction by compressive and/or ischemic non-compressive myelopathy.² We describe here an unusual case of polyostotic PDB complicated for thoracic and lumbar spinal cord compression with non-compressive myelopathy which was successfully treated with zoledronate.

2 | CASE PRESENTATION

A 62-year-old man consulted the rheumatology department for progressive inflammatory thoracic back pain radiating to the left posterolateral chest and progressive weakness of both legs with the burning pain of 3 months' duration. He had a diabetes mellitus history and a discectomy history for a lumbar herniated disc in 1993. He had no family or personal history of malignant neoplasia. On physical examination, the midthoracic spine was tender. A firm, well-circumscribed, non-tender, mobile mass was found over the left shoulder, extending to the area over the left trapezius. Shoulder movement was normal. The upper limb reflexes were normal. Bilateral hyperreflexia of the patellar and Achilles reflexes were noted. Hoffman's test was negative. Babinski's sign was positive on both sides. Clonus was objectified in both ankles and both knees. There

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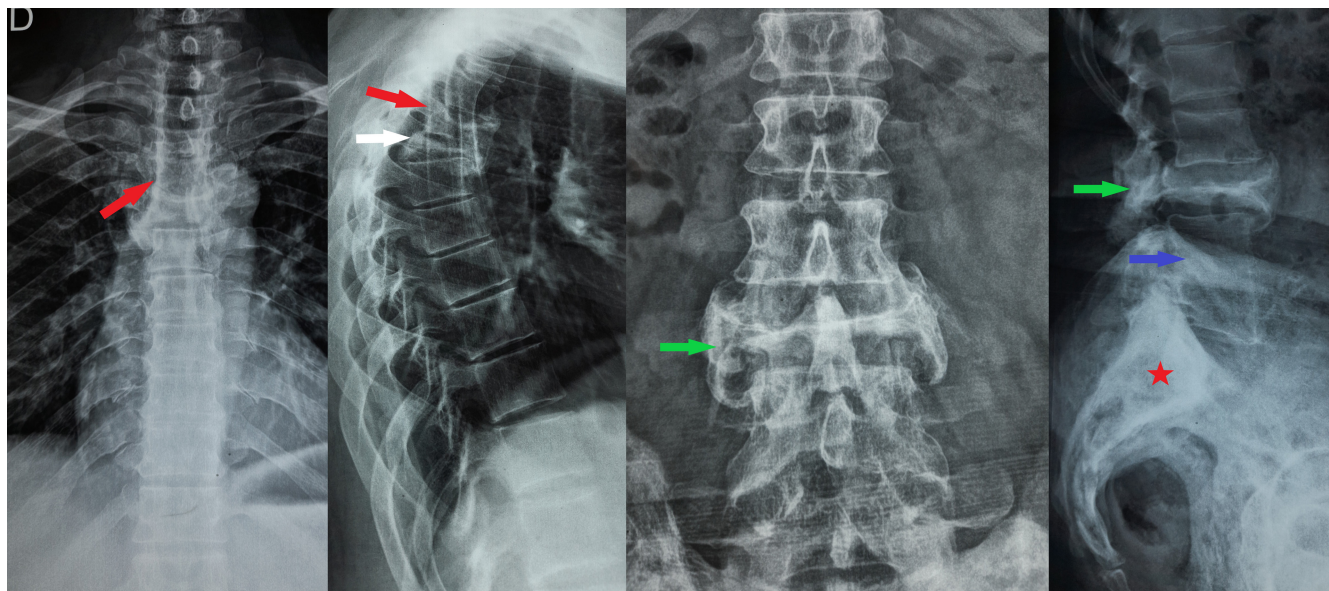


FIGURE 1 Thoracolumbar spine radiography showed thoracic spine deformation with bone heterogeneity, hypertrophy, and pathologic fracture of T4 (red arrow), T5 (white arrow), and L3 (green arrow). Vertebral ankylosis of L4/L5 (blue arrow) and heterogeneous architecture of the sacrum (red Asterix) were noted.

was a persistent and definite loss of all sensory modalities below the 6th dorsal dermatome. A weakness in the bilateral lower extremities involving all groups of muscles (4/5 Medical Research Council grade) was noted and rectal tone was normal. There was no fever, weight loss, superficial lymphadenopathy, hepatomegaly, or enlarged spleen.

Laboratory results revealed normal blood cell counts, normal sedimentation rate, and normal serum C reactive protein, phosphorus and calcium levels, but the serum alkaline phosphatase (ALP) level was found significantly elevated to 1269 U/L (reference value, 30–106 U/L). No abnormality was detected in the series of tests for myeloma. Tumor marker tests were negatives.

Thoracolumbar spine radiography showed thoracic spine deformation and pathological fracture of T4, T5, and L3. Bone heterogeneity and hypertrophy of the vertebral body and posterior elements of T4, T5, and L5 were noted. There were also vertebral ankylosis of L4/L5 and heterogeneous architecture of the sacrum (Figure 1). Chest and abdomen computed tomography (CT) objective left paravertebral mass extending to the area over the left trapezius. The density of the mass was identical to that of subcutaneous adipose tissue suggesting the diagnosis of typical simple lipoma (Figure 2). There was no other primitive tumor identified. The bone window of CT (Figure 3) showed a pathological fracture of T4, T5, and L3 and lytic lesions of the vertebral body of T4 and the cortical of its inferior endplate. It also showed hypertrophy of the spinous process of T4, T5, and L3, local medullar cord compression at T5 and L3 levels.

Vertebral ankylosis of L4/L5 and heterogeneous architecture of the pelvis were noted.

Total spine magnetic resonance imaging (MRI) (Figure 4) showed an abnormal pathological process of marrow infiltration and replacement involving T4, T5, and L3 and their posterior neural arches, appearing as low signal on T1 and high signal on T2 weighted images, with non-homogeneous enhancement. There was an expansion of the vertebral body and posterior elements (posterior inter-apophyseal joint, transverse process, and particularly the spinous process) of T4, T5, and L3. Asymmetric structural collapse of the T4, T5, and L3 vertebra were noted with posterior vertebral surface convexity bulging into the spinal canal responsible for significant cord compression. MRI images also showed the structural deformities of the thoracic spine and evoked the diagnosis of PBD. Whole-body bone scintigraphy associated with single photon computed tomography-computerized tomography (SPECT-CT) was performed. It demonstrated extremely hot focus involving the left calcaneus, T4, T5, and L3 affecting the entire vertebra with heterogeneous condensation affecting the entire body and the posterior arch. It demonstrated also extremely hot focus with enlargement of the bony parts of the right pelvis and sacrum. Furthermore, there were a heterogenic condensation, corticommedullary dedifferentiation, and enlargement of the bone parts of the entire pelvis predominantly on the right suggestive of polyostotic PBD (Figure 5).

The diagnosis was bilevel cord compression and dysfunction secondary to PBD of the thoracic and lumbar

spine. Treatment was commenced with 5 mg zoledronic acid in intravenous perfusion. The neurosurgical unit agreed with medical treatment and declined immediate surgery. At one month, there was a steady improvement with the decrease of ALP, objective improvement of power in all groups, and resolution of sensory signs with the ability to walk without aids confirming the amelioration of spinal cord dysfunction.

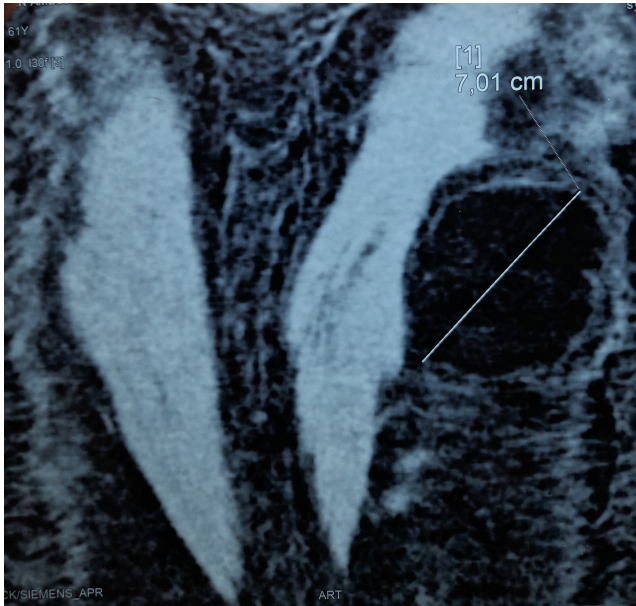


FIGURE 2 Chest and abdomen computed tomography objective left paravertebral mass extending to the area over the left trapezius. The density of the mass was equal to that of subcutaneous adipose tissue suggesting the diagnosis of typical simple lipoma.

3 | DISCUSSION

PBD was first reported by Sir James Paget in 1877.³ Recent studies have shown a reduction, in both the incidence and disease severity of PBD in the last decades, the cause of which is not known.

The principal characteristic of PBD pathogenesis is the increased activity of osteoclasts that become large and numerous. Secondly, there is increased recruitment of osteoblasts to resorption sites which produce excessive quantities of new bone matrix.^{4,5}

PBD is generally polyostotic (66% of cases).^{2,6} The spine is the second most common site of PBD after the pelvis (spinal Paget's disease: SPD).⁷ The disease commonly involves the lumbar spine (62%), whereas the thoracic spine is affected in only 29.8% of the cases.⁸ In our case, the thoracic spine was involved which was seldom reported in the literature.

Patients who have PDB are usually asymptomatic or complain of localized bone pain.⁹ Pain forms vary considerably from patient to patient depending on the sites, the extent of the disease, and the mechanism of pain.¹⁰

Clinical features related to SPD include back pain and neurological compromise. Just 12–24% of back pain is attributed to the SPD disease itself and not to its numerous complications.¹¹

CT and MRI may be helpful to reveal SPD's complications such as compression spine fracture, malignant degeneration, spinal stenosis, and resultant cord compression, compressive myelopathy, or radiculopathy.¹²

Compression fracture of the vertebral body is the most frequent complication of SPD. Most cases occur in the

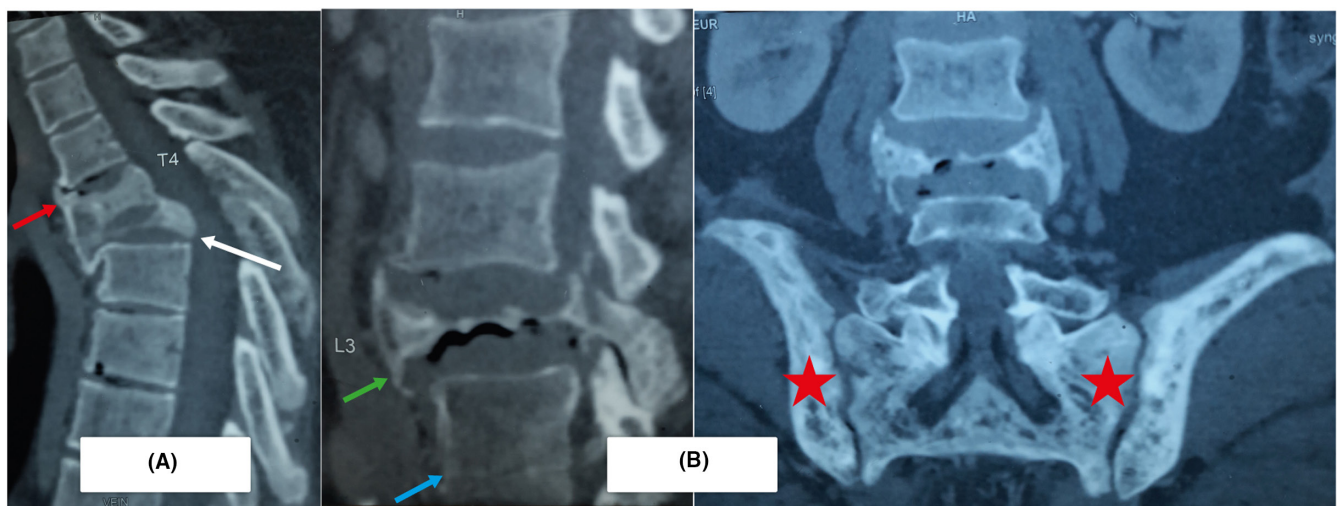


FIGURE 3 Bone window of computed tomography with sagittal (A) and coronal (B) reconstructions of the spine and the pelvis showing pathologic fracture of T4 (red arrow), T5 (white arrow), and L3 (green arrow). There were lytic lesions of the vertebral body of T4 and the cortical of its inferior endplate with posterior elements involvement and local medullar cord compression at T5 and L3 levels. Vertebral ankylosis of L4/L5 (blue arrow) and heterogeneous architecture of the pelvis (red Asterix) were noted.

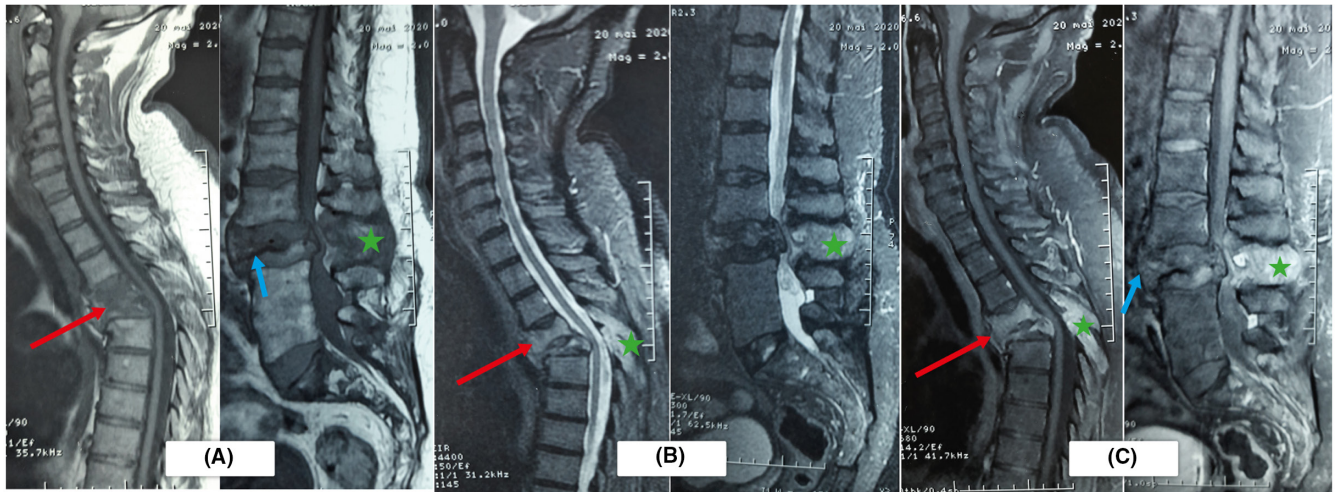


FIGURE 4 MRI of the spine. Abnormal pathological process of marrow infiltration and replacement involving T4, T5 (red arrow), and L3 (blue arrow) and their posterior neural arches (green Asterix), appearing as low signal on T1 (A) and high signal on T2-weighted images (B), with non-homogeneous enhancement (C). There was an expansion of the vertebral body and posterior elements of T4, T5, and L3. The asymmetric collapse of the T5 and L3 vertebra is noted with posterior vertebral surface convexity responsible for significant cord compression.

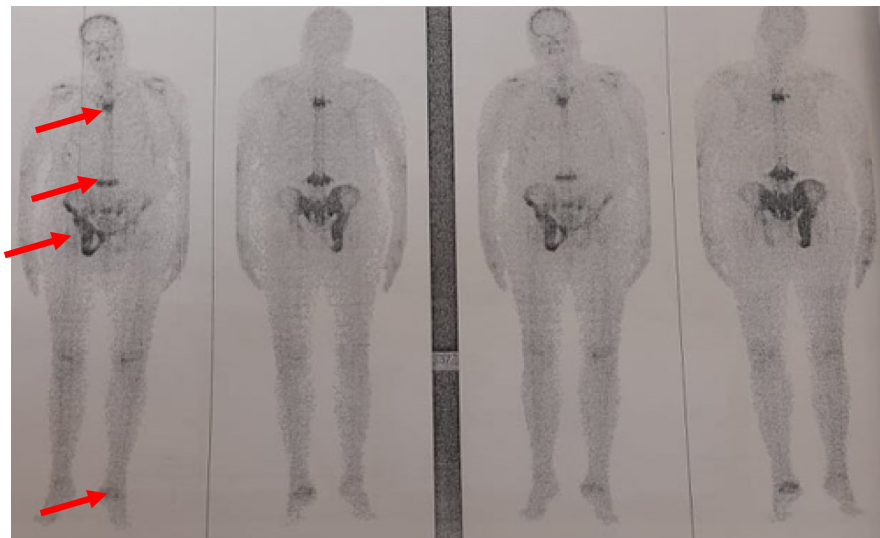


FIGURE 5 Whole-body bone scintigraphy showing high osteoblastic activity in the spine, pelvis, and the left calcaneum (as marked with red arrows)

lumbar region¹² but cases involving the dorsal region,^{13–18} odontoid peg,¹⁹ coccyx,²⁰ and sacrum¹² have also been reported.

Pagetic spinal stenosis has been described as compression of the spinal nerves, cauda equina, or spinal cord by enlarged pagetic bony tissues of the spine.²¹ Spinal cord compression is commonly single level, predominates at the lumbar region, and can cause compressive myelopathy.² Then, our case illustrates an original feature of SPD with thoracic and lumbar spinal cord compression.

Another mechanism of spinal cord dysfunction in SPD is due to the vascular steal syndrome in which blood gets away from the neural structures towards the pagetic tissue responsible for non-compressive ischemic myelopathy.²

Painful or deformed bones in PBD have commonly a mixed appearance of areas of osteolysis with sclerosis.²²

Lytic lesions in SPD are seldom reported in the literature. Cases have been described involving L5²³ and the axis.²⁴ The present case reported lytic lesions of the vertebral body of T4 and its inferior endplate which is an atypical presentation of SPD.

A radionuclide bone scan using a radio-labeled bisphosphonate is the most reputable mean of detecting PDB in the skeleton; however, it lacks specificity. This test is used primarily to establish the full extent of skeletal involvement for a patient.²⁵

Besides clinical, radiographic, and scintigraphy investigations, more diagnostic evidence may be got by serologic investigations, measuring the serum ALP concentration

and urinary total hydroxyproline excretion. However, these bone turnover markers' parameters delete specificity and cannot contribute to a certain diagnosis of PDB.²² These markers correlate with widespread bony alteration and disease activity like in our case.

Bisphosphonates, by their antiresorptive effect, are the main tool of disease control. It reduces bone resorption and turnover and serum ALP level begins to decrease or normalize. Bisphosphonates approved for PDB treatment are alendronate pamidronate, risedronate, tiludronate, neridronate, ibandronate, and zoledronate. The principal indications for pharmacologic treatment of PDB are prevention of complications, neurologic deficit associated with vertebral disease, bone pain, high-output congestive cardiac failure, hypercalcemia, and the evaluation for orthopedic surgery.²³

Once treatment is inaugurated, it is accepted that a decrease of 25% in the total (or bone-specific) ALP designates a significant response, but the optimal aim would be a normalization of such markers. Retreatment could be indicated to patients with an augmentation in ALP activity of 25% above the nadir or with recurrent symptoms.²⁴ Cases of full improvement of neurologic impairment after starting the medical treatment, like our case, have been reported.^{26–28} Such considerable benefit may be made by the resultant fall of the “vascular steal syndrome.”

Our patient was treated favorably with bisphosphonates, and we perceived zoledronate beneficial because it is recommended by the Endocrine Society guidelines.²² It can be administered in a single intravenous dose, and it has been shown to get a long duration of suppression and high rates of biochemical remission.²³

Surgical treatment of patients with PDB is seldom indicated; however, if needed, surgery can ameliorate the quality of life for these patients. The common orthopedic procedures available include spinal decompression, fracture fixation, corrective osteotomy for long bone deformity, joint arthroplasty, and tumor resection. Technically, surgery is complex and risky because of the excessive bleeding due to increased vascularity, presence of hard bone, and deformities.²³ We would advocate in agreement with the neurosurgical unit avoiding immediate surgery for our patient.

4 | CONCLUSION

We report an original case of PDB involving 3 vertebrae from different levels and presenting numerous atypical aspects: ischemic non-compressive myelopathy, vertebral lytic lesions, and bilevel spinal cord compression. In this case, medical treatment with zoledronic acid was efficient to improve spinal cord dysfunction and neurological

compromise by correcting the vascular steal syndrome and had avoided surgery.

AUTHOR CONTRIBUTIONS

Afef Feki and Imen Sellami contributed to the drafting of the article and revising it critically for important intellectual content. Zouhour Gassara and Samar ben Djemaa contributed to the analysis and interpretation of data. Meriem Ezzeddine and Mohamed Hedi Kallel contributed to conception and design of data. Hela Fourati and Rim Akrouit contributed to the acquisition of data. Sofien Baklouti agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors approved the final version to be submitted.

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None.

CONFLICT OF INTEREST

None.

DATA AVAILABILITY STATEMENT


Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

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