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Atraumatic Bilateral Lumbar Pedicle Fractures in a Patient with Back Pain and History of Long-Term Bisphosphonate Therapy: A Case Report

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Background: Development of atypical femoral fractures is a known complication of chronic bisphosphonate therapy; however, the finding of atraumatic lumbar pedicle fractures without a prior history of spinal surgery or contralateral spondylolysis is rare. While a few cases of osteoporotic pedicle fractures associated with adjacent vertebral compression fractures have been reported, only a single case of isolated atraumatic bilateral pedicle fractures has been published in a patient who had been on chronic risedronate therapy of 10-year duration.

Case Report: The present case report illustrates a 63-year-old man who developed isolated atraumatic bilateral lumbar pedicle fractures after 3 years and 5 months on alendronate treatment. The patient's past medical history had been significant for osteoporosis with a lumbar spine T-score of -2.7. At the time of initial diagnosis, a comprehensive work-up for secondary causes of osteoporosis proved to be negative; this was followed by initiation of bisphosphonate treatment with 70 mg of alendronate once per week. Ten months after starting bisphosphonate therapy, he underwent magnetic resonance imaging (MRI) of the lumbar spine for low back pain that had not responded to conservative management, with imaging not revealing any evidence of pedicle fractures or pedicle stress reaction. He was again seen in the spine clinic, for atraumatic exacerbation of his chronic low back pain with concurrent right lower extremity radiation, 6 months after stopping bisphosphonate therapy. Since the patient failed to respond to conservative management over the ensuing 6 months, a repeat MRI was obtained, which showed new acute/subacute bilateral L5 pedicle fractures.

Conclusion: An isolated atraumatic lumbar pedicle fracture may be an additional type of atypical fracture associated with chronic bisphosphonate therapy in an osteoporotic patient.

Key words: Chronic low back pain, bisphosphonate, alendronate, pedicle fracture

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BACKGROUND

Occurrence of vertebral compression fractures is a known complication of osteoporosis; however, the finding of atraumatic pedicle fractures without a prior history of spinal surgery or contralateral spondylolysis is rare (1-3). While a few cases of osteoporotic pedicle fractures associated with adjacent compression fractures have been reported, only a single case has been published of isolated atraumatic bilateral pedicle fractures in a patient who had been on chronic risedronate therapy (4-5). Bisphosphonates are commonly used for the treatment of osteoporosis and have recently been associated with atypical fractures after prolonged exposure. Kim et al (6) published a case of a 64-year-old woman who presented with bilateral atypical femoral and L4 pedicle fractures after a 3-year treatment with intravenous ibandronate.

We present the case of a 63-year-old osteoporotic man treated with alendronate for 3 years and 5 months, who subsequently developed isolated bilateral L5 pedicle fractures without a prior history of trauma, adjacent vertebral compression fractures, spondylolysis, or spinal surgery. This would be the second case report of such isolated pedicle fractures in a patient with a history of long-term bisphosphonate therapy.

CASE REPORT

A 63-year-old man with a history of chronic recurrent low back and right lower extremity pain presented for reassessment with atraumatic symptom exacerbation to a hospital-based academic outpatient spine clinic. The patient's past medical history had been significant for osteoporosis with an initial lumbar spine T-score of -2.7. At the time of original diagnosis, a comprehensive work-up for secondary causes of osteoporosis proved to be negative, which was followed by initiation of bisphosphonate treatment with 70 mg of alendronate once per week. Ten months after starting bisphosphonate therapy, he underwent magnetic resonance imaging (MRI) of the lumbar spine for low back pain that had not responded to conservative management, with imaging not revealing any evidence of pedicle fractures or pedicle stress reaction (Fig. 1). The patient stayed on alendronate for a total of 3 years and 5 months, followed by discontinuation of therapy when repeat bone density scan showed an improvement in his bone density metrics (lumbar spine T-score of -2.1). Six months after stopping alendronate treatment, the patient reported a significant flare-up of low back pain, now with concurrent right lower extremity radiation that partially responded to conservative management. He was reassessed 6 months later, or 12 months after alendronate discontinuation, presenting mostly with right posterolateral hip and thigh pain and normal neurological examination. Repeat MRI showed new acute/subacute bilateral L5 pedicle fractures with surrounding bone edema and probable fracture lines (Fig. 2). He denied any preceding history of trauma or physical activity that had consisted of repetitive lumbar extension or prolonged impactful aerobic exercise such as running. The patient was educated about the radiological findings and encouraged to continue with regular swimming utilizing freestyle and backstroke techniques and light flexion-based home exercises. A computed tomography (CT) scan was obtained 6 months later, which showed well-corticated L5 pedicle fractures with the patient's pain level described as intermittent, 2 out of 10 on the 0-10 Numerical Rating Scale (NRS-11) (Fig. 3). He was encouraged to continue with his daily walking, swimming, balanced diet, and calcium and vitamin D supplementation.

DISCUSSION

To the best of our knowledge, only a single case of isolated atraumatic bilateral pedicle fractures not associated with adjacent vertebral compression fracture, previous spinal surgery, or contralateral spondylolysis has been reported. In this particular case, a patient who had been on 10-year risedronate therapy presented with exacerbation of chronic low back pain and was subsequently diagnosed with acute atraumatic L5 pedicle fractures (5). Somford et al (7) proposed that an imbalance between osteoclastic and osteoblastic activities can lead to atypical femoral fractures in patients treated with bisphosphonates. Markers such as C-telopeptide, osteocalcin, N-telopeptide, and deoxypyridinoline can estimate bone turnover, but their applicability to atypical fracture assessment is uncertain (8), with a systematic review by Giusti et al (9) finding normal marker levels in at least 70% of such cases. In this same review, Giusti (9) reported that among patients with atypical fractures, 25.5% were taking oral glucocorticoids, 11.8% were using estrogens, and 38.9% were using proton-pump inhibitors, suggesting other possible causes for fracture occurrence. In the case of our patient, there was no evidence of preexisting exposure to glucocorticoids, estrogens, or proton pump inhibitors, while a growing body of medical literature has documented an as-

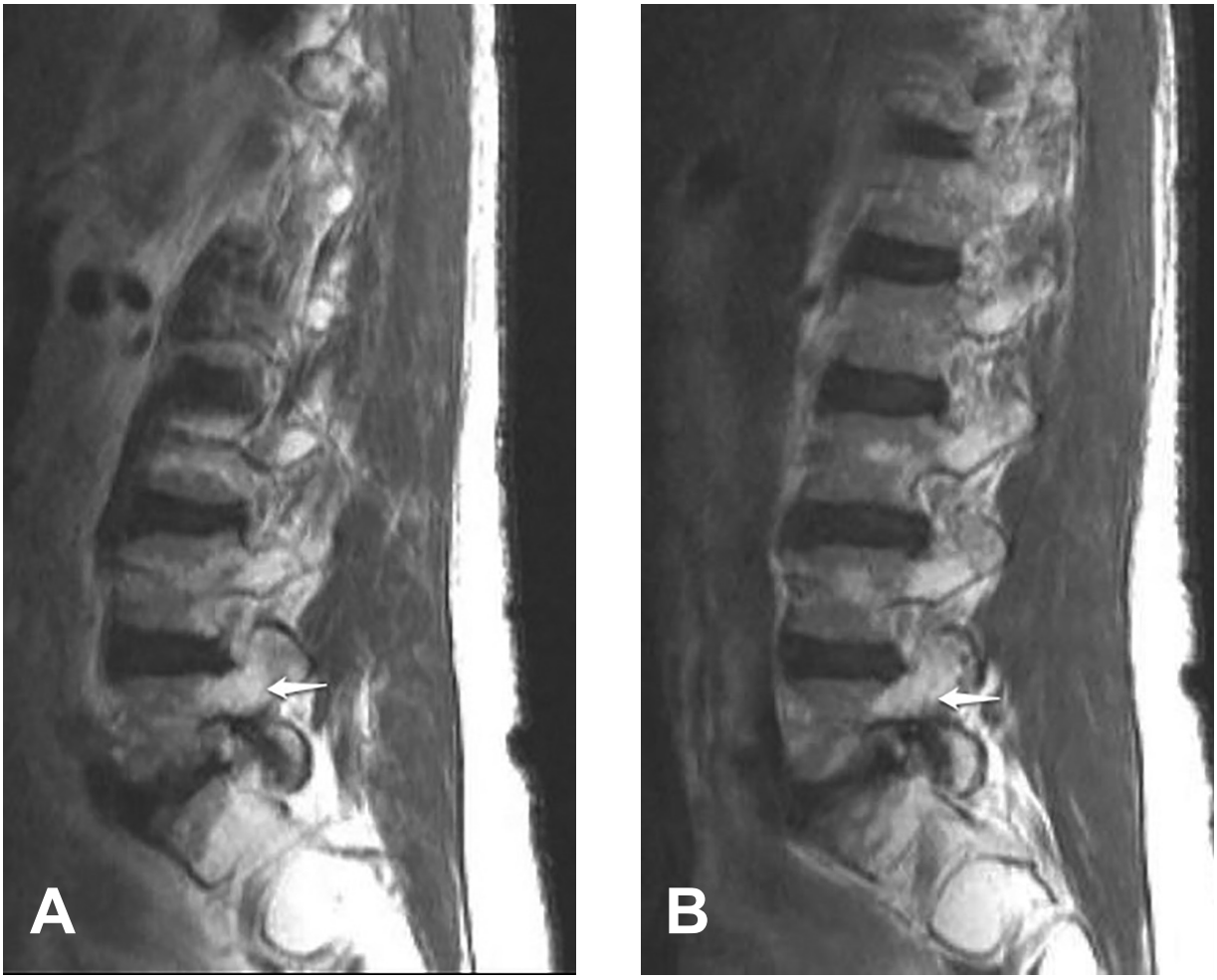


Fig. 1. Sagittal MR T2–weighted images of lumbar spine 10 months after initiating alendronate therapy. Left (A) and right (B) L5 pedicles (arrow).

sociation of diaphyseal femoral fractures and chronic exposure to bisphosphonates (10-13).

Lumbar pedicle stress fractures in an older patient are uncommon. This is probably attributable to the fact that the pedicle has greater intrinsic strength and a shorter moment arm as compared to the vertebral body and pars interarticularis, which allows it to resist greater cyclic forces (14). Previously described cases have identified fatigue fractures, due to disproportionate biomechanical stress of normal bone, and insufficiency fractures, due to abnormal physiological stress on deficient bone, as conceivable mechanisms of bone injury (2-4).

Sadiq (15) reported a case of a 36-year-old otherwise healthy sedentary office worker who presented with chronic low back pain and an incidental finding of chronic bilateral L2 pedicle fractures. In the case published by El Rachkidi et al (5), the atraumatic L5 pedicle fractures occurred in the patient who had been taking risedronate for 10 years. In our own patient, the vertebral fractures also developed at the L5 level, however, the patient had only taken alendronate for 3 years and 5 months, a significantly shorter duration. Other possible causes of atraumatic isolated pedicle fractures were ruled out by history, chart review, and a negative work-up for secondary causes of osteoporosis. Therefore, this would be only the second reported case

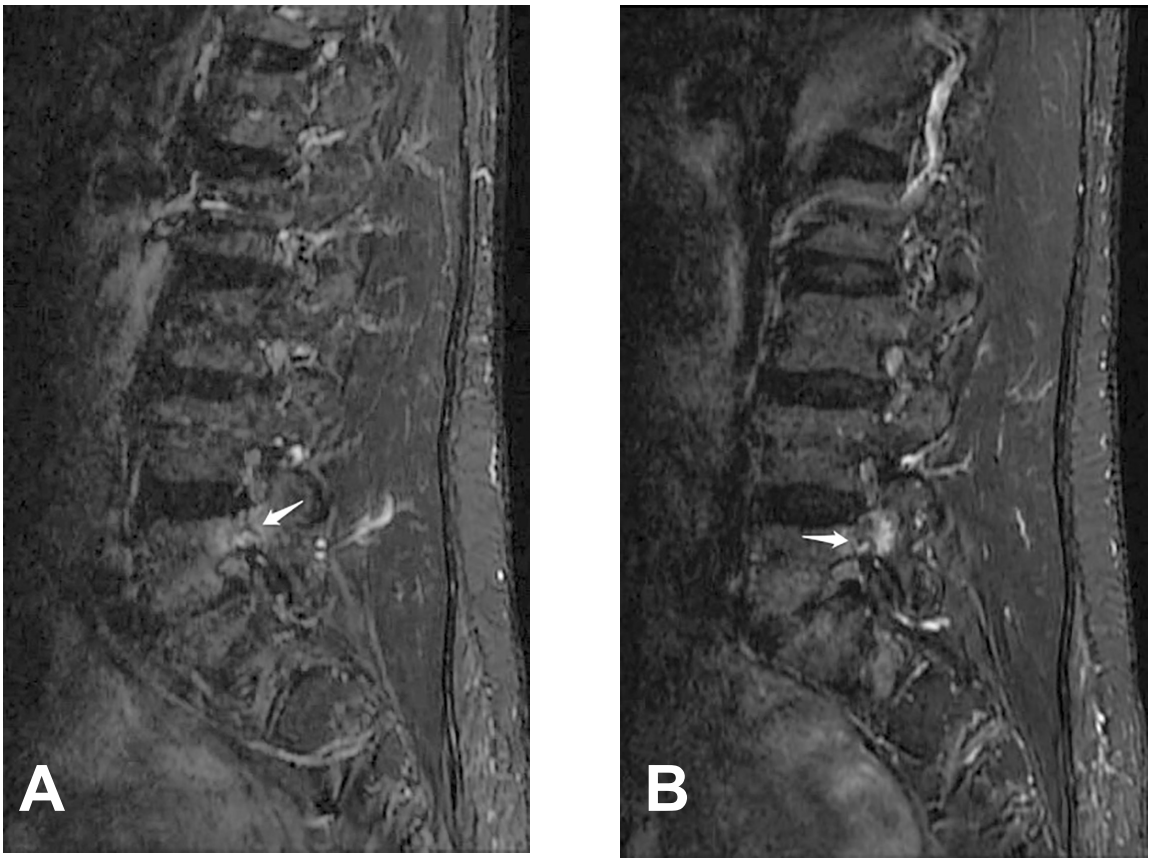
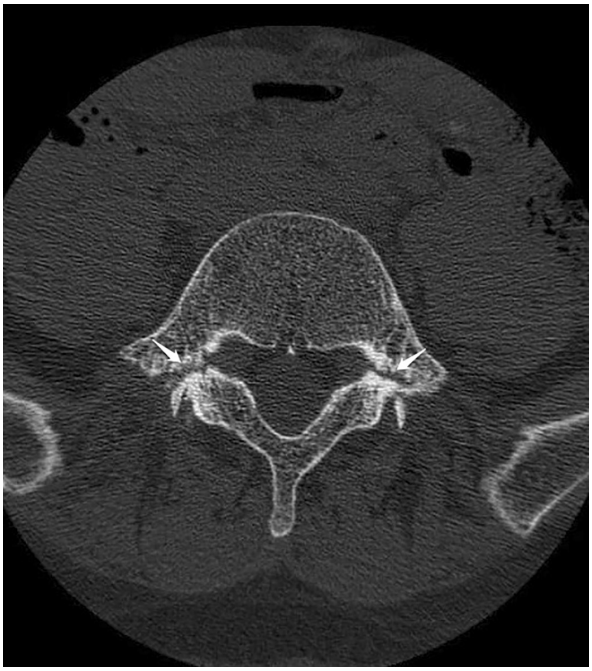


Fig. 2. Sagittal MR STIR images of lumbar spine demonstrate pedicle fracture lines and reactive bone edema. Left (A) and right (B) L5 pedicles (arrow).



of bilateral atraumatic pedicle fractures in the setting of osteoporosis and prolonged bisphosphonate exposure, and the first case associated with alendronate use specifically.

There are several limitations to our case report. We did not obtain bone turnover markers or a bone biopsy, which would have provided additional diagnostic information on the status of our patient's bone turnover as well as on the state of bone mineralization and microarchitecture within fracture defects. These tests could have possibly provided supplementary constructive information to either help in supporting or refuting our assumptions. Moreover, given that this is a single case report, the occurrence of bilateral atraumatic pedicle fractures in an osteoporotic patient using chronic alendronate therapy may simply be attributed to chance.

Fig. 3. Axial CT images of lumbar spine demonstrate corticated pedicle fractures (arrows).

In conclusion, isolated atraumatic bilateral lumbar pedicle fractures are rare. We present the second reported case of such fractures in the setting of osteoporosis and long-term bisphosphonate use, and the first case associated with alendronate therapy specifically. Lumbar pedicle fracture may be an additional type of atypical atraumatic fracture associated with chronic bisphosphonate treatment in an osteoporotic patient with additional large observational studies necessary to clarify this possible association.

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