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Case report: An atypical spontaneous fracture of the tibial diaphysis following bisphosphonate treatment

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Abstract

Atypical fractures are a rare, serious adverse effect of long-term bisphosphonate or DENOSUMAB use, typically involving the proximal femur. We present the case of a 53-year-old female with osteoporosis and psoriatic arthritis treated for five years with bisphosphonates and one year with DENOSUMAB. She developed a spontaneous, painful, oblique fracture of the proximal tibia diaphysis following minimal trauma. Radiographic findings and medical history were consistent with an atypical fracture, despite the unusual tibial location. The patient achieved complete healing after eight weeks of non-weight-bearing immobilization, successfully avoiding surgery. This case highlights that atypical fractures can occur in the tibia, urging caution and full assessment for patients on long-term anti-resorptive therapy presenting with unexplained bone pain.

Keywords: Atypical fracture, bisphosphonate, insufficiency fracture, osteoporosis, tibial shaft, fracture

Introduction

Bisphosphonates are drugs frequently found in elderly people with osteoporosis. They are the most prescribed drugs for osteoporosis to reduce the risk of osteoporotic fractures [1]. Atypical fractures after long-term use of bisphosphonates or DENOSUMAB are a rare, serious, and little-known adverse effect [2]. The most reported fracture sites are spontaneous fractures of the proximal femur [3], humerus, and vertebrae. Atypical fractures are defined as diaphyseal fractures with no (or minimal) traumatic cause, with no or minimal comminution, with a short transverse or oblique fracture line extending to both cortices, and with a local periosteal reaction [4]. Other minor criteria include thickened cortex, prodromal pain, and prolonged healing time [4]. These fractures generally occur far after discontinuation of bisphosphonate treatment lasting at least two years [5]. Here we describe the case of a patient who was treated with bisphosphonates without interruption for nearly five years, followed by one year of treatment with DENOSUMAB.

Case

This is a 53-year-old female patient who had been treated with bisphosphonates without interruption for nearly five years, followed by one year of treatment with DENOSUMAB. The patient had radiologically proven osteoporosis, which had already led to complications in the form of fractures, and had not responded to treatment (no radiological response after 5 years of treatment). Her main medical history included psoriatic arthritis and active smoking estimated at 6 pack-years. Her medication included HUMIRA 40 mg per week, NSAIDs 3 times a day, and occasional doses of LAMALINE.

The patient reported pain in her left leg that had been developing for two months prior without any apparent cause. The pain suddenly worsened when she tried to get up from her sofa, with no notion of any associated trauma or fall. She used crutches at home for three weeks before calling the emergency services due to persistent pain. Upon arrival at the hospital, the patient presented with almost total functional impairment of her left lower limb with a knee flexion at 80°, pain on active and passive mobilization of the knee, and pain on palpation of the anterior aspect of the proximal tibia. She also presented with weight loss, attributed to her immobilization at home. She had no fever or local signs of inflammation.

The possible causes suggested upon her arrival were: a flare-up of spondyloarthropathy, septic arthritis, or a flare-up of congestive osteoarthritis.

The patient was not up to date with her routine screenings at the time of her hospitalization. A complete clinical examination and a TAP scan were therefore performed to look for a potential primary lesion. None of the tests found any evidence of a neoplastic origin.

The X-ray taken during her hospitalization revealed an oblique fracture of the proximal diaphysis of the left tibia, in the process of healing, with no underlying osteolytic lesion (Figure 1).



Fig 1: First X-ray 3 weeks after the worsening of the pain



Fig 2: Control X-ray 6 weeks after the first contact in the emergency department

After discussion within the orthopedic surgery department, it was concluded that this fracture was probably the result of continuous bisphosphonate use. The typical location is more likely to be subtrochanteric, but the patient's medical history and radiographic data support this hypothesis: spontaneous fracture with no trauma reported by the patient, clear transverse fracture line at the diaphysis-metaphysis junction, continuous use of bisphosphonates for 5 years followed by one year of DENOSUMAB without a break, painful prodromes.

Surgical treatment was proposed, involving intramedullary nailing with reaming to stimulate bone healing, but had to be postponed due to the patient's immunosuppressive treatment. The patient ultimately refused surgery, and complete healing was achieved after 8 weeks of immobilization in a non-weight-bearing cast.

Discussion

In recent years, numerous studies have examined the complications associated with long-term bisphosphonate use. These drugs have been proven to reduce the long-term risk of fracture in target populations, but the risk of atypical fractures has not been adequately assessed. Some bisphosphonate-associated fractures are well described, particularly subtrochanteric fractures. However, tibial fractures associated with long-term bisphosphonate use are poorly understood. Rare cases of atypical tibial plateau fractures have been described [6], as have tibial shaft fractures [7]. Over the past decade, several reports have suggested that the suppression of bone resorption metabolism associated with bisphosphonates could weaken bones and contribute to the development of atypical fractures [8]. In some cases, there may be a significant reduction in trabecular bone with few bone islands, a decrease in bone marrow cellularity, and a lack of osteoid [8].

The patient reported here presented with a spontaneous, short oblique fracture of the tibial diaphysis. Risk factors for bone fragility included psoriatic arthritis [9-10] and smoking. Taking HUMIRA seems to protect against osteoporosis in patients with inflammatory rheumatism, even though a minority of patients in this population appear to have an increased risk of atypical lower limb fractures when taking bisphosphonates [11]. The effectiveness of monitoring bone metabolism markers to identify these at-risk patients is still controversial, and it remains to be seen whether patients with inflammatory conditions are at greater risk of complications due to the combination of treatments they are taking.

The criteria for atypical fractures under bisphosphonates only apply to femoral fractures, however the fracture reported in this case meets all the major ASBMR criteria and some minor criteria. It is a short, non-comminuted, spontaneous oblique fracture of the metaphysis-diaphysis with local periosteal reaction and overall increased thickness of the anterior diaphysis in a patient with comorbidity (psoriatic arthritis) [4].

Insufficiency fractures associated with bisphosphonate treatment are mainly described in the femoral diaphysis, although other sites such as the humeral or tibial diaphysis have also been reported [8-12]. Most reported cases involve middle-aged women with cortical remodeling around the fracture site. However, the literature remains fragmented on this type of fracture, and some cohort studies have not demonstrated that the incidence of atypical fractures following bisphosphonate use exceeds that of osteoporotic hip fractures [13].

In conclusion, the mechanism of fracture in this patient is not entirely established. Nevertheless, the arguments in favor of an atypical fracture under bisphosphonate treatment are the metaphyseal-diaphyseal topography, the involvement of a long bone, the orientation of the short oblique fracture line, the absence of trauma, and the cortical thickening opposite the fracture. The radiographic appearance of the fracture without underlying osteolytic lesion did not support a secondary lesion. Atypical subtrochanteric fractures after bisphosphonate treatment are well described in the literature, but little data exists concerning tibial involvement.

Atypical fractures under bisphosphonates are a rare adverse effect with a very low absolute risk compared to the benefits

of these treatments, particularly in relation to the anti-fracture effect achieved ^[14]. These fractures mainly affect the proximal femur, but they have also been reported in other long bones. Therefore, treatment with bisphosphonates may benefit from breaks during patient follow-up, as recommended by some experts ^[15], even though the causal link has not yet been proven conclusively. Furthermore, it seems prudent to pay particular attention to patients undergoing long-term bisphosphonate treatment who complain of bone pain without any reported trauma ^[16], by performing a complete radiological and clinical assessment of the area of interest and, in case of doubt, considering the possibility that the medication may be the cause.

Conflict of Interest

Not available.

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Not available.

References

- McClung M, Harris ST, Miller PD, Bauer DC, Davison KS, Dian L, *et al.* Bisphosphonate therapy for osteoporosis: benefits, risks, and drug holiday. *Am J Med.* 2013 Jan;126(1):13-20. DOI: 10.1016/j.amjmed.2012.06.023. PMID: 23177553.
- Shane E, Burr D, Ebeling PR, Abrahamsen B, Adler RA, Brown TD, *et al.* American Society for Bone and Mineral Research. Atypical subtrochanteric and diaphyseal femoral fractures: report of a task force of the American Society for Bone and Mineral Research. *J Bone Miner Res.* 2010 Nov;25(11):2267-94. DOI: 10.1002/jbmr.253. PMID: 20842676.
- Wilk R, Kusz D, Grygiel H, Grosiak M, Kamiński J, Kusz M. Atraumatic femoral neck fracture during bisphosphonate treatment: case report and review of the literature. *Aging Clin Exp Res.* 2018;30(7):881-5. DOI: 10.1007/s40520-017-0846-0.
- Shane E, Burr D, Abrahamsen B, Adler RA, Brown TD, Cheung AM, *et al.* Atypical subtrochanteric and diaphyseal femoral fractures: second report of a task force of the American Society for Bone and Mineral Research. *J Bone Miner Res.* 2014 Jan;29(1):1-23. DOI: 10.1002/jbmr.1998. PMID: 23712442.
- Curtis JR, Saag KG, Arora T, Wright NC, Yun H, Daigle S, *et al.* Duration of Bisphosphonate Drug Holidays and Associated Fracture Risk. *Med Care.* 2020 May;58(5):419-26. DOI: 10.1097/MLR.0000000000001294. PMID: 31985584; PMCID: PMC8287838.
- Suthar A, Yukata K, Suetomi Y, Yamazaki K, Sakai T, Fujii H, *et al.* Bisphosphonate-related atypical insufficiency fracture of the tibial plateau: a case report. *J Med Invest.* 2021;68(1.2):186-8. DOI: 10.2152/jmi.68.186. PMID: 33994468.
- Bissonnette L, April PM, Dumais R, Boire G, Roux S. Atypical fracture of the tibial diaphysis associated with bisphosphonate therapy: a case report. *Bone.* 2013 Oct;56(2):406-9. DOI: 10.1016/j.bone.2013.07.012. PMID: 23871749.
- Armamento-Villareal R, Napoli N, Panwar V, Novack D. Suppressed bone turnover during alendronate therapy for high-turnover osteoporosis. *N Engl J Med.* 2006 Nov 9;355(19):2048-50. DOI: 10.1056/NEJMc062268. PMID: 17093260.
- Adami G, Fassio A, Rossini M, Caimmi C, Giollo A, Orsolini G, *et al.* Osteoporosis in Rheumatic Diseases. *Int J Mol Sci.* 2019 Nov 22;20(23):5867. DOI: 10.3390/ijms20235867. PMID: 31766755; PMCID: PMC6928928.
- Ogdie A, Harter L, Shin D, Baker J, Takeshita J, Choi HK, *et al.* The risk of fracture among patients with psoriatic arthritis and psoriasis: a population-based study. *Ann Rheum Dis.* 2017 May;76(5):882-5. DOI: 10.1136/annrheumdis-2016-210441. PMID: 28093419; PMCID: PMC5384863.
- Ricciardi BF, Paul J, Kim A, Russell LA, Lane JM. Osteoporosis drug therapy strategies in the setting of disease-modifying agents for autoimmune disease. *Osteoporos Int.* 2013 Feb;24(2):423-32. DOI: 10.1007/s00198-012-2113-8. PMID: 22955310.
- Odvina CV, Levy S, Rao S, Zerwekh JE, Rao DS. Unusual mid-shaft fractures during long-term bisphosphonate therapy. *Clin Endocrinol (Oxf).* 2010 Feb;72(2):161-8. DOI: 10.1111/j.1365-2265.2009.03581.x. PMID: 19302584.
- Abrahamsen B, Eiken P, Eastell R. Subtrochanteric and diaphyseal femur fractures in patients treated with alendronate: a register-based national cohort study. *J Bone Miner Res.* 2009 Jun;24(6):1095-102. DOI: 10.1359/jbmr.081247. PMID: 19113931.
- Black DM, Kelly MP, Genant HK, Palermo L, Eastell R, Bucci-Rechtweg C, *et al.* Fracture Intervention Trial Steering Committee; HORIZON Pivotal Fracture Trial Steering Committee. Bisphosphonates and fractures of the subtrochanteric or diaphyseal femur. *N Engl J Med.* 2010 May 13;362(19):1761-71. DOI: 10.1056/NEJMoA1001086. PMID: 20335571.
- Ott SM. What is the optimal duration of bisphosphonate therapy? *Cleve Clin J Med.* 2011 Sep;78(9):619-30. DOI: 10.3949/ccjm.78a.11022. PMID: 21885695.
- Goddard MS, Reid KR, Johnston JC, Khanuja HS. Atraumatic bilateral femur fracture in long-term bisphosphonate use. *Orthopedics.* 2009 Aug;32(8):orthosupersite.com/view.asp?rID=41933. DOI: 10.3928/01477447-20090624-27. PMID: 19708622.

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