

Silent Articular Knee Fracture Following Passive Physiotherapy in a Paraplegic Patient: The Underrated Impact of Disuse Osteoporosis and Diagnostic Value of CT Imaging

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Abstract

Case Report

Disuse osteoporosis is a frequently overlooked consequence of prolonged spinal cord injury, leading to severe bone fragility and predisposing affected individuals to spontaneous or iatrogenic fractures. We report the case of a 50-year-old paraplegic woman who developed painless right knee swelling a few hours after a routine session of passive physiotherapy. A CT scan revealed a partial articular fracture of the medial femoral condyle (AO type B2) occurring on markedly demineralized bone, along with subchondral cysts suggestive of type I complex regional pain syndrome. This case underscores the critical importance of imaging in the early detection of silent osteoarticular complications in neurologically impaired patients. It also highlights the need for systematic bone assessment prior to initiating rehabilitation programs in individuals with long-standing immobilization.

Keywords: Disuse osteoporosis, paraplegia, passive physiotherapy, articular fracture, complex regional pain syndrome, CT imaging.

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INTRODUCTION

Disuse osteoporosis is characterized by a significant loss in bone mineral density (BMD) secondary to prolonged mechanical unloading, typically affecting individuals with chronic spinal cord injury (SCI) [1]. Within the first year of a complete SCI, BMD can decrease by more than 50%, especially in weight-bearing skeletal regions such as the distal femur and proximal tibia [2,3].

Despite being largely asymptomatic, this condition poses a substantial risk of spontaneous or physiotherapy-induced fractures [4]. Passive mobilizations, although essential in functional maintenance, can become harmful if not adapted to the patient's skeletal fragility [5].

We report a case of silent articular fracture following a routine passive physiotherapy session in a paraplegic woman, emphasizing the crucial role of imaging in detecting complications of disuse osteoporosis and the need for individualized rehabilitation protocols.

CASE PRESENTATION

A 50-year-old woman with a history of flaccid paraplegia for 12 years due to post-infectious spinal myelitis presented with painless swelling of the right knee, noted by her family three hours after a scheduled passive physiotherapy session. Sessions occurred twice weekly and were conducted by a trained therapist.

There was no reported trauma, fever, redness, or limitation of joint range before or after the incident. The patient had no prior bone densitometry or imaging follow-up. No laboratory investigations were performed at the time, and the patient was subsequently transferred to another facility. Follow-up data could not be obtained.

IMAGING FINDINGS

A non-contrast CT scan of the right knee showed:

- A partial intra-articular fracture of the medial femoral condyle, classified as type B2 per the AO classification;
- Severe diffuse trabecular demineralization of the femorotibial and patellofemoral compartments;

- Multiple subchondral cystic lesions (geodes), consistent with stage I complex regional pain syndrome (CRPS) or reflex sympathetic dystrophy;
- No joint effusion, soft tissue abnormalities, or intra-articular foreign bodies.

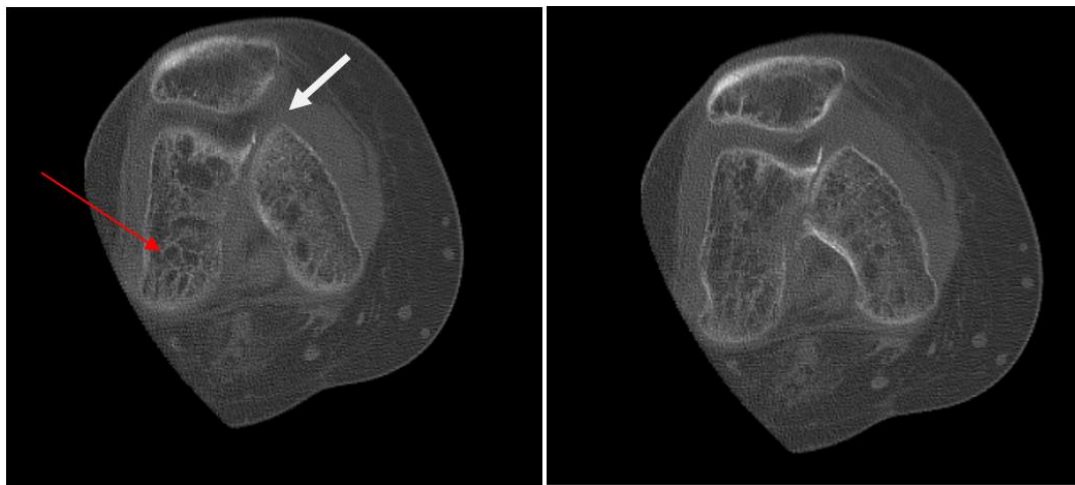


Figure 1: Non-contrast CT scan of the right knee showing a partial articular fracture of the medial femoral condyle (white arrow) on demineralized bone. Multiple subchondral cysts (red arrows) suggestive of type I complex regional pain syndrome

DISCUSSION

Disuse Osteoporosis in SCI

Chronic immobilization in paraplegic patients induces rapid and severe demineralization of the skeletal system. Bone loss is most marked in weight-bearing regions, driven by altered calcium metabolism, hormonal dysregulation, and absence of mechanical stimulation [1,2,4]. In SCI patients, the risk of lower limb fractures is estimated at 3.0 per 100 person-years compared to 0.9 in non-paraplegic controls [1].

Iatrogenic Fractures During Physiotherapy

While physical therapy remains indispensable, its application must consider skeletal vulnerability. Passive mobilization performed on demineralized bones can lead to microtrauma and fractures, particularly when no pre-rehabilitation imaging or DEXA screening is performed [5,6].

Diagnostic Role of CT Imaging

CT imaging remains the modality of choice for evaluating suspected fractures in osteoporotic bones, especially in patients with altered pain perception. It provides detailed assessment of trabecular integrity and helps identify indirect signs of chronic bone pathology such as subchondral cysts, which may precede structural failure [6].

Complex Regional Pain Syndrome in SCI

Although CRPS is rare in paraplegic patients, it can occur even in the absence of pain perception. The presence of geodes and synovial inflammation post-physiotherapy supports the hypothesis of sympathetic overactivation and local dysautonomia in these patients

[7]. Recent evidence also suggests that unadapted physiotherapy may exacerbate inflammatory responses, potentially triggering CRPS [8].

Preventive and Therapeutic Approaches

Preventive strategies should include baseline DEXA scans and/or plain radiographs or CT prior to initiating intensive mobilization in patients with >1 year of SCI. When disuse osteoporosis is confirmed, treatment with calcium/vitamin D, bisphosphonates, and tailored physiotherapy regimens is warranted [2,4,5].

CONCLUSION

This case underlines the diagnostic value of imaging in silent complications of disuse osteoporosis, particularly in neurologically impaired patients. Passive rehabilitation, although essential, can be a source of iatrogenic harm when performed without prior bone assessment. Multidisciplinary collaboration between radiologists, physiatrists, and therapists is vital to avoid preventable injuries.

REFERENCES

1. Frotzler A, Coupaud S, Perret C, et al. Osteoporosis in the lower extremities in chronic spinal cord injury. *J Bone Miner Res*. 2020;35(1):95–104.
2. Varacallo M, Fox EJ. Osteoporosis in Spinal Cord Injuries. In: *StatPearls*. StatPearls Publishing; 2023.
3. Leone GE, et al. Neurogenic Bone Loss after Spinal Cord Injury. *Biomedicines*. 2023;11(9):2581.
4. Jiang SD, Dai LY, Jiang LS. Osteoporosis after spinal cord injury. *Osteoporos Int*. 2006;17(2):180–192.

5. Bauman WA, Cardozo CP. Osteoporosis in individuals with spinal cord injury. *PM&R*. 2015;7(2):188–201.
6. Maïmoun L, et al. Bone loss in spinal cord–injured patients: from physiopathology to therapy. *Spinal Cord*. 2006;44(4):203–212.
7. Gallien P, Durufle A, Nicolas B. Algodystrophy in a paraplegic patient. *Rev Rhum Mal Osteoartic*. 1993;60(7–8):541–3.
8. Smart KM, Wand BM, O'Connell NE. Physiotherapy for pain and disability in adults with complex regional pain syndrome. *Cochrane Database Syst Rev*. 2022;5:CD009416.