

# Asymmetric Bone Mineral Density Loss in an Ambulatory Individual with Spinal Cord Injury : A Case Report

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## ABSTRACT

**Setting:** Inpatient rehabilitation hospital.  
**Patient:** A 34 year old male sustains a T4 spine injury due to an occupational related fall.  
**Case Description:** At the time of admission to inpatient rehabilitation the patient had a right T5, left T6 ASIA Impairment Scale (AIS) B SCI, which gradually improved to AIS C, and then AIS D, long term. He progressed to be functionally independent in ambulation with a rolling walker and left ankle foot orthosis at discharge, and then independent ambulation long term. We present the case of an asymmetric bone mineral density loss in the lower extremities of an ambulating individual.

## INTRODUCTION

Osteoporosis is nearly universal after SCI. The bone loss resulting from elimination of habitual mechanical loading is region specific and associated with the degree of immobilization. Over time, patients with SCI develop a specific pattern of bone abnormalities, with marked loss of bone density in the proximal tibia and femur, and relatively less bone loss in the spine [1,2]. Neuronal factors and hormonal changes may play a role [5]. There is a paucity of data on bone mineral density in ambulatory individuals with SCI. Currently there is no consensus on surveillance for osteoporosis with people with SCI.

## CASE REPORT

A 34 year old Caucasian male was injured in a work related fall from a 12 foot height. He was diagnosed with a T4 AIS B SCI. His BMI was 25.8kg/m. He had no significant medical history and no history of fractures. He underwent an open reduction internal fixation/decompression at T5 with a fusion at T4-T6. He was fitted for a TLSO brace which was worn for 13 weeks. By discharge from rehab he was diagnosed with a T4 AIS C and was ambulating limited household distances using a rolling walker and an ankle foot orthoses. In comparison to his baseline motor exam (table 1) he was ambulatory with weakness and numbness in the left lower extremity greater than right lower extremity after 1.5 years. Motor exam at 1.5 years revealed right iliopsoas strength to be 5/5, quadriceps to be 5/5, tibialis anterior 4/5, extensor hallucis longus 4/5, and gastrocnemius 4/5. The left iliopsoas was found to be 4/5, quadriceps 2/5, tibialis anterior 2/5, extensor hallucis longus 2/5, and gastrocnemius 1/5.

## ASSESSMENTS

Figure 1: Right lower limb Left lower limb

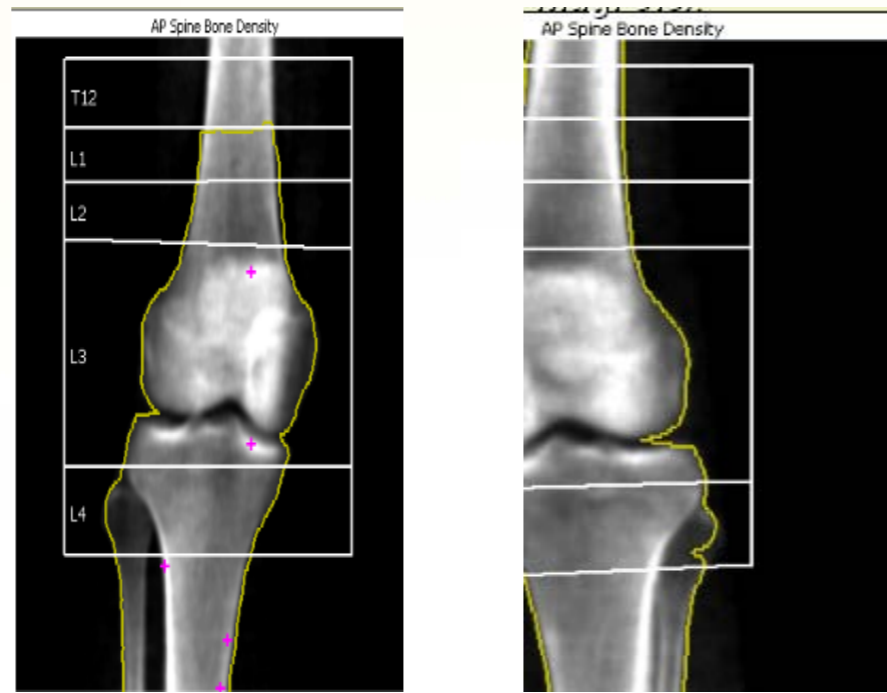


Figure 2: Right Femur Left Femur

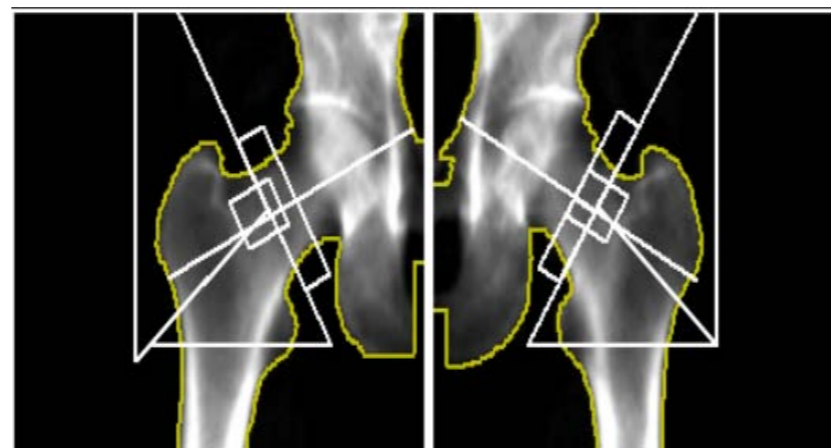


Figure 3: Bone mineral density

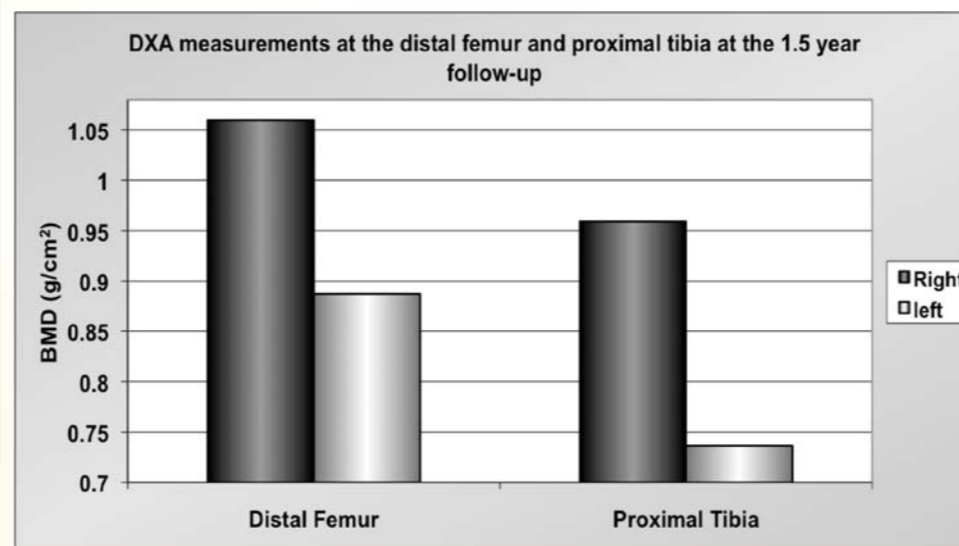


Figure 4: Densitometry results at baseline

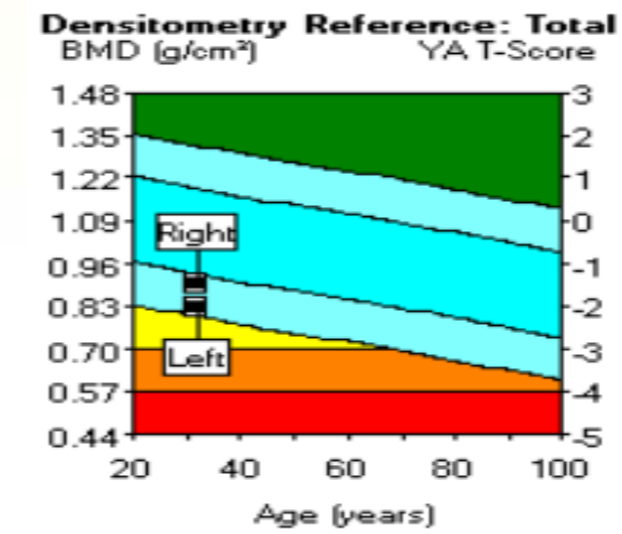
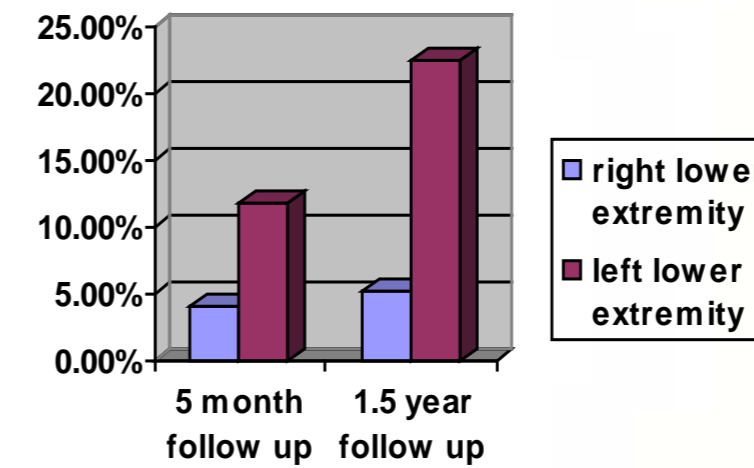


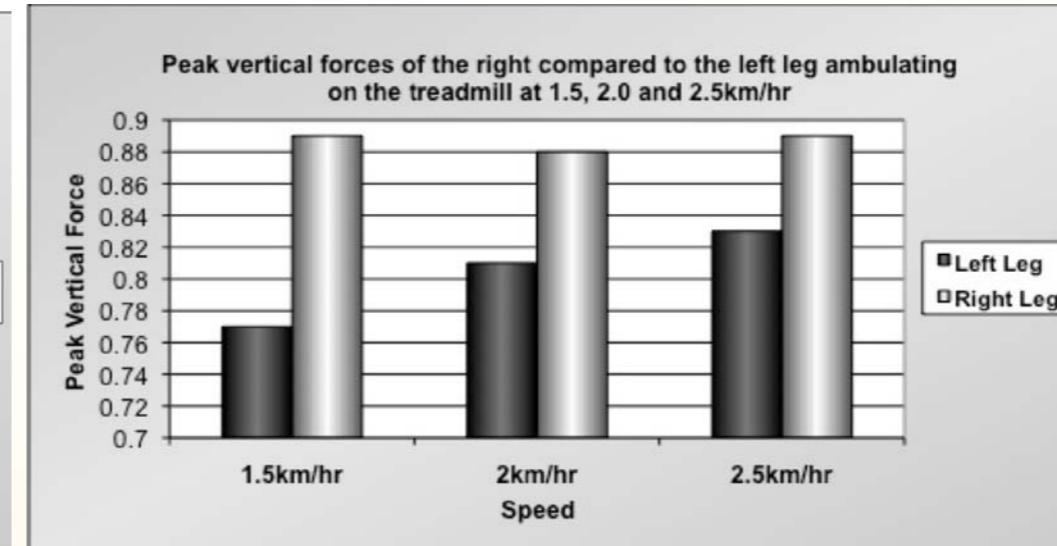
Figure 5: DXA results report



This patient's DXA score's demonstrates,

- T-score of -2.5 SD at the left femur as osteoporotic.
- T-score of -1.5 SD at the right femur as osteopenia.
- The spine T-score is -0.7 SD, is considered normal.

Figure 6: Gait Analysis



## MOTOR EXAM

Table 1: Data collected at baseline and 5 months status compared to 1.5 years post SCI

Lower Extremity Muscles	Spinal Root	Baseline and 5 months Right	1.5 years Right	Baseline and 5 months Left	1.5 years Left
Iliopsoas	L2	5	5	2	4
Quadriceps	L3	5	5	2	2
Tibialis Anterior	L4	4	4	2	2
Gastrocnemius	S1	4	4	1	1

## DISCUSSION & CONCLUSION

**Discussion:** In this ambulating individual with AIS D SCI, the BMD after 1.5 years was significantly reduced in the left lower limb (22.5%) in comparison to the right lower limb (5.2%). The greater loss in BMD is correlated with greater motor weakness in the left lower extremity and with less weight bearing during ambulation. This case demonstrates the importance of surveillance for osteoporosis even in those individuals with the most incomplete SCI and those highly functional and ambulatory. The literature supports a nearly universal and progressive loss of bone in people with SCI during (at least) the first few years after injury. We recommend surveillance DXA between 3 and 12 months post injury, depending on the individual circumstances and functional goals.  
**Conclusion:** This case demonstrates the importance of surveillance for osteoporosis in all individuals with SCI.

## REFERENCES

AU Shoiaei H; Soroush MR; Modirian. Spinal cord injury-induced osteoporosis in veterans. *ESO J Spinal Disord Tech.* 2006 Apr; 19(2):114-7

AU Maimoun L; Fattal C; Micallef JP; Peruchon E; Rabischong P. Bone loss in spinal cord -injured patient: from physiopathology to therapy. *SO Spinal Cord,* 2006 Apr 44 (4):203-10.

Biering-Sorensen F, Bohr H, Schaadt O. Longitudinal study of bone mineral content in the lumbar spine, the forearm and the lower extremities after spinal cord injury.(1990) *Eur J Clin Invest* 20:330-335.

Dauty M, Verbe BP, Maugars Y, Dubois C, Mathe JF. Supralesional and sublesional bone mineral density in spinal cord-injured patients. (2000) *Bone* 27(2):305-309

Zehnder, Y., Lüthi, M., Michel, D., Knecht, H., Perrelet, R., Neto. Long term changes in bone metabolism, bone mineral density, quantitative ultrasound parameters, and fracture incidence after spinal cord injury: A cross sectional observational study in 100 paraplegic men (2004) *Osteoporosis International*, 15 (3), pp. 180-189.