

Figure 1. Chest CT scan showing large left-sided pleural effusion, as well as T4 and T6 compression fractures.

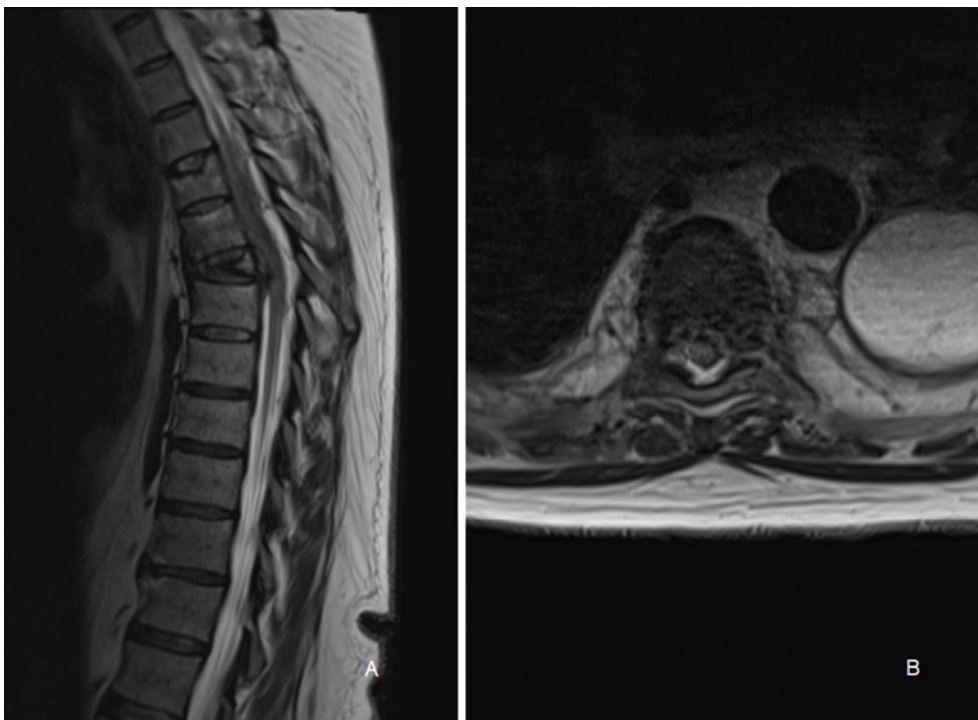


Figure 2. T2 sagittal and axial MRI images showing mild ventral cord compression at the level of the compression fractures with a small anterior hematoma.

covery W DXA, Hologic, Massachusetts, USA) was normal with a T-score of -0.8 in the lumbar spine, 0.0 in the left hip and -0.1 in the right hip, with corresponding Z-scores of -0.6, 0.2, and 0.2, respectively (Fig. 4). Interestingly, pre-operative CT scan shows a Hounsfield Unit measurement of 102 \pm 32 on axial sequences of the L1 vertebral body, sug-

gesting osteopenia⁷. At one year post-operatively, he still had complete spinal cord injury (ASIA A).

Cushing's syndrome is characterized by oversecretion of glucocorticoids and is a well-recognized cause of secondary osteoporosis and pathological fractures⁸. Despite an increased risk of fracture, BMD scores are typically normal or

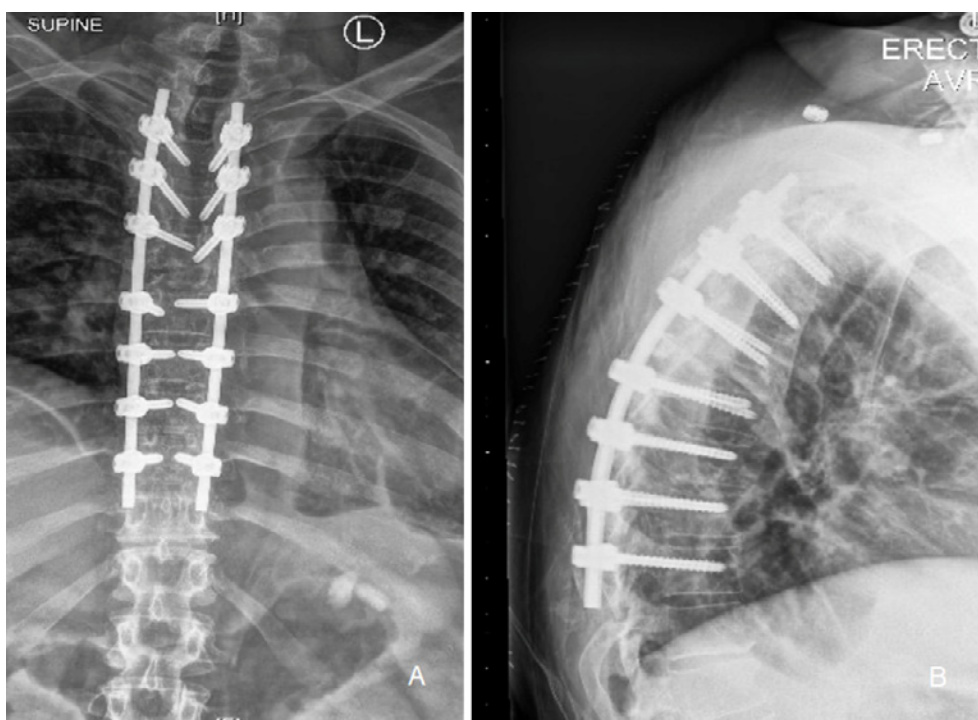


Figure 3. Anteroposterior and lateral postoperative x-rays showing posterior decompression, fusion, and shortening procedure.

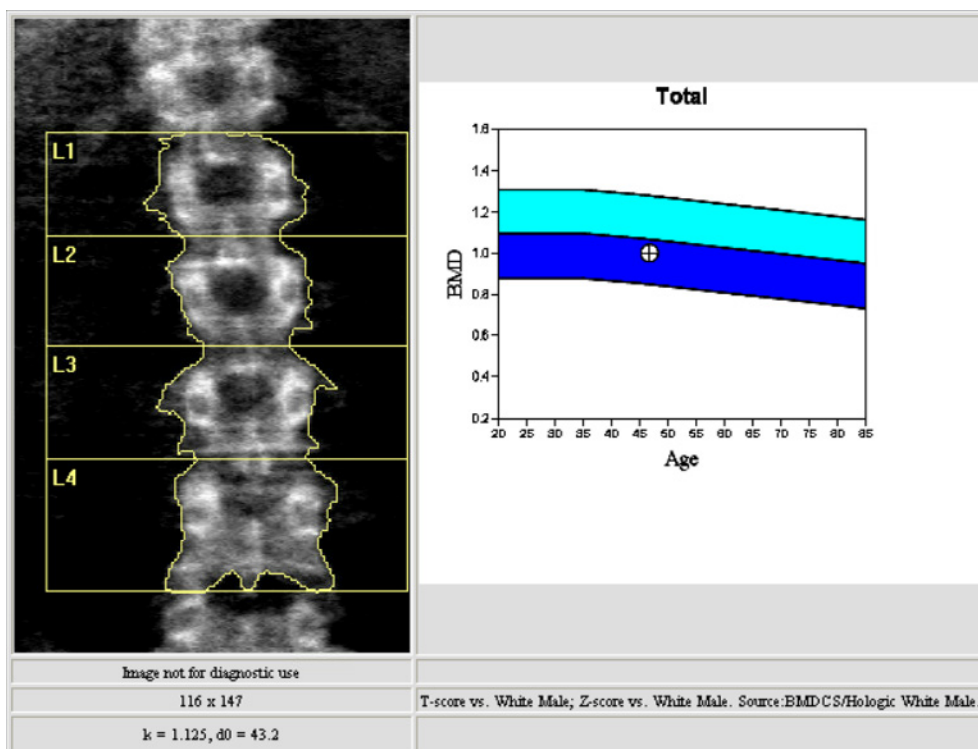


Figure 4. DXA table and image of the lumbar spine.

only slightly decreased in patients with Cushing’s Syndrome^{9,10}. It is theorized that glucocorticoids interfere with normal trabecular micro-architecture and can impair structural integrity without a concomitant decrease in density as measured by conventional DXA scan¹⁰. Trabecular Bone Scan (TBS) is a method applied to DXA that allows estima-

tion of bony trabecular microarchitecture¹¹ and has been shown to be a better predictor of fracture than BMD for patients with Cushing’s Syndrome¹⁰.

Spinal constructs in osteoporotic spines are often augmented by longer constructs, fenestrated screws with cement injection, or circumferential fixation¹. We caution surgeons

to not rely on BMD alone in making these surgical planning decisions. As this case demonstrates, even in the absence of technical error, conditions which affect trabecular architecture may yield normal BMD despite poor bone quality.

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Publication Statement: This work has not, in whole or in part, been previously published or presented elsewhere.

References

1. Pantoja S, Molina M. Surgeon management of osteoporosis in instrumented spine surgery: AOSpine Latin America survey. *Glob Spine J.* 2019;9(2):169-72. doi:10.1177/2192568218785369.
2. Briot K. DXA parameters: beyond bone mineral density. *Joint Bone Spine.* 2013;80(3):265-9.
3. Lotz JC, Cheal EJ, Hayes WC. Fracture prediction for the proximal femur using finite element models: part I—Linear analysis. *J Biomech Eng.* 1991;113(4):353-60.
4. Schuit SCE, van der Klift M, Weel AEAM, et al. Fracture incidence and association with bone mineral density in elderly men and women: the Rotterdam study. *Bone.* 2004;34(1):195-202.
5. Bandaru S, Hare K, Krueger D, et al. Do patients that fracture with normal DXA-measured BMD have normal bone? *Arch Osteoporos.* 2020;15(1):70.
6. CARE Checklist. CARE Case Report Guidelines. 2022 Sep. Available from: <https://www.care-statement.org/checklist>.
7. Yaprak G, Gemici C, Seseogullari OO, et al. CT, Derived Hounsfield Unit: an easy way to determine osteoporosis and radiation related fracture risk in irradiated patients. *Front Oncol.* 2020;10:742.
8. Minetto M, Reimondo G, Osella G, et al. Bone loss is more severe in primary adrenal than in pituitary-dependent Cushing's syndrome. *Osteoporos Int.* 2004;15(11):855-61.
9. Dalle Carbonare LD, Arlot ME, Chavassieux PM, et al. Comparison of trabecular bone microarchitecture and remodeling in glucocorticoid-induced and postmenopausal osteoporosis. *J Bone Miner Res.* 2001;16(1):97-103.
10. Belaya ZE, Hans D, Rozhinskaya LY, et al. The risk factors for fractures and trabecular bone-score value in patients with endogenous Cushing's syndrome. *Arch Osteoporos.* 2015;10:44.
11. Pothuau L, Carceller P, Hans D. Correlations between grey-level variations in 2D projection images (TBS) and 3D microarchitecture: applications in the study of human trabecular bone microarchitecture. *Bone.* 2008;42(4):775-87.

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