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A 50-year-old gentleman with paraplegia after a motorbike accident presented with swelling of his right thigh. He gave a history of having lower limb massage two months previously, after which he developed extensive bruising on his right thigh. A pelvis radiograph (**Panel**) revealed an abnormality.

What is the diagnosis?

Answer: refer to page 122

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Answer: Healed sub-trochanteric fracture of the right femur with excessive callus formation

The fracture in this case was the result of a relatively trivial trauma, raising suspicion of osteoporosis in a paraplegic patient. The fracture healed in two months with excessive callus. Work up for osteoporosis confirmed vitamin D deficiency (35.8 nmol/L; Normal >50 nmol/L), increased bone turnover (deoxypyridinoline/creatinine ratio 12.8 nM/mM, < 6.6 nM/mM) and bone mineral density T score of -2.9 on quantitative computed tomography scan. The patient was referred for rehabilitation and started on vitamin D supplements and bisphosphonate.

Patients with spinal cord injury have a high incidence of fractures, and the fracture rate is associated with the severity and duration post spinal cord injury.¹ Most fractures result from low-impact injuries and are most frequently located in the femur. As observed in traumatic brain injuries, long-bone fractures in spinal cord injury have also been associated with accelerated fracture healing and excessive callus formation.²

The management remains controversial. In a recently published observational study of 1,281 male veterans with chronic spinal cord injury, most of the fractures were treated conservatively. The study found no

difference in mortality between surgical and non-surgical management.³

One of the most important consequences of spinal cord injury is osteoporosis, which is seen in almost every patient with spinal cord injury. Spinal cord injury results in rapid, severe osteoporosis and hence an increased fracture risk. The pathogenesis of osteoporosis in spinal cord injury patients remains complex but a number of mechanisms are thought to play a role, including increased osteocyte expression of sclerostin (a protein which inhibits bone formation and growth), suppressed bone formation, and indirect stimulation of bone resorption.⁴

Currently, there are no standard clinical guidelines for management of osteoporosis in spinal cord injury, although the use of pharmacological and non-pharmacological therapies have been reported in the literature. Bisphosphonates are the most widely-studied pharmacological agents and have been shown to decrease bone loss in both acute and chronic spinal cord injuries.⁴ Non-pharmacological therapies that are being studied are rehabilitation-oriented which include weight-bearing exercises with electrical stimulation (ES) and functional electrical stimulation (FES), and mechanical stimulation using vibration therapy.⁴

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