

Bilateral Stress Fractures of the Femoral Neck from Renal Osteomalacia: A Case Report

S Sengupta, FRCS (Edin)

Department of Orthopaedics Surgery, University Malaya Medical Centre, Kuala Lumpur

ABSTRACT

A rare case of spontaneous bilateral stress fractures of femoral neck leading to coxa vara in a young female with history of chronic renal disease and secondary osteomalacia is described. Once the underlying disease was controlled, the fracture was treated by valgus osteotomy with good result.

Key Words:

Renal rickets, Osteomalacia, Stress fractures, Valgus osteotomy

INTRODUCTION

Renal rickets and osteodystrophy are known to occur in patients with chronic renal disease due to profound metabolic disturbances involving calcium metabolism. In young and adolescent patients this may lead to slipped capital femoral epiphysis (SCFE)¹. However spontaneous stress fractures of the femoral neck in older patients are rare and bilateral fractures have not been documented before. This report describes one case of bilateral stress fracture of the femoral neck in an elderly patient and its surgical management.

CASE HISTORY

A 23-year-old Indian girl presented with a history of periodic generalized weakness since she was 19. There was no family history and siblings were normal. At the age of 23 she presented with multiple bone and joint pain involving spine, knees, shoulders and elbows but not of wrists and fingers. Her complete blood count was within normal limits except the erythrocyte sedimentation rate (ESR) was 44mm/hr. Biochemical analysis showed Ca⁺ 2.2 mmol/l, sodium 145 mmol/l, potassium 3.1 mmol/l, chloride 117 mmol/l, inorganic phosphate 0.6 mmol/l and serum alkaline phosphatase was 191 IU/l. Hypokalaemia was thought to be causing the periodic paralysis and she was put on potassium supplements which relieved her symptoms.

Three years later, the patient now 26 years old, was re-admitted with painful large joints, backache, generalized

weakness and difficulty walking. Examination of the large joints revealed no effusion or synovial thickening, but hip movements were painful and limited in all directions. There was no evidence of thyrotoxicosis, Sjogren's syndrome or rheumatoid arthritis and no neurological deficit except generalized muscle weakness.

Complete blood count was again normal. ESR was 23 mm/hr; sodium, 144 mmol/l; potassium, 3.8 mmol/l; chloride, 109 mmol/l; calcium, 1.7 mmol/l; magnesium, 1.04 mmol/l; and blood sugar 6.4 mmol/l. Serum alkaline phosphatase was 184 to 216 IU/l, pO₂ was 7.26 and bicarbonate was 17.0 mEq/l. Urine: pH varied between 6 and 7, sodium 67 and potassium 47 mEq/l. Twenty-four hour urine contained 600 mgm of protein. A bone scan showed diffuse uptake, especially around the costochondral junctions, metatarsals, calcaneum, L3 vertebra and necks of both femora representing pseudofractures and consistent with widespread osteomalacia.

Radiographs showed subcapital fractures of both femoral necks with postero-inferior displacement of femoral heads (similar to SCFE). Tomograms (Fig. 1) clearly showed growth plates has already fused and that these were fractures of femoral necks and not a case of SCFE. The patient was then diagnosed with renal tubular acidosis (RTA) type I with generalized osteomalacia and stress fractures of the femoral necks. The patient was stabilized with potassium supplements in the form of 30 mols of Shohl's solution daily.

Subsequently, bilateral subtrochanteric valgus osteotomies were carried out sequentially after preliminary percutaneous adductor tenotomies (Fig. 2). The excised bone fragments were sent for histopathologic examination. Central trabeculae bordered by osteoid tissue confirmed the diagnosis of osteomalacia.

Post operatively the patient was pain free, was able to walk unaided, and gait improved to normal. Three years after surgery and continued medication, patient had no further episodes of pain or weakness. Knee and hip movements were fully restored and she was able to squat. Radiographs after removal of implants (Fig. 3) showed complete union of



Fig. 1: Tomogram of pelvis showing near symmetrical transcervical fractures of femoral neck bilaterally. Physseal plates have fused.



Fig. 2: Subtrochanteric valgus osteotomy using fixed angle plates.



Fig. 3: After removal of plates, both original transcervical fractures and the osteotomy cuts are united and normal neck shaft angle has been restored.

both fractures and osteotomy sites. There was no evidence of avascular necrosis or chondrolysis.

DISCUSSION

SCFE is sometimes seen in adolescents with chronic renal disease¹. Due to interference with calcium metabolism, the zone of provisional ossification is weakened; this, combined with the peculiar mechanical stresses acting on the relatively vertical epiphyseal plate of the femoral neck, may result in chronic slip, and may even occur bilaterally. In adults, after the capital epiphysis has fused, SCFE is not possible. However, profound metabolic abnormalities such as severe osteomalacia or age related osteoporosis may, as previously reported, lead to vertebral collapse, pelvic deformities or fractures of the femoral neck in the elderly². Faraj³ described a case of bilateral simultaneous intra-articular and extra-articular femoral neck fractures in a case of nutritional osteomalacia. In the case under study, however, dietary intake was normal. Secondary osteomalacia resulting from

RTA seems to have caused the fractures, which in the current case were both extra-articular and intra-capsular in nature.

Once a bone is weakened by an underlying systemic abnormality, normal stresses may cause it to yield and crack. Spontaneous (stress-related) femoral neck fractures have been classified into three groups by Dorne *et al*⁴. Fatigue fractures occur in normal bones subjected to abnormal stresses such as in military recruits and athletes undergoing vigorous training. On the other hand, insufficiency fractures occur with normal activity in a bone weakened by underlying systemic problem e.g., post menopausal or steroid induced osteoporosis, Paget's disease, hyperparathyroidism, osteomalacia, scurvy, or rheumatoid arthritis. A significant number of femoral neck fractures may, in addition to age related osteoporosis, have osteomalacia as the underlying problem. The third type is a pathological fracture due to localized bone destruction by a tumour or cyst. The case presented here clearly belongs to the category of insufficiency stress fracture.

SCFE secondary to renal disease in the young may result in coxa vara. This consequent deformity may be corrected by a subtrochanteric valgus or cuneiform osteotomy. In older people with traumatic or osteoporotic fractures of femoral neck, a vertical fracture (Gardner III or IV) can be made to unite by valgus subtrochanteric osteotomy, thus making the fracture line more horizontal. This procedure eliminates shearing stress⁵ as well as the development of coxa vara. In the case presented, valgus osteotomy at the subtrochanteric region, not only caused the subcapital fracture to unite, but also corrected the coxa vara and restored full movements at the hips. We conclude that localised pain in a patient with chronic renal disease should be properly investigated for stress fractures. Early diagnosis and management will result in satisfactory outcome.

REFERENCES

1. Switzer P, Bell HM. Slipping of the capital femoral epiphysis with renal rickets: a case report. *Can J Surg.* 1973; 16(5): 330-2.
2. Lee C, Lashari S. Pseudofracture of the neck of femur secondary to osteomalacia. *J Bone Joint Surg. (B).* 2007; 89(7): 956-8.
3. Faraj AA. Bilateral simultaneous combined intra and extracapsular femoral neck fracture secondary to nutritional osteomalacia: a case report. *Acta Orthop Belg.* 2003; 69(2): 201-3.
4. Dorne HL, Lander PH. Spontaneous stress fractures of femoral neck. *Am J Roentgenol.* 1985; 144: 343.
5. Dickson KF, Bennett JT, Warren FH, Mast JW, Mayo KA, Darling J. Nonunion of femoral neck fracture and trochanteric osteotomy after a pinned, slipped femoral capital epiphysis: a case report. *Am J Orthop.* 2003; 32(11): 551-5.