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Radiological Studies

Fig. 1. A Lateral roentgenograms of both knees show erosive changes involving the articular surface of each patella, considerably more marked on the right. A faintly defined, linear, vertically placed radiolucency is noted in the posterior cortex of the upper end of the right tibia. B Observe the calcification in each popliteal artery. The femoropatella joint cartilage on the left appears thinned, but this could be technical.

Clinical Information

This 52-year-old woman was referred to a rheumatologist because of pain in both knees. She had been chronically ill for a number of years. Physical examination was not contributory except for the finding of decreased range of motion of both knees due to pain. No evidence of soft tissue swelling was ascertained. Radiological studies of the skeleton, including both knees, were obtained (Fig. 1 A, B) and a description of the radiological findings are observed in the foregoing.

Further history and the report on specific laboratory studies are withheld.
Diagnosis: Secondary Hyperparathyroidism Related to Chronic Renal Disease with Erosion of Articular Surface Both Patellae

The differential diagnosis includes calcium pyrophosphate dihydrate deposition disease (CPDD), Wilson disease (hepatolenticular degeneration) and bilateral (post-traumatic) patellar necrosis.

The patient had known renal disease dating to childhood and had been on dialysis for the past five years. Laboratory studies showed an elevated alkaline phosphatase and creatinine in the blood serum.

The rather subtle finding of the linear radiolucency in the posterior cortex of the upper surface of the right tibia, in retrospect, suggests the possibility of “tunneling” as observed, on occasion, in hyperparathyroidism. This radiological feature alone should have suggested the possibility of the diagnosis.

Discussion

The radiological features of hyperparathyroidism secondary to renal disease include resorption of bone, generalized diminution in degree of bone mineralization (increased lucency), osteosclerosis (on occasion), calcification in blood vessels and soft tissues and erosive arthritis. This erosive type of arthritis may involve the hands and wrists [8], elbows [7], acromioclavicular, glenohumeral, sternoclavicular, sacroiliac, vertebral and the patellofemoral joints. Involvement of the last named joint has been described in the literature only rarely. Bywaters et al. [1] first reported patellofemoral erosions in patients with renal osteodystrophy. Kricum and Resnick [6] reported similar abnormalities in patients on chronic dialysis and suggested that these changes may represent the most striking skeletal finding in renal osteodystrophy.

Radiologically, these features consist of thinning of the femoropatellar joint cartilage with erosions of the posterior (articular) surface of the patella. The anterior aspect of the femur as well as the femorotibial joint may also be involved [6]. Clinically, these patients often present with pain and swelling of the knees (not present in this case). Restriction of joint motion and the presence of a joint effusion occur frequently [1]. Bilateral involvement is common.

The precise mechanism of such patellofemoral erosions is not entirely clear, although the process may be related to osteomalacia [1, 6]. Subchondral weakening of bone with subsequent microfractures and fragmentation of bony surfaces at the sites of mechanical pressure constitutes a reasonable causative hypothesis [1]. The hyaline articular cartilage over the fragmented bone disappears and is replaced by irregular fibrous cartilage. When healing occurs, intrasosseous callus forms and mimicks an erosion. These changes are to be considered essentially post-traumatic in origin.

The incidence of patellofemoral erosions has not been reported. However, with the advent of long term dialysis and longer survival an increasing number of patients may show such alterations. Cohen et al. [2] reported that 60% of patients had skeletal changes after 4 years of long-term dialysis, while only 14% had abnormal findings at the start of the dialysis. Hodsmen et al. [5] reported 1.4% of patients on dialysis developed osteomalacia, with no signs of secondary hyperparathyroidism. It has been reported that up to 30% of patients on dialysis may develop predominant osteomalacia [3]. The pathogenesis of osteomalacia in these patients is unclear and may be related to adjunctive therapy or substances in the dialyzate which inhibit bone mineralization.

It may be of interest to illustrate two other patients with radiological features similar to the case just reported.

The first patient is a 38-year-old man with a known history of gout, who showed the classical features of gout radiologically, particularly in both first toes. He presented six years after the diagnosis of gout had been established in uremia. Radiological studies show the erosions of the posterior articular surface of the patella and the calcification of the popliteal artery (Fig. 2). Synovitis is also present.

The second case is that of a 45-year-old woman who was on long-term dialysis. Laboratory and radiological studies indicated the presence of secondary hyperparathyroidism. The radiological features are those of a small erosive area in the middle third of the posterior (articular) surface of the patella. At least three small well-defined but confluent osteolytic areas are noted on the posterior surface of the upper end of the tibia. Calcification of the popliteal artery is also present (Fig. 3).

In summary, patellofemoral subchondral bony