Extraosseous granuloma after total knee arthroplasty—a case report

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An 85-year-old white man underwent total arthroplasty of the right knee (P.C.A., Howmedica). After 10 years of satisfactory function, revision was necessary because of aseptic loosening; the radiographs showed periprosthetic radiolucency, settlement of the tibial component, and varus deformity (Figure 1).

At revision, the tibial insert was severely worn and fractured and the tibial tray was loose. There were florid reactive tissues and extensive osteolysis at the proximal tibia beneath the tibial prosthesis. Although the patellar prosthesis was stable, moderate wear was noted on the polyethylene surface. The femoral component was intact and stable. Microscopic examination of the removed prosthesis and tissue revealed fragments of synovial tissue with marked chronic synovitis, dense hyalinized fibrosis, calcification and a foreign body type of inflammatory reaction. No popliteal mass was seen. Revision TKA with bone grafts to the medial tibial plateau was performed.

Although the patient did well postoperatively, he experienced recurrent joint effusions that required aspiration 4 times over a period of 9 months. Synovial fluid was observed to be yellow and cloudy; microscopic examination revealed normal glucose, protein and cell count, and the fluid was negative for crystals. Due to the limitations of our laboratory at that time, no synthetic particulates could be identified. Culture of the aspirate was negative for infection. Serum laboratory analyses (CBC, erythrocyte sedimentation rate, C-reactive protein, rheumatoid factor, and uric acid) were within normal limits.

2 years after the revision, the patient noticed a slightly tender lump in the popliteal area. He also had pain, local swelling, and tenderness around the knee.

A round firm mass approximately 5.0 × 4.0 cm was felt in the popliteal area. Bone scan showed a soft tissue mass, without increased uptake around the prosthesis. Ultrasound showed that it was solid.

The mass was excised. Gross pathology showed two discrete solid tumors, one measuring 3.7 cm and the other 1.5 cm. The masses were irregularly nodular and granular, tan-colored and well circumscribed. On cross-section, the larger mass showed a 0.8 cm cystic cavity containing greyish-white granular material (Figure 2). Microscopic examination revealed foreign body granuloma, with a focus of ischemic necrosis (Figure 3). Polarized light microscopic examination showed numerous birefringent extracellular polyethylene particulates throughout both tumors (Figure 4).

The postoperative course was uneventful. At 2

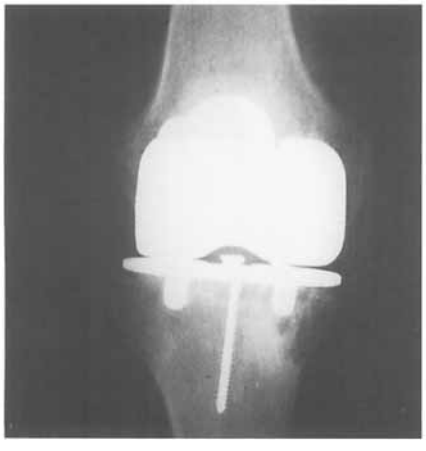

Figure 1. Preoperative anteroposterior radiograph of the right knee.

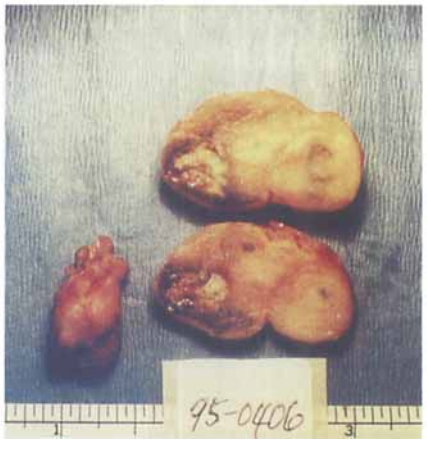

Figure 2. Cystic cavity on cross-section of granuloma.

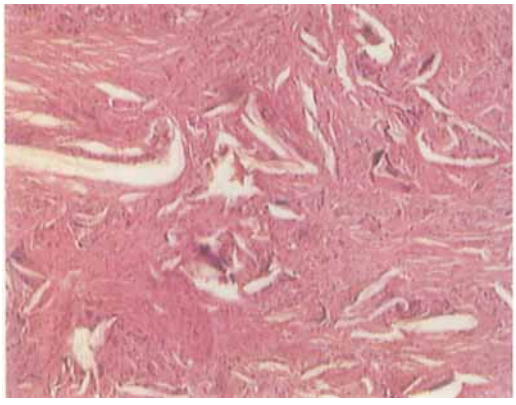

Figure 3. Microscopic view of granuloma.

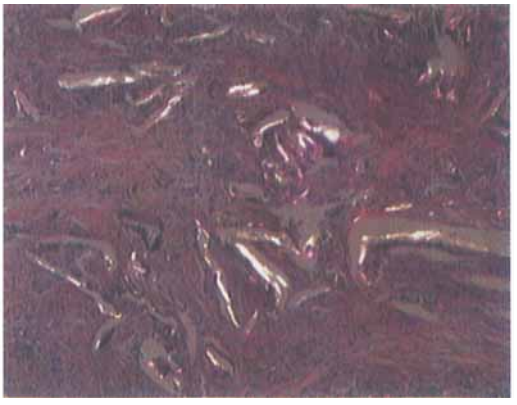

Figure 4. Polarized light microscopy of granuloma.

years' follow-up, the knee was doing well, without recurrence of effusion or granuloma formation.

Discussion

Aggressive periprosthetic granulomatosis has been reported after both total hip arthroplasty (Santavirta et al. 1990b) and total knee arthroplasty (Nolan and Bucknill 1992). Reigstad and Røkkum (1992) described an intrapelvic granuloma due to a loosening acetabular cup. Such intraosseous granulomas have been well studied, and one of the main reasons for granulomatosis is polyethylene debris. Our case had an extraosseous polyethylene-induced granuloma after total knee arthroplasty (TKA).

Polyethylene wear can result in the failure of total joint arthroplasties (Christensen et al. 1990, Lindstrand et al. 1990, Santavirta et al. 1990b). Polyethylene debris resulting from wear has also been found to cause granuloma formation in total joint arthroplasties (Santavirta et al. 1990a, Nolan and Bucknill 1992). Although aggressive granulomatosis is an entity distinct from commoner forms of prosthetic loosening, it may be associated with earlier prosthetic loosening (Santavirta et al. 1990a, b).

Intrapelvic granulomas due to loosening acetabular cups are thought to be a foreign body reaction against debris resulting from prosthetic wear (Reigstad and Røkkum 1992). Mjöberg (1992) hypothesized that micromovement due to a loosening prosthesis may drive joint fluid and debris under high pressure into the bone-prosthesis interface, resulting in the deposition of debris and particulates in the joint confinement. The debris at the bone-prosthesis interface may cause osteolysis and eventual prosthetic loosening. Polyethylene particulates at the popliteal recess may also induce a foreign body tissue reaction. Over a longer period, such tissue may proliferate and cause a tumor-like granuloma.

In our case, granuloma formation occurred probably as a result of polyethylene debris from the failed TKA. Although frank granulomatosis was not seen on microscopic examination of the original failed TKA prosthesis, a foreign body type of inflammatory reaction was found in the surrounding tissue. Furthermore, polarized light microscopy confirmed the presence of polyethylene particles in the excised granuloma. We speculate that polyethylene particulate debris from the original prosthesis may have been pulled posteriorly by gravity and sequestered in the synovial capsule in the popliteal fossa, resulting in granuloma formation in this area.

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