

Metal Hypersensitivity

In Total Knee Arthroplasty

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CASE PRESENTATION TULSA, OKLAHOMA

V.P. is a 48-year-old male that presented for a 2nd opinion regarding his painful total knee arthroplasty. His complaints consisted of pain at rest and with activity. He required the use of a cane to ambulate and was limited to 50-100 feet. He also experienced recurrent swelling, persistent redness and warmth, occasional mottling and recurrent low-grade fevers with periodic nighttime chills and sweats.

Three years prior to his presentation the patient had undergone a knee arthroscopy secondary to a work related injury that showed severe degenerative arthritis. His surgeon offered him a total knee replacement and the procedure was performed one month later. Following the surgery he experienced a delayed wound healing with prolonged drainage, swelling, redness and occasional fevers. He was ultimately placed on several courses of antibiotics for what was thought to be a superficial infection.

The wound eventually healed but he continued to have knee pain. Radiographs showed findings consistent with loosening of the tibial component. He underwent a revision of the tibial component 18 months after the initial knee replacement.

Following the revision surgery the patient experienced a symptom free interval of two to three months followed by insidious onset of his knee pain. Aspirations of his knee revealed no organisms and a triple phase bone scan showed increased activity in the proximal tibia around the component, but the indium scan did not demonstrate activity consistent with infection. His knee pain persisted and forty months after his initial total knee replacement he presented to us for further evaluation.

On physical exam his right total knee had a small effusion. There was exquisite tenderness on the medial and lateral aspects of the right knee and joint line as well as the medial and lateral patellar retinaculum. The patella was found to track smoothly and appropriately. His range of motion was 0 to 125 degrees with muscle strength 5-out-of-5. Distally he was neurologically and vascularly intact with minimal lower extremity edema.

After the initial evaluation, additional radiographic studies were obtained and revealed a PR total knee with an uncemented femoral component, a cemented tibial component, and an all polyethylene patella component (see figures 1 and 2). Sizing and alignment were acceptable and the joint-line appeared to be restored appropriately. There was a complete 2mm lucency noted between the bone-cement interface of the tibial component consistent with loosening (see figures 3-5). The Merchant's view of the patella showed a less than 1mm smooth radiolucency line between the bone-cement interface and the patella was centrally located in the prosthetic trochlea.

Additional laboratory studies were obtained to rule out an infectious etiology. Joint aspirations revealed no organisms and aside from a significant normocytic anemia, the complete blood count, C-reactive protein and erythrocyte sedimentation rate were all within the normal range. Given the patient's history and clinical presentation, occult infection was suspected and a two-stage re-implantation was planned.

During the removal of the total knee a large amount of cloudy synovial fluid was seen upon entering the knee joint, the surrounding tissue appeared chronically and acutely inflamed. No antibiotics were administered prior to obtaining intra-operative cultures and frozen sections from the synovium as well as the tibial and femoral interfaces. Forty to fifty polymorphonucleocytes per high-powered field were noted with focal areas of necrosis with abscess formation (see figure 6).

After removal of the components, meticulous debridement and removal of all cement, a tobramycin/vancomycin impregnated spacer block with intramedullary rod was placed in the knee joint (see figure

7). The wound was then closed and the patient was placed in a bulky compressive dressing with a fiberglass shell and started on a six-week course of IV vancomycin. Upon completion of his antibiotics he was to return for re-implantation of his total knee components. Prior to discharge the intra-operative final culture results revealed no organisms and the patient then admitted to having an allergy to titanium

Blood was drawn and sent to Rush Presbyterian-St. Luke's Medical Center for in-vitro metal sensitivity testing. The results indicated a high degree of reactivity to chromium and moderate reactivity to both zirconium and aluminum (see figure 8). After several lengthy and detailed discussions regarding his condition, a knee arthrodesis was recommended.

Approximately four years after his initial procedure, the patient underwent a right knee arthrodesis. A Hoffman II ringed external fixator (Howmedica, Rutherford, NJ) was applied allowing removal of all hardware from the knee joint (see figure 9). After 18 weeks the external fixator frame was dynamized and the patient was allowed to bear weight as tolerated. A CT scan revealed bone trabeculae crossing the fusion. The patient was brought back to the operating suite for removal of the external fixator and evaluation of the arthrodesis under direct fluoroscopy. At his latest follow up appointment (see figures 10-12), the patient expressed that his knee pain has essentially resolved; his surgical incision and pin tracts healed without complications and he was ambulating with the use of a cane comfortably for unlimited distances.

Initial Evaluation



Figure 1 & 2

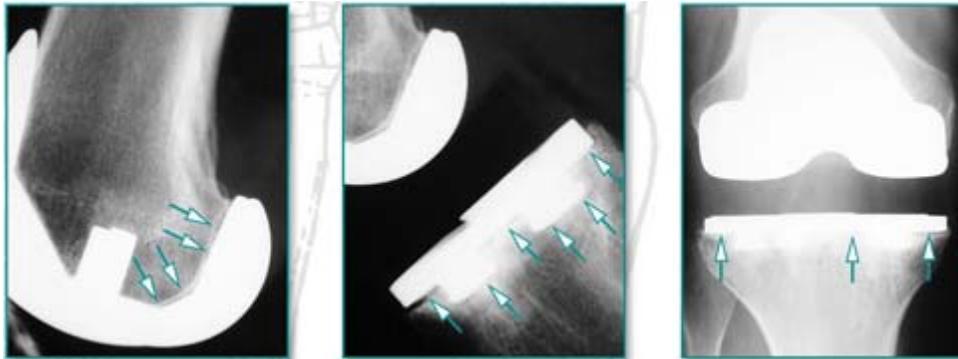


Figure 3, 4, & 5

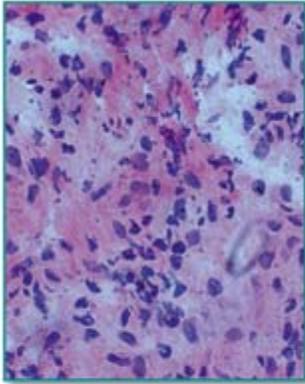


Figure 6: Histological frozen sections demonstrate benign proliferative synovitis with granulomatous inflammation, mixed inflammation, and focal accumulation of polymorphonuclear cells of 40-50 per high-powered field.



Figure 7: Radiograph demonstrating right knee with temporary antibiotic impregnated spacer block with intermedullary rod.



Post-Operative



Figure 9

Figures 11 and 12: Enhanced radiographs demonstrating a successful arthrodesis with bony trabeculae crossing the fusion site.