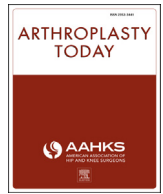




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Case report

Early failure with massive metallosis and posteromedial wear following atraumatic anterior cruciate ligament rupture after medial unicompartmental knee arthroplasty

Ashok Rajgopal, MS, MCh, FRCS (Orth) *, Inayat Panda, MS, DNB (Orth), Vipin C. Tyagi, D-Orth

Fortis Bone and Joint Institute, Department of Orthopaedics, New Delhi, India

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ABSTRACT

Severe metallosis following medial unicompartmental knee arthroplasty (UKA) is relatively rare. It is usually due to long-standing wear of the polyethylene component, resulting in frictional wear between the femoral and tibial metallic components. Biomechanical and cadaveric studies have shown the effects of anterior cruciate ligament (ACL) transection following medial UKA. We describe a case of a 58-year-old male who developed attritional rupture of the ACL 16 months following medial UKA leading on to early accelerated failure over the next 8 months. The patient underwent revision to total knee arthroplasty with good outcome. The clinical effect of spontaneous ACL transection on medial UKA causing abnormal posteromedial wear of polyethylene component and tibial tray, massive metallosis, and worsening of mechanical axis can be demonstrated in this case report.

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Introduction

Metallosis is the abnormal deposition of metallic debris and/or electrically active particles in the periprosthetic soft tissue secondary to metallic corrosion causing localized inflammatory reaction and synovitis and complications resulting from the same [1]. Accumulation of polyethylene particles from polyethylene wear is termed as plasticosis [2]. These phenomena are a result of friction and wear between the components implanted across a prosthetic joint and result in local osteolysis and loosening of the prosthesis.

Severe metallosis requiring revision is most common following a total hip arthroplasty (incidence of 2%–5%), especially with the use of metal-on-metal articulating surfaces [3]. It is less common following a total knee arthroplasty (TKA) and is even rare after a

unicompartmental knee arthroplasty (UKA) and is due to long-standing polyethylene wear resulting in frictional wear between the metallic femoral and tibial components [4,5].

An intact anterior cruciate ligament (ACL) has been considered a prerequisite for a successful UKA and has been proven in biomechanical and cadaveric studies [6]. We report a 58-year-old male who developed a spontaneous attritional/degenerative rupture of the ACL 16 months following medial UKA. He developed progressively increasing instability with an abnormal posteromedial wear pattern over the polyethylene insert and metal backed tibial component, massive metallosis, osteolysis and component loosening, tibial tray subsidence, and progressive worsening of the mechanical axis. The clinical effect of a spontaneous ACL rupture on medial UKA causing early failure can be demonstrated through this case report.

Case history

A 58-year-old male presented with 8-month duration of increasing pain and swelling over the left knee. There was no localized erythema, increased temperature, or discharge that could suggest a septic etiology.

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* Corresponding author. Fortis Escorts Research Institute, Department of Orthopaedics, Okhla, New Delhi 110025, India. Tel.: +91 9810590150.

E-mail address: a_rajgopal@hotmail.com

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Two years prior to this, he had presented with primary degenerative osteoarthritis involving both knees with a Knee Society Score (clinical, KSS) and Oxford Knee Score (OKS) of 72 and 35 (left knee) and 64 and 28 respectively (right knee) with predominant medial compartment involvement on the left knee. The overall University of California, Los Angeles (UCLA) activity score was 3. A medial UKA was performed on the ipsilateral (left) knee and a TKA was done for the right knee. The immediate postoperative radiographs of the left knee showed a well-fixed unicondylar implant in slight varus alignment with no evidence of retained cement or debris (Fig. 1).

At 1-year postoperative review, the functional scores were higher on the left knee (compared to right knee) (KSS 88 vs 84 and OKS 42 vs 39) and the UCLA score was 8, with history of preferential weight bearing on the left side especially during stair climbing. Radiographs done at this stage were similar to the immediate postoperative radiographs with no evidence of radiolucent lines, implant loosening, or metallic debris.

At 2-year follow-up, he complained of progressively increasing pain and persistent swelling over the left knee, which had been present for the past 8 months. He complained of instability and reduced confidence in bearing weight over the left knee (KSS 48, OKS 19). The contralateral knee was asymptomatic. He had a significant reduction in his activity levels (UCLA 3) due to left knee pain. There was no history of trauma although he gave history of minor twisting injury without fall while walking 8 months earlier following which his symptoms had started and increased progressively. He was of average built (basal metabolic index 29.4 kg/cm^2), nondiabetic, and without any medical comorbidities. Besides known allergy to sulfa group of drugs, there was no history of allergy to metal or other organic/inorganic materials.

Physical examination revealed tenderness over the medial joint line and a diffuse suprapatellar effusion over the left knee with a passive range of motion from 0° to 100° . Previous surgical wound was healthy with no local rise in temperature, erythema, or pigmentation over the knee. There was instability on anteroposterior and varus-valgus stress testing.

Knee radiographs revealed particulate densities behind the posterior femoral condyles. The medial joint space was completely diminished and the femoral component was in contact with the



Figure 1. Immediate postoperative radiographs following index medial compartmental arthroplasty surgery showing well-fixed and well-aligned femoral and tibial components.



Figure 2. At 2 years of follow-up, anteroposterior and lateral radiographs of medial UKA knee showing posterior displacement of femur, absent medial joint space, and increased femorotibial contact area.

posterior aspect of the metal backed tibial component (Fig. 2). Radiolucent lines and cystic changes were seen underneath the metallic tibial tray and also surrounding the 2 tibial studs with evidence of loosening of the femoral and tibial components.

A blackish tinged synovial fluid was aspirated with a white blood cell count of $5400/\text{mm}^3$ and 35% neutrophils. Leucocyte esterase was not detected and 2 days of culture did not reveal any organism. The erythrocyte sedimentation rate was 7 and C-reactive protein $<0.6 \text{ g/dL}$. A diagnosis of aseptic loosening of the implant with metallosis was made and a revision to a TKA was planned.

Intraoperatively, extensive blackish staining of the synovium, capsule, and the surrounding tissue was noted (Fig. 3). The synovium was rubbery in consistency and blackish staining of the synovial fluid was noted. Complete synovectomy was performed along with debridement of the surrounding tissue to debulk the metallic debris without compromising the integrity of the collateral ligaments. The ACL was found to be deficient which may have occurred due to an attritional rupture since there was no significant history of trauma or fall. There was full thickness wear of the posterior one-third and posteromedial aspect of the polyethylene component and the tibial tray (Fig. 4). The femoral component was loose but the anterior half of the tibial tray was well fixed. There was evidence of osteolysis underneath the femoral component and posterior aspect of tibial component with subsidence of the metallic tibial tray.



Figure 3. Intraoperative image showing black rubbery synovium due to massive metallosis.

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