

# Primary Knee Arthrodesis in Severe Crystalline Arthropathy

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## Abstract

Gout is a common form of inflammatory arthritis involving deposition of monosodium urate crystals within a diarthrodial joint. In this article, we report the case of a 54-year-old man who had severe, uncontrolled gout and presented with a 10-year history of knee pain. On consideration of all patient factors, including age, desired functional level, significant bone loss, periarticular soft-tissue masses, significant ligamentous instability, and difficult access to healthcare, knee arthrodesis was the surgery of choice. A knee fusion for gouty arthritis allowed the patient to have a stable, pain-free knee.

Gout is a common form of inflammatory arthritis involving deposition of monosodium urate (MSU) crystals within a diarthrodial joint. It is the most common form of inflammatory arthritis in men older than 40.<sup>1,2</sup> Rates of gout in men vary from low rates in African countries (0.03% in Nigeria) to average rates in Western countries (1% or 2%), and high rates among aboriginals (15.2% in Taiwanese aboriginals).<sup>2</sup> Chronic gout-induced arthropathy can cause severe disability. Becker and colleagues<sup>3</sup> found that patients (mean age, 59 years) with chronic gout had physical function scores analogous to those of people at least 75 years

old in the general population. Knee arthrodesis is typically reserved for salvage from a failed arthroplasty or for large bony and soft-tissue defects left after resection of large bony lesions.<sup>4</sup>

In this article, we report the unusual case of an elective knee arthrodesis performed for end-stage gouty arthritis. The patient provided written informed consent for print and electronic publication of this case report.

## Case Report

A 54-year-old Liberian man living in the United States for 10 years as a refugee was referred by his primary care physician to our orthopedic clinic. He had intractable left knee pain and instability after years of recurrent gouty attacks. Using a single-point cane, he ambulated with a markedly antalgic gait pattern.

The man was born in Liberia and immigrated to the United States when he was in his late 40s. He had his first gouty attack in the left knee 10 years before his arrival and, over that decade, recurrent attacks affecting both knees (left worse than right), both wrist joints, and multiple small joints in both hands and feet. Notably, his father also had severe tophaceous gout.

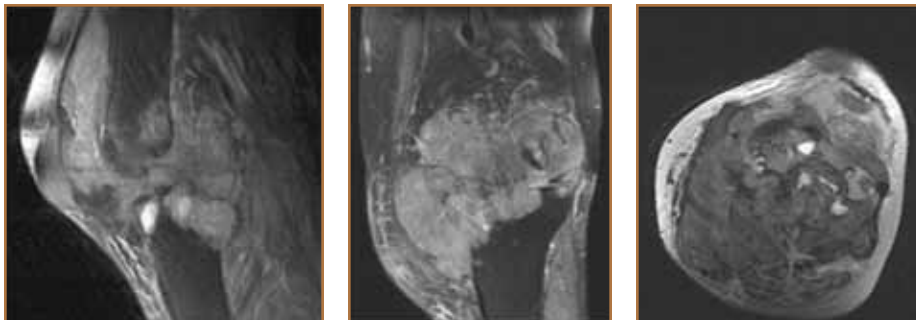
In the United States, the man was being managed by a rheumatologist, who treated him with a combination of allopurinol 200 mg twice daily, probenecid (which he was no longer taking when he presented to us), and dexamethasone oral 0.5 mg daily.

Examination in our clinic revealed extensive soft-tissue gouty tophi over both elbows, the metacarpophalangeal (MCP) joints in both hands, and prominently about the left knee. The lesions on the elbows and MCP joints limited range of motion (ROM) somewhat, but were of little clinical consequence.

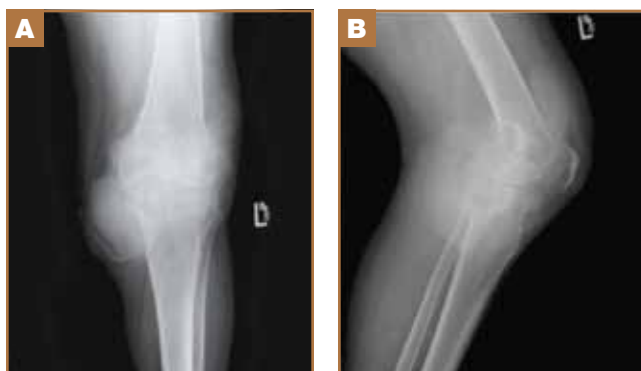
There was a gouty tophus (12.7 cm in diameter) on the medial side of the left knee. Active ROM was 30° to 105°, and the knee was unstable to valgus stress at 30°, indicating chronic medial collateral ligament (MCL) deficiency. This instability and a giving-way feeling prompted the man to come to our clinic.

Magnetic resonance imaging (MRI) showed large intra-articular tophi, an incompetent MCL, and significant bone loss within the proximal tibia (Figures 1A-C).

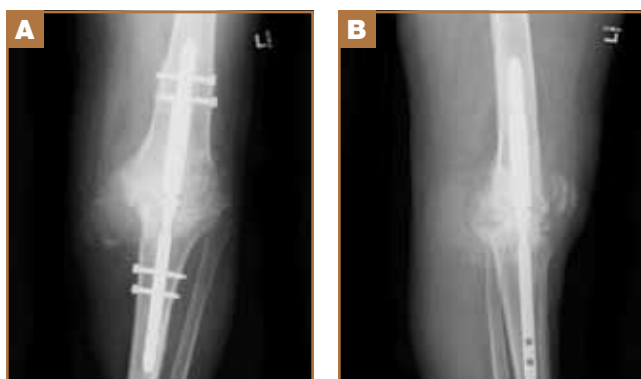
**Figure 1.** Magnetic resonance imaging of left knee shows gouty tophi and bone destruction.



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**Figure 2.** Standing (A) anteroposterior and (B) lateral radiographs of left knee before surgery.



**Figure 3.** Eight months after surgery, standing (A) anteroposterior and (B) lateral radiographs show evidence of consolidated bony callus, indicating fusion has occurred.

Radiographs corroborated these findings in conjunction with advanced secondary arthrosis (Figures 2A, 2B). Creatinine level was 1.71 mg/dL, uric acid level was 9.3 mg/dL, and erythrocyte sedimentation rate was 11 mm/h. Over the 2 years the patient was followed in our clinic before surgical intervention, uric acid levels were measured multiple times (lowest, 6.8 mg/dL). The left knee was aspirated to rule out infection before surgical intervention. Nucleated cell count was unobtainable because of excessive MSU crystals obscuring the specimen. Cultures were negative. A soft-tissue biopsy performed in the clinic confirmed the diagnosis of gouty arthritis.

The patient initially was interested in total knee arthroplasty (TKA). His main concern was pain relief and a stable platform for weight-bearing in advance of a planned return to his native country. Over numerous clinic visits, we discussed the difficulties inherent in TKA in his case. First, he would have practically no access to orthopedic care in Liberia, as healthcare resources there are very limited.<sup>5</sup> Second, with his ligamentous compromise and significant tibial bone loss, constrained arthroplasty with stems and/or endoprosthesis reconstruction would be anticipated. Given his age of 54 years at initial presentation, most likely he would require revision at some point. Third, for 10 years the gout had been poorly controlled with suboptimal medical care, raising the question whether TKA outcomes would be compromised by persistent, recalcitrant

postoperative crystalline arthropathy.

The patient was concerned that after arthrodesis, he would lack mobility, especially when getting into and out of vehicles. He was told that instead he could expect significant pain relief—lower risk of gout attack, compared with what has been reported for TKA<sup>6-8</sup>—and significantly increased functional mobility, resulting from pain relief and knee joint stability.

After discussing the situation with his family, the patient elected to have knee arthrodesis. We performed the procedure using the Wichita Fusion Nail (Stryker Orthopedics, Mahwah, New Jersey), which consists of a retrograde femoral nail and an antegrade tibial nail connected by a compressive locking screw.<sup>9</sup> During surgery, we discovered large gouty tophi, and resected them from the suprapatellar pouch and the medial and lateral gutters. The MCL was incompetent. After placement of the intramedullary nails, the leg was brought out to neutral alignment, and the compression screw was placed. Autograft removed from the distal femur, patella, and proximal tibia was placed in the fusion site.

After surgery, the patient was transferred to the orthopedic floor. He was allowed weight-bearing as tolerated, and the day after the procedure he was out of bed for physical therapy. Two days after the procedure, he reported pain in both wrists, the right knee, and multiple joints in both hands. His uric acid level was 10.3 mg/dL. He was seen by the rheumatology service in the hospital and was effectively managed with his home medications in addition to colchicine and methylprednisolone, which was tapered to oral prednisone on discharge.

Three days later, the patient was discharged home with a rolling walker and a shoe lift. At 8-month follow-up, he was ambulating without any walking aides, had complete pain relief, and was very satisfied with his overall progress. Since discharge, he has not had any gouty attacks, and just recently he returned to Liberia to reunite with his family. Radiographs showed consolidation of the arthrodesis mass, maintenance of neutral limb alignment, and no evidence of hardware migration (Figures 3A, 3B).

## Discussion

Gout is the culmination of several physiologic disturbances that ultimately result in deposition of uric acid salts and crystals in the joints and periarticular soft-tissues.<sup>10</sup> The cumulative incidence of gout in US men was reported to be 8.6%.<sup>11</sup> The overall incidence of gout in the US population has increased from 0.03% in 1978 to 0.05% in 1996.<sup>12</sup> Forty-seven percent of patients with primary gout were reported to have musculoskeletal disability, and 31% had renal failure,<sup>2</sup> as was the case with our patient. Gout-related disability is an underestimated and understudied problem.<sup>3</sup> Gout can cause severe pain, and the gouty tophi can limit motion. Presentations of excessive tophaceous gout as seen in our patient's case, are less common in the United States, as under normal circumstances medical management and dietary restrictions are typically effective treatments. However, we may see diseases such as uncontrolled gout in patients who emigrate from countries that do not have adequate access to health care.

We speculate that our patient's disease had a strong genetic

component, but we did not formally pursue it because of his young age at presentation, multiple joint involvement, and father's history. Recent findings suggest that renal excretion of uric acid is a major determinant of gout.<sup>13</sup> The numerous other gout pathogenesis points at which inherited genes may increase risk include hepatic production of urate, formation of MSU crystals, and initiation and resolution of the inflammatory response to MSU crystals.<sup>13</sup>

In addition, our patient had been undertreated for chronic hyperuricemia. Multiple reasons have been suggested for "treatment-failure gout," including patient nonadherence, inadequate use of urate-lowering therapies, and inadequate follow-up by primary care physicians. By report, our patient adhered to his prescribed medical therapy. He likely had been undertreated with allopurinol. Allopurinol dosages up to 600 or 800 mg/d have been used for recalcitrant cases of hyperuricemia. Several widely circulated yet not validated reports seemed to show a larger number of adverse events in patients who have chronic kidney disease and receive high doses of this medication. More recent studies have demonstrated that adherence to the creatinine clearance-adjusted allopurinol dosing guidelines led to suboptimal control of hyperuricemia and did not prevent the hypersensitivity reactions that were the basis for the original dosing guideline recommendations.<sup>14,15</sup>

The most common indication for knee arthrodesis is salvage management for pain and for instability of an unreconstructable knee after arthroplasty infection.<sup>4</sup> Less common indications are substantial metaphyseal bone loss, inadequate ligamentous restraints, multiple failed revisions, inadequate soft-tissue coverage with loss of the extensor mechanism, and infection with virulent or resistant organisms.<sup>4</sup> In our patient's case, we were concerned about metaphyseal bone loss, MCL instability, and the soft-tissue envelope after the gouty tophi were removed. Wilde and Stearns<sup>16</sup> noted a lower fusion rate with increased bone loss in a series of 12 arthrodesis cases. Fusion was another concern in our patient's case. However, when bony union is achieved, knee arthrodesis can provide a stable, pain-free limb.

Several authors have evaluated function after knee arthrodesis. Harris and colleagues<sup>17</sup> compared patients who had knee arthrodesis with patients who had constrained TKA and patients who had above-knee amputation. The patients who had knee arthrodesis performed the most physically demanding activities and had superior stability. With regard to overall function, patients can expect a stable, painless extremity with difficulty in climbing stairs and sitting in movie theaters and in airplanes.<sup>4</sup> Knee arthrodesis should provide our patient with a durable, long-lasting solution to his gouty arthritis, and this outcome outweighed the drawbacks.

## Conclusion

Primary arthrodesis for knee arthropathy is not the procedure of choice for most arthroplasty surgeons and their patients. However, for rare cases of crystalline arthropathy associated

with extensive bony and periarticular soft-tissue lesions, arthrodesis should be considered a viable management option, as it allows for a painless, stable, and durable weight-bearing platform that can outlast an arthroplasty. For physiologically young patients who have limited access to specialized orthopedic care and who may be at risk for revision of a complex arthroplasty, arthrodesis may provide a safer primary option for surgical management.

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*This paper will be judged for the Resident Writer's Award.*