Acute Gouty Arthropathy After Total Knee Arthroplasty

Jeffrey W. Salin, DO, Adolph V. Lombardi, Jr., MD, FACS, Keith R. Berend, MD, and Douglas J. Chonko, MS, DO

In the complete development of its natural history, gout passes through 4 stages: asymptomatic hyperuricemia, acute gouty arthritis, intercritical gout, and chronic tophaceous gout. The first attack is usually monoarticular and associated with few constitutional symptoms. Later attacks become polyarticular and associated with fever.[1]

Gout incidence varies in populations, and overall incidence is 1.6 to 13.6 per 1000.[1] Gout is the most common inflammatory arthritis in US men older than 40. In 1986, there were an estimated 2.2 million self-reported cases of gout.[2]

Five cases of gout involving total knee arthroplasty (TKA)[3-5] and 2 cases involving total hip arthroplasty[6,7] have been reported. In the present article, we describe 3 knees in 2 patients with post-TKA gouty arthritis. In our retrospective study, we used our practice's electronic medical records plus information from routine clinical follow-ups, which reflected regular office visits or interviews conducted by telephone. We complied with privacy guidelines and obtained patient authorization to use and disclose protected health information for research purposes.

Case Reports

Case 1

A woman in her early 50s who had undergone a right primary TKA 4 years earlier and a revision left TKA 4 years earlier presented with pain in the left knee. The right knee was symptom-free on initial presentation. The left knee had been asymptomatic until presentation.

Dr. Salin is Associate, Kansas City Bone and Joint Clinic, Inc., Overland Park, Kansas. When this article was submitted, he was Resident (PGY-3), Orthopedic Surgery, Doctors Hospital of Stark County, Massillon, Ohio.
Dr. Lombardi is Senior Associate, Joint Implant Surgeons, Inc., New Albany, Ohio, and Clinical Assistant Professor, Department of Orthopaedics and Department of Biomedical Engineering, Ohio State University, Columbus, Ohio.
Dr. Berend is Associate, Joint Implant Surgeons, Inc., New Albany, Ohio, and Clinical Assistant Professor, Department of Orthopaedics, Ohio State University, Columbus, Ohio.
Dr. Chonko is Adult Reconstructive Surgeon, North Star Orthopaedics, Akron, Ohio.

Address all correspondence to: Adolph V. Lombardi, Jr., MD, FACS, Joint Implant Surgeons, Inc., 7277 Smith's Mill Rd, Suite 200, New Albany, OH 43054 (tel, 614-221-6331; fax, 614-221-4744; e-mail, lombardiav@joint-surgeons.com).

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The patient had a 7-day history of severe pain with associated erythema and swelling of the left knee. She denied fever, chills, and a recent traumatic event. Physical examination of the knee revealed warmth to touch, mild erythema, slight effusion, and severe global tenderness on palpation. Left knee aspiration yielded 25 mL of cloudy yellow fluid.

Past medical history was significant for obesity, diabetes, and hypothyroidism. The patient denied excessive alcohol intake and did not have a prior history of gout.

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Laboratory studies revealed a serum white blood cell (WBC) count of 8.2×10^9/L (normal, 4.5-11.0 $\times 10^9$/L), an erythrocyte sedimentation rate (ESR) of 89 mm/h (normal, 0-20 mm/h), and a quantitative C-reactive protein (CRP) level of 10.3 mg/L (normal, <1.0 mg/dL). Left knee aspiration results, including gram stain of the synovial fluid, as well as fungal, aerobic, and anaerobic cultures, were all negative for growth. A cell count was not obtained. The patient had not been given prophylactic antibiotics, which possibly could have caused a negative result. Radiographs did not show evidence of loosening or malposition of the prosthesis.

Given the patient's severe, unremitting pain and suspicious laboratory profile, and the presumptive diagnosis of acute infection, we irrigated and débrided the left knee and exchanged the polyethylene insert.

On arthrotomy, components appeared well fixed, and there was no grossly purulent material, but synovial tissue was dramatically stained a chalky white. Synovial biopsy was performed and repeat cultures obtained. Given lack of obvious infection, we performed polyethylene insert exchange, synovectomy, and irrigation. Final culture results were negative for infection, but infectious disease consultation recommended empiric treatment with antibiotics, which was initiated.

Histologic examination of the synovial tissue specimen revealed many needle-shaped, negatively birefringent urate crystals, consistent with gout. The patient's serum uric acid level was elevated (9.9 mg/dL; normal, 2.4-7.0 mg/dL). At this point, allopurinol 100 mg/d was added

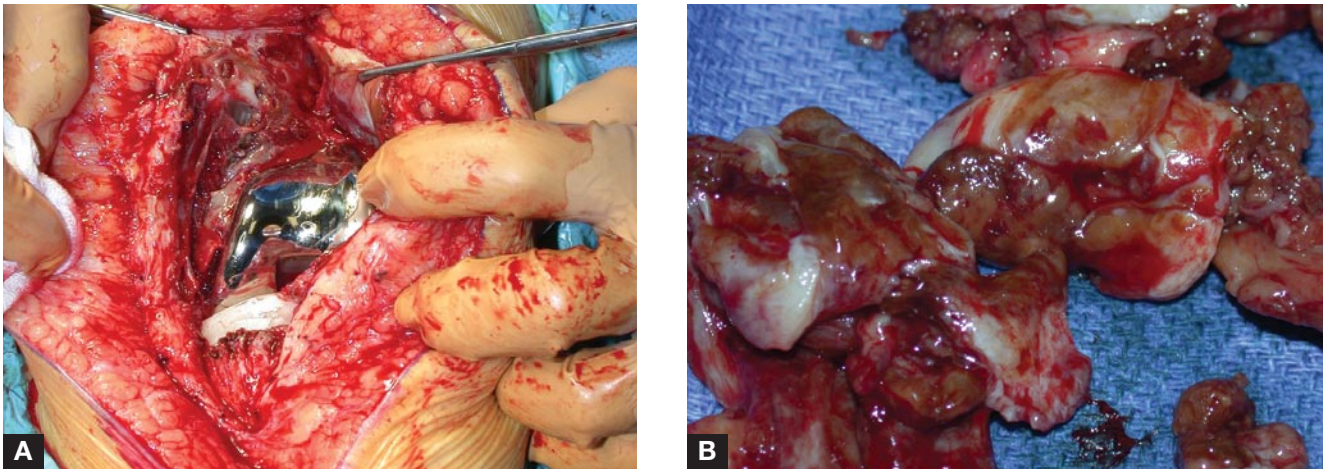

Figure. (A) Inflamed synovium laden with gout crystals at time of incision and débridement. (B) Close-up of same.

to her medication regimen for the diagnosis of gout. By 5-week follow-up, the patient's left knee symptomatology had improved dramatically.

Case 2 (Same Patient)

The same patient presented with new, sudden onset of severe right knee pain and low-grade fever at follow-up, approximately 4 weeks after the diagnosis of gouty arthropathy had been confirmed in the contralateral knee. Serum uric acid had been elevated (9.9 mg/dL) at the time of that diagnosis. Because of the recent sequelae of events in the left knee, we decided on empiric treatment of presumed gout in the right knee. Knee aspiration was not performed, and CRP level and cell count were not obtained. The patient was given a tapering dose of steroids per her medical doctor's recommendations for an assumed diagnosis of gouty arthropathy now affecting the right knee. This treatment gave her complete pain relief without surgical intervention. At most recent follow-up, the patient was asymptomatic bilaterally and the knee arthroplasties well fixed.

Case 3

A woman in her early 80s presented to an outlying emergency department with a complaint of acute onset of left knee pain and swelling. Bilateral cemented TKAs had been performed 11 years earlier, and her postoperative convalescence had been uneventful.

The patient reported a 4-day history of sudden onset of left knee pain, edema, erythema, and warmth and no history of fever, chills, or trauma. Physical examination revealed the knee to be warm and erythematous, with a mild effusion. Medical history was remarkable for recurrent urinary tract infection, pyelonephritis, chronic diarrhea, and history of breast cancer, hypertension, and gout.

Laboratory studies revealed an elevated serum WBC count of 17.3×10^9/L (normal, $4.5\text{-}11.0 \times 10^9$/L) and a serum uric acid level of 6.0 mg/dL. ESR was elevated (61 mm/h). Knee aspiration in the emergency department revealed cloudy yellow synovial fluid, which was positive for *Escherichia coli,* and negatively birefringent urate crystals, consistent with gout on gram-stain and crystal evaluation.

Given the positive gram stain, culture results, and acute symptom onset, we performed synovectomy, débridement, and polyethylene insert exchange (Figure). Components were found to be well fixed, and cultures and synovial tissue were obtained and sent for analysis. Intraoperative culture and tissue specimen confirmed the presumptive diagnosis of concomitant septic TKA and gouty arthropathy. Cultures were again positive for *E coli* with urate crystals positively identified on synovial fluid analysis. Administration of ciprofloxacin and indomethacin 25 mg 3 times a day was started.

At most recent follow-up, the patient was asymptomatic and the left knee arthroplasty well fixed.

Discussion

Gout may have a role in sudden onset of pain and in TKA-associated aseptic loosening.[3-5] Higher serum urate concentrations are associated with serum creatinine and urea nitrogen levels, alcohol intake, body bulk (estimated by body weight, surface area, or ponderal index), males, postmenopausal females, medications (diuretics, intravenous heparin, cyclosporine), infections, and hemorrhage.[1]

CRP has a pathophysiologic role in the inflammatory process. CRP of more than 10 mg/dL is highly suggestive of infection (sensitivity, 0.96; specificity, 0.92).[8] Most moderate (1-10 mg/dL) CRP elevations are from inflammatory conditions, including gout.[1,2]

The differential WBC count of synovial fluid is more than 85% polymorphonuclear cells in infectious arthritis without TKA, but it ranges from 50% to 90% polymorphonuclear cells in inflammatory arthritis without TKA.[9] The test with the highest positive predictive value for infection (excluding intraoperative samples) is total WBC count in synovial fluid being more than 80% in nonarthroplasty knees.[8] The same fluid documenting crystals has a positive predictive value of 100% for gout.

Post-TKA aspiration of synovial fluid and inspection of synovial WBC count were recently shown to be very effec-

tive in predicting presence of infection. Specifically, a post-TKA aspirate with a WBC count of 2.5×10^9/L and 60% polymorphonuclear cells is highly suggestive.[10] However, that study did not specifically address the issue of gouty arthropathy or concomitant gout and infection, in which cases WBC count could be varied.

Obtaining a thorough history (including previous episodes of gout and other risk factors) and performing CRP and synovial fluid analysis (including cultures) can facilitate a correct diagnosis of gouty arthropathy and possibly prevent unnecessary surgical intervention. In one knee described here (case 2), surgical intervention was not required for adequate treatment after the precedent for the diagnosis had been established (case 1).

As evidenced by case 3, infection can also be associated with gout, and therefore coexisting infection should always be investigated before diagnosing gout. This exclusion of infection can be difficult, however, as the synovial fluid analysis and laboratory profiles may be significantly abnormal in the presence of acute gouty arthropathy.

In cases that remain suspicious for infection, irrigation and débridement with polyethylene exchange appear to be a viable treatment (as in case 1). Intraoperative pathologic evaluation of synovial tissue and intraoperative gram stain may also be of benefit in these cases.

Post-TKA gout appears to be a rare but recognized event. We have altered our standard evaluation protocol to include synovial fluid crystal analysis and serum uric acid level measurement in cases in which a diagnosis of infection is not clearly established. Crystals in synovial fluid are diagnostic, but serum uric acid level may be a baseline indicator in assessments of the effectiveness of medical management. In cases of concomitant acute infection and in cases in which the diagnosis is questionable, surgical débridement and irrigation provide satisfactory results. Medical treatment for high uric acid level and acute gouty arthropathy was effective, in the one case that we encountered, after infection had been adequately ruled out.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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References

1. Wortmann RL, Kelley WN. Gout and hyperuricemia. In: Kelley WN, Ruddy S, Harris ED, Sledge CB, eds. *Textbook of Rheumatology*. Philadelphia, PA: Saunders; 2001:1339-1364.
2. Hershfield MS. Gout and uric acid metabolism. In: Goldman L, Bennett JC, eds. *Cecil Textbook of Medicine*. Philadelphia, PA: Saunders; 2000:1541-1548.
3. Blyth P, Pai VS. Recurrence of gout after total knee arthroplasty. *J Arthroplasty*. 1999;14(3):380-382.
4. Williamson SC, Roger DJ, Petrera P, et al. Acute gouty arthropathy after total knee arthroplasty: a case report. *J Bone Joint Surg Am*. 1994;76(1):126-128.
5. Archibeck MJ, Rosenberg AG, Sheinkop MB, et al. Gout-induced arthropathy after total knee arthroplasty. *Clin Orthop*. 2001;(392):377-382.
6. Healy JH, Dines D, Hershon S. Painful synovitis secondary to gout in the area of a prosthetic hip joint: a case report. *J Bone Joint Surg Am*. 1984;66(1):610-611.
7. Ortman BL, Pack LL. Aseptic loosening of a total hip prosthesis secondary to tophaceous gout: a case report. *J Bone Joint Surg Am*. 1987;69(7):1096-1099.
8. Spangehl MJ, Masri BA, O'Connell JX, Duncan CP. Prospective analysis of preoperative and intraoperative investigations for the diagnosis of infection at the sites of two hundred and two revision total hip arthroplasties. *J Bone Joint Surg Am*. 1999;81(5):672-683.
9. Schumacher HR Jr. Synovial fluid analysis and synovial biopsy. In: Kelly WN, Ruddy S, Harris ED, Sledge CB, eds. *Textbook of Rheumatology*. Philadelphia, PA: Saunders; 2001:1339-1364.
10. Mason JB, Fehring TK, Odum SM, Griffin WL, Nussman DS. The value of white blood cell counts before revision total knee arthroplasty. *J Arthroplasty*. 2003;18(8):138-143.

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