

# Surgical Management of a Large, Gouty Tophus

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This patient, who could not tolerate medical therapy for his chronic gout, eventually consented to surgery to remove a tophus on his left foot that was severely affecting his quality of life.

**G**out is a metabolic disease that occurs when excess amounts of uric acid circulating in the blood crystallize and subsequently deposit in joints or soft tissue. Hyperuricemia is the condition most often associated with an acute gouty attack or, in chronic states, with the formation of tophi.<sup>1,2</sup> In all cases, the demonstration of monosodium urate crystals in the joint or surrounding soft tissues is sufficient to make a definitive diagnosis of gout.<sup>3-5</sup>

In this article, we describe the case of a patient with chronic hyperuricemia who presented to a VA podiatry clinic with an unusually large, gouty tophus. While management of his condition through medication, dietary changes, and other lifestyle modifications was attempted, surgical intervention eventually was necessary. Among the other notable features of this case was the fact that he was diagnosed with chronic renal failure and nephritic syndrome after developing multiple tophi, whereas such conditions usually are diagnosed before any gouty symptoms manifest.

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## INITIAL EXAM

A 56-year-old man was referred to a VA podiatry clinic by his primary care provider (PCP). He presented with a large, indurated mass about his left first metatarsophalangeal (MTP) joint (Figure 1). The lesion was not focally tender, but its girth hindered the patient's ability to wear shoes. The patient had similar masses and symptoms of intermittent pain and swelling in multiple other joints, including his hands, knees, wrists, and elbows. These lesions had developed over a six-year period prior to his initial clinic presentation.

The patient was being treated by his PCP for hypothyroidism (which his PCP described as "borderline myxedema") and hyperlipidemia. His PCP also previously had detected hyperuricemia and diagnosed him with polyarticular tophaceous gout, for which the PCP prescribed a regimen of allopurinol. The patient could not tolerate this medication, however, and discontinued the regimen after three months of chronic nausea. Colchicine was prescribed but also was not tolerated by the patient.

The primary lesion of concern was the tophus surrounding the left great toe. Upon physical examination at the initial clinic visit, the lesion was observed to extend medially and

plantarily. It extended distally to the interphalangeal joint of the hallux and proximally toward the plantar medial arch, approximately mid-shaft of the first metatarsal bone.

Radiographs revealed a large, contiguous, soft tissue density about the first MTP joint as described (Figure 2). There were no lytic osseous lesions or areas in proximity with diminished bone density. Examination revealed excellent pedal pulses (dorsalis pedis, +2/4; posterior tibial, +2/4) bilaterally with three-second capillary refill to all digits. Tactile and vibratory sensations were intact and normal distally, bilaterally, and symmetrically.

## TREATMENT COURSE

Alternative treatments were discussed with the patient, including excision of the mass, but the patient declined surgery. He was advised to refrain from eating purine rich foods and to use shoes that provided extra depth and width to accommodate the deformity as much as possible for his work (as a plumber) and casual activities.

The patient returned to our clinic two years later. He had taken an early retirement since the gouty tophi and debilitating pain made it impossible to continue his work. At this visit, the lesion on the first

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Figure 1. The patient's left foot at initial (2004) presentation to the podiatry clinic, showing a large, indurated mass about the first metatarsophalangeal joint.



Figure 2. Radiographic images of the patient's left foot at initial (2004) presentation to the podiatry clinic, showing a large, contiguous, soft tissue density about the first metatarsophalangeal joint.

MTP joint was observed to be markedly larger, denser, and more indurated (Figure 3). The soft tissues overlying the lesion were becoming atrophic and distended. The patient was unable to wear any shoes other than oversized house shoes or slippers.

A small ulceration was present on the proximal plantar margin of the mass. A considerable amount of chalky material was curetted from the wound, and a sample of this material was cultured and submitted for crys-



Figure 3. The patient's left foot in 2007, showing a markedly larger, denser, and more indurated lesion, with atrophy and distension of the overlying soft tissues.



Figure 4. Radiographic images of the patient's left foot in 2007, showing a larger, denser soft tissue mass, with increased lucency in the bone around the first metatarsophalangeal joint. A modest, hallux, valgus deformity and crowding of the lesser digits was developing.

tal analysis. The results of cultures were negative. Crystal analysis under a polarized microscope confirmed the presence of needle-like, negatively birefringent urate crystals.

Radiographs at this time revealed a larger soft tissue mass in the area described (Figure 4). The mass had increased in density and the bone

around the first MTP joint had increased in lucency. A modest, hallux, valgus deformity and crowding of the lesser digits was developing secondary to the tophus.

The patient was urged to consider excision, but he again declined surgical intervention. (Up to this point in his life he had never been admitted to a hospital nor had surgery of any kind.) We recommended local wound care measures and followed up with him monthly to monitor the integrity of tissue overlying the tophi. In the months that followed, the patient developed other small ulcerations.

Results of laboratory testing during this period revealed elevated blood urea nitrogen, uric acid, and creatinine levels. Based on these findings, the patient was referred to a nephrologist, who made a diagnosis of nephritic syndrome and chronic renal failure. The patient also was screened for lead toxicity, the results of which were negative. As the patient could not tolerate allopurinol or colchicine, and he continued to defer recommended procedures, we referred him to an orthotist for molded accommodative shoes.

One year later, the patient returned to the clinic, unable to wear the prescribed shoes and otherwise to find relief. The patient agreed to and was scheduled for an outpatient procedure to surgically remove his tophus. Results of preoperative laboratory testing were unremarkable and clearance was obtained from his PCP. Concerns about tissue compromise, possible wound complications, deformity of the first MTP joint, and crowding of the digits were discussed with the patient and his PCP. The patient provided informed consent to perform a Keller arthroplasty involving resection of the base of the proximal phalanx and Kirschner-wire stabilization of the hallux.<sup>6</sup>



Figure 5. The patient's left foot immediately before surgery (2008), showing progression of the gouty tophus.



Figure 6. Keller arthroplasty of the patient's tophus, with use of a Steinmann pin to stabilize the joint and surrounding soft tissues.

### Surgical procedure

One month later, under regional anesthetic with intravenous sedation, the patient underwent excision of the gouty tophus and stabilization of the hallux on the patient's left foot (Figure 5). "Time out" protocols were followed to ensure that proper patient, side, and site of procedures were carried out.

A dorsomedial incision was effected over the mass. Immediately deep to the skin, tophaceous material was encountered. There was very little subcutaneous tissue found over the lesion, as it had become displaced by the mass. The tophus was comprised of dense, chalky material with irregularly traversing septal elements. Contrary to expectations, the margins of the tophus were not distinct or encapsulated. The mass was contiguous, and tissue planes were difficult to identify between the skin and the joint. Care was taken to avoid degloving the overlying skin and to avoid disrupting neurovascular structures to the hallux. The margins dorsally, proximally, and distally were ascertained, but the plantar margins could not be visualized through the dorsal incision. A plantar medial incision was made to visualize the plantar and lateral extent of the tophus, which revealed some invasion to the adjacent plantar fat pad.

The lesion measured roughly 2 cm x 6 cm x 8 cm. The densely packed tophaceous material had disrupted much of the medial first MTP joint capsule. Approximately 60% of the bulk of the lesion was removed piecemeal using sharp and blunt dissection and curettage. Pulsed lavage proved helpful in loosening adherent tophaceous deposits from healthy capsular tissues.

Due to disruption of the joint capsule and persistent valgus deformity, a Keller arthroplasty was performed. The articular surfaces of the joint were white with tophaceous deposition. Tophaceous material and bone specimens were submitted to pathology and for crystal analysis. A Steinmann pin was used to stabilize the joint and surrounding soft tissues (Figure 6). We considered performing a skin plasty with the resultant redundant tissue, but the tissue had been so compromised by the mass that we risked compromising the skin flap. Considerable dead space remained and a small Penrose drain was placed in the proximal plantar border of the wound. A thick compression dressing was then applied.

### Postoperative course

Following the procedure, the patient was admitted to the hospital due to

concerns about wound complications. When the wound was checked the next morning, a modest hematoma was discovered. The drain was removed, the hematoma evacuated, and the wound irrigated at bedside. A thick compression dressing was then reapplied.

The patient was discharged on the second postoperative day after another wound check. At that time, the overlying skin flap was intact and viable with good capillary refill. There was no drainage and no signs of infection. The patient was discharged with a regimen of cephalexin and hydrocodone.

The patient adhered to the postoperative instructions and remained non-weight bearing until his sutures were removed on the 14th postoperative day. At that time, there was a 1.5-cm portion of the dorsal wound that dehisced. A sterile compression dressing was applied for a subsequent 14 days. Radiographs taken on the 28th postoperative day confirmed good alignment of the joint and good reduction of the soft tissue mass. Four weeks after surgery, the wound was entirely closed and the pin was removed. The patient was instructed that he could begin to bear weight, to tolerance, on his foot using a DARCO shoe (DARCO International, Inc., Huntington, WV).

At six weeks, the patient was allowed unrestricted activity in accommodative shoes. Two months after surgery (Figure 7), his foot had healed to the point at which he could comfortably wear casual, lace-up shoes.

One notable complication that arose approximately two months after the patient returned to shoes is that the redundant tissue formed a pedicle proximally. The cleft of this redundant skin developed an intertrigo that resolved with topical astringents and



Figure 7. The patient's left foot eight weeks after surgery.

antifungals. We explained to the patient that a skin plasty to remove this redundant skin could be performed in the future.

### ABOUT THE CONDITION

A hyperuricemic state can be caused by overproduction or underexcretion of uric acid. Overproduction of uric acid can be primary due to genetic defects that result in hypoxanthine-guanine phosphoribosyltransferase deficiencies or phosphoribosylpyrophosphate synthetase overactivity. Secondary overproduction often is caused by excessive dietary intake of purine rich foods, but it also may be a result of myeloproliferative or hemolytic disorders. Underexcretion often is due to renal insufficiency or hypothyroidism; it may also be secondary to dehydration, use of diuretics, or insulin resistance. Lead toxicity (nephropathy) is another known cause.<sup>2</sup>

Uric acid in a supersaturated solution (such as serum) can form a precipitate of sodium urate crystals. The deposition of monosodium urate crystals may be perceived as a mechanism of lowering—or a physiologic attempt to maintain—serum levels of uric acid. Acute gouty attacks are the result of intense inflammation aroused by precipitates of monosodium urate that form during an intermittent state of hyperuricemia. Gouty tophi develop when a chronic

state of hyperuricemia exists.<sup>7,8</sup> Tophi are relatively indolent but often become a nuisance due to their volume or mass. Common sites of tophi are fingers, ears, and prepatellar and olecranon bursae. Pressure areas on the Achilles tendon and ulnar surface of the forearm also are common. This patient's case is particularly interesting due to the dramatic presentation and course.

Radiographs are very useful in tracking the progression of tophaceous gout: The density of the tophus can be appreciated at its proximal, distal, medial, and lateral margins. Similarly, radiographs are helpful in patients with intermittent gout to evaluate bony erosions or joint destruction wrought by the acute inflammatory processes.

Treatment of gout usually is aimed at relieving the acute exacerbation, with colchicine and nonsteroidal anti-inflammatory drugs being prescribed most often for acute gouty episodes. Periarticular and intra-articular injections of soluble corticosteroids also can be helpful (after a peripheral lidocaine nerve block) in diminishing the intensity and duration of the acute attack, especially if injected early in the acute episode.

When chronic hyperuricemia is diagnosed, allopurinol and probenecid often are used. Allopurinol is used frequently for tophaceous gout and, if tolerated, can reduce the size of tophi over time. Dietary counseling to reduce intake of purine rich foods also is important. When medical therapy is insufficient or unable to be tolerated, as illustrated in this case study, surgical intervention may be considered.

### REVISITING THE CASE

In the case of the patient presented here, hypothyroidism and renal pathology both likely contributed to his hyperuricemia and chronic, to-

phaceous gout—even though the renal disease was not diagnosed until after his gout had progressed to the chronic stage. It is more often that gout will manifest after such primary conditions are diagnosed. Lead toxicity also was suspected as a contributing factor in this patient, but his lead levels were within normal limits when tested around the time of his nephrology referral.

In terms of the surgical approach, we could have been more aggressive in the volume of tophus that we excised from this patient. Additionally, better incision planning might have allowed better access to the margins of the lesion and a possible skin plasty to be performed to remove redundant tissue.

In defense of the more conservative choices, however, the skin overlying the mass was compromised preoperatively by the pressure and bulk of the lesion (ulcerations had developed). Additionally, the skin flap was fairly devoid of subcutaneous tissue to offer vascular support to the dermis, which would have been the case even if more clever flaps had been devised at the outset. The hematoma that formed in the dead space postoperatively would have been just as likely. Due to poor definition of anatomy from the density of the lesion, we were hesitant to remove more of the tophus—especially along the distal lateral margin of the lesion—for fear of causing vascular embarrassment or neuropraxia to the hallux.

Even without severe joint destruction, the Keller arthroplasty was a good choice as an adjunct to improve the joint position postoperatively. The Kirschner-wire fixation further stabilized the soft tissue and diminished stress to the flap. Pulsed lavage also proved useful in removing some sections of the lesion. ●

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### Author disclosures

The author reports no actual or potential conflicts of interest with regard to this article.

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