

# Surgery for Tophaceous Gout

Cases of tophaceous gout amenable to surgical management may be encountered in a podiatric practice. This paper reviews the indications for surgery, the pathology, the principles of surgical technique, the preoperative and postoperative management, and presents a case report.

Jared P. Frankel, D.P.M., F.A.C.F.S.<sup>1</sup>  
Thomas J. Boysen, D.P.M.<sup>2</sup>  
Gary F. Ochwat, D.P.M.<sup>3</sup>

Tophaceous gout may be encountered today in a podiatric practice despite the effectiveness of current medical management. Medical therapy with uricosuric agents and xanthine oxidase inhibitors is often effective in stabilizing and reducing tophus size, but 5 to 10% of patients suffering from gout may not respond, and may proceed to the tophaceous stage (1, 2). Talbot (3) stated that "the surgical management of chronic tophaceous gout has not been utilized to its maximum effectiveness. Until such time as gouty patients are placed prophylactically on satisfactory uricosuric agents in the pre-tophaceous stage, there will be a need for surgical removal in selected patients". It is therefore necessary to review the surgical aspects of treatment.

## Indications for Surgery

Straub *et al.* (2) condensed and reclassified the earlier indications of Linton and Talbot (4) and of Larmon and Kurtz (5) into four main categories: 1) functional—excision to permit wearing of shoes and clothing, restoration of motion, and stabilization of joints; 2) symptomatic—control of drainage and infection, reduction of pain, and decompression of nerves; 3) cosmetic restoration; and 4) metabolic—decrease of total body urate.

## Pathology

The tophus is the pathognomonic lesion of gout—"a mass of urates, crystalline or amorphous, surrounded by an intense inflammatory reaction, composed of macrophages, lymphocytes, fibroblasts, and foreign body giant cells" (6).

Tophi are characteristically deposited in articular and periarticular structures, but nerves, blood vessels, and muscle are not usually involved. Their predilection seems to be for the more avascular tissues. Neurovascular structures are pushed aside by developing tophi and encircled or entrapped, but not invaded (7).

An enlarging tophus may eventually involve the skin, causing it to become thin and friable. The study of Straub and his co-workers (2) reported frequent infiltration of the skin directly overlying a large subcutaneous tophus. According to Larmon (1), this skin will maintain viability until trauma or distention causes rupture of the tophus, in which case urates are discharged and the skin may heal rapidly or may slough and form an ulcer with inflammatory margins and with a base of urate crystals.

Larmon (1) has described the typical appearance of tophi in these sites: 1) In elastic structures, such as bursa and subcutaneous fat, lesions appear to be encapsulated. The fibrous capsule isolates the tophus from normal surrounding tissue unless the skin becomes involved. 2) In nonelastic or dense fibrous tissue such as ligament and tendon, the capsule apparently cannot form, and the urate deposits invade and infiltrate the tissue. When tendons are invaded, fusiform or nodular enlargement occurs, limiting or preventing the normal gliding motion. Eventually, destruction of tendon fibers may cause rupture. 3) In bone, crystals deposit in the haversian system, and bone is slowly destroyed and replaced by tophaceous material. The site of predilection is the metaphysis about the joint margin and the subchondral bone. The bone may slowly expand as the interior is destroyed. The cortex eventually becomes thin, followed by complete replacement by urates. 4) In joints, crystals deposit directly on the cartilage surfaces, as well as within synovial membrane. Deposition tends to occur in the interstitial spaces between cartilage cells, with eventual fissuring and fibrillation of the cartilage occurring. Pannus may form about the margins of the articular surface, growing over and destroying the cartilage.

From the Department of Orthopedics, Section of Podiatric Surgery, St. Anne's Hospital West, Northlake, Illinois.

<sup>1</sup> Director of Podiatric Education. Diplomate, American Board of Podiatric Surgery.

<sup>2</sup> Diplomate, American Board of Podiatric Surgery. Address correspondence to: 5601 Victoria Drive, Oak Forest, Illinois 60452.

<sup>3</sup> Submitted while first year resident.

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## Principles of Surgical Technique

The gentle handling of tissues is essential, particularly the skin overlying a large subcutaneous tophus, since they may have impaired vascular supply.

Encapsulated lesions, just as any other form of encapsulated tumor, may be totally excised (2). Infiltrative deposits should be treated by conservative excision and curettage. Many tophi cannot be completely removed without sacrificing vital structures, and this should not be attempted (1). Deposits closely adherent to important structures should be left in place or gently curetted from the surface. For example, tendons can be kept intact merely by shaving the tophus down to the original tendon size (8). No attempt should be made to remove a tophus completely if excision will permanently damage the structures required for future function (2).

When tophaceous deposits are found to extend into bone, conservative curettage should be carried out with soft tissue excision. Every effort is made to preserve the remaining periosteum and shell of bone in order to maintain continuity of skeletal architecture. In some instances these areas are later replaced by bone (2). When a joint has been destroyed by tophi, an arthroplasty of the joint or part of the joint is indicated.

Larmon (1) suggests frequent irrigation of the wound during surgery to help wash away urates and prevent the wound from drying, as urate crystals are moderately water soluble.

Wounds should be closed with a minimum of subcutaneous sutures, except where there is adequate subcutaneous fat. The fine network of blood vessels just beneath the skin over a tophus is jeopardized if subcutaneous sutures are used indiscriminately (1). Pressure dressings and drains are used to eliminate dead space and the formation of hematomas.

### Care of Tophaceous Lesions

When a chronic draining sinus is present it can be surgically enlarged and the underlying tophaceous material removed. As much as possible of the urate deposit is removed with care being taken to preserve vital structures. This will permit collapse of the overlying cutaneous layers and will provide a better opportunity for the sinus to heal. The wounds should be left totally or partially open, and they will respond with formation of granulation tissue and subsequent healing (2). When all of the tophus cannot be removed, wet dressings will aid in the discharge of urate crystals. Granulation tissue will not appear until most of the urate crystals have been removed mechanically, or with the aid of wet dressings (1). Additionally, wounds will not epithelialize until the urates at the base of the ulcer have been removed (3). In extensive ulcers, skin grafting may

speed closure when granulation tissue has appeared. An infected draining sinus should be treated with wet dressings and antibiotics before surgery.

### Pre- and Postoperative Management

Patients with chronic tophaceous gout may have accompanying cardiovascular disease, impaired renal function, or other systemic disease, therefore a thorough medical examination of the patient must be made before any surgical procedure is performed.

Adequate prophylactic administration of 1.5 mg colchicine daily for at least 3 days before surgery and for at least a week postoperatively is recommended to keep acute postsurgical gouty arthritis to a minimum (1-3, 9, 10).

Wound healing after the surgical removal of tophaceous material is good and the incidence of postoperative infection is low (2). Larmon (1) reported that "occasionally, a few days after surgery the wound may discharge semiliquid urates, and may be accompanied by a local inflammatory reaction. Wet dressings and removal of a few sutures will aid in discharge of the material from the wound. Usually this phenomenon subsides within a few days and the wound heals without difficulty. Should wound separation occur, the wound may be left open and wet dressings applied. It will eventually heal with minimal scarring when the urates have been discharged".

Recurrence of tophi is unpredictable, although in the series of Straub (2) 36 procedures were performed and the tophus returned in only three instances.

### Case Report

A 67-year-old white male presented with a chief complaint of an enlargement on the plantar aspect of the first metatarsophalangeal joint of the right foot and two nodules on his right Achilles tendon. The patient had a history of painful prominences on the right foot for 10 years duration, and the masses had grown progressively larger over that period of time. The mass on the plantar aspect of the right first metatarsophalangeal joint was especially uncomfortable because of its size, which was approximately 6 cm x 6 cm.

The patient had previous conservative treatment of shoe modifications, including custom made molded shoes, but was still having difficulty and his symptoms were becoming progressively worse. The tentative diagnosis, pending pathology report, was gouty tophaceous deposits of the right foot. He was admitted to St. Anne's Hospital West on March 27, 1983 for surgical excision of these masses.

Past medical history included gouty arthritis for 25 years, renal calculi in 1950 without recurrence, diabetes



mellitus for 1 year, scarlet fever without sequelae, and borderline hypertension. The patient was taking NPH insulin 25 units every morning and Piroxicam<sup>4</sup> occasionally for arthritic pain.

Physical examination revealed an obese white male. Pedal pulses were palpable and symmetrical. Neurovascular status of the lower extremities was normal. A large firm subcutaneous mass was noted on the plantar aspect of the right first metatarsophalangeal joint, approximately 6 cm x 6 cm (Fig. 1). Also noted were two nodular masses at the Achilles tendon, gouty deposits of the right olecranon and metacarpophalangeal joints of both hands. Preoperative laboratory results were essentially normal with the exception of blood glucose of 250, blood urea nitrogen 24, and uric acid 9.6. The results of a 24-hr urine for creatinine and uric acid were within the high limits of normal. A repeat glucose the morning of surgery was 106.

Radiographic examination revealed a very large, partially calcified mass involving the medial plantar aspect

<sup>4</sup> Pfizer Laboratories, New York, N. Y.

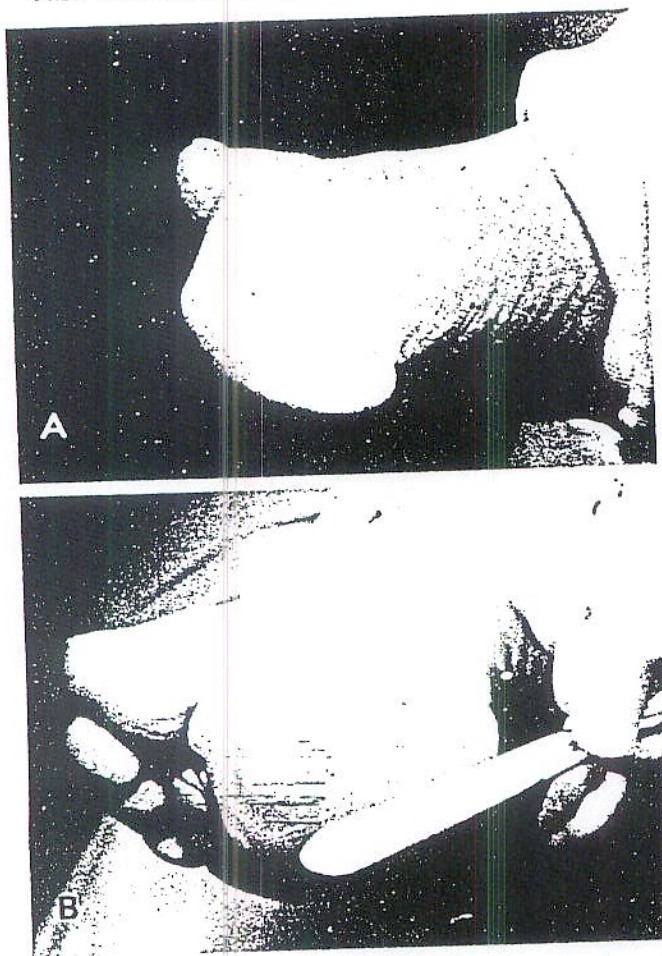


Figure 1. Preoperative view of right first metatarsophalangeal joint showing large, firm subcutaneous mass. A, lateral; B, oblique.

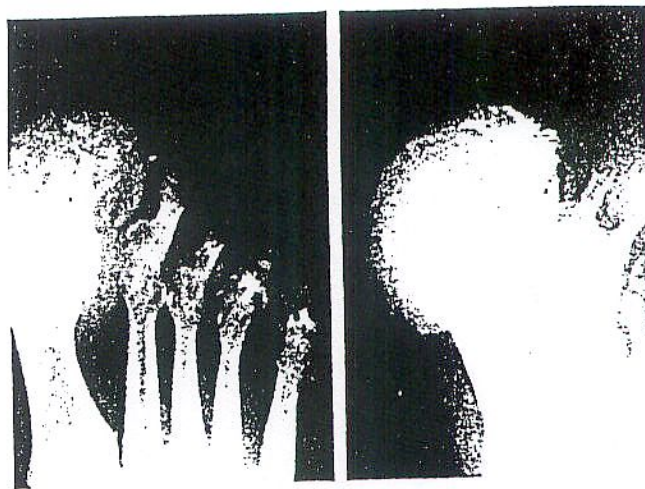


Figure 2. Radiographic evidence of tophaceous masses.

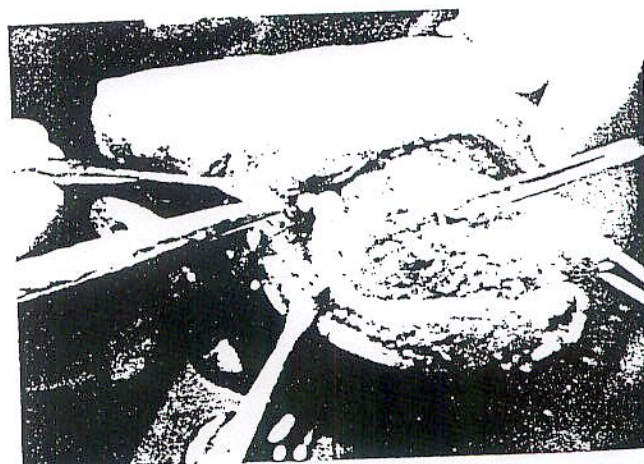


Figure 3. Surgical exposure of the right first metatarsophalangeal joint with massive urate deposition. Care must be taken to preserve an adequate skin flap.

of the first metatarsophalangeal joint with narrowing of the joint space (Fig. 2).

On March 28, 1983, the patient underwent surgical excision of soft tissue masses in the right foot, under general anesthesia. No tourniquet was utilized, but hemostasis was maintained throughout the entire procedure with minimal blood loss.

Attention was directed to the medial plantar aspect of the first metatarsophalangeal joint of the right foot where a 6-cm curvilinear incision was created, away from the weight-bearing surface. The incision was made approximately the same length as the lesion itself. It was deepened via sharp and blunt dissection. Superficial bleeders were clamped and ligated as necessary. With additional dissection, a yellowish-white, caseous material resembling tophi was identified (Fig. 3). The size and length of the soft tissue mass was so extensive that dissection had to be continued both dorsally and plantarily to dissect the entire mass from the operative area without sacrificing vital structures. The entire mass was



removed in two portions (Fig. 4). The area was frequently irrigated with sterile saline and kanamycin irrigant. The redundant skin margins were sharply remodeled. The wound was inspected and any remaining bleeders were clamped and ligated as necessary. One-quarter inch Penrose drain was inserted into the wound to allow for drainage, and the skin was coapted with 3-0 nylon sutures in a horizontal mattress fashion (Fig. 5).

Attention was next directed to the posterior aspect of the right heel cord where two nodules were found. A 4-cm curvilinear incision was placed from proximal to distal and the incision was deepened by sharp and blunt dissection. The two nodules were identified and removed without sacrificing tendon. The area was irrigated and inspected for adequate hemostasis. The skin was closed with 3-0 nylon sutures, and postoperative injection of 0.5% bupivacaine was utilized. The wounds

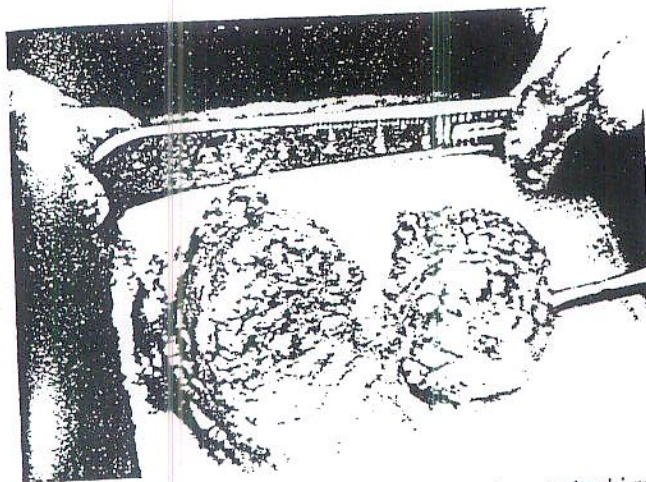


Figure 4. Gross postoperative appearance of gouty tophi removed from the first metatarsophalangeal joint.



Figure 5. Skin margins remodeled and coapted with 3-0 nylon horizontal mattress sutures. Penrose drain in place.

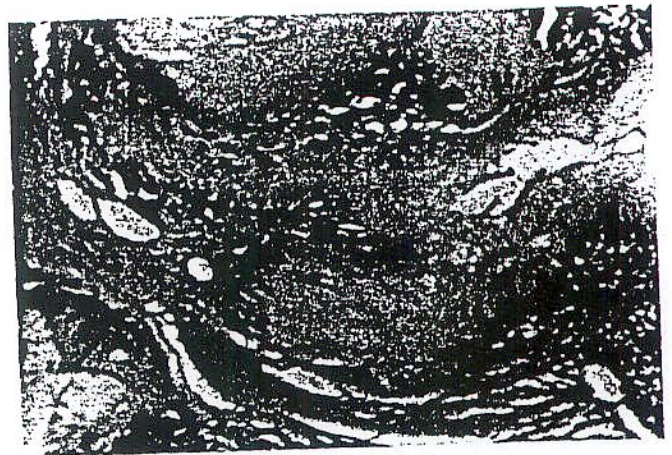


Figure 6. Microscopic section of tophus; a collection of amorphous urates in necrotic debris surrounded by a zone of inflammatory cells, including multinucleated giant cells (H & E,  $\times 100$ ).

were dressed with dry, sterile, compression dressing, and a posterior splint was utilized with 6-inch elastic bandages.

All pathology specimens were placed in alcohol and submitted for analysis. On the first postoperative day, the dressings and drain were removed. Approximately 5 ml of serous drainage were expressed from the first metatarsophalangeal site, and the wounds were redressed. The patient was allowed non-weight bearing, three point crutch walking. On the second postoperative day, the wounds were inspected and drainage had ceased. The foot was bandaged and the patient was discharged. No pain medications were requested.

The patient was last seen in follow-up approximately 1 year postoperatively. All incisions had healed well, and there was no clinical evidence of further deposition of urates at the surgical sites. Additionally, the patient was able to return to conventional footwear, and was being maintained on allopurinol.

### Pathologic Examination

Microscopic examination revealed dense fibrocollagenous tissue containing cystlike cavities filled with an eosinophilic granular material. The cystic spaces were surrounded by numerous multi-nucleated giant cells (Fig. 6). Examination under polarized light showed the presence of uric acid crystals.

### Discussion

The surgical management of tophaceous gout has been reviewed. Surgery offers definite benefits to patients in whom deforming masses develop or when drainage and infection are present. The removal of large subcutaneous tophi may be indicated before the overlying skin becomes necrotic and a draining sinus is



formed. A case report has been presented involving excision of a large, deforming tophus of the plantar aspect of the first metatarsophalangeal joint.

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