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Case Report

Gouty Tophi Excision

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Gouty Tophi Excision: Bridging Modern Surgery and Ayurvedic Wisdom

Singh J[1*], Soni R[2]

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[1*] Jaswant Singh, MS Ayu Shalya Tantra, Shivam Orthocare and Multispeciality Hospital, Una, Himachal Pradesh, India.

[2] Ritesh Soni, MS MCh Ortho, Director, Shivam Orthocare and Multispeciality Hospital, Una, Himachal Pradesh, India.

Gouty tophi are a hallmark of chronic gout, resulting from the deposition of monosodium urate (MSU) crystals in tissues, leading to granulomatous inflammation. Chronic tophaceous gout typically develops in long-standing hyperuricemia and may cause pain, deformity, infection, and functional impairment, often necessitating surgical intervention. From an Ayurvedic perspective, gout corresponds to Vatarakta, a condition involving an imbalance of Vata Dosha and Rakta Dhatu. Chronic cases with deeper joint involvement are classified as Gambhira Vatarakta. Management strategies include dietary regulation, detoxification therapies (Panchakarma), and herbal formulations aimed at reducing uric acid levels and inflammation. This case report presents a 59-year-old male with a 15-year history of hyperuricemia and progressive tophaceous swellings on his left foot, complicated by pain and pus discharge. Clinical examination revealed elevated uric acid levels (8.3 mg/dL). Surgical excision of the tophus at the fifth metatarsophalangeal (MTP) joint was performed under local anesthesia, resulting in symptom resolution. This case highlights the importance of early gout management to prevent chronic progression. While surgery provides effective symptomatic relief, long-term control of hyperuricemia through pharmacological, dietary, and Ayurvedic approaches remains essential to prevent recurrence and joint damage.

Keywords: Gouty tophi, Chronic gout, Ayurveda, Vatarakta, Herbal formulations

Corresponding Author

Jaswant Singh, MS Ayu Shalya Tantra, , Shivam Orthocare and Multispeciality Hospital, Una, Himachal Pradesh, India.

Email: jajaswant9@gmail.com

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Introduction

Gout is a metabolic disorder caused by hyperuricemia, an excess of uric acid in the blood. It results from overproduction or reduced excretion of uric acid, leading to crystal deposits in joints and soft tissues.

This triggers inflammatory arthritis with severe pain, redness, and swelling. Chronic cases can cause tophi, joint damage, and kidney issues. Women develop gout less often but are at higher risk later in life due to renal disease, diabetes, and diuretics.

Gouty tophi are firm nodules of urate crystals forming in untreated or poorly managed gout. Common sites include fingers, toes, elbows, ears, and the Achilles tendon. Persistent hyperuricemia leads to crystal accumulation, inflammation, joint deformity, ulcers, infection, and mobility issues.

Risk Factors for Gouty Tophi:

1. Diet: High purine intake (red meat, seafood, organ meats) raises uric acid. Alcohol, especially beer and spirits, hinders excretion, while sugary drinks increase production.

2. Genetics: A family history of gout indicates a genetic predisposition affecting uric acid metabolism. Mutations in renal urate transporter genes (e.g., SLC2A9, ABCG2) reduce uric acid elimination.

3. Renal Dysfunction: Chronic kidney disease (CKD) impairs uric acid excretion, increasing the risk of persistent hyperuricemia, gout flares, and tophi formation.

In Ayurveda, gouty tophi are compared to *Vatarakta*, with deeper joint involvement referred to as *Gambhira Vatarakta. Vatarakta* is a disorder caused by an imbalance of *Vata Dosha* (air and space) and *Rakta Dhatu* (blood tissue), manifesting as joint pain, inflammation, redness, and stiffness.

The condition arises due to vitiation of *Vata* and accumulation of *Ama* (toxins), leading to impaired metabolism and deposition of waste products in the joints.

Types of *Vatarakta*

Vatarakta has been well explained in Charak Chikitsa 29 /19-23

Classification of *Vata-Rakta*

उत्तानमथ गम्भीरं द्विविधं तत् प्रचक्षते|
त्वङ्मांसाश्रयमुत्तानं गम्भीरं त्वन्तराश्रयम्||Ch.Ch.29/19

These verses describe the two types of *Vata-Rakta* (Gout) - Uttana (Superficial) and *Gambhira* (Deep-seated) - and their clinical manifestations.

Vata-Rakta is classified into two types:

***1. Uttana* (Superficial Type) -** Affects the skin (*Tvak*) and muscles (*Mamsa*).

***2. Gambhira* (Deep-seated Type)** - Affects deeper tissues such as joints, bones, and internal organs.

This classification indica. that disease can have mild (superficial) or severe (deep-seated) progression, depending on extent of tissue involvement.

Symptoms of *Uttana Vata-Rakta*

कण्डूदाहरुगायामतोदस्फुरणकुञ्चनैः|
अन्विता श्यावरक्ता त्वग्बाह्ये ताम्रा तथेष्यते|| Ch.Ch.29/20

In *Uttana Vata-Rakta,* symptoms are mainly superficial and include:

- *Kaṇḍu* (Itching)
- *Dāha* (Burning sensation)
- *Ruja* (Pain)
- *Āyāma* (Tension or stiffness in the skin)
- *Toda* (Pricking pain)
- *Sphuraṇa* (Twitching or throbbing sensation)
- *Akuñcana* (Spasms or contracture)

The affected area appears reddish (*Tāmrā*) or purplish (*Śyāva-Raktā*), indicating inflammation and blood stagnation in the superficial layers of the skin and muscles.

Symptoms of *Gambhira Vata-Rakta*

गम्भीरे श्वयथुः स्तब्धः कठिनोऽन्तर्भृशार्तिमान्|
श्यावस्ताम्रोऽथवा दाहतोदस्फुरणपाकवान्|| Ch.Ch.29/21

In *Gambhira Vata-Rakta,* the condition progresses deep into the tissues, leading to:

- *Śvayathu* (Swelling)
- *Stabdhatā* (Stiffness)
- *Kaṭhina* (Hardness of affected joints or tissues)
- *Bhṛśārtimān* (Severe pain inside the affected joints or muscles)

- *Śyāva-Tāmra* (Bluish-red discoloration, indicating deep-seated inflammation)
- *Dāha, Toda,* and *Sphuraṇa* (Burning, pricking pain, and throbbing sensation, similar to *Uttana* type but more intense)
- *Pākavān* (Ulceration or suppuration in severe cases)

This description suggests chronic inflammation, which can lead to joint deformities, fibrosis, and necrotic changes over time.

Effects on Bones and Joints

रुग्विदाहान्वितोऽभीक्ष्णं वायुः सन्ध्यस्थिमज्जसु।
छिन्दन्निव चरत्यन्तर्वक्रीकुर्वंश्च वेगवान्।। Ch.Ch.29/22

When *Vata* and *Rakta* invade deeper structures like joints (*Sandhi*), bones (*Asthi*), and bone marrow (*Majja*), they cause:

- *Ruja* (Severe pain)
- *Vidāha* (Burning sensation in the joints and bones)
- *Chindanniva Caratyantar* (Pain as if being cut from inside, suggesting nerve involvement)
- *Vakrīkurvaṁśca Vegavān* (Distortion and deformity due to aggravated Vata moving rapidly through the joints)

This explains why chronic gouty arthritis can lead to joint deformities, restricted mobility, and nerve pain resembling sciatica.

Functional Impairment Due to Severe *Vata-Rakta*

करोति खञ्जं पङ्गुं वा शरीरे सर्वतश्चरन्।
सर्वैर्लिङ्गैश्च विज्ञेयं वातासृगुभयाश्रयम्।।२३।। Ch.Ch.29/23

If untreated, severe *Gambhira Vata-Rakta* can cause:

- Khañja (Limping due to joint damage)
- Paṅgu (Complete disability or paralysis in severe cases)
- Sarvataścaran (Spreading throughout the body, affecting multiple joints and organs)

The text emphasizes that both types of *Vata-Rakta* (superficial and deep) should be carefully diagnosed by evaluating all signs and symptoms.

Clinical Interpretation in Modern Medicine

- These verses describe acute and chronic gout.
- The *Uttana* type corresponds to early-stage gout, presenting as inflammatory arthritis with redness and swelling.
- The *Gambhira* type represents chronic tophaceous gout, leading to joint destruction, fibrosis, and systemic complications.
- Severe cases may mimic rheumatoid arthritis or neuropathic joint disorders, causing deformities and disability.

Importance of Reporting Unusual or Severe Cases of Gouty Tophi

1. Medical Awareness & Early Diagnosis: Reporting rare or severe cases helps increase awareness among healthcare professionals about atypical presentations, ensuring early diagnosis and intervention.

2. Understanding Disease Progression: Severe cases provide insights into how gouty tophi develop, their complications (e.g., joint destruction, ulceration), and long-term disease impact.

Case Report

A 59-year-old male presented with pain, pus discharge, and nodular swellings over his left foot. He had a history of hyperuricemia for 15 years and hypertension for 2-3 years. The swellings progressively increased over time, with a notable discharge from the 5th MTP joint on the left foot in the past week. His pain was sharp, intermittent, and aggravated at night.

Clinical Presentation

- Nodular swellings over both feet, worsening over 15 years
- History of hyperuricemia (15 years) and hypertension (2-3 years)
- Medically managed at multiple healthcare facilities

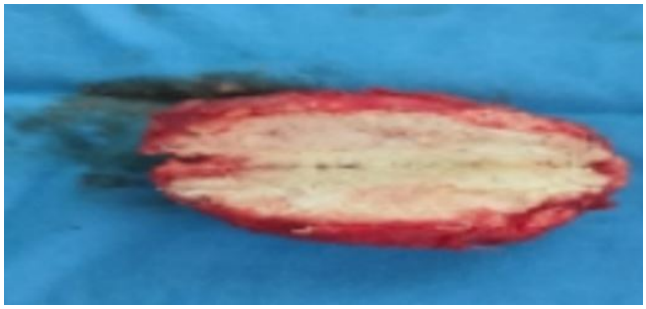
Investigation

- Serum uric acid levels : Uric acid level: 8.3 mg%
- Joint aspiration (urate crystals under polarized microscopy)
- X-ray, ultrasound, or MRI (soft tissue involvement) not done as the patient was not financially stable.

Preoperative and Postoperative Details

- **Preoperative:** Visible tophaceous swelling at the 5th MTP joint of the left foot with pus discharge

- **Surgical Intervention:** Tophus excision at the 5th MTP joint under local anesthesia



- **Postoperative Recovery:** Patient discharged with follow-up instructions

Discussion

Pathophysiology of Tophi Formation in Gout

Gouty tophi are chronic deposits of monosodium urate (MSU) crystals in soft tissues, which develop due to persistent hyperuricemia. The formation of tophi follows complex inflammatory and immunological process involving urate crystallization, immune response, & tissue damage.

1. Hyperuricemia and Uric Acid Deposition

- Gout begins with **hyperuricemia (serum uric acid > 6.8 mg/dL),** which occurs due to:
  - **Overproduction of uric acid** (e.g., purine metabolism disorders, excessive dietary intake).
  - **Decreased renal excretion** (e.g., chronic kidney disease, diuretics).
- When uric acid levels exceed **solubility thresholds, monosodium urate (MSU) crystals** precipitate in tissues.

2. Formation of Gouty Tophi

- In **acute gout,** MSU crystals are deposited in **synovial fluid and joints**, triggering inflammation.
- In **chronic gout,** urate crystals accumulate in **soft tissues (cartilage, tendons, subcutaneous areas, ear helix, bursae)**, forming **gouty tophi.**

Steps of Tophi Formation:

1. MSU Crystallization:

- Persistent hyperuricemia leads to the **precipitation of urate crystals** in avascular or poorly perfused tissues.

2. Macrophage Activation:

- Macrophages engulf MSU crystals but fail to degrade them.
- This results in the **release of pro-inflammatory cytokines** (IL-1β, TNF-α, IL-6).

3. Chronic Granulomatous Inflammation:

- The immune system surrounds MSU deposits with a granulomatous reaction.
- Giant cells, fibroblasts, and lymphocytes form a protective capsule around the crystal deposits.

4. Tissue Damage and Fibrosis:

- Chronic inflammation leads to tissue necrosis, fibrosis, and joint destruction.
- Tophi can erode bones (punched-out lesions on X-rays), cause cartilage damage, and deform joints.

3. Management of Gouty Tophi

- **Urate-lowering therapy (ULT):** Allopurinol, Febuxostat, Pegloticase.
- **Anti-inflammatory treatment:** Colchicine, NSAIDs, corticosteroids.

- **Surgical removal:** Indicated for **large, ulcerated, or functionally impairing tophi.**

Management in *Ayurveda*

विरेच्यः स्नेहयित्वाऽऽदौ स्नेहयुक्तैर्विरेचनैः |
रूक्षैर्वा मृदुभिः शस्तमसकृद्वस्तिकर्म च ||

- The verse states that purgation therapy (Virechana) should be administered after proper oleation (*Snehana*) to prepare the body.
- The purgation (Virechana) should be done using medicated purgatives that contain unctuous (oily) substances (*Sneha*).
- Alternatively, mild purgatives of dry nature (Rūkṣa, meaning non-oily) may also be used if necessary.
- The best approach is repeated administration of Basti (medicated enemas), as they help to balance *Vata* and provide long-term relief.

सेकाभ्यङ्गप्रदेहान्नस्नेहाः प्रायोऽविदाहिनः |
वातरक्ते प्रशस्यन्त ...

- In *Vatarakta*, therapies like fomentation (Seka), oil massage (Abhyanga), and external application of medicated pastes (Pradeha) are highly recommended.
- Mild oleation (*Sneha*) that does not cause excessive heat (*Avidāhin*) is preferable.
- This implies that while oil-based treatments are beneficial, they should not be excessively heating, as too much heat can worsen *Rakta (blood) disorders*.
- These treatments help relieve pain, stiffness, and dryness, which are common in *Vatarakta*.

This verse highlights a structured Ayurvedic treatment protocol for *Vatarakta*, emphasizing detoxification, careful use of oils, and external therapies to balance *Vata* and *Rakta*.

Differential Diagnosis of Gouty Tophi

Since gouty tophi present as firm, nodular, subcutaneous masses, they can mimic various other conditions. A proper clinical, radiological, and laboratory evaluation is essential for differentiation.

1. Rheumatoid Nodules

Similarities

- Firm, subcutaneous nodules over extensor surfaces (e.g., elbows, fingers).
- Associated with chronic arthritis.

Differences

- Rheumatoid nodules are painless and non-inflammatory.
- Seronegative for urate crystals; associated with positive rheumatoid factor (RF) and anti-CCP
- X-ray shows joint erosion without crystal deposits.

2. Osteoarthritic Heberden's & Bouchard's Nodes

Similarities

- Hard, bony swellings around DIP (Heberden's) and PIP (Bouchard's) joints.

Differences

- Caused by osteophyte formation, not urate deposits.
- No inflammatory signs, unlike gouty tophi.
- X-ray shows joint space narrowing and osteophytes instead of urate crystal deposits.

3. Psoriatic Arthritis (PsA) Nodules

Similarities

- Chronic inflammatory arthritis with joint deformity.
- Can present with subcutaneous nodules.

Differences

- Associated with psoriasis (skin plaques, nail pitting).
- Seronegative for urate crystals; presence of HLA-B27 in some cases.
- X-ray shows pencil-in-cup deformity, unlike the "punched-out" lesions of gout.

4. Chronic Tophaceous Pseudogout (CPPD - Calcium Pyrophosphate Deposition Disease)

Similarities

- Crystal deposition disorder leading to chronic nodular swelling.
- Can mimic tophi in knee, wrist, or fingers.

Differences

- Crystals are rhomboid-shaped, weakly positive birefringent under polarized light (unlike MSU crystals, which are needle-shaped and strongly negative birefringent).

- Commonly affects large joints (knees, hips) rather than peripheral small joints.
- X-ray shows chondrocalcinosis instead of tophi deposits.

5. Epidermoid or Sebaceous Cysts

Similarities
- Subcutaneous nodules that may ulcerate.

Differences
- Cysts contain keratin or sebaceous material, not urate.
- No chronic inflammatory symptoms like joint pain or swelling.
- Can be aspirated, yielding cheesy white material, unlike chalky urate deposits of tophi.

6. Bone Tumors (Osteochondroma, Enchondroma, Giant Cell Tumor)

Similarities
- Can present as firm, growing masses near joints.

Differences
- Tumors cause progressive bone expansion, while tophi remain localized.
- X-ray/MRI shows neoplastic growth, unlike the "punched-out" erosions of gout.
- No birefringent crystals in joint aspiration.

7. Infectious (Tuberculous or Mycotic) Granulomas

Similarities
- Chronic nodular masses with ulceration.
- Can involve joints, mimicking chronic gouty arthritis.

Differences
- Associated with systemic symptoms (fever, weight loss, night sweats).
- Positive culture or biopsy for TB/fungal pathogens.
- No birefringent urate crystals on microscopy.

Importance of Early Intervention in Gouty Tophi to Prevent Complications

Early diagnosis and intervention in gouty tophi are crucial to prevent irreversible joint damage, disability, and systemic complications.

1. Prevents Chronic Joint Deformity & Disability
- Untreated tophi lead to progressive joint destruction, erosion, and deformities.
- Early urate-lowering ther. (ULT) prevents tophi growth & joint impairment, preserving mobility.

2. Reduces Risk of Skin Ulceration & Infection
- Large tophi can ulcerate, leading to secondary bacterial infections.
- Prompt urate control and surgical removal (if needed) reduce the risk of complications like sepsis and gangrene.

3. Avoids Bone and Soft Tissue Damage
- Chronic inflammation causes bone erosion ("punched-out" lesions) and tendon damage, leading to functional impairment.
- Early treatment halts inflammatory cycles, preserving bone and soft tissue integrity.

4. Prevents Kidney Damage (Urate Nephropathy & Stones)
- Chronic hyperuricemia can cause urate crystal deposition in kidneys, leading to:
  - **Kidney stones** → Severe pain, infection, obstruction.
  - **Urate nephropathy** → Progressive **renal dysfunction**.
- Early intervention with uricosuric agents or xanthine oxidase inhibitors protects kidney function.

5. Improves Quality of Life & Reduces Pain
- Recurrent gout flares and tophi cause chronic pain, restricted mobility, and psychological distress.
- Early management with anti-inflammatory medications (NSAIDs, colchicine, corticosteroids) and lifestyle modifications improves daily functioning and well-being.

6. Reduces Surgical Intervention Needs
- Advanced tophaceous gout often requires surgery (debulking, joint replacement).
- Early ULT and lifestyle changes can shrink tophi and avoid invasive procedures.

Managing gouty tophi presents several challenges that can complicate treatment and affect patient outcomes. Key challenges include:

1. Patient Adherence to Urate-Lowering Therapy (ULT)

- **Non-Adherence Issues:** Many patients struggle with adhering to long-term ULT due to concerns about side effects, misconceptions about the necessity of continuous treatment, and the asymptomatic nature of hyperuricemia between gout attacks.

2. Comorbidities Impacting Treatment

- **Renal Impairment:** Chronic kidney disease (CKD) complicates gout management, as impaired renal function can limit the use of certain medications and increase the risk of adverse effects\
- **Cardiovascular Diseases:** The presence of cardiovascular conditions necessitates careful selection and monitoring of gout medications to avoid exacerbating these issues.

3. Medication Side Effects and Interactions

- **Adverse Reactions**: Medications like allopurinol and febuxostat can cause side effects ranging from mild rashes to severe hypersensitivity reactions, leading to discontinuation.
- **Drug Interactions:** Patients often take multiple medications for comorbid conditions, increasing the risk of drug interactions that can complicate gout treatment.

4. Development of Refractory Gout

- **Treatment Resistance:** Some patients develop refractory gout, characterized by persistent hyperuricemia and tophi despite standard treatments, necessitating alternative therapeutic approaches.

5. Delayed Diagnosis and Intervention

- **Progression to Severe Disease:** Late diagnosis or initiation of treatment can lead to the development of tophi, resulting in joint damage, deformities, and functional impairments.

6. Patient Education and Lifestyle Modifications

- **Diet and Lifestyle Factors:** Educating patients on the importance of dietary changes, weight management, and reducing alcohol intake is crucial but often challenging to implement and maintain.

In this case, excision of the tophus at the 5th MTP joint led to symptom resolution. However, long-term hyperuricemia management remains critical to prevent further gout flare-ups and tophi formation.

Prognosis explained by *Sushruta*

आजानुस्फुटितं यच्च प्रभिन्नं प्रस्रुतं च यत् ।
उपद्रवैश्च यज्जुष्टं प्राणमांसक्षयादिभिः ।।४९।।
शोणितं तदसाध्यं स्याद्याप्यं संवत्सरोत्थितम् ।५०।

These verses discuss prognostic indicators of incurable (Asādhyā) and difficult-to-treat (Dushchikitsya) bleeding disorders (Rakta Vikara or Raktapitta).

Characteristics of Incurable Rakta Vikara

आजानुस्फुटितं यच्च प्रभिन्नं प्रस्रुतं च यत् ।
उपद्रवैश्च यज्जुष्टं प्राणमांसक्षयादिभिः ।।४९।।

This verse describes severe and incurable types of Rakta disorders with the following features:

1. Ājānusphuṭita (Spontaneous bursting of blood vessels) – Indicates extreme vascular fragility, possibly due to chronic hypertension, severe infections, or advanced systemic disease.

2. Prabhinnam (Extensively ruptured tissues or vessels) – Suggests deep-seated damage, ulceration, or necrosis, leading to uncontrollable bleeding.

3. Prasrutam (Excessive bleeding or continuous hemorrhage) – Indicates life-threatening blood loss, possibly seen in severe hemophilia, disseminated intravascular coagulation (DIC), or ruptured aneurysms.

4. Upadravaiścha Yajjuṣṭam (Associated with serious complications) – Refers to conditions involving secondary infections, gangrene, shock, or multiple organ dysfunction syndrome (MODS).

5. Prāṇa-Māṁsa-Kṣayādibhiḥ (Severe loss of vital energy and muscle mass) – Implies cachexia, extreme weakness, and multi-organ failure, as seen in advanced tuberculosis, cancer, or end-stage diseases.

Prognosis Based on Duration

शोणितं तदसाध्यं स्याद्याप्यं संवत्सरोत्थितम् ।५०।

This verse categorizes the prognosis of bleeding disorders:

1. Asādhyam (Incurable) – If the bleeding is severe, persistent, and accompanied by life-threatening complications, it is considered incurable. This aligns with terminal-stage diseases where medical intervention is ineffective.

2. Yāpyam (Manageable but not completely curable) – If the disease has been present for one year or more (Saṁvatsarotthitam), it is considered chronic and difficult to treat. Conditions like chronic hematological disorders, recurrent variceal bleeding, or advanced autoimmune diseases may fall into this category.

Clinical Interpretation in Modern Medicine

These verses describe advanced hemorrhagic conditions, which can be correlated with:

- Severe hemorrhagic fevers (Dengue hemorrhagic fever, Ebola)
- Advanced hematological disorders (Leukemia, hemophilia, aplastic anemia)
- Chronic liver disease with portal hypertension (leading to variceal bleeding)
- End-stage infections with sepsis-induced coagulopathy
- Malignant ulcers or carcinomas causing severe tissue destruction and bleeding

Conclusion

This case highlights the importance of early diagnosis and gout management to prevent progression to chronic tophaceous gout, which can cause severe joint deformities and functional impairment. Surgical intervention is necessary in cases where tophi cause pain, infection, or functional limitation. While excision of the tophus provided symptomatic relief, long-term hyperuricemia control remains essential to prevent recurrence.A combination of clinical history, joint aspiration (polarized microscopy for urate crystals), imaging (X-ray, ultrasound, CT), and serological markers helps in differentiating gouty tophi from other mimicking conditions.Early detection and aggressive management of gouty tophi prevent irreversible joint damage, disability, and systemic complications. Regular monitoring, adherence to urate-lowering therapy, and lifestyle modifications play a key role in long-term disease control and improved patient outcomes.

Effective long-term urate-lowering therapy and early intervention can prevent or reduce tophi formation and associated complications.Understanding these principles helps in guiding treatment decisions, palliative care, and patient counseling.

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