The deposition of monosodium urate crystals in joints and periarticular connective tissue is a characteristic feature of chronic gout. Typically, tophi are found in the distal joints of the appendicular skeleton including in synovial fluid, cartilage, tendon sheaths, and subcutaneous tissue [1]. Reports of gouty tophi in the cervical spine have been rare [2]. The clinical manifestations ranged from chronic neck pain to quadriplegia. We report a case of cervical intervertebral disc involvement by tophaceous gout which mimicked disc herniation.

CASE REPORT

A 50-year-old male had a 20-year history of alcohol consumption and a 15-year history of hyperuricemic gout involving the fingers, elbows, ankles, and metatarsophalangeal joints. Previous treatment had consisted of intermittent courses of colchicine and indomethacin for acute episodes of gouty arthritis. His medical history also included mild essential hypertension for which no treatment was given. The patient developed progressive numbness and weakness in all four limbs following neck pain over a period of one month. Magnetic resonance imaging of the cervical spine revealed intervertebral disc bulging at the C3-4 and C5-6 levels. Anterior discectomies with fusion of C3-4 and C5-6 were performed; a chalky-white, granular material was noted in the C3-4 and C5-6 disc spaces. Pathologic examination demonstrated deposits of needle-like crystals surrounded by histiocytes and multinucleated giant cells, with an appearance that was compatible with gout. The patient was independently ambulatory one month after the operation. The clinical and diagnostic features of tophaceous gout of the spine are reviewed.
Cervical spinal tophaceous gout

(Fig. 1). Non-enhanced magnetic resonance imaging (MRI) showed segmental narrowing of the thecal sac at the C3-4 and C5-6 levels due to hypertrophic spurs and bulging discs (Fig. 2a, 2b). Axial view MRI showed severe narrowing of the thecal sac at the C3-4 and C5-6 levels (Fig. 2c, 2d). Cervical disc herniation with cord compression was diagnosed. He was referred to the neurosurgery department for surgical intervention. Anterior microdiscectomies of C3-4 and C5-6 with interbody fusion were performed. During the operation, some chalky-white, granular friable material was found in the C3-4 and C5-6 disc spaces and overlying the posterior longitudinal ligament (Fig. 3). Histology of a formalinized specimen revealed multiple nodules of amorphous substance separated and encased by fibrotic tissue and foreign body giant cells (Fig. 4). The appearance was compatible with gout. He was prescribed 100 mg of benzbromarone daily for treatment of hyperuricemia postoperatively. The patient was able to ambulate independently one month following surgery.

**DISCUSSION**

Gouty arthritis is a common metabolic disorder. Deposition of monosodium urate crystals in joints and adjacent soft tissue is a common complication of longstanding, poorly controlled hyperuricemia [2]. The gouty tophi are often found in the metatarsophalangeal joints, ankles, knees, wrists, elbows, fingers, and shoulders [3]. Extraskeletal tophi are less commonly observed. They have been reported to occur in aorta, myocardium, prepuce of the penis, corpora cavernosa, tarsal plate of the eyelids, cornea, sclera, vocal cord, tongue, and epiglottis [4]. Symptomatic axial skeletal tophi deposits are uncommon [5].

In 1953 Koskoff et al. reported the first case of spinal cord compression due to gouty tophi deposition in the cervical spine [6]. The spinal column can be affected from the level of C1 to S1. Neurologic symptoms are related to the level of the tophaceous deposits [2, 7]. Hyperuricemia was present in most but not all such cases [2]. Some instances of symptomatic tophaceous gout of the spine have been reported without clinical evidence of either tophi or gout history, however, a history of chronic peripheral polyarticular tophaceous gout is usually revealed in most cases of gout involving the spine [2, 8, 9].

Gout is approximately 20 times more common in men than in women. Draganescu et al. reviewed 57 previously reported cases of spinal gout in 2004 [3]. The age of the patients ranged from 21 to 76 years (average, 57 years). The male-to-female ratio in spinal tophaceous gout was about 3
Cervical spinal tophaceous gout

Seventeen of the 57 patients did not have any history of gout. Among the other 40 patients with a history of gout, more than one third had severe tophaceous gout. Spinal involvement was evenly distributed between the cervical (17 cases), thoracic (14 cases), and lumbar areas (25 cases).

Gouty tophi deposited in the intervertebral disc spaces has been noted in previously reported cases. In these cases there was involvement of the adjacent vertebral bodies, ligamentum flavum, facet joints, laminae, pedicles, adjacent posterior osseous elements, extradural and intradural

Figure 2

Figure 2. a,b. Sagittal T2-weighted image (a) (TR/TE: 2500/130 ms) and T1-weighted image (b) (TR/TE: 349/14 ms) reveal degenerative change with multiple discs bulging at C3-4 and C5-6. c. Axial T2-weighted image (TR/TE: 2647/120 ms) at C3-4 level show severe cord and root compression resulting from disc bulging. d. Axial T2-weighted image (TR/TE: 2647/120 ms) at C5-6 level shows focal disc herniation with right root compression.
space, and filum terminale [1, 10, 11]. The clinical presentations of these cases have ranged from local pain to radiculopathy and myelopathy [3]. There have also been cases of asymptomatic spinal gout found at autopsy [3, 11]. Factors that may increase precipitation of urate crystals and induce tophi formation include lower temperature, decreased pH and binding to plasma proteins, and trauma [10]. Long-term hyperuricemia is usually secondary to decreased renal clearance of urate, and occurs most commonly with chronic renal failure or use of diuretic agents [9]. Excessive consumption of alcohol augments the production and decreases the secretion of urate [12]. Our patient had a long

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**Figure 3.** Chalky-white, granular friable material was noted intraoperatively.

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**Figure 4.** Histological section demonstrates multiple nodules of amorphous substance separated and encased by fibrotic tissue and foreign body giant cells. (H&E, x400)
history of hyperuricemia with intermittent medical control. He presented with cervical myelopathy. Subcutaneous deposition of gouty tophi in multiple peripheral joints was noted over a long time. It occurred during winter. Long-term consumption of alcohol was also evident from the patient’s history. These observations indicate that relatively low environmental temperature and decreased renal urate clearance may be prerequisites for urate deposition.

In contrast to the peripheral joints, where gouty erosions may be seen, radiographs of the spine do not contribute to the diagnosis [13]. Plain films can appear deceptively normal, especially in the early stages, or can show degenerative changes or vertebral end-plate erosion [3]. These findings are not specific and may deceptively mimic a degenerative, inflammatory, or infectious process [14]. The classic findings of spinal gout on computed tomography (CT) are lobular juxta-articular masses with an attenuation density greater than that of the surrounding muscle, well-defined intra-articular and juxta-articular osseous erosions with sclerotic borders, normal bone density, and relative preservation of synovial spaces [1]. CT may help in delineating bone and soft-tissue changes and disclosing tophi as low-density areas [15].

Magnetic resonance imaging is required for complete assessment of spinal gout [16]. The tophi are manifested as homogeneous intermediate to low signal intensity on T1-weighted images and homogeneous high to low signal intensity on T2-weighted images [14,16]. The extremely high signal intensity on T2-weighted images has been described as reflecting high protein content in the amorphous center of the tophus histologically [14,16]. After gadolinium administration, the tophi showed different patterns of enhancement, ranging from homogenous to heterogeneous peripheral enhancement [14, 16]. The former may reflect vascularized reactive tissue within the tophus and the latter may result from hypervascular granulation tissue surrounding the tophus [14]. The differential diagnosis has included disk-overtake infection, epidural abscess, rheumatoid arthritis, metastases, dialysis-related amyloid spondyloarthropathy, facet joint infection, synovial cyst, and calcified intradural tumors [15-18]. The clinical information, laboratory data, and MRI appearance can help in the diagnosis of spinal gout. However, these changes are nonspecific. A definitive diagnosis may require surgical decompression with biopsy or percutaneous needle biopsy. For our patient, the plain films of the cervical spine revealed marked cervical spondylosis, and non-enhanced MRI revealed low signal intensity of disc on both T1- and T2-weighted sequences and multiple segmental narrowing of the thecal sac at the C3-4 and C5-6 levels due to hypertrophic spurs and bulging discs. These appearances mimic cervical disc herniation with cord compression. Enhanced MRI was not obtained because the gouty tophi inducing myelopathy were not considered until discectomy was undertaken.

In most of the reported cases of spinal tophaceous deposition patients underwent surgical decompression, generally with successful relief from neurological compromise [5]. Only a relatively few patients accepted non-surgical management, that has proven to be successful using medication, cervical traction, or immobilization [19]. If suspected in the early stages of neck pain, spinal gout may be successfully managed with medical treatment alone [3]. When neurologic symptoms are present, the treatment of choice is surgical decompression [7]. At surgery, a characteristic chalky, cheese-like, friable mass is usually identified. Microscopically, the urate depositions are surrounded by multinucleated histiocytes, basically giant cells with foreign bodies associated with lymphoplasmocytic cells, and fibroblasts [20, 21]. Material obtained at biopsy must be preserved in 100% alcohol if gout is suspected, because monosodium urate is soluble in formalin [3, 18, 21]. In our case, the absence of birefringent crystals under polarized light is explained by the fact that the specimen was treated with formalin, which dissolved the crystals. The prevalence of spinal gout is probably underestimated because when there is no synovial fluid or biopsy material available, as in peripheral gouty arthritis, the diagnosis of spinal gout is more difficult [10]. For patients with known gout, symptoms of back, neck, or radicular pain should suggest spinal column involvement.

To summarize, we report a case of gouty tophi deposition in the cervical intervertebral disc spaces and subsequent myelopathy. We emphasize that spinal cord or root compression secondary to tophaceous gout should be considered in all patients with gout, and especially in those patients with severe long-standing peripheral gouty arthritis. Although CT and MRI may prove helpful for diagnosis, they are nonspecific for the differential diagnosis of gout. Surgical decompression with subsequent optimization of pharmacological treatment almost always results in a good outcome.

REFERENCES