Gout without crystals on initial synovial fluid analysis

NORMAN R. ROMANOFF
M.D.

ALAN RUBINOW
M.D.

ELIZABETH C. SPARK
M.D.

Rheumatology Section, Boston Veterans Administration Hospital and the Arthritis and
Connective Tissue Disease Section, Boston University Medical Center

Summary

In five patients with acute arthritis in whom gout was
eventually documented, an initial synovial fluid analy-
sis failed to reveal urate crystals. Four of the patients
were seen in one hospital during a period of 30 months
in which 103 cases of gout were documented on initial
aspiration. While this is an uncommon event, the
importance of being able to make a definitive diagnosis
of gout is such that re-aspiration of the same or other
joints may be justified under certain circumstances.

Introduction

A definitive diagnosis of acute gouty arthritis is based
upon the identification of urate crystals in the
synovial fluid (SF) (McCarty and Hollander, 1961). In
some patients, however, an initial SF analysis may
not reveal crystals although they may be subse-
quently found on re-aspiration of the same or differ-
ent joint (Schumacher et al., 1975). Five
patients with this phenomenon are now reported,
and an estimate is made of its frequency in a gouty
population.

Methods and case reports

Synovial fluid was aspirated into sterile syringes
and transferred to heparinized and non-heparinized
tubes after appropriate cultures were obtained. Each
specimen was examined for at least 30 min on a
polarizing microscope by a rheumatology fellow and
a staff rheumatologist. A mucin clot test, leucocyte
count, Gram stain, and a differential count using the
Wright–Giemsa stain were performed on each fluid

Case 1

A 56-year-old man with a history of gout pre-
tented ten days after the onset of pain and swelling
of the right ankle. He had taken colchicine before
admission, but without relief. On examination, his
temperature was 37.8°C and his right ankle region
was acutely inflamed. Laboratory investigations
showed a haematocrit of 33%, white blood count
(WBC) 7.7 x 10^9/l, blood urea nitrogen 13 mg/dl, and
serum urate 6.6 mg/dl (normal < 8.3 mg/dl). The
right subtalar joint was aspirated and turbid SF was
obtained. The SF was highly inflammatory and no
crystals were identified. A Gram stain was negative
(Table 1). The right ankle was then aspirated and
one drop of fluid was obtained in which no crystals
were found. Since gout was still strongly suspected,
the patient was begun on colchicine. That evening
his temperature rose to 38.4°C. By this time, the
ankle had improved but the left wrist became
acutely inflamed. Aspiration of the wrist yielded a
trace amount of fluid in which many urate crystals
were identified. Colchicine was discontinued and
indomethacin was initiated with rapid improve-
ament of all involved joints. Antinuclear antibodies
(ANA), latex fixation and multiple cultures including blood,
SF, throat, rectum and urethra, were negative.

Case 2

A 26-year-old man presented with pain and swell-
ing of the left knee of two days' duration. He denied
backache as well as ocular, cutaneous, bowel or
urethral symptoms. Several of his immediate rela-
tives were obese, and his mother and one sister had
diabetes. On examination, his temperature was
38°C and his weight was 115 kg. The left knee was
held in flexion and was erythematous, warm,
diffusively tender and had a tense effusion. Labora-
tory investigations showed a haematocrit of 46%,
WBC 10.8 x 10^9/l with 66% polymorphonuclear
cells (PMNs), erythrocyte sedimentation rate (ESR)
5 mm in the first hour (Westergren), serum urate
9.4 mg/dl and fasting serum triglycerides 343 mg/dl
(normal < 135 mg/dl). Urinalysis was normal. Serum
creatinine, glucose, transaminase, alkaline
phosphatase, and cholesterol were normal. The knee
was aspirated on admission and again the following day. The SF was highly inflammatory. No urate crystals were identified and a Gram stain was negative (Table 1). No medications were given. He became afebrile by the third day, the swelling resolved and he was discharged asymptomatic by the tenth day of hospitalization. Tests reported normal or negative included ANA, latex fixation, serum and SF complement, antistreptolysin O, hepatitis B surface antigen and cultures of blood, SF, throat, rectum and urethra. The 24-hr urine uric acid was 626 mg. X-ray studies of sacro-iliac joints and upper and lower gastro-intestinal tract were normal.

Four weeks after discharge, he returned with acute arthritis of both knees and right ankle. Aspiration of the left knee revealed an inflammatory fluid with many intracellular urate crystals (Table 1). Indomethacin therapy was initiated with prompt response. He was discharged on colchicine and the appropriate diet without recurrence of the gout in the ensuing 18 months.

Case 3

A 60-year-old man with a history of hypertension was admitted one day after the onset of pain and swelling in his left elbow. On examination, his temperature was 37°C and his blood pressure was 140/90 mmHg. A hot, painful, swollen left elbow was held in 45° flexion. Laboratory investigations showed a haematocrit of 31%, WBC 7·0 × 10⁹/l and serum urate 9·2 mg/dl. The elbow was aspirated, and turbid, highly inflammatory SF was obtained. No crystals were identified (Table 1). Repeat aspiration 12 hr later again revealed inflammatory fluid but urate crystals were now seen. The patient was treated with colchicine and discharged 24 hr later, greatly improved. Blood, SF and urethral cultures were negative.

Case 4

A 50-year-old man was admitted with a 24-h history of malaise, shaking chills and pain in his right groin and thigh. On examination, his temperature was 38°C and the right hip was held in flexion. Attempts to move his hip elicited severe pain. The 1st metatarso-phalangeal joint (MTP) was tender. Laboratory investigations showed a haematocrit of 42%, WBC 7·1 × 10⁹/l with 65% PMNs and 5% band forms, ESR 30 mm in 1 hr and serum urate 6·9 mg/dl. X-rays of both hips were normal. The hip was aspirated under fluoroscopic control and turbid, inflammatory SF was obtained in which no crystals were identified. A Gram stain was negative (Table 1). The tender MTP joint was then aspirated and a drop of bloody fluid was obtained in which urate crystals were found. The patient was treated with colchicine and two days later he was able to walk. Blood and SF cultures were negative.

Case 5

A 42-year-old man with a history of recurrent episodes of arthritis in knees and feet was evaluated two days after the onset of pain in his right knee. His temperature was 37°C and the knee contained an effusion and was tender. Serum urate was 8·8 mg/dl. X-ray studies of knees and ankles revealed distension of the right supra-patellar pouch. Joint aspiration yielded a mildly inflammatory fluid in which no crystals were identified. A Gram stain was negative.
crystals were found (Table 1). The synovitis subsided spontaneously. Three months later the patient returned 24 hr after the onset of pain in his left knee. He described an episode of podagra which had resolved three days before the onset of pain in the left knee. Aspiration of the knee revealed a highly inflammatory fluid in which intra- and extracellular urate crystals were identified (Table 1). He was treated successfully with indomethacin. Latex fixation and ANA were negative.

Discussion

In earlier series (Zvaifler and Pekin, 1963; McCarty, 1965) urate crystals were not found in approximately 5% of gouty effusions. However, it is not known whether ultimate demonstration of crystals was made in all. Recently there has been a detailed report of nine patients with acute gout in whom crystals were not found on initial SF analysis but on repeat aspiration of the same or other joint (Schumacher et al., 1975). However, no mention was made of the total number of patients with documented gout concurrently seen by the same investigators. Thus, some uncertainty remains regarding the prevalence of initially negative joint aspirates in a population of patients with crystal-proved gout.

In the patients described, urate crystals were found on aspiration of a different joint a few hours later (Cases 1 and 4) and three months later (Case 5) or the same joint 12 hr later (Case 3) and one month later (Case 2). Cases 1, 2, 4 and 5 were seen at the Veterans Administration Hospital where during the same 30-month period gout was documented on initial SF analysis in 103 patients. The ratio of 4:107, or 4%, parallels the findings from the earlier reports. It must be pointed out, however, that some patients with gout and initially negative SF analysis may not have been subject to repeat joint aspiration owing to various reasons such as a good response to therapy or lack of follow-up. Thus, the observed ratio represents a minimal estimate of a phenomenon whose true frequency may be very difficult to assess.

Interestingly, the initially crystal-negative fluids did not differ in leucocyte count, percentage of PMNs and quality of the mucin clot from those initially crystal-positive, in which the median and range values were 11.7 (0.8–152) × 10^9/l, 83 (38–99)% and fair (fair to poor) respectively.

It is unclear why the initial aspirate in the patients presented and in those previously reported by others failed to show crystals. Loculation, previous digestion of the crystals, an immunological basis for the inflammation, and observer error, have all been considered (Schumacher et al., 1975). Whatever the final explanation will be, it is important to realize that, despite its rarity, an initially negative SF analysis does not entirely eliminate gout as a diagnostic possibility.

Addendum

While this manuscript was in press, Honig et al. (1977) reported the electron microscopic finding of urate and calcium pyrophosphate crystals in synovial fluid after polarizing microscopy had failed to reveal crystals. Thus, in selected cases, electron microscopic examination of synovial fluid may be crucial for initial documentation of crystal-induced synovitis.

References


McCarty, D.J., Jr (1965) The inflammatory reaction to microcrystalline sodium urate. Arthritis and Rheumatism, 8, 726.
