Markedly Elevated Intra-articular White Cell Count Caused by Gout Alone

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Abstract

Joint pain accompanied by erythema, swelling, and decreased range of motion is concerning for septic arthritis and typically warrants joint aspiration. The synovial fluid white blood cell count plays a central role in the decision-making process regarding these patients. Traditional teaching holds that a cell count greater than 50,000 white blood cells/µL is likely caused by infection and therefore warrants either operative intervention or serial aspiration. This report describes 2 patients with extremely high synovial fluid white blood cell counts in the absence of infection. Case 1 involved a 59-year-old man who presented to the emergency department with sudden onset of atraumatic left elbow pain and was found to have a white blood cell count of 168,500 white blood cells/µL on joint aspiration and innumerable monosodium urate crystals. The patient ultimately improved with treatment with oral prednisone, avoiding operative intervention. Case 2 involved a 69-year-old man who presented to the emergency department with acute onset of atraumatic left knee pain. On arthrocentesis, the patient had a cell count of 500,000 white blood cells/µL and was therefore taken to the operating room for arthroscopic irrigation and debridement. Final analysis of the synovial fluid showed monosodium urate crystals and negative culture findings. These cases illustrate the highest synovial fluid white blood cell count reported in patients with gout and highlight the potential difficulty in differentiating between acute gout and septic arthritis in the setting of markedly elevated white blood cell count.

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The findings of pain, decreased range of motion, erythema, and swelling of any joint on physical examination are concerning for septic arthritis and warrant joint aspiration. This article reports 2 cases in which the white blood cell count in the synovial fluid was extremely elevated in the setting of gout and negative culture findings.

**CASE REPORTS**

**Patient 1**

A 59-year-old right-hand–dominant man with hypertension, obesity, and gout presented to the emergency department with sudden onset of atraumatic left elbow pain 1 day previously. He had a history of gout attacks in both ankles and feet but had no previous attacks in the upper extremities. Range of motion of the elbow had been limited since the onset of pain. He started taking allopurinol 300 mg daily 1 week before presentation. The patient had been previously diagnosed with gout, although he had stopped taking his allopurinol for unclear reasons. His primary care physician noted this and had him restart it.

Physical examination in the emergency department showed an alert, obese male in no acute distress. Temperature was 99.7º, blood pressure 140/83 mm Hg, heart rate 90 beats/min, respiratory rate 20 breaths/min, and oxygen saturation 97% on room air. Diffuse swelling, tenderness, and erythema were noted in the left elbow. Elbow range of motion was 30º short of full extension to 80º of flexion, with pain at the extremes of motion. Results of blood tests were as follows: white blood cell count, 13.0×10⁹/L with 80% neutrophils; hemoglobin, 11.0 g/dL; serum sodium, 140 mmol/L; serum potassium, 3.5 mmol/L; serum chloride, 106 mmol/L; serum bicarbonate, 22 mmol/L; serum urea nitrogen, 28 mg/dL; serum creatinine, 1.5 mg/dL; serum glucose, 104 mg/dL; serum calcium, 8.4 mg/dL; and uric acid, 6.5 mg/dL. Radiographs of the left elbow showed joint effusion (Figure 1).

The possibility of septic arthritis in the left elbow prompted immediate arthrocentesis. Under sterile conditions, the elbow was aspirated with an 18-gauge needle via a lateral portal, yielding 9 mL dark yellow fluid. No gross purulence was seen. At that time the joint was also flushed with saline. The aspirate was sent for Gram stain and culture, cell count, and total protein and crystal analysis. Gram stain analysis showed many polymorphonuclear leukocytes but no organisms. Cell count showed 168,500 white blood cells/µL with 89% segmented neutrophils. Because of the markedly elevated white blood cell count, the patient was given empiric antibiotic treatment with vancomycin and piperacillin-tazobactam. Synovial fluid analysis was performed the next day (hospital day 1) and showed innumerable monosodium urate crystals. Cultures of the synovial fluid were evaluated for aerobic, anaerobic, fungal, and acid-fast bacteria, and final cultures showed no growth. Antibiotics were discontinued on hospital day 2 because of the negative culture and rheumatologic findings consistent with gout. Oral prednisone taper was initiated on hospital day 1, and allopurinol was continued at the recommendation of the rheumatology service. The patient was unable to take nonsteroidal anti-inflammatory drugs because of chronic kidney disease. Pain decreased and range of motion gradually increased after the initiation of prednisone treatment. The patient was discharged on hospital day 4 with rheumatology follow-up, with markedly improved elbow motion that had returned to normal.

**Patient 2**

A 69-year-old man presented to the emergency department with gradual onset of left knee pain and swelling over the preceding 4 days. Medical history was significant for insulin-dependent diabetes mellitus, hypertension, obesity, obstructive sleep apnea, and a cerebrovascular accident in 1993, with residual left lower-extremity weakness. The patient had no antecedent trauma, recent illness, fevers, or chills. He reported several previous instances of gout attacks, 1 time in the left knee, but the current symptoms were much more severe than he had experienced in the past. Since the onset of pain, range of motion and ability to bear weight had decreased dramatically, and he could no longer ambulate on presentation to the emergency room. The patient noted that he was not currently taking nor had he in the past taken any medications (nonsteroidal anti-inflammatory drugs, colchicine, allopurinol) to treat gout.

Physical examination in the emergency department showed an alert, obese...
male in moderate distress. Temperature was 100.8°, blood pressure 179/83 mm Hg, heart rate 140 beats/min, respiratory rate 18 breaths/min, and oxygen saturation 96% on room air. Examination of the left lower extremity was notable for diffuse swelling and erythema around the knee, marked tenderness to palpation over both the medial and lateral aspects of the knee as well as anteriorly, and severely limited range of motion (15°-20° of flexion) secondary to pain. Findings on neurovascular examination were largely unremarkable. Results of blood tests were as follows: white blood cell count, 6.1×10^9/L with 66% neutrophils; hemoglobin, 13.9 g/dL; serum sodium, 140 mmol/L; serum potassium, 3.7 mmol/L; serum chloride, 105 mmol/L; serum bicarbonate, 20 mmol/L; serum urea nitrogen, 15 mg/dL; serum creatinine, 1.43 mg/dL; serum glucose, 174 mg/dL; and serum calcium, 9.6 mg/dL. C-reactive protein, erythrocyte sedimentation rate, and uric acid levels were all elevated at 95 mg/L, 35 mm/h, and 9.7 mg/dL, respectively. Radiographs of the left knee were significant for marked tricompartmental degenerative osteoarthritis with mild joint effusion (Figure 2).

Concern about septic arthritis as well as deep venous thrombosis prompted urgent lower-extremity Doppler ultrasound examination along with arthrocentesis of the left knee, both of which were performed in the emergency department. Ultrasound of the bilateral lower extremities was negative for deep venous thrombosis. Arthrocentesis of the left knee yielded 20 mL turbid-appearing fluid that was sent for cell count, culture, and Gram stain as well as rheumatologic evaluation. Synovial fluid collection was performed before administration of oral or intravenous antibiotics. Cell count showed 500,000 white blood cells/μL with 87% segmented neutrophils and 5000 red blood cells/μL. Gram stain and culture showed no polymorphonuclear leukocytes and no organisms. Because of the markedly elevated white blood cell count, the patient was given empiric antibiotic treatment with vancomycin and piperacillin-tazobactam and scheduled for urgent arthroscopic irrigation and debridement for presumed left knee septic arthritis.

Intraoperative arthroscopic evaluation of the knee joint showed mildly purulent effusion with diffuse, severe inflammation of the synovium and extensive damage to the cartilage on the articular surfaces of both the femur and the tibia. The synovium was debrided and the joint irrigated copiously with 12 L normal saline. The patient tolerated the procedure well, with no intraoperative complications. Synovial fluid analysis was completed the next day (hospital day 1) and showed scattered intracellular negatively birefringent needle-shaped crystals visualized under polarized light microscopy, consistent with monosodium urate crystals, suspicious for acute gout.

Postoperatively, the patient’s symptoms improved gradually with appropriate pain control, including careful use of nonsteroidal anti-inflammatory drugs, physical therapy, and continued intravenous antibiotics, as per the recommendations of the infectious disease team. On postoperative day 3, the patient had regained almost full painless motion of the left knee, achieving 0° to 120° of flexion and extension with only very mild residual pain on maximum flexion. Findings of final joint fluid cultures were negative.

**DISCUSSION**

Gout is a common condition caused by deposition of monosodium urate crystals. The elbow is involved in approximately 5% of adults with a diagnosis of gout or pseudogout. Gout occurs more commonly in the knee but still less commonly than it does in the foot and ankle. Risk factors for gout include hypertension, obesity, renal insufficiency, type 2 diabetes mellitus, alcohol use, and diuretics. Serum uric acid levels are often but not always elevated during an acute attack. Differentiation between sepsis and gout in a patient with joint pain, swelling, erythema, and decreased motion is difficult and requires a thorough evaluation, including prompt joint aspiration and synovial fluid analysis and culture.

Gout and septic arthritis appear quite similar on physical examination. Fever may or may not be present and does not help to differentiate between the 2 conditions. Furthermore, systemic laboratory findings are not useful because the peripheral white blood cell count and erythrocyte sedimentation rate can be elevated in both cases.
and crystal analysis, is often diagnostic. Abnormal specimens can be categorized into 3 groups, consisting of non-inflammatory (200-2000 white blood cells/mm³), inflammatory (2000-50,000 white blood cells/mm³), and septic (>50,000 white blood cells/mm³). However, there can be significant overlap between these categories. The diagnosis of gout is made by identifying monosodium urate crystals in the synovial fluid. These needle-shaped crystals show negative birefringence on polarizing microscopy. Rarely, gout and septic arthritis coexist, making it essential to analyze the synovial fluid for both crystals and the presence of organisms. The distinction between gout and septic arthritis is important because treatments differ significantly.

In the first patient, an acute gout attack could not be differentiated from a septic elbow based on history and physical examination alone. The patient underwent immediate elbow aspiration and synovial fluid analysis because of concern about septic arthritis. Aspiration showed 168,500 white blood cells/μL with a differential of 89% segmented neutrophils. These results are more typical of septic arthritis. The patient improved after arthroscopic irrigation and debridement. However, results of final cultures were negative, indicating that the marked elevation in the white blood cell count in the joint fluid was solely caused by gouty arthritis.

**Conclusion**

To the best of the authors’ knowledge, these cases illustrate the highest synovial fluid white blood cell counts reported in patients with gout. These cases show the potential difficulty involved in differentiating the synovial fluid in gout from that of a septic joint based on white blood cell count and differential alone. Furthermore, these cases highlight the importance of crystal analysis in cases of suspected septic arthritis. Given the current diagnostic capabilities available to clinicians, it is difficult, if not impossible, for the clinician to know definitively at the time that a treatment decision must be made whether a patient with a significantly elevated white blood cell count has pain as a result of septic arthritis or gout. Certainly, clinical judgment plays a role in deciding what treatment is most appropriate for these patients.

**References**