



CASE REPORT

An unusual imaging finding mimicking double contour sign following ultrasound-guided intra-articular knee injection of steroid: A case report

Ultrason rehberliğinde diz eklem içi steroid enjeksiyonunu takiben çift konturu taklit eden görüntüleme bulgusu: Bir olgu sunumu

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Summary

Examination of monosodium urate crystals in the synovial fluid remains the gold standard for the diagnosis of gout. On ultrasound (US) examination, the double contour sign (DCS) is one of the most common imaging findings of gout. In this article, we present, for the first time, a unique imaging finding mimicking DCS after US-guided intra-articular knee injection of steroid and discuss it in light of the literature data.

Keywords: Arthritis, gouty; intraarticular injection; steroids; ultrasound.

Özet

Sinoviyal sıvı incelemesinde monosodyum urat kristallerinin tespit edilmesi, Gut hastalığının tanısında halen altın standarttır. Ultrason değerlendirmesinde ise çift kontur bulgusu, Gut hastalığının en yaygın bulgularındandır. Bu makalede, literatürde ilk kez, ultrason rehberliğinde eklem içi steroid enjeksiyonunu takiben diz ekleminde çift kontur görünümü oluşan bir olguyu sunduk ve güncel bilgiler ışığında tartıştık.

Anahtar sözcükler: Eklem içi enjeksiyon; gut artriti; steroidler; ultrason.

Introduction

Gout is a common form of inflammatory arthritis, and its prevalence varies between 1 to 6%.^[1] Examination of monosodium urate (MSU) crystals in the synovial fluid remains the gold standard for the diagnosis of gout.^[2] However, limited access to arthrocentesis and polarized light microscopy, insufficient knowledge and skills of the physician regarding these procedures, and the absence of active arthritis have led to the use of different diagnostic tools in clinical practice.^[2] Ultrasound (US) is one of these diagnostic imaging modalities. Unlike other imaging tools, the main advantages of US include no ionizing radiation exposure, cost-effectiveness, and accessibility.^[3]

On US examination, the double contour sign (DCS), tophi, and “snowstorm” appearance are the most common imaging findings of gout.^[2] The DCS was included in the 2015 American College of Rheumatology/European League Against Rheumatism (ACR/EULAR) Gout Classification Criteria.^[1] The DCS is defined as an abnormal hyperechoic band over the superficial margin of the articular hyaline cartilage.^[4] In the majority of cases, DCS is caused by the accumulation of MSU crystals over the cartilage.^[5]

The DCS is more common in patients with gout and asymptomatic hyperuricemia (AH).^[3] Prolonged disease duration, persistent increases in serum urate levels,

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and an increased number of episodes have been associated with a higher rate of DCS diagnosis.^[5] Unlike previously reported high specificity of DCS at about 100%, recent studies have demonstrated a specificity of 76%, and even 64% in some reports, in the diagnosis of gouty arthritis according to the 2015 ACR/EULAR guidelines.^[6-8] One reason for this decline in the specificity of DCS is that it is not only detected in patients with AH but also in healthy individuals.^[9] In addition, DCS can involve asymptomatic joints, although it is likely to be associated with subclinical gout.^[10] Therefore, large-scale studies including healthy individuals are needed to identify false-positive findings. In another study, Löffler et al.^[6] investigated the diagnostic value of the DCS alone and in combination with Doppler US signals and uric acid levels in patients with acute arthritis. The authors found that, although the DCS alone was helpful in predicting crystal-related arthropathies, it was not reliable in distinguishing gout from CPPD in daily clinical practice. Of note, in this study, 18.1% of patients with a positive DCS had no crystal-related arthropathy, resembling a paradox.

In this article, we present, for the first time, a unique imaging finding mimicking DCS after US-guided intra-articular knee injection and discuss it in light of the literature data.

Case Report

A 65-year-old female patient was admitted to our clinic with bilateral knee pain lasting for more than 10 years. Her medical history revealed the use of oral non-steroidal anti-inflammatory drugs (NSAIDs) and short-term physical therapy programs; however, no significant relief was achieved. On physical examination, both knee joints were painful on palpation and movement. There was crepitus in the joint during range of motion (ROM) testing, although no significant limitation was observed. There was no increase in skin temperature over the affected joints or color change. Systemic examination findings were normal. She had no history of malignancy or inflammatory rheumatic disease. Bilateral anteroposterior radiographs of the knees revealed osteophytes, and the patient was diagnosed with bilateral grade 3 osteoarthritis.

The patient underwent a US examination, which revealed synovial effusion in the right knee. Synovial fluid aspiration was performed, and an intra-articu-

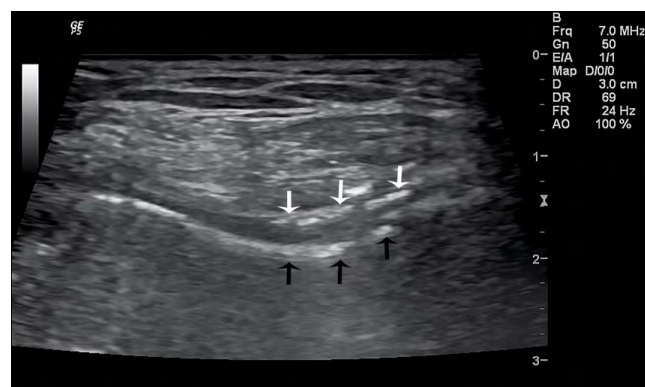


Figure 1. Double contour sign following intra-articular steroid injection. Femur (black arrows) and crystallized steroid (white arrows).



Figure 2. Ultrasonographic examination prior to intra-articular steroid injection.

lar corticosteroid injection (betamethasone dipropionate 5 mg/1 mL + betamethasone sodium phosphate 2 mg/1 mL) was administered. On the US after the injection, the DCS appeared in the right knee (Fig. 1), which was not identified in the pre-procedural detailed imaging examination (Fig. 2). The left knee, which was left untreated, was re-examined, and no DCS, tophi, or “snowstorm” appearance was identified. The laboratory test results were also retrospectively analyzed and found to be within normal ranges. The culture of the synovial fluid was negative, and no crystals were detected in the microscopic examination. Based on all findings, we considered that this imaging finding mimicking the DCS was caused by steroid crystallization within the joint cartilage.

Written informed consent was obtained from the patient for all the diagnostic and therapeutic procedures.

Discussion

In accordance with the laws of physics, US is an ideal imaging tool to identify crystal materials, as they can reflect US waves and be distinguished from hyaline cartilage and synovial fluid, making them easily visualized.^[7]

Steroids have molecular conformation and crystal structures.^[11,12] Depending on the solubility conditions, these crystals can precipitate in the affected tissues, a process known as crystallization. When the injected steroid crystallizes within the tissue, steroid flare occurs, characterized by severe pain and inflammation at the injection site for a few days.^[13] In the present case, an imaging finding mimicking the DCS was induced by corticosteroid (betamethasone) crystallization within the joint cartilage of the right knee. To the best of our knowledge, this is the first case of corticosteroid crystallization producing an imaging finding mimicking DCS after an intra-articular injection. On the other hand, as our patient was lost to follow-up, it is unclear how long this appearance persisted.

Previous studies have reported that DCS has a negative predictive value of 78 to 91% and a positive predictive value of 56 to 74% in gout patients.^[2,6] In conclusion, patients presenting with the DCS on US examination should be further questioned about recent intra-articular corticosteroid injection use. Although the DCS alone is not sufficient to diagnose gouty arthritis, it can be helpful in eliminating misdiagnosis due to inconsistency between clinical, laboratory, and imaging findings.

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