Hypercholesterolemic arthritis: A case report with emphasis on synovial fluid cytology

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ABSTRACT

Hyperlipidemia is a risk factor of osteoarthritis. In the present case report, a case of hypercholesterolemic arthritis secondary to diabetes mellitus is described in a 40-year-old male along with the cytological features of synovial fluid.

Keywords: Arthritis, cholesterol, synovial fluid

Introduction

Hyperlipidemia is characterized by an increase in one or more of the plasma lipids, including triglycerides, cholesterol, cholesterol esters, and plasma lipoproteins. They are classified as hypercholesterolemia, hypertriglyceridemia, or combined based on the type of lipid which is elevated. Hyperlipidemias may be either familial (primary) due to specific genetic abnormalities or acquired (secondary) due to diabetes mellitus, hypothyroidism, chronic alcoholism, drugs like corticosteroids, beta-blockers, and oral contraceptives, kidney failure, and metabolic disorders. The primary hyperlipidemia is further categorized into type I to V based on the Fredrickson classification of primary hyperlipidemia.

Association of hyperlipidemia with diabetes, cardiovascular disease, and atherosclerosis is well-known. Hyperlipidemia is also associated with the risk of osteoarthritis, however the molecular mechanism underlying this association is not clear. Here we report a case of secondary hypercholesterolemic arthritis in a 40-year-old male and describe the cytological findings of synovial fluid.

Case Report

A 40-year-old male presented with painful swelling of the right foot. The swelling had been gradually increasing in size for the last 1 year. On local examination, the first tarso-metatarsal joint of the right foot was swollen. There was no history of trauma. There was no significant past or family history. She was a case of uncontrolled diabetes mellitus with a blood glucose level of 282 mg/dL and Hba1c of 8.1%. Erythrocyte sedimentation rate (ESR) and C-reactive protein were normal. Biochemical parameters showed serum calcium of 8.1 mg/dL (Normal 9–11 mg/dL), phosphate of 3.3 mg/dL (Normal 2.5–4.5 mg/dL), and uric acid of 4.5 g/dL (Normal 3.4–7.0 g/dL). Her rheumatoid factor (RF), anti-cyclic citrullinated peptide, and antinuclear antibody (ANA) were negative. Her lipid profile study showed total serum cholesterol of 315 mg/dL (normal <200 mg/dL), low density lipoproteins of 250 mg/dL (normal <100 mg/dL), triglyceride of 100 mg/dL (normal <150 mg/dL), and high density lipoproteins of 55 mg/dL (normal >40 mg/dL).

Plain radiographs of the right foot did not show any bony or joint erosion. There was no evidence of tendon xanthomas.

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or tendinitis. Synovial fluid was aspirated from the first tarso-metatarsal joint of the right foot by a 24 gauge needle. Wet mount preparation from the fluid showed crystals plates with notched ends [Figure 1a]. Under polarized light microscopy these crystals were positively birefringent [Figure 1b]. May Grunwald Giemsa (MGG) stain showed mainly extracellular rhomboid and square-shaped crystals along with scattered foreign body giant cells [Figure 1c]. The background showed chronic inflammatory cells consisting of lymphocytes and histiocytes.

A diagnosis of hypercholesterolemic arthritis was made. The blood glucose was controlled. The patient was started with atorvastatin and paracetamol. After 3 months, the lipid levels returned to normal with significant improvement in arthritis.

Discussion

The opinion that cholesterol is a risk factor for osteoarthritis has developed lately.[3] Hyperlipidemia may give rise to various musculoskeletal disorders such as mono/oligoarthritis, tendinitis, migratory polyarthritis similar to rheumatic fever or even simple arthralgias.[4] The symptoms of hyperlipidemias may resemble those of rheumatoid arthritis. However, rheumatoid arthritis patients usually have circulating RF.[5]

Higher amounts of cholesterol crystals have been demonstrated in the synovial fluid of patients with inflammatory joint conditions like rheumatoid arthritis and hyperlipidemia.[4,5] Other than cholesterol crystals, synovial fluids may contain a number of crystals.[4] Monosodium urate monohydrate (MSUM) and calcium pyrophosphate dihydrate (CPPD) crystals are pathogenic and their identification leads to the diagnosis of gout and CPPD disease/pseudogout respectively.[6] Crystals like basic calcium phosphates including apatites are of doubtful significance.[6]

Polarizing light microscopy is very useful in identifying the crystals as it is relatively inexpensive. Cholesterol crystals are 5–40 µm in size and are positively birefringent notched plates under polarized microscope.[6] Lipid crystals are 1–3 µm ovoids with a “Maltese cross” appearance and show positive birefringence.[6] Basic calcium phosphates are aggregates of size 2–80 µm and very weakly birefringent under a polarized microscope.[6] MSUM crystals are negatively birefringent needle-shaped crystals ranging from 1 to 20 µm whereas CPPD crystals are weakly birefringent rods/rhomboids with squared/blunt ends of size ranging from 1 to 20 µm.[4,6]

Although tuberculosis of foot and ankle bones accounts for about 10% of osteoarticular tuberculosis, a clinical differential of tubercular arthritis should be kept in mind especially in endemic regions like India.[7] Radiological findings of periarticular osteoporosis, marginal erosion, and joint space narrowing (Phemister triad) along with marked leukocytosis on synovial fluid cytology give clues to the diagnosis of tubercular osteoarthritis.[7]

In the present case, biochemical parameters like deranged lipid profile helped in the diagnosis of hypercholesterolemia and increased blood glucose pointed to the secondary nature of the condition. Glycated hemoglobin (HbA1c), which is a measure of glycemic control as well as dyslipidemia, was increased in this case.[8] In the present case, characteristic positively birefringent notched crystal plates along with deranged lipid profile and uncontrolled blood glucose clinched the diagnosis of hypercholesterolemic arthritis secondary to diabetes mellitus.

Hypercholesterolemic arthritis is an uncommon form of crystal-induced arthropathy. A meticulous search for crystals in synovial fluid and examination under polarized microscopy may give important clues to the diagnosis.

The cardiovascular risk along with increased morbidity and mortality rates associated with hyperlipidemia are considered as obstacles to quality of life and a major public health issue.[9] Moreover the functional impairment caused by osteoarthritis adds on to the morbidity.[9] Thus, the control of the signs and symptoms of hyperlipidemia and osteoarthritis are essential in promoting a healthy life. Thus the primary care physicians should be aware of the association of these two public health issues as well as the basic diagnostic modalities.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and
due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**
There are no conflicts of interest.

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