

Idiopathic Avascular Necrosis of Humeral Head: A Rare Case Report

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ABSTRACT

Avascular necrosis (AVN) of the humeral head is a rare but concerning condition that can lead to significant joint pain and eventually results in arthritis, greatly impacting a patient's quality of life. In the early stages, symptoms related to AVN of the humeral head are often unrecognised and non-specific, which can lead to misdiagnosis and inappropriate treatment. Corticosteroid use is the most common aetiology behind AVN. We present a rare case of a young female who had aplastic anaemia for which she received steroids and more than four years post-treatment, she presented with shoulder pain and was found to have AVN of the humeral head. Management strategies include physiotherapy of the shoulder. This helps enhance muscle strength and improve range of motion. These therapies are used before considering core decompression or other surgical options.

Key Words: Humeral head, Avascular necrosis, Steroid use, Shoulder pain, Shoulder stiffness, Osteoarthritis.

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INTRODUCTION

Avascular necrosis (AVN) or osteonecrosis of bone results from epiphyseal bone ischaemia leading to structural collapse and subsequent bone death.¹ This condition is an uncommon clinical entity but particularly concerning as it can cause significant joint pain and eventually lead to arthritis, severely affecting a patient's quality of life.² Common causes of AVN in general can be divided into two categories i.e. traumatic and non-traumatic. Traumatic AVN, associated with fractures and dislocations, is more common than non-traumatic AVN. Chronic use of corticosteroids, multisystem diseases (e.g. systemic lupus erythematosus, sickle cell disease), and alcohol abuse are important causes of non-traumatic AVN.¹

Humeral head AVN is relatively rare, the second most frequently affected site after the femoral head.³ Symptoms of the humeral head AVN are often unrecognised as they are relatively non-specific in the early stages, often leading to misdiagnosis which ultimately results in inaccurate treatment.⁴ The collapse of the humeral head in radiology is diagnostic. Physical therapy, activity modification, anti-inflammatory medications, and risk factor management usually comprise non-operative treatment.³ Interventional treatment options include core decompression, arthroscopic debridement of vascularised bone grafts, and shoulder arthroplasty.²

The Cruess classification system is utilised to classify the severity of osteonecrosis of the humeral head. The classification comprises five stages. In stage I, no abnormalities are visible on plain radiographs, but MRI reveals changes in the bone marrow signal. Stage II is characterised by findings on plain radiographs that show focal osteolysis and sclerosis in wedge shape of the humeral head located at the superior aspect of the bone, with a collapsed articular surface. In stage III, there is subchondral collapse and a loss of the normal sphericity of the humeral head, often associated with a crescent sign appearance. Stage IV involves extensive subchondral bone collapse and further sphericity loss with significant secondary arthritic changes. Finally, stage V indicates osteonecrosis progressively worsening, with arthritic changes extending into the glenoid surface.⁴

The treatment of these cases starts with physical therapy and medical treatment. Surgery is reserved for cases that are not responsive to conservative treatment. Usually, grade III and above would benefit from surgical interventions.²

CASE REPORT

A 22-year female patient presented to the emergency department (ED) in September 2024 with complaints of left shoulder pain. The pain started in the morning when she woke up. There was no history of trauma, and she denied local symptoms such as swelling, numbness, tingling sensations, burning, or any skin colour changes. She also denied any systemic symptoms such as fever, chest pain, headache, or neck pain. Her vital signs were within normal limits, so she was seen in the fast-track area as category 4, as per the Canadian triaging system used in our hospital. She was right-hand dominant and a student. This was her first presentation with pain. Pain aggravated on both active

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and passive movements, and it was graded as a pain intensity score of 4/10 (mild pain) on the visual analogue score (VAS).

Local joint examination showed no deformity swelling or skin colour changes, and there was a full range of motion (ROM) with mild pain at extremes of flexion and abduction. The neurovascular examination was intact in the whole upper limb. X-ray of the left shoulder showed findings suggestive of AVN grade III (Figure 1).

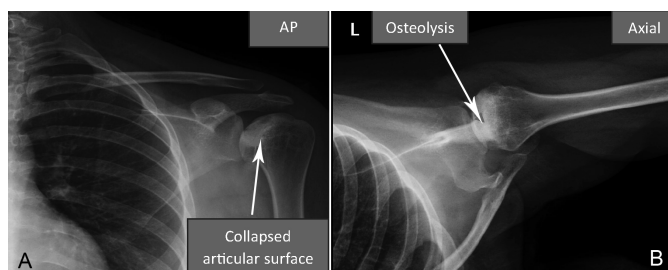


Figure 1: Radiograph of the left shoulder. (A) is the anterior-posterior (AP) view and (B) is the axial view showing focal osteolysis and sclerosis in a wedge shape of the superior humeral head, with a collapsed articular surface.

Upon further inquiry, it was discovered that she had previously received treatment for aplastic anaemia. She was diagnosed with aplastic anaemia in 2018 for which she was started on steroids (prednisolone) and immunosuppressants (cyclosporine) in September 2018. She did not respond to treatment by the end of the 4th month. Due to the non-availability of compatible human leucocyte antigen (HLA) donors, haploidentical transplantation from her father was planned. Alpha-beta T cell-depleted haploidentical stem cell transplantation with a non-myeloablative regimen was done in February 2019 and she remained stable after the transplant. The post-transplant vaccination programme was completed. Currently, she is not taking immunosuppressants or steroids post-transplant.

She was referred to the orthopaedic team, who planned to discharge her on symptomatic management with early follow-up within a week on an outpatient basis. As the pain severity was not significant, she was followed up in the clinic after a week showing improvement with the analgesia given. The conservative treatment was continued which did not affect the daily routine and her day-to-day work. After three months of follow-up, she was doing well on conservative management and did not show signs of disease progression.

DISCUSSION

AVN results in fibrosis, inflammation, and sclerosis of the head of the humerus occurring as an attempt to heal the damaged bone.⁴ The fractures and dislocations of the proximal humerus are the common traumatic causes of AVN.³ Steroid use is the most common non-traumatic cause² with a prevalence that varies from 3 to 38% accounting for 5–25% of patients with non-traumatic osteonecrosis.⁵ Steroid use increases lipids in circulation, which may precipitate fat embolism into the humeral head vessels. Corticosteroids are used in the treatment of a wide variety of diseases. AVN may complicate steroid use over a

post-steroid use period ranging from six to 24 months.² Our patient, presented after more than four years of the use of steroids, which was unusual.

The humeral head AVN usually begins at the superomedial aspect. This region is the area where the greatest amount of stress is exerted over the head of the humerus. This area is also the most vulnerable to injury due to its poor blood supply.² The shoulder joint is not a weight-bearing joint unlike the hip joint and the glenoid has a lesser area of encompassing when we compare it to the acetabulum,⁶ allowing the compensatory movement at the scapulothoracic joint. Nevertheless, patients are often symptomatic and complaint of a painful click accompanying certain active movements at the shoulder joint, resulting from joint incongruity or a cartilage flap.⁴ This can lead to pain at rest and a limited ROM, resulting in compromised daily activities; the same pain mechanism could be appreciated in this patient. Lifestyle modifications, avoiding excessive active shoulder flexion and abduction while preventing stiffness through passive ROM are parts of the conservative management.² The impact on activities of daily life (ADLs) depends on the severity of pain and the stage. In this particular case, as she was right-hand dominant, it did not affect her ADLs.

Surgical interventions including arthroscopic debridement and core decompression with or without bone grafting are options available in joint-preserving surgeries. Before contemplating core decompression or other surgical options, management may involve shoulder physiotherapy to enhance strength and improve range of motion, modifications to activities, and medical treatment of any underlying conditions that contribute to osteonecrosis.⁴ A similar approach was taken in managing this case.

When a patient is diagnosed with non-traumatic humeral head osteonecrosis, it is important to consider the possibility of multifocal osteonecrosis, which means that other areas of bone may also be affected.⁷ One common site to check is the femoral head, as osteonecrosis can occur in multiple locations simultaneously. Traumatic AVN on the contrary does not require any other site checks and screening.

Though humeral head AVN is a rare entity, emergency physicians must be vigilant not to miss such a diagnosis with special emphasis on history including the medicine history, relevant examination, and radiologic investigations, as disease progression can be slowed and permanent disability of patients can be avoided. It is recommended that a patient with humeral head osteonecrosis should undergo an MRI of the femoral head to rule out multifocal osteonecrosis.⁸ MRI of the pelvis was not done in this case as she was symptom-free for any pain around the pelvis and mobilising daily without regular activities being affected. So, the bottom line is, that any non-traumatic pain should alarm ED physicians to look for such aetiology, which is the main purpose of bringing up this case report.

PATIENT'S CONSENT:

Informed consent was obtained from the patient.

COMPETING INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

NNK: Conception, design of the work, analysis, drafting and interpretation.

AP: Analysis, interpretation, and drafting.

ROZ: Design of the work, acquisition, and analysis.

All authors approved the final version of the manuscript to be published.

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