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Atlantoaxial Dislocation in Rheumatoid Arthritis: A Case Report Emphasizing the Pivotal Role of MRI

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Abstract **Case Report**

Atlantoaxial dislocation (AAD) is a potentially severe complication of rheumatoid arthritis (RA), resulting from chronic synovial inflammation and ligamentous destruction. It may remain clinically silent or present with polymorphic symptoms. Magnetic resonance imaging (MRI) is essential for early diagnosis to prevent neurological complications. We report the case of a 45-year-old female with a known history of RA under treatment, presenting with progressive neck pain. MRI revealed atlantoaxial instability and confirmed anterior atlantoaxial dislocation with synovial pannus and no evidence of spinal cord compression.

Keywords: Atlantoaxial dislocation, Rheumatoid arthritis, MRI, Cervical spine, Pannus.

INTRODUCTION

Rheumatoid arthritis (RA) is a progressive systemic inflammatory disorder typically affecting peripheral and small joints like the wrists, metacarpophalangeal and proximal interphalangeal joints [1-2]. However, chronic inflammation can also involve axial skeletal structures such as the atlantoaxial joint [1-3]. This cervical spine involvement occurs in longstanding disease and may lead to instability and neurological complications [4-5].

Atlantoaxial dislocation (AAD) is the most frequent form of cervical spine involvement in patients with RA [6-7]. It refers to a loss of normal articulation and malalignment of C1 and C2 [8], mainly related to pannus formation, leading to ligamental laxity and tears with subsequent atlantoaxial subluxation in different directions [4-9]. The major risk of this entity is spinal cord compression, cranial nerve neuropathy, brainstem compression, and vertebral artery injury, which are a life-threating conditions [1-10].

Clinical presentation is highly variable and non-specific, ranging from asymptomatic cases to neck pain, restricted mobility, and neurological deficits. In this context, the role of imaging especially magnetic resonance imaging (MRI) has been highlighted, demonstrating a greater sensitivity for an accurate recognition of this manifestation and severity assessment [2-3].

We report a case of a female patient with a known history of RA complicated by atlantoaxial subluxation, emphasizing in this review the value of imaging in diagnosis and management.

CASE REPORT

A 45-year-old female with a known history of seropositive RA under medical treatment presented with progressive neck pain, sometimes associated with stiffness. Physical examination revealed limited cervical mobility, particularly in rotation, without motor or sensory deficits.

Given the clinical context of RA and the suspicion of cervical spine involvement, imaging study was performed.

The patient declined initial cervical spine radiograph and proceeded directly to MRI as the first line imaging.

Sagittal sequences demonstrated inversion of normal cervical lordosis, associated with widening of the atlantodental interval (ADI) exceeding normal values (8 mm), consistent with anterior dislocation of the atlantoaxial joint measured in both sagittal and axial T2-

weighetd images. A soft tissue mass consistent with synovial pannus was identified within this space, pushing the anterior arch of C1 forward. The pannus appeared isointense on T1-weighted images and hyperintense on T2-weighted images. Sagittal STIR images showed peri-dental synovitis. Gadolinium injection was not performed in our case as the patient presented with severe renal failure. No evidence of spinal cord compression was present and no intramedullary T2 hyperintensity was observed. (Figure 1).

The diagnosis of AAD was made, with no evidence of neural axis involvement.

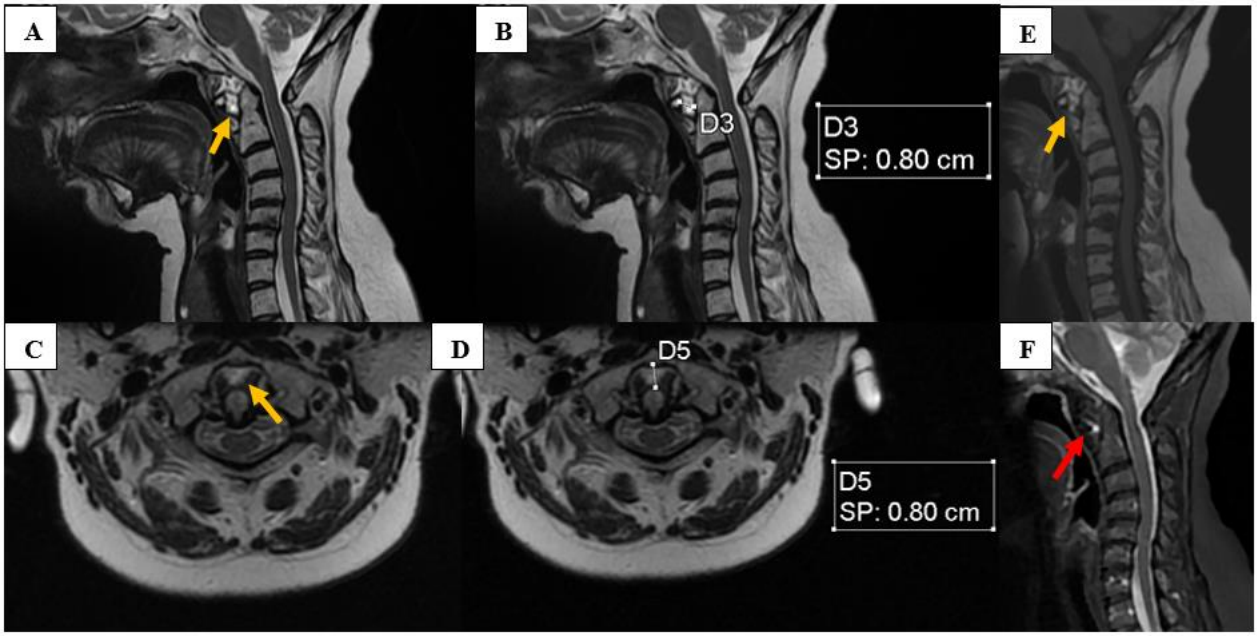

Figure 1: Sagittal (A, B) and axial (C, D) T2 sequences demonstrating widening of the atlantodental interval measuring 8 mm associated with soft tissue mass consistent with synovial pannus within this space (yellow arrows) appearing isointense on T1-weighted images (E), hyperintense on T2 weighted images (A, B, C, D). STIR images (F) showing peri-dental synovitis (red arrow)

DISCUSSION

Cervical spine involvement in RA is common, with AAD being the most frequent form [11]. It may occur early in the disease or after several years of progression [6].

AAD results from chronic synovial inflammation leading to pannus formation, progressive erosions and ligament damage particularly the transverse ligament, followed by multidirectional subluxations [3-4-12].

Clinical symptoms may differ widely across patients and show no correlation with the severity of radiological damage [13]. They ranged from asymptomatic to localized head and neck pain with stiffness, and neurological manifestations in advanced stages [6-10]. The Sharp-Purser test may be used for the assessment of a possible anterior AAD [13].

Imaging plays an important role in the diagnosis of cervical spine pathologies, with classic radiography being the first-line approach [4-14].

Dynamic lateral views in flexion and extension may be more useful than static and neutral views in detecting AAD, but should be used cautiously [15].

Radiography allows measurement of the ADI and evaluation of cervical spine alignment [4-10].

The diagnosis of anterior AAD is made when the ADI, which is defined by the distance between the posterior border of the anterior arch of C1 and the anterior border of the odontoid process, is > 3 mm [3-4-9-12].

On the other hand, conventional radiography lacks 3D information on soft tissues, joints, and spinal cord [9-12]. Thus, further imaging modalities are used, such as MRI and computed tomography (CT) for more precise evaluation of this complex anatomical area [4-13-14].

CT provides excellent visualization of bony structures and their erosive changes, particularly of the odontoid process [13,14]. Multiplanar reconstructions are essential for evaluating the type of subluxation and are requested in almost all cases for surgical planning [4-9].

MRI remains the gold standard for evaluation of AAD in RA. Typical protocols include sagittal T1- and T2-weighted sequences, T2 STIR (short tau inversion recovery), and axial T2-weighted images. In addition, sagittal post-contrast T1-weighted images can be helpful to assess active inflammatory lesions [4].

It demonstrates active synovitis which is defined as a thickening of the synovial membrane at the atlantoaxial joint, showing increased water content in fat-suppressed T2-weighted and STIR sequences or an abnormal post-gadolinium enhancement [3].

Also, MRI enables early detection pannus tissue, odontoid erosion and allows assessment of spinal cord compression, brain stem or nerve roots [3-13-16].

Cervical myelopathy manifests in MRI as a focal area of increased signal in fluid-sensitive images; However, very early changes might remain undetected [14].

Several types are described: anterior AAD is the most common form, followed by lateral then posterior AAD [4]. The lateral form may occasionally induce cerebral ischemia due to compression of the VA as considered by Takeshima and *et al* [11].

In some cases, it can progress and result in vertical migration of the odontoid into the cranial cavity, also known as cranial settling or basilar impression [9-10-14].

Lastly, cervical involvement in RA patients can also affect the subaxial cervical spine, defined as the segments from C3 to C7. The most common form is subaxial subluxation [9-14].

Appropriate management of RA patients with AAD requires a multidisciplinary approach. It depends mainly on severity of instability and presence of neurological symptoms, varying from conservative management, to surgical interventions in more advanced cases. [1]

Conclusion

Atlantoaxial dislocation is the most frequently encountered radiological abnormality in rheumatoid arthritis.

MRI is the leading imaging technique for the assessment of cervical spine involvement. It enables early recognition of soft tissue lesions, evaluate neurological risk and guide proper management.

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