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Case Report

Rare but characteristic MRI Shoulder findings of *chlamydia trachomatis*-associated reactive arthritis ☆

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ABSTRACT

Spondyloarthritis is an inflammatory disease characterised by tendon adhesions and sacroiliitis. Herein, we present a case of reactive arthritis (ReA) after Chlamydia infection. The condition was characterised by rotator cuff enthesitis accompanied by inflammation of the rotator cuff muscles and presence of contrast-enhanced lesions at several tendon attachments without pelvic sacroiliitis. Some studies have reported about shoulder joint involvement observed on magnetic resonance imaging (MRI) in ankylosing spondylitis and psoriatic arthritis. However, there are no reports on shoulder lesions detected on MRI in *C. trachomatis* infection-associated ReA. The patient presented with hip, lower back and right shoulder pain. MRI of the pelvis revealed inflammation of the tendon attachments such as the spinous process, sciatic tuberosity and greater and lesser trochanter. However, sacroiliitis was not observed. These imaging findings indicated enthesitis. The patient tested positive for *C. trachomatis* immunoglobulin but negative for HLA-B27 antigen. Hence, he was diagnosed with Chlamydia-related ReA. Antibiotic treatment combined with sulfasalazine was initiated. This resulted in an evident clinical improvement without remission. To the best of our knowledge, this is the first case report showing the presence of shoulder lesions on MRI in *C. trachomatis* infection-associated ReA. Further, this study showed that shoulder lesions in spondyloarthritis, including ReA, are characterised by not only adhesive inflammation but also bone marrow oedema in the tendon attachments and rotator cuff inflammation.

Introduction

Spondyloarthritis (SpA) encompasses a spectrum of diseases with similar clinical and genetic characteristics. These conditions are characterised by manifestations in the axial skeleton (including sacroiliac and spinal involvement), peripheral arthritis, enthesitis and dactylitis. Clinically, this disease group includes ankylosing spondylitis (AS), psoriatic arthritis (PsA), inflammatory bowel disease-related arthritis and reactive arthritis (ReA) [1]. In 1969, ReA was proposed and defined as a sterile, nonpurulent type of arthritis that develops after a microbial infection at sites other than the joints [2]. The differential diagnoses of patients with urinary tract

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infection-associated enthesitis should include *C. trachomatis*-related ReA [3]. Patients with SpA such as PsA [4] and AS [5] commonly develop shoulder joint lesions. Nevertheless, imaging-based reports are limited. Moreover, there are no documented cases of shoulder magnetic resonance imaging (MRI) abnormalities in patients with ReA. Herein, we present a case of chlamydial infection-related ReA characterised by rotator cuff enthesitis accompanied by inflammation of the rotator cuff muscles and presence of contrast-enhanced lesions at several tendon attachments without pelvic sacroiliitis.

Case presentation

A male patient who was in his 50s experienced hip and lower back pain. Due to the intensity of his hip pain, he could not bend forward and pick up items from the floor. Moreover, the patient's lower back pain intensified, causing difficulty in standing upright. On the next month after pain initiation, he started experiencing right shoulder pain and presented with evident weakness when trying to apply force. Due to symptom worsening, the patient decided to visit the hospital. Blood tests revealed elevated white blood cell counts at 10,340/μg and C-reactive protein levels at 6.45 mg/dL. Nevertheless, other blood tests showed no abnormalities. Table 1 shows the laboratory test results. During the interview, the patient claimed to have highly sexual activities and reported pyuria symptoms. Sexually transmitted infections including *C. trachomatis* were suspected. The patient's *C. trachomatis* immunoglobulin A and G antibody levels were 15.9 and 16.1, respectively. These findings were indicative of active *C. trachomatis* infection. MRI of the right shoulder revealed inflammation of the tendon attachments involving the rotator cuff muscles (Fig. 1). These findings were indicative of adhesive inflammation of the rotator cuff muscles and associated muscle inflammation. Further, bone marrow oedema of the greater tuberosity of the humerus and peritendinitis were observed. These results indicated spa-related rotator cuff tendinitis. MRI of the pelvis showed contrast-enhanced lesions indicative of inflammation of tendon adhesions at the sciatic tuberosity, spinous process, greater trochanter and lesser trochanter without sacroiliitis (Fig. 2). These findings indicated active inflammation at the tendon attachments. Shoulder and pelvic MRI revealed enthesitis of the right shoulder and pelvis. However, the patient tested negative for the HLA-B27 antigen. Hence, he was diagnosed with Chlamydia-related ReA based on his active *C. trachomatis* infection. Antibiotic treatment was initiated for his infection and sulfasalazine was administrated for ReA-related symptoms. The patient reported a significant improvement in his clinical symptoms without side effects and remission.

Table 1 – Laboratory findings

AST	26 U/l	WBC	10,340/μl	HBs Ag	-
ALT	22 U/l	RBC	441万/μl	HCV Ab	-
LDH	147 U/l	Hb	12.0 mg/dl	HIV Ab	-
Na	143 mEq/l	Plt	26.9万/μl	HTLV-1 Ab	-
K	4.3 mEq/l	CRP	6.45 mg/dl	TP	-
Cl	101 mEq/l				

Discussion

ReA is a type of arthritis that occurs after bacterial infection at the nonarticular sites such as the urinary or intestinal

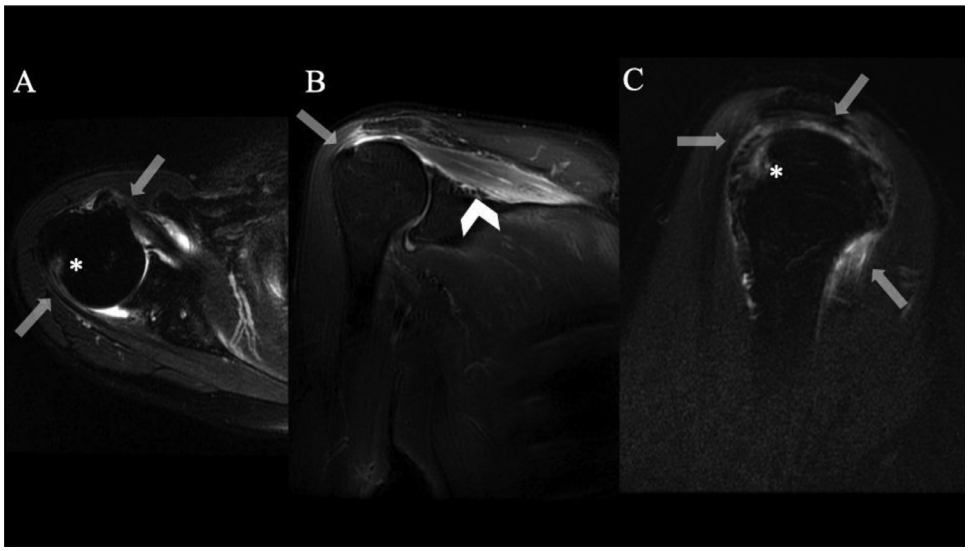

Fig. 1 – (A) Axial short tau inversion recovery (STIR) magnetic resonance imaging (MRI) of the right shoulder showed a high signal at the enthesis of the infraspinatus and subscapularis (arrow). Bone marrow oedema was found in the greater tuberosity of the humerus (asterisk). (B) The supraspinatus muscle had a high signal on coronal STIR MRI (arrowheads), with enthesitis of the supraspinatus (arrow). (C) Sagittal STIR MRI revealed enthesitis of the supraspinatus, infraspinatus and subscapularis (arrow). Bone marrow oedema was observed in the greater tuberosity of the humerus (asterisk).

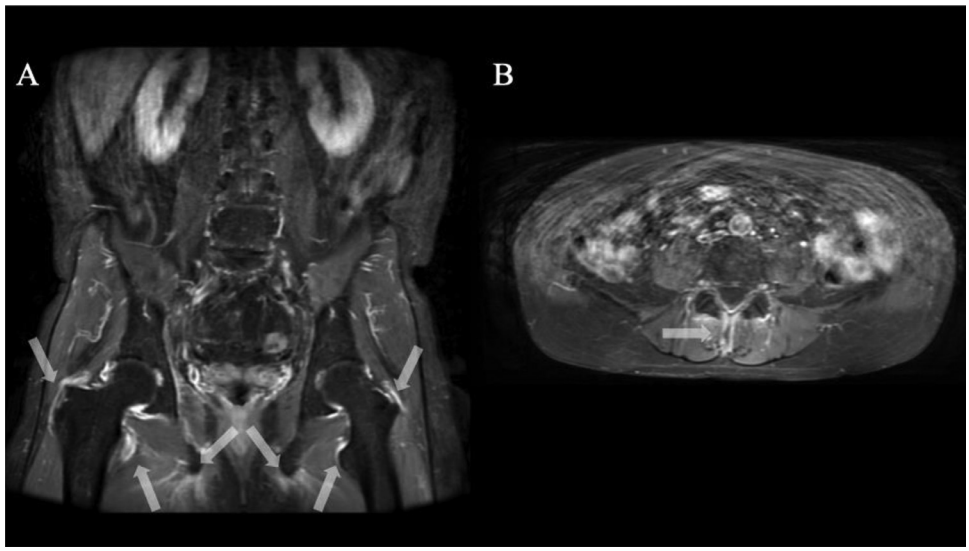

Fig. 2 – (A) Coronal postcontrast T1-weighted imaging revealed a high signal in the greater and lesser trochanter and sciatic tuberosity (arrow). (B) T1-weighted imaging after contrast administration showed a contrast effect in the spinous process (arrow). These findings indicated enthesitis of the greater and lesser trochanter, sciatic tubercle and spinous process.

tract. This condition can be attributed to infections caused by Chlamydia, Salmonella, Shigella, Yersinia and Campylobacter. The site where the tendons, ligaments and joint capsules are attached to the bone (enthesis) is an interesting area for inflammation. Herein, we present a case of chlamydial infection-associated ReA. The novel diagnostic criteria for SpA include sacroiliitis, tendon adhesions and inflammatory back pain on MRI [6–9]. According to the imaging findings of SpA, the earliest inflammatory changes are best observed on MRI. In addition, they include inflamed ligaments and their insertions [10]. MRI is clinically used to evaluate lesions in patients with SpA before and after successful therapy with infliximab [11] and etanercept [12].

Patients with sacroiliitis commonly test positive for the HLA-B27 antigen. However, the role of HLA-B27 in ReA pathogenesis remains unclear [13]. In our case, the absence of sacroiliac arthritis could have been caused by HLA-B27 negativity. Nonetheless, due to the development of ReA in populations who test negative for HLA-B27, researchers aim to investigate the influence of microbiological factors more closely. A study evaluated patients with reactive ReA triggered by Salmonella. Results showed that proteins in the Salmonella outer membrane may stimulate the production of interleukin-17 and interleukin-23 by immune cells within the synovium, potentially leading to arthritis development [14]. In addition to these findings, another study identified mRNA in the synovial tissue of patients with ReA after Chlamydia infection, thereby indicating the presence of metabolically active *C. trachomatis* [15]. Therefore, the differential expression of the heat-shock protein 60 gene affects the continuous activity of these microbial proteins [16]. Nevertheless, further investigations on its pathogenesis must be performed.

Findings such as inflammation of the enthesis may not be evident on imaging, which leads to delayed diagnosis. Therefore, it can be challenging to obtain a diagnosis if there is no evidence of sacroiliitis, as in the current case. Patients with SpA frequently experience a significant delay between symptom onset and diagnostic establishment. Consequently, the treatment provided may be insufficient or ineffective [17]. In addition, there has been a case report in which ReA after Chlamydia infection led to dislocation of the knee and shoulder joints due to delayed diagnosis [18]. Therefore, it is important to cautiously examine medical images to determine the presence of enthesitis.

Shoulder lesions are observed as part of the SpA spectrum [19,20]. Plain radiography can identify osteoporosis, joint crevice narrowing and bony erosion of the greater tuberosity. Bone erosion of the greater tuberosity occurs at the attachment of the rotator cuff, and it may present as a large hatchet-like lesion. Patients with AS are more likely to present with rotator cuff tendinitis than those with other inflammatory diseases [5]. Patients with AS also present with bone marrow oedema at the entheses of the supraspinatus, infraspinatus, subscapularis and deltoid attachments. Inflammation of the acromial process with bone marrow oedema is a specific finding in patients with AS [5]. Edematous changes in the rotator cuff and bone marrow oedema at the attachment site in PsA are observed on shoulder MRI [4]. ReA may cause arthritis predominantly in the lower leg. However, approximately 10% of cases also involve the shoulder or other parts of the upper extremity [21]. Shoulder lesions in ReA are common. Nevertheless, to the best of our knowledge, this is the first report on shoulder lesions on MRI in *C. trachomatis*-associated ReA. We believe that bone marrow oedema and edematous changes in the rotator cuff are evident and important imaging findings of SpA. Hence, these results can help in differentiating SpA from other inflammatory diseases, such as rheumatoid arthritis (RA). This is because the synovial membrane is the main site of inflammation in RA. Meanwhile, tendon attachments are the main site of SpA. Therefore, inflammation can easily spread to the rotator cuff and other parts outside the joint capsule [22].

In our case, pelvic MRI revealed inflammatory changes in the spinous process, greater and lesser trochanter and ischial tuberosity without sacroiliitis. Previous studies have revealed that F-fluorodeoxyglucose (FDG) accumulation on FDG positron emission tomography (PET)/computed tomography (CT) scan of the spinous process is a characteristic of polymyalgia rheumatica (PMR) [23,24]. However, it has also been observed in SpA [25]. Taniguchi et al. found that patients with SpA developed inflammation of the lumbar spinous processes and ischial tuberosities on FDG-PET/CT scan [25]. Based on a previous study [26], the SpA and PMR groups had a higher FDG accumulation in the spinous processes, ischial tuberosities and greater trochanter on PET than the RA group [26]. Hence, PET can be effective in detecting enthesitis in patients with SpA. However, PET alone cannot confirm whether the increased uptake in the spinal spinous processes, ischial tuberosities and greater trochanter is caused by SpA-associated enthesitis or PMR-related bursitis. In the diagnostic process of SpA and PMR, it is important to confirm the location of inflammation (ligamentous attachment vs within the bursa) on MRI.

Conclusion

If enthesitis involving the rotator cuff muscles and bone marrow oedema is observed on MRI, SpA including ReA, AS and PsA should be considered as a differential diagnosis. In addition, healthcare professionals must pay close attention to the spinous process, sciatic tuberosity, greater trochanter and lesser trochanter as these structures can be useful in the diagnosis of SpA without sacroiliitis on MRI.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethical approval was provided by Shizuoka Red Cross Hospital Ethics Committee.

Data set availability

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Author contributions

Kenji Ohira conceived and designed the analysis, collected data, performed the analysis and wrote the paper. Daisuke Kanai and Yukio Inoue contributed data and analysis tools. All authors have read and approved the final manuscript.

Patient consent

A written informed consent was obtained from the patient.

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