

Rheumatoid arthritis

Radiological changes in the cervical spine

Ahmed A. Al-Boukai, MD, DMRD, Abdurhman S. Al-Arfaj, MRCP, FRCP.

ABSTRACT

Objective: To describe the radiographic cervical spine changes in rheumatoid arthritis patients.

Methods: Forty-nine patients (37 females and 12 males) diagnosed with rheumatoid arthritis at King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia, between June 1998 and June 2000, were studied for their radiographic cervical spine changes. Their mean age at disease onset was 41.4 ± 13.4 years (range of 18-73) and mean duration of the disease was 9.1 ± 6.28 years (range of 2-34). Their demographic data including rheumatoid factor status was obtained. Standard conventional radiographs of cervical spine were obtained to study the cervical spine changes.

Results: Cervical spine radiographic changes were found in

34 patients (27 females and 7 males), 10 had subluxation (7 with atlanto-axial subluxation, 2 with sub-axial subluxation, and one with lateral subluxation). No vertical impaction was seen. Erosion of odontoid process was seen in one patient. All were rheumatoid seropositive.

Conclusion: Cervical spine changes in patients with rheumatoid arthritis are common, in particular subluxation in the upper cervical spine. Our study showed somewhat lesser prevalence of these changes. These were clinically correlated with disease duration, female sex, and rheumatoid factor, but were not statistically significant.

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Cervical spine involvement in patients with rheumatoid arthritis (RA) is a frequent and well-recognized manifestation that may lead to neurological complications including compressive myelopathy, vertebro-basilar artery ischemia, pachymeningitis and death.¹⁻⁴ Several short and long-term studies have looked at the changes in cervical spine of RA patients.⁵⁻¹² These studies have yielded varying conclusions as a result of variability in patients selection, inter and intra-observer errors and lack of a uniformly accepted grading system for radiological changes in cervical spine.

The aim of our study is to describe the radiographic cervical spine changes in RA patients attending at King Khalid University Hospital (KKUH), Riyadh, Kingdom of Saudi Arabia (KSA), and compare it with previously published studies.

Methods. Forty-nine patients diagnosed with rheumatoid arthritis according to the American Collage Of Rheumatology (ACR) criteria¹³ who were attending outpatient's rheumatology clinic at KKUH, Riyadh, KSA between June 1998 and June 2000, were included

From the Department of Radiology and Medical Imaging (Al-Boukai) and the Division of Rheumatology, Department of Medicine, (Al-Arfaj) King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia.

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Address correspondence and reprint request to: Dr. Ahmed A. Al-Boukai, Department of Radiology, King Khalid University Hospital, PO Box 7805 (40), Riyadh 11472, Kingdom of Saudi Arabia. Tel. +966 (1) 4671999. Fax. +966 (1) 4671746. Email: aboukai@ksu.edu.sa

in our study. The medical records were reviewed, and the following data were obtained: age, sex, age of onset of rheumatoid arthritis, duration of disease and rheumatoid factor status (using latex method), erythrocyte sedimentation rate at initial presentation for each patient. An evaluation of cervical spine radiographic changes was the scope of our study. The cervical spine was radiographed using antero-posterior, and lateral (extension/flexion) views. The 2 authors read the radiographs separately, and a consensus reporting was documented. We assessed the following radiographic features: bone density, osteosclerosis, osteophytosis, and alteration in joint space, subchondral cyst formation, joint erosion and subluxation. Anterior Atlanto-axial subluxation (AAAS) was diagnosed when the distance between the anterior aspect of the dense and the posterior margin of the anterior arch of the atlas measured more than 3 mm. Atlanto-axial impaction (AAI) was evaluated using McGregor's line.¹⁴ By this method, invagination was deemed present if the odontoid process projects above the McGregor's line by more than 4.5 mm. Sub-axial subluxation (SAS) was considered present when there has been loss of normal alignment with more than 3 mm shift between 2 adjacent vertebrae. Lateral atlanto-axial subluxation was recorded positive if there is asymmetry of the space between odontoid process and lateral masses of the atlas in an open mouth antero-posterior view of cervical spine. We used the statistical package for social sciences (Chicago, Illinois, United States of America) to analyze data.

Results. Forty-nine patients (37 females and 12 males) with rheumatoid arthritis were studied. Their mean age at disease onset was 41.4 ± 13.4 years (range 18-73), mean age at time of study was 50.5 ± 14.2 years (range 22-76) and mean duration of the disease was 9.1 ± 6.28 years (range 2-34). Cervical spine radiographic

changes were demonstrated in 34 (69%) patients (27 females and 7 males). These changes are tabulated in **Table 1**. Ten patients (20%) showed subluxation (AAAS, lateral atlanto-axial subluxation [LAAS], SAS) in the upper cervical spine. A diagnosis of AAAS was made in 7/49 patients (14%). The gap of this AAAS ranged between 4 and 6 mm. In 5 out of the 7 cases this distance did not differ between flexion and extension, while in 2 patients the distance changed by 1-2 mm. Lateral atlanto-axial subluxation was recorded in only one patient (2%). In 2 patients (4%), SAS was noted at the level of C2-C3 and C3-C4. No cases of atlanto-axial impaction were observed. Mal-alignment of the cervical spine was seen in 6 patients (12%) in the form of loss of normal lordosis or kyphosis. Erosive changes of odontoid process were seen in one patient (2%). Narrowing of disc spaces was seen in 20 patients (41%), 5 had multiple disc levels involvement while 15 had a single level involvement. The intervertebral disc space between C5 and C6 was the most frequently involved level followed by C4-C5 level. Generalized osteopenia was observed in 35 patients (71%), while osteosclerosis was seen in only 2 (4%). Osteophytosis was recorded in 17 patients (35%).

The rheumatoid factor was positive in 40 patients (30 females and 10 males), and negative in 9 patients. All the cervical spine radiological changes were found in those with a positive rheumatoid factor. Clinically, none of our patients showed signs of neurological complication. Although radiological changes in our study were seen more in females (27/34) and occurred only in those who are rheumatoid factor positive, it showed no significant association when tested statistically. Subluxation showed no significant correlation with any of the parameters measured including duration of disease, age at onset, sex, rheumatoid nodules, rheumatoid factor, erythrocyte

Table 1 - Distribution of cervical spine radiological changes.

| Cervical spine radiological changes | Female (n) | Male (n) | Total n (%) | RF Status |
|--|------------|----------|-------------|-----------|
| Erosions | - | 1 | 1 (2) | positive |
| Scoliosis | 1 | - | 1 (2) | positive |
| Subluxation (N = 10 [20%]) | | | | |
| AAAS | 6 | 1 | 7 (14) | positive* |
| LAAS | 1 | - | 1 (2) | positive |
| SAS | 2 | 0 | 2 (4) | positive* |
| Osteophytes | 13 | 4 | 17 (35) | positive* |
| Disc space narrowing | 17 | 3 | 20 (41) | positive* |
| AAAS - anterior atlanto-axial subluxation LAAS - lateral atlanto-axial subluxation SAS - sub-axial subluxation, RF - rheumatic fever | | | | |

Table 2 - Comparison with other studies.

| Radiological changes | Our study | Kappi et al ¹⁷ study | P value | Winfield et al ⁵ study | P value |
|--|------------|---------------------------------|---------|-----------------------------------|---------|
| AAAS | 7/49 (14) | 16/68 (23) | 0.206 | 12/100 (12) | 0.73 |
| LAAS | 1/49 (2) | 3/52 (6) | 0.301 | NR | - |
| AAI | 0 | 18/69 (26) | - | 3/100 (3) | - |
| SAS | 2/49 (4) | 13/69 (19) | 0.007* | 24/100 (24) | 0.0001* |
| Disc space narrowing | 20/49 (41) | 45/69 (65) | 0.009* | - | - |
| * significant, NR - not reported, AAAS - anterior atlanto-axial subluxation LAAS - lateral atlanto-axial subluxation AAI - atlanto axial impaction SAS - sub-axial subluxation | | | | | |

sedimentation rate value, erosions in cervical spine. However, cervical spine erosions showed correlation with the presence of rheumatoid nodule ($r=0.303$, $p=0.038$), but not with rheumatoid factor ($r=0.072$, $p=0.632$), nor with disease duration. Joint space narrowing did not show any significant correlation with any of the parameters considered. Osteophytosis of cervical spine correlated with mal-alignment ($r=0.290$, $p=0.043$), age ($r=0.469$, $p=0.001$), and age at onset ($r=0.430$, $p=0.002$) but not with disease duration.

Discussion. Thirty-two synovial joints within cervical spine make this region susceptible to the ravage of rheumatoid arthritis. The high risk of cervical spine neurological complications and mortality, as well as the failure of clinical assessment to define the character and location of the spinal lesions made radiological assessment of this region important.¹⁵⁻¹⁷ The prevalence of radiographic changes of cervical spine in RA ranged widely between 17-86%.¹⁷⁻²¹ This broad range of prevalence was attributed largely to differences in patient's selection, radiographic techniques and radiographic diagnostic criteria. Changes were more pronounced in the upper cervical spine. The mechanisms leading to the radiographic changes in this area are similar to those involved in peripheral joints, namely, ligament laxity, pannus formation, cartilage and subchondral bone destruction.²¹ Although the natural history of the disease is not really defined yet, AAAS appeared to be the most common radiological findings.^{17,21} It has been described in 19-70% of patients.⁴ Although these changes appear to be related to disease duration,^{4,12} Winfield et al⁵ reported changes occurring as early as 2 years from disease onset. In our study, the disease duration was not a factor in the occurrence of these changes. Osteophytes formation was seen in our study to correlate with age and age at onset but not with disease duration suggesting that these changes could be explained fully by degenerative process rather than inflammation. This was seen in a study in Nigerian women with no rheumatoid arthritis.²² **Table 2** shows comparison between our results and those of Winfield et al,⁵ and Kuppi et al.¹⁷ Our results were similar to the results of those studies apart for us reporting significantly lower prevalence of SAS and disc space narrowing. Cervical spine changes were reported more frequently in females, patients with a positive rheumatoid factor, peripheral erosive changes and patients on corticosteroids.⁵ Our results show a higher frequency of radiographic changes in females and those having positive rheumatoid factor, but it did not reach statistical significance. This may be due to the fact that the cohort group; namely male and sero-negative cases were low. Other reported changes were AAI in 4-35%, SAS in 7-29% and LAAS in 10-20%.⁴ In our study AAAS was seen in 7 patients, SAS in 2, LAAS in one and none of the patients showed changes of AAI. The factors, which may have contributed to the absence of vertical impaction are the absence of significant erosive

changes at the odontoid process, apophyseal joints or vertebral end-plates; presence of multiple disc space narrowing with secondary osteoarthritic changes as well as presence of muscle spasm and stiffness, which has also a protective role in subluxation and reduction of spinal cord compression or injury. These factors may have played also a role in the lower incidence of subluxation in our study compared to others. None of our patients developed a neurological complication or required surgical intervention. Similar results were also reported by Winfield et al⁵ study in which they suggest that neurological signs of cervical myelopathy do not occur in the early stages of the disease, and that they are likely to be related to disease duration. Sharp and Purser¹⁹ reported however, an incidence of cervical myelopathy in 23% of their patients, while Stevens et al¹⁸ reported incidence of 67% of cervical myelopathy in patients with AAS.

In conclusion, cervical spine changes in patients with rheumatoid arthritis are common. Their association with disease duration, sero-positivity and female sex are evident clinically but not statistically significant. The severity and magnitude of these changes in our study are somewhat lower than those reported in other series.

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Related Abstract

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Institute: Royal Jordanian Rehabilitation Center, Jordan
Title: A comparative study of functional performance between male and female rheumatoid arthritis patients at (RJRC)
Source: Saudi Med J 1997; 18: 410-413

Abstract

Objectives: The purpose of this study is to compare the functional disability between male and female rheumatoid patients measured by the Stanford Health Assessment Questionnaire Disability Scale (HAQ). **Methods:** This is a prospective study of 150 rheumatoid arthritis patients seen in the rheumatology clinic at the Royal Jordanian Rehabilitation Center during a 10 week period in 1994. One hundred and twenty seven were females and 23 were males with a mean age of 46 years. Patients were assessed using standardized clinical, biochemical and radiographic examination. Functional disability was measured using the Stanford Health Assessment Questionnaire Disability Scale. **Results:** The results suggest that there is a significant differences between male and female for HAQ score (mean score M=1.07, F=1.5, p=0.05) and for hemoglobin (means (SD) M=13.5 (1.2), F=12.0 (1.6) g/dl, p<0.01 but not for other parameters. **Conclusion:** The data suggest that the impact of rheumatoid arthritis has a greater effect on the functional status of women.