

Involvement of Atlanto-Axial Joint in Rheumatoid Arthritis : Rare or Frequent ?

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Summary The authors studied the incidence of atlanto-axial joint involvement by conventional radiography and CT in 183 patients with classical or definite rheumatoid arthritis (RA). In determining lesions the significance of factors such as age, sex, duration and severity of the disease was evaluated. Atlanto-axial subluxations turned out to be quite frequent (30%) in the series of patients examined and were directly correlated with age, duration and stage of the disease, and extra-articular manifestations. Clinical symptoms were evident in only 70.9% of cases, confirming the correlation reported by other authors between clinical manifestations and radiologically observed lesions.

Traditional radiography performed in the dynamic position revealed a prevalence of anterior subluxation, whereas CT gave a precise indication of the entity and type of atlanto-axial lesion.

In conclusion, the authors confirm the importance of such investigations in all patients with RA, even those without evident clinical manifestations. They also emphasize the necessity of periodic monitoring in view of the possible risk of mortality in these patients.

Key words Rheumatoid Arthritis, Computerized Tomography, Atlanto-axial Joint.

INTRODUCTION

Involvement of the cervical spine in rheumatoid arthritis (RA) was first described by Garrod in 1890. Reports of its presence vary widely, from 1% to 86% of RA patients, and are unrelated to pain and neurological symptoms (7,9,14,16). In 40% of cases, the elective site is the craniocervical joint where loose ligaments, cartilage damage and bone destruction caused by chronic inflammation give rise to spontaneous subluxation which may be anterior, posterior, lateral, vertical or rotatory (6,10). This site seems to be favoured by prolonged, high-dose, steroid treatment (3) and is more frequent in long-term forms of RA with radiologically revealed damage to the peripheral joints and extra-articular manifestations (8,10,17,18,23). Atlanto-axial subluxation may cause spinal cord compression and cervical myelopathy; the RA patients with atlanto-axial subluxation risk premature death but not necessarily because of subluxation (20).

The variability of prevalence percentage of the atlanto-axial involvement induced us to verify the incidence of the involvement in a group of patients with classical or definite RA and to evaluate the importance of predisposing factors such as sex, age, duration and severity of disease, in determining these lesions.

PATIENTS AND METHODS

The investigation was extended to 183 consecutive patients, 36 males and 147 females. They ranged in age from 20 to 81 years (mean age 33.35 ± 14.72 years) and had classical or definite RA fulfilling ARA criteria. They had been outpatients or admitted to our Institute in the last two years.

At the time of the study, all patients were on maintenance therapy, taking non-steroid anti-inflammatory agents at the recommended doses and cyclic corticosteroids (6-methylprednisolone) at a mean dose of 2 mg/day. All the patients were undergoing a therapy with slow-acting disease modifying drugs. Particularly, parenteral gold salt (sodium aurothiomalate) was given to 93 patients, oral gold salt to 3 patients, sulphasala-

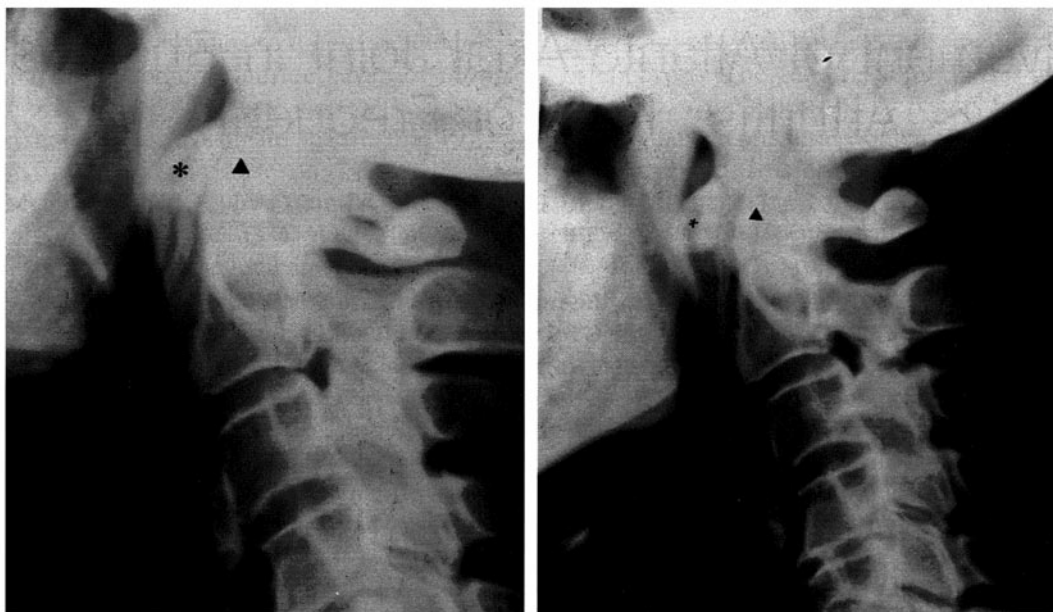


Fig. 1: Slight lesion: 68-year-old male with an 8-year history of RA. Conventional radiographies with dynamic projection :
 a) In normal position no modification of joint facets is evident.
 b) The radiography taken in hyperflexion of the head shows a slight subluxation between atlas anterior arch* and odontoid process ▲. No lesion is present in the bone structure.

zine to 67 patients, hydroxychloroquine to 7 patients and methotrexate to 13 patients. They underwent clinical examination, evaluation of the involvement of small and large joints and extra-articular involvement (subcutaneous nodules, signs of vasculitis). All subjects were asked whether they suffered from cervical spine pain, either spontaneous or provoked by flexion-extension or rotary movements. They were also asked about the details of such pain, namely its duration, onset, severity and branching to the frontal or temporal regions.

Examination of the cervical spine included the classical manoeuvres for the evaluation of the subaxial region, and the manoeuvre of Sharp and Purser (19). The activity of the disease was evaluated by aspecific indices of inflammation such as ESR and CRP; ESR was measured by the standard Westergren method (normal range: M = 5 - 10 mm/hr; F = 5 - 15 mm/hr) and CRP by nephelometric method (normal range <1 mg/dl); rheumatoid factor (RF) was evaluated by the RA and Waaler-Rose tests; a patient was regarded as seropositive if the serum Waaler-Rose was ≥ 64 UI and/or latex fixation was $\geq 1:40$ at the present examination. Liver and kidney function was tested to exclude visceral involvement.

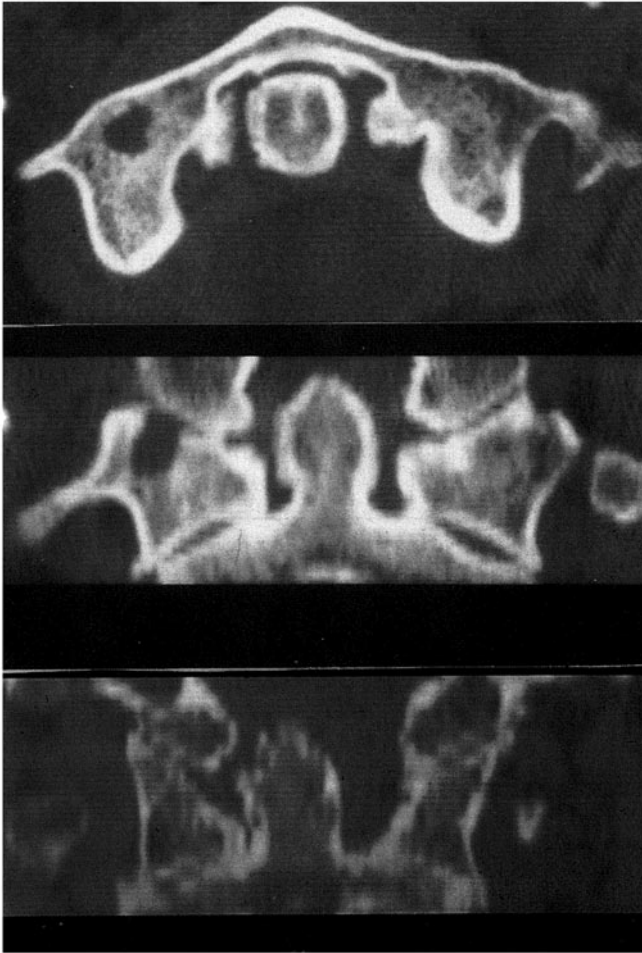
All patients, irrespective of clinical and laboratory parameters, underwent radiography of the atlanto-axial joint. Lateral radiograms were taken in normal position and with hyperflexion of the head on the spine in order to accentuate existing subluxations and show non-permanent ones. Chest X-ray was also performed to ex-

clude interstitial disorders, and X-ray of the peripheral joints, especially the hands and wrists, in order to establish the severity and progression of the disease. Radiological staging from I to IV was performed according to ARA criteria (13).

In patients in whom atlanto-axial subluxation was found, neurological examination and CT scan were performed for detailed evaluation of bone structure, joint surfaces, rheumatoid pannus and lateral, rotatory or vertical subluxation. CT examination was performed with a GE 9800 apparatus operating at 120 Kv and 200 mA for bone resolution, taking axial sections at 1.5 mm intervals with a scanning time of 3 sec. The sections extended from the base of the epistropheus to the upper edge of the foramen magnum.

Reconstructions were also performed in median and paramedian sagittal planes, and in frontal planes corresponding to the odontoid process and vertebral bodies. Lesions found by CT and conventional radiography were graded arbitrarily, mainly on the basis of structural bone changes, as follows:

- Slight lesions: bone structure practically normal, sometimes small calcifications, varying degrees of functional alteration due to joint instability (anterior subluxation) (Fig. 1);
- Moderate lesions: marked structural changes of the odontoid process and lateral bodies (Fig. 2), substantial calcification, hypertrophic pannus (anterior subluxation and/or lateral-rotatory subluxation);



Figs. 2a, 2b and 2c: Moderate lesion: 61-year-old male with a 10-year history of RA. CT shows focal bone absorption in atlas lateral mass; no subluxation is evident in axial scan a) and in coronal reformat b).

c) 68-year-old female with an 18-year history of RA coronal reformat with evident lateral atlanto-axial subluxation.

- Severe lesions: marked bone absorption, deformation and ankylosis (subluxation also vertical) (Fig. 3).

Anterior and posterior subluxation was evaluated in dynamic projections of conventional radiography because CT is performed with a neck position conditioned by supine position on the apparatus and is therefore meaningless from the point of view of joint function in forced extension and flexion.

Statistical analysis was performed by Student's test for parametric data and the Chi squared test with Yates correction for the frequencies studied.

RESULTS

We found atlanto-axial subluxation in 55 patients (30.0%), 9 of whom were men and 46 women. The subjects ranged in age from 28 to 70 years (mean age 59.25

Table I: CT scan evaluation of C1-C2 articulation damage

	No. of cases	%
Slight	16	29.1
Moderate	27	49.1
Severe	12	21.8

± 10.08 years), with a duration of RA ranging from 3 to 58 years (mean value 14.7 ± 9.7 years). Clinical symptoms were present in 39 of these patients (70.9%) and were characterized in most cases by pain at the nape of the neck and in the region of the cervical vertebra and by spontaneous or movement-provoked headache. In two cases there was also paraesthesia of the upper limbs when there were no alterations of other parts of the cervical spine. The Sharp and Purser test was positive in all 55 cases, aside from the symptoms and the radiological involvement. Neurological examination was normal except in the two cases mentioned above, who had hyperreflexia and surface sensory anomalies of the upper limbs. Subcutaneous nodules were found on the extensory surfaces of the upper limbs in 6 patients and vasculitis of the lower limbs in four. Liver, kidney and lung involvement was not found in any subject.

According to the clinico-radiological staging used, 10 patients were in stage II, 26 in stage III and 19 in stage IV of RA. The mean values of ESR and CRP were respectively 60.2 ± 34.9 and 4.8 ± 2.1 and RF was positive in 33 cases (60%).

In 48 patients radiography revealed anterior and/or lateral subluxation and in another 7 patients a vertical subluxation between the anterior arch of the atlas and the odontoid process of the axis. The CT study confirmed slight alterations in 16 patients, moderate alterations in 27 patients and severe alterations in 12 patients (Table I). In subjects with clinical symptoms and neurological findings, compression of the spinal cord was found.

The group of 128 patients (27 males and 101 females) with RA and no lesions of the atlanto-odontoid joint had a lower mean age (56.67 ± 15.94 years) and duration of disease (11.15 ± 8.06 years) than the group with involvement of this joint. Extra-articular involvement was not found in any of these cases. Fifty-two of them were in stage II, 53 in stage III and 23 in stage IV.

The mean values of ESR and CRP were respectively 56.1 ± 2.9 and 4.2 ± 2.3 and RF was positive in 63 subjects (49.2%).

No significant differences in sex, activity of the disease and seropositivity for RF emerged from the comparison of demographic, clinical, radiological and laboratory data of the two groups of subjects at the time of the study (Table II).

DISCUSSION AND CONCLUSIONS

The present results showed quite a frequent involvement (30%) of the C1-C2 joint in patients with RA. The wide variations in its incidence reported in the literature can be ascribed to the different criteria of selection of patients, to the different techniques and parameters used and to individual interpretation of radiological findings, especially in the absence of correlations between radiological changes and clinical symptoms (4,7).

Among possible factors favouring involvement of the atlanto-axial joint in RA we considered sex, age, duration of disease, radiological findings and stage and activity of the disease. In contrast with other studies (21), statistical analysis of our data did not show a significant difference in distribution of the sexes in the two groups, nor any positive correlation with indices of inflammation and positivity for RF. This lack of correlation may be due to the fact that RA has a very irregular course, characterized by alternating phases of activity and remission even after many years of duration, and is sometimes unrelated to the efficacy of maintenance therapy. A single evaluation of these indices, as performed in the present study, is therefore of little

Table II: Comparison between demographical and clinical-radiological data relative to the two groups studied

	Group I (n=55)	Group II (n=128)	
Age (yrs.) (m ± SD)	59.2 ± 10.1	56.6 ± 12.9	p<0.05
male	n=9	n=27	
Sex			ns
female	n=46	n=101	
Disease duration (yrs.) (m ± SD)	14.7 ± 9.7	11.1 ± 8.1	p<0.05
Extraarticular involvement	n=10	n=0	p<0.001
Clinico-radiological stage II	n=10	n=52	
III	n=26	n=53	p<0.05
IV	n=19	n=23	
ESR (mm/1st hr) (m ± SD)	60.2 ± 34.9	56.1 ± 2.9	ns
CRP (mg/dl) (m ± SD)	4.8 ± 2.1	4.2 ± 2.3	ns
RF (Positive)	n=33	n=63	ns

value. On the other hand, patient age and duration of disease seem to be determinant; it was observed that the patients with atlanto-axial involvement were signif-

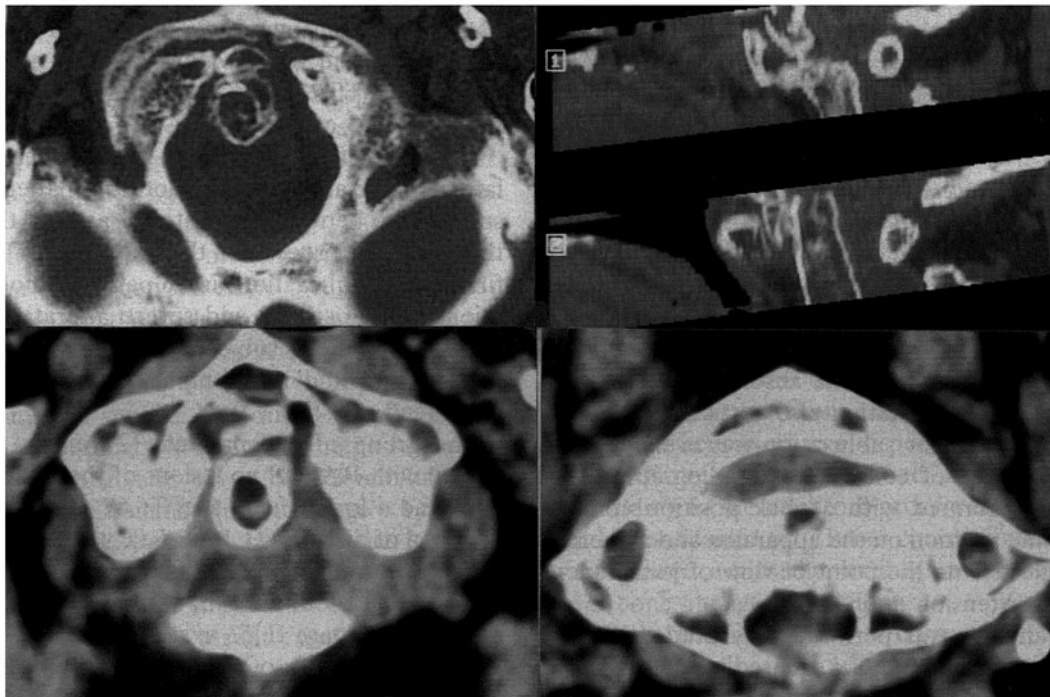


Fig. 3: Severe lesions.

67 year old female with 20-year history of RA: headache and cervical rigidity without neurological evidence. CT axial scan shows severe anterior atlantoaxial and vertical subluxation.

- Atlas anterior arch is in front of occipital condyles (arrow).;
- Reformat in paramedian (1) and in median (2) sagittal plane. In (1), the anterior atlas subluxation is confirmed (arrow); In (2), the vertical subluxation of the axis above the foramen magnum is shown (arrow).
- A calcified structure (arrow) interposes between odontoid process and atlas, makes the anterior subluxation not reducible.
- The space between the atlas posterior arch and the axis is particularly narrowed (two arrow heads) with remarkable compression of the cord.

icantly older and showed a significantly longer duration of RA than the ones with no atlanto-axial involvement. Similarly, a positive correlation was found between radiological staging and manifestations of the disease. The discrepancy between radiographic findings and clinical symptoms reported by other authors was confirmed. Clinical symptoms may in fact be aspecific or slight, only manifesting with signs of spinal cord compression in 2-5% of cases (22,23). However, this lack of relationship and the frequent involvement of atlanto-axial joint in RA suggest that systematic radiological study of the cervical spine is of primary importance in patients with a long history of RA, severe peripheral joint involvement and extra-articular manifestations. Besides conventional radiography, CT and possibly even NMR investigations that give a clearer picture of spinal cord compression, should be performed. C1-C2 involvement in RA causes high mortality in trauma and

surgery: for instance, special care must be taken when performing intubation under anaesthesia (11,12).

Except in these situations, atlanto-axial subluxation is not necessarily a negative prognostic factor; the high mortality reported in these patients is probably associated with the frequency of severe, rapidly progressive forms, often with extra-articular manifestations such as vasculitis, which can be the true cause of death (1,20).

The therapeutic approach should be conservative, at least initially, with the use of rigid collars to reduce local pain and the risk associated with trauma. Surgery consisting of posterior vertebral or transoral arthrodesis is necessary when there are signs of cervico-bulbar syndrome (5,14).

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