

JUVENILE RHEUMATOID ARTHRITIS: CERVICAL SPINE INVOLVEMENT AND MRI IN EARLY DIAGNOSIS*

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SUMMARY: Ören B, Ören H, Osma E, Çevik N. (Departments of Pediatrics and Radiology, Dokuz Eylül University Faculty of Medicine, İzmir, Turkey). Juvenile rheumatoid arthritis: cervical spine involvement and MRI in early diagnosis. Turk J Pediatr 1996; 38: 189-194.

Magnetic resonance imaging (MRI) of the cervical spine was performed on 20 patients (mean age 10 years) with a preliminary diagnosis of juvenile rheumatoid arthritis (JRA). In all patients conventional x-rays of the cervical spine were obtained, and the relationship between clinical status and MRI findings were evaluated. Two patients with clinical manifestations, including neck pain and diminished range of motion, exhibited significant pathologic features on radiogram and MRI, the latter providing more detailed information. Among 18 patients who had no complaints about their cervical spines, 3 patients (65%) had either soft tissue involvement, pannus formation or erosions on the surface of atlantoaxial joints; only four patients (20%) had erosions on plain x-ray views. Since the early diagnostic ability of MRI in JRA allows early therapeutic intervention, every patient with a probable diagnosis of JRA would benefit from MRI. *Key words: cervical spine, juvenile rheumatoid arthritis, magnetic resonance imaging.*

Juvenile rheumatoid arthritis (JRA) is a chronic synovitis of childhood associated with a number of extra-articular manifestations. The cervical spine is frequently affected in patients with JRA, a finding that can be of diagnostic value if its involvement can be exhibited properly¹⁻⁴. Chronic synovitis and synovial proliferation, consequent erosion of articular cartilage and pannus formation can best be demonstrated by magnetic resonance imaging (MRI), even in cases without apparent clinical manifestations³⁻⁷.

Although there are several articles in the literature presenting MRI findings of cervical spine involvement in rheumatoid arthritis, they mostly concern adults^{3,5,7}. In this study we presented the MRI findings of the cervical spine in a series of 20 young patients with JRA and compared the results with plain x-ray views and clinical features.

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Material and Methods

The cervical spines of 20 patients with different types of JRA were examined by MRI over a period of 32 months, beginning in 1991. The patients consisted of seven females and 13 males between the ages of three and 16 years (mean age 10 years). We reviewed the medical records of all patients and noted the presence or absence of neck pain, reduced range of motion, neurological symptoms and signs attributable to neck involvement. Anteroposterior and lateral x-ray views of the neck were obtained in all cases, including flexion-extension views.

All patients were examined with a Siemens 1.0-T Magnetom MR imager. T1-weighted spin-echo 500/15 msec (TR/TE) pulse sequences were performed, as were T2-weighted 2500/22.9 msec sequences with the multiplanar guide imaging technique. A head coil was used for evaluation of the craniocervical junction, and a neck coil was used for the middle and distal parts of the cervical spine. The slice thickness was 4 mm with an interval of 0.4 mm. Sagittal, coronal and axial images were obtained with the head in the neutral position. Anterior atlantoaxial subluxation was considered to be present if the distance from the posterior margin of the corpus of C1 to the anterior margin of the odontoid process was greater than 2.5 mm⁸. In reviewing the MR images, abnormalities of the spinal cord, bones, disc-vertebral joints and soft tissue were noted.

Results

Table I lists the data for the 20 patients studied. Two patients were seropositive for the rheumatoid factor and the others were seronegative. The average duration of disease was 21 months, with a range of one month to eight years. Two patients (10%) had neck pain and diminished range of motion, and none had neurologic deficits attributable to cervical involvement. They had erosions and atlantoaxial subluxation both on plain films and MRI (Fig. 1). Eighteen patients (90%) were free of complaints related to their cervical spines, and no positive physical findings could be detected. Even though they had no complaints, 13 patients (65%) had soft tissue involvement and pannus formation on the MR images; six of them (30%) also demonstrated erosions (Figs. 2-4). On the plain radiographs only four patients (20%) showed erosion of the atlantoaxial joint.

There was no correlation between age and duration of disease in our cases; however, the cases with systemic and polyarticular types of JRA revealed more advanced erosions and soft tissue involvement on cervical MR images than did patients with oligoarticular JRA. Comparisons between groups could not be analyzed statistically because of the small number of cases.

Table I: Patient Data

Patient No.	Age (yrs) / Sex	Type of JRA	Duration of Disease	Radiologic x-ray	Key MRI Findings
1	11/F	Oligoarthritis	< 1 year	—	—
2	14/F	Oligoarthritis	> 1 year	—	+ (Pannus)
3	11/F	Polyarthritis	> 1 year	—	+ (Pannus)
4	5/M	Systemic	> 1 year	—	+ (Soft tissue)
5	12/M	Polyarthritis	< 1 year	+	+ (Subluxation)
6	15/F	Polyarthritis	> 1 year	—	+ (Erosion)
7	5/M	Polyarthritis	> 1 year	+	+ (Erosion)
8	8/M	Polyarthritis	< 1 year	+	+ (Erosion)
9	13/M	Oligoarthritis	> 1 year	—	+ (Erosion)
10	12/M	Polyarthritis	< 1 year	—	+ (Erosion)
11	16/M	Systemic	> 1 year	+	+ (Subluxation)
12	8/M	Polyarthritis	< 1 year	—	—
13	10/F	Systemic	> 1 year	+	+ (Erosion)
14	10/M	Oligoarthritis	< 1 year	—	+ (Soft tissue)
15	3/M	Oligoarthritis	< 1 year	+	+ (Erosion)
16	6/M	Systemic	< 1 year	—	—
17	12/M	Polyarthritis	< 1 year	—	—
18	4/M	Polyarthritis	> 1 year	—	+ (Pannus)
19	14/F	Polyarthritis	> 1 year	—	+ (Soft tissue)
20	12/F	Oligoarthritis	< 1 year	—	—



Fig. 1: T.1-weighted MRI of a 16-year-old patient with an 8-year history of JRA. Atlantoaxial subluxation, and destruction and irregularity at the odontoid process.

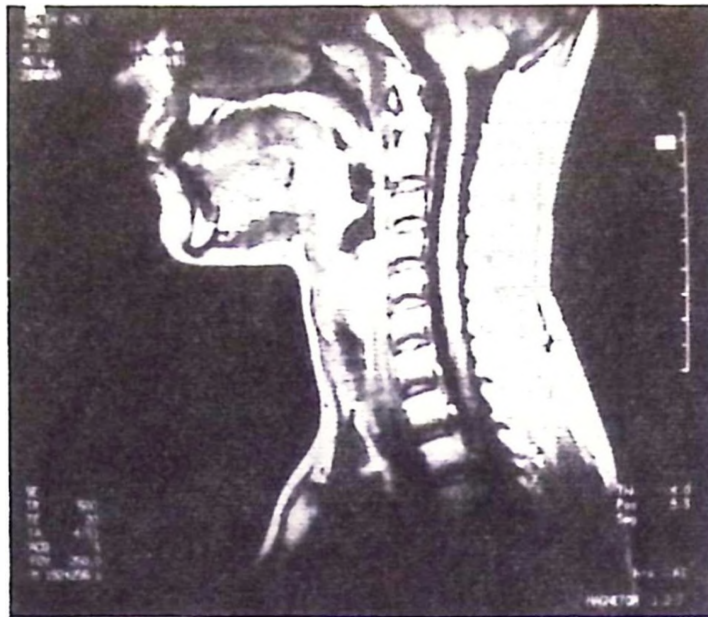


Fig. 2: MRI of a 13-year-old patient with a 12-month history of JRA. Odontoid process surrounded by pannus.

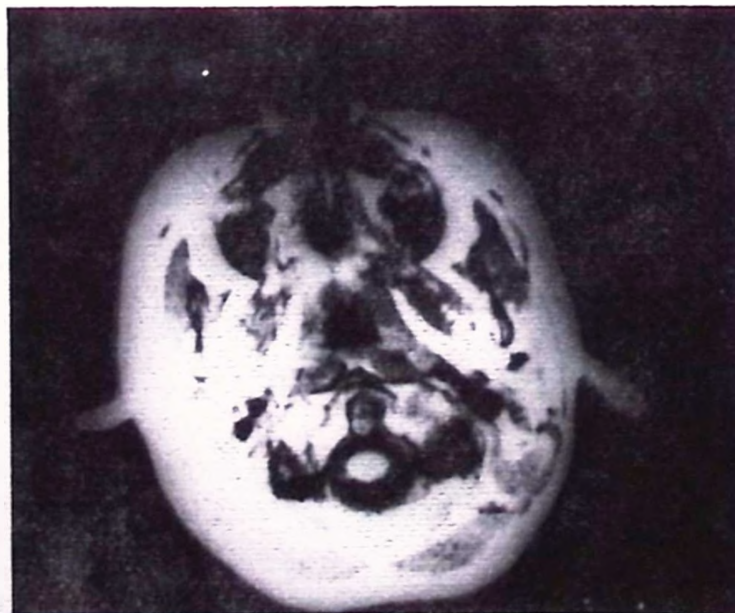


Fig. 3: Constriction at the odontoid process of C-2 and diminished signal intensity of a 3-year-old patient with JRA.

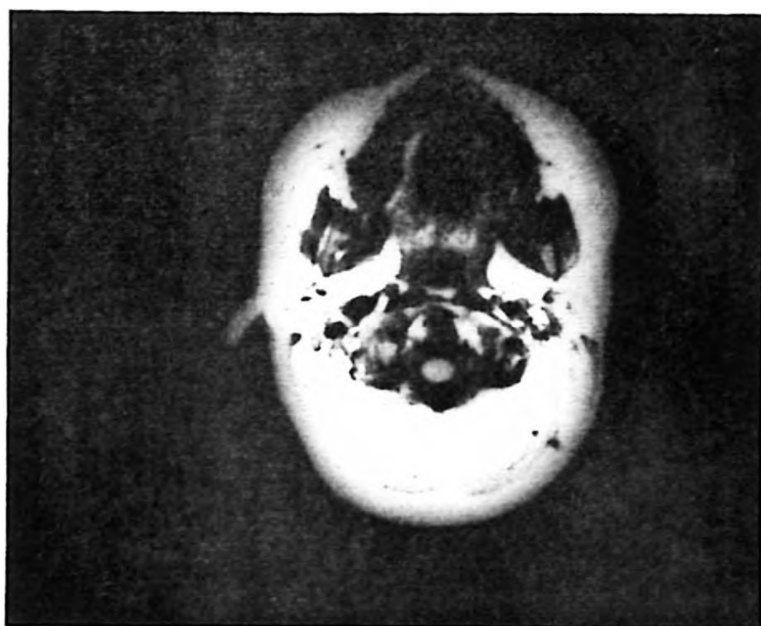


Fig. 4: MRI of a 10-year-old girl with an 8-year history of systemic JRA. Periodontal pannus formation and erosion of odontoid process.

Discussion

Cervical spine involvement in patients with JRA is common, and the evaluation of radiographic findings plays an important role in diagnosis^{2, 4, 9}. In cases with JRA, plain films of the neck are not usually satisfactory. Conventional tomography is often helpful but allows demonstration only of bony structures; it is not ideally suited for demonstrating the relationship of the cord to the spinal canal, and contrast agent is generally required⁴. On the other hand, MRI has the capacity to image soft tissues such as the pannus formation, spinal cord and brain stem with great anatomic detail in any plane and generally without the need for contrast material^{3, 7}.

Our findings demonstrate that MRI can provide useful information, especially in the early diagnosis of JRA. In two patients with clinical manifestations, atlantoaxial subluxation was present, and the degree of subluxation and its projection on the cervical portion of the spinal cord was directly imaged by MRI, whereas it could not be clearly seen on plain films. JRA may involve the cervical spine without apparent clinical manifestations, and this can be demonstrated by different radiological methods⁹. In our study, among 18 patients without any clinical manifestations of cervical involvement, 13 (65%) had soft tissue involvement, pannus formation and erosions on MRI. On plain x-ray views, only erosion could be seen in four patients (20%).

As an interesting finding, the MRI revealed no correlation between the patients' ages and the duration of disease in our cases; however, the type of JRA was important. In systemic and polyarticular types of JRA, mostly erosions and soft

tissue involvement were present. Relying on these findings, cervical spine involvement in cases of systemic and polyarticular-type JRA should always be taken into consideration, especially for early diagnosis of the disease.

The early diagnostic ability of MRI in JRA is very valuable in preventing severe deformities and neurological sequelae and in facilitating early therapeutic intervention. In conclusion, MRI has much to offer in the evaluation of the rheumatoid cervical spine. Every patient with a probable diagnosis of JRA will certainly benefit from MRI in given its ability to confirm the diagnosis and allow for early intervention. However, further cases must be evaluated through MRI in order to make definite conclusions in this regard.

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