

Cervical spine instability in rheumatoid arthritis

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Summary

Atlanto-axial instability in the rheumatoid patient is discussed. Special reference is made to the importance of diagnosing this potentially lethal condition by means of routine flexion and extension radiographs of the cervical spine. Treatment by means of occipito-C1-C2 posterolateral fusion is recommended.

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Subluxation between the atlas (C1) and the axis (C2) is, among other disabilities, a common problem in the patient suffering from rheumatoid arthritis.¹ Every doctor who has dealings with such patients should be aware of this potentially lethal condition.¹⁻³ The following case history serves to illustrate the problem.

Case report

A 57-year-old White man who had been suffering from rheumatoid arthritis for 15 years presented at the Arthritis Clinic, H. F. Verwoerd Hospital, Pretoria, for further treatment. He had multiple joint involvement, and the left knee was severely disorganized by the arthritic process. In consultation with the joint replacement unit a total knee joint replacement was contemplated. Before surgery routine flexion and extension radiographs were taken of the patient's cervical spine (Figs 1 and 2), and significant subluxation between the atlas and the axis was discovered. The knee operation was postponed and a posterolateral fusion from the occiput to C2 was performed in order to stabilize the upper cervical spine.

The atlanto-axial joint

Normal anatomy

The anterior surface of the dens forms a diarthrodial joint with the posterior border of the arch of the atlas. The structures mainly responsible for the stability of this joint are the vertical and horizontal parts of the cruciate ligaments. These ligaments lie posterior to the dens and prevent its posterior subluxation into the spinal canal. Also of importance are the apical ligament, which is attached to the apex of the dens and the posterior margin of the foramen magnum, and the alar ligaments, which are attached to the sides of the dens and the medial sides of the occipital condyles (Figs 3 and 4)

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Fig. 1. Flexion view of the cervical spine.

Pathological anatomy

The rheumatoid process attacks the atlanto-axial joint in the same way as it does other joints in the body. A synovitis is produced with pannus formation, and the ligaments and capsular structures of the joint are destroyed.⁴ Subluxation ensues, the degree of which increases as the instability becomes more severe.⁵ Granulation tissue fills the gap between the dens and the arch of the atlas, preventing reduction of the subluxation when the neck is extended.² Other forms of instability are basal invagination in which the atlas/axis complex migrates proximally, and multiple-level instability in which the disease process affects the joints at various levels in the cervical spine.

Radiographic appearance

The normal upper cervical spine⁶

A normal lateral view of the axis and the atlas shows an exact relationship between the two vertebral bodies at their articulations. In the normal cervical spine the spinous processes of the atlas and the axis, viewed laterally, would remain parallel in both the flexed and the extended neck. On the lateral flexed view of the atlas and axis the distance between the posterior border of the arch of the atlas and the anterior surface of the dens should be 3 mm or less. If a line is drawn from the hard palate to the inner

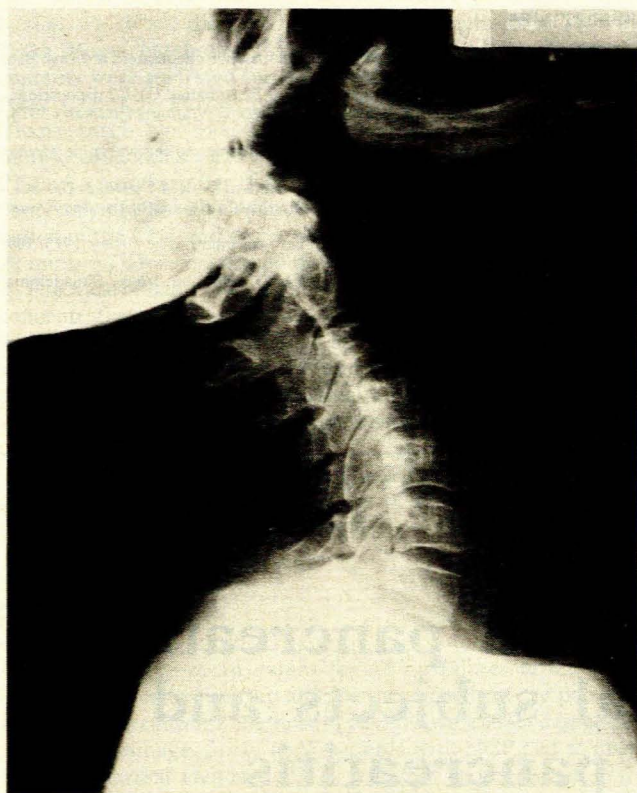


Fig. 2. Extension view of the cervical spine.

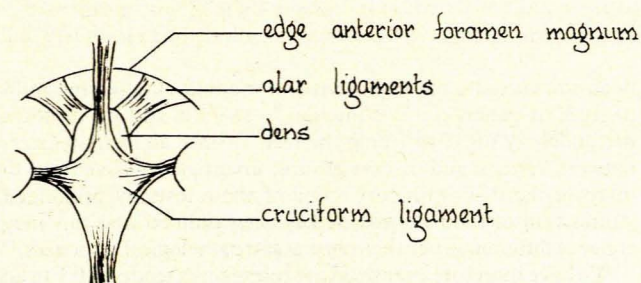


Fig. 3. Atlanto-axial articulation, posterior view.

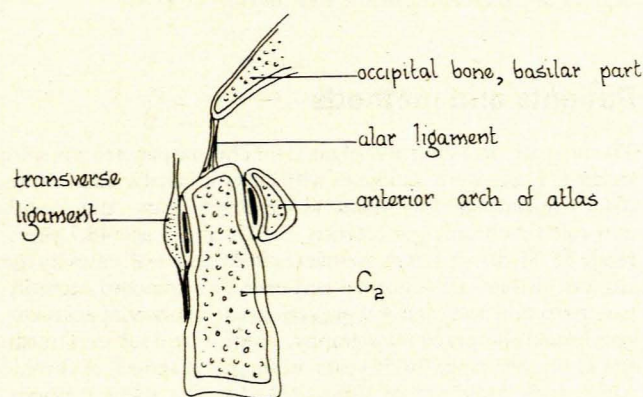


Fig. 4. Atlanto-axial articulation, lateral view.

cortex of the posterior margin of the foramen magnum (Chamberlain's line⁷), the tip of the dens should lie on this line or, at the most, 3 mm above it. Further displacement indicates vertical subluxation of the atlas.

The upper cervical spine in rheumatoid arthritis

Two lateral views of the cervical spine are necessary, one with the neck flexed and the other with it in extension. It should be noted that when views in flexion are taken the whole cervical spine with the head should be flexed and not the head alone. If the head only is flexed a false-negative result may be obtained, because only by the 'forward movement' of the head element will subluxation be exposed. These views must always be preceded by neutral anteroposterior and lateral views in order to exclude any other cervical lesions. Anteroposterior instability at the atlanto-axial joint will be demonstrated by an abnormally great distance between the posterior border of the arch of the atlas and the anterior surface of the dens on the flexed view. There will also be a divergence of the spinous processes of C1 and C2 with loss of parallelism. Any basal invagination can be determined by drawing Chamberlain's line.

Discussion

Rheumatoid arthritis patients with any of the three instabilities of the neck mentioned (C1-C2 instability, multiple-level instability or vertical invagination)⁵ often complain of pain in the neck and especially occipitocranial pain.¹ This pain may be a result of either nerve root irritation or merely the continuous muscular action needed to 'splint' the head on the neck.

A thorough history-taking and neurological examination for long-tract neurological signs will often reveal an 'unstable neck'. These signs, which may include bladder or bowel disturbances or hyperreflexia, may be present only to a slight degree.

All patients with rheumatoid arthritis, especially those who are to undergo general anaesthesia with possible endotracheal intubation, should have lateral flexion and extension views of the upper cervical spine taken. Any instability in this region will then be discovered.

Since anteroposterior instability between the atlas and axis is a life-threatening disability, stabilization procedures should be considered.

On the conservative side, a host of braces could be used to maintain the integrity of the upper cervical spine. However, in practice only a very small number of these braces are effective in preventing the unwanted movement of the cervical spine. Furthermore, the permanent wearing of a brace is not only cumbersome but adds to the misery of an already handicapped patient.

Many surgical procedures have been described for the stabilization of the atlanto-axial joint.¹ In the rheumatoid patient the bone is very soft and of poor quality. Fixation devices such as wires are unsuitable. A simple posterolateral fusion between the occiput, atlas and axis is suggested. Bone slivers are taken from the posterior iliac crest. The bony elements (i.e. occiput, superior surface of spinous process of C2, posterior arch of C1, transverse processes) are simply denuded and decorticated before the bone slivers are layed onto the prepared bed. It is of the utmost importance that these slivers be placed as far laterally as possible in order to form a broad transplanted base. This technical detail has been found to prevent non-union to a great degree. Postoperatively the patient is kept in bed without a head pillow for some 10 days. At this stage the sutures are removed and the patient is fitted with a sterno-occipitomandibular immobilizer brace. This is a safe and easy procedure which establishes sound fusion within 12-14 weeks and has the added advantage of controlling two of the three instabilities found in the necks of patients with rheumatoid arthritis — C1-C2 instability and vertical invagination of C2.

Conclusion

A mere bump on the head or even the action of turning in bed may turn a subluxation into a dislocation with immediate death. We would like to emphasize the importance of the diagnosis of atlanto-axial instability in the rheumatoid arthritis patient.

The suggested treatment for atlanto-axial instability is a simple occipito-C1-C2 fusion, which will prevent the hazard of subluxation, dislocation and vertical invagination, and which invariably relieves the patient of head and neck pain.

REFERENCES

1. Brattström H, Granholm L. Atlanto-axial fusion in rheumatoid arthritis. *Acta Orthop Scand* 1976; **47**: 619-628.
2. Kao Chun C, Messert B, Winkler SS *et al.* Rheumatoid C1-C2 dislocations: pathogenesis and treatment reconsidered. *J Neurol Neurosurg Psychiatry* 1974; **37**: 1069-1073.
3. Thomas WH. Surgical management of the rheumatoid cervical spine. *Orthop Clin North Am* 1975; **6**: 793-800.
4. Editorial. Rheumatoid atlanto-axial subluxation. *Br Med J* 1976; **2**: 200-201.
5. Matthews JA. Atlanto-axial subluxation in rheumatoid arthritis. *Ann Rheum Dis* 1974; **33**: 526-531.
6. Weir DC. Roentgenographic signs of cervical injury. *Clin Orthop* 1975; **109**: 9-17.
7. Turek SL. *Orthopedics: Principles and Their Application*. 3rd ed. Philadelphia: JB Lippincott, 1977: 783.