



## Immediate Postoperative Disappearance of Retro-Odontoid “Pseudotumor”

Abhidha Shah, Sonal Jain, Amol Kaswa, Atul Goel

■ **OBJECTIVE:** The authors present reports of 2 cases in which there was manifest atlantoaxial instability and presence of retro-odontoid pseudotumor. The retro-odontoid tumor disappeared in the immediate postoperative phase after surgery, which involved facetal distraction and atlantoaxial fixation. The cases are discussed. Although regression of the retro-odontoid pseudotumor has been reported after atlantoaxial fixation, its disappearance in the immediate postoperative phase has not been recorded.

■ **METHODS:** Two patients (42 years and 16 years old) presented with progressive quadriparesis. Investigations revealed presence of retro-odontoid “pseudotumor” and evidence of cord compression. There was radiologic evidence of atlantoaxial instability in both cases. Both patients were treated by atlantoaxial lateral facet distraction and fixation. No attempt was made to directly manipulate or handle the retro-odontoid tissue.

■ **RESULTS:** The patients had remarkable clinical improvement after surgery. Immediate postoperative imaging showed disappearance of pseudotumor.

■ **CONCLUSIONS:** The retro-odontoid pseudotumor appears to be related to buckling of the posterior longitudinal ligament. Distraction of the facets probably assists in stretching of the posterior longitudinal ligament. Our experience reconfirms that retro-odontoid pseudotumor could be a manifestation of atlantoaxial instability and need not be directly handled by surgery.

### INTRODUCTION

The retro-odontoid “bony” or “cartilaginous” mass has been referred to by various names, including pseudotumor, inflammatory granulation tissue, degenerative fibrochondral-like tissue, and cystic deterioration. In the year 2004, for the first time in the literature we identified that the presence of retro-odontoid pseudotumor is indicative of atlantoaxial instability and merits atlantoaxial-stabilization surgery.<sup>1</sup> Most surgeons now consider the need for resection of the retro-odontoid tumor that was in common practice previously as unnecessary.<sup>2</sup> Regression of the retro-odontoid pseudotumor has been observed after atlantoaxial fixation; however, its regression in the immediate postoperative phase has not been recorded. We report our experience with 2 such cases, wherein the retro-odontoid pseudotumor regressed in the immediate postoperative phase. On the basis of our findings, we re-evaluate the pathogenesis of retro-odontoid pseudotumor.

### CASE 1

A 42-year-old man had progressively increasing pain in the nape of neck and weakness of all the 4 limbs for a period of 6 months. He could carry on with his routine work only with significant difficulty and needed assistance. Findings of a neurologic examination revealed Grade 4 spastic quadriparesis. He had short neck size since childhood. Computed tomography (CT) scan of the craniovertebral region showed atlantoaxial dislocation with an os odontoideum. There was evidence of retroodontoid soft-tissue ligamentous thickening with “osteophyte” formation within it. Type A atlantoaxial facetal dislocation was noted, meaning thereby that the facet of atlas was dislocated anterior to the facet of axis (Figure 1).<sup>3</sup> (In Type B atlantoaxial dislocation, the facet of atlas is dislocated posterior to the facet of axis, and in Type C atlantoaxial dislocation, the facets of atlas and axis are in alignment). Magnetic resonance imaging (MRI) of the region

### Key words

- Atlantoaxial dislocation
- Atlantoaxial facet distraction
- Basilar invagination
- Retro-odontoid pseudotumor

### Abbreviations and Acronyms

- CT:** Computed tomography  
**MRI:** Magnetic resonance imaging

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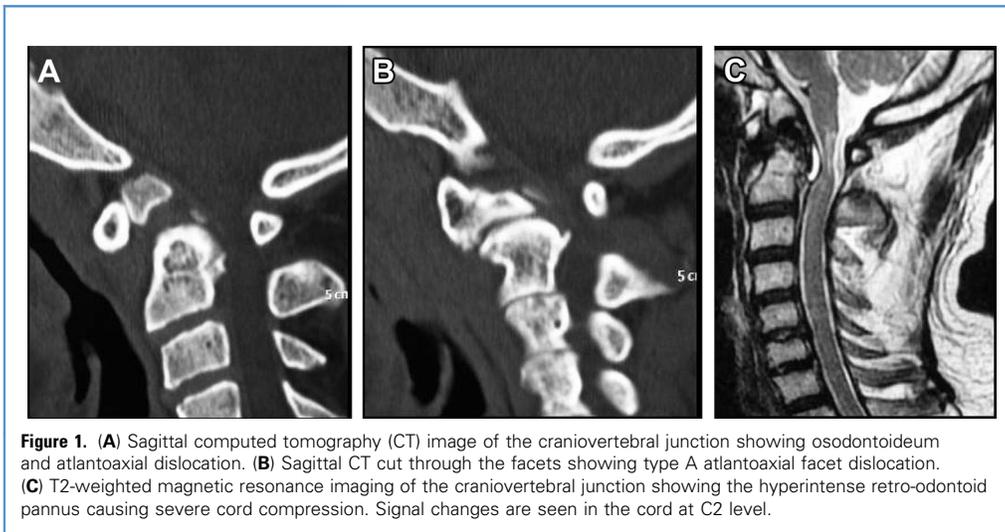
Citation: *World Neurosurg.* (2016) 91:419-423.

<http://dx.doi.org/10.1016/j.wneu.2016.04.050>

Journal homepage: [www.WORLDNEUROSURGERY.org](http://www.WORLDNEUROSURGERY.org)

Available online: [www.sciencedirect.com](http://www.sciencedirect.com)

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**Figure 1.** (A) Sagittal computed tomography (CT) image of the craniocervical junction showing os odontoideum and atlantoaxial dislocation. (B) Sagittal CT cut through the facets showing type A atlantoaxial facet dislocation. (C) T2-weighted magnetic resonance imaging of the craniocervical junction showing the hyperintense retro-odontoid pannus causing severe cord compression. Signal changes are seen in the cord at C2 level.

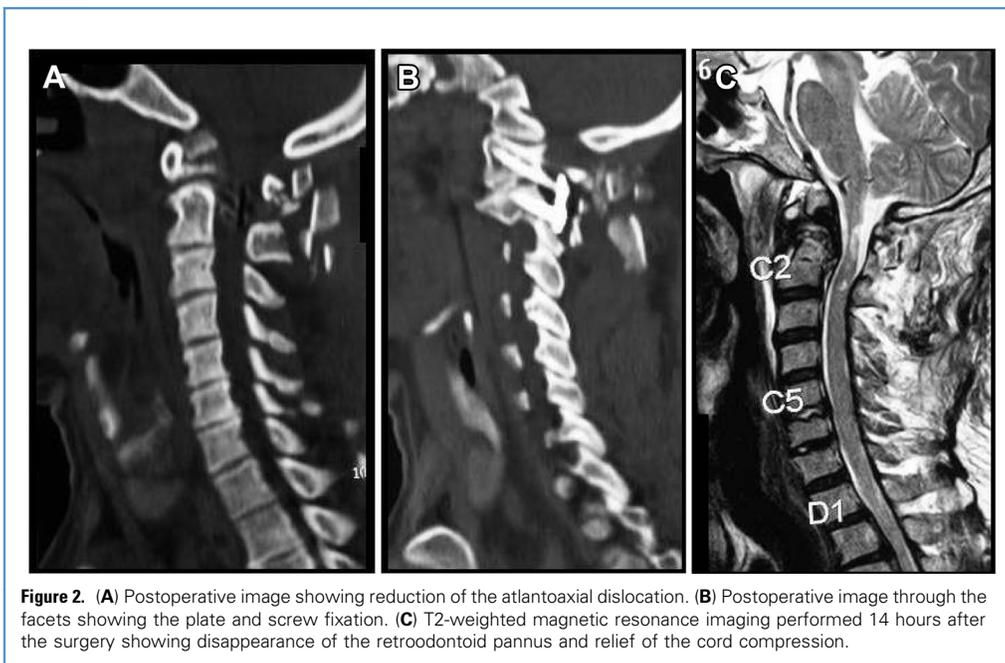
showed a retro-odontoid pannus extending from C1 to the lower border of C2. It was not homogeneous and was isointense on T1-weighted images and hyperintense on T2-weighted images. There was evidence of cord compression with signal changes in the spinal cord at the C2 level (Figure 1).

The patient underwent atlantoaxial fixation surgery. The procedure involved opening of the joint, denuding of the articular cartilage, distraction of the facets, introduction of the bone graft within the articular cavity, and direct fixation of lateral masses of atlas and axis with plates and screws. Bone graft was harvested from the iliac crest and was stuffed within the articular cavity and was placed loosely and widely, without any suturing or restraint, in the midline over the arch of atlas and lamina of axis after appropriately preparing the host bone. The patient had

improvement in his symptoms after the surgery. Postoperative MRI performed after about 14 hours of surgery showed a complete regression of the retro-odontoid “pannus” with relief of the cervicomedullary compression (Figure 2). CT scan showed reduction and fixation of the atlantoaxial fixation. The patient continued to show progressive clinical recovery and at a follow-up of 2 years, the patient had normal Grade 5 power in the limbs, was leading his normal life, and had returned to his previous occupation.

**CASE 2**

A 16-year-old male patient presented with weakness in all 4 limbs and neck pain. The symptoms had progressed slowly over 3 months. When admitted, he had a grade 3–4 spastic



**Figure 2.** (A) Postoperative image showing reduction of the atlantoaxial dislocation. (B) Postoperative image through the facets showing the plate and screw fixation. (C) T2-weighted magnetic resonance imaging performed 14 hours after the surgery showing disappearance of the retroodontoid pannus and relief of the cord compression.

quadriplegia, was unable to walk unaided, and needed assistance to carry out his routine activities. There was no history of trauma. CT scan of the craniocervical junction showed atlantoaxial dislocation with retro-odontoid ligamentous buckling. There was evidence of calcifications seen in the retro-odontoid tissue (Figure 3). MRI showed the pannus to be extending from C1 to C2 with severe cord compression (Figure 3).

The patient underwent surgery with a similar surgical technique, and a C1–C2 lateral mass and pedicle screw fixation was performed. The patient had significant improvement in his symptoms after surgery. MRI performed in the immediate postoperative period (after about 20 hours of surgery) showed a complete regression of the retro-odontoid ligamentous tissue with good fixation of the atlantoaxial joints (Figure 4). At a follow-up of 1 year, the patient was fine and had a near-normal neurologic examination. He had mild spasticity of limbs and the power was Grade 5.

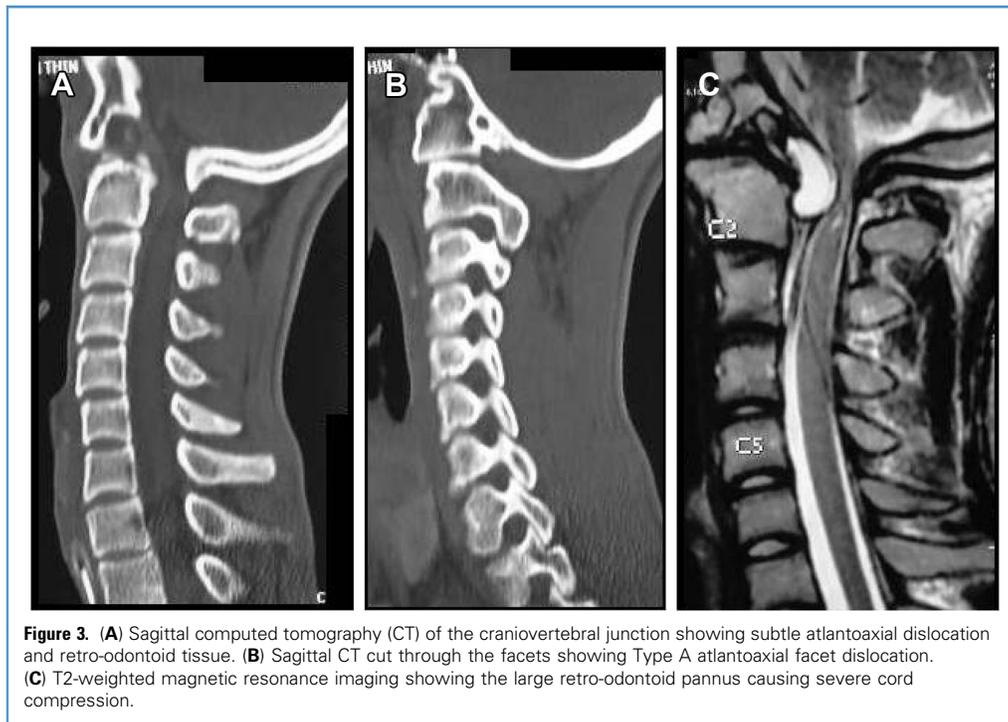
## DISCUSSION

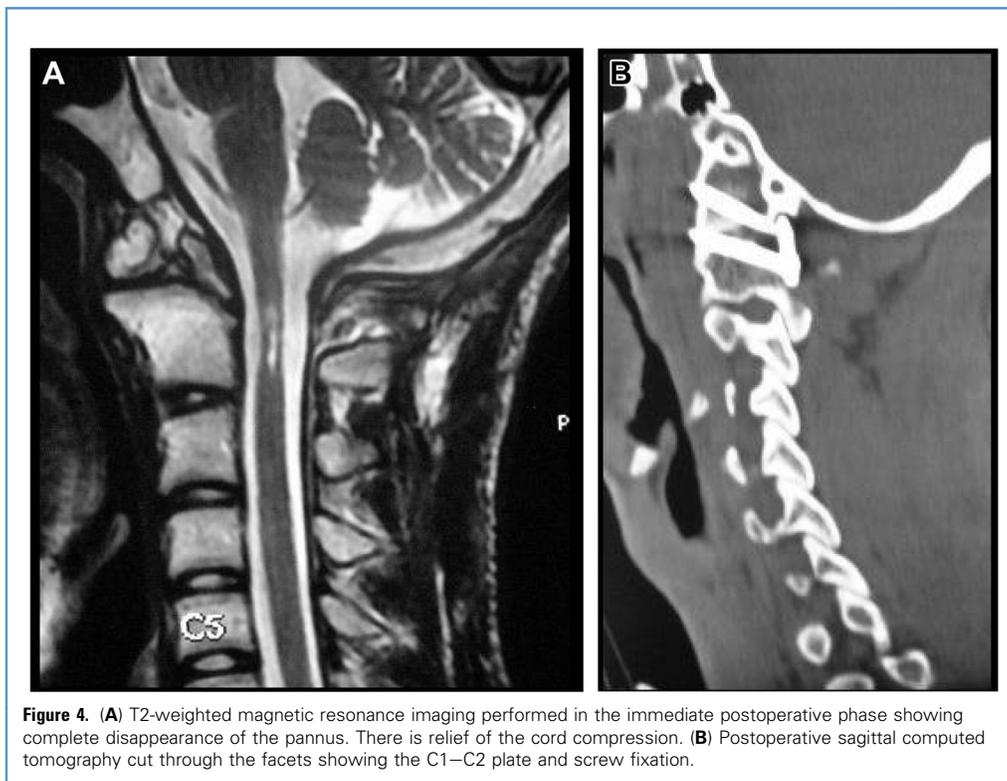
Retro-odontoid pseudotumor has been known by various terms such as ligamentous hypertrophy, pannus, and cystic deterioration.<sup>4–6</sup> It refers to a bony or cartilaginous “tumorous” growth in the retro-odontoid region. In general, the term pannus refers to hard and solid mass but has been interchangeably used for all kinds of retro-odontoid masses, including those associated with rheumatoid arthritis. More commonly, retro-odontoid pseudotumors are identified in relatively old patients. On imaging, the mass is seen to indent into the neural tissues and compromise the spinal canal. The patients generally present with longstanding, slow, progressive, and crippling neurologic deficits. A number of surgical approaches, including transoral

and lateral skull base approaches, have been identified to be effective.<sup>6–8</sup>

In 2004, we identified that retro-odontoid pseudotumor is an indicator of atlantoaxial instability.<sup>1</sup> On the basis of this observation, we suggested that the patients warrant atlantoaxial fixation surgery and that there is no need for direct surgical resection of the pseudotumor. It is crucial to differentiate these lesions from a tumor because the management may widely vary. Radiologically and physically, the lesion ranges from being “cartilaginous” or “bony” to cystic in nature. The lesion is usually isointense on T1-weighted image and hypointense on T2-weighted images. There is no contrast enhancement. The atlantoaxial joint space generally is reduced, and there is relatively subtle atlantoaxial dislocation and basilar invagination. The instability of the region is only marginal, can be missed, or it may not even be evident on radiologic imaging.

We recently simulated retro-odontoid tumor to “osteophytes” in the subaxial spine.<sup>9,10</sup> We also identified that the presence of osteophytes is an indicator of longstanding instability of the spinal segment and suggests the need for stabilization and that there may not be any need to directly remove the osteophytes.<sup>10</sup> Vertical spinal instability, listhesis of the facets, and reduction of the intervertebral disc space height in the subaxial spine result in buckling of the posterior longitudinal ligament and subsequent osteophyte formation. Like the osteophytes in the subaxial spine, retro-odontoid pseudotumors are a long-term outcome of buckling of the posterior longitudinal ligament. Craniovertebral junction arthritis has been discussed infrequently in the literature.<sup>11</sup> Just as arthritis affects the various joints of the body, the atlantoaxial facets also are susceptible to degeneration. The degeneration begins in the atlantoaxial joints, which form the fulcrum of all movements in the craniocervical region.





**Figure 4.** (A) T2-weighted magnetic resonance imaging performed in the immediate postoperative phase showing complete disappearance of the pannus. There is relief of the cord compression. (B) Postoperative sagittal computed tomography cut through the facets showing the C1–C2 plate and screw fixation.

Reduction of atlantoaxial joint space results in buckling of the ligament complex posterior to the odontoid process and secondary “pseudotumor” formation.

Although there are some recent reports that suggest the validity of direct surgical resection, the current trend of treatment is toward atlantoaxial stabilization without handling or resecting the retro-odontoid tissue. Regression of the pseudotumor or cystic deterioration, as a delayed event, has been recorded on some occasions. In our 2 cases, the retro-odontoid mass was not directly handled during surgery, and it is unclear whether the mass was hard and solid or was soft and cystic/necrotic. The exact sequence of formation of mass also is unclear. It may be that in the process of formation of the mass, there are periods of inflammation and sero-exudative fluid formation that accumulates between ligament and bone. It is possible that such accumulated fluid, rather than solid and firm mass, is most likely to disappear after surgery.

We recently reported a case of immediate postoperative disappearance of retro-odontoid pannus in a case having rheumatoid arthritis.<sup>12</sup> Our surgical technique involved opening of the atlantoaxial joint, wide removal of the articular cartilage, distraction of the facets, stuffing of bone graft within the articular cavity, and direct lateral mass plate and screw fixation. On the basis of the report, we speculated that the pathogenesis of pannus could be related to buckling of the posterior longitudinal ligament rather than being purely an inflammatory

phenomenon. Considering the fact that in both our cases, the atlantoaxial instability was manifest and the duration of symptoms was relatively short, it appears that the quality of retro-odontoid tissue may be different from that encountered in cases with longstanding symptoms and only subtle instability.

On the basis of our current experience and that reported previously, we conclude that the presence of retro-odontoid pseudotumor is an indicator of atlantoaxial instability and indicates the need for stabilization. The technique of facet distraction and fixation described by us can lead to reduction of the atlantoaxial dislocation and the basilar invagination.<sup>13-15</sup> The craniovertebral realignment achieved by this technique also causes regression of the buckling of the posterior longitudinal ligament and results in it becoming taut. This regression sometimes occurs immediately, as has been demonstrated in our patients or maybe a delayed phenomenon.

## CONCLUSIONS

Retro-odontoid tissue in the form of ossification, calcification, ligamentous hypertrophy, or cystic degeneration is secondary to facet space reduction and atlantoaxial instability. The retro-odontoid mass does not need to be addressed primarily. Facet distraction, reduction, and fixation can lead to craniovertebral stabilization and by stretching of the posterior longitudinal ligament to unbuckling of the ligaments and reduction of the retro-odontoid mass in the immediate postoperative phase.

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*Received: 8 March 2016; accepted: 15 April 2016*

*Citation: World Neurosurg. (2016) 91:419-423.*

*http://dx.doi.org/10.1016/j.wneu.2016.04.050*

*Journal homepage: [www.WORLDNEUROSURGERY.org](http://www.WORLDNEUROSURGERY.org)*

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