

MRI Demonstrates Alar Ligament Damage

Allow me to apologize in advance for the technical nature of this newsletter. I found the data so important that I decided to bore my non-physician readers with some current research.

Spine Journal published a paper on November 15, 2006 (Volume 31(24), pp 2820-2826) titled Magnetic Resonance Imaging Assessment of Craniovertebral Ligaments and Membranes After Whiplash Trauma. The authors evaluated the upper cervical spines of 92 chronic whiplash patients and 30 matched control patients. All patients were 2-9 years chronic with normal x-rays. The paper was particularly interesting because it identified a serious injury that often times goes unidentified in clinical practice. The injury they were looking for in this paper involved the Alar ligaments which support the upper cervical spine and skull

The Alar ligament provides significant support to the cervicocranial junction. The two alar ligaments connect the sides of the dens (on the axis, or 2nd cervical vertebra) to tubercles on the medial side of the occipital condyle (the base of the skull). They are short, tough, fibrous cords that attach the skull to C1 vertebra and function to check side-to-side movements of the head when it is turned. The alar ligaments are also known as the "check ligaments of the odontoid."

The study reviewed the literature and looked at whiplash imaging and the associated anatomic and morphologic findings. The authors conclude that there is a correlation between clinical impairment and morphologic findings. Furthermore, they concluded that whiplash trauma can damage soft tissue structures of the upper cervical spine, particularly the Alar ligaments.

To make the diagnosis, special MRI protocols need to be applied. Proton-density weighted sequences of 2mm or less are the format of choice and they should be performed on a high field magnet (preferably 1.5 Tesla)

Here are some of the observations of the authors:

1. "Most investigators who have studied the natural history of whiplash patients have found long-term symptoms in 24% to 70%, among whom 12% to 16% are severely impaired many years after the accident interfering with their job and everyday activities."
2. The prevalence of the **cervical facet joint** as an anatomic source of chronic pain after whiplash trauma pain is 60%.
3. Whiplash trauma can cause structural changes predisposing to premature degenerative disc disease.
4. One study found that "10% of patients with normal radiographic findings in the acute stage of whiplash injury developed new degenerative changes at 2- to 3-year follow-up."
5. Flexion and extension x-rays in chronic whiplash syndrome tend to show "significantly decreased range of motion in chronic whiplash syndrome compared with asymptomatic individuals."
6. "The Alar ligaments are the main restraints to axial rotation and lateral bending in the upper cervical spine."
7. **CT documented increased upper cervical rotation toward one side indicates Alar ligament injury with laxity on the opposite side.**
8. 33% of patients with chronic neck pain from whiplash have increased rotation of the upper cervical spine.

9. Rotation of more than 7° at C0-C1 and more than 54° at C1-C2 (on CT rotational scanning) is considered to be a pathologic instability.

A rotated head position was associated with more severe lesions after rear-end collisions when compared to frontal collision (93.8% vs. 31.8%). They also found that the injuries were present in a rotated head position far greater than when the head was in a neutral position.

So what does all this mean to you and your clients? It suggests that patients with clinical findings suggestive of upper cervical instability should be worked up more diligently than routine post-traumatic neck pain. Special MRI procedures need to be ordered with specific orders from the doctor as to how the test should be performed and what they are looking for on the exam. As important, you should make sure your doctor is aware of these potential injuries and orders the proper tests on select populations of patients

As a side note, another way to demonstrate the Alar ligament damage is the use of fluoroscopic studies.