MR investigation in evaluation of chronic whiplash alar ligament injury in elderly patients

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KEY POINTS FROM THIS STUDY

1) Chronic neck pain and headaches are a major complaint in elderly patients.

2) Approximately 66% of the elderly suffer from chronic pain disorders.

3) "Nearly 50% of patients with acute whiplash injury cannot be cured and evolved into chronic whiplash injury syndrome."

4) "The activity point of whiplash movement mainly concentrates in the alar ligament ends."

5) "The main function of alar ligaments is to restrain the excessive axial rotation and lateral flexion activities of atlantoaxial joint."

6) "A large number of studies have shown that alar ligament injury can lead to chronic neck pain and headaches and it becomes one of the important reasons for chronic secondary neck pain and headaches in elderly patients."

7) Proton density weighted MR imaging sequence has good signal to noise ratio and high resolution and is "considered as the most suitable sequence at present for craniocervical junction ligament."

8) This study assessed 134 elderly patients who suffered from post-whiplash injury chronic neck pain. All patients were given comprehensive health examination (CT, MR, ultrasound and laboratory examination) and high-resolution proton density weighted MR imaging. Anatomy and signal characteristics of the alar ligament are clearly displayed by high-resolution proton density-weighted imaging.

9) The MRI was performed with a 3.0 T system using a head and neck joint coil.

10) The alar ligament was found to be the cause of the chronic pain in 21 of the 134 subjects. "Chronic whiplash [alar] ligament injury was proved to be the reason for long term neck pain and headaches in 15.7% patients."

11) Horizontal, coronal, oblique coronal, and sagittal planes clearly displayed the shape and range of the abnormal signal in the alar ligaments; the oblique coronal plane was the optimum orientation to display the injury.

12) "High resolution proton density-weighted imaging is an effective method to evaluate the image features of alar ligaments and can provide an accurate diagnosis for chronic neck pain and headaches caused by the alar ligament whiplash injury."

13) High-resolution proton density weighted MR imaging "clearly displayed the changes of structure and signals in the [alar] ligaments."

14) Abnormal high signals in the ligament body or the vicinity of the occipital condyle involving the ligaments edge or adjacent side subdural effusion of cerebrospinal fluid were defined as positive signs of chronic [alar] ligament injury.

15) "Whiplash injury of alar ligaments is an important reason for chronic neck pain in elderly patients."

16) Whiplash alar ligament injury can cause long-term neck pain and headaches.

17) Long-term repeated injury and damage often cause ligament fiber tear, and these are poor to repair, heal.

18) "Cloudy or linear signals were increased adjacent to the dura in 12 patients who had cerebrospinal fluid leakage surrounding the dura in varying degrees."

19) "The results also demonstrated that the characteristics of the structure and signal could be effectively evaluated by the oblique coronal plane because the alar ligament started at the lateral margin of the odontoid and extended outward to the upper part (coronal plane was up to 20–30 degree angle), therefore we adjusted the scanning angle (oblique coronal and axial line were about 20–30 degree angle) which can effectively observe the complete structure of ligaments at one image, exactly display the morphology and changed signals in ligaments, and reduce the diagnostic error caused by the incomplete observation angle."

20) Of the 21 injured alar ligaments found, 5 were located at the body part of the ligament, and the remaining 16 were at the edge of ligament.

21) 12/21(57%) of the injuries found cerebrospinal fluid leakage around the dura adjacent to the alar ligaments. Dural leakage is one of the important characteristics for chronic neck pain, and is an important indirect sign of chronic injury of the alar ligament.

22) It can be confirmed the whiplash alar ligament injury often appears as an "abnormal high signal with an cerebrospinal fluid leakage around the ligament."

23) "Chronic whiplash alar ligament injury is one of the important reasons for long-term neck pain and headaches in elderly."

24) "The abnormally high signal in the body of the ligament combined with cerebrospinal fluid leakage around the ligament adjacent to the subdural space is an important sign of ligament injury, and high-resolution proton density-weighted imaging with oblique coronal imaging can clearly and effectively display the changes of the signal characteristics and scope of ligament injury, so as to provide the basis for the diagnosis and treatment of elderly patients with long-term neck pain and headaches."

COMMENTS FROM DAN MURPHY

We have reviewed a number of articles noting the following:

- The alar ligaments are often injured in a whiplash mechanics.

- Alar ligament injury can cause chronic neck pain and headache.

- High-resolution proton density weighted MR imaging is the gold standard for documenting alar ligament injury.

- Injured alar ligaments heal poorly.

THIS ARTICLE ADDS:

- The 3T MRI unit is more apt to find alar ligament injury.

- The best "slice" to view the alar ligaments is the "oblique coronal image."

- Alar ligament injury is often coupled with dural leakage, which should be looked for.

Article Review 23-02: MRI assessment of the alar ligaments in the late stage of whiplash injury - a study of structural abnormalities and observer agreement.
Article Review 46-04: Whiplash-Associated Disorders Impairment Rating: Neck Disability Index Score According to Severity of MRI Findings of Ligaments and Membranes in the Upper Cervical Spine
Article Review 43-05: Head Position and Impact Direction in Whiplash Injuries: Associations with MRI-Verified Lesions of Ligaments and Membranes in the Upper Cervical Spine
Article Review 17-07: Magnetic Resonance Imaging Assessment of Craniovertebral Ligaments and Membranes After Whiplash Trauma
Article Review 20-10: MRI of the alar and transverse ligaments in whiplash-associated disorders (WAD) grades 1–2: high-signal changes by age, gender, event and time since trauma
Article Review 15-11: Dynamic kine magnetic resonance imaging in whiplash patients
Article Review 47-13: Delineation of Alar Ligament Morphology: Comparison of Magnetic Resonance Imaging at 1.5 and 3 Tesla