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Utilizing Halo Posture Head-Weighting to Address Instability of the Upper Cervical Spine (M53.2X1) Secondary to Auto Collision Trauma.

--- Jack Sells DC

During auto collisions, the forces acting upon the vehicle can often cause injury to the occupant(s). This paper will deal with the injury to a very specific set of ligaments located near the top of the cervical spine – the Alar Ligaments. Injury to either of these ligaments will often lead to upper cervical spinal instability, which can lead to several signs and symptoms, including vascular compromise. Lastly, this paper will describe the use of Halo Posture head-weighting in the conservative rehabilitation and treatment of such injuries.

Anatomy Review:

The Alar Ligaments arise from the posterior aspect of the top of the dens of C2. The primary fibers run superior and lateral to insert onto the occipital condyles while a smaller section of fibers run almost directly laterally to insert on the lateral masses of C1.¹ The importance of the Alar ligaments to the stability of the entire Occiput-C1-C2 joint complex cannot be overstated.⁶

The Alar ligaments can be injured during side-impact collisions,² and rear-end collisions when the head is initially slightly rotated at the moment of impact.³⁻⁴ Injury to the Alar Ligaments often results in excess lateral displacement and excess axial rotation between C1 and C2, which “may reduce blood flow in the vertebral artery”⁵ and cause such patients to “present with vertebrobasilar insufficiency from vertebral artery compression.”⁶ In fact, research has suggested that auto collision trauma is the most common cause of vertebrobasilar ischemia as it results in C1-C2 instability secondary to Alar Ligament injury.⁷

Symptomatology and Presentation:

Patients who have been involved in an auto collision (V49.40XA/V49.50XA) and have suffered injury (S13.4XXA) to the upper cervical spine ligaments (M24.28) will often experience some degree of upper cervical spinal instability (M53.2X1) --- as opposed to spinal instability from C3-C7 (M53.2X2), which will be covered separately -- which may lead to vertebral artery compression (M47.021). These patients will typically present to healthcare providers/facilities with various symptoms, the most common being neck pain (M54.2), spasms (M62.838), and headaches (G44.309).

Imaging:

Guidelines allow for the use of evaluation of the spine by x-ray in cases where trauma, pain, and suspected spinal instability are present.⁸⁻¹⁰

It is the author’s experience that the functional imaging required to detect C1-C2 instability is rarely performed. The typical post-trauma x-ray examination of the cervical spine will include the 5 or 7 view Davis series. The 5-view Davis series includes the A-P, APOM, neutral lateral, and flexion and extension lateral

views; the 7-view series adds neutral oblique films of each side.¹¹ The problem is that to properly image C1-C2 for instability, lateral flexion (side-bending) views are necessary.

“Although flexion and extension study provides the most information regarding excessive and aberrant motion secondary to ligamentous laxity and/or injury, **lateral bending (lateral flexion)** study of the cervical spine has proved to be of great value in the evaluation of the C1-C2 vertebral motion segment.”¹²

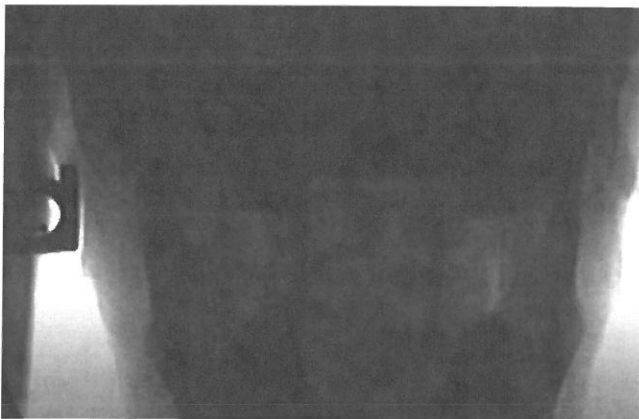
“Evaluation of the C1-C2 vertebral motion segment, with regards to the integrity of the **alar ligaments**, is best performed by lateral bending (lateral flexion) functional x-rays. The alar ligament is most stretched, and consequently more vulnerable, when the head is rotated and flexed. Injury to the alar ligaments may be presented with asymmetry of the periodontoid space and overhang of the lateral mass of C1 in relation to C2.....The resulting instability is presented as increased translatory motion of the C1-C2 vertebral motion segment upon lateral bending (lateral flexion).”¹²

Therefore, unless the A-P Open Mouth (APOM) views have been obtained, do not assume that the patient’s spine has been evaluated for Alar ligament injury and resulting spinal instability. An example of the views in question can be seen on our YouTube video titled “Normal v Abnormal APOM” which shows the easiest method for this evaluation, which is low-radiation diagnostic videofluoroscopy (although digital x-ray is a close second in ease of use).

Once the lateral bending views have been obtained, the images can be digitized and computer analyzed “and apply geometric threshold criteria to objectively identify structural abnormalities.”¹⁰ In this regard, we have a handful of studies that have established the following limits: the normal range for lateral translation of C1 on C2 is 0.0mm - 1.7mm with the uppermost limit being 3.0mm.¹³⁻¹⁷

Treatment Options:

Surgical fusion – Reducing C1-C2 hypermobility can be accomplished through surgical fusion, especially in cases where excess motion is causing vertebral artery compression (M47.021). There are numerous surgical techniques that can be utilized, including the following example:



Injections – Prolotherapy injections have been used for some time now as a less invasive measure to reduce cervical spine instability. I have referred a number of patients out for such treatment and have found it to provide noticeable improvement in most, especially when coupled with a strengthening and stabilizing rehabilitation program utilizing the Halo Posture anterior head weighting exercises, described below.

Halo Posture –

In the mid-2000s we discovered, purely by accident, that anterior head weighting could significantly reduce C1-C2 hypermobility when used regularly. After some study, we realized that the same suboccipital muscle groups that help restore normal posture when strengthened (namely the Obliquus Capitis (OC) Superior and Inferior, and the Rectus Capitis Posterior (RCP) Major and Minor), also help to stabilize the Occiput-C1-C2

joint complexes. As such, we recommend and utilize Halo Products for not only Forward Head Posture, but for upper cervical spinal instability.

Halo Posture Recommendations for the Rehabilitation of Upper Cervical Spinal Instability (M53.2X1):

Unfortunately, as with most injuries to the spine, there is no One Size Fits All rehabilitation program for the treatment of upper cervical spinal instability. These cases must be addressed on a case by case basis as there are many factors that will be different from person to person. Such factors include the severity and complexity of the ligament injury/injuries, the individual's pre-injury spinal strength and stability, their tolerance to the exercise, and so on.

However, let's keep in mind the question of what the goal should be for these patients: Improved Spinal Stability. We are going to accomplish this by strengthening the suboccipital muscle groups listed above. This should result in the ability to properly wear a 2-4lb. Halo Posture unit for 15 minutes 2-3 times daily.

Proper head position while wearing the Halo Posture is critical to its success. The patient should keep their head in a neutral, static position at all times while keeping the chin tucked. Tilting the head in flexion or extension will diminish the benefits of the head weight. Engaging the extensors and flexors is the intended goal.

As you might expect, patients with unstable cervical spines will not be able to tolerate such a stress on the spine right away. Instead they will need to very gradually work their way up to that weight for that amount of time. So, with the goal of increasing the strength of an unstable spinal region to the point of being able to wear 3-5lbs for 15 minutes 2-3 times daily, and knowing that these patients will likely have to start light (1lb.) for very little time (2-3 min), I will outline below how I introduce patients to Halo Posture rehabilitation. We will assume (1) the patient has been properly diagnosed as having C1-C2 hypermobility as described above and (2) they are no longer in acute pain and are ready to begin light rehab exercises.

Step 1: Once I believe the patient is ready to begin, and after demonstrating and explaining the process, necessity, procedures, and goals to the patient, and while the patient is still being seen in the office 3-4 times per week, I will fit the 1lb Halo Posture unit to the patient while in the seated and stationary position for no more than 2-3 minutes while monitoring them for signs of distress.

If the patient is unable to tolerate the exercise, or is unable to continue, I will discontinue and return to the patient's regular treatment and wait until they've stabilized to the point where I believe they can tolerate the exercise. If the patient CAN tolerate the exercise I will have them add a minute to each visit until they reach 10 minutes. I may also add an exercise ball to the regimen. Instead of sitting on a chair, I will have them sit on the exercise ball and wobble their hips back and forth and side to side to make their foundation unstable, thus increasing the stress on the neck while the Halo Posture is in place.

Step 2: At this point, the patient will be sent home with their own Halo Posture unit with instructions to reduce time to 5 min per set for 3 sets per day (15 min total). They will be instructed to add 1 minute to each set per day working up to 15 min per set (45 min total). Once they reach this point, we will move up in weight to either 2 or 3lbs, depending on body size, strength, tolerance, severity of underlying injury/instability, etc., while moving back down in time per set to 5 min, 3 times per day (15 min total). The patient will then begin to add time per set until they reach 15 min, 3 sets per day (45 min total).

Keep in mind that every patient is different and no two patients will progress at the same rate.

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In ICD-10 terms

V49.40XA/V49.50XA → S13.4XXA → M24.28 → M53.2X1 → M47.021

V49.40XA

---Driver injured in collision with other and unspecified motor vehicles in traffic accident.

V49.50XA

---Passenger injured in collision with other and unspecified motor vehicles in traffic accident.

S13.4XXA

---Sprain of ligaments, cervical spine.

M24.28

---Disorder of Ligament, Vertebrae. (Instability secondary to old ligament injury, ligamentous laxity)

M53.2X1

---Spinal instability, Occ-C1-C2

M47.021

---**Vertebral Artery Compression Syndrome, Occ-C1-C2**