Peer Review File

Article information: https://dx.doi.org/10.21037/jss-23-60

Reviewer A

Interesting case and interesting images. well discussed and well written.

Reviewer B

Would recommend changes with imaging and interpretation and more detail on the comments as outlined below.

While I understand f/u for trauma patients may be difficult, you were clearly able to do some in person f/u and video f/u visits and the pt had a social support system which would have enabled advanced imaging beyond one lateral XR and a "manual traction" XR. The authors should have obtained at CT and or MRI at the 1-year mark (as pt was still having neurological recovery). Nonetheless, I will comment on the imaging obtained with points below:

Comment 1: XR c-spine with kyphosis throughout the cervical spine and a cervical SVA that appears well beyond the accepted 4cm. Was there more ligamentous injury in the subaxial spine that was NOT identified given the delayed MRI at the initial injury (1 week post-accident)?
Reply: caption was changed to reflect the above comments.

Comment 2: Is there any neck pain now? The authors commented on neurological status but not on pain.
Reply: Lines 44-45: "He had some posterior cervical pain consistent with muscular pain."

Comment 3: The authors comment in Figure 3D that there is bilat fusion across the atlanto-occipital joints. This image only depicts arthrodesis across the RIGHT atlanto-occipital joint—NOT the LEFT. If there is imaging that shows bilat, please submit or change the caption.
Reply: caption was changed to reflect the above comments.

Comment 4: The mechanism for this AOD and AAD is completely different that historically described. This AOD is associated with FRACTURES of the bilat occipital condyles which if allowed to have gravity do its work in a collar, the fractures should heal in a relatively immobile person (as is the case in this patient). Once the fractures of the occipital condyles heal/arthrodesis occurs, then the injury essentially should be resolved. Having just treated one of these patients 2 weeks ago with AOD and AAD surgically with NO fractures—sole ligamentous injury—that is a completely different entity and should clearly be defined here. PURE ligamentous AOD and AAD cannot be treated this way. The type III condylar fractures created an environment of arthrodesis in this young 18-year-old and allowed him to FUSE at the right atlanto-occipital joint.
Reply: Lines 118-120 do support your comments here, "Another factor that likely contributed to his successful outcome was the fact that his injuries consisted of bony avulsion fractures off of the occipital condyles which may have allowed favorable bone to bone healing.". An expanded paragraph focusing on the occipital condyle fractures was also included in the revised manuscript attached.

Comment 5: The authors need to qualify the types of condylar fractures here and define the usual treatment mechanism for those fractures. I would classify this as bilateral type III Anderson and Montesano fractures, which in the presence of instability or concerns for associated AOD or AAD, should be treated surgically, understanding here that non-surgical treatment was chosen due to the surgical risks of placing this polytrauma prone in pins at 540 lbs. However, key to recognize that non-surgical treatment of such injuries involves allowing gravity to do its great work which is a COLLAR—not a halo which when sitting up can lead to DISTRACTION of the fractures. Also should be noted here that that a halo would NOT be the choice of treatment NOR would be feasible for this morbidly obese patient. Key to note that regardless of weight,

rigid collar is the appropriate treatment here.
Reply: We have expanded this point in a separate paragraph at the end of the discussion, and also included another sentence in the conclusion to highlight this comment.

Comment 6: The mechanism of the "AAD" is mostly at the right atlantoaxial joint and the minimal increased STIR on 1wk post-injury MRI which can be somewhat less accurate in detecting injury and/or increasing concerns for injury given tissue edema by that time post-injury.
The ADI appears within normal range on the CT and MRI and the authors should comment that the mechanism of the dorsal distraction or avulsion type injury likely persevered the ADI and facilitated some of the healing at the atlantoaxial joint. With complete distraction of the C1/2 articulation ventrally and dorsally, healing is less likely b/c the entire C1-C2 ligamentous relationships are disrupted.
Two sentences were added to the end of the discussion section reflecting your comments here. The caption for figure 1A was also revised, commenting on the preserved ADI.

Reviewer C

Well written.

Reviewer D

The authors presented a unique case in which a partial neurological recovery had been made after non-operative treatment had been done for atlanto-occipital dislocation.
This manuscript is well-written and interesting.
I think the authors are reporting very important findings in this field.
The manuscript is regarded to be suitable for publication in Journal of Spine Surgery as a present form.