

## Peer Review File

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Reviewer A comments;

1. *The authors should discuss the advantage of the proposed new entry point compared to midpoint of C1 lateral mass commonly used by most surgeons. The midpoint of C1 lateral mass can be easily determined by direct visualization during surgery, and anatomically speaking the proposed new entry point is very close to the center of the lateral mass anyway.*

Thank you for your comment. We have added this to our manuscript in the Discussion, paragraph 2.

**The advantages of the proposed new entry point compared to the entry point used by most surgeons are numerous. Due to its location at a bony intersection, this technique is easier, to be reproduced rather than attempting to identify the center of the lateral mass. There is no need for angulation to avoid the vital medial or lateral structures. Also, with minimal posterior dissection, the risk of injury to the venous plexus or the C2 nerve root is minimized as bony landmarks will guide placement of the screw.**

2. *In addition, the authors should include discussion the advantages and disadvantages of C2 neurectomy, as well as the advantages and disadvantages of utilizing navigation to make it a stronger paper.*

Thank you for your comment. We have added the following two paragraphs to our manuscript (Discussion) to address these issues:

**Sectioning or neurectomy of the C2 nerve root allows for better visualization of the C1-C2 joint but this does not come without a cost. Dewan et al[18], performed a prospective questionnaire study of twenty-eight patients undergoing placement of C1**

lateral mass screws. Eight patients underwent transection and in twenty cases the C2 nerve was preserved. They concluded that C2 trans-sectioning was associated with decrease operative time, decreased blood loss, and occipital numbness. They noted that this occipital numbness had no impact on patient reported quality of life. In those cases, where the C2 nerve root was preserved, those patients reported occipital neuralgia, had higher scores on mean disability surveys, and negatively impacted patient disability and quality of life scores.

Imaging navigation in spine surgery has been increasing in popularity since the 1990's. Although not a substitute for understanding anatomy, navigation is helpful in cases of altered normal anatomy, or in cases where minimal dissection or exposure is desired [28, 29]. Advantages of utilization of navigation include; higher rates of acceptable screw placement as compared to open techniques[30], and less overall radiation exposure to the surgeon and operative team as compared to traditional fluoroscopic methods[31-33]. Disadvantages of navigation include, need for costly navigation machinery, operative staff training on devices, and the learning curve associated set up and utilization [34-36].

#### **Reviewer B**

*This article is concerning "Lateral Mass Screw Placement in the Atlas: Description of a Novel Surgical Technique, Radiographic Parameters, and Review of the Literature". It is the article of the new insertion technique of C1 lateral mass screw using O-arm navigation. However, there are some problems. Because a position of screw depends on O-arm navigation, it is necessary to show the accuracy in the clinical example by this procedure. That is to say, a display of the accuracy in the real clinical example by this procedure is necessary.*

Thank you for your comment. Figure 3C, and 4 A and B demonstrates the PA trajectory of the lateral mass screw, utilizing the technique described in the manuscript. There is no violation of the anterior cortex of the lateral mass. Because of the PA trajectory without any medial or lateral angulation we feel that this validates our accuracy. **Additional images of an intraoperative case example added to demonstrate trajectory of screw (Figure 4A and Figure 4B).**

*An insertion point or insertion angle of the screw using anatomical parameter is unclear. It is unknown how different it is from other procedures. The display of the figure of plain surgical procedure is necessary.*

Thank you for your comment. As outlined in our manuscript, most surgeons currently utilize the center of the lateral mass of C1 as the start point for screw insertion. Here we are describing our novel technique of moving that start point to the confluence of the medial aspect of the posterior arch and the lateral mass. By moving the start point laterally, we do not angle our screws in any plane to avoid medial or lateral structures. This is different from the current standard insertion technique with a midpoint lateral mass entry as most surgeons will angle their screws approximately 10-15 degrees medially.

Please see addition to manuscript to clarify this point (Discussion, paragraph 2):

**The advantages of the proposed new entry point compared to the entry point used by most surgeons are numerous. Due to its location at a bony intersection, this technique is easier, to be reproduced rather than attempting to identify the center of the lateral mass. There is no need for angulation to avoid the vital medial or lateral structures. Also, with minimal posterior dissection, the risk of injury to the venous plexus or the C2 nerve root is minimized as bony landmarks will guide placement of the screw.**