

Peer Review File

Article information: <https://dx.doi.org/10.21037/jss-24-46>

Reviewer A

The manuscript presents a case report detailing the successful treatment of a type II odontoid fracture using computer-assisted navigation for anterior odontoid screw fixation (AOSF). The paper is well-structured, with clear sections including Abstract, Introduction, Case Presentation, Discussion, and Conclusion. The novelty of the case lies in the utilization of CT navigation for AOSF, along with a practical positioning technique using a pressure infusion bag for cervical stabilization.

Strengths:

Novelty and Clinical Relevance: The manuscript addresses an important clinical challenge in the treatment of type II odontoid fractures and presents a novel approach using computer-assisted navigation.

Clear Presentation: The case presentation is clear and well-organized, allowing readers to understand the clinical scenario, surgical technique, and outcomes effectively.

Practical Technique: The use of a pressure infusion bag for cervical stabilization introduces a practical and cost-effective technique that could potentially improve surgical precision and outcomes. Another important aspect that deserves attention is that navigation doesn't require hyperextension of the head, usually needed to obtain trans-oral Xrays views. Please highlight this as well.

Reply 1: We appreciate and agree with the reviewer on this point, and have added their suggestion to the text, see lines 164-166.

Changes in the text: Added “Unlike fluoroscopy, navigation does not require significant neck hyperextension, which is typically necessary for adequate trans-oral X-rays.” (Lines 164-166)

Compliance with Reporting Guidelines: The manuscript adheres to the CARE reporting checklist, ensuring transparency and completeness in reporting the case.

Areas for Improvement:

Comparative Analysis: While the paper discusses the advantages of navigation-guided AOSF, it lacks comparison with traditional fluoroscopy-assisted techniques. Including a comparative analysis would strengthen the argument for adopting navigation-guided approaches.

Reply 2: Thank you for this comment. We added a section on traditional fluoroscopy-assisted techniques, and we agree that comparisons between this and navigated AOSF strengthens the argument for adopting navigation-guided approaches, see lines 160-170.

Changes in the text: Added “Fluoroscopy-guided navigation for AOSF requires the use of one, and sometimes two, C-arm machines positioned orthogonally near the head and approaching from opposite sides of the table. This setup can pose challenges and inconvenience for the surgeon and their assistant when maneuvering instruments due to limited space. Operating a second C-arm machine often necessitates the presence of an additional radiology technician. Unlike fluoroscopy, navigation does not require significant neck hyperextension, which is typically necessary for adequate trans-oral X-rays. Due to parallax and the superimposition of structures such as teeth or the skull, achieving optimal fluoroscopic imaging of the odontoid process can be reliably challenging without experienced surgeons and radiology technicians. The advantages of fluoroscopy include rapid image acquisition and real-time identification of fracture displacement or screw malposition.” (Lines 160-170)

Radiation Exposure: The discussion briefly touches upon radiation exposure but lacks in-depth analysis or comparison between navigation-guided and fluoroscopy-assisted techniques. Further discussion on this topic would enhance the comprehensiveness of the manuscript.

Reply 3: Thank you for your comment. We did include the available literature on the topic. We also added some depth to our discussion as you recommended, see lines 190-208.

Changes in the text: Added “Multiple intraoperative CT scans may be required with navigation techniques to ensure safe screw placement and maintain fracture reduction. This can result in higher radiation doses to the patient. Fluoroscopy-guided techniques expose both the patient and the operating room staff to radiation. As discussed earlier, less experienced surgeons and radiation technicians may require longer fluoroscopy times and deliver higher radiation doses to achieve optimal imaging.” (Lines 196-202). Also added “Further study comparing aggregate fluoroscopy time and lead apron dosimetry data should be collected between fluoroscopic and CT-guided techniques.” (Lines 206-208).

Previous experiences: please consider to comment previous reports and in particular technical notes aimed to reduce invasiveness of the the procedure 10.23736/S0390-5616.20.04886-9.

Reply 4: This is also an excellent suggestion. We added additional published minimally invasive techniques for anterior odontoid fixation that may augment navigated techniques using our positioning pearl, see lines 181-187.

Changes in the text: Added “Minimally invasive techniques, including endoscopic or percutaneous placement of odontoid screws, have also been described. One study

discusses a series that used a tubular dilator retractor system for screw placement, achieving good results with no complications in 28 out of 29 patients (11). Another study utilized a beveled bone marrow biopsy needle (Jamshidi needle) as a sleeve for guide wire insertion, showing excellent clinical and radiological outcomes without soft tissue or esophageal complications (12). We believe these minimally invasive techniques can be employed alongside our positioning technique using navigation-guided instrumentation to enhance safety.” (Lines 181-188).

Ethical Considerations: While the manuscript mentions obtaining written informed consent from the patient, it would be beneficial to include a statement regarding institutional review board approval, particularly considering the use of innovative techniques.

Reply 5: Thank you for your comment. We received both informed consent and institutional review board approval to publish this project and we included their statement in the manuscript, see lines 238-240.

Changes in the text: Added “Because the project involves only one case and is intended as an illustrative example for educational purposes, including the off-label use of a healthcare device, no additional IRB approval is required.” (Lines 238-240).

Future Directions: The conclusion could be strengthened by providing insights into potential future research directions or clinical implications arising from the reported case.

Reply 6: Agree with this reviewer here. We added our future research directions that were inspired from this case. We hope this case will add value to spine surgeons across the globe and help improve anterior odontoid surgical techniques.

Changes in the text: Added “Additional research is necessary to evaluate radiation time, patient-reported outcomes, radiographical fusion rates, optimal screw positioning, and complication rates in the treatment of type 2 odontoid fractures with AOSF using intraoperative CT navigation versus fluoroscopy-guided techniques. We plan to continue using this novel technique in the future to eventually compare our series with a historical fluoroscopy-guided cohort. (Lines 211-215).

Overall Assessment:

The manuscript presents a valuable contribution to the field of spinal surgery by introducing a novel technique for AOSF using computer-assisted navigation. With minor revisions and additional comparative analysis, the paper has the potential to significantly impact clinical practice and stimulate further research in this area.

Reviewer B

1. Please also provide the full name of the abbreviated terms in the highlight box.

Full name of abbreviations was provided, specifically for AOSF, anterior odontoid screw fixation. Also, the abbreviation for CT, computed tomography, was provided at the beginning of the highlight box so that the abbreviation could be used later in the highlight box.

2. The publication information of *Ref 2* seems incomplete, please supplement the page number/doi link for it.

Updated the reference. This reference is from a chapter out of a book.

3. Figures

- **All abbreviations** in figures and legends should be explained. “CT” in Figure 1 for example. Please check all abbreviations and provide the full names in the corresponding legends. **Done**
- Please use **uppercase letters** A, B to number the subparts of Figure 3. **Done**
 - (a) Intravenous pi
 - (b) The contour of
- Please provide a **summarized legend** for Figure 3. The format of legend should be like: Figure 3. Xxxxx (summarized legend). (A)xxxx. (B)xxxx. **Done**
- Please indicate the meaning of “L” “ECS” in Figure 5 legend. **These were markings from the radiology technologist’s initials, and the beam of the X-ray was from the left. These initials, and the laterality of the beam, which are not informative, were removed from Figure 5 to mitigate confusion. See attached Figure 5**

4. Reporting Checklist

- 1) In the reporting checklist, please specify the **Page/Line** number in the first column, **Section/Paragraph** information in the second column, for example, Case Presentation/Paragraph 1; Discussion/Paragraph 1.

Revised, see attached checklist

- 2) Please double check item 7 in the checklist. Please fill “N/A” in the first column.

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| Timeline | 7 | Historical and current information from this episode of care organized as a timeline | Lines 107-108 | N/A |
|----------|---|--|---------------|-----|

Done