Peer Review File

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Reviewer A

Technically, this is a feasibility study on defining a novel approach to insert pedicle screws with maximal purchase of cortical bones. The authors demonstrated that the average screw size of the new trajectory, which involves more cortical bone interfaces, is comparable to that of traditional pedicle screws. This new pathway is similar to the cortical bone trajectory with more cortical bone engagement. Although the indication of this new technique of screw placement would be limited to lower lumbar levels in osteopenic bones, the authors are to be commended for this work. There are some minor points to be made about the study:

1) ABSTRACT

Line 30: please correct "screw size" to "screw length"

Reply: Thank you for this comment. We had made the following change:

Changes in the text: "…Screw Length at least 30mm…" [Abstract, Page 1, Line 30].

2)INTRODUCTION

Line 57: please correct "… as led…" to "… has led…"

Reply: Thank you for this comment. We had made the following change:

Changes in the text: "…has led to a popular…" [Introduction, Page 2, Line 57].

3) MATERIALS and METHODS

Lines 83-84: The study is based on analysis of lumbar CT images of 50 consecutive trauma patients undergoing lumbar pedicle fixation. It is common to see broken or crushed pedicles in trauma series. Have the authors excluded levels with deformed or broken pedicles? If yes, then please explain why there are 50 samples for each studied spine level from L1 to S1 (table 1)? And if no, how the researchers overlaid a virtual screw on the image of a deformed or crushed pedicle and determined the angles or breaches?

If possible, please include a figure to show the measurements with virtual screw overlaid on a pedicle.

Reply: Thank you for this comment. To clarify these were 50 trauma patients who obtained lumbar CT scan in the trauma bay, however they did not undergo lumbar pedicle fixation. These were templated with uninjured pedicles and we have included figures to show trajectory of virtual screw.

Changes in the text:

"…A retrospective review was conducted on trauma patients that underwent CT of the lumbar spine. Fifty consecutive patients were selected from the 18-45 age bracket that underwent the necessary lumbar CT scan. A preliminary screen was performed by the senior radiologist ensuring no injury. A second screen was performed by the senior

spine surgeon confirming no trauma or fracture to the pedicles." [Methods, Page 3, Lines 81-85].

"The outline of the CBT screw is demonstrated in Figure 2." [Methods, Page 5, Line 127].

Line 109- please put a comma after "…occurred".
Reply: Thank you for this comment. We had made the following change:
Changes in the text: "If breach occurred, the screw was …" [Methods, Page 4, Line 109].

DISCUSSION
Lines 188-91 – It's important to note that excessive retraction and soft tissue exposure are typically only necessary when using an open midline incision to insert pedicle screws. However, in minimally invasive procedures under navigation, a small stab incision with minimal soft tissue retraction is usually sufficient.
Reply: The reviewer makes a great point. Minimally invasive procedures does indeed provide the benefit of minimal soft tissue disruption but careful patient selection is key. Not all surgeons are comfortable with MIS techniques as well. Nonetheless, this is an important contradiction.
Changes in the text: "In contrast to minimally invasive techniques under navigation, where only a small stab incision with minimal soft tissue retraction is required; TPS requires a larger exposure in order to initiate the pedicle screws lateral to the facet joint with immense retraction of the tissues which can be a significant source of morbidity due to blood loss and pain
following the procedure" [Discussion, Page 7, Line 188-91].

Line 199- please add "to" after closer.
Reply: Thank you for this comment. We had made the following change:
Changes in the text: "…starting points are closer to midline" [Discussion, Page 7, Line 199].

Line 248- please add "to" after similar.
Reply: Thank you for this catch. We had made the following change:
Changes in the text: "…much similar to the TPS technique" [Discussion, Page 9, Line 248].

Line 257- please drop "s" from "allow" and change "infer" to "confer".
Reply: Thank you for this comment. We had made the following change:
Changes in the text: "…allow maximization of screw working length and can confer an increased screw" [Discussion, Page 9, Line 257].

Reviewer B

I read with interest this manuscript about a new pedicle screw technique through the articular surface of the vertebral superior facet. To my opinion, the significance of content, the scientific soundness and interest to readers is too low. Nowadays, there several different techniques for screw placement. Moreover, this technique can be used only for the L3-S1 segment that is a big limitation. This should not discourage authors.

Reply: Thank you for this comment. We believe this technique offers a great alternative to traditional screw options. There are certain patients and scenarios where the articular surface screw technique could be advantageous for attaining fixation and/or fusion.