Author’s response to reviews

Title: The effect of different screw-rod design on the anti-rotational torque: a biomechanical comparison of three conventional screw-rod constructs

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Reviewer reports:

Philip Hanna (Reviewer 1):

(1) The amount of torque needed for twisting off the end cap of Legacy system, this will make it more comparable to the other two systems and justify eliminating the tightening torque as a variable that might affect the study results.

Answer: Thank you for this good suggestion. We had add the tightening torque of Legacy system in the paragraph of Materials and Methods.

(2) The point to failure of construct regarding the anti-rotational torque is not clear.

Answer: It is a good suggestion. We had attached a figure (figure 5) in the article to demonstrate the failure region of rod regarding the anti-rotational torque.

(3) I would also recommend replacing figure(3) with another clear version.
Amin Mohamadi (Reviewer 2):

1. Groups A (Legacy, Medtronic Inc), Group B (USSII), and Group C (RF-F-10) are used inconsistently. For example in figure 4, torque of group B is larger than group C but in the results it is said group C had larger torque. It reads better if the construct names are used for reporting results instead of defining groups A to C.

Answer: This is a good suggestion, we had change the information in the article according to your suggestion.

2. Including an image from tested constructs outside of the jig would be helpful to understand how constructs are built.

Answer: Thank you for this suggestion, we had add a figure of tested constructs outside of the jig in the Figure 3.

3. The maximum torque was measured while rod is twisted. However, it is not clear at which level the failure of rotational stability has happened. It could have happened at the junction of rod inside MTS mechanical testing machine, rod inside the groove of screws, or screws and PMMA fixation material, or any combination of those.

Answer: Thank you for this good suggestion, we can confirmed the failure mode of testing unit was at rod inside the groove of screws in the Figure 5, which showed the sliding notch of rod at the groove of screws, but not at the junction of rod inside MTS mechanical testing machine, furthermore, we can found PMMA fixation material was integrity during the testing.

4. Why for tightening cap of the screws in groups B and C the torque is measured and not for group A? Is 12 N.m torque enough to tighten the cap completely? The friction between rod and groove of the screws, presumably determines the rotational stability of rod inside groove of screws. Therefore, if the caps of the screws are not tightened enough, the friction is not large enough to keep the rod inside the groove steady. This may be the reason for the observed higher maximum torque for group A—for which the cap is twisted off without measuring the torque.
Answer: Thank you for this good suggestion, we had confirmed the tighten torque of Legacy was 11-12.5 Nm, which was similar with the other two groups, so we think the result of this study were comparable, the following table was the tighten torque demonstration of Legacy instrumentation.

5. The experiments using only one screw and fixating screws on PMMA does not mimic surgical technique for AIS corrective surgery. Data from experiments on cadaveric vertebrae and employing more screws can provide better insight for the clinic.

Answer: yes, we agree with you, and discuss this limitation in our paper.

6. The name of post-hoc test should be mentioned in the methods.

Answer: Thank you for this good suggestion, we had added this name in the Statistical analysis paragraph.