Reviewer's report

Title: Comparison and Prediction of Pullout Strength of Conical and Cylindrical Pedicle Screws within Synthetic Bone

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Reviewer: Ching-Kong Chao

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This study developed the mathematical formula to predict the pullout strength of both cylindrical and conical pedicle screws. The authors concluded that this new formula could predict the results of their biomechanical tests. In addition, the predicted accuracy of the new formula was better as compared with that of the Chapman's formula.

Please respond to the following questions.

1. The authors just used the results of their mechanical tests to validate the predicted accuracy of the new formula. This is weak and not equitable. The authors should verify the applicability of this new formula with use of the published papers or the results of other laboratories.

2. Table 1 showed the design factors and dimensions of the pedicle screws. Actually, the design factors of the pedicle screws also included the root radius, the half angle, and the thread width. Among those factors, the half angle will affect the pullout strength of the pedicle screws. Unfortunately, this factor is not considered for developing the new predicted formula.

3. The Chapman's formula is derived on the basis of the half angle of 30o. The authors also used this assumption to derive the new formula. However, the half angle is varied for different commercial pedicle screws. In addition, the past research showed that the half angle is one of the significant factors in the pullout performance of the pedicle screws. Again, the applicability of the new formula should be justified by other mechanical results.

4. The structure of the artificial bone used in this study is solid. This is different from human bone especially for a cancellous bone with porous structure. Please explain the difference between these two structures if the porous structure of the artificial bone was used in this study.

5. The literatures which are cited in this research are too old (from 1986 to 2001). The authors should survey the newer published papers, which related to this research work. In recent years, I think that there are other
technologies or methodologies which can be used to predict the pullout strength of pedicle screws. For instance, the finite element analysis is a good method to simulate the mechanical performances of the orthopaedic implants.

6. The authors should describe the limitations and assumptions of the new predicted formula.