Author’s response to reviews

Title: In-vivo study of osseointegration in Prestige LP cervical disc prosthesis

Authors:

Jigang Lou (loujigang@163.com)
Beiyu Wang (Beiyu120@163.com)
Tingkui Wu (871094764@qq.com)
Wenjie Wu (2595738432@qq.com)
Huibo Li (412290356@qq.com)
Ziyang Liu (740744247@qq.com)
Hao Liu (liuhao110@126.com)

Version: 1 Date: 29 Dec 2017

Author’s response to reviews:

Dear Editors and Reviewers:

Thank you for your letter and for the reviewer’s comments concerning our manuscript entitled “Total disc replacement with the Prestige LP cervical disc in a Caprine model”. Those comments are all valuable and very helpful for revising and improving our paper, as well as the important guiding significance to our researches. We have studied comments carefully and have made corrections which we hope meet with approval. The main corrections in the paper and the responds to the reviewer’s comments are as following:

Reviewer #1:

Comments:

In Methods: The operative motion segments were examined using microcomputed tomograph (Micro-CT) for histomorphometric quantification of trabecular bone area at the prosthesis-bone interface. In Results: Micro-CT of the operative motion segments showed excellent osseointegration at the prosthesis-bone interface (Fig. 4 A and B). In Fig 3, the lateral XR seems the motion segment was fused. Fig 4 A and B, it seems the motion segment was fused, with
almost kissing bone growth on the left hand side of Fig 4A, likely posterior, and also on the bilateral sides on Fig 4B. Can we have more data on the ROM of the explanted motion segment? And more data on the Micro-CT for analysis. The bony in-growth on the porous coating should be higher if there is no motion on the implant, which acts like a fusion cage.

Response:

Indeed, it seems that the motion segment was almost fused in Fig 3 and 4. However, the emphasis of our study was to evaluate the extent of osseointegration at the prosthesis-bone interface. There were no data on the ROM of the explanted motion segment in this paper, for the following two reasons. Firstly, unlike a person who can proactively bend and extend his cervical spine and hold the final posture, it is difficult to measure and evaluate the ROM of the explanted motion segment in a caprine model. Secondly, multi-directional flexibility testing is the current widely used method to evaluate the ROM of the explanted motion segment, however, there has been a variety of in-vitro biomechanical studies on the Prestige LP prosthesis [1-3].


In this paper, although we focused on the mean porous ingrowth (apparent bone contact area/gross total endplate area) at the prosthesis-bone interface, there were still more data on the Micro-CT for analysis provided in the additional file 1.

The bony in-growth on the porous coating may be higher if there is no motion on the implant. However, there is still controversy that how motion on the implant influences the bony ingrowth at the prosthesis-bone interface. No motion on the implant is a favorable factor for bony ingrowth on the porous coating. Besides, interfacial stress within a certain range caused by the motion on the implant may also be conducive to promote the bony in-growth at the prosthesis-bone interface.

Overall, this study was undertaken to preliminarily evaluate the extent of osseointegration in Prestige LP prosthesis. However, more comprehensive and precise study is still needed.
Reviewer #2:

General comment:

This is an in vivo study of the osteointegration of Prestige LP prosthesis. Although this kind of study for Prestige LP prosthesis is lacking in the literature, similar studies using caprine model testing on other porous coated cervical disc replacement prostheses have been extensively published. The result would be more convincing if the study included other porous coated cervical disc replacement prostheses as the control.

Response:

Indeed, there has been several reports on the osseointegration of other coated cervical disc arthroplasty (CDA) prostheses. Hu et al. found the mean porous ingrowth for CDA with the PCM prosthesis was 40.5% ± 24.4% and 58.65% ± 28.04% at 6 and 12 months after surgery, respectively. Lou et al. demonstrated the mean porous ingrowth was 42.5% ± 8.4% at 6 months after surgery for CDA with a novel prosthesis Pretic-I, which has been added as the reference 16 in this paper. In our study, the mean porous ingrowth was 48.5% ± 10.4%, similar to that reported in the above two studies. Moreover, in the discussion section (line 169-171, page 8), we have demonstrated excellent porous osseointegration at the prosthesis–bone interface for the Prestige LP prosthesis, similar to that reported in several previous studies [12-16]. Besides, according to the reviewer’s comment, we have enrolled the above two disc prostheses as the control in this paper, shown in a revised Fig 5. Further in-vivo studies of osseointegration in different disc prostheses are still needed.

Specific comments:

1. The title is vague and not specific. It would be better to rename as "In-vivo study of osseointegration in Prestige LP cervical disc prosthesis"

Response: Obviously, our study was designed to quantify the extent of biologic porous osseointegration at the prosthesis-bone interface in the Prestige LP prosthesis in a caprine model. Therefore, it would be better that the title was modified to “In-vivo study of osseointegration in Prestige LP cervical disc prosthesis”.

2. The number of subjects is too small. In other similar studies the number of study subjects were at least 12.

Response: Indeed, the number of subjects is a little small. However, according to the least sample rule of mathematical statistics, eight sample sizes still meet statistical requirement.
Moreover, there was much smaller samples (7 or 6 samples) followed for a period of 6 months in some previous studies [1-2].


The above two references were also cited and numbered 13 and 14 respectively in this paper. Nevertheless, further study with a larger sample size is still needed to verify our conclusions.

3. The follow-up period of 6 months is too short. At least 1 year result should be included.

Response: In clinical observations, the complications associated with CDA prostheses most often occur within 6 months after surgery. Moreover, excellent porous osseointegration at the prosthesis–bone interface usually occurs within 6 months after surgery. Hence, the animals included in our study were followed for a period of 6 months, similar to the previous study [1].


Definitely, it would be better that at least 1 year follow-up result were included in this paper. Therefore, it is expected that longer follow-up evaluation with greater numbers of subjects would be required to obtain a more reliable measure of the biological osseointegration of CDA with the Prestige LP prosthesis.

4. Besides the histomorphometric assessment, other tests such as multi-directional flexibility testing can also reflect the stability and extent of the osteointegration. Please give more reason to support your choices of assessment method.

Response: Multi-directional flexibility testing can directly reflect the stability, and indirectly reflect the extent of osseointegration. Besides, we can also evaluate the stability through the flexion-extension cervical radiographs, and estimate the rough extent of the osseointegration by the three-dimensional reconstruction of cervical computed tomograph. However, these methods are infeasible to quantitatively evaluate the extent of osseointegration. Histomorphometric analysis is a quantitative method to evaluate the extent of osseointegration. Hence, it has been widely used to evaluate the osseointegration at the prosthesis-bone interface.
We tried our best to improve the manuscript and made some changes in the manuscript. These changes will not influence the main content and framework of the paper. Besides, our manuscript has also been reviewed and revised by my fellow who is fluent in English. And here we listed the main changes, and described exactly where these could be viewed.

We appreciated for Editors/Reviewers’ warm work earnestly, and hope that the correction will meet with approval. Meanwhile we are sorry that we fail to login the website in time, so that we submit the revised manuscript a little late.

Once again, thank you very much for your comments and suggestions.