Author’s response to reviews

Title: Surgical injury and repair of hip external rotators in THA via posterior approach: A three-dimensional MRI-evident quantitative prospective study

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Author’s response to reviews:

Dear Editors and Reviewers,

Please find enclosed our revised manuscript with the ID BMSD-D-18-00923 entitled "Surgical injury and repair of hip external rotators in THA via posterior approach: A three-dimensional MRI-evident quantitative prospective study". (The title has been changed according to the reviewer’s suggestion, the previous title was "Surgical injury and repair of hip external rotators via posterior THA: A three-dimensional MRI-evident quantitative prospective study").

We seriously appreciate the editors’ and reviewers’ helpful comments and have included a separate respond document and related reference below that indicates how our manuscript has been modified in response to each comment. The changes are also highlighted in our revised manuscript. Also, the relevant duplicates have been deleted from the original. We look forward to hearing from you regarding our submission. We would be glad to respond to any further questions and comments that you may have.

Thank you for your consideration of this revised manuscript.

Editors’ comments to author:

Firstly, we have changed “Background” into “Introduction” in the manuscript to avoid the ambiguity.(Introduction section, Line 20, Page 4).

1. Title. The authors stated "repair of hip external rotators", but actually only the piriformis muscle is repaired in this study.
Our answers:

Thanks for your comment. We are sorry that this part was not clear in the original manuscript. We fully understand the confusion of the editors and we hope that our explanation will dispel the confusion of the editors.

The superior gemellus muscle and inferior gemellus muscle are too small to be clearly identified in MRI, so this study focused on the piriformis and the internal obturator muscle. During the operation, the piriformis and the internal obturator muscle suffered the same injury. Whether the muscle tendon was sutured or not affected the muscle recovery. According to the results of this study, we recommended the repair of the hip external rotators, especially the piriformis. Based on this, we stated the title “Surgical injury and repair of hip external rotators”, in order to elucidated the necessity of repair to the external rotators under the same surgical injury.

2. Introduction. Authors should clarify the primary and secondary endpoints of the study. What did you mean as “surgical approach-related injury” and "muscle recovery"? In the results section, the authors mentioned "external rotator volume" and "external rotator fat-muscle ratio".

Our answers:

Thanks for your comment. We completely agree that the primary and secondary endpoints should be clearly clarified.

For the surgical injury to the external rotators, two key points of the muscle morphology, the “muscle volume” and the “fat-muscle ratio” in the results section were the primary endpoints to be focused while the external rotation range was the second endpoint. And for the postoperative recovery of the external rotators, the changes of the muscle morphology were the primary endpoints.

Corresponding revisions in manuscript:

The original has been changed into “1) What were the changes in the muscle morphology of hip external rotators and the external rotation function after posterior THA? 2) Whether the repair of external rotators contributed to a better amelioration in the muscle morphology postoperatively?” (Introduction section, Line 19-22, Page 5; Line 1, Page 6).

3. Method. 1) Please do not report the same data in the text and table 1.

Our answers:

Thanks for your comment. The same data presented both in the text and table 1 has been deleted. In addition, some duplicate content in both the text and the figure 1 has been also deleted.
2) Please clarify the rehab protocols. Could it affect the muscle recovery?

Our answer:

Thanks for your comment. We have a standard rehabilitation protocol for each patient after THA via posterior approach by the same physiotherapist. The aim was to ensure that the positive effect of postoperative rehabilitation exercises on muscle recovery was consistent in each patient.

Our rehabilitation protocol was conventional which did not include the special muscle exercises. For example, passive and active leg-raising training from the first day, partial weight bearing walking from the third day, going up and down stairs from seventh to tenth day. Therefore, it will generally benefit the muscle recovery.

3) Who performed the assessment of postoperative ROM? Why did you not present the results distinguished according the two groups?

Our answer:

Thanks for your comment. The assessment of postoperative ROM was performed by the same medical practitioner.

Corresponding revisions in manuscript:

In order to clarify this point more clearly, the original has been changed into “Bilateral hip external rotation range measurement was conducted on each patient by the same medical practitioner preoperatively, 6, 12 and 52 weeks postoperatively. The medical practitioner was blinded to the surgical procedure and the MRI results.”

(Methods section, Line 5-8, Page 9).

This study was self-paired design in order to eliminate the bias due to some interference factors such as body position on the different measurement points. The muscle morphological data and the ROM data of the operative side were compared with the contralateral side. So we analysed the bilateral data at the same time for each patient throughout the entire follow-up.

4) Please provide a sample size and power analysis assessment.

Our answer:

Thanks for your comment. The sample size of this study was calculated by the relevant statistical formula before it started, we are sorry that this point was not mentioned in the original manuscript. Since the study was self-paired design, The formula “n
\[ n = \left( \frac{Z_{\alpha/2} + Z_{\beta}}{S/\delta} \right)^2 \] was used for the calculation of a sample size \( (\alpha=0.05, \beta=0.1) \). The smallest sample size was about 50.

Corresponding revisions in manuscript:

“Since the study was self-paired design, the formula “\( n = \left( \frac{Z_{\alpha/2} + Z_{\beta}}{S/\delta} \right)^2 \) was used for the calculation of a sample size \( (\alpha=0.05, \beta=0.1) \).” has been added in the statistical analysis section. (Statistical analysis section, Line 17-18, Page 9).

4. Discussion. Please move the main finding of the study at the beginning of the section.

Our answer:

Thanks for your comment. According to the editors’ suggestion, the main finding of the study has been moved to the beginning of the discussion section and the relevant duplicates were deleted. (Discussion section, Line 6-10, Page 12).

5. Conclusion. Please delete "in summary".

Our answer:

Thanks for your comment. According to the editors’ suggestion, “in summary” has been deleted from the conclusion section.

We would like to express our heartfelt thanks for your patient and meticulous work.

Reviewers’ comments to author (Reviewer 1):

Interesting work. The language level is low. Please maintain the focus on the aim of the study.

Additional comments:

The introduction and the discussion were too much dispersive and do not focused on the topic. I think the authors should improve and better clarify the background and current evidences in the introduction part, while in the discussion they have to should improve their findings and related scientific and clinical impact, suggesting new perspectives, further researches, maintaining the discussion on the topic.

Our answer:

Special thanks to you for your good comments as well as your keen interest in this study. And, We are deeply sorry for any inconvenience ambiguity to your review. According to your
suggestion, in order to make the topic more focused and clear, and to put forward some new perspectives as well as our further researches, the manuscript have been revised, especially the “Introduction” section and the “Discussion” section. The corresponding references have been also updated. At the same time, we appreciate your tolerance for our language problem. We have already invited a orthopedical professor, a native English speaker, to polish the manuscript.

Corresponding revisions in manuscript:

1. Introduction. “Limited by the lag in radiology, previous researches related to the damage of hip external rotators were almost confined to the functional analysis, lacking the muscular morphological assessment[3-6]. With the development of imaging technology, magnetic resonance imaging (MRI) has been the gold standard for muscles evaluation. It was already applied as the most direct evidence of approach-related muscles trauma in some clinical studies recently[7,8].” has been changed into ”Various studies have confirmed the muscle damage to the short external rotators via posterior THA from cadaveric tests, electromyography(EMG), biochemical serum markers and gait analysis[3-6]. However, there was still a lack of consensus on the extent of the muscle damage and the necessity of the muscle repair. With the development of imaging technology, magnetic resonance imaging (MRI) has been the gold standard for muscles evaluation, especially the muscular morphological changes[7,8].” (Introduction section, Line 6-13, Page 5).

2. Discussion. 1) The main finding of the study has been moved at the beginning of the section. (Discussion section, Line 6-10, Page 12).

2) “However, the research conclusions without muscle morphology analysis could not be entirely convincing.” has been changed into “Several pathologic researches have already identified that loss of tendon-bone adhesion could lead to muscle atrophy and fatty infiltration[17,18]. In theory, there was no doubt that the detachment of the muscle tendon intraoperatively could cause the injury to the short external rotators. Still, the research conclusions without muscle morphology analysis could not be entirely convincing.” (Discussion section, Line 12-18, Page 12).

3) “The muscular modeling process contained all the recognizable MRI slices of external rotators, using the multidimensional dataset to provide a more visualized and reliable result for further analysis.” has been changed in to “Therefore, this study not only confirmed the previous research conclusions, but also further presented the extent of the muscle injury quantificationally.” (Discussion section, Line 9-11, Page 13).

4) “The previous studies related to the surgical injury of external rotators, whether to repair them and the effect of repair provoked some other controversy.” has been changed into “Muscle injury is inevitable, so how to minimize the injury seems more important. The previous studies related to the surgical injury of external rotators, whether to repair the muscles or not and the effect of repair provoked some other controversy.” (Discussion section, Line 15-18, Page 13).
5) “Despite plenty of debate, none of these researches was based on the differences in postoperative muscle recovery of external rotators. Undoubtedly, the muscle quality of external rotators directly determines the external rotation function as well as the joint stability.” has been changed into “Undoubtedly, the morphology and the quality of the short external rotators directly determine the muscular function as well as the joint stability[31]. Nevertheless, few studies have focused on its changes whether did the repair or not.” (Discussion section, Line 6-9, Page 14).

6) “In addition, as the anatomical characteristic of the short external rotators, the root of the internal obturator muscle is connected to the levator ani muscle which is closely involved in supporting the pelvic organs. Tomonori Baba et al. found that the symptoms of urinary incontinence were significantly aggravated after THA via the posterior approach due to the internal obturator muscle damage. If the tension and strength of the external rotators recovers, support of the pelvic organs and urinary incontinence may be improved[32]. Although there were no postoperative complications of prosthesis dislocation and urinary incontinence in this study, the muscle damage as well as the significant effects of the effective muscle repair was obvious. More interestingly, Tetsu Yamaguchi et al. found that the reconstruction of the short external rotators had significantly higher abduction muscle strength and external rotation muscle strength, and it could improve joint stability without limiting range of motion(ROM)[33].” has been added between “In our research, the results demonstrated the more obvious degeneration of the incised but unrepaired muscle comparing to the repaired.” and “Therefore, we recommend the reattachment of the detached external rotators if conditions permit.” (Discussion section, Line 14-22, Page 14; Line 1-6, Page 15).

7) “Moreover, in order to further explore the value of the repair, a extended analysis about the effects of posterior reconstruction on the important hip muscle groups has been in progress.” has been added at the end of “Discussion section”. (Discussion section, Line 14-16, Page 15).


The corresponding order of the references has been also updated.

The corresponding abbreviation has been also updated.

We seriously appreciate your valuable comments on the overall framework of this study.

Reviewers’ comments to author(Reviewer 2):

1. Title. I think the title "Surgical injury and repair of hip external rotators via posterior THA" should be "Surgical injury and repair of hip external rotators in THA via posterior approach".

Our answer:

Thanks for your comment. We agree with the reviewer’s suggestion.

Corresponding revisions in manuscript:
The title of the manuscript has been changed into “Surgical injury and repair of hip external rotators in THA via posterior approach: A three-dimensional MRI-evident quantitative prospective study”. (Title section, Line 1-3, Page 3).


Our answer:

Thanks for your comment. We agree with the reviewer’s suggestion.

Corresponding revisions in manuscript:

“K-L approach” has been changed into “Kocher-Langenbeck approach”. (Introduction section, Line 1-2, Page 5).

3. Methods. 1) The implant data used in this study must be shown in detail. It is very important. Which cup, liner, stem, and head were used? What were those materials? For example, titanium, cobalt chrome, stainless steel, ceramic, polyethylene, and so on.

Our answer:

Thanks for your comment. We completely agree with the reviewer’s suggestion. We have added the type and the material of our prosthesis in manuscript.

Corresponding revisions in manuscript:

“The prosthesis for each patient were all biological type. The material of femoral stem(LCU or Ribbed) and acetabular cup(T.O.P or Combi cup) were titanium alloy. In addition, the acetabular lining was high-crosslinked polyethylene and the femoral head was ceramic.” Has been added in manuscript. (Material section, Line 2-5, Page 7).

2) Please describe the method of reattachment in greater detail.

For example, what kind of thread did you use? How did you reattach the capsule and tendon? Did you make suture holes to the greater trochanter? If.

Our answer:

Thanks for your comment. We are in full agreement with the reviewer’s suggestion. We have added the detail of the rettachment in manuscript. Since the contracture of the piriformis was severe, we couldn’t perform the in-situ reattachment which was mentioned in “Discussion section”.
Corresponding revisions in manuscript:

“Only the tendon of the piriformis in combination with the posterior joint capsule was non-in-situ reattached on the posterior part of femoral great trochanter (Figure 2).” has been changed into “Only the tendon of the piriformis in combination with the posterior joint capsule was non-in-situ reattached through a suture hole on the posterior part of femoral great trochanter using the non-absorbable suture (Ethibond) (Figure 2).”

4. Results. In the hip OA patients whom THA is indicated for, preoperative hip range of motion is usually often limited as compared with a contralateral healthy side; particularly internal rotation. From my experience, most hip OA patients can not internal rotate more than 30 degree because of pain or head deformity. However, in this series, most patients could internal rotate almost 40 degree preoperatively, as same as contralateral healthy side. I cannot trust this clinical data about range of motion.

Our answer:

Thanks for your comment. As an experienced orthopedic specialist, your doubts are entirely logical and valid. We also had a heated discussion about this issue. Finally, we concluded the following reasons according to our actual situation. a) Most of the patients included were peasants or blue-collar workers, whose pain sensation threshold was higher than the average level, which also could be reflected by the VAS pain score. b) Most of the patients have routinely taken the NSAIDS or some other pain relievers which might partly reduce the activity pain. c) Among the 56 patients enrolled, only 3 were OA, while the rest were ANFH and DDH with just mild or moderate deformity. d) Since the patients enrolled have signed informed consent, their subjective initiative might also affect the measurement results.

We look forward to discussing in-depth on this issue with you.

5. Discussion. The authors should mention in the discussion part about theoretical effect of the short external rotator muscle insufficiency for the hip joint function, pelvic floor muscles function, or urinary function, and real effect after THA via posterior approach. I think the insufficiency is usually can be ignored after THA.

Our answer:

Thanks for your comment. We appreciate your suggestion and we are very sorry for our negligence of considering the theoretical effect of the short external rotator muscle insufficiency for the pelvic floor muscles function, or urinary function. We do find that the integrity of the short external rotators is important to the pelvic floor muscles function and urinary function. However, there were no any related postoperative complications in our study. As you stated, it might be the theoretical effect which usually can be ignored after THA. And, the effect of the short external rotator muscle insufficiency for hip joint function has been mentioned in manuscript. (Discussion section, Line 14-18, Page 13).
Although there were no postoperative complications of prosthesis dislocation and urinary incontinence in this study, the muscle damage as well as the significant effects of the effective muscle repair was obvious. Therefore, we recommend the reattachment of the detached external rotators if conditions permit.

Corresponding revisions in manuscript:

“Tomonori Baba et al. found that the symptoms of urinary incontinence were significantly aggravated after THA via the posterior approach due to the internal obturator muscle damage. If the tension and strength of the external rotators recovers, support of the pelvic organs and urinary incontinence may be improved[29]. Although there were no postoperative complications of prosthesis dislocation and urinary incontinence in this study, the muscle damage as well as the significant effects of the effective muscle repair was obvious.” has been added in manuscript and the corresponding reference “29. Tomonori Baba, Yasuhiro Homma, Naoko Takazawa, Hideo Kobayashi, Mikio Matsumoto, Kentaro Aritomi, Takahito Yuasa, Kazuo Kaneko. Is urinary incontinence the hidden secret complications after total hip arthroplasty?. Eur J Orthop Surg Traumatol. 2014; 24: 1455-1460.” has also been updated.(Discussion section, Line 13-18, Page 14; Reference section, Line 9-13, Page 20).

Special thanks to you for your helpful comments as well as your patience.