Author’s response to reviews

Title: Hip stability after total hip arthroplasty predicted by intraoperative stability test and range of motion: a cross-sectional study

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Author’s response to reviews:

Authors's response to editor and reviewers' comments is attached as Supplementary Material.

AUTHORS’ RESPONSE TO EDITOR AND REVIEWERS’ COMMENTS 9/9/2018

Dear editor/reviewers

Many thanks for taking the time and suggest ways to improve our manuscript. The manuscript has been revised according to the editor and reviewers’ comments. A point-by-point reply is given below. The line, figure and table numbers noted in the replies refer to the revised manuscript. In the following response, the editor and reviewers’ comments are shown in italics (italic font is not available in this part) and our responses appear immediately below in normal type. In the revised manuscript, changes are indicated in the text by highlighting.

Comment from Dr. Sebastian Mukka (Editor):
Q1: Regarding ROC curves, the authors could present two analyses as mentioned by one of the reviewers.

Reply: We agree with editor and reviewer’s comments. In the revised manuscript, two cutoff points are presented; one is IR angle same as before (51°) and the other IR angle is 67°, with a sensitivity of 0.8.

We added below sentences in the Results and Figure legend.

Page 10; Line 112-113; Page16; Line 207-208:
‘When a sensitivity was 0.8, IR angle was 67°, with a specificity of 0.6, a positive likelihood ratio of 2.1, and a negative likelihood ratio of 0.3.’

We also added below sentences in the Discussion, Abstract, and the Conclusions.

Page 12; Line 151-153:
‘Because it is important for surgeons to have an intraoperative stability test with a high sensitivity and our results showed IR angle was 67° when a sensitivity was 0.8, we also suggest 67° to be the severe criteria of cutoff point for IR angle.’

Page 3; Line 13-14:
‘The receiver-operating characteristic curve analysis suggested that the cutoff points for IR angle were 51° and 67°.’

Page 3-4; Line 19-20:
‘51° and 67° were indicated as cutoff points for IR angle.’

Page 15; Line 191-192:
‘and 67° was also indicated as the severe criteria of cutoff point for IR angle.’

Comments from Dr. Maziar Mohaddes (Reviewer 1):

Q1: This prospective study is performed on a relatively substantial cohort of patient with meticulous measurement of IR peroperatively. Due to low risk of dislocation following THR, I
have concerns for this study not being sufficiently powered. This is evident in particular when performing a logistic regression (1-5), trying to control for the difference between dislocators and non-dislocators.

Reply: We understand the limitations of logistic regression analysis from the reviewer’s comments with references. We again discussed our analyses with a statistician for modifying our analyses and manuscript.

Jolles et al. reported a case control study to investigate the factors related with dislocation after total hip arthroplasty (THA) [1]. In their study, 21 patients with dislocation from 2023 primary THAs were matched with 21 patients without dislocation, who constituted the control group. The statistical analysis was twofold: First, a univariate analysis was performed comparing each variable in the two groups. Second, a multivariate analysis was performed using 6 variables.

In this reply, 10 patients with posterior dislocation were matched with 10 patients without dislocation trying to control for the difference between dislocators and non-dislocators, similar to Jolles et al. [1]. The patients were computer-matched by age and gender. Logistic regression analyses were performed using all eight variables; age, height, weight, gender, cerebral dysfunction, preoperative diagnosis, history of previous hip surgery, and IR angle, and using three variables (cerebral dysfunction, history of previous hip surgery, and IR angle) that were statistically significant in a chi-square test or a nonparametric Mann-Whitney U test. Any variables were not statistically significant in logistic regression analyses. We think this is due to a small number of patients included in the analyses (10 patients for each group).

Editor previously pointed out ‘Statistics: highlighten your power calculation, include baseline data in the multivariate log reg calculation,’ as Editor’s comments to our first submission(submitted May 05). Our reply to previous editor’s comment, especially for logistic regression analysis, was below.

Logistic regression analysis

In our previous manuscript (our first submission; submitted May 05), logistic regression was performed using the variables that were statistically significant in a chi-square test or an unpaired t-test. So, cerebral dysfunction, history of previous hip surgery, and IR angles were used as the variables, and logistic regression analyses determined that significant risk factors were the presence of cerebral dysfunction, history of previous hip surgery, and IR angle. In the revised
manuscript (our previous Revision 1; submitted July 09), logistic regression was performed using all eight variables; age, height, weight, gender, cerebral dysfunction, preoperative diagnosis, history of previous hip surgery, and IR angle. Logistic regression analyses determined that significant risk factors were same as before; the presence of cerebral dysfunction, history of previous hip surgery, and IR angle. So, we think logistic regression analyses in this study are robust.

Above reply to previous editor’s comment may be a part of our response to reviewer’s comment, but we think it is not enough. In our analyses, we used all eight variables and found three variables were statistically significant. So, we changed the sentence in the Results.

Page 10; Line 116-118:

‘Adjusting with age, height, weight, gender, and preoperative diagnosis, we observed that significant risk factors were the presence of cerebral dysfunction (OR: 5.3 (95%CI 1.1-25.9); p=0.037), history of previous hip surgery (OR: 8.6 (95%CI 1.2-63.0); p=0.035), and IR angle (OR: 10.4 (95%CI 1.9-57.1); p=0.007).’

We also checked the number of patients and the number of the variables in other studies investigating the factors related with dislocation after THA using logistic regression analysis.

<table>
<thead>
<tr>
<th>Patients(n)</th>
<th>Hips with dislocation(n)</th>
<th>Variables in regression models(n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woolson [2]</td>
<td>315 (315 hips)</td>
<td>14</td>
</tr>
<tr>
<td>Jolles [1]</td>
<td>42 (42 hips)</td>
<td>21</td>
</tr>
<tr>
<td>Sierra [4]</td>
<td>142 (150 hips)</td>
<td>8</td>
</tr>
<tr>
<td>Krezel [5]</td>
<td>2948 (3379 hips)</td>
<td>94</td>
</tr>
<tr>
<td>Peter [6]</td>
<td>2341 (2734 hips)</td>
<td>50</td>
</tr>
<tr>
<td>Fujishiro [7]</td>
<td>1294 (1555 hips)</td>
<td>50</td>
</tr>
<tr>
<td>Danoff [8]</td>
<td>- (1289 hips)</td>
<td>42</td>
</tr>
<tr>
<td>Yoshimoto [9]</td>
<td>162 (178 hips)</td>
<td>16</td>
</tr>
</tbody>
</table>
Although several studies included large number of patients, the number of patients with dislocation and without dislocation, and the number of variables in our study seem to be similar to several studies.

From above consideration, we think our analyses and manuscript revised according to editor and reviewer’s comments are reasonable. However, we hope to hear reviewer’s recommendations for modifying our manuscript, if reviewer think our response is not enough.

References:


Comments from Dr. Volker Otten (Reviewer 2):

Q1: At first the measurement of internal rotation itself. In the M&M section it is stated that internal rotation was measured "similar to Sultan et al" and even in the article that the text is referring to the description of the measurement is relatively vague. Measurement of internal rotation as described can be challenging. Did the authors perform any double examination of the measurements to determine the repeatability of this test or any accuracy test? If so for this study or in any earlier study, this should be mentioned otherwise this should be discussed in the discussion section. In the discussion section, line 168/169 it is stated that "A navigation system was used to measure intraoperative ROM accurately." This sentence is confusing in the context of the M&M section where no use of a navigation system is mentioned. This should be clarified.

Reply: We investigated the repeatability of IR angle measurements. During surgery, we measured the IR angle three times in three patients.
<table>
<thead>
<tr>
<th>Patient</th>
<th>IR angle (degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First</td>
</tr>
<tr>
<td>1</td>
<td>65</td>
</tr>
<tr>
<td>2</td>
<td>71</td>
</tr>
<tr>
<td>3</td>
<td>63</td>
</tr>
</tbody>
</table>

The intraobserver reproducibility was calculated using interclass correlation coefficient (ICC). Because the measurements of IR angle in this study were done by the single surgeon and the same assistant surgeon, the interobserver reliability was not investigated.

The intraobserver reproducibility was excellent with 0.975 (95%CI 0.822-0.999).

We added below sentences in the Discussion.

Page 13; Line 173-177:

‘To investigate the repeatability of IR angle measurements, the IR angle was measured three times in three patients during surgery. The intraobserver reproducibility was calculated using interclass correlation coefficient. The intraobserver reproducibility was excellent with 1.0 (95%CI 0.8-1.0). Because the measurements of IR angle in this study were done by the single surgeon and the same assistant surgeon, the interobserver reliability was not investigated.’

And we deleted the sentences, ‘A navigation system was used to measure intraoperative ROM accurately [26]. The accuracy of IR angle measurement used in this study is not known.’ in the Discussion.

Q2: The second major point regards the statistic used and the presentation of the results in table 1. The parametric unpaired t-test is used to compare continuous variables, especially the intraoperative internal rotation possible before dislocation. It should be tested if the results of
internal rotation are normal distributed in both groups, and if not, a non-parametric test should be preferred. Furthermore, I would suggest to use mean values (range) for internal rotation in table 1.

Reply: In the revised manuscript, statistical analysis was done using a nonparametric Mann-Whitney U test for continuous variables. So, we changed the sentences in the Methods.

Page 8; Line 84-85:

‘For continuous variables, the normality of the data was assessed using Shapiro-Wilk test, and statistical analysis was done using a nonparametric Mann-Whitney U test.’

We changed p values in Table 1 and the Results. Statistical significance was not changed from previous manuscript.

And we added ‘(range)’ for continuous variables in Table 1.

Q3: The third major point is the chosen point from the ROC curve. As a clinician it is probably most important to have a per operative test with high sensitivity for the risk of later dislocation. The authors picked a cut-off point with a very specificity but with a relatively low sensitivity. Fig 2 indicates that it is possible to pick a cut-off point with a sensitivity of 0.8 and still have a sensitivity of about 0.65. In my opinion this would be even more useful in clinical work.

Reply: We agree with editor and reviewer’s comments. In the revised manuscript, two cutoff points are presented; one is IR angle same as before (51°) and the other IR angle is 67°, with a sensitivity of 0.8.

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Q4: In the "Methods" section, line 58 "… without posterior capsule repair" It should also be mentioned the neither the external rotators are repaired. This information is given in the discussion section but should also appear here.

Reply: We changed the sentence in the Methods.

Page 6; Line 57-58:

‘All of the procedures were performed in the lateral decubitus position, using a posterolateral approach without posterior capsule or external rotator repair.’

Q5: In the "data collection" section, line 80 it should be clarified if only clinic and hospital records from one hospital or from the hole regions were used. This might be important in case any patients have been treated for dislocation in other hospitals.
Reply: All patients in this study have been routinely followed-up at one clinic. So, we can know the dislocation rate, even if dislocation was treated in other hospitals. Our previous statement in the Methods was not clear, so we changed the sentence.

Page 7; Line 80-81:

‘All patients included in this study were routinely followed-up at one clinic, and dislocation rates were obtained through clinic records.’

Q6: In table 2 the reference angle for IR should be 51° instead of 55° according to the text in the result section In figure 2 on the y-axis it should show 0.4 and 0.6 instead of 4 and 6.

Reply: We fixed Table 2 and Figure 3.

Q7: I would suggest to use only one decimal in all numbers besides p-values.

Reply: We changed the manuscript.

Q8: In the results section line 105/106, the sentence "In the patients without dislocation … compared with patients who had a dislocation." does not add any information and is rather confusing. I would suggest to delete this hole sentence.

Reply: The sentence was deleted.
Q9: A boxplot with measured angles of internal rotation for the group without dislocation and the group with dislocation might be helpful to visualize the variety of measured IR angles in both groups.

Reply: In the revised manuscript, we added box-plots of IR angles as Figure 2.