Author's response to reviews

Title: Influence of bi- and tri-compartmental knee arthroplasty on the kinematics of the knee joint

Authors:

Markus Wünschel (Markus.Wuenschel@med.uni-tuebingen.de)
JiaHsuan Lo (Joshualo@umich.edu)
Torsten Dilger (Torsten.Dilger@kabelbw.de)
Nikolaus Wülker (Wuelker@med.uni-tuebingen.de)
Otto Müller (Otto.Mueller@med.uni-tuebingen.de)

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Author's response to reviews: see over
Response to Reviewers’ comments:

Thanks for the points and suggestions from the reviewers. We appreciate the time and efforts you spent on the review. Author responses to Reviewer Points and associate Editors’ comments are given in italics below:

Associate Editor’s comments:

Your manuscript entitled " Influence of bi- and tri-compartmental knee arthroplasty on the kinematics of the knee joint" which you submitted to BMC Musculoskeletal Disorders, has been reviewed. The reviewer comments are included at the bottom of this letter.

The reviews suggest that the manuscript undergo major revision and I agree. Please consider the suggestions of both reviewers. Please return the revised manuscript with a separate word document describing how you addressed the comments of both reviewers. Please re-organize the figures as they are not presented clearly. Make sure figures can ?stand alone?. Again, please pay close attention to all comments the reviewers made and address each comment as a response and clearly show what was added/changed/removed in the text. Also, please carefully edit your paper and check grammar.

Figures have been reorganized to improve presentation. The whole manuscript was edited to improve grammar.

Copy-editing

Further consideration of your manuscript is conditional on improvement of the English used - please bear in mind that as we are a free-access publisher, we cannot bear the costs of copyediting English ourselves. Please ensure particular attention is paid to the abstract. You should have a native English speaking colleague help you with this, if possible, or use a commercial copyediting service. Examples are those provided by the Manuscript Presentation Service (www.biomedes.co.uk), International Science Editing (http://www.internationalscienceediting.com/) and English Manager Science Editing (http://www.sciencemanager.com/). BioMed Central has no first-hand experience of these companies and can take no responsibility for the quality of their service.

The manuscript has been revised by a native English speaker.

We would be grateful if you could address the comments in a revised manuscript and provide a cover letter giving a point-by-point response to the concerns.

See below.
I believe the investigation is well conceived although I do have some concerns:

**Major Compulsory Revision**

There are certain statements provided throughout the manuscript that need to be revised. I will try to point out the location even though it might be difficult considering there is no line numbering for precise referencing.

**Line numbering has been added.**

In the results of the abstract the authors mention "TKA and BKA+ were similar in translation compared to the intact knee". I don't think this statement is appropriate and could lead to misinformation considering that with no ACL the greatest differences in translation would be more evident in full extension, which was not evaluated in this study.

*We agree to the reviewer's comment, since our tests were performed from 15-90 degrees of flexion. The paragraph has been modified as listed below to clarify the statement.*

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"Within the tested flexion range (15 to 90 degree of flexion), there was no significant difference in the anterior-posterior translation among intact, BKA+, and TKA knees."
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In the background the authors mention "UKA has been reported with excellent results comparable to those of TKA in longitudinal studies". I believe this statement should be revised considering there is certainly many articles published that show high revision rates for unicompartmental knee compared to TKA. As a reference example a recent article published in 2010 (Clin Orthop Relat Res (2010) 468:64–72) by Parratte demonstrated a revision rate at about 15 years of almost 50%.

*The revision rate Parratte et al. demonstrated refers to the combination of UKA and patellofemoral arthroplasty (PFA). From the 27 revisions they found, 20 were caused by an isolated loosening of the patellofemoral implant [1]. The 17-year survival rate of 78% for the bicompartamental arthroplasty was much better. Others also found good clinical results and survivorship after UKA [2]. The main reason for failure in our opinion is the isolated PFA as shown by Parratte et al.*
We agree that especially at the beginning of performing UKA high revision rates were found due to implant failure or technical shortcomings and that e.g. transforming a UKA to a TKA remains problematic [3]. The paragraph was changed to improve comprehensibility.

Through out the manuscript when the authors compare translational and rotational knee joint kinematics amongst the native knee and other designs it is important to not mislead the reader and mention the degrees at which the evaluations were performed (30-90). The term “similar” as a comparison between two devices, specifically when it comes to TKA, shouldn’t be used. As mentioned previously the greatest translation has been seen in full extension, data that wasn’t evaluated in this investigation.

Our evaluation was performed from 15-90 degrees of flexion (not 30-90). This surely is a shortcoming of the study but inevitable since the kinemator is operated fully force-controlled. This topic is discussed in the discussion-section of the manuscript. The word “similar” was replaced throughout the manuscript.

Minor Essential Revisions
I suggest that to better observe and follow the purpose of the study the authors should focus on following a structured design. After stating the objectives (1,2, and 3), the description of the results and discussion should follow the same pattern and address the stated objectives in that same order.

Manuscript was changed to maintain a consistent pattern.

Level of interest: An article of importance in its field
Quality of written English: Acceptable
Statistical review: No, the manuscript does not need to be seen by a statistician.
Declaration of competing interests: I declare that I have no competing interests
Reviewer's report
Title: Influence of bi- and tri-compartmental knee arthroplasty on the kinematics of the knee joint
Version: 2 Date: 23 November 2010
Reviewer: Denis Brunt
Reviewer's report:

This cadaver study investigated knee kinematics during progressive loading in different simulated surgeries. In general the paper is well written and organized. Please consider the following comments to improve the manuscript.

Abstract

It is unclear as to what you mean by muscle-loaded flexions. Can this be rephrased.

*We have either deleted or rephrased the expression as “simulated weight-bearing flexion”.*

Background

Is there another term for leg-axies. axies is incorrect spelling.

*Leg-axis has been changed to mechanical axis.*

ACL does not need to appear in parenthesis both in the abstract and text.

*The parentheses have been removed accordingly.*

Are there previous data to show that the cadaveric knee actually simulates normal knee motion. It seems some data should be presented to show this.

*In our setup the tibiofemoral kinematics during flexion is comparable to the results published in previous weight-bearing in vivo studies [4-6].*

*We agree that a cadaveric study never can reflect the exact physiological condition. This applies to any in vitro study, yet we believe that in vitro studies are still necessary to test the influence of different invasive conditions on joints, since this cannot be done in vivo because of obvious ethical reasons.*

*To stress this fact, a paragraph in the discussion has been changed.*

Methods

How do the actuators generate motions of the muscles. Surely it is the motion of the tibia as determined by muscle forces. The meaning of muscle movement, which occurs later, is also unclear.
We agree that the description may not be clear concerning the way we simulate muscle forces. Now we replaced the term “muscle movement” by “muscle force” (line 117) to avoid the confusion, since in fact we adjust the muscle force by controlling the movement of the respective actuators. The paragraph that explain the generation of joint movement and muscle forces have been rewritten as (line 133-148):

“To generate the weight-bearing knee flexions, the main actuator produced a continuous, descending motion of the hip assembly from 15 to 90 degrees of knee flexion with a constant rate of 1 deg/s. During this movement, the control system dynamically adjusted the muscle cable tension by varying their lengths so as to maintain a constant resulting ground reaction force on the ankle joint. The reaction force on the ankle joint, which holds equilibrium with the applied muscle forces quasi-statically, was assumed to characterize the amount of body weight. In order to prevent the tendon ruptures caused by excessive muscle forces [7], we selected a conservative ankle force of 50 Newton to simulate a portion of the body weight, which required the quadriceps-actuators to pull with a linearly rising force and a maximum of approximately 600N at 90 degrees of flexion. During knee flexion, the three quadriceps forces were always maintained identical to one another, while the hamstrings forces were kept constant at 10 N. A constant hamstring force was used to simplify the control algorithm and to reveal the effects of other factors of research interests. This knee flexion with a 50 N simulated partial body weight was repeated twice for each of the four different parameters.”

Should be unconstrained not ‘unconstraint’ tibiofemoral movements.

The typo has been corrected.

Would not motion of the hip move the knee from 15 to 90 degrees and not 90 to 15.

Correct ! This has been corrected in the text.

Do you need both Figure 1 and 2. One could easily use just Figure 2 but with improved labeling of the actuators and tendons.

We agree, the figures can be joined together if illustrated carefully. Therefore we present now a new figure with improved labelling. The text in the manuscript (figure captions as well) has been changed accordingly. In order not to overcrowd the figure we now show just the orientation of one of the knee coordinate systems.

How figure 3 is referenced in the text is different from the caption. For example, the figure does not show soft tissue balancing.

Changed referencing in the text.

Is there a reason you chose 10Hz. Granted motion was only 1 deg/s

Thank you for the observation. 10 Hz was a typing error. Actually we used 1 Hz. (We changed this in the text)
Results

Figures 4 and 5 need improvement. How they were presented to the reviewers is inappropriate. Error bars need to be changed so that they do not overlap. If this is not possible then an alternative way of showing variability should be explored.

The figures have been modified so that the error bars do not overlap.

Discussion

How reasonable is it to compare cadaver studies for translation to in vivo data as you do in the second paragraph of the discussion. Should there be discussion as to why you found differences as you do with internal rotation and also alluded to in limitations. See comment in background

See response above (Background). Using cadaveric models of course simplify matters compared to the in vivo situation. They are used to test hypotheses which can not be tested in vivo. Since our results resemble the kinematics found by in vivo studies we think we still can elucidate relevant information while minimizing interspecimen variation.

Level of interest: An article whose findings are important to those with closely related research interests
Quality of written English: Needs some language corrections before being published
Statistical review: No, the manuscript does not need to be seen by a statistician.
Declaration of competing interests:
I declare that I have no competing interests

Reference List


