Author's response to reviews

Title: Association between knee alignment and knee pain in patients surgically treated for medial knee osteoarthritis by high tibial osteotomy A one year follow-up study

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Author's response to reviews: see over
Comments to the reviewer

We thank you for your very constructive criticism. We have considered all suggestions and made changes accordingly as outlined below.

Below you find our comments *(in italics)* to your comments inserted directly after each of your comments followed by the actions taken.

**Reviewer 1:**
1. BMI and other possible confounders were adjusted for in this multivariate analysis! I wonder if adjusting for height in this study would change the results? Have the authors tried this in their analysis?

*Answer:* To find out about the influence of height we changed BMI to height in the analysis. Including height change the results in the way that height has no relation to preoperative pain (0.26 CI -0.02 – 0.55, p 0.69). Neither did height have any relation to change in pain (0.11 CI -0.26 – 0.47, p 0.57).

*Action:* No action.

2. I am not too familiar with the AHL system for radiographic grading, I have a feeling a number of readers will feel the same! Any reason why K&L system was not used (Gold standard!)?

*Answer:* The Ahlbäck classification is used especially in northern Europe and by orthopaedic surgeons. The Ahlbäck system classifies as well as differentiates OA in patients with a more severe grade of OA than the classification of Kellgren & Lawrence that may be useful in the decision of alternative of surgical treatment.

*Action:* The paragraph on Alhbäck in the discussion part was rephrased: The Ahlbäck system differentiates more severe grades of OA than the classification of Kellgren & Lawrence which is useful in orthopedics and decisions relating to surgical treatment.

3. HKA; need to spell out full form at start in the text, regardless of the abstract!

*Action:* HKA has been spelled out.

**Reviewer 2:**

Background
1. Clear. Need to space out paragraph 1 and 2.
**Methods**

1. Why include an assessment of the patellofemoral joint when it is not an outcome in this study?

   **Answer:** The axial view of the patellofemoral joint is a part of the routine radiographic evaluation and should thus be described in the methods section.

   **Action:** No action.

**Results**

1. What should the audience make of a pre-operative KOOS of 42? Is this rather low for a cohort of people undergoing operative intervention?

   **Answer:** Preoperative KOOS pain of 42 points is considered as severe pain. Patients waiting for knee arthroplasty surgery report similar preoperative KOOS pain.

   **Action:** An addition is made to the discussion: The mean KOOS Pain score of 42 is comparable to a preoperative score of 38 seen in patients having total knee replacement [24], indicating patients undergoing high tibial osteotomy having severe pain preoperatively.

2. Is a mean change of 13 degrees, in surgical terms, considered a successful outcome? I presume because most knees achieved 4 degrees valgus, this is considered a surgical success?

   **Answer:** 13 degrees in mean change is considered successful if the preoperative HKA-angle is 9 degrees of varus. The mean change in knee HKA-angle was 13 degrees (meaning the number of degrees from the preoperative HKA-angle (varus) to the HKA-angle achieved (4 degrees of valgus) when the correction was done). The goal of correction is 4º valgus for the varus knee independent of preoperative HKA-angle.

   **Action:** No action.

3. Why, logically, would pre-operative knee pain be associated with change in knee angle post-operatively? I do not understand the rationale for considering this question.

   **Answer:** It’s not what we studied. We evaluated the association of change in pain, (preoperatively to the one-year follow-up) to change in HKA-angle (preoperative to the postoperatively achieved HKA-angle). The rationale for analysing this association is the belief that severer grade of preoperative HKA angle may be related to less improvement in pain.
Action: An addition has been made to the second paragraph: The rationale for analysing this association is the belief that higher grade of preoperative HKA-angle may be related to less improvement in pain.

4. Can you provide evidence that there was a significant improvement in knee pain from the procedure, independent of angle? This could strengthen your conclusion that it is not necessarily change in angle that is associated with change in pain. Such data helps to still justify the short-term utility of HTO.

Answer: The mean change in KOOS pain (preoperatively to the one-year follow-up) was 32 points (unadjusted). It is the change in HKA-angle i.e. altering the load from the damaged medial compartment to the healthier lateral compartment, which improves pain. However the size of correction is not associated to change in pain (for each degree of change of HKA-angle the patients’ changed KOOS pain by 0.4 points).

Action: An addition has been made to the discussion part, last sentence in the paragraph dealing with Assessment and interpretation of pain:
The mean improvement from high tibial osteotomy was 32 points at one year compared to 45 at one year after total knee replacement [24], indicating the effect of high tibial osteotomy being nearly as large as that from total knee replacement.

Discussion.
1a. Opening paragraph – the last two sentences are clumsy.

Answer: The last two sentences have been rewritten and moved forward to a third paragraph also including possible weaknesses of the study.

Action: A strength of our study is the wide range of HKA angle and KOOS pain both preoperatively and over time. If there were any associations between preoperative HKA-angle and preoperative pain, or between change in pain and change in HKA-angle, the study had the possibility to detect them. We used the Ahlbäck classification [8] to determine the OA severity. The Ahlbäck classification, used especially in orthopedics and in northern Europe, primarily focus on reduction of the joint space as an indirect sign of cartilage loss while the more commonly used classification according to Kellgren & Lawrence takes osteophytes, joint space narrowing or both into account [9]. The Ahlbäck system differentiates more severe grades of OA than the classification of Kellgren & Lawrence which is useful in orthopedics and decisions relating to surgical treatment. The agreement between K&L grade 2-3 and Ahlbäck grade 1 as well as K&L grades 3-4 versus Ahlbäck grades 1-2 has been shown to be good (k 0.76 and 0.78) [20].

1b. A better use of this space would be to justify the importance of this study’s findings to potential clinical utility, or in the case of this study, to even disperse certain myths that
it is the change in knee angle which may mediate the reduction in pain seen post-operatively from HTO.

Answer: Patients with more severe varus alignment experience similar pain relief from high tibial osteotomy with the hemicallotasis technique as patients with less varus alignment. It is the change in HKA-angle (alignment) i.e. altering the load from the damaged medial compartment to the healthier lateral compartment, which improves pain from HTO. We have moved the paragraph explaining the clinical value of the study to become the second paragraph of the discussion.

Action: To our knowledge the association of alignment and pain has not previously been assessed in patients undergoing an intervention improving malalignment. The rationale for analysing this association is the belief that higher grade of preoperative HKA-angle may be related to less improvement in pain. However our results indicate that patients with more severe varus alignment experience similar pain relief from high tibial osteotomy by the hemicallotasis technique as patients with less varus alignment which could be a valuable knowledge in the patient selection.

2. The second paragraph is out of place and perhaps redundant. It could be incorporated elsewhere, but in it’s current form, needs to be removed.

Answer: That we used the Ahlbäck classification may be a weakness or at least different as the classification of Kellgren & Lawrece is more commonly used. This paragraph has been rewritten.

Action: The Ahlbäck system differentiates more severe grades of OA than the classification of Kellgren & Lawrence which is useful in orthopedics and decisions relating to surgical treatment. The agreement between K&L grade 2-3 and Ahlbäck grade 1 as well as K&L grades 3-4 versus Ahlbäck grades 1-2 has been shown to be good (k 0.76 and 0.78) [20].

3. The third paragraph’s agenda strays away from the aim of the study. I do not understand why the authors have chosen to write their discussion in a disjointed fashion.

Answer: That patients with more severe varus alignment experience similar pain relief from high tibial osteotomy by the hemicallotasis technique as patients with less varus alignment is of clinical value in the patient selection.

Action: The paragraph has been rewritten and moved to become the second paragraph. To our knowledge the association of alignment and pain has not previously been assessed in patients undergoing an intervention improving malalignment. The rationale for analysing this association is the belief that higher grade of preoperative HKA-angle may be related to less improvement in pain. However our results indicate that patients with more severe varus alignment experience similar pain relief from high tibial osteotomy by the hemicallotasis technique as patients with less varus alignment.
4. Paragraph 4 is cursory. This needs to be thoroughly expanded upon.

Answer: The paragraph has been rewritten.

Action: Our results differ from previous reported results on the relation of knee alignment and pain measuring alignment from long limb radiographs[1-3] However our results are in line with results from studies measuring alignment from anteroposterior (AP) radiographs of the knee joint [4, 5].

5. Paragraph 5. Again disjointed.

Action: We have changed our disposition of the discussion so it now starts with a brief summary of our findings followed by the clinical value, the strengths and the weaknesses of the study, and possible reasons for differences in findings compared to previous studies and finally ends with the conclusion.

6. X-ray figures are of poor quality when I view them. Can these be improved?

Action: Quality of the x-ray figures has been improved.

Reviewer 3:

1. The questions posed by the authors are substantially well defined, the methods used are appropriate and well described, the data is sound and the only thing I am missing is a power analysis of the sample size, hence pain is a multi-influence variant.

Answer: This is an observational study including several variables (preop pain, change in pain, preop HKA angle and change in alignment preop to 1 year postop) in the analysis and power calculation is not meaningful. However the narrow 95% confidence interval preop pain to preop HKA angle (95% CI -0.4 – 1) and change in pain to change in alignment (95% CI -0.6 – 1.4) shows the statistical precision. 8-10 points of the KOOS pain is considered as clinically significant.

The manuscript adheres to the relevant standards for reporting and data deposition; The discussion and conclusions are well balanced and adequately supported by the data and it is quite important to have the information published that pain is not affected by the alteration of knee axis.

Lund 2009-09-03

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