Author's response to reviews

Title: The effect of high tibial osteotomy on the results of total knee arthroplasty. A matched case-control study.

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Author's response to reviews:

REFERENCE Number: 1252195119107808

Dear Professor Kouremenou,

Please find attached our revised manuscript entitled The effect of high tibial osteotomy on the results of total knee arthroplasty: a matched case control study, which we would like to resubmit for possible publication in BMC Musculoskeletal disorders. We thank the reviewers for their valuable and constructive comments, and like to provide a point-by-point response to each of their comments. The revised paper has been checked by a native English speaker who has experience in correcting scientific manuscripts.

We would like to emphasise that our data suggests that clinical outcome of total knee replacement after proximal tibial osteotomy is almost identical to that of a matched group that had no HTO previously. We are convinced that this manuscript may be of interest for the readers of BMC Musculoskeletal disorders.

I confirm that all authors have seen and agreed with the contents of the revised manuscript. The work has not been submitted or published elsewhere in whole or in part. All authors certify that they have not signed any agreement with a commercial interest related of this study, which would in any way limit publication of any and all data. There is no conflict of interest and no funding for this work was available.

Please do not hesitate to contact me, should you have further queries.

Yours sincerely,
Reviewer's report

Title: The effect of high tibial osteotomy on the results of total knee arthroplasty. A matched case-control study.

Version: 1 Date: 2 February 2007
Reviewer: Rene Verdonk
Reviewer's report:

General

Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)
The authors have addressed a difficult subject investigating differences in results of total knee arthroplasty between postosteotomy cases and primary total knee arthroplasty. The orthopaedic world tends to believe that postosteotomy cases have worse clinical results than primary cases. Apparently the authors suggest that, but for relatively minor radiological discrepancies, no major differences are to be expected between these two types of patients. They come to this remarkable conclusion based on their correct follow-up with an outcome at a median of 3.7 years. It could be of major interest to the specialist reader to enlarge on the postoperative time required to obtain similar median clinical results. Indeed, extended investigations in the literature suggest that the improvement in mobility stops at 1 to 2 years postoperatively. One could wonder whether the index group would have required more time to reach the maximum range of motion.

Thank you for these comments. The results presented in our matched case control study do suggest a very similar clinical outcome between patients who received TKA after osteotomy and patients with primary knee replacement only. According to literature, with a median follow-up of 3.7 years (minimum of 2 years) improvement in mobility will not be likely for the group with primary TKA (controls). Most studies report no significant improvement in mobility 6 months after surgery; they also suggest a lasting effect of knee replacement on the long-term. Very few studies have reported on mobility after knee revision surgery. Deehan et al. report no significant improvement of knee mobility 3 and 12 months after knee revision surgery. Therefore we think it is justified to say that 2 years after TKA with prior osteotomy further improvement of mobility is not to be expected. In the revised paper we have extended on the postoperative time required to obtain final clinical results, and have added 2 references to the Discussion section (please see page 13, line 3 - 9):

Literature suggests that after primary knee joint replacement substantial improvements in the scores for physical health, such as those for pain and physical functioning seem to take place within the first 3 to 6 months after surgery. Studies with longer-term follow-up describe long-lasting improvement [Ethgen et al.]. Deehan et al. also found an enduring improvement in KSS at 3 and 12 months after revision surgery, which was comparable with the improvement in KSS for primary TKA [Deehan et al.]. Successive surgical revision, however, had a negative influence on reported functional outcome. In our series, after a median follow-up of 3.7 years, HSS, KSS and WOMAC scores showed inferior results for the patients who underwent TKA after tibial osteotomy; possibly due to the low numbers of patients these differences in function scores did not reach significance.

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Minor Essential Revisions (such as missing labels on figures, or the wrong use of
... after lateral closing wedge tibial osteotomy ... : which type of fixation was used? Was a plaster cast immobilization at the index surgery required? Was the hardware removed at the total knee implant surgery?

Based on the above questions we have revised the Materials and methods section (please see page 5, line 6 - 12):

A lateral closing wedge technique through a transverse incision with the patient in supine position was performed. The osteotomy was fixated with two step staples. After surgery a cylinder plaster cast was applied for 6 weeks. All patients were mobilised on the first postoperative day, and partial weight-bearing with the use of two crutches was allowed for 6 weeks. After bony healing the staples were removed in all knees except one; in 9 knees before, in 3 during, and in one knee after joint replacement.

In the discussion, the authors could enlarge on their potential expertise whether or not an opening wedge osteotomy would interfere more or less with total knee arthroplasty after a closing wedge osteotomy.

Based on these suggestions, we have expanded on the presumed effect of medial opening wedge osteotomy on subsequent TKA, and have added our comments to the Discussion section (please see pages 13 - 14, line 14 - 25 and 1 - 4; respectively):

The last decade medial opening wedge HTO with special implants for internal fixation has gained popularity in the treatment of varus gonartrosis. Opening wedge osteotomy is advocated to be technically easier and a fibular osteotomy is not required. To our knowledge no results have yet been published on the effect on subsequent TKA. However, since larger implants are necessary in open wedge osteotomy, implant removal should not be combined with total knee arthroplasty. A recent RCT showed significantly more patellar descent and tibial slope increase after opening wedge HTO compared to the closing wedge technique [Brouwer et al]. This might cause exposure and patellar eversion problems during knee replacement. The advantage of opening wedge osteotomy is preservation of bone stock with tensioning of the medial collateral ligament. This may result in a more conservative amount of bone removed during knee joint replacement. Consequently, joint line elevation by the use of a thicker than desired tibial component in balancing the ligaments, is less likely. Furthermore, unlike closing wedge osteotomy, the relative position of the medullary canal is not altered. This may facilitate tibial component placement by intramedullary guidance. Future studies, however, have to confirm whether these aspects of the opening wedge osteotomy technique influence conversion to a TKA.
Conflicting results of TKA after HTO have been reported. Some studies identify no clinical or radiographic difference in outcome for TKA with or without a previous osteotomy [Meding et al. and Staeheli et al.] while others see substandard TKA outcome after HTO [Nizard et al. and Katz et al.].

As requested, we have added the references (please see Discussion section; page 11, line 8 - 10):

Windsor et al. (1988) and Mont et al. (1994) reported on the need for lateral retinacular release to evert the patellar mechanism. Due to postoperative scarring and the development of patella infera after closing wedge osteotomy proximal to the tibial tubercle, difficulties in exposure and patellar eversion might occur. We encountered these problems in our series. We altered the section about eversion difficulties and added 1 reference. Please see below.

Patellar tendon shortening, and a decreased distance from the tubercle to the joint after closing wedge osteotomy proximal to the tuberosity, make patellar eversion more difficult [Mont et al.]. In our series we had to perform three lateral retinacular releases and one tuberosity osteotomy to facilitate eversion of the patella and the patellar ligament.

We did not encounter any infections in our series NOR DID component loosening occur in the index group IN THE COURSE OF THIS FOLLOW-UP.

We have made some changes to the Discussion section. The amentioned
comment has been deleted and we refer to the statement later in the Discussion section (please see page 14, line 14 - 16):

In our series however we did not encounter any TKA revisions because of loosening or infection in the group of patients receiving TKA after prior HTO in the course of our evaluation.

... young patients with osteoarthritis of THE MEDIAL compartment has good results. Indeed, one needs to be very precise in this respect bearing in mind the worse results after varus osteotomy.

We agree with this remark and please see page 14, line 6 - 7 (Discussion section):

Correction osteotomy in relatively young patients with osteoarthritis of the medial compartment has good results and delays knee replacement [Brouwer et al.].

... The cumulative revision rate for ... : it is not fair to state only one Swedish registry in that respect. It clearly appears from your text that you prefer valgus osteotomy for the treatment of medial compartmental arthrosis. However, extensive literature supports better long-term results after unicompartmental prosthesis compared to closing wedge valgus osteotomy !

... the significance of age in knee replacement SURVIVORSHIP : it may be even worse when considering revision !

Thank you for these very useful remarks and we have decided to focus the Discussion section on the results of the present matched case control study: i.e. TKA after prior osteotomy. In the young and active patient, HTO is a well-accepted treatment of medial gonarthrosis, and arthroplasty does not seem to be the therapy of first choice. Studies like the Swedish Knee Arthroplasty Register and Mayo Clinic total joint register underscore that knee arthroplasty at a younger age has an increased risk of prosthetic revision. We feel that it is important to report on this subject because we are obliged to our patients to investigate whether prior surgery compromises future joint replacement. However, we agree that enlarging on this subject is beyond the aim of the present study. Therefore, we have decided to leave out the statement on unicompartmental knee replacement compared to HTO in the treatment of medial gonarthrosis (please see changes; page 14, line 6 - 16).

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... In our opinion, young patients ... : please do not enlarge on this particular subject. It is not correct to blindly state your preferences in this particular paper with a very different subject. As with every surgery, correct indications will lead to
good results both in uni replacement and in alignment correction.

Please see above.

... Over the past decade 443,008 total knee arthroplasties ... : this is a very cheap conclusion.

In our opinion the subject addressed in the present study has its importance in the treatment of a common clinical problem. We have tried to emphasise the potential amount of patients treated with TKA after previous osteotomy. However we agree that this statement does not put the importance of TKA after HTO more on the stage. Therefore, we decided to minimise this particular part of the Discussion section (page 14, line 6 - 16). Also because we have added a substantial part on the presumed outcome of subsequent TKA after opening wedge HTO to the Discussion section (please see earlier).

... of patients receiving TKA after prior HTO IN THE COURSE OF OUR EVALUATION.

We have added the above comment (Discussion section; page 14, line 14 - 16). Please see also earlier.

... Especially no deep infection or ... : most infections are of late hematogenous origin. A median follow-up of 3.7 years is very short in respect to component loosening.

The follow-up period of the present study is indeed short with respect to late haematogenous infections. That is why we have added "during the course of our evaluation" to emphasize that this study presents mid-term results. We erased the sentence in the last alinea of the Discussion section (page 14 - 15), and refer to the statement made earlier (please see page 14, line 14-16)

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Discretionary Revisions (which the author can choose to ignore)

What next?: Accept after minor essential revisions

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable

Statistical review: Yes, and I have assessed the statistics in my report.
Reviewer’s report

Title: The effect of high tibial osteotomy on the results of total knee arthroplasty. A matched case-control study.

Version: 1 Date: 30 April 2007

Reviewer: Nicola Maffulli

Reviewer's report: General

This is an interesting manuscript, which suffers from low numbers. This is inevitable, given the underlying conditions

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Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

Mention should be made of an intrinsic selection bias. Although the authors have matched the patients for several variables, by definition the index patients have had symptomatic osteoarthritis of the operated knee for longer, and therefore it is conceivable that, had the original disease allowed to progress, the changes would have been more advanced than observed.

Thank you for this very useful remark and selection bias does seem inevitable, especially in non-randomised studies. We have now mentioned selection bias in the Discussion section and have referred the Parvizi study that also acknowledged an unfavourable demographic status for patients with prior osteotomy. Please see page 11, line 13 - 19:

Risk of selection bias in non-randomised studies may be another cause of differences in outcome [Deeks et al.]. Patients who had a previous osteotomy are a highly selected population with presumably an unfavourable demographic status [Parvizi et al.]. We attempted to minimise selection bias by controlling for known prognostic factors. That is why we conducted a case control study matched for diagnosis, time of follow-up, BMI, gender, age and type of prosthesis. We realise, however, that the present study cannot address the problem of unknown or immeasurable prognostic factors.

It should be made clear that HTO allows to 'buy time' before performing a total knee arthroplasty, and, in this respect, the study does show that this has indeed been achieved.
As suggested, we have revised the Discussion section with and have emphasized the time bought by the osteotomy procedure (page 11, line 1 - 6):

Proximal tibial osteotomy is a well-accepted treatment of medial unicompartmental osteoarthritis of the knee with varus malalignment in young and active patients [Virolainen et al.]. In general, however, progression of disease will occur and ultimately many patients require TKA. In the present study osteotomy delayed total knee replacement with a median of 4.8 years. This amount of time bought before performing arthroplasty compares well with other studies [Mont et al. and Haslam et al.].

The authors state that knee replacement after HTO was 'more technically demanding as indicated by prolonged operative time and greater blood loss'. The data only show a trend in this respect, and the prolonged operative time and greater blood loss are not necessarily indicative of greater technical difficulty. They could have been the results, for example, of the lesser familiarity of the surgeons with the knees which had undergone HTO. Also, it is not clear whether the TKS operative time included removal of the metalwork used for HTO.

We found this remark of great value. Not many studies report on TKA after previous osteotomy, probably because the numbers are low. However we feel that it is important to report on this subject because we are obliged to our patients to investigate whether prior surgery compromises future joint replacement. We calculated the sample size in the present study based on an expected inferior clinical result for the index group. Perhaps that is why we only found a trend in prolonged operative time, blood loss, exposure problems and thicker tibial component for the index group.

We agree that factors other than technical difficulties may contribute to these differences. However, all TKA procedures were performed by qualified knee surgeons over the given time period in a teaching hospital setting, which represents common orthopaedic practice. Also removal of the staples caused no substantial difficulties according to the surgical records. However, in the present study a significant patellar height decline was found after closing wedge HTO (index group) in the present study. Mont et al. (1994) and Windsor et al. (1988) reported earlier exposure and patellar eversion problems after development of patella infera. Although we cannot be sure about unknown factors attributing to prolonged operative time and blood loss, we feel it is justified to state that the observed trend is due to revision surgery with respect to scarring, patellar eversion problems and soft tissue balancing. Your remarks have enabled us to revise the manuscript (please see below).

Discussion section; page 11 and 12, line 22 - 23 and 1 - 7; respectively:

Knee replacement after closing wedge tibial osteotomy showed a trend towards
prolonged median operative time and a greater amount of blood loss. Hardware removal during knee implant surgery only occurred in three knees, and surgical records showed no difficulties in taking out the step staples. A more plausible reason may have been the significant decline in patellar height (mean IS ratio = 0.93). Patellar tendon shortening, and a decreased distance from the tubercle to the joint after closing wedge osteotomy proximal to the tuberosity, make patellar eversion more difficult [Mont et al.]. In our series we had to perform three lateral retinacular releases and one tuberosity osteotomy to facilitate eversion of the patella and the patellar ligament.

Discussion section; page 14, line 23-25:

Our matched control study tends to show that total knee replacement after proximal tibial osteotomy is a therapeutic option technically more demanding than a primary knee arthroplasty

At present, opening wedge HTO is popular. The discussion should mention this, and the possible impact that this technique may have on subsequent TKA

We have enlarged on the presumed effect of medial opening wedge osteotomy on subsequent TKA, and have added our comments to the Discussion section (pages 13-14, line 14-25 and 1-4; respectively): please also see earlier (reviewer Professor Verdonk).

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Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

Discretionary Revisions (which the author can choose to ignore)

What next?: Unable to decide on acceptance or rejection until the authors have responded to the major compulsory revisions

Level of interest: An article of importance in its field

Quality of written English: Needs some language corrections before being published

The revised paper has been checked by a native English speaker who has experience in correcting scientific manuscripts.
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'