Is Coronal Alignment Overcorrection a Risk Factor for Revision in TKA?

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INTRODUCTION: Total knee arthroplasty (TKA) is a successful surgery. There still is 7-15% of unfavorable outcomes. Revisions in the first 2 years may be required due to infection, malpositioning, instability and patellar problems. Ideal alignment has been described in the literature. Malalignment and instability can be a cause of revision surgery due to eccentric loading of the tibia resulting in sclerotic bone and subsidence of the tibial component. There are a number of papers that evaluate the importance of coronal alignment but there is a paucity of studies that have evaluated overcorrection. The purpose of this study is to evaluate whether there is a correlation between overcorrection of coronal alignment in TKA (past neutral into varus from valgus or vice versa) and subsequent revision surgery.

METHODS: This was a retrospective chart review that was approved by our University IRB. We used CPT code 27486 and 27487 and reviewed cases from 1/1/2005 - 12/31/2015 for 4 high volume joint replacement surgeons. Only revisions for tibial loosening and instability were included. Infection and all other causes for revision were excluded. Mechanical alignment was measured on weight bearing, long standing lower extremity x-rays. A minimum of 1-year follow up was required as well as complete x-rays and clinical records. We compared revision cases to a control group of primary TKA. All patients had an initial diagnosis of osteoarthritis. Subjects were matched by sex, age, BMI, number of comorbidities and cemented or uncemented implant. Time from primary to revision surgery was recorded in months. Post-operative revisions and complications were noted. For comparison, the change in value from pre and post-operative alignment between the 2 groups was calculated, calculated as post-operative mechanical alignment minus pre-operative alignment. Statistical analysis included Chi squared for categorical variables and Mann-Whitney for continuous variables. A p value ≤ 0.05 and a 95% CI were used.

RESULTS: There were 566 revisions in the period, 85 met study inclusion 74 patients had complete records and were include in the study. Both groups were 81.5% female, were primarily Caucasian and had similar BMIs (Table 1). The control group average age was 67 vs. 61 for the revision group. This disparity was due to matching BMIs more closely than age. The revision group had 53% 3-6 comorbidities and the control group had 62%. Average time to revision was 77.8 months; range was 3-267 months. There were 2 revisions in the study group both were irrigation and debridement with a poly insert exchange. There were no revisions in the control group. The average pre-op mechanical alignment of the revision group was 1.488° +/- 10.198° (range -21° valgus to 28 varus) and the control group was 5.616° +/- 7.970° (range -13 valgus to 21 varus). There was a statistical significant between the groups, p = 0.022. The average post-operative alignment was -0.467° +/- 4.532° for the revision group and 0.813° +/- 2.528° for the control group. This was also statistically significant with a p value of 0.005. There also was a statistically significant difference when comparing the change in alignment between the 2 groups p = 0.013.

DISCUSSION: This study attempted to demonstrate that an eccentrically placed tibia could be the cause for revision TKA. Our data did not support our hypothesis since the pre and post-operative coronal alignment between our study and control groups was similar but did show statistical significance but not clinical significance. (Table 1). Our control group had larger average pre-op malalignment 5.6° than the study group, 1.48. An early study done by Gargen et. Al. correlated biomechanical and clinical observations, which is needed to determine the cause of revision in this study. There are limitations to this study, which include the retrospective nature, small study group and limited pre-revision clinical information. It would have been helpful to know the primary implant that was used in the revision group.

SIGNIFICANCE/CLINICAL RELEVANCE: Alignment after revision for loose and unstable tibia components shows similar post-operative alignment to our control group. The statistical significance is not clinically significant. Our data did not support the hypothesis that overcorrection can cause revision TKA.


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<table>
<thead>
<tr>
<th>Table 1</th>
<th>Study Group</th>
<th>Control Group</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>82% F</td>
<td>81% F</td>
<td>0.894</td>
</tr>
<tr>
<td>Race</td>
<td>87% Caucasian</td>
<td>94% Caucasian</td>
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<tr>
<td>Avg Age</td>
<td>61.1 yrs</td>
<td>67.4 yrs</td>
<td>&lt;0.001</td>
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<td>BMI Avg</td>
<td>36.14</td>
<td>35.77</td>
<td>0.79</td>
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Pre Alignment
Avg, Range 1.488 +/- 5.616 +/- 7.97 (-13) 13 -21) 0.022
Degrees, Valgus 10.198 (21-24) 13 -21)

Post-Op Alignment Avg,
Range Degrees -0.467 +/- 4.532 0.813 +/- 2.528 (-20-132) 6 -9) 0.005