Accuracy Of Empirical Distal Femoral Valgus Cut Angle of 4 to 6 Degrees In Total Knee Arthroplasty: A Randomized controlled Trial

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Background and rationale

Many study found that knee replacement surgery has performed well for over 10 years, more than 90%.

The ability to use the knee effectively for a long time depends on many factors.

The primary factor is the position of the prosthesis that should not outlier than 3 degree.
Background and rationale

• The use of measuring instruments in the anatomical axis, intramedullary guide to distal femur is the standard commonly used in knee replacement surgery.
Background and rationale

- The angles of the cut were measured directly from the long X-ray image in the standing position or computer assist surgery.

In real life

Many hospital have only short film.
Background and rationale

The routine practice of selecting 5- to 6- of the distal femoral cut for an uncomplicated primary total knee arthroplasty is safe.

32% of Asian patients present with a distal femoral valgus resection angle that is outside the range of $5^\circ \pm 2^\circ$

We hypothesized that which distal femoral valgus angle cut is the safest for inlier prosthesis alignment.
Objective

• Compare femoral component alignment after distal femoral cut by intramedullary guide in variant valgus angle 4, 5, 6 degree in primary total knee arthroplasty
Material and method (Cohort study)

Between February 2012 to December 2012.

1️⃣ OA that plan to perform TKA at Siriraj hospital age older than 18 yrs

Rheumatoid arthritis
Chacot joint
Post knee and hip surgery

by single orthopaedic surgeons
distal femoral side cut technique

CT scannogram
3 month
Alignment measurement

Femoral component alignment
Total alignment
Femoral Bowing
Neck shaft angle

Intraclass Correlation Coefficient
0.87
Interclass Correlation Coefficient
0.74
Femoral Bowing measurement

Method described by Mullaji et al.

A schematic diagram illustrating the key radiographic landmarks used to define the axial alignment parameters. H, femoral head center; N, midpoint of femoral neck base; Fs, midpoint of cortical width at lesser trochanter; Fp, midpoint of cortical width at proximal one-third femoral length; HN, bisector of femoral neck; FsFp, anatomic axis of proximal femur; B, intersection of lines HN and FsFp; Fm, midpoint of distal one-third femoral length; Fd, a point bisecting the shaft 10 cm proximal to the knee joint; K, knee joint center; a point bisecting the shaft midway between Fs and Fd was designated as Fc; HK, mechanical axis of femur; A, ankle joint center; KA, mechanical axis of tibia; HK–FmK, the valgus correction angle of the distal femur; HB–BFp, the femoral neck–shaft angle; FsFc–FcFd, the coronal femoral bowing angle

Excessive femoral bowing > 5 degree
Statistical analysis

• Compare between 3 group
  • Quantity parameter (Anova)
  • Quality parameter (Chi-square)
  • P-value <0.05
  • 95% CI
Result (demographic data)

<table>
<thead>
<tr>
<th>Demographic variable</th>
<th>4 degree group</th>
<th>5 degree group</th>
<th>6 degree group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>67.95±1.1</td>
<td>71.49±1.103</td>
<td>69.81±1.188</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>male</td>
<td>7</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>female</td>
<td>33</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>BMI</td>
<td>27.249±0.6915</td>
<td>27.03±0.597</td>
<td>25.882±0.6348</td>
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<tr>
<td>weight</td>
<td>66.775±1.833</td>
<td>64.7±1.61</td>
<td>61.974±1.7</td>
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<tr>
<td>Heighth</td>
<td>156.538±1.25</td>
<td>154.64±0.966</td>
<td>154.619±1.058</td>
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<tr>
<td>Radiographic measurements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coronal femoral bowing</td>
<td>36</td>
<td>29</td>
<td>32</td>
</tr>
<tr>
<td>Femoral neck-shaft angle</td>
<td>130.43±0.824</td>
<td>131.62±1.043</td>
<td>130.55±0.847</td>
</tr>
<tr>
<td>Anatomical femurotibial angle</td>
<td>3.18±0.893</td>
<td>4.53±0.731</td>
<td>3.45±0.677</td>
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</table>

No statistical significant
### Result

<table>
<thead>
<tr>
<th>IM guide No</th>
<th>Inlier</th>
<th>Outlier</th>
<th>total</th>
<th>P-value</th>
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</thead>
<tbody>
<tr>
<td>4</td>
<td>34(85%)</td>
<td>6(15%)</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>34(81%)</td>
<td>8(19%)</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>35(83.3%)</td>
<td>7(16.7%)</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>total</td>
<td>103(83.1%)</td>
<td>21(16.9%)</td>
<td>124</td>
<td>0.886</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>P-value</th>
<th>Exp(B)</th>
<th>95% CI (lower)</th>
<th>95% CI (upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM guide (&lt;2degree)</td>
<td>0.847</td>
<td>1.138</td>
<td>0.306</td>
<td>4.225</td>
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<tr>
<td>IM guide (&lt;3 degree)</td>
<td>0.836</td>
<td>0.868</td>
<td>0.228</td>
<td>3.307</td>
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<tr>
<td>Neck shaft angle</td>
<td>0.314</td>
<td>0.957</td>
<td>0.878</td>
<td>1.043</td>
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<td>Femoral bowing&gt;3</td>
<td>0.046</td>
<td>2.883</td>
<td>1.017</td>
<td>8.178</td>
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<tr>
<td>Femoral bowing&gt;5</td>
<td>0.003</td>
<td>4.932</td>
<td>1.714</td>
<td>14.186</td>
</tr>
</tbody>
</table>
Discussion

• From study show that 4-6° distal femoral valgus resection angle have not significant different in produce outlier in 2 or 3 degree and used fixed distal valgus angle does not hold true in the ethnic Asian population as literature (4-5 degree)

16.9% of all patient are in outlier group and significantly correlate with excessive femoral bowing.
Discussion

• Distal femoral valgus resection angle has high variability, especially in elderly female Asian patients who have excessive femoral bowing.

• Prevalence of excessive femoral bowing in this study are 21.4%.

Survivorship of case that have excessive femoral bowing which used fix valgus cut and variable cut depend on pre operative scanogram are interested to study in the future.
Discussion

• Limitation
  • Distal femoral side cut
  • One prosthesis instrument and design
  • Asian population
Conclusion

• For the conclusion Fix distal valgus cut in 4-6 degree can be used to get good post operative component alignment

• Should aware in especially Asian people that have femoral bowing more than 3 degree