Challenging Alignment Concepts in Total Knee Arthroplasty

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Goal

Since the onset of the modern era of TKA, the commandment has been to restore the limb to a neutral mechanical axis.
Why the Mechanical Axis?
To avoid excessive poly wear or device loosening.
However, alignment has become a topic of some debate.
Support for adherence to Mechanical Axis

- Lotke, Ecker (1977) JBJS(A) 59(1)
- Bargren, Blaha, Freeman (1983) CORR 173
- Rand, Coventry (1988) CORR 232
- Jeffrey, Morris, Denham (1991) JBJS(B) 73(5).
TKA Patient Satisfaction?

17% to 25% of TKA patients are dissatisfied with their outcome\(^1,^2\)

Is 0 right for everyone?

\(^1\) Baker, van der Meulen, Lewsey et al (2007) JBJS(Br) 2007
Shape Match
Position implants on pre-disease model
Guides designed to fit on diseased bone and set transverse resection and rotation.
Why consider Shapematching?

What are advocates saying?\(^1,2\)

- For the Surgeon and Staff
  - Fewer instruments
  - Aside from osteophyte removal there are no other soft tissue releases needed
  - Guides suggest size and orientation of implants
  - Faster

\(^1\) Howell, Kuznik, Hull, and Siston (2008) Orthop Sep;31(9):857-63
Why consider Shapematching?
What are advocates saying?\textsuperscript{1,2}

- For the patients
  - Feel better sooner
    - Less soft tissues violated
  - Feels more normal
    - Natural, pre-disease alignment restored

\textsuperscript{1} Howell, Kuznik, Hull, and Siston (2008) Orthop Sep; 31(9): 857-63
\textsuperscript{2} Spencer, Mont, McGrath et al (2008) Int Orthop. Dec
Increased efficiency

Increased patient satisfaction

Uncompromised survivorship
Study Design

- N=12 pairs of Cadaveric Knees
- Matched Pair Design
- 2 experienced Surgeons
- Left or Right side randomly chosen for OtisMed or Standard Triathlon Single Raduíus Knee Procedure (STRYKER)
For all cadaveric knees MRI scans were made and 3D models were created. All MRI were sent to OtisMed and custom made jigs were fabricated.
Implant Position Alignment Measurement with Knee Navigation System (STRYKER, Leibinger)
Results

Overall Limb alignment a little more varus in Shape Match but not significantly different
No significant differences
Significant difference in Femoral Flexion Extension Due to the Difference in alignment Algorithm (internal aligment for conventional and external shape for Shape Match)
Conclusion

- OtisMed ® shape matching resulted in similar limb alignment as the conventional method for Triathlon single radius knee.
- A difference was only found for flexion / extension of the femoral component.
- This might be due to the different alignment algorithms with the conventional one using intra-medullary alignment and the shape matching follows the external bone surface.
Thank you