

Effects Of Implantation Method on Biomechanical Alignment After Total Knee Arthroplasty: Data From A Southwest Ohio Orthopaedic Practice

Background

- With increasing rates of total knee arthroplasties (TKA), it is important to evaluate the impact of the implantation method
- Purpose of this Study:** Compare the ability of computer navigated guides and traditional mechanical instrumentation in achieving the intraoperative goals for knee biomechanical alignment.

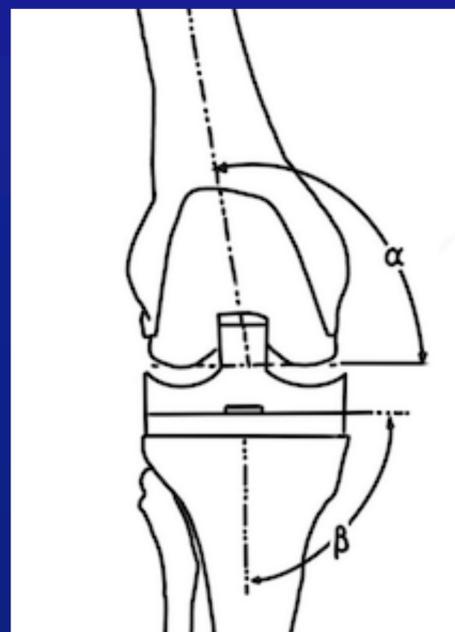
Methods

- Patient Population**
 - 469 patients included who underwent a TKA performed by Dr. Swank at Beacon Orthopaedics Surgery Center between Nov 2019 to March 2021
 - Computer Navigated Guides (369 cases):
 - 201 DePuy Attune Prosthesis implanted via TruMatch
 - 125 Conformis
 - 43 Smith & Nephew Prosthesis implanted via Visionaire
 - Mechanical Instrumentation (100 cases):
 - 35 DePuy Attune
 - 65 Smith & Nephew
- Alignment Analysis**
 - Retrospective evaluation of preoperative and 14 day postoperative anteroposterior and lateral radiographs using Medstrat's "Joints" application
 - Angles measured:
 - Femoral Valgus (α)
 - Tibial Varus (β)
 - Posterior Tibial Slope (σ)

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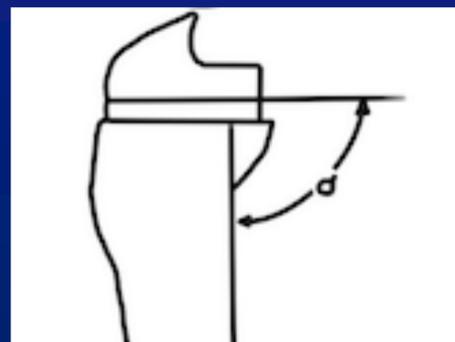
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Femoral Valgus (α)		
5° cut goal	Computer	Mechanical
Mean Degrees (°) from Goal	0.67	0.03
Range (°)	(-4.8:10.5)	(-7.9:6.1)
SD (°)	2.39	2.69

Tibial Varus (β)		
	Computer	Mechanical
Mean Degrees (°) from Goal	2.07	2.49
Range (°)	(0.0:8.7)	(0.1:9.8)
SD (°)	1.67	2.41



Posterior Tibial Slope (σ)		
Implant Specific Goal	Computer	Mechanical
Mean Degrees (°) from Goal	0.83	1.41
Range (°)	(-7.6:7.1)	(-6.5:7.2)
SD (°)	2.40	3.00

Results

- Mechanical instrumentation achieved a total mean femoral valgus (α) significantly closer than computer navigated guides (Total: 0.67°; Conformis:0.02°; DePuy:1.56°; Smith&Nephew:1.6°)
- Computer navigated guides achieved a total mean tibial varus (β) (Conformis: 2.41°; DePuy: 1.90°; Smith&Nephew: 1.85°) significantly closer than mechanical instrumentation (2.49°; $p < 0.05$)
- For implant specific tibial slope targets (σ), computer navigated guides (Total: 0.83°; Conformis: 0.74°; DePuy: 0.87°; Smith&Nephew: 0.88°) significantly cut closer than mechanical implantation (1.41°; $p < 0.05$).

Conclusion

- Regardless of manufacturer and instrumentation technique, most implants achieved tibial and femoral alignments close to our standard targets
- Variations in postoperative alignment between implants may be the result of differing implant engineering
- With respect to alignment goals, computer navigated guides achieved significantly closer total mean tibial varus and tibial slope angles, but significantly farther total mean femoral valgus angles compared to mechanical instrumentation.
- SIGNIFICANCE/CLINICAL RELEVANCE:** Our current findings highlight that implantation with both computer navigated guides and traditional mechanical implantation will allow clinicians to achieve tibial and femoral biomechanical alignment close to standard targets for patients. If clinically desirable, computer navigated guides can achieve significantly closer total mean tibial varus and tibial slope angles to standard goals.