

# Mechanical Alignment of a Customized TKA Implant System as Determined by Intraoperative Computer Navigation

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## INTRODUCTION

A neutral mechanical limb alignment has been linked to increased Total Knee Arthroplasty (TKA) survivorship<sup>1,2</sup>. Patient-specific cutting blocks have demonstrated close to neutral alignment on average, but have also found a varying number of outliers ( $>3^\circ$ ) within specific brands (Otismed, Visionaire, Signature etc.) as well as between brands<sup>3-6</sup>. However, no study has investigated patient-specific cutting guides in conjunction with customized TKA implants (ConformMIS iTotal CR). Hence, the purpose of this study was to utilize computer navigation intra-operatively to measure the mechanical alignment of a patient-specific implant and instrument TKA system.

## METHODS

A consecutive series of 63 patients undergoing TKA, utilizing patient-specific instruments and implants, were prospectively measured with intraoperative computer navigation. The instruments and implants were first created utilizing a pre-operative CT scan. The mechanical alignment of all patients was measured using computer navigation. The patient-specific instruments were then utilized per the manufacturer's recommendations and bone cuts were made (Figure 1). All bone cuts were recorded utilizing the navigation system as a confirmatory measurement. The patient-specific implants were then fixated and surgery completed. Final mechanical alignment was recorded with computer navigation.

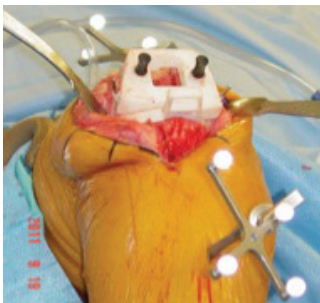


Figure 1. Computer assisted navigation was used to measure the pre-op and post-op mechanical alignment intra-operatively.

## RESULTS

The patient-specific instruments and implants provided neutral mechanical alignment, zero degrees, in 84.1% of patients (53/63). The remaining 10 patients each had a post-operative alignment within  $\pm 2^\circ$  of neutral, with no

outliers. The average pre-operative degree of deformity for this cohort was  $5.57^\circ$  v.  $0.19^\circ$  postoperatively ( $p < 0.0001$ ) (Table 1). The mean correction angle for this cohort was  $5.70^\circ$ . Additionally, no patients had extension deficits as measured with navigation post-operatively ( $7.5^\circ$  pre-op for 40/63 patients).

Table 1: Average pre-op and post-op mechanical axis measurements

	Pre-op	Post-op
Average Deformity	$5.57^\circ \pm 6.5^\circ$	$0.19^\circ \pm 0.47^\circ$
Deformity Range	$12^\circ$ varus - $15^\circ$ valgus	$1^\circ$ varus - $2^\circ$ valgus
Extension Deficit	$7.5^\circ$ (5.58-30)	Full extension in all patients

## DISCUSSION

Customized, patient-specific instruments and implants accurately restore neutral mechanical alignment as measured by intra-operative computer navigation. The patient-specific instruments aligned all patients in this cohort to within  $\pm 2^\circ$  of neutral. It is well documented that the restoration of a neutral mechanical axis within  $\pm 3^\circ$  is important to achieve long-term survivorship.<sup>1</sup>

## REFERENCES

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