

# If CAS is worth using in primary TKR, what about revision TKR?

LIONBERGER DR<sup>1</sup>, PANDIT TALATI P<sup>2</sup>

<sup>1</sup>Methodist Hospital, Houston, TX, USA

<sup>2</sup>Foundation for Southwest Orthopedic Research, Houston, TX, USA

payalpandit22@yahoo.com

**Introduction:** Approximately 14% of all primary total knee replacements (TKRs) will undergo revision surgery at some time in their use life. Twenty-five to 35% of these cases have been reportedly due to inaccuracies of alignment and ligament balance, making it incumbent upon the orthopedic community to provide exceptional precision in subsequent surgeries (Julin, 2010, Venkataramanan, 2006, Gofton, 2002, Hanna, 2011).

Likewise, the useful life reported in survival of revisions is even less optimistic at 85% and 75% at 5 and 10 years, respectively. Although computer assisted surgery (CAS) has proven to improve accuracy in primary TKRs, it is still unknown as to the merits of the same technology for revision TKRs. With an increasing burden of 200% revisions by the year 2020 (Kurtz, 2007), it is reasonable to assess the merit of CAS for revision TKR surgeries in efforts of alleviating failures through accuracy improvement.

**Methods:** This study was a prospective sequential review of the results of revision TKR using CAS for primary guidance. Accuracy was the primary endpoint while secondary endpoints included operative time, complications, functional outcome, and estimated cost analysis. Statistical analysis was compared by a student T-test and standard statistical differentiation.

Patients were prospectively enrolled in the trial and assessed by pre-operative and post-operative 36-inch standardized films with two blinded X-ray interpreters for comparison measurements. Intraoperative CAS measurements were obtained and formulated the basis for comparison to X-ray results. These were then compared to a historical cohort of traditionally performed revision TKR patients without CAS.

All revision TKRs were performed by the same surgeon and were cementless long stem implants (greater than 90 mm stem length) using either Zimmer (Warsaw, IN) or Stryker (New Jersey) whereas the study group were all similar long stem implants using only Aesculap (Tuttlingen Germany) implants.

**Results:** CAS revision TKR improved accuracy and precision in achieving a mechanical angle 178.5 versus 177.2 (SD 1.5 versus 3.2) in the CAS versus traditional group, respectively. Additionally, individualized angular measurements were statistically more accurate in the CAS group as compared to the traditional by 89.2 versus 88.6 alpha angle and 89.6 versus 89.1 beta angle. The gamma and delta angles did not statistically differ significantly.

Predictive measurements and documentation of accomplished intraoperative corrections of femoral and tibial defects proved to be easier and more accurate in both estimation as well as predicting accurately the proper implant selection in the navigated group. Stem preparation and blind reaming using real time guidance proved to be dependable with no violations in the cortices when using CAS compared to the traditional instrumentation where cortical penetration was the result in two recorded cases in the traditional cohort. Total operative time was significantly longer for the CAS group compared to the traction by 16 minutes (SD 5.8).

**Conclusion:** Navigation revision TKR appears to have a benefit in enhancing accuracy in individualized component placement. Secondary benefits included the use of blind reaming for accurate stem placement and minimization of complications associated with cortical penetration by inaccurate reaming angulation. While functional outcomes remain similar in the two groups in this

early follow-up, the enhanced accuracy associated with the AP alignment suggests optimism in superior survivability in this group of patients. CAS required a statistically longer operative time by an average of 9% over previous operative times without navigation. As with primary TKR, the added time necessary for CAS appears to be justified given the enhanced accuracy in this extremely costly and technically demanding group of patients. It is expected that long-term follow-up might further validate the benefit and ultimate necessity of CAS for revision TKR even beyond the need for its use in primary TKR.

## References

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