

Coronal alignment, outliers and operative time in total knee arthroplasty with navigation, patient specific guides or standard instrumentation: a single surgeon series on 274 cases.

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1. INTRODUCTION

Neutral alignment in total knee arthroplasty (TKA) is defined as a hip-knee-ankle angle (HKA) within 3° from neutral and is associated with improved implant survival and function. Several studies reported higher rates of inaccurate positioning and alignment outliers when using standard instrumentation and technique. However, single surgeon clinical series comparing implant positioning and alignment with standard technique (STD), patient-specific instrumentation (PSI) and navigation (NAV) are lacking. Therefore, this study aimed to compare coronal alignment and implant positioning as well as operative time when the three techniques are performed by the same surgeon.

2. METHODS

A single surgeon series of 274 patients who underwent TKA via standard instrumentation (STD), patient-specific guides (PSI) and computer assisted surgery (NAV) was analyzed at a one-year follow-up. The three groups (STD, n=89; PSI, n=94; NAV, n=89) were matched for pre-operative coronal alignment. Pre- and post-operative HKA angles were retrospectively assessed analyzing stereoradiographic images of patients in functional position as obtained through the EOS® System (Figure 1).

Alignment outliers were defined as having a deviation of more than 3° from neutral (HKA <177° or HKA >183°). Operative times were retrospectively assessed on patient's operative reports.

Analysis of variance (ANOVA), T-test and Fisher's exact test were used to assess differences of the studied parameters in the groups.

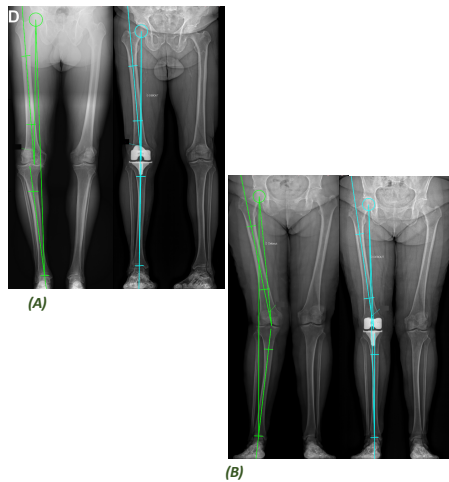


Figure 1: Pre- (green lines) and Post- (blue lines) operative Hip-Knee-Angle measurements. (A) Pre-operative varus and post-operative alignment. (B) Pre-operative valgus and post-operative alignment.

3. RESULTS

Coronal alignment as measured through the HKA was significantly different between STD and NAV groups (p=0.001) (Figure 2), but not between STD and PSI (p=0.4) nor between PSI and NAV (p=0.1) (Figure 2). There were 20 (23%) outliers in the STD group, 15 (17%) outliers in the PSI group and 8 (9%) outliers in the NAV group.

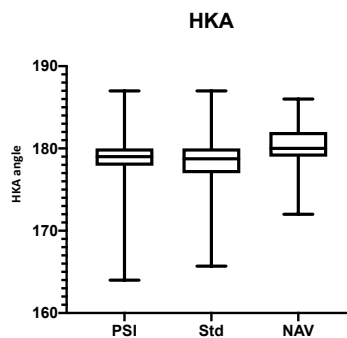


Figure 2: Comparison of coronal alignment as measured through the HKA between STD, PSI and NAV groups

The operative time was significantly lower in STD procedures (129 ± 3 min) and PSI procedures (126 ± 5 min) when compared with navigation (134.8 ± 9 min) (NAV:PSI p=0.03 (Figure 3), NAV:STD p= 0.04 (Figure 4), STD:PSI p=0.06 (Figure 5)).

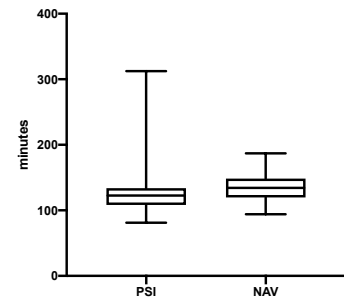


Figure 3: Comparison of duration of surgery between PSI and NAV groups

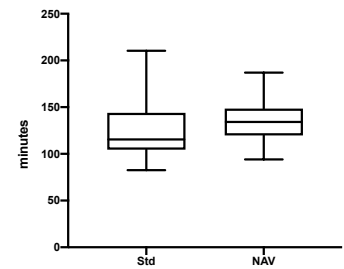


Figure 4: Comparison of duration of surgery between STD and NAV groups

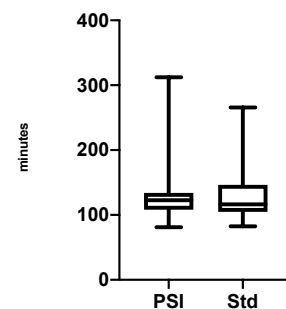


Figure 5: Comparison of duration of surgery between PSI and STD groups

4. CONCLUSION

In the present single surgeon series, TKA performed with navigation resulted in a significant improvement in implant positioning and coronal alignment when compared to standard technique. Moreover, use of navigation resulted in a significant reduction of alignment outliers. No difference in terms of alignment or operative time existed between standard and patient specific instrumentation technique. However, because of the significantly longer operative time and the uncertain clinical benefit, routine use of navigation is still to be questioned.