

Intra-operative alignment deviation in computer-navigated total knee arthroplasty

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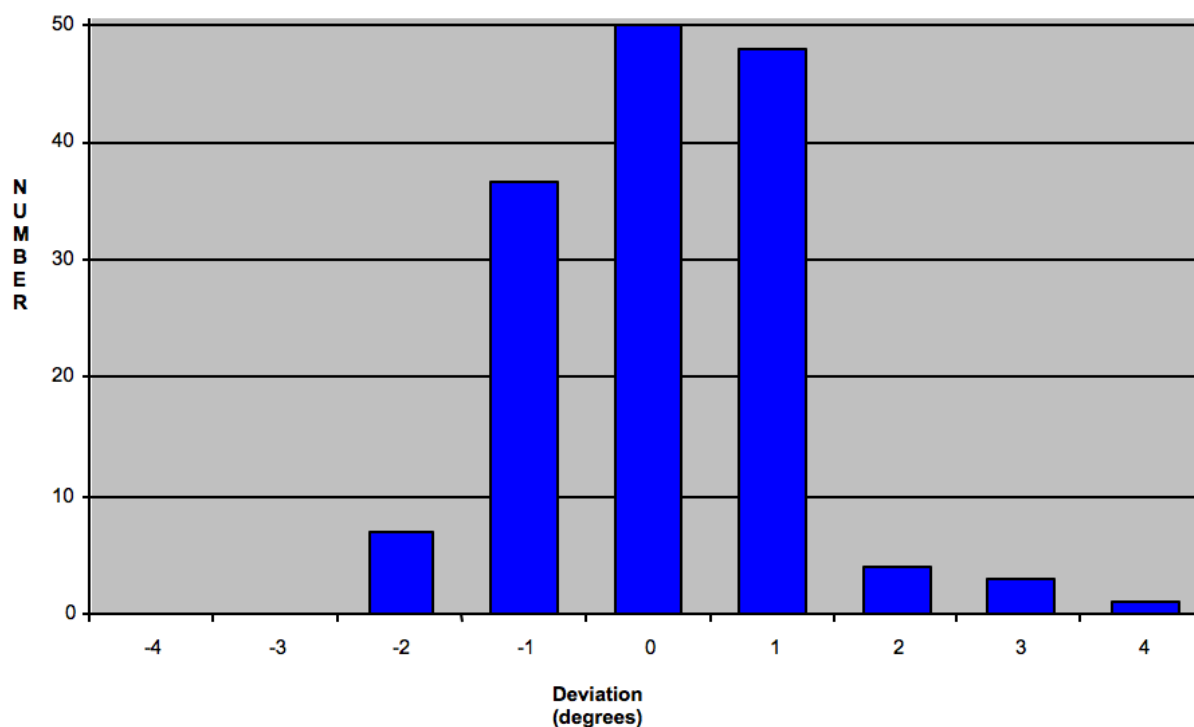
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One of the aims of computer-navigation is to improve the surgical accuracy and minimise the number of outliers in limb alignment in total knee arthroplasty. Several studies have shown the superior accuracy of alignment achievable with navigation, but malalignment can still occur^{1, 2}. Changes in alignment occurring at the stage of implantation are known to occur and may be underestimated³. An apparent attempt by surgeons to correct errors in pre-implantation bony alignment at the stage of implantation has also been noted³. Changes in alignment incurred at this stage are likely to result in asymmetrical cement penetration which has been implicated in reduced implant longevity^{4, 5}.

This study undertook a retrospective review of navigation data from 150 computer-assisted primary total knee replacements (60 men and 90 women) performed by the senior author (AWGK). In all cases the procedure was performed using Stryker's Imageless Navigation system, aiming to achieve neutral overall limb alignment (0°). The mean 'pre operative' deformity (Femorotibial-Mechanical Angle) - as measured by the navigation system intra-operatively (and standard deviation) was 2° of varus, (+/- 6° range -14° Varus to +16° Valgus). The mean age (and standard deviation) was 68 (+/- 9.4), the mean Body Mass Index (and standard deviation) was 32 (+/- 5.8). All procedures were performed through a medial para-patellar approach following the same surgical sequence. Data recorded whilst the knee was extended (at 0°) was used to examine overall limb alignment in the coronal plane. The deviation occurring at implantation was calculated by comparing the overall limb alignment recorded by the system using the trial components with the overall limb alignment recorded with the final implanted components.

Figure 1: Deviation in overall limb alignment following cementation
(negative away from neutral, positive towards neutral)



136 (91%) patients had a final overall limb alignment within 2° of neutral following implantation. Three patients had a final overall limb alignment of greater than 3° away from neutral overall limb alignment. Of these patients the deviations between the trial and final implanted position were 1°, -2°, and -1°. The calculated deviation occurring at implantation can be seen in Figure 1 showing the number of knees with deviations towards (positive values) and away from (negative values) neutral overall limb alignment.

The results of this study are consistent with previous studies demonstrating the alignment achievable using navigation systems and the incidence of outliers. From this study it can be concluded that implantation has an effect on overall coronal limb alignment, but that this effect is generally small; +/- one degree in 90% of procedures, but can be as much as four degrees (seen in one patient). We do not see any evidence of attempts to improve the alignment at cementation as previous studies have suggested.

References

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