

Precise Lag Screw Placement with the Use of a Novel Computer-Assisted Surgery System During Cephalomedullary Nailing

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Purpose: We hypothesized that utilizing a novel computer assisted surgery system (CASS) would allow for the precise placement of a lag screw in the femoral head during cephalomedullary nailing, while decreasing radiation and operative time.

Method: This study is a retrospective case-control study comparing the initial 123 cases that utilized this novel CASS to the previous 126 cases without the use of the CASS (conventional cases). Electronic chart review was performed to obtain the demographic information, fracture classification, and clinical outcomes. The tip-apex distance (TAD) for each case was measured postoperatively on PACS images, and the CASS TAD measurements were obtained from the case information saved on the CASS hard drive. The variables TAD, radiation time, operative time, and postoperative complications (cut-out, nonunion, mortality, removal painful implants, and deep infection) were evaluated for both groups. The groups were then subdivided into stable and unstable fractures, and the same demographics and variables were compared for all groups.

Results: The patients in this study represented a typical hip fracture population. Median age was 84 years. 66% were female and 34% were male. 73% were classified ASA class 3, severe systemic disease. All fractures were closed. Laterality was evenly split: 51% right and 49% left. The demographics of all groups were noted to be equivalent, with no significant differences detected ($P > 0.05$). The use of CASS in all cases resulted in a significantly better/lower TAD ($P < 0.001$) with significantly better precision/less variation ($P < 0.001$). These results are the same for the stable and unstable fracture groups ($P < 0.001$). The use of CASS resulted in a significantly shorter radiation time for all cases ($P = 0.003$) and for the stable fracture group ($P = 0.002$). No significant difference could be detected in the unstable fracture group ($P > 0.05$). The use of CASS in stable fractures resulted in significantly shorter operative time ($P = 0.039$). No significant difference could be detected when analyzing unstable fractures and all cases combined ($P > 0.05$). No significant difference was detected in the cut-out rate ($P > 0.05$), but the potential risk for a cut-out was higher in the conventional group (CASS group 95% CI: 0%-3.03%, whereas conventional group 95% CI: 0.44%-5.60%).

Conclusion: Precise lag screw placement during cephalomedullary nailing is possible with the use of the novel CASS. In addition, utilization of the CASS provides significant benefit by decreasing radiation time, operative time, and the potential risk of cut-out.