

5 Year Results Of A Randomised Trial Of Robotic Arm Assisted Vs Manual Unicompartamental Knee Arthroplasty

Matthew Banger¹, Mark Blyth², Bryn Jones², Angus MacLean², Philip Rowe¹

¹ Department of Biomedical Engineering, University of Strathclyde, Glasgow (UK)

² Glasgow Royal Infirmary, NHS Greater Glasgow & Clyde, Glasgow (UK)

Background

Robotic arm assisted surgery in unicompartamental knee arthroplasty (UKA) resulted in better early post-operative pain and clinical outcomes, but this was lost at two years. In the subgroup of patients with increased pre-operative activity levels, observed improved functional outcomes in the robotic assisted UKA group persisted to two years.

Early evidence suggests that robotic arm assisted surgery can deliver more accurate implant positioning, improved lower limb alignment, improved soft tissue balancing compared to conventional surgery. Mid-term survivorship of this randomised control cohort are presented.

Objectives

Comparison of mid-term clinical outcomes of a single centred, prospective, randomised control trial comparing robotic arm assisted vs manual conventional UKAs.

Study Design & Methods

139 patients were randomised to receive UKA with/without the aid of robotic assistance. Patients were assessed at 3 months, 1 and 2 years post-op. The outcome was assessed using the American Knee Society Score (AKSS), Oxford Knee Score (OKS), Pain VAS, Stiffness VAS, Forgotten Joint Score (FJS), complications and adverse events.

Subgroup analysis was performed to examine the outcome in more active patients (UCLA Activity Score >5, n=33, 23.7%).

Survivorship of the implant was also reviewed at 5 years in both groups for all patients as part of a Kaplan-Meier survival analysis.

Results

There was a difference between the main treatment groups in the AKSS at three months ($p=0.042$), but not at one year ($p=0.098$), two years ($p=0.951$) nor 5 years ($p=0.562$). No significant differences in the FJS ($p=0.783$), Pain VAS ($p=0.453$), Stiffness VAS ($p=0.443$) or OKS ($p=0.811$) by 5 year time point. In patients who were more active pre-surgery, while there was no significant difference in AKSS at three months ($p=0.213$), there was a difference at one year in favour of robotic surgery ($p=0.007$) but these difference were no longer present by 5 years ($p=0.195$). In these patients, the OKS was similar at three months ($p=0.368$), but better in the robotically assisted UKA group at one year ($p=0.025$), but no significant differences were seen at 5 years ($p=0.314$). The VAS pain ($p=0.853$) and stiffness ($p=0.132$) scores were not different at 5 years.

0% of the robotic arm assisted group required readmissions/ further surgery with 9% (6/65, 2 revisions, 1 poly exchange and 3 arthroscopies) of the manual group requiring additional intervention.

Conclusions

Excellent mid-term (5 year) survivorship in the robotic arm assisted group represents better survivorship of the implants over the manually performed surgery in this randomised control trial. Robotic assisted surgery

in UKA resulted in better early post-operative pain and clinical outcomes up until 2 years, but no difference was found by 5 years between both surgical groups as well as subgroup analysis of patients with increased pre-operative activity levels. Midterm outcomes of the robotic assisted surgery are therefore shown to be similar those of the manual surgical group having previously experienced better early outcome scores. This loss of the difference at midterm follow-up did not include the knees that required additional surgery narrowing of outcome score differences that were lost to follow-up. These revised knees presented the bottom quartile of outcome scores for the manual group.