

Seven year follow up of a PRCT of robot assisted uni-compartmental knee arthroplasty

HENCKEL J¹, ALSOP H¹, RODRIGUEZ Y BAENA F², DAVIES BL², COBB JP¹

¹*Section of Musculoskeletal Surgery, Department of Surgery and Cancer, Imperial College, London, UK*

²*Department of Mechanical Engineering, Imperial College, London, UK*

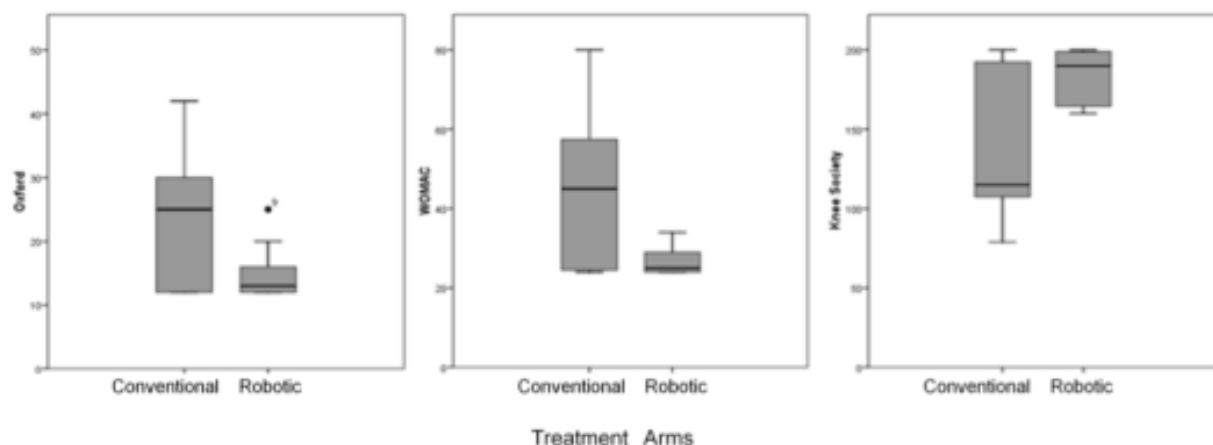
j.henckel@ucl.ac.uk

Introduction: We report 7-year outcomes of a prospective randomised controlled study on uni-compartmental knee arthroplasty using an active constraint robot.

The ultimate aim of CAOS devices is to aid the surgeon in minimising technical errors, therefore improving both clinical and functional outcomes whilst reducing outliers. Much of the analysis of CAOS systems is based around surrogate radiological measures with currently few long-term functional follow-up studies reported. We present 7-year follow up results of robotic vs. conventional surgery in uni-compartmental knee replacement using 3 validated and widely used clinical scoring systems.

Materials & Methods: The original study took place in 2003 and included 28 patients, 13 in the robotic arm and 15 in the conventional arm. All patients underwent medial compartment knee arthroplasty using the 'OXFORD' mobile bearing knee system (Biomet inc.). Clinical outcome at seven years was scored (blinded assessor) using the Oxford, WOMAC and Knee Society Scoring Systems, with each patient attending in person for both functional scoring and radiographic imaging in keeping with the original study design. In addition, we compared this seven year data with previously reported 5 year results using the Knee Society Score.

Results: 13 patients were initially included in the robotic arm; of these, one was revised following trauma and a further patient died, leaving a total of 11, with an average age of 77 years (range 66 - 86). In the control arm, out of a total of 15 patients, 3 were revised to a total knee replacement due to pain and one died. Their age ranged from 72 to 83 years (mean 78). The gender distribution of the subjects with surviving UKAs in both groups were identical (male n=7, female n=4).



A total of 22 patients were included (conventional n=11, robotic n=11) in this follow up study. Knee Society Scores in the robotic group ranged from 160 to 200 (Mean 183, median 190) and in the conventional group ranged from 79 to 200 (mean 138, median 115). The Oxford scores for the robotic group ranged from 12 to 25 (mean 14, median 13) and for the conventional group ranged from 12 to 42 (mean 24, median 25). The WOMAC scores for the robotic group ranged from 24 to 34 (mean 27, median 25) and for the conventional group ranged from 24 to 80 (mean 44, median 45) [Figure 1]. All three scoring systems showed a statistically significant functionally better outcome (paired t test) in

the robotic group compared to the conventional (Knee Society knee score, WOMAC and Oxford all with $p < 0.05$).

We also found a statistically significant decline in the functional outcome (Knee Society Scores) between the five and seven year data in the conventional arm whereas this was not the case for the robotic group.

Discussion: Whilst this is a small study, we were able to contact and score all surviving patients in this trial. Sparse data is available on seven year computer-assisted unicompartmental arthroplasty and whilst most studies report no clinical benefit, we demonstrate significance. These results were not confounded by patient's age or gender.

In our original study¹ the primary outcome measure of tibiofemoral alignment in the coronal plane was within 2 degrees of the planned position in the robotic group whilst in the conventional group only 6 of the 15 knees achieved this level of accuracy.

In the study the primary hypothesis was that the use of an active constraint robot improved prosthetic position: improved placement accuracy continues to be associated with improved functional outcome.

The deterioration in the scores in the last 2 years in the control group is neither explained by gender or age. Three revisions were performed prior to this period and were considered technical failures and have been excluded from this analysis. On-going plain film and computerised tomography radiological analysis may shed light on the cause of this functional decline.

References

1. Cobb J, Henckel J, Gomes P, Harris S, Jakopiec M, Rodriguez F, Barrett A, Davies B. Hands-on robotic unicompartmental knee replacement: a prospective, randomised controlled study of the Acrobot system. J Bone Joint Surg Br. 2006 Feb;88(2):188-97.