The Bone & Joint Journal

Journal Club: 18 October 2016

Attendees: Dr M Al Sawah, Mr I Chambers, Dr P Sinclair, Dr Z Sadozai, Mr V Mushtaq, Mr C Fenton, Mr R Pacheco, Dr A Butt

Reviewer: Dr Pierre Sinclair

Scunthorpe General Hospital, UK

Theme: Total knee arthroplasty

Waterson HB, Clement ND, Eyres KS, Mandalia VI, Toms AD. The early outcome of kinematic versus mechanical alignment in total knee arthroplasty. *Bone Joint J* 2016;98-B:1360–8.

Purpose:

This randomised controlled trial (RCT) compared the outcome of kinematic *versus* mechanical alignment of total knee arthroplasties (TKA) on function.

Method:

- Patients aged between 18 and 85 with a diagnosis of degenerative osteoarthritis were recruited from the waiting lists of three consultant Trauma and Orthopaedic surgeons.
- They were randomised by a computerised random number generator to one of two arms of the trial - either mechanically aligned or kinematically aligned TKA.
- Post-surgery, the patient and the assessor were both blinded to the arm into which the patient had been randomised.

- The groups into which the patients were enrolled were similar in terms of size but the authors did not mention whether the demographics of the arms were similar.
- In some respects the groups were treated in a similar fashion although it appears that the kinematic group had a pre-operative MRI to plan the surgery, whereas the mechanically aligned group did not.
- There was no crossover option in this trial, and patients who wanted a particular option were excluded from the trial.
- All patients were accounted for at the conclusion.
- Thirteen patients following allocation were not included in the results due to the following reasons: decision to have an alternative procedure (n = 2); decision against the operation (n = 1); withdrawal due to implant recall (n = 7); inability to get transport to hospital (n = 2) and quadriceps rupture, so unable to complete functional tests (n = 1). Patients were excluded from the study if the varus or valgus deformity exceeded 10°; if they had a flexion contracture which exceeded 20°; if there was history of any previous lower limb orthopaedic surgery within the year preceding the study; a prior history of unsuccessful partial or total knee arthroplasty of the contralateral knee; any contraindications to having an MRI scan; a neuromuscular or neurosensory deficiency or inflammatory arthritis.
- In addition to this, patients who had adverse outcomes which potentially could have influenced the functional outcome (including deep infection, fracture or dysfunction of the extensor mechanism) were also excluded from the assessment of function at one year post-operatively.

Results:

- This study comparing early outcomes of the function of kinematic *versus* mechanical total knee arthroplasties found that though there was a statistically significant difference in the mean (AKSS) in favour of the kinematically aligned group at six weeks (p = 0.05), there was no significant difference between the two options at one year.
- This resulted in the analysis of 35 patients in the mechanically aligned group and 36 patients in the kinematically aligned group.
- To assess the functional outcomes the researchers used validated knee scoring systems including the knee injury and osteoarthritis outcome

score (KOOS), American Knee Society Score (AKSS), University of California at Los Angeles Knee Score (UCLA) and EuroQol (EQ-5D).
- The measures of function were not significant at any point post-operatively with a follow-up period of one year.
- There was no evidence of selective reporting of the outcomes.
- The researchers used 95% confidence intervals and p values (< 0.05) to report statistical significance between the groups.

Conclusions:

- This prospective RCT failed to demonstrate any significant difference in functional outcome when comparing use of kinematically *versus* mechanically aligned TKAs.
- It was felt that the trial would not necessarily affect the method of arthroplasty performed locally, as it provided short-term results with relatively small numbers of patients (although they were looking for a relatively large effect size in terms of respective changes in the scores pre- and post- operatively – so a type 2 error, as concluded by the authors, was possible).

CRITIQUE

Strengths of the study

- Double-blinded
    - The patients were blinded regarding the procedure they were having, although patients randomised to the kinematic group were given an MRI prior to the procedure whereas the mechanical group were not
    - Physiotherapist assessing function also blinded
- Power calculations were undertaken
- Use of a true random number generator programme

Methodological concerns

- No calculation of inter- or intra-observer variability
    - Measurements were to 1° of alignment performed by the authors

- No mention of surgeons' prior experience in carrying out these procedures
    - Familiar with both techniques
- With three surgeons performing the operations, there may have been differences among them in the outcomes
    - Perhaps use only one surgeon

Final thoughts

- Although this trial did not find any significant differences in the functional outcome, the follow-up data comparing the survivorship of the prosthesis in the two groups may yield significant results.
- With the added cost of performing MRI scans on patients and of individualising implants for each patient, these results are unlikely to alter current practices.
- Higher powered and larger trials will certainly have to be undertaken to view the long-term outcomes and survivorship of implants using this technique.