The Knee 22 (2015) 122–125

Contents lists available at ScienceDirect

The Knee

Knee arthroplasty with a medial rotating total knee replacement. Midterm clinical findings: A district general experience of 38 cases

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ARTICLE INFO

Article history:
Received 30 April 2014
Received in revised form 11 November 2014
Accepted 17 November 2014

Keywords:
Medial rotation knee replacement
Learning curve
Clinical outcome

ABSTRACT

Background: The Medial Rotating Knee replacement (MRK) was first used in 1994, reporting high rates of satisfaction. It is designed to replicate natural knee kinematics and improve stability and function. There are limited studies on the mid-term clinical outcomes, in particular in a district general hospital (DGH) environment. This is the first study that we are aware of that evaluates the learning curve of the implementation of this knee system in this environment.
Patients/method: Between 2007 and 2009 we performed 38 consecutive MRK replacements (MAT ORTHO, UK) in 36 patients. The mean follow-up was four years. Patients were evaluated clinically, using OKS and patient questionnaire and radiographically (good/acceptable/poor) to assess outcome.
Results: Mean age was 73.0 years. Mean pre-operative OKS was 17.7 (range 8–29), which rose to 38.1 (range 23–48) at latest follow up ($p < 0.005$). Overall 71% of the patients were either satisfied (29%) or very satisfied (42%). 81% felt an improvement of the ability to go up or down stairs and 92% felt stable. All poor radiographic and the majority of acceptable outcomes were experienced in the first 50% of cases.
Conclusion: The MRK can be successfully implanted in a DGH environment. It improves pain and function comparably to standard TKRs, however, subjective improvement may be higher. Radiographic evaluation shows an acceptable learning curve.
Level of evidence: Level IV case series.

1. Introduction

The medial rotation knee replacement (MRK, Finsbury Orthopaedics, UK, Figure 1), first used in 1994, was proposed as an alternative design to standard condylar knee replacements used since their advent in the late 1960s [1].

Studies have shown that native knee kinematics have little or no medial femoral condyle 'rollback' but act as a modified hinge with free lateral movement [2–5]. In this knee design the lateral compartment is unrestricted. The spherical nature of the medial femoral condyle and raised anterior and posterior lip of the tibial insert reduces femoral AP translation. This makes the prosthesis 'ultra congruent' in the medial compartment [6] and more accurately matches the kinematics of the native knee [7]. This concept and an increased radius of curvature have improved stability at ranges of movement, reduced contact stresses, point loading and therefore less polyethylene wear [8].

The MRK [6,7,9–11], posterior stabilised [12,13] and cruciate retaining [14,15] TKRs are largely comparable with similarly high patient reported outcomes and implant survival rates of greater than 94% at ten years. The MRK is more constrained throughout the entire range of motion, resisting theoretical AP femoral translation [16] more effectively than other unstabilised designs which may improve outcome. Hossain et al. 2011 [7] show a greater range of motion and functional outcome but similar knee scores when compared to posterior stabilised implants, suggesting that it is indeed high-end function that is improved by this prosthesis.

Limited mid-term follow up has shown patient reported outcomes to be similar to other knee designs without greater component loosening which might be expected in a more constrained device [7–10]. Mannan et al. 2009 [8] reports a 10-year survival rate of 98.4% with aseptic loosening as the endpoint. This is replicated in joint registry data with a recorded all cause revision rate of just 1.33% [17] at nine years. It is however not that widely used with only 4712 MRK replacements implanted in 2012 in the UK [17].

Here we report the midterm outcomes and survivorship of 38 medial rotation TKRs implanted at our district general hospital. This environment is particular as the volume of arthroplasty is lower than in specialist arthroplasty centres, however it is more representative of the majority of arthroplasty providers in the UK.

Our aim is to show that this implant can be successfully implemented with a minimal learning curve. There are few studies reporting the early

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http://dx.doi.org/10.1016/j.knee.2014.11.008
0968-0160/

Fig. 1. Medial rotation knee (MatOrtho, UK).

radiological outcomes, in particular issues with the slightly different implantation techniques required for this type of implant.

2. Patients and methods

Between 2007 and 2009, 38 consecutive MRK arthroplasties (MatOrtho, UK) (Fig. 1) were performed in 36 patients. These patients were retrospectively identified from theatre logs. The patients had a mean age of 73 years (61–87). Indications for surgery were bone on bone arthrosis of the tibio-femoral component, severe pain and decreased function that limited quality of life and which was resistant to non-operative treatments. Patients with inflammatory arthropathies, previous or active sepsis or ligamentous instability were excluded. Within this department approximately 250 TKRs are performed annually for the same indications as above (Triathlon, Stryker was the standard knee prosthesis used). Patients were allocated to this prosthesis as part of a departmental trial of the implant.

All procedures were performed by one of the senior authors and underwent a standard anaesthetic and surgical protocol. All cases were performed using a midline incision and medial para-patella approach and prostheses were implanted in accordance with the manufacturer's guidelines. The PCL was sacrificed in all cases. One pre-op dose of teicoplanin (600 mg IV) was administered, tourniquets were routinely used, large volume local anaesthetic with adrenaline capsular infiltration was performed and postoperative physiotherapy started on day one. Drains were not routinely used.

Data were collected from patient notes regarding indication for operation, patient demographics, pre-operative Oxford Knee Scores (OKS), tourniquet times, complications and revision rates. Weight bearing Antero-posterior (AP), lateral and skyline radiographs were obtained in all patients before discharge from hospital and were evaluated for component mal-position, sizing inaccuracy, subsidence and radiolucency as per guidelines proposed by Ewald et al. 1989 [18]. The assessment was further split into three groups, good, acceptable and poor. Latent X-ray follow up was undertaken by review of routine post-operative radiographs performed in an outpatient clinic.

Functional and pain assessment was performed using the OKS and a basic questionnaire regarding patient satisfaction giving the patient a score out of 5, 1 being very dissatisfied and 5 being very satisfied. Data were also collected on high-end patient reported function, specifically stability and stair climbing ability.

In the MRK group 10 of 38 had undergone patellar resurfacing that was selectively performed in those patients with patellar changes Outerbridge grade of at least 4.

Statistical evaluation was performed using the Mann–Whitney-*U*-test for non-parametric data and was considered significant if $p < 0.05$.

3. Results

Mean follow up was four years (3.5–4.7). At final follow up 2 patients had died and 2 were unavailable for contact.

Mean pre-operative OKS were 17 (range 8–29) and at follow up had risen to 37.3 (range 23–48) ($p < 0.005$). Postoperative ROM was mean 100° (range 70–130) at latest clinical follow up.

Post-operative radiological evaluations were good 28/38 (73%), acceptable 8/38 (21%) and poor 2/38 (5%). Overall 71% of the patients were either satisfied (29%) or very satisfied (42%). 81% felt an improvement of the ability to go up or down stairs and 92% felt stable.

To assess for changes in terms of 'learning curve' the cohort of patients were subdivided into the first and second chronologically performed 50% (19 patients in each) of the cases. The first 50% of MRKs had a mean postoperative OKS of 36 (range 23–46) whereas the second had mean OKS of 38.3 (range 28–48) ($p = 0.21$) at long-term follow up. Mean patient satisfaction was 3.9/5 in the first 50% of MRKs compared to 4.2/5 in the second 50% at late follow up. There was no difference in mean ROM, stability or stair climbing ability between the 2 groups.

When subdivided, all poor radiographic outcomes (2/2) were in the first half of the series as were the majority of the acceptable cases (5/8) (Fig. 2). Specific findings in the first 50% cohort were: four cases of tibial mal-alignment (anterior sloping), two cases of medial tibial overhang and 1 posterior cementophyte. In the second cohort there were no cases of tibial mal-alignment or component oversizing however there was one case of femoral notching, one of a lack of anterior cement with regards to the femoral component and a further case of a cementophyte.

Latest radiographic follow up was performed in clinic (mean two years post-op) in which no radiolucent lines were identified. There were no superficial infections or revisions for aseptic loosening or fracture in either group.

In the first cohort, 3 patients were manipulated under anaesthetic for postoperative stiffness. In the second cohort there was one arthroscopic washout for haematoma (at latent follow up this case had an OKS of 38) and one deep infection, which was revised at a different institution.

4. Discussion

The Medial Rotation TKR has been designed with the goal of replicating physiological motion of the native knee joint as much as possible in the hope that it will reduce wear, whilst enhancing stability, range of motion, and patient satisfaction. Its medial articulation is effectively a ball-and-socket joint with a raised antero-posterior lip preventing translation in this direction. On the lateral side there is lack of congruence to facilitate rotation [19]. High contact surface area is thought to reduce pressure and therefore wear [8]. Our results reflect this with high rates of patient satisfaction, greater than 80% improvement in the ability to climb and descend stairs and greater than 90% feeling subjectively stable.

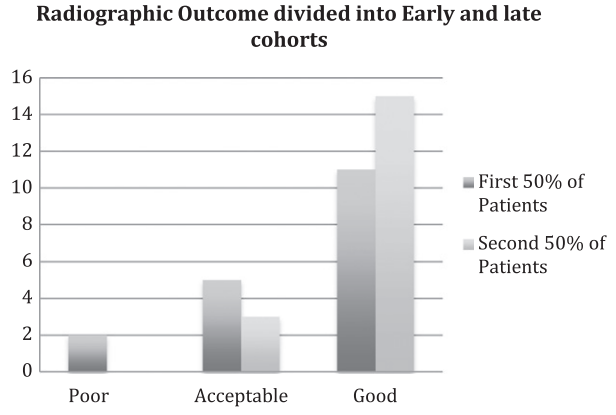

Fig. 2. Post operative radiographic outcomes divided into early and late cohorts of patients.