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Patient Reported Kneeling Ability in Fixed and Mobile Bearing Knee Arthroplasty

Neil J. Artz, PhD [a], Mo A. Hassaballa, MD [b], James R. Robinson, MBBS, MRCS, FRCS(Orth) [b], John H. Newman, FRCS [b], Andrew J. Porteous, MBChB(UCT), FRCS(Ed, Tr & Orth), MSc(Ortho Engin) [b], James R.D. Murray, MA, FRCS (Tr Orth), MB BChir (Cantab) [b]

[a] School of Health Professions, Peninsula Allied Health Centre, University of Plymouth, Plymouth, United Kingdom
[b] Bristol Knee Group, Avon Orthopaedic Centre, Southmead Hospital, Bristol, United Kingdom

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ABSTRACT

Kneeling is an important function of the knee joint required for many daily activities. Bearing type is thought to influence functional outcome following UKA and TKA. Self-reported kneeling ability was recorded in 471 UKA and 206 TKA patients with fixed or mobile bearing implants. Kneeling ability was recorded from the Oxford Knee Score question 7. The self-reported ability to kneel was similar in patients with fixed and mobile bearing UKA implants following surgery. In TKA, greater proportions of patients were able to kneel in the fixed compared to the mobile bearing groups up to two years after surgery indicating that self-reported kneeling ability is enhanced in fixed compared to mobile bearing TKA.

Knee arthroplasty is a common procedure used to treat knee osteoarthritis. Since 2003 almost 600,000 knee arthroplasty procedures have been performed in England, Wales and Northern Ireland [1], with 76,497 primary total knee arthroplasties (TKAs) and 7,065 primary unicompartmental knee arthroplasties (UKAs) performed in 2012 alone [1]. Reports from registry data indicate that approximately 85% of patients are satisfied with their knee arthroplasty and up to 90% describe improvements in symptoms after surgery [1]. However, despite these high levels of symptomatic improvement and satisfaction many patients continue to struggle with more challenging activities that require high-flexion knee angles such as kneeling, squatting and sitting crossed-legged [2,3].

Kneeling is an important function of the knee joint required for many normal activities and lifestyles and is indicative of a highly functioning knee [2,3]. Several studies have shown that the ability to kneel is not always possible after knee arthroplasty [2,4,5]. Consequently, functional limitations have been shown during occupational, recreational, sporting and religious activities that can impact greatly upon patient quality of life and satisfaction following knee arthroplasty [6,7].

It is reported that although approximately 50% of patients undergoing knee arthroplasty consider the post-operative ability to kneel as an important outcome, almost 80% will have limitations in their kneeling ability [8], and a recent study has indicated that with appropriate education and practice, kneeling ability can be significantly improved after knee arthroplasty (UKA) [9] that may have a beneficial impact on function and quality of life.

The ability to kneel also appears to be better in patients undergoing UKA compared to total knee arthroplasty (TKA) [4]. Several studies have suggested that in both UKA and TKA, mobile bearing implants restore kinematics closer to those of the native knee, yet despite this, none of the published clinical series have demonstrated a significantly superior function [10–12]. Recent reviews also suggest that mobile bearing TKA implants have no superiority in kneeling ability or functional outcomes over fixed bearing prostheses [13,14]. However the literature comparing these different designs is scarce and further investigation is warranted to determine whether mobile or fixed bearing implants provide the best outcome after surgery, particularly with respect to highly demanding activities such as kneeling.

With the limited information on kneeling ability after knee arthroplasty in mobile and fixed bearing knee arthroplasties, the primary aim of this study was to investigate mid-term kneeling ability in both fixed and mobile bearing UKA and TKA prostheses. The secondary aim of this study was to investigate the relationship between kneeling ability and measured knee motion, pain and function. Our hypothesis was that mobile bearing implants (both total and unicompartmental) would confer and advantage for patient kneeling ability.

Materials and Methods

Between 2000 and 2010, four hundred and seventy-one medial unicompartmental knee arthroplasties were performed in our unit.

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The medial UKA group consisted of 205 mobile bearing knees (102 male, 103 female, with mean age 62.0 years) and 284 fixed bearing knees (158 male, 126 female, with mean age 71.4 years). Between 2001 and 2006, two-hundred and six total knee arthroplasties were performed as part of a prospective randomised controlled study. The TKA group consisted of 104 mobile bearing knees (47 male, 57 female, with a mean age of 61.7 years) and 102 fixed bearing (54 male, 48 female, with a mean age of 61.6 years). All data were collected and stored on our knee group database which has been granted approval by the regional ethical committee (reference number 09/H0206/72).

Outcome Measures

Self-reported kneeling ability was determined from question 7 of the Oxford Knee Score (OKS) [15] where patients are asked "during the past 4 weeks could you kneel down and get up again afterwards?" The suggested responses are; yes easily (4 points), with little difficulty (3 points), with moderate difficulty (2 points), with extreme difficulty (1 point), no impossible (0 points).

In addition, all patients completed the Western Ontario and McMaster Universities Arthritis Index (WOMAC) [16]. Range of motion (ROM) was assessed using a universal Goniometer. All data were collected preoperatively and at one, and two-years following surgery by an experienced research nurse or physiotherapist.

Prostheses and Surgical Technique

Unicompartmental Knee Arthroplasty

The Uniglide (Corin, Cirencester, UK) (Fig. 1) femoral component has a triple-radius femoral design made of cobalt chrome coated with titanium nitride. The tibia has both fixed and mobile-bearing options. The fixed-bearing component is a flat, ultra-high molecular-weight all polyethylene design with a stubby keel. The mobile-bearing option consists of a titanium nitride coated cobalt chrome tibial component which has a flat articular surface with a medial flange that lies against the tibial intercondylar eminence and an ultra-high molecular-weight polyethylene meniscal insert that is unconstrained. For all medial UKAs a limited medial parapatellar approach without patella dislocation was used. There was a minor variation in surgical technique between a small sub-vastus or mid-vastus extension or complete quads sparing where possible.

Total Knee Arthroplasty

All TKAs were the Rotaglide+ prosthesis (Corin, Cirencester, UK) (Fig. 2). Both mobile and fixed bearing options are compatible with a universal femoral component and tibial baseplate. For the fixed bearing option, the specific bearing simply snaps into place on the same tibial baseplate [17]. All TKA cases were done through a midline skin incision and a medial parapatellar approach.

Fig. 1. The Uniglide (Corin, Cirencester, UK).

Fig. 2. The Rotaglide+ total knee system.

Statistical Analysis

Descriptive statistics were used to calculate the proportion of scores recorded for the OKS question 7 for each mobile and fixed bearing knee arthroplasty. TKA and UKA data were analysed separately when comparing kneeling ability of fixed and mobile bearing prostheses at each time point. Pearson's Chi-squared test was used to compare kneeling ability before and after surgery and between bearing types. Kneeling ability was correlated with WOMAC pain and function scores using Spearman's rank correlation coefficient for ordinal data. Significance was accepted at the 5% level. IBM SPSS statistical software package version 21 was used to analyse the data.

Results

Kneeling ability and range of motion before and after surgery for both UKA and TKA are shown in Tables 1 and 2.

Unicompartmental Knee Arthroplasty

Pre-Operative Scores

Before surgery kneeling ability was poor with only 6% of patients awaiting UKA reporting the ability to kneel with little or no difficulty compared to 34% reporting that kneeling was impossible (Table 1). No difference in kneeling ability was observed between those patients awaiting a fixed or mobile bearing UKA ($P = 0.683$). Correlations between self-reported kneeling ability and WOMAC measures of pain and function were $R = -0.365$ ($P < 0.001$) and $R = -0.422$ ($P < 0.001$) respectively indicating a significant but poor correlation before surgery (Table 3).

Post-Operative Scores

Kneeling ability was not significantly different between fixed or mobile bearing prosthesis at one ($P = 0.801$) or two ($P = 0.199$) years after surgery (Table 1). One-year after surgery the proportions of patients reporting an inability to kneel (35%) were similar to before surgery.