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Patient-perceived outcome measures following unicompartmental knee arthroplasty with mini-incision

Received: 14 April 2004 / Accepted: 11 May 2004 / Published online: 26 June 2004
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Abstract We reviewed 150 patients (183 knees) who underwent mini-incision unicompartmental knee arthroplasty (Oxford). Mean age was 71.5 (36–92) years. Review was conducted at least 12 months following surgery. To assess results, we used the Oxford knee questionnaire, modified Grimby score, return to sport and work, knee “normality” and patient general health. The mean Oxford knee score was 22.17 (range 12–54). Kneeling scored worse than other activities. No significant age or gender difference was found. Mean modified Grimby score was 3.89, equating to moderate exercise less than 2 h a week. Patients with “artificial-feeling” knees had significantly worse scores than patients with normal/near-normal-feeling knees. Patients who returned to/increased sporting activity had better Oxford scores than those who did not. Ninety-four percent of patients working pre-operatively returned to work. Sixty-seven percent continued at the same level of or increased sporting activity. Oxford knee scores and return to sport compared well to published data. Results regarding modified Grimby score, return to work and pain relief were encouraging. The best results were achieved in active patients who felt their health was good and their knee felt normal or near normal following surgery.

Résumé Nous avons examiné 150 malades (183 genoux) qui ont subi une arthroplastie unicompartmentale (Oxford) par une mini-incision. L'âge moyen était 71,5 ans (36–92). L'examen a été conduit au moins 12 mois après la chirurgie. Nous avons utilisé le questionnaire de genou Oxford, le score modifié de Grimby, le retour au sport et au travail, la “normalité” du genou et la santé générale du malade. Le score moyen d'Oxford était 22.17 (12–54). Le défaut d'agenouillement était le plus péjoratif. Aucune

différence notable de sexe ou d'âge n'a été trouvée. Le score moyen modifié de Grimby était 3.89, équivalent à un exercice modéré moins de deux heures par semaine. Les malades avec la sensation de genou “artificiel” avaient des scores nettement moins bons que les malades ayant la sensation d'un genou normal ou proche de la normale. Les malades qui avaient retrouvé ou augmenté l'activité sportive avaient un meilleur score d'Oxford que les autres. Ninety-fourpercentage des malades travaillant avant l'opération ont repris le travail après. 67% des malades ont continué au même niveau de sport ou ont augmenté l'activité sportive. Les scores d'Oxford et le retour au sport étaient comparables aux données publiées. Les résultats selon le score modifié de Grimby, le retour au travail et la disparition des douleurs étaient encourageant. Les meilleurs résultats ont été obtenus chez des patients actifs, en bonne santé, et qui ont senti leur genou comme normal ou sub-normal après l'opération.

Introduction

Unicompartmental knee arthroplasty (UKA) for the surgical management of isolated medial compartment osteoarthritis of the knee with an intact anterior cruciate ligament is widely used with twice the number now being inserted compared to 10 years ago [14]. The Oxford UKA (Biomet, Inc., Warsaw, IN, USA) has a proven track record in such cases [18, 19]. The phase 3 Oxford UKA is implanted via a minimally invasive technique utilizing a mini-medial arthrotomy without patella eversion and has perceived advantages of rapid recovery and short patient hospital stay without detrimental effects on implant positioning [16].

To date, little has been published on patient-perceived outcomes of the Oxford UKA through mini-medial arthrotomy, although reports exist using a standard medial parapatellar approach [20]. This study aimed to assess patient outcomes with a minimum 12-month follow-up.

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Table 1 Oxford knee scores with patient demographics

Patients	Mean score	SD	Range
All	22.17	9.03	12–54
Men	21.59	8.26	12–43
Women	22.77	9.78	12–54
Older than 65 years	21.45	8.7	12–43
Younger than 65 years	25.07	10	12–54

Methods and materials

A consecutive series of patients who underwent an Oxford UKA in one centre between January 2000 and June 2002 were recruited into a retrospective cohort. One hundred seventy patients were recruited and sent a self-assessment questionnaire at a minimum of 12 months following surgery. We received 152 completed questionnaires of which 150 were usable (89%).

The revised cohort contained 150 patients who underwent 183 UKAs performed by three consultant orthopaedic surgeons using a standard mini-medial arthrotomy and rehabilitation regime. All had isolated medial compartment osteoarthritis with an intact anterior cruciate ligament. There were 76 men and 74 women of mean age 71.5 (range 36–92) years who underwent 96 right and 87 left UKAs.

Data was gathered using the validated Oxford 12-item knee questionnaire [3], which assesses patient function and activities of daily living, scoring each activity from 1 to 5 (the higher the score, the worse the function). A cumulative score was therefore calculated to score the patients from 12 (the best possible) to 60 (the worst possible). A modified Grimby score [4] to assess level of physical activity was also calculated. Information regarding how “normal” the knee felt was obtained by asking whether the replaced knee felt normal, near normal or artificial. Details of sporting and working activities before and after surgery were obtained, as well as an assessment of general health. Pain before and after surgery was assessed using visual analogue scales. Statistical analysis was performed using Fisher’s exact test for categorical data and unpaired *t* test for continuous data.

Results

The mean Oxford knee score was 22.17 (SD 9.03), range 12–54 (Table 1). Breakdown of the Oxford knee score is seen in Table 2. Statistical analysis revealed there was no significant difference in Oxford knee scores between sexes or ages. The mean modified Grimby score was 3.89 (SD 1.26), range 1–6. This corresponds to moderate exercise

less than 2 h a week. Sixty-five patients considered their knee felt normal post-operatively, 72 considered their knee near normal and 13 considered their knee felt artificial.

Comparing the individual question scores of the Oxford questionnaire, the ability to kneel and then stand up was found to score significantly worse than scores for other questions ($p=0.0048$). The ability to wash and dry oneself was found to score significantly better than scores for other questions ($p=0.0146$). No other statistically significant differences were found between question scores.

If the knee had been recorded as feeling artificial, then Oxford knee scores were highly significantly worse than if the knee was recorded as feeling normal or near normal ($p<0.0001$), as were modified Grimby scores ($p<0.0001$). Table 3 illustrates return to sports/activity of most popular sports/activities.

Eighty patients (54% of cohort) returned to the same level of sport post-operatively as they had maintained pre-operatively. Twenty (13% of cohort) actually increased their sporting activity, half of whom (ten patients) increased from no sport pre-operatively to starting sport post-operatively, meaning 30% of patients who did no exercise pre-operatively took up exercise post-operatively. Fifty patients did no exercise post-operatively of whom 21 had done no exercise pre-operatively, and 29 (19% of cohort) patients reduced their sporting activities and exercise post-operatively. Significantly better Oxford scores were recorded in patients who returned to or increased sporting activity compared to those who failed to return to sport ($p=0.0037$). However, there was not a statistical difference between the likelihood of returning to sport if the knee felt artificial compared to feeling normal or near normal ($p=0.0677$). No statistical difference was found between gender or age and return to exercise. Return to walking for exercise, swimming and gardening were significantly faster than return to bowls ($p<0.0001$, $p=0.0143$ and $p=0.003$, respectively). Return to exercise walking was also significantly faster than return to golf ($p=0.0376$).

Eighty-two patients (54% of the cohort) had retired prior to surgery, and four were unemployed or disabled. Sixty of 64 (94%) patients working pre-operatively returned to work, while four failed to do so. Of the 60

Table 2 Oxford knee score by domain

S. no	Question	Mean score	SD	Range
1	Usual pain from the knee	2.12	1.17	1–5
2	Trouble with washing and drying due to the knee	1.42	0.65	1–4
3	Trouble getting in and out of vehicles due to the knee	1.81	0.85	1–4
4	Distance walked before severe knee pain	1.55	0.89	1–5
5	How painful to stand after sitting for a meal	1.71	0.89	1–4
6	Limping when walking due to the knee	1.82	1.07	1–5
7	Able to kneel and then get back up	2.89	1.35	1–5
8	Night pain from the knee	1.98	1.22	1–5
9	Has pain from the knee disturbed normal work	1.94	0.99	1–5
10	Any knee instability	1.51	0.77	1–5
11	Able to do household shopping alone	1.48	0.88	1–5
12	Able to walk down a flight of stairs	1.99	1.09	1–5

Table 3 Return to sport/activity for the most frequent sports/activity

Sport/activity	Pre-op. participants	Post-op. participants	Mean weeks to resumption	SD	Range
Walking for exercise	77	88	7.87	8.74	1–48
Swimming	23	27	9.38	7.75	2–26
Gardening	75	73	10.44	13.3	1–104
Cycling	19	20	11.81	11.02	1–36
Golf	21	15	13	8.75	3–32
Bowls	20	19	24.63	24.69	4–104

who returned, 48 (80%) returned to their old job, ten (17%) returned to lighter work and two (3%) returned to heavier work. If a patient had been working pre-operatively, return to work was independent of age. There was no difference between Oxford or modified Grimby scores in patients who returned to work and those who did not.

Pre-operatively the mean pain score was 8.2 (SD 1.78), range 0–10 and postoperatively 2.1 (SD 2.46), range 0–9. The mean change in pain score was 6.0 (SD 2.94) range –10 to +3. Three patients had an increase in pain scores, while 147 had a decrease. Statistically, post-operative pain scores were significantly better than those pre-operatively ($p<0.0001$).

Nineteen patients felt they had excellent general health, 55 very good health, 48 good health and 28 fair health. No patients felt they were in poor general health. Of patients feeling their knee to be “artificial”, 11/13 also felt their general health was fair or good. Patients who felt their general health to be fair had significantly worse Oxford knee scores when compared to those who felt their health was good, very good or excellent ($p<0.0001$). No difference was found between other groups.

Discussion

Patient-perceived outcomes following knee surgery have not been widely addressed in the literature. To our knowledge, no studies have been performed regarding patient-perceived outcomes of unicompartmental knee replacements using a mini-medial arthrotomy. Patient and surgeon outcome measures correlate poorly following arthroplasty, and the concerns and priorities of patients and surgeons differ [2]. Functional activities that are important to patients following total knee arthroplasty (TKA) have been reported to be the ability to do simple stretching exercises, to kneel and to do gardening [21].

The current study assesses patient defined outcomes using a validated scoring system with additional questions to address activity at a minimum of 1 year post-surgery without relying on flawed patient recall [10]. Timing of the questioning of patients at 1 year following surgery was selected because knee function will have been regained by most patients by that time, although some improvement can be seen as late as 3 years [9, 15, 17]. Equally, return to seasonal sports and activities will have occurred.

The mean Oxford knee score of this series (22.17, SD 9.03) compares favourably with that of the series of TKA reported in the initial study by the Oxford group using the Oxford knee score (mean 29.33, SD 10.65) [3]. The activity addressed by the Oxford questionnaire in the current series that recorded the worst score was kneeling down then standing up again. This question recorded a significantly worse score than the other 11 questions (mean 2.89, SD 1.35, $p=0.0048$), and these results concur with previous findings that a majority of patients will have difficulty with kneeling after knee arthroplasty [5].

The hypothesis that patients with a subjectively normal knee would have better knee scores than those who felt their knee was artificial was examined. The hypothesis is supported by the findings that Oxford and modified Grimby scores were significantly worse in patients who reported their knee felt artificial when compared to patients with normal or near-normal-feeling knees ($p<0.0001$). The majority of patients with artificial-feeling knees felt their general health to be only fair or good rather than very good or excellent. Also, patients who felt their health was only fair had significantly worse Oxford scores when compared to those with good or better health ($p<0.0001$). Fair general health may be a reflection of a less-successful UKA or other co-morbidities, but equally these results suggest there may be a patient group that does not recover as well functionally following surgery due to poorer general health, particularly if they consider their replaced knee feels artificial.

Little has been written about safe and appropriate activities for patients following knee arthroplasty [11]. Many would advocate a return to only low-impact, low-demand and short-duration sporting activity [13]. Avoidance of jogging and running sports is generally advised due to concerns that these activities cause high inlay stress in polyethylene joint bearings, risking delamination and polyethylene wear [7]. Activities such as walking for exercise and cycling are encouraged [8]. Reduced sporting activity following TKA has been reported [12] but sporting activity actually increased in this series, with 67% of the cohort maintaining or increasing their pre-operative level of sporting activity. Those who did increase or maintain their sporting activity had significantly better Oxford scores than those who did not ($p=0.0037$). High-impact sports such as jogging were universally stopped on surgeon's advice, but a return to swimming and cycling was encouraged and achieved in the majority of patients who undertook such activities

before surgery. Of patients who participated in sports pre-operatively 77% returned to sport and 95% returned to bowls, which is comparable to published data [1]. Of previously sedentary patients, 30% took up sport post-surgery, which compares favourably to previous series [1]. Timing of return to sport varied between sports. Return to walking for exercise (mean 7.87 weeks) and swimming (mean 9.38 weeks) were significantly faster than return to bowls (mean 24.63 weeks) [$p < 0.0001$ and $p = 0.0143$, respectively].

Rate of return to work was 94%, independent of patient age, if the patient had been working pre-operatively. However, differences in Oxford and modified Grimby scores were not statistically significant when comparing patients who worked post-operatively and those who did not. Of patients had not worked prior to surgery, none returned to work following surgery despite adequate knee scores.

Pain scores improved significantly after surgery ($p < 0.0001$), and this finding is supported in many series [6, 12]. This conclusion should be viewed with caution, however, as patients tend to over-estimate pre-operative pain scores [10]. Nonetheless, pain is a major surgical indication for knee arthroplasty and this result is encouraging.

In this series, Oxford knee scores and return to sport following UKA compared well to published data, and results regarding modified Grimby score, return to work and pain relief were encouraging. The best results were achieved in active patients who felt their health was good and their knee felt normal or near normal following surgery.

Acknowledgements Mr. C.J.V. Mann and Mr. A. Smith, previous fellows at WOC, are acknowledged for their efforts in setting up this project.

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