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ORIGINAL PAPER

Minimally invasive Oxford medial unicompartmental knee arthroplasty

A note of caution!

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Abstract We present the peak outcome results of the Oxford medial unicompartmental arthroplasty through a minimally invasive ssurgical incision. This prospective study included 78 Oxford medial unicompartmental knee replacements in 68 patients. At the 2 year review the patients achieved a mean Oxford Knee Score of 38.3. This was not significantly different to the 2 year results of the phase 2 Oxford knee carried out using a standard parapatellar approach when patients achieved a mean OKS of 36.0. Four unicompartmental knee replacements required revision for unexplained pain, deep infection, aseptic loosening and bearing dislocation. Minimally invasive joint replacement is attractive to both patients and surgeons, but is technically demanding with complications inherent to limited access.

Résumé Nous présentons les résultats de la prothèse Oxford unicompartimentale interne après MIS. Grâce à une étude prospective qui a inclus 78 prothèses chez 68 patients. Après 2 ans de recul, le score moyen d'Oxford est de 38.3. Il n'y a pas de résultats significativement différents entre MIS et un abord para patellaire standard (score OKS 36.0). Quatre prothèses ont nécessité une révision pour des douleurs inexpliquées, une infection profonde, un descellement aseptique ou une dislocation rotatoire. La mise en place d'une prothèse unicompartimentale par MIS apparaît satisfaisante pour les patients. Elle est néanmoins techniquement difficile pour les chirurgiens avec un risque de complications inhérent à l'accès limité de l'abord.

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Introduction

Unicompartmental arthroplasty suffered a decline in the 1990s with recognition of a higher rate of failure compared with total knee arthroplasty [7]. The Oxford medial unicompartmental knee arthroplasty is now undergoing a revival because of "minimally invasive surgery". Through a much smaller incision, without dislocation of the patella, the prosthesis can be implanted. The result is much less postoperative pain and patients have been discharged home within a day [12].

Since one of the main reasons for failure of the phase 2 Oxford knee arthroplasty has been attributed to faulty operative technique [10], we are concerned that smaller incisions will lead to an increase in the rate of technical error and early failure. Most technical failures occur within the first 2 years [10]. In fact, 2 years is the ideal time to assess the peak outcome of knee replacement [9].

Materials and methods

Between June 1998 and November 2001, 78 consecutive UKRs were undertaken in 68 patients under the care of the

senior author. Eight patients were excluded from the study, including four patients who died from unrelated problems and a further four patients who underwent revision surgery. A review of the case notes of all patients who required revision surgery or died prior to their 2-year assessment was undertaken. The remaining 60 patients were reviewed 2 years following surgery. The primary study endpoint was the postoperative Oxford Knee Score (OKS). Secondary endpoints included the American Knee Society Score (AKSS), pain scores and range of motion. Preoperatively, patients were asked to complete the OKS. Patients were reviewed as close as possible to 2 years following surgery, at which time the outcome was assessed with a further OKS. In addition, an AKKS was completed. Demographic details were obtained from the patients and their case notes including age, sex, height, weight, preoperative health status, postoperative health status and postoperative complications. Health status was assessed using a modification of the classification system devised by John Charnley for hip arthroplasty. Patients who have no other medical problems are group A, patients who have had a successful knee replacement in the other knee are group BB, patients whose other knee is symptomatic are group B and patients with concomitant conditions that impair locomotion are group C (Table 1).

Indications for Oxford unicompartmental knee replacement included anteromedial osteoarthritis Ahlbach stages I to III [1], a passively correctable varus deformity, a normal lateral compartment and an intact anterior cruciate ligament. The presence of chondrocalcinosis or mild patellofemoral osteoarthritis was not considered a contraindication. Patients with an inflammatory arthropathy were not included in this study.

Table 1 Demographic details

	Oxford knee replacement
Number of patients	60
Number of knees	74
Age (mean/range)	63.4/41–79
Sex	
Male	33
Female	27
BMI (mean/range)	28.4
Preoperative health	
A	29
B	19
BB	3
C	9
Postoperative health	
A	24
B	10
BB	16
C	10
Exclusions	

The femoral and tibial components of the Oxford Knee (Biomet Merck Ltd.) are composed of cast cobalt chromium molybdenum alloy. The meniscal bearings are manufactured from compression-moulded ultra high molecular weight polyethylene sterilised in an argon gas environment. The phase 3 version modifications include the introduction of four femoral sizes for improved patient fit, modification of the anteromedial edge of the tibial component to avoid overhang, a redesigned meniscal bearing with a chamfered anterior slope to prevent impingement against the femoral condyle in extension and a minimally invasive approach.

The minimally invasive technique involved a paramedial skin incision made vertically from the medial margin of the patella above to a point 3 cm distal to the level of the tibial plateau. The incision was deepened through the capsule and was extended obliquely medially and proximally for 1 to 2 cm. The fat pad was partially removed and retractors inserted to allow inspection of the anterior cruciate ligament and lateral compartment of the knee. If the indications for surgery were appropriate the Oxford Phase 3 Knee was then implanted following the manufacturer's guidelines, but using extramedullary alignment.

Postoperatively all patients received thromboprophylaxis with aspirin and foot pumps. All patients also received three perioperative doses of intravenous cefuroxime. Mobilisation was started on the first postoperative day.

Results

The mean Oxford knee score (OKS) at the 2-year review was 38.3±8.6 for the Oxford knee replacement (Table 2).

The mean American Knee Society score (AKSS) at the 2-year review was 91.8±10.5 with a function score of 84.0± 19.0 for the Oxford knee (Table 2).

Health status had a significant effect on outcome. In the Oxford knee group those patients with a health status of A/BB had an OKS of 41.6 falling to 36.6 for group B and 30.4 for group C ($P<0.01$) (Table 3).

Four patients required revision surgery and were excluded from the analysis of knee scores. The reasons

Table 2 Summary of outcome measures at 2-year review for Oxford unicompartmental knee replacement

	Score±SD
Preoperative Oxford knee score	20.6±8.6
Postoperative Oxford knee score	38.3±7.8
American Knee Society score	91.8±10.5
American Knee Society score (function)	84.0±19.0
ROM	119.5 degrees (range 95–140)

OKS: Oxford knee score; ROM: range of motion; AKSS: American Knee Society score; ns: not significant

Table 3 Summary of the effect of health status on outcome from the Oxford knee and the AGC total knee replacement *by mean and standard deviation*

	Score ± SD
Postoperative Oxford knee score	
A/BB	41.6±5.5
B	36.6±6.5
C	30.4±7.9
Postoperative American Knee Society score	
A/BB	94.2±7.9
B	90.8±11.5
C	85.2±14.3
Postoperative American Knee Society score (function)	
A/BB	92.0±12.9
B	81.6±16.4
C	60.5±22.6

A: isolated knee problem; BB: other knee successfully replaced; B: other knee symptomatic; C: multiple medical problems

for revision included aseptic loosening, persistent pain, deep infection and bearing dislocation. Two other patients required further surgery including one patient who had an MUA and another who underwent an arthroscopy. Complications included one patient who developed a clinically evident postoperative deep venous thrombosis and another who had a pulmonary embolism.

Discussion

The concept of minimally invasive joint replacement surgery is attractive to both patients and surgeons, but this study shows that it is technically demanding with a risk of complications.

This study shows that excellent results can be obtained for the minimally invasive phase 3 Oxford medial unicompartmental arthroplasty. The Oxford knee is a technically demanding procedure, and there was some concern that the minimally invasive approach with its limited visibility could compromise the result. It is reassuring to find that the results are equally as good as the published peak outcome results of the phase 2 Oxford knee [14].

Our results only apply for the use of the Oxford knee in cases of anteromedial osteoarthritis in which the anterior cruciate is intact and the disease confined to the central and anterior parts of the medial tibial plateau. No medial collateral ligament release is required as the varus deformity is correctable, not fixed. We find this variety accounts for one in four cases of osteoarthritis of the knee [11, 15]. Ideally we would have conducted a randomised controlled trial (RCT) of the Oxford knee in patients with anteromedial osteoarthritis, but due to the relatively small number of patients suitable for this procedure a multicentre trial would be required and to date we know of no such study in existence. A consecutive series of patients are included in the study with prospective measurement of the knees using the Oxford knee status questionnaire both preoperatively and at 2 years.

The Oxford-12 has been shown to have the best overall ranking for specific questionnaires [5]. The concerns and priorities of patients and surgeons may differ and patients themselves can provide reliable and valid judgements of health status and of the benefits of treatment [4]. However, Harcourt [6] has shown the OKS is heavily influenced by disease of the hip or back. Our results also demonstrate the overwhelming importance of sub-classification of patients according to their ABC status. The most profound influence in outcome was their general health. Patients with no other medical problems (type A) and those who had previously undergone a contralateral knee arthroplasty (type BB) had a much better outcome as measured by the OKS, AKSS functional ratings. For these reasons we recommend the use of the ABC grading first advocated by Charnley in stratifying the measurement of outcome of knee arthroplasty [3]. Konig et al. showed that knee scores improve rapidly in the first 3 postoperative months and reach a peak at 2 years after surgery [9]. We were therefore surprised to find that there was a significant decline in health status over the 2 years following surgery.

Lewold showed that most of the failures (70%) of the Oxford knee arthroplasties occurred in the first 2 years after surgery and dislocation of the bearing was found to be the commonest cause of failure [10]. The most difficult problem is access to the posterior compartment of the joint for removal of the meniscus and posterior osteophytes. Retained tissue at this site could lead to impingement of the meniscal bearing, loosening and dislocation. We had one bearing dislocation in this 2-year outcome study using the minimally invasive technique. There was one case of aseptic loosening. Clearly, longer term studies at 5 and 10 years will be required to fully assess the survivorship of the phase 3 Oxford Arthroplasty in comparison with the earlier designs [2, 8, 11, 13].

In conclusion, the results show that with careful patient selection and attention to surgical technique the minimally invasive approach of the phase 3 Oxford medial unicompartmental knee replacement can provide an excellent outcome.

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