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## The Oxford II medial unicompartmental knee replacement. A minimum 10-year follow-up study

**Key words:** unicompartmental arthroplasty, unicompartmental knee arthritis

### SUMMARY

**Background.** The first clinical results from unicondylar knee arthroplasty (UKA), which was introduced in the early seventies, were non-conclusive. The development and modernization of unicompartmental implants (mobile bearing models, such as Oxford II), and also stricter qualification criteria for UKA brought about significant improvement in long term outcome. The aim of our study was to assess the long-term outcome of UKA using Oxford II implants, and also to verify the inclusion criteria.

**Material and methods.** The authors present an analysis of long-term outcome in unicompartmental knee arthroplasty in 42 patients, qualified for treatment according to the criteria of Kozin and Scott, and also the designers of the implant. The follow-up assessment was performed a minimum of 10 years after surgery (11.2 years average).

**Results.** The results were assessed using the 100-point HSS scale. Excellent results were achieved in 10 cases, good results in 22 cases, fair results in 6 cases, and poor results in 4 cases. The implant survival rate was 86%. There were some complications related to surgical error or lack of strict compliance with the qualification criteria.

**Conclusion.** UKA late results are comparable to those achieved in TKA, given proper qualification. Also, this procedure can be considered as a definitive solution in older patients.

### BACKGROUND

Unicondylar knee arthroplasty (UKA) was first introduced in the early 1970s, with diverse clinical results, ranging from a high failure rate to favourable outcome. All available UKA implants in the market are based on one of two different design concepts: fixed and mobile bearing knee systems. The latter was introduced by Goodfellow and O'Connor with a design known as the „Oxford meniscal system.” [1]. The main idea of the mobile bearing was to imitate the function of the human meniscus. In this way the „rolling and sliding” movements of the femoral condyle could be more natural and effective. As implant design and surgical technique have progressed, the mid- and long-term outcomes of UKA have improved, and are beginning to challenge the results of total knee arthroplasty (TKA) [2,3,4]. The revival of UKA is also a result of the introduction of minimally

invasive surgical techniques. Additionally, surgeons have been interested in UKA because the prothesis itself was designed to rest on the subchondral bone without interfering with either the cruciate ligaments or the major capsular structures of the knee joint.

The main question to be addressed in this type of arthroplasty is: Is the arthritis progressing in the retained compartment? Although the first clinical results provoked controversy, several recent publications have found no progress of arthritis in the opposite compartment in long term follow-up [5,6,7,8]. Moreover, many authors have observed almost the same survivorship in UKA as in TKA [9,10]. In our department, UKA using the Oxford meniscal system was implemented in 1989, and we published preliminary results in 1992 [11]. Our positive experiences encouraged us to evaluate the long-term outcome. The purpose of our study was to perform a retrospective assessment of long-term outcome, and also clinical analysis of complications.

## MATERIAL AND METHODS

We analysed 42 patients treated between 1989 and 1992. Of these individuals, 34 had osteoarthritis of the knee and 8 patients with posttraumatic osteoarthritis of the knee. The mean age of the patients at the time of surgery was 64 years (range 58-76 years).

The qualification criteria for UKA were consistent with those of Kozin and Scott [2], which have been universally accepted. The main indication was unicompartmental osteoarthrosis. The patients should be generally older than 60 years. Additional criteria include:

- stable knee with flexion contracture less than 15 degrees;
- passively corrected varus malalignment;
- cartilage of patellofemoral joint and lateral compartment in good condition.

Analysis of preoperative x-rays revealed that radiological changes were between grade II and III according to Ahlbäck [12]. Any angular deformity pre-

sent in the knee was passively correctable to at least clinically neutral position. The range of motion in all operated knees was at least 80 degrees, with maximum 15-degree flexion contracture. The surgical technique was traditional, consistent with that used by other authors and the manufacturer's recommendations [2,3]. Stage II implants inserted into the medial compartment were used in every case. Walking with full weight-bearing was commenced 5 to 10 days after surgery. Flexion was allowed after wound healing (in about 12-14 days).

The Hospital for Special Surgery grading scale was applied to assess clinical outcome [4]. The main criteria were pain, function, range of motion, muscle strength, flexion deformity and instability. We divided our patients into 4 groups: excellent outcome (85-100 points), good outcome (70-84 points), fair outcome (60-69 points), and poor results (less than 60 points). The final examination was performed a minimum of 10 years after surgery.

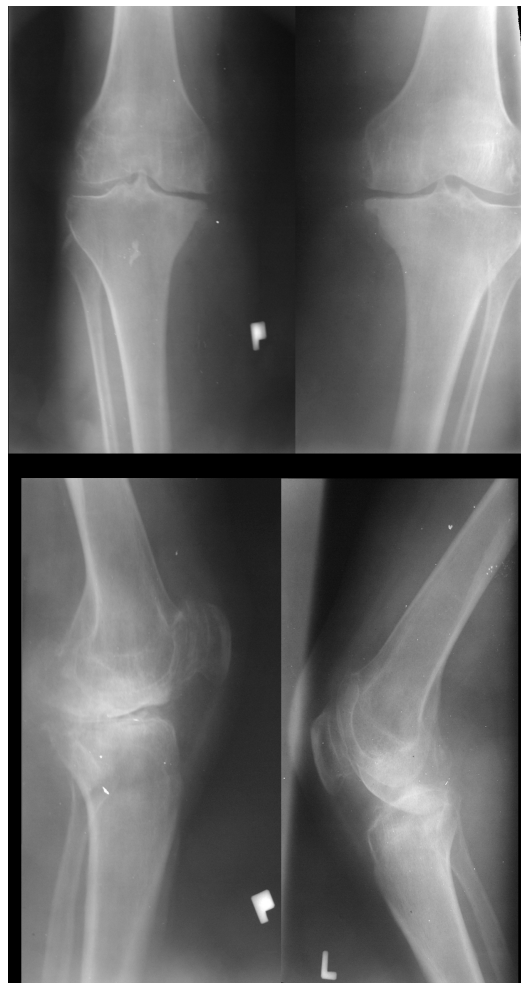


Fig. 1. 64-year-old patient with bilateral knee osteoarthritis

## RESULTS

The mean time of follow-up was 11.2 years. In clinical outcome, the average HSS knee score, with survivorship rates of 86%, ranged from 52 points (before surgery) to 76 points (the latest follow-up). Overall, the following results were obtained:

- excellent – 10 cases (24%);
- good – 22 cases (52%);
- fair – 6 cases (14%);
- poor – 4 cases (10%).

The average arc of active flexion before surgery was 98°, which improved to 115° postoperatively. No instability was observed pre- or postoperatively. Pain

in the knee was observed preoperatively in all patients. On follow-up, one patient (Fig. 1-4) had severe pain, three patients had moderate pain, seven patients noted slight pain (increasing after exertion) and the remaining 31 patients had no pain.

The UKA procedure was rated „unsatisfactory” by 4 patients, and 6 patients reported „some improvement”, while 32 patients rated their experience „very good” or „good.”

In radiographic results, the average preoperative deformity (in standing position in all patients), was 10° of varus, compared to 4° varus postoperatively. Radiolucency around the tibial component appeared in 5 cases, but in only 2 cases was progress

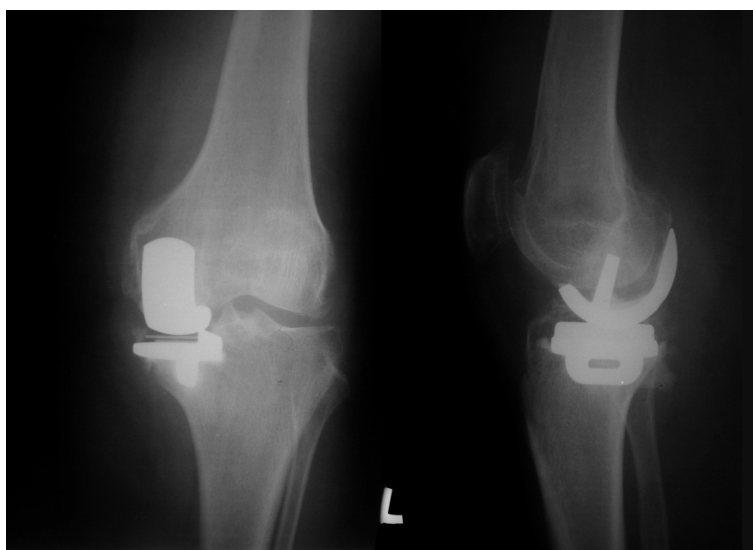


Fig. 2. The same patient after surgery (UKA)

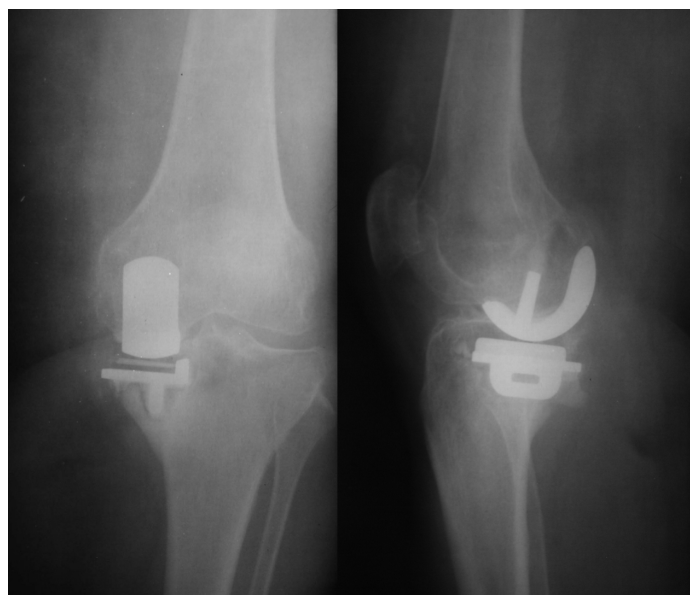


Fig. 3. The same patient 10 years after surgery. Signs of loosening of the implant's tibial component. The patient did not consent to implant replacement



Fig. 4. The same patient with fractured medial condyle 12 years after surgery. TKA was performed as a final solution

observed. Evidence of progress of osteoarthritis in the opposite compartment was noted in 1 case. Patello-femoral joint arthritis was observed in 1 case (malalignment of femoral component).

We did observe some clinical complications. Postoperative X rays revealed 1 case of femoral component malalignment and one 2o valgus hypercorrection. In 4 cases we observed deep venous thrombosis. Every case was treated with low molecular-weight heparin without long-term consequences. There were no infections. Among the above-mentioned complications, only 4 cases resulted in bad HSS score result. All of these had required revision from UKA to TKA.

## DISCUSSION

The long term outcomes we found after unicompartmental knee arthroplasty should be regarded as fully satisfactory. An implant survivorship rate above 80% over 11 years of follow-up is slightly lower than the figures given by the implant's inventors, as

well as by other authors [3,5,7,9,13,14,15,16,17]. However, we found several publications reporting similar results [6]. Our analysis of the procedures applied, with respect to poor results, clearly reveals that complications can appear at every stage. In all patients, strict qualification criteria were applied. The age criterion was strictly observed except for two patients with posttraumatic arthrosis of the medial compartment. The criteria pertaining to the condition of the patello-femoral joint and also the lateral knee compartment were likewise strictly observed. In all cases, proper thickness of joint cartilage was the main criteria, as well as lack of rheumatoid and inflammatory processes in the joint. It should be stressed that we do not share the opinion expressed by some authors, that minor pathologies of the patella's medial surface present no difficulties for UKA [8,10,18,19]. Certainly, after limb axis correction, patella tracking was improved, and the observed pathological changes should resolve after reduction of weight load. Moreover, they should not give some of the clinical signs, such



as pain. However, it is very important to remember that these specific changes would be irreversible and progressive in respect to the patella's poor vascularization.

In view of the foregoing, we consider the above-listed qualification criteria to be correct in relationship to limb axis correction and the knee's range of motion after 11 years of follow up.

Our analysis of alignment revealed that evidently poor positioning of the implant was performed in two cases (in one case, malalignment of femur, and in the other, evident hypercorrection of the axis). This resulted in early total knee replacement, because of progressive pathological changes in other compartments. The complications we listed should be linked to the lack of experience with this type of implant, given that these procedures were being performed for the first time. The regression of pain, fast improvement of range of motion, and the lack of recurrence of flexion contracture caused some patients to overestimate treatment outcome according to the HSS score. When we compared the group of eight patients with post-traumatic arthrosis of the medial compartment to the others, we found no significant differences. In this group of patient (posttraumatic) there seem to be considerable correction of the limb axis in cases with depressed and incorrectly healed arthrotic condyles.

The progress of pathological changes in the lateral compartment can be considered a result of overloading, or as a long-term effect of post-traumatic damage to the cartilage (there was one such case from the group with posttraumatic arthrosis). Another possible explanation is immunological destruction of the cartilage by polyethylene concrements. These mechanisms have been discussed by Weale et al. and Argenson and O'Connor [8,13].

It is essential to note that the varus reduction from 10° to 5° can be classified as undercorrection. Several authors have emphasized the need for undercorrection of the deformity in UKA to avoid rapid degeneration in the retained compartment. We should mention, however, that the great advantage of UKA is the fact that patient has retained knee ligament structure, and thus proprioceptive stimulation and biomechanical play of movement have not been destroyed to the same extent as in TKA. This problem has also been mentioned by other authors [8,9,10,19,20].

Long term outcome in cases treated with Oxford II implants using traditional surgical techniques is generally very good, though somewhat worse than in patients treated with minimally invasive techniques [21,22]. The complications mentioned above have also been described by others [23,24,25,26]. Signifi-

cantly, this was the first group of 42 patients treated with this type of implant in our hospital. Technical errors were eliminated due to the increasing experience of the operating surgeons. The development of minimally invasive techniques and modern navigation systems will probably make it possible to achieve much better results in the future [21,22].

## CONCLUSIONS

1. The long-term outcome of unicompartmental arthroplasty is quite satisfactory due to the high survivorship rate.
2. Due to the long survivorship of the implants, unicompartmental knee arthroplasty can be considered as the definitive treatment in a carefully selected group of older patients.

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