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Mid-term results of Oxford Phase 3 unicompartmental knee arthroplasty in obese patients

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Objective: The aim of this study was to evaluate the mid-term outcomes of Oxford Phase 3 unicompartmental knee arthroplasty (UKA) in obese patients in terms of prosthesis survival, progression of lateral compartment arthrosis and functional outcomes.

Methods: The study included 67 patients, with a body mass index over 30, treated with mobile bearing Oxford Phase 3 UKA for isolated medial osteoarthritis between January 2005 and December 2010. Preoperative and postoperative knee range of motion (ROM) and knee scores (Hospital for Special Surgery, HSS and Oxford knee scores) were compared. Additionally, prostheses were evaluated using Oxford radiographic evaluation criteria at the final follow-up.

Results: Mean age was 61 years and mean follow-up was 67.5 months. Insert dislocation occurred in 3 patients (4.5%). Postoperative knee ROM, HSS and Oxford knee scores were significantly improved ($p<0.05$). There was no sign of prosthesis failure or lateral compartment arthrosis in radiographic evaluation at the final follow-up.

Conclusion: Oxford Phase 3 UKA with mobile bearing has good mid-term results in obese patients over 60 years of age.

Key words: Mid-term; obese patient; Oxford Phase 3 unicompartmental knee arthroplasty.

Osteoarthritis of the knee is one of the most common causes of painful loss of mobility in the middle-aged and elderly population. For cases in which conservative treatment is insufficient, surgical treatment choices such as osteotomies correcting lower extremity alignment (distal femoral osteotomy, high tibial osteotomy), unicompartmental knee arthroplasty (UKA) and total knee arthroplasty (TKA) are available. Unicompartmental knee arthroplasty has been used for a long time in gonarthrosis patients with isolated medial or lateral compartment involvement.

The effect of UKA on joint function and the progression of arthrosis remains subject to debate. Additionally, the effect of body weight on patient selection is also controversial, particularly in obese patients generally excluded from UKA due to concerns regarding prosthesis survival.

In our clinic, the majority of UKA patients were obese. In this study, we aimed to evaluate the mid-term functional outcomes of obese patients who underwent UKA due to medial compartment arthrosis and assess the development of arthrosis in lateral compartment and prosthesis survival.

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Fig. 1. Preoperative radiologic evaluation. **(a)** Medial compartment closure of the left knee on AP X-ray at standing position. **(b)** Intact posterior compartment of the tibia on lateral knee X-ray at 20° flexion. **(c)** Narrowing of the medial joint space on varus stress X-ray. **(d)** Correctable varus deformity of the knee evaluated by separation of the medial femoral condyle from the tibial plateau on valgus stress X-ray.

Patients and methods

The records of 102 patients diagnosed with isolated medial knee osteoarthritis who underwent mobile carrier Oxford Phase 3 UKA between January 2005 and December 2010 were evaluated. Of these, 82 patients with a preoperative body mass index (BMI) higher than 30 were selected. The 67 patients available for follow-up were included in the study.

In our clinic, medical history, physical examination and radiological evaluation is routinely taken for all patients undergoing planned unicondylar knee prosthesis. Routine radiograph imaging includes AP standing upright, lateral at 20° of flexion and varus/valgus stress views of both knees (Fig. 1). Preoperative weight, height, joint range of motion (ROM) and knee scores (Hospital for Special Surgery, HSS and Oxford knee scores) are recorded. Measurements were repeated during the follow-up visits of the included patients. Prostheses were evaluated based on the Oxford radiologic evaluation criteria (Fig. 2).

Descriptive statistics of data were expressed as mean, standard deviation, frequency and percent value. The Kolmogorov-Smirnov test was used to determine distribution of variables. Intergroup comparisons were made using the paired sample t-test and the Wilcoxon test. SPSS 20.0 (SPSS Inc., Chicago, IL, USA) software was used for all analyses.

Results

Demographic characteristics are given in Table 1. Pre- and postoperative evaluations are summarized in Table 2.

The Oxford criteria were used for radiologic evaluation. None of the patients showed laxity sign radiologically.[1]

During follow-up, 3 patients (4.5%) had insert dislocation. In the first, a 67-year-old woman, insert dislocation was observed 6 months after surgery and a 4-mm insert was replaced with a 6-mm insert. The second patient was a 51-year-old woman in which insert dislocation occurred at the postoperative 18th month. A 6-mm insert was replaced with a 7-mm insert in this patient. The last patient, a 43-year-old woman with insert dislocation at the 9th postoperative month, the insert was revised together with the femoral component. None of the patients had complications such as deep vein thrombosis or infection.

Fig. 2. Postoperative radiologic evaluation. Left; the appearance of two straight lines (the tibial component base and wall) perpendicular to each other on AP X-ray. Right; this image shows superposition of both femoral condyles and inferior rim of the prosthesis.

Table 1. Demographic data of the patients.

	Mean±SD	n	%
Age (years)	61±7.3		
Gender			
Male		13	19.4
Female		54	80.6
Follow-up (months)	67.5±15.4		
Weight (kg)	88.4±3.8		
Height (cm)	157.4±6.2		
BMI (kg/m^2)	35.7±2.6		

BMI: Body mass index; SD: Standard deviation.

Table 2. Changes in knee scores during follow-up period in obese patients who had UKA surgery.

	Preoperative	Final visit
HSS knee score	59.2±10.5	85.8±6.4*
Oxford knee score	18.5±4.7	40.0±5.0*
Knee ROM (degrees)	117.6±5.0	127.0±5.2*

*p<0.05

Discussion

While the initial practice of single compartment knee arthroplasty (SCKA) in the 1970s led to disappointment, there have been recently promising results with increasing value. Despite early 10-year survival rates of 85 to 88%, recent series have been more successful due to innovations in prosthetic design, patient selection, and surgical technique, leading to survival rates of 90 to 98%. The majority of these studies included elderly and female patients. Newer studies with younger and active patients have resulted in a 90 to 92% 10-year survival rate.[2-4]

In the current study, mean age was 61±7.3 years and the mid-term (mean: 5.5 years) prosthesis survival rate based on clinical evaluation and radiological Oxford criteria was 95.6%. Only 3 (4.5%) patients required revision.

Heck et al. reported that the mean ROM decreased in 294 knees after UKA surgery (from 116° preoperatively to 113° postoperatively).[5] On the other hand, many studies have reported a significant increase in joint ROM in patients with UKA surgery.[6-9] During the follow-up period, we observed that joint ROM values increased from a mean preoperative value of 117.6° to 127°. We believe that this resulted from the restoration of knee ligament balance through a careful surgery paying attention to technique details.

The progression of osteoarthritis in the opposite side is an important factor impacting the long-term outcome of UKA. Steele et al.[10] evaluated the results of 497 knees operated with the St Georg Sled UKA and suggested that UKA was a good method for anteromedial compartment arthrosis and that early radiological findings in other compartments represent a relative contraindication. The authors pointed out that the most important reason for prosthesis failure at the end of 10 years was progression of arthritis. Dacre et al. reported that the involvement of other compartments is not prevalent after UKA for anteromedial osteoarthritis.[11] Studies with a 10-year follow-up revealed that there is no progression of arthrosis in the lateral compartment and that focal changes in this field do not represent contraindication to UKA.[12,13] Similarly, Weale et al. found no radiological evidence of arthrosis progression in the lateral compartment of patients who underwent 'Oxford' medial compartment arthroplasty.[14]

In our study, the mean follow-up period was shorter than 10 years (5.5 years). In this period, none of the patients showed progression of arthrosis in the lateral compartment.

The number of obese patients requiring surgery due to knee osteoarthritis has increased over the past 20 years. Some surgeons have expressed concern about UKA surgery on obese and morbidly obese patients. Such drawbacks include early corrosion of the polyethylene insert, early implant failure and component laxity. Of the 102 UKA patients in our clinic, 82 were obese.

In 1989, Kozinn et al. suggested that UKA should not be recommended to patients above 82 kg, considering early implant failure.[15] The limit of body weight for UKA was increased to 90 kg by Deshmukh and Scott in 2001.[16]

Heck et al.[5] conducted a multicenter study with 294 patients to evaluate survival in UKA. The authors found that the mean body weight of patients with a successful UKA was 67 kg, 90.4 kg for patients requiring revision and 81 kg was a significant cut-off value. Stockelman and Pohl[17] evaluated 63 UKAs in their study and showed no relation between weight and revision need. However, they found body weight to be a significant marker of functional pain. Body weight above 90 kg increases the risk of component laxity or collapse. Experienced surgeons suggest that body weight up to 80 kg is acceptable and the outcome may vary above 90 kg.

Therefore, many authors claimed that UKA should not be performed on young, active or obese patients. Engh and McAuley[18] followed up 49 patients between the ages of 40 and 60 years for a mean of 7.1 years. Excluding problems arising from tiny polyethylene materi-

al, survival rate was 86% in this group with high physical demands. This figure is lower than that (98%) reported for UKA in other studies.[19,20]

Conversely, Ridgeway et al. reported no correlation between survival and body weight and gender in 254 patients with UKA.[7] Finally, Murray et al.[21] suggested that high BMI should not be considered a contraindication for mobile carrier UKA in a multicenter study conducted in 2012. In their study, even very high BMI values such as 45 to 50 resulted in no reduction in Oxford UKA survival.

In our study, mean BMI was 35.7 and these obese patients had no bad results in terms of pain and function. We can say that high BMI should not be accepted as a surgical contraindication and obese patients should not be excluded from UKA indications with the expectation of bad results.

Of the 102 UKA patients in our clinic, 82 were obese. However, 15 of these patients were not reevaluated due to various reasons (failure in getting into contact, moving to another city, not giving consent, etc.) and only 67 patients participated in the study. This 18% vanishing rate can be considered one of the limitations of this study. Another limitation is the lack of comparison between the results of UKA and other treatments of medial compartment arthrosis in obese patients. Further prospective studies focusing on such comparisons would shed light on treatment of choice in obese patients.

In conclusion, although a difficult and complicated procedure, mobile carrier Oxford Phase 3 UKA for knee anteromedial compartment arthrosis is a successful treatment with a high survival rate. As the ligaments are protected during surgery, joint ROM increases and provides almost normal walking mechanics. We observed no sign of progression to arthrosis in opposite compartment during mid-term follow up in obese patients. While our results showed that UKA was successful for treatment of knee anteromedial arthrosis in obese patients above 60 years of age, we do not believe this is sufficient to recommend the method in this patient group. Further studies comparing different treatment methods such as total knee endoprosthesis and high tibial osteotomy should be performed. In addition, longer follow-up periods may provide more complete information on complications such as polyethylene corrosion and implant laxity.

Conflicts of Interest: No conflicts declared.

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