Lo SCALPELLO (2020) 34:112-116
doi number: 10.36149/0390-5276-164



# Unicompartmental *versus* total knee arthroplasty in the same patient

Vincenzo Sessa, Umberto Celentano

*Department of Orthopaedics and Traumatology, Ospedale "S. Giovanni Calibita", Fatebenefratelli, Isola Tiberina, Rome, Italy*

## Summary

Despite good clinical outcomes, unicompartmental knee arthroplasty (UKA) still rises concerns as treatment for isolated medial knee arthritis, to the point that total knee arthroplasty (TKA) is still largely perceived as the best solution. The purpose of this study is to compare clinical results and survivorship rates of two different options for isolated medial arthritis in the same patient, UKA versus TKA, at a mid-term follow-up.

**Materials and methods.** We retrospectively reviewed 22 patients with isolated medial arthritis treated with UKA in the period between 2004 and 2013, who had previously undergone TKA on the other knee. The mean follow-up was 9.2 years for UKA. The inclusion criteria were that preoperative KSS and KOOS scores were similar or presumed similar for both knees, and that the same degree of osteoarthritis affected both knees.

**Results.** Clinical evaluation was carried on according to KSS and KOOS scores. At the final follow-up at 9.2 years, clinical outcomes between UKA and TKA were very similar. Significantly better results were, however, seen in range of motion (ROM) for UKA implants. Among patients invited to choose between the two procedures, 10 expressed no preference, 8 indicated a preference for UKA, and 4 for TKA. Final survivorship at 9.2 years follow-up was 95% for UKA and 100% for TKA.

**Conclusions.** No differences were reported between TKA and UKA in terms of KSS and KOOS scores at a mid term follow-up, while significantly better results were detected for UKA considering ROM.

**Key words:** unicompartmental knee arthroplasty, total knee arthroplasty, same patient, pain, ROM

Received: June 4, 2020
Accepted: September 9, 2020

**Correspondence**
**Vincenzo Sessa**
Department of Orthopaedics and Traumatology
Ospedale S. Giovanni Calibita, Fatebenefratelli,
Isola Tiberina, 00186 Rome, Italy
E-mail: vincenzo.sessa@fbf-isola.it

**Conflict of interest**
The Authors declare no conflict of interest

**How to cite this article:** Sessa V, Celentano U. Unicompartmental *versus* total knee arthroplasty in the same patient. Lo Scalpello Journal 2020;34:112-6. https://doi.org/10.36149/0390-5276-164



## Introduction

Unicompartmental knee arthroplasty (UKA) and total knee arthroplasty (TKA) are both viable options for surgical treatment of isolated medial compartment arthritis. TKA has long been recognized as the most reliable treatment due to its durability, effectiveness in pain relief, and restoration of knee function. Survivorship of TKA is commonly reported between 92 and 100% in long-term studies, even in older investigations [1-6]. Forty years ago, the results of UKA were certainly less satisfactory, with a survivorship rate ranging between 60 and 75% [7]. UKA has gained interest in recent years due to some considerable advantages over TKA: reduced operative trauma, fewer complications, less blood loss, preservation of bone stock, preservation of both cruciate ligaments, restoration of normal kinematics, faster postoperative rehabilitation, excellent range of motion (ROM), and revision surgery is easily performed. On the other hand, it seems to possess important disadvantages in terms of higher revision rates [8].

The introduction of a minimally invasive approach, evolution of materials, and advancements in implant designs were followed by a marked reduction of failures and definitively changed the role of UKA.
So far, UKA has been established as a satisfactory solution with a survivorship of more than 90% at 20 years of follow-up [9,10].
Even studies that reported higher UKA revision rates compared to TKA are being questioned today, because the surgeries had usually been performed in centers with low UKA volumes [8,11].
Few clinical studies have compared outcomes of TKA and UKA in matched groups, and only three have reviewed the results of UKA and TKA performed in the same patient, and all at short term follow-up [12-14]. Clinical and functional results were reported as very similar in all three studies. Patients questioned about their preferences between the two procedures were not able to express a strong preference, which was quite surprising given UKA's excellent functional results and quicker recovery compared to TKA.
The aim of this study is to compare the outcomes of two different treatments of isolated medial arthritis in the same patient: UKA versus TKA, and determine if they remain similar even at a mid-term follow-up. Like other studies, our research also aims to understand if the two procedures are perceived similarly over time.

## Materials and methods

22 patients with isolated medial arthritis were treated with UKA in the period between 2004-2013. All had previously undergone TKA on the other side. 18 of the 22 patients had the TKA performed at other institutions, while only 4 patients underwent surgery in our department. Mean follow-up was 11.2 years for TKA (8-18) and 9.2 years for UKA (7-16). Mean age at the time of TKA was 69 years and at the time of UKA was 71 years. 14 patients were females and 8 were males. Mean BMI for the entire cohort was 29.2 (23.6-32.1).
Very strict selection criteria were adopted: varus deformity not greater than 15°, intact ACL, asymptomatic patellofemoral joint, minimum ROM 100°, and no flexion deformity over 10°. Other inclusion criteria were that preoperative KSS and KOOS scores were similar or presumed similar for both knees.
Patients were evaluated according to KSS and KOOS scores. Preoperative KSS mean values were 55 (range 34-60) for the non operated knee, and 49 (35-59) for the 4 patients who underwent TKA in our institution. Preoperative mean KOOS values were 57 for UKA (40-72) and 48 for TKA (40-72).
Grade of arthritis (OA) was detected and classified according to Kellgren and Lawrence Grading Scale [15]. 19 patients had KL grade 3 OA and 3 patients grade 4. Including criterion was same degree of arthritic degeneration in both knees.
For this purpose, preoperative radiographs were accurately reviewed to confirm that the knees that had previously undergone TKA were exclusively affected by isolated medial compartment arthritis. Total knee implants had various designs. Both components were always cemented. Patellar resurfacing had never been performed. A cruciate retaining prosthesis was used in 20 implants.
Only one UKA model was employed in all cases and both components were cemented (Accuris unicompartmental fixed bearing prosthesis, Smith and Nephew®). All UKA were implanted through a mini invasive approach. A metal backed tibial plate was used in 17 cases and an all polyethylene tibial component in 5 cases (Fig. 1). All surgeries were performed by a single surgeon. 12 UKA were implanted in the right knee and 10 in the left knee.
All patients underwent TKA first followed by UKA. TKA had been performed in other institutions in 18 cases, and 4 cases in our department.
Patients who had TKA as the second procedure were excluded from this study. UKA was implanted 3 years or more following TKA in 7 cases, between 1 and 2 years in 12 cases, and after a period of less than 1 year in 3 patients.
All 22 patients who underwent UKA were routinely mobilized fully weight-bearing on the first or second postoperative day and discharged on the third day. No postoperative complications were registered. Out of the 4 patients who underwent TKA in our department, 1 was discharged after 5 days, and 3 after 7 days. Although UKA is reported to have lower postoperative morbidity compared to TKA, no complications were registered in our series [16, 17].
The follow-up protocol consisted of clinical control at 15 days after discharge from hospital and clinical and radiographic evaluation at 1 month, 6 months, and annually thereafter.

## Results

Clinical evaluation, pain score, ROM, radiographic analysis, and patient preferences were recorded. Clinical evaluation was carried using KSS and KOOS scores. The second scale has the

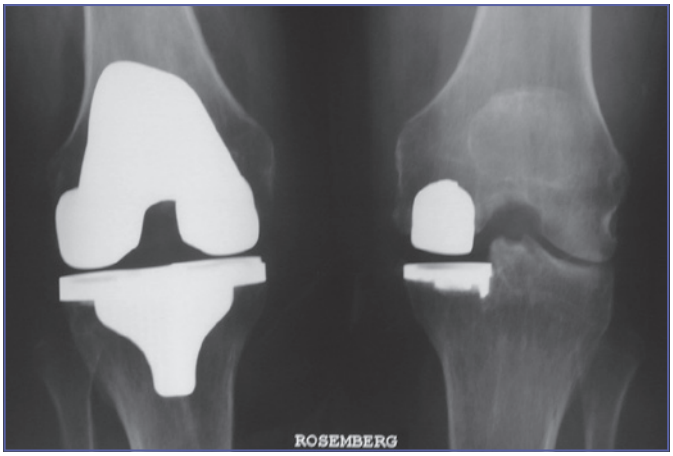


**Figure 1. The two different implants in a 66-year-old man. TKA radiograph 10 years after surgery and UKA after 8 years.**

advantage of presenting a more patient centered assessment of outcomes. KOOS separately evaluates pain, other symptoms, activities of daily living, function in sport and recreational activity, and global quality of life.
At the first control visit 15 days after discharge, mean KSS score for UKA was 75 (range 64-80) compared to a preoperative value of 55. At 1-year follow-up, the mean score was 88 (73-95), and at the final follow-up at 9.2 years was 90 (77-96). The score for TKA after a mean follow-up of 11.2 years was 89 (74-100) (Fig. 2).
Mean KOOS at 15 days after discharge was 65 (54-75) for UKA compared to a mean preoperative value of 57 (40-72). The mean result at 1-year follow-up was 86 (70-91) and 88 (72-92) at the final follow-up of 9.2 years. The KOOS result for TKA at a mean follow-up of 11.2 years was 86 (61-90) (Fig. 3).
Radiographs were obtained at each evaluation considering component alignment, radiolucency, or loosening.
The mean postoperative active ROM was greater after UKA then after TKA. Mean ROM for UKA patients at a mean follow-up of 9.2 years was 126° (± 8°) compared to 116° (± 14°) for TKA patients after a mean follow-up of 11.2 years (Fig. 4).

## Discussion

Laurencin observed 23 patients treated for osteoarthritis with TKA on one knee and UKA on the other knee with a follow-up of 81 months. While 54% of patients expressed no difference between the two procedures, 31% preferred UKA and 15% TKA [14]. Better performance was reported after UKA only with regards to ROM.
In a similar study on 23 patients who received UKA on one knee and TKA on the other, with a follow-up of 41 months, Dalury demonstrated slightly superior ROM with UKA, but no significant difference between groups according to the KSS.

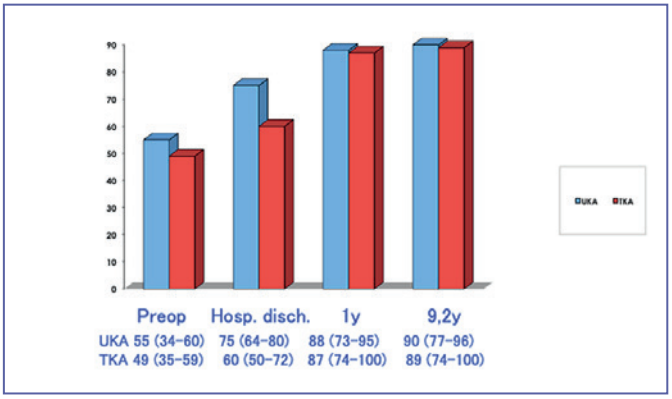


**Figure 2. KSS scores before surgery, 15 days after discharge from hospital, at 1 year follow-up, and at final follow-up. The TKA preoperative values, at discharge from hospital, and at 1 year follow-up, refer only to the 4 cases treated by our group. TKA final evaluation was 11.2 years after surgery and refers to all cases.**

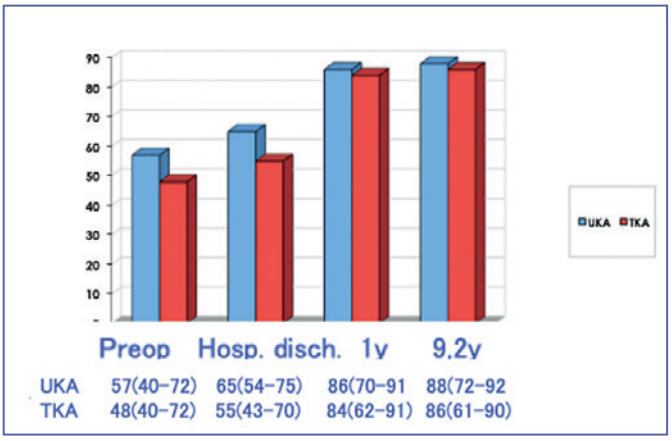


**Figure 3. KOOS scores before surgery, 15 days after discharge from hospital, at the 1 year follow-up, and at final follow-up. The TKA preoperative values, at discharge from hospital and at 1 year follow-up, refer only to the 4 cases treated by our group. TKA final evaluation was 11.2 y after surgery and refer to all cases.**

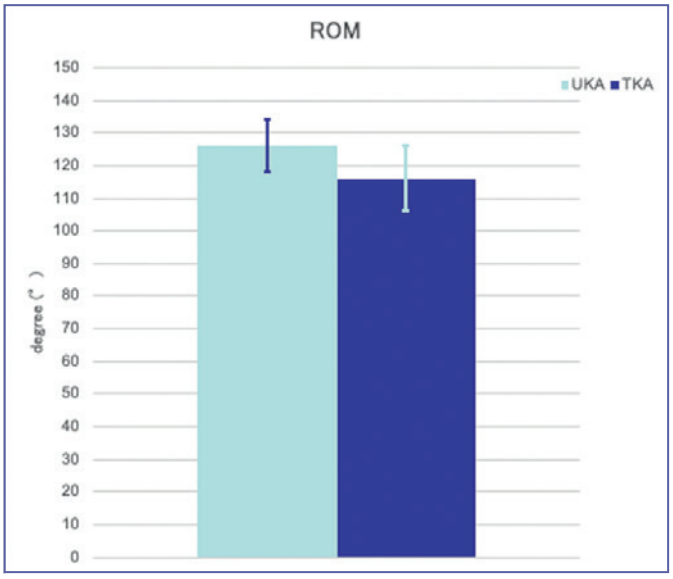


**Figure 4. Comparison of ROM between UKA and TKA at final follow-up. Mean ROM of the UKA implant at 9.2 years follow-up. was 126°. Mean ROM of the TKA implant at 11.2 years follow-up. was 116°.**

Eleven patients expressed no preference between knees and 12 preferred UKA. No patient preferred TKA [13]. Costa observed 23 patients who underwent UKA on one knee and TKA on the other at same time, and reported similar KSS scores between the two procedures, but better ROM with UKA compared to TKA. Mean follow-up was 42 months. Eleven patients expressed no preference and 12 expressed a preference for UKA [12].

We found similar clinical outcomes for both procedures considering the KSS and KOOS scales at mid-term follow-up. We detected significantly better ROM in UKA compared to TKA (126° +/- 8° *versus* 116° +/- 14°), confirming previous studies. The improvement was immediately perceived in the very first days post-op with quicker global recovery. Moreover, maximum flexion after TKA in 2 knees was 102°, where the worst score regarding flexion in UKA was 118°. Pain analysis was conducted using a standardized visual analogue scale (VAS) where patients rated their current pain ranging from 0 to 10 [18]. All knees with TKA were asymptomatic. In the UKA group, pain VAS > 3 was registered in 3 knees at 1 year follow-up. Pain decreased after 1 year in two patients, persisting only in 1. In two additional patients, persistent pain (VAS =/< 2) was reported. Radiolucency lines were detected at 1 year radiographic follow-up in 3 patients. In all cases, the lines were complete but limited to the tibial component. Radiolucencies were asymptomatic and non-progressive.

Questioned about their preference between the 2 procedures, 10 patients expressed no preference, 8 preferred UKA, and 4 TKA. Preference for UKA is intuitive: retaining ACL, a better functional result with preservation of proprioception, and an easier recovery. On the other hand, preference for TKA is easy to understand only in the first year, for persistent pain in a few cases following UKA. These controversial results, that 12 patients were un-

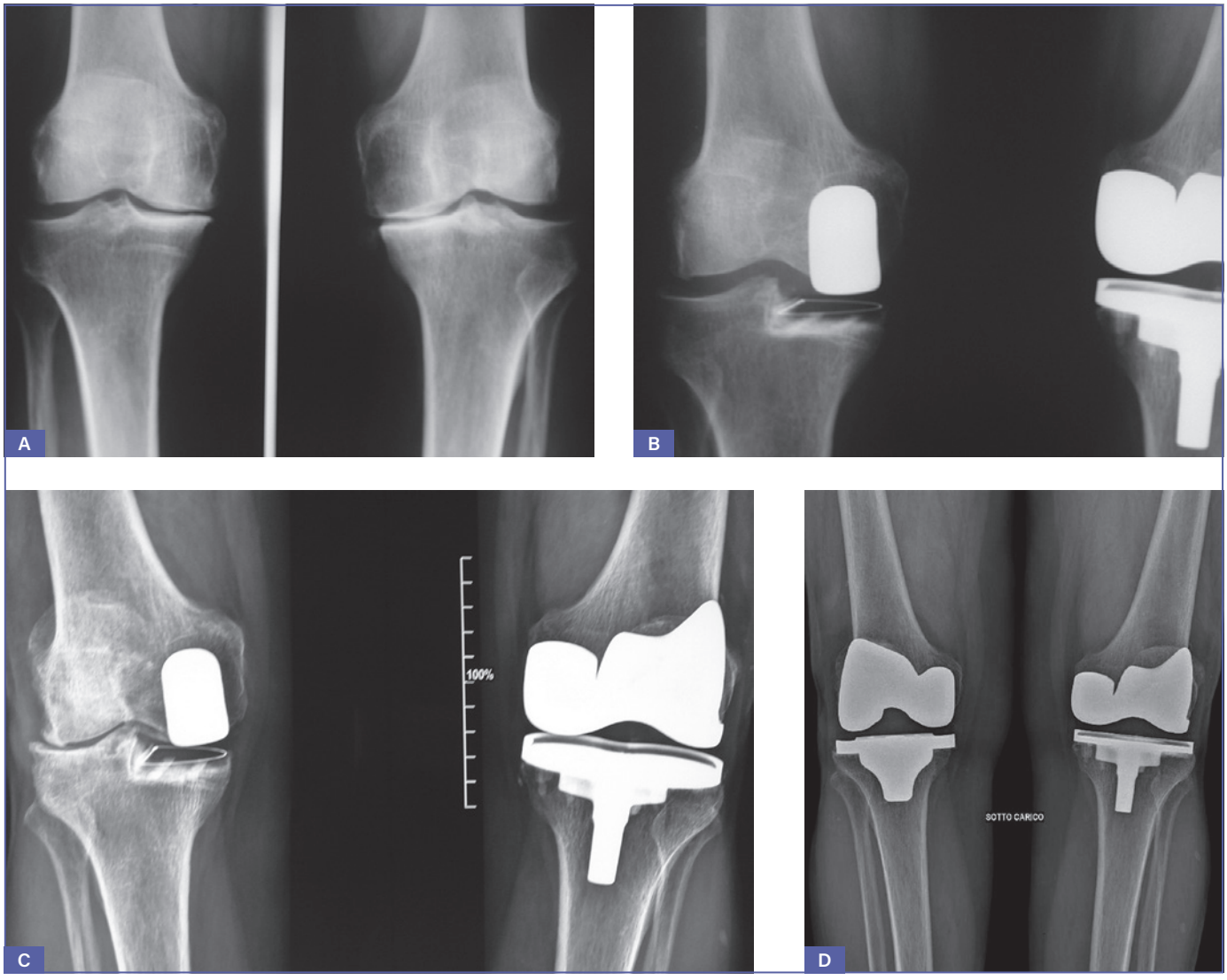


**Figure 5. UKA failure. A) A 67-year-old woman with bilateral medial arthritis. B) Immediate postoperative UKA image and TKA radiographic evaluation at 3 years after surgery. C) Left knee arthritic degeneration following UKA implant 8 years after surgery and on the right TKA at 11 years of follow-up. D) Final postoperative left knee X-ray at 7 years after revision with primary TKA and right knee TKA at 18 years follow-up.**

able to express a preference and 4 patients preferred TKA, confirm the observations of Von Keudell who reported that patients under the age of 55 were the most satisfied with UKA, while patients over 65 year reported good satisfaction with TKA [19].
Final survivorship in our series, with a mean of 9.2 years of follow-up, was 95% for UKA, with 1 failure out of 22 cases and 100% for TKA, although not significantly different.
The survival end point, according to Kaplan-Meier survivorship analysis, was defined as revision of the knee for any reason.
Failure was detected at 8 years after surgery due to increasing arthritis in the patellofemoral joint and lateral compartment. UKA was converted in a primary TKA. Clinical and radiographic evaluation at 7 years after revision was satisfying, without significant differences between knees, both with TKA (Fig. 5).
Most authors point out that the results with UKA deteriorate over time. The Finnish Register in the period 1985-2011 reported a survivorship at 5 years of 89.5% for UKA and 96.3% for TKA. At 10 years follow-up, the difference increased with a survivorship of 80.6% for UKA and 93.3% for TKA. The difference was even greater after 15 years, with a survivorship of 69.9% for UKA and 88.7% for TKA [10]. The current study is only a mid-term one and this is certainly a limit.

## Conclusions

There were no significant differences between TKA and UKA in terms of postoperative KSS, KOOS, and pain score, while there was a significant difference in ROM. Average ROM in UKA was 126° and in TKA was 116°. Even survivorship is similar at a medium follow-up [11,20].
This study confirms that UKA is a reliable option for treating isolated medial knee arthritis with several potential advantages: reduced operative trauma, fewer complications, preservation of bone stock, preservation of both cruciate ligaments, restoration of normal kinematics, faster postoperative rehabilitation, excellent ROM, and revision surgery is easily performed. Revision rates for both procedures in this study were similar to previous investigations at medium term follow-up. The limitations of this study include the small number of patients and relatively short duration of the follow-up, especially in light of the registry data, which report higher revision rates for UKA compared to TKA at long-term follow-up. This study confirms high levels of patient satisfaction after UKA, but also the inability for patients to express a strong preference between the two procedures. Confirmed data of better function and quicker recovery, together with fewer postoperative complications, justify a major increase in the use of UKA.

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