

Medial vs lateral unicompartmental knee arthroplasty: clinical results

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Summary. Unicompartmental Knee Arthroplasty (UKA) is a common procedure for the management of isolated osteoarthritis. UKA is considered less invasive compared to total knee arthroplasty, associated with less operative time, blood loss and faster recovery. Isolated lateral osteoarthritis is a relatively uncommon clinical problem, with an incidence about ten times lower than the medial compartment. In fact, lateral UKA are about 5-10% of the total amount of the UKAs. In addition, it's historically considered more challenging and with poorer results. The aim of this paper was to compare current indications, modes of failure, survivorship and clinical results of medial and lateral UKA by a narrative review of the latest literature. (www.actabiomedica.it)

Key words: UKA, medial, lateral unicompartmental arthroplasty, unicompartmental

Introduction

The unicompartmental knee arthroplasty (UKA) was introduced in the 1970's. In contrast to the TKA, UKA only replace the diseased compartment, while the contralateral is preserved. The initial results of the UKA series were discouraging, but the advancement in prosthesis design and specific and more strict indications produced improved results.

UKA is less invasive compared to total knee arthroplasty and it's associated with reduced operative time, faster recovery, larger postoperative range of motion, improved pain relief (1), earlier return to daily activities and sports (2) and cost reduction. Moreover, in case of a revision and conversion of a UKA to a TKA, the surgery is often less complicated than the revision of a primary TKA in terms of operative time and blood loss (3). Above all, a great advantage in UKA revision is the opportunity to use a primary implant in most cases (from 51% to 78%) (4, 5).

Unicompartmental Knee Arthroplasty (UKA) has gained popularity in the past decade for the man-

agement of isolated osteoarthritis (6). It was launched in 1975 by Skolnick et al. with a study of 14 procedures, 12 medial and 2 on the lateral side (7).

In point of fact, isolated lateral compartment involvement is a relatively uncommon clinical problem, with an incidence about ten times lower than the medial compartment (8) in knee osteoarthritis. Nowadays UKA is performed between 5% to 11% of all knee replacement with an increasing rate over the last 10 years, according to the National Joint Replacement registries (9-14). Only 5-10% of these are related to lateral compartment.

The aim of this paper was to compare current indications, modes of failure, survivorship and clinical results of medial and lateral UKA by a narrative review of the latest literature.

Indications

The classic indications for UKA were: age more than 60 years at the time of surgery, weigh <82 kg,

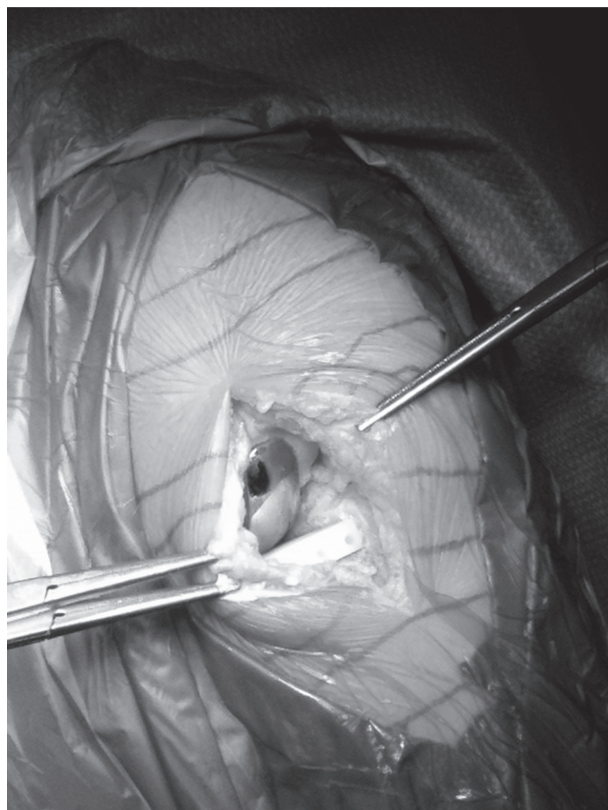


Figure 1. UKA allows less invasive surgery

not physically active or performing heavy work. Clear diagnosis of osteoarthritis (OA), post-traumatic arthritis or osteonecrosis limited to one compartment, and isolated unicompartmental and movement-related knee pain. The patient needed to have a preoperatively flexion of the knee of more than 90° , maximum flexion contracture of 5° , varus or valgus deformity of $<15^\circ$ and passively correctable to neutral. Furthermore, UKA requires an intact anterior cruciate ligament (ACL).

Nowadays these criteria are in discussion and several authors tried to extend them, even though a strict adherence may improve the results. These criteria were defined when surgical techniques and implant designs were not optimised yet.

Recently, several authors included, in their series, patients under 60 years with similar survival rates and functional outcomes compared to previous studies. Good outcomes in younger patients especially in ability to return to sports were also described (15). Nevertheless, the revision rate of UKA in younger patients remains higher (16, 17).

High BMI is considered a bad predictor which could increase perioperative complications and early failure of the implant. Murray et al. compared six groups of patients with raising BMI (18) demonstrating similar survival rate at a mean of 5 years follow-up. Other authors assessed that obesity is not a contraindication with the use of modern UKA designs or techniques (19). However some studies, based on Health Insurance databases, stated that obesity is still a significant risk factor for unicompartmental knee arthroplasty revision (17, 20).

Patellofemoral osteoarthritis (PFOA), was initially considered a contraindication for UKA (21), several studies showed that this condition is not correlated with the outcomes (16, 22-24) and in particular Thein et al. associated these outcomes to the modification of the angle congruency of the PF joint (25).

Historically a knee with functionally deficient ACL is not suited for UKA. Recently, Mancuso et al. (26) in a review of the literature, concluded that the combination of ACL reconstruction and medial UKA is the preferred treatment option for patients in younger and active patients. However, in older patients with ACL deficiency, medial UKA seems to be a fair option, with good survival rate in the short-mid term.

There are no evidences studies in literature of lateral UKA in ACL deficient knees.

Alignment and components positioning

Medial and lateral unicompartmental knee arthroplasty differs in term of anatomic, kinematic, functional outcomes and alignment (27-29). Many surgeons are not used to lateral UKA because of these different characteristics of the lateral compartment, like the increased laxity at the lateral side (30), and consider lateral UKA a more challenging and high-risk failure procedure.

It seems to be very important to define an appropriate postoperative alignment to improve the outcomes in both medial and lateral UKA. Harrington (29) studied, the mechanical load in static and dynamic phase and found that and showed that in varus deformity it was higher on the medial condyle during both phases, instead in moderate valgus the loads were higher on lateral condyle in static phase but transferred

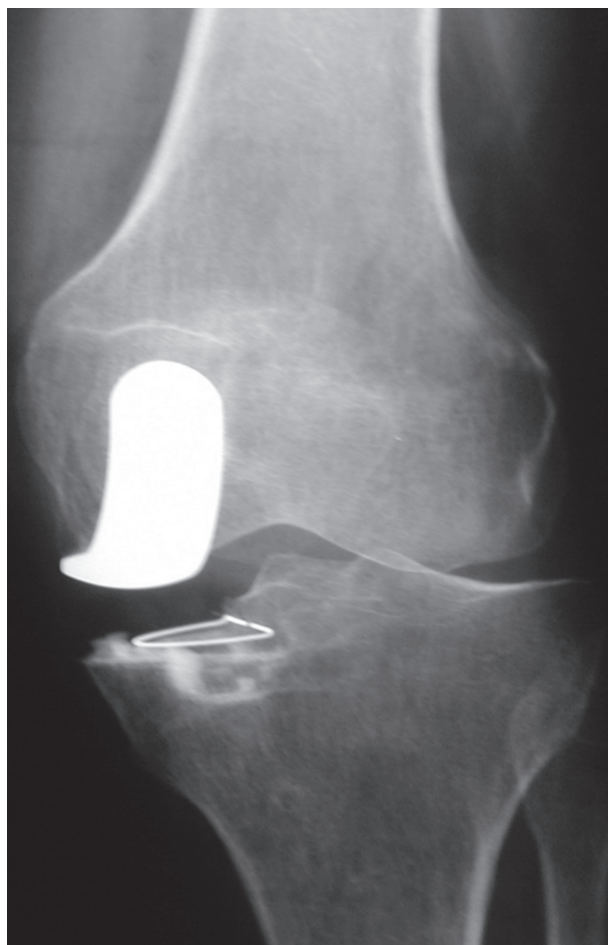


Figure 2. Axial overcorrection

to medial condyle in dynamic phase. In severe valgus, the mechanical load was high on the lateral condyle during both phases.

It has been demonstrated that modest undercorrection contributes better functional outcomes (31, 32).

In order to prevent medial over-loading, the final knee alignment in lateral UKA should be around 5-7° of valgus (33) or even less (3°-7°) (32). The same group found that the functional outcomes of medial UKA are less sensitive to final alignment, but with a neutral alignment (-1 to 3° of varus) a less joint awareness was founded (34). Vasso et al. (31) suggested a varus alignment of 2 to 4° for better functional results.

Ollivier et al. (35), pointed out other two aspects in components positioning in the lateral UKA: avoid impingement of the femoral component with the tibial spine, considering natural kinematics of the femoral

condyle, and excessive lateral placement in extension since it could implicate overload of the lateral portion of the tibial plateau.

Scott (36) has focused on patellar impingement in lateral UKA since in hyperflexion the patella tracks more laterally, suggesting to shift the femoral component laterally and the tibial component medially to maximize mediolateral congruency.

Modes of failure

Several studies reported causes of failure in UKA in the past but most of them bond medial and lateral procedure results. Due to anatomical and kinematical differences, load distribution between compartments and different pattern of cartilage wear (38) so it is important to analyze them separately (37).

Most common failure modes are: aseptic loosening, progression of OA in other compartment, bearing dislocation, infection, instability, unexplained pain, fracture, polyethylene wear.

Epinette et al. (39) in a retrospective multicentric study with 418 failed UKAs, found that the main cause was aseptic loosening (44%) instead of wear, their primary hypothesis.

Loosening on the tibial side was seen more often and developed significantly earlier (37.7% within 2 years) compared with the femoral component. Aseptic loosening was much more common in medial UKA.

Progression of OA in contralateral compartment, can be prevented improving accuracy in positioning of the components and restoration of the appropriate joint line and this has influence on survivorship (40) (41). Moreover, a lower position of the joint line is correlated to loosening, while higher position is due to early polyethylene wear and OA progression in the other compartment. In fact, the height of the prosthetic joint line, affects load transfers between the two femoro-tibial compartments.

Baker et al. (42) found a higher rate of revision for unexplained pain in UKA compared to TKA in National Registry of England and Wales. Their hypothesis was that UKA revision is believed an easier procedure compared to a TKA revision so this lowers the threshold of patient and surgeon to consider pain as a convincing reason to revise; furthermore, often

unexperienced surgeons blame the contralateral compartment even if this is not shown in x-rays or MRI

Van der List et al. (23, 37) showed, in recent systematic reviews, different modes of failure in medial and lateral UKA. The most common cause on the medial side was aseptic loosening (36%) followed by osteoarthritis progression (20%). Aseptic loosening (26%) was most common early failure mode, while OA progression was more commonly seen in midterm and late failures (38% and 40%, respectively). Polyethylene wear and instability are more common in fixed-bearing implants, instead pain and bearing dislocation are more common in mobile-bearing implants (43).

In lateral UKA they found different rates: OA progression (29%), aseptic loosening (23%), and bearing dislocation (10%). In cohort studies, progression of OA was more common (36%) than bearing dislocation (17%) and aseptic loosening (16%), while in the registry-based studies, aseptic loosening (28%) was more common than progression of OA (24%) and bearing dislocation (5%)

Clinical results

A recent systematic review analyzed UKA survivorship rates in both medial and lateral UKA. The survivorship of medial UKA at 5, 10, 15 and 20 years was 93.9%, 91.7%, 88.9% and 84.7%, respectively; the lateral UKA survivorship instead was 93.2%, 91.4% and 89.4%, at 5, 10 and 15 years respectively. However, even if lateral UKA is considered technically more challenging than medial, no statistical difference in survivorship was found between the two procedures.

Baker et al. (44) showed a lower survivorship rate in registry-based studies compared to cohort studies, with a "revision risk" inversely correlated to center and surgeon volumes

This difference can be explained because cohort studies report outcomes of selected centers with high experience while registries consider any center, including those with lower experience and reduced numbers of cases.

Recently the subjective feeling of the patients after joint replacement is taken in a greater consideration for clinical outcomes, evaluation and success of this kind of surgical treatment (45, 46). In this perspective,

UKA shows often superior subjective improvements compared to TKA. Kim et al. (45) found that, despite no significant difference in WOMAC score (47) at 2 years f-up between medial UKA and TKA, the FJS (Forgotten Joint Score) (48) of the UKA group was significantly higher than that of the TKA group. The HFKS (High Flexion Knee Score) (49) was also significantly higher in the UKA group compared with the TKA group and 81% percent of all patients who underwent UKA were satisfied compared with 71% of those who underwent TKA. So they concluded that UKA had better outcomes at 2 years follow up compared to TKA in terms of joint awareness, function and satisfaction. Same result about joint awareness was reported by Zuiderbaan et al. (46) with a FJS significantly higher in UKA compared to TKA at 1 and 2 years of follow-up.

Another study (34) compared medial and lateral UKA at a minimum of 2 years follow up and reported equivalent overall functional outcomes (WOMAC score of 89.8 ± 11.7 and 90.2 ± 12.4) and joint awareness (FJS of 71.2 ± 24.5 and 70.9 ± 28.2).

This last finding is in contrast with Liebs et al. (50) that found quite similar implant survival rates for medial (90%) and lateral UKAs (83%) at 9 years follow up using a cemented mobile bearing prosthesis but medial UKA had better functional scores (WOMAC, pain, SF-36 (51) compared with lateral UKA. This difference could be due to the use of a mobile bearing lateral UKA that had worse outcomes compared to fixed bearing as reported by Marson et al. (52).

Young and active patients that undergoes UKA often have great expectations in their activity level after surgery (53). Several studies demonstrate that most of the patients returned to sport and recreational activities after surgery, with an average rate between 75% to near 100% in medial UKA (15, 54) and around 98% in lateral UKA at a mean follow-up of three years (55).

Conclusions

This review evidences that medial and lateral UKA is a reasonable option for isolated osteoarthritis. Compared to TKA is less invasive and associated with reduced operative time, faster recovery, larger postop-

erative range of motion and better awareness of the joint. UKA allows most of the active patients the return to sports and recreational activities.

The respect of the correct indications, the final alignment of the knee and the correct position of the prosthesis components is mandatory to obtain good results. Even if lateral UKA is historically considered more challenging and with poorer results, the most recent studies has evidenced that there is no difference in clinical and functional outcomes between medial and lateral unicondylar knee replacement. Further studies with long term follow up are needed especially in lateral replacement.

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