MENTORS IN ORTHOPEDICS

MEDIAL UNICOMPARTIMENTAL KNEE ARTHROPLASTY : INDICATIONS AND LIMITS

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SUMMARY

Background: Medial unicompartmental knee arthroplasty (UKA) serves as an intermediary surgical intervention between osteotomy and total knee arthroplasty (TKA). Despite historical concerns regarding failure rates and restrictive selection criteria established in 1989, advancements in tribology and surgical technique have improved clinical outcomes to levels comparable with TKA.

Objective: This article evaluates the evolution of indications and contraindications for medial UKA, examining the impact of patient factors and surgeon experience on long-term implant survivorship.

Key Points: Modern evidence suggests that traditional contraindications, including age under 60, obesity, and asymptomatic patellofemoral chondrosis, do not significantly compromise outcomes. While inflammatory arthritis remains a definitive contraindication, ACL deficiency may be managed successfully in specific older populations. Optimal results are strongly correlated with surgical volume, specifically when UKA constitutes 20–50% of a surgeon's total knee replacement caseload. Technical precision is critical, as axial alignment must avoid overcorrection to prevent lateral compartment degeneration or undercorrection leading to polyethylene wear. The Unicompartmental Indication Score (UIS) provides a contemporary framework for patient selection, with scores exceeding 25 predicting superior clinical satisfaction.

Conclusion: Medial UKA is a highly effective treatment for localized osteoarthritis when performed with meticulous technique. Success depends less on strict adherence to historical age or weight limits and more on the surgeon's proficiency and the relative proportion of UKA procedures within their clinical practice.

KEYWORDS

Arthroplasty, Replacement, Knee; Osteoarthritis, Knee; Patient Selection; Treatment Outcome; Knee Prosthesis

Medial unicompartmental knee arthroplasty (UKA) is currently one of the preferred surgical treatments for medial unicompartmental osteoarthritis of the knee, lying between a total replacement and osteotomy.

After initial failures, it took the obstinacy of surgeons who kept faith in the UKA, an improvement in techniques and tribology, and the refinement of indications and contraindications to raise the success rate of UKA, which now is nearly on a par with total knee arthroplasty.

However, ever since Kozinn published an article on the indications and limits of medial UKA in 1989,[1] the procedure has suffered from fuzzy overlapping theories and constantly-changing opinions which together with its previous poor reputation, has been scaring off surgeons.

Where are we now? Is there an ideal patient? How far can we push the limits?

The best indication is medial tibiofemoral osteoarthritis AND no contraindications. Contraindications are what lead to failure. It is therefore important to look at the causes of failure in order to determine first the limits of this procedure, and then the indications.

Authors have reported widely on the failures of medial UKA. Apart from avoidable technical errors, the main causes of failure derive from poor patient selection. These two observations therefore raise questions as to the importance of the surgeon's experience.

The use of technical tools such as patient-specific cutting guides (PSI) can prevent the technical errors typically committed by inexperienced surgeons (whether newly-qualified or who perform a low volume of procedures).[2] However, despite the use of PSI, these surgeons still record higher rates of failure than those who deal with larger volumes. It therefore comes down to indication.[3] It is tempting to believe that by being stricter with the indications, and by performing UKA only for the small percentage of patients who meet all the criteria, the success rate would be higher. This is not the case. To achieve good UKA outcomes, the key is not the absolute number of procedures performed, but the number of UKA as a percentage of all arthroplasties, with the best results being achieved if UKA account for 20–50% of all knee replacement operations.[4,5] Strict application of the indications is not therefore enough on its own to increase the success rate, because by reducing the number, you limit the surgeon's experience, which is a key factor of success.

Kozinn (1989)[1] established the following indications for UKA:

- Age > 60 years

- Unicompartmental osteonecrosis or osteoarthritis

- Low functional requirements

- Weight < 82kg

- Flexion contracture < 5°

- Frontal deformity < 15° and reducible

- ACL intact

The perfect patient is one who meets all these criteria. However, if we abide strictly by these requirements, only 5% of patients are a good candidate for UKA.

How have things changed in 2020?

Pathology

Inflammatory joint disease is still officially a contraindication to UKA, because the condition affects the entire joint. It is undoubtedly the only official and non-negotiable item on the list.

Since the purpose of a UKA is to replace the damaged joint surfaces, it is primarily intended for condyle osteonecrosis and osteoarthritis.

Fractures can be treated with UKA, but only if they are contained entirely within the joint, which is actually quite rare, especially for the medial compartment.[6]

Age

The minimal sacrifice of the joint and ligament and their more 'natural' function in theory make this the treatment of choice for young, active patients, although in these cases tibial osteotomy should be discussed and is often preferable.

The life expectancy of this population makes revision more likely in the long term, but the procedure is technically simple with good outcomes. The most recent studies of young patients (aged under 50) show 10-year survivorship of 80–90%.[7,8]

Although the objective outcomes appear favourable for this population, patients are still often left disappointed due to their usually high functional expectations.[9,10]

For older patients, the low morbidity of the procedure makes it particularly suitable, with excellent survival rates.[11] Care should be taken if there is any osteoporosis which can result in periprosthetic fractures, especially during surgery, and it is important to ensure good coverage of the tibial surface to avoid any subsidence.

Age is therefore not an official limit for a medial UKA.

Deformity

For optimal survival, the axial deformity should not be corrected, over-corrected or under-corrected.[12] The purpose of the UKA is merely to remedy the wear and correct any joint deformity caused solely by the osteoarthritis. Using the mechanical axis of the lower limb as the reference, overcorrection in varus will lead to wear of the lateral compartment, whereas undercorrection causes polyethylene wear followed by loosening due to excessive medial load.

Hernigou and Deschamps, who did not impose any limits in terms of preoperative varus, and recorded wear in the lateral compartment beyond 180° of residual varus, and polyethylene wear beyond 10°.[12]

Starting from the principle that varus deformity due only to wear should be corrected, and that residual varus should not exceed 10°, we therefore obtain a theoretical preoperative limit of 15° of varus.13 This reflects the recommendations established by Kozinn in 1989.[1]

Kennedy and White (1987) observed the best results for medial UKA when the mechanical axis of the lower limb fell within Zone C or Zone 2 (Fig. 1).[14]

The varus must be reducible, which is best determined with the use of stress radiography.

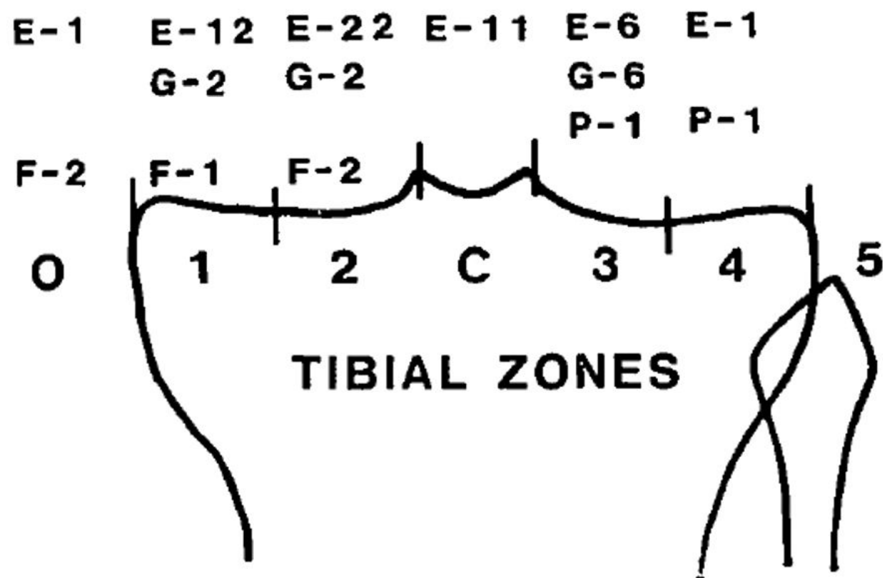


Figure 1: from Kennedy and White(14).

Damage in other compartments

The preoperative assessment will often reveal degenerative damage in the lateral compartment or in the patellofemoral joint. However, is this really a formal contraindication to UKA?

The lateral compartment must be asymptomatic and there must be no degenerative damage visible on the baseline imaging studies. This can be confirmed with x-rays by applying a forced valgus stress to confirm the absence of lateral joint impingement.

There is less consensus as regards the patellofemoral joint.

The presence of asymptomatic lateral patellofemoral chondral damage (loss of substance, osteophytosis, subluxation) can result in short-term anterior pain and lower the patient's satisfaction with the UKA, although outcomes do remain good in this setting.15,16 This type of damage must be taken into consideration prior to the surgery and weighed up against the other risk factors.

The presence of anterior pain combined with medial chondral damage, even severe, does not appear to affect long-term outcomes, including for stair ascent and descent, and is not a contraindication to a UKA.[17]

Anterior cruciate ligament

Most surgeons believe that a functional anterior cruciate ligament is essential to the success of a UKA.[18]

However, broadly speaking, ACL-deficient patients fall into two separate groups:

- a 'younger' group with primary instability and osteoarthritis due to ACL injury. Within this group, a UKA alone is unsuitable but some cases may be eligible for concomitant ACL repair.19

- a second, older group with primary pain and no instability, where the torn ACL is secondary to the osteoarthritis. For this group, UKA alone has produced good results.

No ACL is therefore not a strict contraindication to medial UKA.

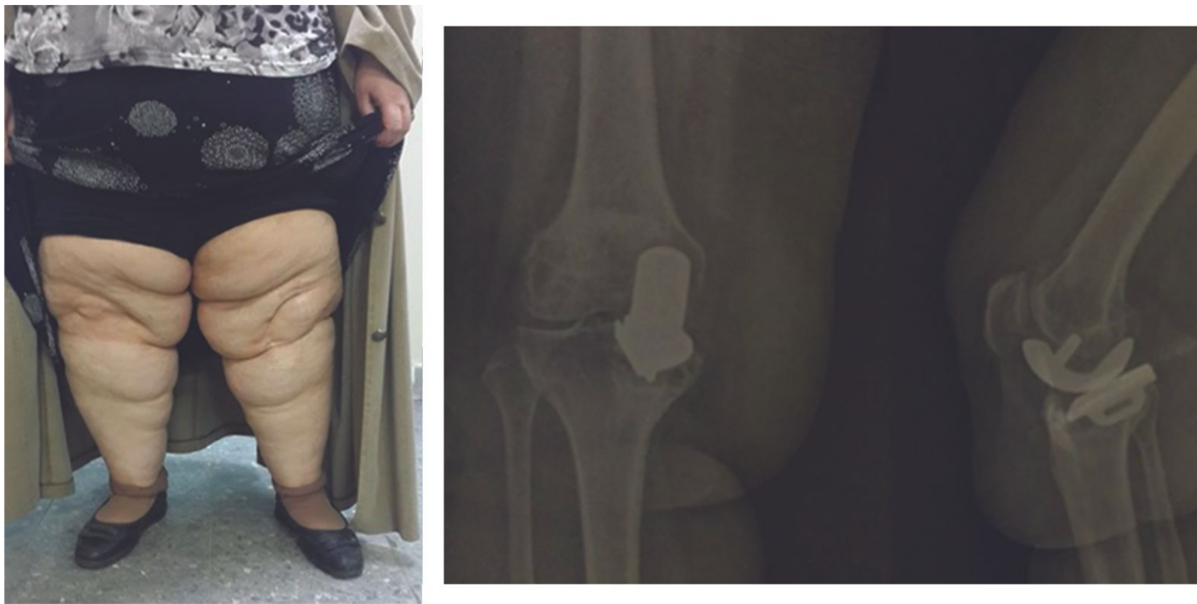
Weight

Weight is not a good indicator and BMI is a more reliable criterion. Heavy but tall patients will more probably require a larger implant and will therefore be able to tolerate greater loads, because the stresses will be better distributed, hence the benefits once again of good tibial coverage to ensure a large contact surface.

The question of whether obesity influences survival is difficult to answer, and there are many arguments for and against. This is probably because the influence is hard to separate from the other risks associated with obesity, such as a more significant past history, higher rate of technical errors due to difficult exposure, and higher rate of short-term post-op complications (e.g. healing, infection, phlebitis).

Whatever the case, numerous studies do not list obesity as a cause of failure,3 and these patients can benefit enormously from the procedure.20

Morbid obesity is however a contraindication since it generally carries a higher rate of revision (Figs. 2 and 3).[21]



Figures 2 et 3 : Early loosening of medial UKA in a morbidly obese patient with BMI = 56.9; from Polat et al.(21)

In conclusion, obesity is not a limit, but care should be taken in cases of morbid obesity (BMI > 35).

A meticulous technique is especially important in these patients since any positioning errors will soon make themselves felt.

Stifness

Stiffness is a relative contraindication because, apart from the removal of osteophytes, UKA does not allow for any form of release. Patients with moderate stiffness must be warned that their mobility is unlikely to improve.

Physical activity

Patients who partake in sports, especially impact sports, have high functional requirements and therefore osteotomy should be discussed.

However, although many surgeons currently do not encourage impact sports after UKA, few list this as a formal contraindication. Patients nevertheless tend to do less impact sport (such as ball sports, running, tennis) after UKA, whilst increasing their participation in soft sports (walking, swimming, cycling).[22]

Patient selection guide

It was only recently that a patient selection guide was produced, known as the UIS (Unicompartmental Indication Score),[23] which is used to calculate a score to help determine the indication for UKA (Table 1).

Variables	1 point	2 points	3 points
Age (ans)	50-60	60-80	> 80
Etiologie	Maladie inflammatoire	Chondrocalcinose	OA/ONA
BMI	≥ 40	30-40	≤ 30
ATCD local	Traumato	Ostéotomie	Aucun
Statut LCA clinique	Absent	Partiel	Normal
Varus/valgus fixé	≥ 10°	5 à 10°	0 à 5°
Atteinte fémoro patellaire (a)	Grade 3 avec ou sans subluxation	Grade 1-2	0
Amplitudes	15-15-100	15-15-120	≥ 0-0-120
Usure compartiment concerné (b)	Grade 2	Grade 3	Grade 4
Usure du compartiment opposé (b)	Grade 2	Grade 1	Grade 0

Tableau 1 : UIS score, from Antoniadis et al.a. Modified Altman scale(24)b. Kellgren-Lawrence classification(25)

This system encompasses all the variables discussed above and assigns a score to each. Good results can be expected with a UIS score greater than [25]. The outcome is not as good for a UIS score less than or equal to 25. Below 20, UKA is not recommended.

CONCLUSION

Medial UKA has now earned its place in the therapeutic arsenal for medial unicompartmental osteoarthritis of the knee. An improvement in surgical techniques, advances in tribology and clearer indications have all restored its former glory and dispelled the bad reputation due to initial failures. With the exception of diffuse degenerative changes, whether inflammatory or mechanical in origin, there is no formal contraindication to UKA provided the technique is well mastered and performed using the various tools developed in recent years, which will help the surgeon gain experience and confidence and ultimately improve survival. If there is an ideal patient, then there is also an ideal surgeon, which we should all strive to be.

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