22 Unicompartmental Knee Arthroplasty

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Introduction

A unicompartmental prosthesis is indicated in unicompartmental arthritis. Patient selection and surgical technique are key factors for a successful outcome. In this chapter, we will detail the surgical technique for a medial UKA (Fig. 22.1). The surgical technique for a lateral UKA is comparable; therefore, we will only cover some specific points regarding a lateral UKA.

Radiological workup (cf. chapter on surgical indications for knee arthritis) (Figs. 22.2a, b, 22.3, and 22.4).

The stress radiograph is essential in the radiological workup. It will indicate whether the deformation is reducible but not overcorrectable (Figs. 22.4 and 22.5).

For UKA, the mechanical femorotibial axis (mFTA) of the lower limb should be within certain limits. The authors propose that they should not exceed 9° of varus or 14° of valgus. Outside these limits, a total knee arthroplasty (TKA) is generally preferred.

Fig. 22.1 U-KneeTec® prosthesis

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Fig. 22.2 AP (**a**) and lateral (**b**) 30° knee flexion X-rays

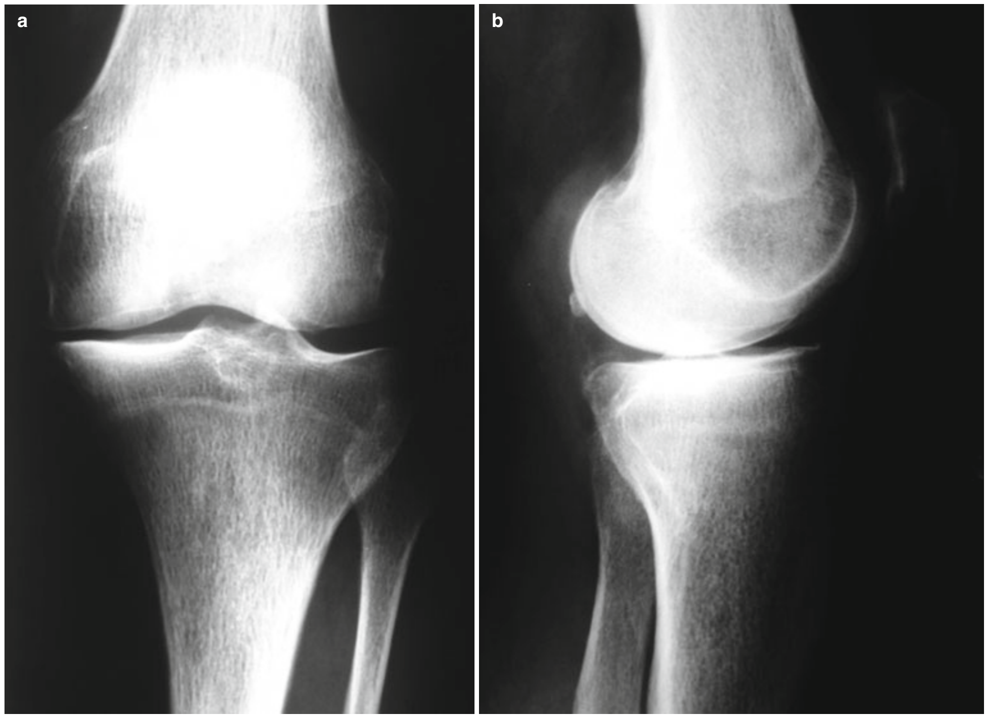

Fig. 22.3 Schuss views (45° knee flexion) are useful to detect mild narrowing of the medial compartment

Fig. 22.4 Stress radiograph in varus and valgus. In this case, the deformity is reducible and not overcorrectable (no medial laxity)

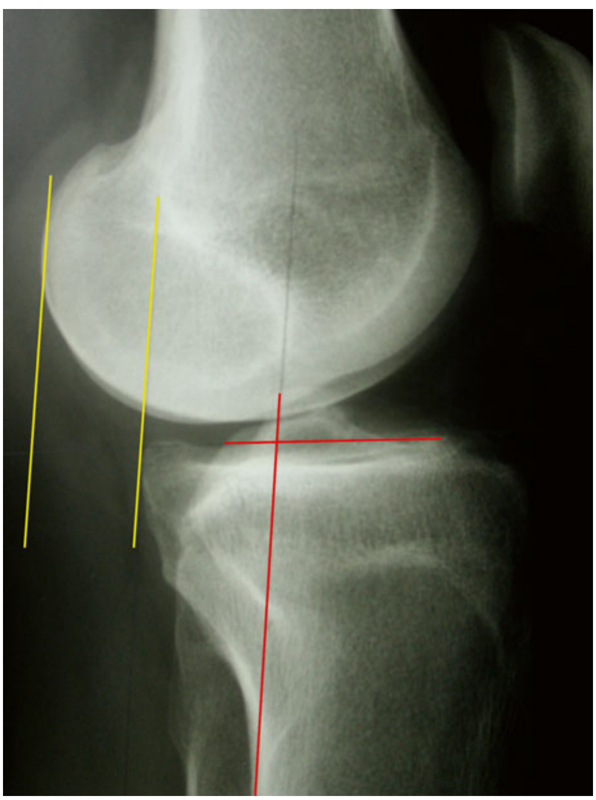

Fig. 22.5 Increased anterior tibial translation is a sign of osteoarthritis associated with ACL deficiency. UKS performed in such a population is prone to early failure

Surgical Technique for a Medial UKA

Setup

- cf. chapter on "Total Knee Arthroplasty"
- Tourniquet
- A vertical lateral support is placed at the level of the tourniquet and a distal horizontal support is placed to keep the knee flexed at 90°.

Approach

A paramedian medial skin incision of 8–10 cm begins at the superior pole of the patella and ends at the medial border of the tibial tubercle (Fig. 22.6). The vastus medialis and the medial border of the patellar tendon are identified. A medial midvastus arthrotomy of the knee is performed (Fig. 22.7). The anterior horn of the medial meniscus is incised and the anteromedial tibial plateau is exposed in a limited fashion. The "midvastus" approach can go 15 mm into the vastus medialis using the Metzenbaum scissors as proposed by Engh. This allows adequate exposure of the femoral condyle. The appropriate retractors are positioned. The articular cartilage and the status of the anterior cruciate ligament are examined.

The anteromedial joint capsule is released from the tibial metaphysis in a triangular fashion. The Trillat periosteal elevator is inserted between the medial border of the medial tibial plateau and the joint capsule. We do not perform any ligamentous release. Using the arthroscopic shaver, the articular cartilage on the distal femur is removed up to the level of the subchondral bone. This subchondral bone will serve as a reference for correct positioning of the UKA.

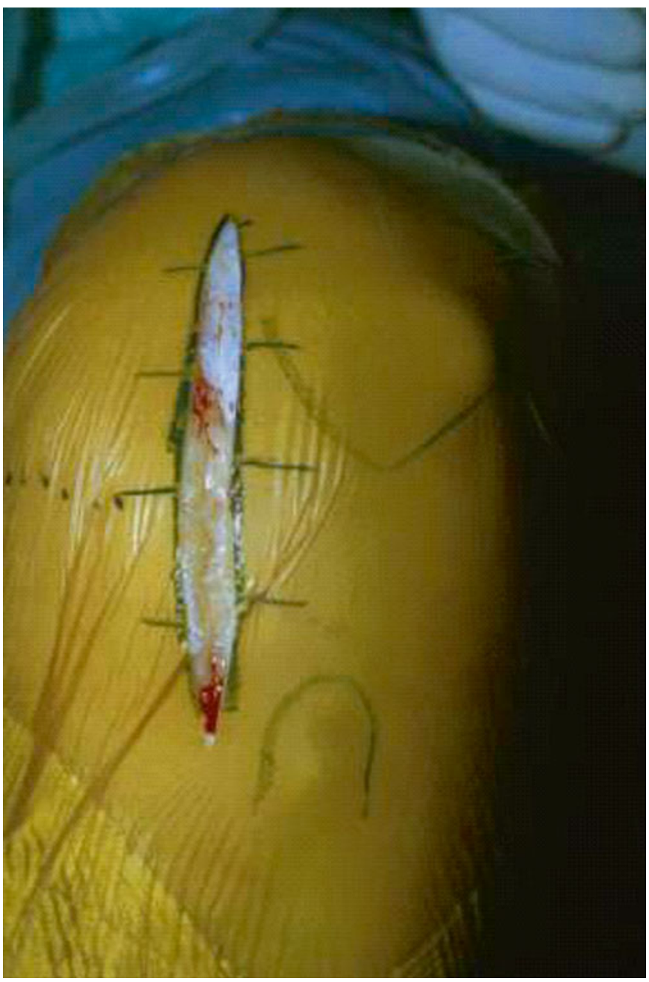

Fig. 22.6 Skin incision

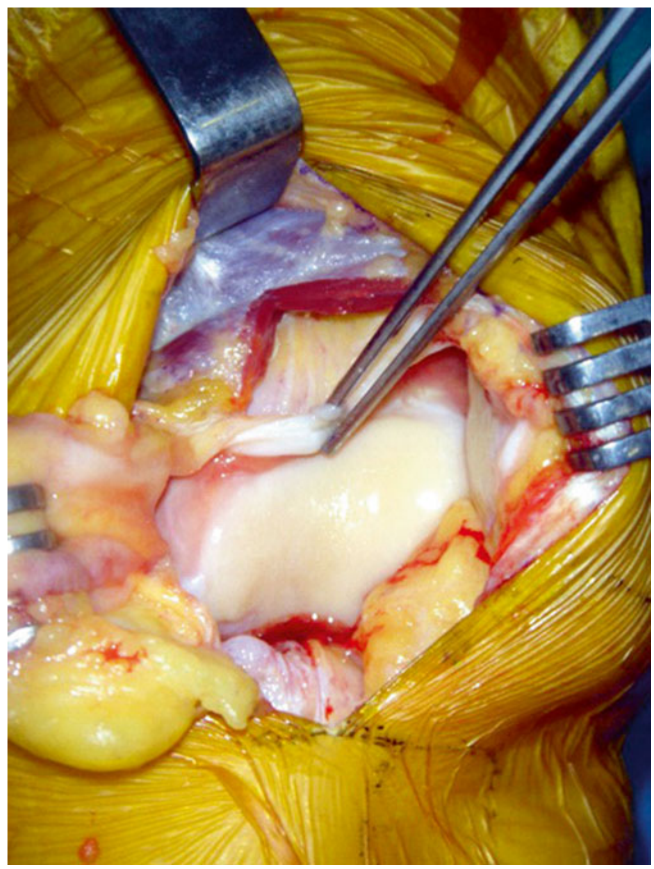

Fig. 22.7 Medial midvastus arthrotomy

The Tibia

The tibial alignment guide is positioned (Fig. 22.8). First coronal and subsequently sagittal plane alignment will determine the tibial cut. In a tibia with no extra-articular deformation, the cutting guide is centered over the midpoint of the mechanical access in the coronal plane. In the case of metaphyseal tibial bowing, the tibial cut should be performed perpendicularly to the proximal tibial epiphysis axis.

In the sagittal plane, a pin is placed into the medial joint space resting on the anterior and posterior margin of the tibial plateau. The extramedullary cutting guide is placed on this pin to reproduce the tibial slope. Once the cutting guide is correctly aligned in both the coronal and sagittal planes, the tibial resection height is determined. In extension, the level of the exposed subchondral bone of the distal femoral condyle is considered the joint line reference. A controlled valgus stress is now applied to reduce the deformity (Fig. 22.9). Generally, we aim to correct only the wear component taking care not to over correct the axial alignment.

Holding the knee in this correct position, the guide pin is now positioned in contact with the distal femoral subchondral bone. The tibial cutting guide is now lowered 13 mm below this reference. The technique of the tibial cut corresponds to the total thickness of the tibial component in extension (9 mm) + the distal femoral component (3 mm) + 1 mm for laxity. The extra millimeter is added to allow some "physiological" laxity. The cutting guide is then securely fixed by 3–4 guide pins through the appropriate holes.

The guide pins allow a perfect horizontal tibial cut while guiding the oscillating saw blade. Next, the vertical tibial cut is performed just lateral to the medial tibial plateau in the axial direction of the medial axis of the notch (Fig. 22.10). The posterior part of the vertical cut can be completed using an osteotome. The medial tibial plateau can now be removed carefully with a large grasper. The posterior meniscal horn can be accessed easily with the knee flexed to 90° and stressed in a valgus position. The cutting guide is removed and the appropriate mediolateral-sized trial tibial component size is selected. Overhang of the trial component is not accepted. The trial component should be easily introducible in flexion and stable during flexion/extension.

Primary assessment of the stability of the trial tibial component is mandatory at this point (Fig. 22.11a, b).

Fig. 22.8 Positioning of the tibial alignment guide

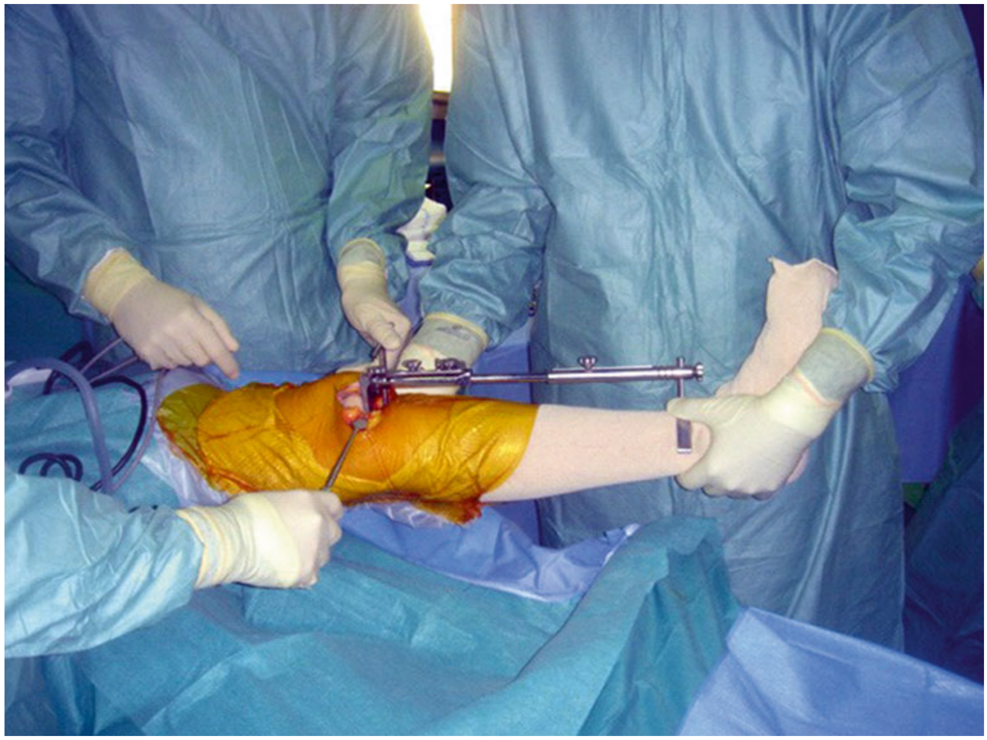

Fig. 22.9 Controlled valgus stress applied to reduce the deformity

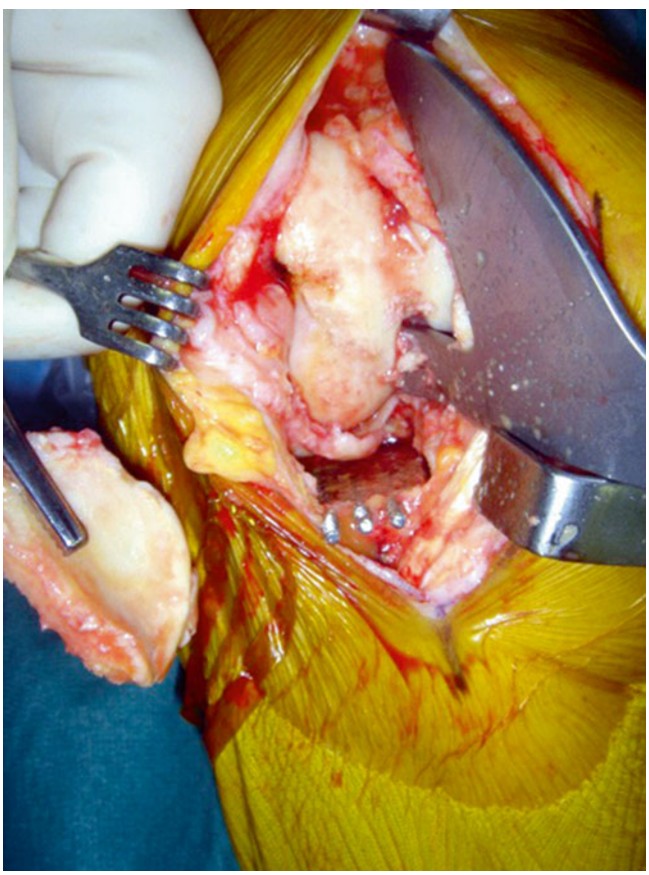

Fig. 22.10 Horizontal tibial cut on guide pins

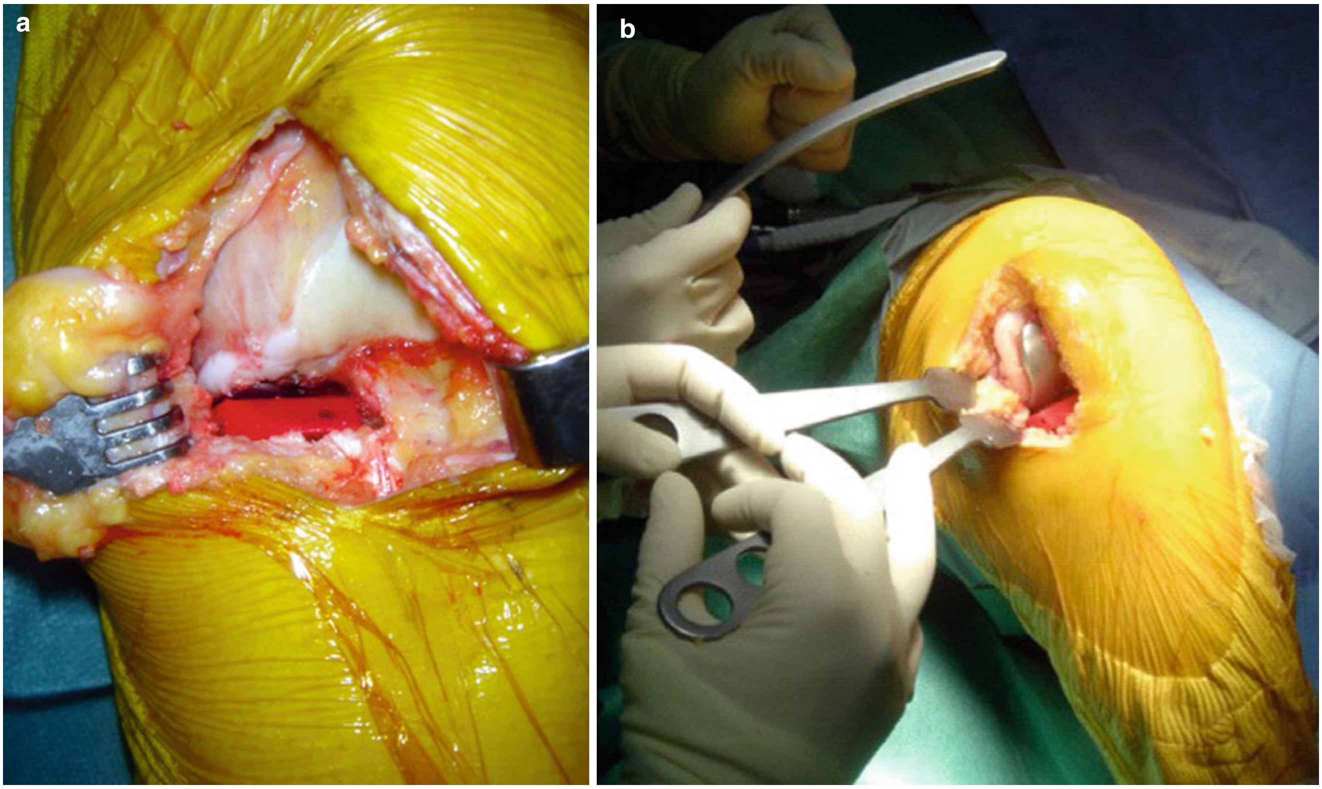

Fig. 22.11 (**a**, **b**) Primary assessment of the stability of the trial tibial component

Femoral Resurfacing

With the trial tibial component in place and the knee now in extension, a mark is made on the femoral condyle opposite the anterior limit of the tibial component. A special femoral guide (the crocodile guide) is vertically introduced and should lie flat on the tibial component with the knee still in full extension (Fig. 22.12a, b). This step is very important because the orientation determines the correct positioning of the femoral cutting guide and the femoral component in the coronal and horizontal planes. Two guide pins are inserted through the two holes of the crocodile guide. With the crocodile guide still in place, the knee is now flexed to 90°. The posterior border of the crocodile guide should be parallel to the tibial plateau. A small adjustment can be made at this point or during the next step. The crocodile guide is subsequently removed while the guide pins are left in place. These guide pins will accommodate the femoral drilling guide. In 90° of flexion, the femoral drilling guide is placed onto the two guide pins (Fig. 22.13). The correct position of this guide is perpendicular to the tibial cut. Although the design of the prosthesis accepts some freedom of alignment, this should not exceed 6°. In case of excessive malalignment of the drilling guide, the guide should be realigned. If necessary, realignment is performed by pinning the guide through the most central hole on the mediolateral axis of the lateral condyle including the lateral osteophyte. Next, the guide is removed and the femoral drilling guide is correctly aligned perpendicularly to the tibial cut with the knee in 90° of flexion. A third pin can ensure the correct alignment. All remaining holes are now predrilled. The guide is removed and the predrilled holes are now connected with each other by an oscillating saw to create the femoral recess. The femoral recess is subsequently enlarged and impacted. The appropriate femoral cutting block is chosen according to the size and the curvature of the femoral condyle (Fig. 22.14). The femoral cutting block size is assessed with a classic posterior femoral condyle reference system. Anteriorly it should be in between the femoral condylar mark and the two femoral guide pinholes. The curvature of the block should match that of the femoral condyle. The cutting block is fixed in place with pins. Finally, correct femoral alignment is double-checked. The posterior cut and the posterior chamfer are then performed. No distal femoral cut is performed.

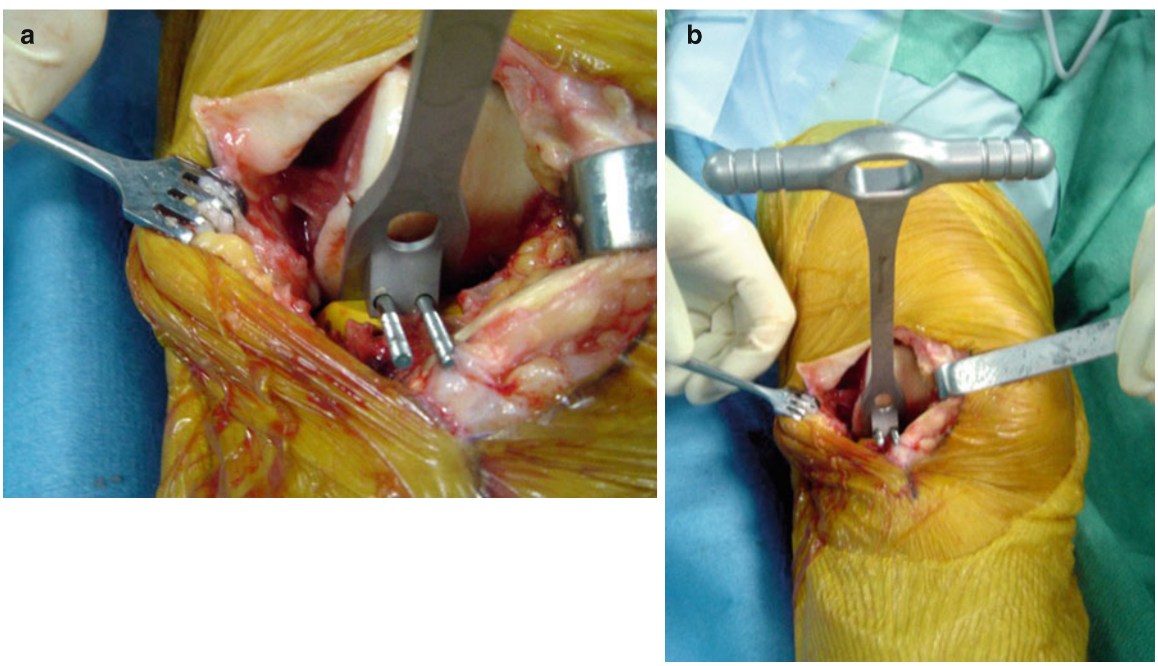

Fig. 22.12 (**a**, **b**) Femoral guide positioning in extension

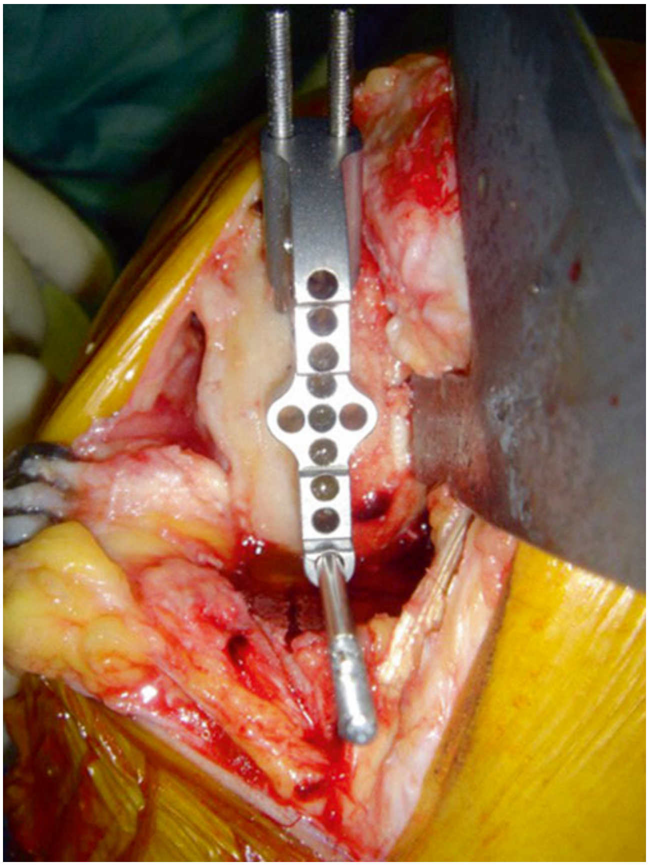

Fig. 22.13 Femoral drilling guide positioning in flexion. If necessary, the guide can be moved medially or laterally

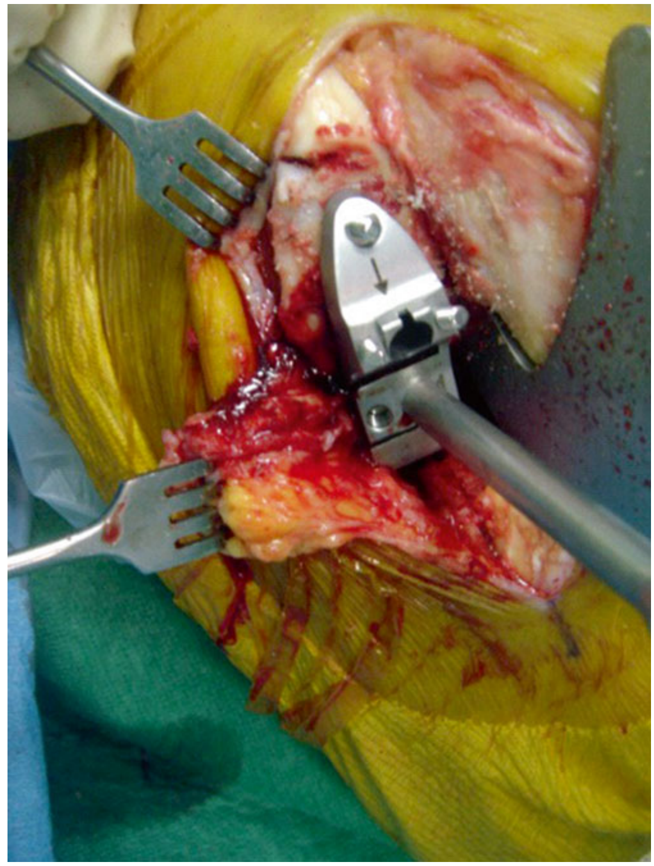

Fig. 22.14 Femoral cutting block positioning

Key Points

1. The cutting block size is determined by the shape and curvature of the femoral condyle.
2. It should be at a level of or cover the two previously performed two holes on the anterior border of the distal femur.
3. The cutting block should be in contact with the posterior condyle.
4. Rotation should not be modified in order to obtain a better cover of the condyle. Rotation of the femoral component is solely determined by the tibial cut.

The femorotibial components are introduced and primary stability is verified first in flexion and then in extension. If the tibial component has a tendency to advance in flexion, one should first suspect the remnant of a posterior meniscal horn pushing the tibial plateau anteriorly or an insufficient slope of the tibial plateau. A slight laxity should be accepted to guarantee undercorrection. If ligament tightness exists, the correct position of the femoral guide should be checked. It should be in contact with the subchondral bone. If the tightness is still present, one should proceed with an additional tibial cut of 1–2 mm. This cut can be done easily free hand using the oscillating saw: the tracts of the guide pins, which correspond with approximately 1–2 mm in thickness, should just be sawed away. Under no circumstances should one perform a ligamentous release to address the tightness. Again overhang of the trial tibial component is not accepted.

Implant Fixation

If alignment and laxity are satisfactory, the component can be cemented. Generally, we firstly cement the femoral component followed by the tibial component (Figs. 22.15, 22.16, and 22.17). A small bony recess is made underneath the tibial spine. The joint articulations are cleaned from debris and irrigated. The knee joint capsule and skin are closed. The tourniquet is not released for the closure. A drain is left intra-articularly.

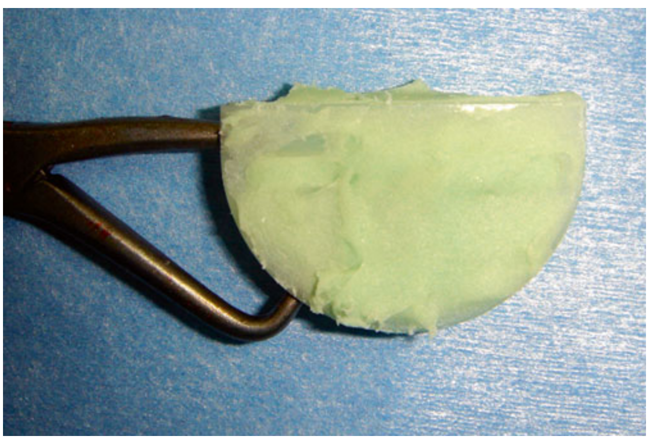

Fig. 22.15 Cemented tibial component

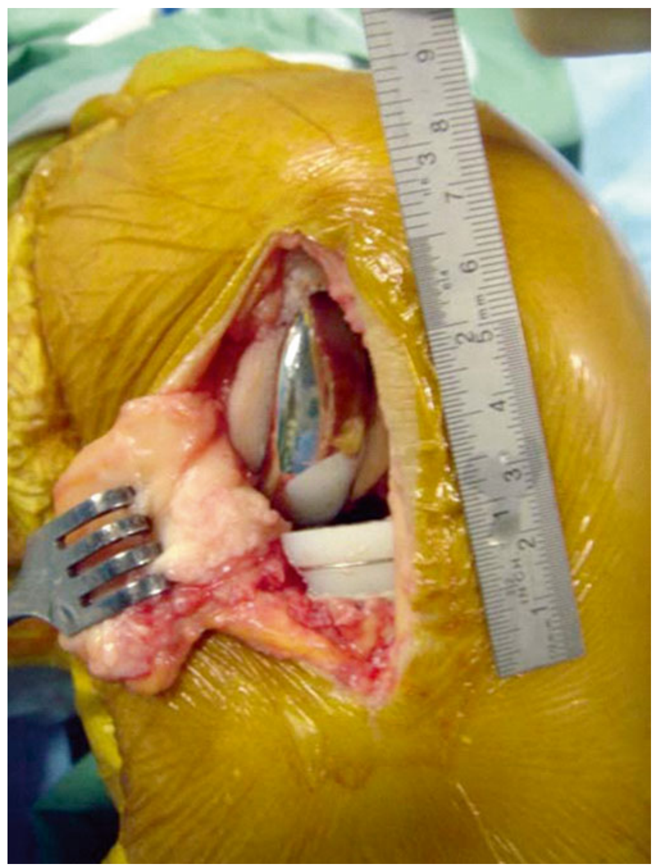

Fig. 22.16 Cemented components

Fig. 22.17 Fixation of the components

Postoperative Guidelines

- Postoperative radiographs (Fig. 22.18).
- Weight bearing is allowed on day 1; crutches are used for 1–3 weeks.
- Removal of the drain when production of less than 50 cc (maximum 1–3 days).
- Hospital stay for 3–5 days depending on the comorbidities and social circumstances.
- Flexion from 0 to 120° until day 45, unlimited afterwards.
- Thromboprophylaxis for 15 days.

Fig. 22.18 Postoperative X-rays

Specific Points for the Lateral Unicompartmental Arthroplasty

The surgical technique for a lateral unicompartmental knee arthroplasty is very comparable to the medial unicompartmental arthroplasty except for some specific points:

Approach

A lateral longitudinal parapatellar incision of approximately 8 cm is made with the knee in 90° of flexion to gain access to the lateral compartment of the knee joint. The joint capsule is opened using a lateral arthrotomy. The iliotibial band is NOT released from its distal attachment on Gerdy's tubercle (Fig. 22.19).

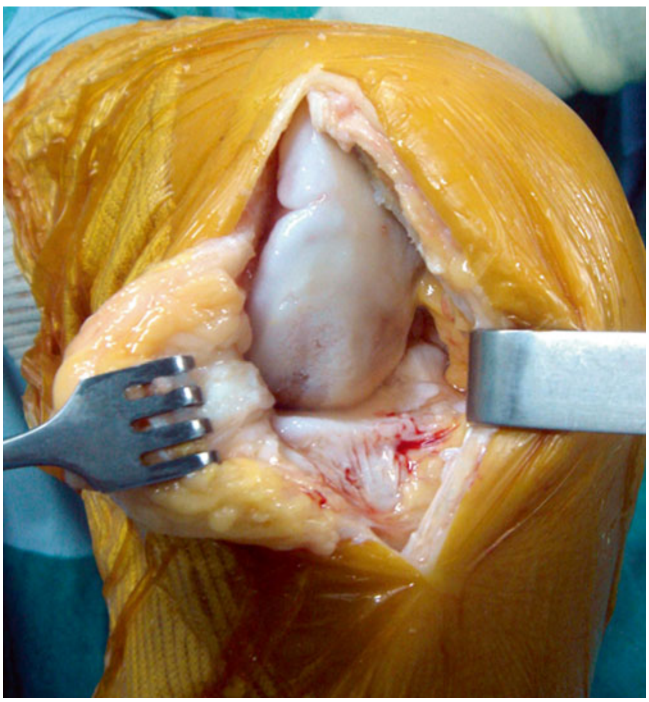

Fig. 22.19 The joint capsule is released but the iliotibial band stays intact

Tibial Cut

A common error in the lateral compartment is the overcorrection of the deformity by excessive varus stress, resulting in a tibial cut of insufficient thickness. Therefore, we generally opt to incompletely reduce the deformity in valgus. This will result in a thicker tibial cut (Fig. 22.20).

Fig. 22.20 Incomplete reduction of the deformity in valgus

Femoral Resurfacing

Generally, we place the femoral cutting guide on the most lateral part of the femoral condyle and, if present, on the lateral femoral osteophyte. This will eliminate a potential conflict between the femoral component and the tibial spines. As mentioned earlier, a general error is overcorrection in the coronal plane. This is due to the physiological laxity, which is present in the lateral compartment and should be preserved. In general, the surgical technique for a lateral unicompartmental knee arthroplasty is not more difficult than for the medial one using modern instruments. In fact, the lateral compartment is more tolerant than the medial one due to the extrinsic moment arm, which pushes the knee into varus. Therefore, the indications for the lateral unicompartmental knee arthroplasty can be pushed somewhat further going up to 12–15° of valgus alignment in the frontal plane.

Associated Procedures

In specific indications, a lateral facetectomy of the patella can be performed in associated with a UKA (Fig. 22.21).

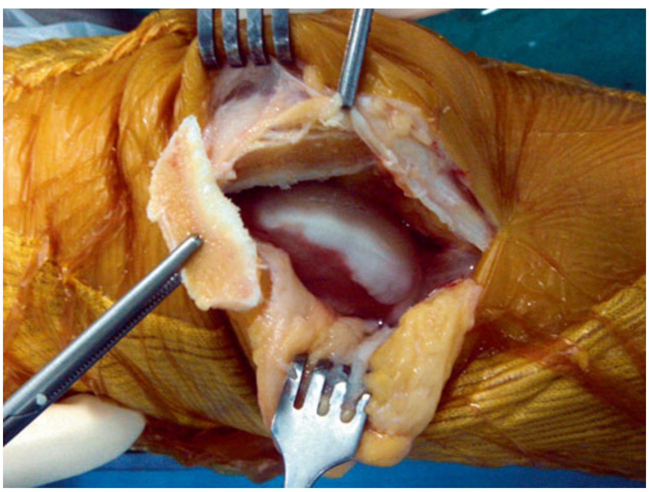

Fig. 22.21 Associate lateral facetectomy of the patella

Comments

Until 1996, an osteotomy of the anterior tibial tuberosity was routinely combined with a lateral unicompartmental knee arthroplasty. Due to the arrival of new and minimally invasive instruments, the osteotomy is no longer necessary to position the lateral unicompartmental knee prosthesis in a correct and reproducible manner. Therefore, this technique has been abandoned since 1996.

Complications

General complications are less frequent than for total knee arthroplasty: fat embolism and DVT are rarely observed. Septic arthritis remains an exception.

Axial malalignment: overcorrection is the most frequently observed error in our experience.

One should always take care of:

- An excessive tibial cut on the medial side for medial UKA
- Overcorrection in lateral UKA