
The Lateral Side

Lateral unicompartamental OA is a relatively rare disease said to account for about one eighth of all unicompartamental arthritis ¹. However, the incidence may be higher because it is a disease of flexion and is commonly missed on standing AP radiographs. To identify lateral OA reliably, either a valgus stress radiograph in 45° flexion or a Rosenberg view is necessary. The clinical results of UKA in the lateral compartment have sometimes been worse than in the medial compartment ² and sometimes better ³. Some early papers reported results of series containing both medial and lateral operations as if they were essentially the same, but the normal anatomy and the pathological lesions of the two compartments are very different so the surgical techniques are different.

Anatomy and kinematics

The soft tissues of the lateral side of the knee are a complex arrangement of static and dynamic stabilisers whose primary function is to provide stability in varus angulation, anteroposterior translation of the tibia and internal/external rotation (Chapter 3).

The stabilising effect of the LCL is very different to that of the MCL. The latter provides stability throughout the full range of movement and therefore dislocation of a mobile bearing is rare (Chapter 9). Conversely, the LCL is tight only in extension. All of its fibres are slack beyond 12° flexion (Chapter 3) and, by 90°, 5 - 10 mm of distraction is possible in the lateral compartment. An MRI study showed that, in flexion under valgus and varus load, the medial compartment opens an average 2 mm whereas the lateral opens 7 mm (see Figs. 1.10 and 6.1) ⁴. Dislocation of the mobile bearing is therefore a potential problem in mobile bearing lateral UKA.

The lateral collateral ligament (LCL) is round and cordlike, usually between 59 and 74 mm in length. It arises from the lateral epicondyle of the femur (from a fovea posterior to the apex of a bony ridge). It inserts distally into the apex of the fibular head as a conjoint tendon with the biceps femoris tendon ⁵.

Dynamic stability is provided by popliteus, the ileo-tibial tract and the extensor mechanism to keep the lateral articular surfaces in contact during activity.

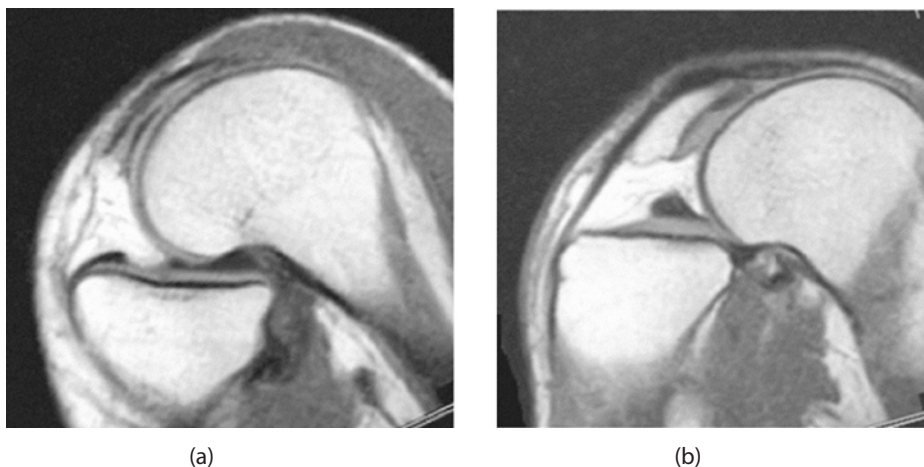


Figure 12.1 In the normal knee, in high flexion (a) in the medial side the femoral condyle is on top of the tibia; (b) in the lateral side the femoral condyle subluxes off the back of the convex tibial plateau. (Dr Y Kadoya, personal communication).

The medial plateau is larger than the lateral and is slightly concave whereas the lateral plateau is convex (Fig. 12.1). The lateral meniscus is more mobile than the medial meniscus, and its excursion during flexion–extension and axial rotation is greater than that of the medial meniscus. In high flexion (>120°), the lateral femoral condyle rolls over the posterior lip of the lateral plateau onto the posterior surface of the tibia (Fig. 12.1(b)), taking the posterior horn of the meniscus with it. By contrast, the posterior excursion of the medial meniscus is much less and the medial condyle and its meniscus, stay on the upper surface of the tibia (Fig 12.1 (a)).

Iwaki *et al.*⁶ amongst others has shown much more movement in the lateral compartment (up to 20 mm) compared to medial side (8 mm) although the difference does depend on the loading conditions (Chapter 3)⁷.

Pathology

The pattern of cartilage and bone erosion seen in anteromedial arthritis is not found on the lateral side⁸. Medial unicompartmental OA is a disease of extension whereas lateral unicompartmental OA is a disease of flexion. On the lateral side, the cartilage and bone erosions tend to begin in the central part of the tibial plateau which is in contact with the femur at about 45° flexion. On the femoral side, there is a kissing lesion at about 45° flexion. The lesion then expands both anteriorly and posteriorly. As a result there is usually some retained cartilage on the femur in extension and 90° flexion⁹.

Gulati *et al.*⁹ reported the patterns of osteoarthritis (OA) in both medial and lateral unicompartmental OA of the knee. Forty patients with medial and 20 with lateral unicompartmental knee osteoarthritis were studied to determine the location of full thickness cartilage lesions. Intra-operatively, the distance between

margins of the lesion and reference lines were measured. The femoral measurements were transposed onto lateral radiographs to determine the relationship between the lesion site and knee flexion angles. Both tibial and femoral lesions were significantly ($p < 0.01$) more posterior in lateral OA than medial OA. In medial OA, the lesion centre was, on average, at 11° (SD 3°) of flexion, whereas in lateral OA it was at 40° (SD 3°). The smallest medial femoral lesions were near full extension and, as they enlarged, they extended posteriorly. The smallest lateral femoral lesions extended from 20° to 60° flexion. As these lesions enlarged, they extended both anteriorly and posteriorly. There was a well-defined relationship between the site of the lesions and their size, suggesting that they develop and progress in a predictable manner (Fig. 12.2). The relationship was different for medial and lateral OA, suggesting that different mechanical factors are important in initiating the different types of OA. The lesions in medial OA occur in extension, perhaps initiated by events occurring at heel strike¹⁰. The lesions in lateral OA begin at flexion angles above those occurring during the single leg stance phase of the gait cycle, so activities other than gait are likely to induce lateral OA.

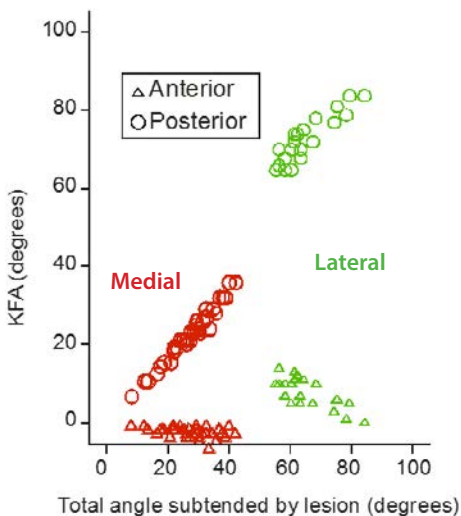


Figure 12.2 The site (Knee Flexion Angle (KFA)) of the anterior (triangle) and posterior (circle) extent of the full thickness lesion compared to its length in medial OA (red) and lateral OA (green).

History and development of the Lateral Oxford UKA

The mobile bearing OUKA has worked well in the medial compartment but the results of lateral arthroplasty have been marred by dislocation of the bearing. Dislocation is primarily due to the lax lateral ligament in flexion. Over the years, lateral OUKA has been successively improved but the dislocation rate still remains higher than the medial side.

Initially both the standard Phase 1 and Phase 2 OUKA components were used for lateral and medial unicompartmental replacement and both were implanted through a medial parapatellar approach with patellar dislocation. Due to the

high dislocation rate, modifications to implant and technique were introduced. It was observed that the popliteus tendon sometimes wrapped around the bearing postero-laterally, tending to dislocate the bearing into the intercondylar space (Fig. 12.3). Therefore the tendon was routinely divided.

The entrapment of the medial bearing was 3 mm at the back and 5 mm at the front. The reason for the 3 mm entrapment at the back was that this was found to be the largest amount of entrapment that would allow the bearing to be inserted medially. However, on the lateral side, more entrapment could be used because of the lax ligaments. A symmetrical bearing, with entrapment of 5 mm posteriorly as well as anteriorly, was introduced. Unfortunately, despite these changes, the dislocation rate remained high. In 1996, Gunther *et al.* published the results of 53 Phase 1 and Phase 2 Oxford Knees implanted in Oxford¹¹. The survival at 8 years was 76% (see Fig. 12.6 'early'). The main reason for the poor survival was that the dislocation rate was 10%. The survival with disease progression or implant loosening as failure was similar to that achieved on the medial side. As the dislocation rate was unacceptably high, it was recommended that the mobile bearing should not be used in the lateral side and a fixed bearing device should be used instead. However, if the problem of dislocation could be addressed, the results would be expected to be similar to those achieved on the medial side.

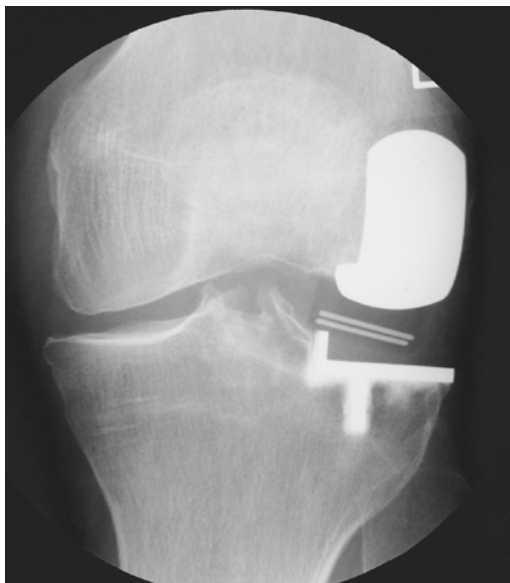


Figure 12.3 Lateral bearing dislocated onto the medial wall of the tibial component.

A radiographic study comparing knees that had and had not dislocated found that those that had dislocated were associated with a high lateral joint line¹². This suggests that the dislocations were caused either by overstuffing the knee with the bearing too tight in extension, or by over-milling the distal femoral condyle and thus making the bearing too tight in flexion. It was therefore decided that the technique should be changed: the femoral component was implanted approximately