Radiological anatomy

An anatomical and radiological study of the femoropatellar articulation

O Galland1,2, G Walch1, H Dejour1 and JP Carret1,2

1 Clinique de Chirurgie Orthopédique et Traumatologique, Centre Hospitalier Lyon Sud, F-69310 Pierre Bénite, France
2 Laboratoire d’Anatomie Médico-Chirurgicale, Faculté de Médecine Lyon Sud, F-69921 Oullins, France

Summary. An analytical study was made of 30 knees by dissection, 200 by conventional radiology, 120 by CT scans, and of 2,400 pathological knees by conventional radiology, and 900 by CT. The radiological and scanning methods most used for a study of the femoropatellar articulation are described and the normal values of each feature determined by a computer study. The femoral trochlea and its shape are very important for the stability of the patella. The normal and pathological types of trochlea are described. This study established a number of anatomical factors which influence patellar stability, and form a basis for proposing the correction of anatomical anomalies in the treatment of instability of the joint.

Method and material

Method

The joint has been studied by dissection and anatomical cuts, by standard radiology, and by scanner.

The dissection and cuts were of freshly frozen subjects. The cuts were in the sagittal and horizontal planes, the knee being in 30° of flexion.

The standard radiographs comprised one lateral view with the knee in 30° of flexion, and an axial view of the patella:
- the profile radiograph was strictly lateral, with the posterior borders of the two condyles superimposed and the central ray along the articular line;
- the axial view of the patella was with the knee in 30° of flexion. For this view the leg and foot were rotated to the angle of step determined before the examination.

The scanner: the patient was placed supine, the feet externally rotated 15° on a board perpendicular...
The plantar support is necessary to avoid quadriceps contraction. The examination was carried out twice: static and then dynamic.

The static examination was always carried out first because the maneuvers required for the dynamic study change the position of the limb. It comprised: (1) a cut at the level of the hip, passing through the top of the digital fossa. Although Lerat [10] recommended making two cuts (through the femoral head and the base of the neck), it appears that the error in the measurement of the axis of the neck is minimal. (2) A cut passing through the middle of the patella for an analysis of the trochlea. The study of various scanner cuts and of sections in the cadaver have enabled us to determine exactly the ideal cut: the best reference is the intercondylar notch which has different appearances according to the level. In the most distal part, the lateral surface of the intercondylar notch forms a vertical line and the medial surface forms a curve like a gothic arch. In the proximal part of the trochlea, the notch forms a rounded Roman arch. This is the landmark that one tries to show (Fig. 1). When the cut is too high, it has the form of an arc of a circle representing a quarter of a sphere and the condyles disappear. On the lateral surface the area of insertion of the popliteus muscle has disappeared. The trochlear angle is further changed, the lines which form this angle are no longer straight lines but curves, and we are below the trochlea. (3) A cut through the upper tibial epiphysis just below the articular plane allows one to determine the posterior axis of orientation of the tibial epiphysis. The main part of lateral tibial torsion is in the upper few centimeters of the superior epiphysis; the measurement should thus be made as high as possible in the tibia. The ideal cut has as its limits the tibiofibular articulation below and the beginning of the posterior vertical surface of the lateral tibial plateau above. This much reduced space explains the frequent errors in measuring the posterior tibial axis. This error is often of several degrees (Fig. 2). (4) A cut through the bimalleolar axis.

The dynamic examination is made with cuts through the middle