CASE REPORT

Loosening of the femoral component after unicompartmental knee replacement

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We describe a technique for the diagnosis of loosening of the femoral component of the Oxford Unicompartmental Knee Replacement using accurately aligned lateral radiographs in extension and flexion. If gaps are present between the component and cement on one radiograph and not on the other, the component is loose.

The Oxford Unicompartmental Knee Replacement (UKR; Biomet, Swindon, United Kingdom) uses an unconstrained mobile bearing, the upper surface of which articulates with a spherical femoral component which is fully congruent throughout the range of movement.1,2 Causes of failure include aseptic loosening of the cemented femoral component,3-5 which may be difficult to diagnose on standard anteroposterior (AP) and lateral radiographs. On the latter, most of the inferior, convex cement-bone interface is obscured by the component. In secure implants, narrow, well-defined radiolucencies can be seen at the cement-bone interface.6 Although migration of the component on sequential radiographs is diagnostic of loosening, there are often not available. We describe a technique using lateral radiographs in extension and flexion to diagnose loosening of the femoral component.

Case Report

A 72-year-man had a medial Oxford UKR for osteoarthritis in 1990. Initially the outcome was good with radiological evidence of well-fixed implants. However, when followed up at four years he complained of pain over the medial side of the knee, which had been present for approximately six months and was aggravated by walking. The haematological and biochemical markers were normal. AP and lateral radiographs showed no definite evidence of loosening of the femoral component although the lucency around the peg was suggestive of loosening. The knee was otherwise normal (Fig. 1a). The lateral view was therefore repeated at 90° of flexion for comparison with the previous view taken in 20° of extension. The two views showed differing features. A crescent-shaped radiolucent defect (crescent-sign) was seen between the femoral component and the bone in flexion but not in extension. A piston-like effect of the peg of the component moving in the cylindrical drill hole was also revealed. These findings showed that the femoral component had changed position between 20° and 90° of flexion and was therefore loose.

The patient underwent a revision operation which loosening of the femoral component was confirmed and a cemented total knee replacement implanted.

Discussion

Although long-term follow up studies of the Oxford UKR have shown excellent outcomes in properly selected patients, some failures occur.7 Loosening of the femoral component is the second most common cause of revision and the incidence ranges from 0% to 2.1%.8-11 It can be difficult to diagnose. Although radiographs may show poorly defined radiolucencies around the peg or elsewhere secondary to osteolysis, these are often difficult to see. If early post-operative radiographs are available, a comparison between those and current radiographs may show migration of the component, but often no diagnostic features can be seen. Hitherto, if femoral loosening was suspected we undertook an arthroscopy and probed the component. The use of flexion and extension views is simple and non-invasive and demonstrates loosening evidenced by movement of the component. The important features to look for are the piston and crescent sign shown on the flexed radiograph, as demonstrated by this case (Fig. 1), another with more subtle signs (Fig. 2) and a schematic diagram (Fig. 3). A further feature of loosening which may be seen only on the extended view is the wedge sign between the posterior part of the component and its base (Figs 3 and 4). We have
used this technique to diagnose loosening of the femoral component in five patients, in all of whom the diagnosis would probably have been missed without the 90° flexion view.

There are a number of factors which may result in loosening. A posterior femoral saw cut may slope too far anteriorly giving inadequate support to the posterior part of the femoral

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**Fig. 1a**

Lateral radiographs showing a knee in a) 20° of flexion and b) 90° of flexion showing the crescent sign (arrow).

**Fig. 2a**

a) Extension and b) flexion lateral views, with magnification (c and d), showing the piston and crescent signs of a loose femoral stem in flexion.
component, as shown on a lateral radiograph by the wedge sign (Fig. 4) between the posterior aspect and its base. There may be failure to secure the femoral peg. Cement needs to be pressurised into the central peg hole. Absence of cement in the hole is seen in figure 2. Multiple small keying holes must be drilled in the femoral condyle, particularly in the sclerotic bone behind the main hole, and the femoral component must not be allowed to move during pressurisation of the cement. In order to avoid this, the knee must be held in 45° of flexion, a feeler gauge inserted to pressurise the cement, and the knee held in this position until it has cured.

We now use fluoroscopically screened radiographs routinely to assess the Oxford UKR. The radiographer can accurately align the beam with the components so that the bone-implant interfaces are clearly seen. Radiolucencies and subtle migration of the component can then be detected. However, even if screened radiographs are not available, carefully taken standard lateral radiographs in flexion and extension will be useful. We have taken the flexion radiograph in 90° of flexion. This angle is probably not critical and it may be advantageous for the knee to be flexed further. However, flexion beyond 130° should be avoided as the bearing may be resting on retained articular cartilage in the posterior femur, and with less pressure on the component it may not move.

In our five patients the use of flexion and extension in radiographs allowed rapid diagnosis and appropriate treatment. Although this technique was developed for the Oxford UKR it could probably be applied to all types of UKR.

References