

X-ray Protocol

Preoperative Stress X-ray

Stress X-rays are useful tools to determine whether an osteoarthritic knee is appropriate for medial unicompartmental replacement. Important decisions are based upon the X-ray; therefore, it is essential that they are taken correctly. It is strongly recommended that the stress X-ray is supervised by the surgeon.

Stress X-ray Procedure

The patient lies supine on the X-ray table in a relaxed position.

Insert a foam wedge behind the knee so that it is flexed approximately 20 degrees. Place the X-ray film beneath the foam wedge with the X-ray tube 1 metre above the knee and angled approximately 10 degrees (Figure 1). Wearing a lead apron and lead gloves, apply a varus or valgus load to the knee.

⊖ **Note:** Take care that the leg does not rotate (i.e. the patella remains central).

Take two X-rays, one in varus and one in valgus.

Review images to ensure that the following items have been addressed:

- X-ray beam was parallel with the tibial joint surface
- Patella was appropriately centered over the femur (i.e. the leg was not rotated)

⊖ **Note:** If the X-rays were not taken correctly then they should be repeated with the beam tilted to avoid rotation.

Interpretation

In the varus stressed image, the medial compartment is examined to determine whether there is full thickness cartilage loss (Figure 2).

⊖ **Note:** If bone-on-bone is not seen on AP weight bearing view, perform varus stress or Rosenberg/standing PA 20 degrees flexion X-ray. If these do not show bone-on-bone, consider arthroscopy.

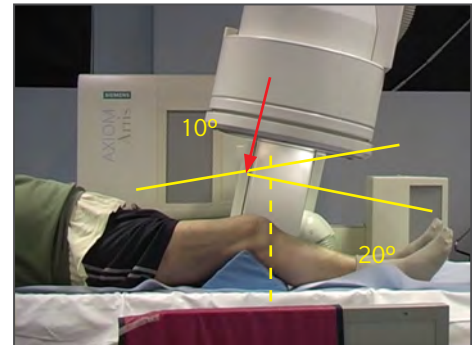


Figure 1

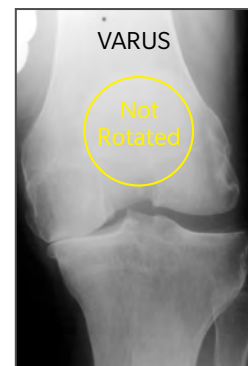


Figure 2



Figure 3

Examine the valgus stressed image to see if the medial joint space has opened up to its normal thickness. If it has, it can be concluded that the medial collateral ligament is normal (Figure 3). Examine the lateral joint space to determine the state of its articular cartilage. If the joint space retains its normal thickness under valgus stress, it can be concluded that the articular cartilage is of normal thickness and will be able to resume normal weight-bearing function.

ⓘ **Note:** Narrowing the lateral joint space implies thinning of the cartilage, which is a contraindication to medial Oxford Partial Knee replacement. Marginal osteophytes are often seen and are not a contraindication. If there is mediolateral subluxation of the femur on the varus stress X-ray and it does not fully correct on the valgus stress film, the anterior cruciate may be ruptured (Figure 4).

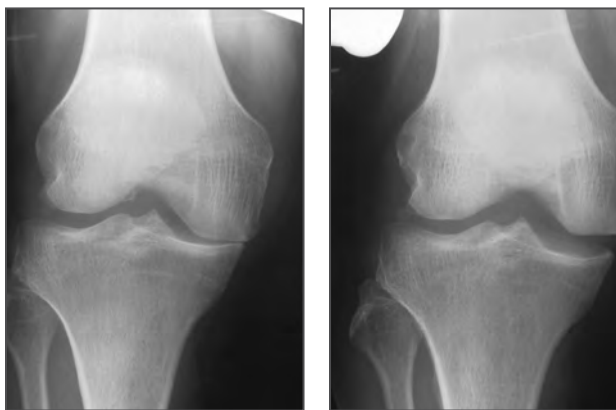


Figure 4

Postoperative Fluoroscopic, Controlled Screened X-ray

After implanting an Oxford Partial Knee, follow-up X-rays are necessary for the following:

- Ensure quality of the surgical technique
- Assess bone/implant interfaces/imaging
- Set a baseline for later follow-up X-ray comparison

ⓘ **Note:** Standard X-rays are adequate in total knee replacement but with an Oxford Partial Knee, the position of the femoral and tibial components relative to one another is an important variable and can only be assessed if the direction of the X-ray beam is known in each film.

Standard methods of alignment are neither sufficiently accurate, nor repeatable. The required precision can only be achieved by screening with an image intensifier.

Anteroposterior X-ray Procedure

ⓘ **Note:** Anteroposterior (A/P) films should be used to evaluate tibial positioning. Evaluation of the femoral component should be done using a lateral X-ray which is described in the next section.

The patient lies supine on the X-ray table in a relaxed position.

Adjust the table height to provide adequate clearance for the fluoroscopic C-arm and the foam wedge. Adjust the C-arm in the two planes until the tibial component appears in perfect silhouette on the screen.

ⓘ **Note:** The X-ray source is usually angled 7 degrees.

Figure 5 shows a screen image that requires further adjustment. The tibial component appears slightly tilted because the X-ray beam, though well-aligned with the keel is not exactly parallel with the plane of the plateau.

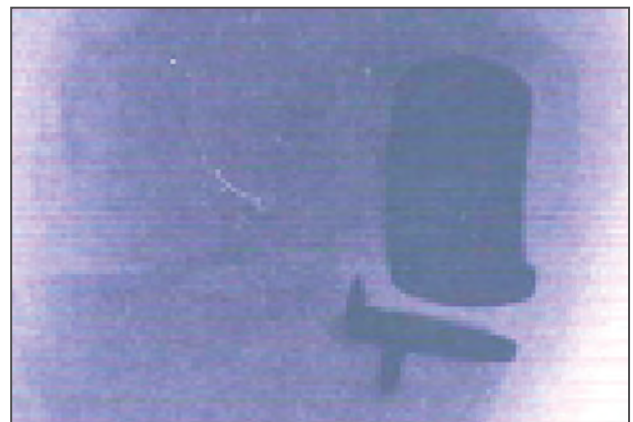


Figure 5

ⓘ **Note:** Based on the still image, it is not possible to tell the direction of the error. It can be corrected by making adjustments to the C-arm until a perfect “end on” silhouette is achieved. Then take the high resolution X-ray.

Lateral X-ray Procedure

Flex the contra-lateral hip and knee to approximately 90 degrees by resting the leg on a support (Figure 6).



Figure 6

Rotate the C-arm to the horizontal position to view the image.

Adjust the C-arm until the femoral component appears in perfect lateral silhouette (Figure 7). Then take the high resolution X-ray.



Figure 7

X-rays of the Oxford Knee taken without fluoroscopic control may be difficult to interpret.

The two views described below exploit the geometry of the components:

A/P View: Tibial Component

- The tibial component has flat surfaces which form a right angle to one another, the horizontal plateau and the vertical wall.
- The plateau and the keel both appear in perfect silhouette on a fluoroscopic screen when the X-ray beam is aligned in both the horizontal and the vertical planes (Figure 8).

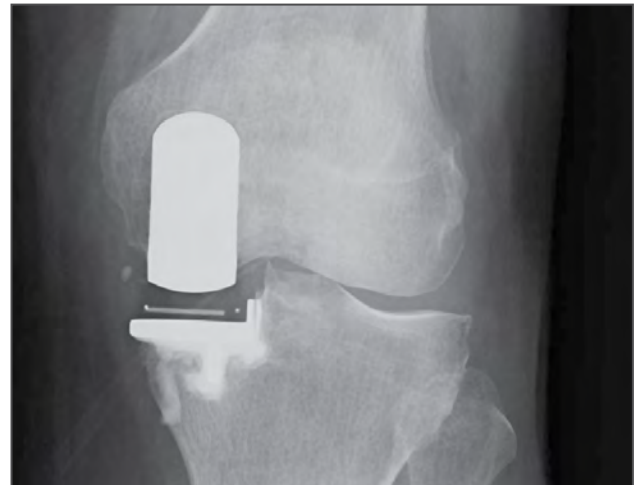


Figure 8

Lateral View: Femoral Component

- The flat tibial surfaces are not readily visible and the femoral component is used instead.
- When the image of the femoral component appears in perfect lateral silhouette, the X-ray beam is directed at the center of the spherical surface and parallel with the flat posterior facet (Figure 7).

ⓘ **Note:** The average radiation dose employed is less than a standard knee X-ray and takes 10–15 minutes. The technique should be used for the first postoperative film and for all subsequent films. The accuracy of the anteroposterior projection alignment is more accurate and reproducible than the lateral. Only gross alignment errors of the limb can be detected on these films. Varus/valgus long-leg X-rays are needed for precise measurement.

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In the United States (U.S.), the Oxford Partial Knee is intended for use in individuals with osteoarthritis or avascular necrosis limited to the medial compartment of the knee and is intended to be implanted with bone cement. The Oxford Knee is not indicated for use in the lateral compartment or for patients with ligament deficiency. Various countries outside of the U.S. offer Oxford partial knees intended for lateral use and indicated for cementless applications; these devices are not available for sale in the U.S. Please check your local product clearances. Potential risks include, but are not limited to, loosening, dislocation, fracture, wear, and infection, any of which can require additional surgery.

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