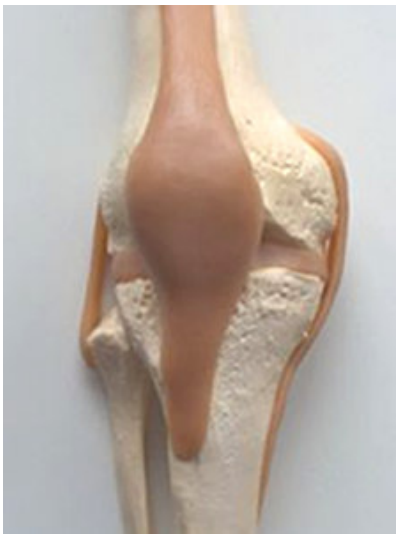
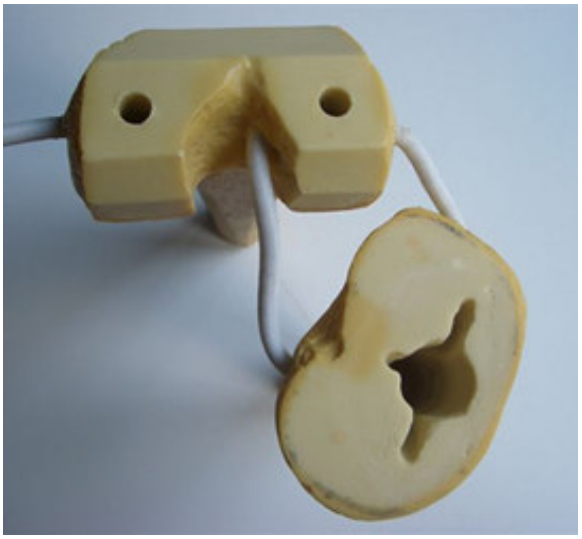
Total Knee Replacement: How it is done

An incision is made across the front of the knee. The patella (kneecap) is flipped over to one side, and the knee is then bent right back, which exposes the inside of the joint.
Various soft tissue releases are performed to allow a clear view of the end of the femur (thigh bone) and the upper end of the tibia (shin bone).



Picture on the left shows the knee before, and on the right after the sequence described above. The anterior cruciate ligament (ACL) and the menisci are removed. Using special jigs and guides, the end of the femur and the top of the tibia are cut with a surgical saw-blade to look like this from the side and from the top: [much easier on plastic bones than in real life…….!]



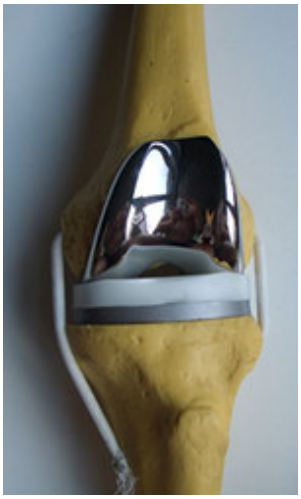
This allows the surgeon to fix the components onto the ends of the prepared bone, which now matches the shape of the components.

The femoral component looks like this:

And the tibial component like this: (plastic tray on top of a metal plate)

The components are usually cemented onto the bone so the knee looks like this before being straightened and checked for stability, range of movement, tracking and alignment:

So the final product looks like this (from the front, and bent to a right angle):



Not shown in the sequence above is the patella (kneecap). This is flipped back across the front of the knee when the surgeon is happy all is well and the knee is ready for final closure. Some surgeons leave the patella alone if it is in reasonably good condition, except for removing any osteophytes (small irregularities on the edge). Other surgeons will resurface the patella with a small plastic 'button' if it is deformed or much worn. Still others always resurface the patella – it is quite controversial! I personally will leave it alone if it looks near perfect in shape AND there is little erosion or cartilage loss. Otherwise, I resurface and will always do this for inflammatory arthritis e.g. rheumatoid arthritis. So I tend to err on the 'resurface unless it looks really good' side rather than the 'leave it alone unless it looks really terrible' side.
My rationale is that one occasionally sees patients who have had a TKR and who are improved, but are still not 100% happy. Such patients often have vague anterior knee pain that is difficult to assess and pin-point as to causation.
If such patients have had their patella resurfaced, it allows a narrower focus on what might be the residual problem. If they have NOT had the patella resurfaced, it is harder to eliminate patello-femoral irritation from the equation, and tempting to go back into the knee to resurface the patella. Unfortunately, the results of re-operation on the patella in this context are relatively poor, and the patient may therefore end up having had 2 operations, yet remaining unhappy. It seems better to more often resurface the patella to avoid this dilemma (during the original operation), even if some of the patella resurfacings might be unnecessary.

A final comment. Patients sometimes ask if, as with the hip, there is a 'resurfacing' procedure for the knee. The answer is basically that existing

[Total] knee replacements ARE resurfacings. We only remove enough bone to provide a secure base for fixation of components thick enough to withstand body weight. The knee is fundamentally different from the hip, in that it is a hinge joint with certain other subtle degrees of freedom of movement (glide, translation and rotation). The hip is (mechanically!) a 'simpler' ball and socket joint. Other features of the hip may be more complicated, but when it comes to arthroplasty, the mechanics are simpler.

So whilst it is possible to achieve 'fluid film' lubrication in the hip, this is only transiently possible in the knee. The differences between the joints also make a metal-on-metal knee replacement currently impossible to conceive of without inviting massive release of metal ions and wear particles.