Total Knee Replacement in the Varus Knee

- Approximately 80-85% of total knee replacements are performed for medial compartment osteoarthritis with a pre-operative varus deformity. The surgery is usually straightforward with predictably good results in majority of cases.

- Less commonly, patients will present much later in the disease process after prolonged period of medial wear. This results in bone stock loss usually on the medial tibia, chronic stretching of the lateral stabilising structures and often, a significant flexion contracture. Imaging will demonstrate sizable peri-articular osteophytes, medial tibial plateau bone loss, lateral subluxation of the tibia and large posterior femoral osteophytes.

- The goals of surgery in this setting remain the same as if the patient had presented five to ten years earlier when the wear and secondary changes were less marked. It is expected that the patient will have a replacement that will fully extend, have a functional range of flexion, be stable and allow near pain-free activities. What does the surgeon need to do to achieve this outcome? Most surgeons are comfortable to leave a patient with massive varus as described in some small amount of varus at the end of the procedure.

Surgical exposure

- Dislocation of the patella laterally in the presence of massive varus can be difficult and may damage the tibial attachment of the patellar tendon
especially if the patella is everted rather than dislocated. A longer incision proximally in the extensor mechanism and dislocation rather than eversion helps mitigate against inadvertent patellar tendon avulsion. If the patella remains tight, either a tubercle osteotomy or rector snip can be necessary.

- Navigation if utilised, allows the surgeon to numerically quantify the deformity in both the sagittal and coronal planes. This information can subtly alter the bony preparation.

**Femoral preparation.**

Massive tibial bone loss often necessitates the tibia being cut in slight varus to reduce the thickness of the lateral plateau offcut and to have the cut on the medial side be within a few millimetres of the worn surface. This varus tibial cut can be counted by cutting the distal femur in 1° - 2° of valgus.

If there is significant posteromedial femoral condyle cartilage wear, guides that reference off the posterior condylar axis will be placed in more external rotation than intended. Rotation of the femoral cutting block should be referenced to both the plotted epicondylar axis and orthogonal to Whiteside’s line to ensure correct rotation of the femoral component. Over resection of the posterior medial femoral in a knee that has already lost bone on the medial plateau can result in a markedly loose medial flexion space.
**Tibial preparation**

Massive tibial bone loss can be a major problem to resolve. The alternatives are;

1- a very low cut on the tibia removing excessive bone from the lateral plateau and a much smaller surface for the tibial implant
2- cutting the tibia in 2° - 3° of varus to reduce excessive bone removal from the lateral plateau and not cutting to the depths of medial wear
3- providing a tibial augment supported by a stem.

The author’s preference is to cut the tibia in slight varus removing at a maximum approximately 10mm of bone from the lateral plateau with the sloped cut coming down close to the depths of medial plateau bone stock loss. Following this, utilise a slightly smaller tibial tray sited flush to the lateral margin of the lateral tibial plateau. This avoids siting the tibial base plate on an area of significant bone loss. The resulting medial protuberance, usually 3mm – 5mm can be removed with an oscillating saw resulting in the shorter course for the medial stabilising structures which helps balance the tight medial structures against the stretched lateral side. Sclerotic bone can be drilled to improve cement penetration and posterior femoral and tibial osteophytes should be removed to decrease the excursion required of the posterior capsule to achieve full extension. Leaving the knee in 3-4 degrees of varus makes balancing easier and usually puts the patient back to where they were before arthritis supervened.
Ligament balancing

If the surgical steps outlined above have not been sufficient to balance the knee, it is usually a simple matter to release the medial structures. This usually involves pie crusting of the medial capsule (deep MCL) with a 19 gauge needle or if a severe tightness is present a 15 blade for pie crusting. A posterior capsular release may be necessary in the presence of a significant flexion contracture. Rarely, a distal release of the superficial MCL may be necessary but this should be performed incrementally to minimise the risk of medial ligament instability.

Occasionally in the presence of a resistant flexion contracture, it may be necessary to partially release the semimembranosus tendon from the posterior tibia usually by partially dividing the more proximal attachment to the posterior tibial cortex.

Trial implants – successful balancing

With the trial implants in position, the knee should fully extend and have a similar amount of opening to varus and valgus at 20°. As outlined above, in the patient with a massive varus deformity, it is easier to achieve balance if the knee is left in slight varus. Modern polyethylene- cross-linked and sterilised in Argon- has greatly improved wear characteristics and our absolute need to achieve a straight mechanical axis is becoming less critical to implant survivorship. In practical terms, a patient with a well balanced knee in slight varus will be more likely to be satisfied with the outcome and have better function than a patient aligned at zero degrees with overly tight medial structures and a little loose laterally.