Implant Sizing and Determination of Correction Angle

A technical overview of Arthrex's iBalance HTO approach to proximal tibial osteotomy: preoperative planning

Proximal tibia osteotomy is performed to restore anatomic alignment to the knee joint. This procedure is indicated for patients who have primary degenerative osteoarthritis involving a single compartment of the knee and a corresponding malalignment of the involved limb[1]. Re-alignment can be done to restore the biomechanical load distribution and to relieve symptoms and slow disease progression. When using the iBalance HTO System, the tibia size, as well as the degree of malalignment is determined in order to select the appropriate instrument settings, implant size and correction angle.

The iBalance HTO Instrument System and the iBalance HTO Implant are sized to accommodate a variety of tibial widths. To achieve an optimum implant fit, the patient's tibial width is determined and the implant size selected accordingly. Imaging systems which use a calibration object in the image can be used to accurately assess the tibial width. However, the tibial width can be determined intra-operatively using the iBalance HTO Steel Rule, which comes with easily viewable holes drilled at specific intervals. The intra-operative technique for determining the tibial width requires two fluoroscopic images; one anterior and one posterior to the knee while the knee and the fluoroscope are maintained in a fixed position. The two measurements are then averaged to compensate for magnification and parallax *(see Figure 1)*.

Figure 1. Tibial Size Assessment

$$\textbf{Tibial Width} = \frac{(\text{Width Anterior} + \text{Width Posterior})}{2}$$

The tibial width is then used to select the instrument size settings and to select the implant size.

While the implant size (SM, MD and LG) determines the footprint of the implant, the height of the implant is set by the correction angle in degrees. The use of implant sizes and correction angles eliminates the need for trigonometric calculations and tables to determine the implant height[2].

Determine the implant correction angle by measuring the degree of preoperative varus malalignment. Malalignment is measured by constructing the mechanical axes of the femur and tibia through a point that is 62.5% of the medial to lateral tibial width using a hip-to-ankle full weight bearing x-ray *(see Figure 2)*.

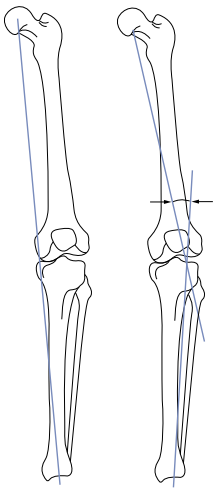

Figure 2. Mechanical Axes using a Hip-to-Ankle Full Weight-bearing X-ray

The femoral axis is drawn through the center of the femoral head through the point which is 62.5% of the medial to lateral tibial width. The tibial axis is drawn from the midpoint of the tibial plafond through the same point *(see Figure 3)*.

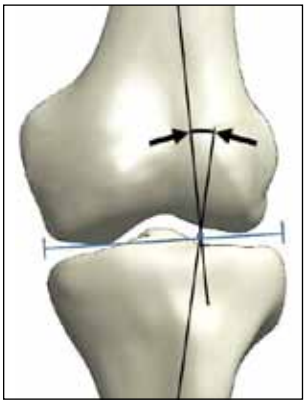

Figure 3. 62.5% of the Medial to Lateral Distance *(left knee shown)* and the Correction Angle

With the lines drawn as in Figure 2 such that they pass through the 62.5% point as shown in Figure 3, the angle measured between the arrows is the desired correction angle.

The iBalance HTO Implants are available in increments of 1 degree. The implant that matches the measured tibia size and the measured correction angle is then selected.

REFERENCES

1. Annunziato Amendola, M.D., Ludovico Panarella, M.D., *High Tibial Osteotomy for the Treatment of Unicompartmental Arthritis of the Knee,* Orthopedic Clinics of North America, 36 (2005) 497-504.
2. P. Hernigou, W. Ma, *Open Wedge Tibial Osteotomy with Acrylic Bone Cement as Bone Substitute,* The Knee, 8 (2001) 103-110.