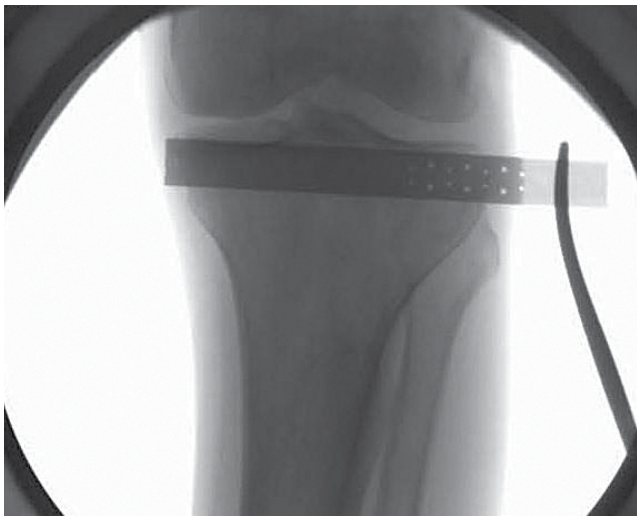
Implant Sizing and Determination of Correction Angle: Preoperative Planning for the iBalance® HTO System for Proximal Tibial Osteotomy

A 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] Realignment can help restore biomechanical load distribution, relieve symptoms, and slow disease progression.[1] When using the iBalance HTO system, tibial size and degree of malalignment are determined in order to select the appropriate instrument settings, implant size, and correction angle.

The iBalance HTO instrument system and implant are sized to accommodate a variety of tibial widths. To achieve optimal implant fit, determine the patient's tibial width and select the corresponding implant size. Imaging systems with a calibration object in the image can be used to accurately assess the tibial width. However, it can also be determined intraoperatively using the iBalance HTO steel ruler, which has easily visible holes drilled at specific intervals. The intraoperative technique for determining the tibial width requires two fluoroscopic images, one anterior and the other 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 (Figure 1).

Tibial width is then used to select instrument size settings and implant size.

Figure 1. Tibial size assessment

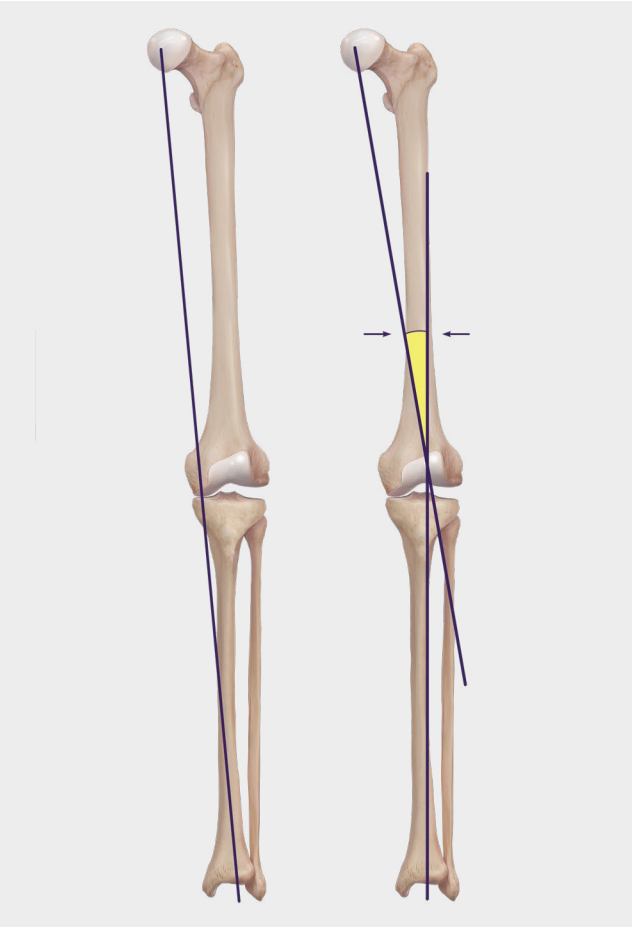


Tibial width = (Anterior width + Posterior width) ÷ 2

Implants are available in small, medium, and large. The implant's size determines its footprint, and its height is set by the correction angle (in degrees). Using implant sizes and correction angles eliminates the need to use trigonometric calculations and tables to determine implant height.[2]

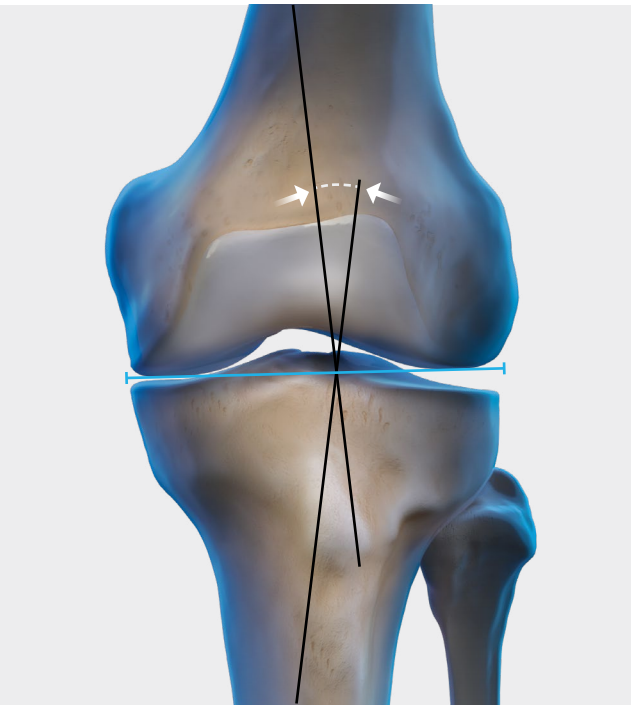
Determine the implant correction angle by measuring the degree of preoperative varus malalignment. This is measured by constructing the mechanical axes of the femur and tibia through a point that is 62.5% of the medial to lateral tibial width using a hip-to-ankle full–weight-bearing x-ray (Figure 2).

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. The tibial axis is drawn from the midpoint of the tibial plafond through the same point (Figure 3).

Figure 3. 62.5% of the medial-to-lateral distance (left knee shown) and the correction angle



After drawing lines (Figure 2) so they pass through the 62.5% point (Figure 3), the angle measured between the arrows is the desired correction angle. iBalance® HTO implants are available in 1° increments; select the implant matching the measured tibia size and correction angle.

References

1. Amendola A, Panarella L. High tibial osteotomy for the treatment of unicompartmental arthritis of the knee. *Orthop Clin North Am.* 2005;36(4):497-504. doi:10.1016/j.ocl.2005.05.009
2. Hernigou P, Ma W. Open wedge tibial osteotomy with acrylic bone cement as bone substitute. *Knee.* 2001;8(2):103-110. doi:10.1016/s0968-0160(00)00061-2

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