

**ISOMETRIC RECONSTRUCTION OF THE ANTERIOR CRUCIATE LIGAMENT
FEMORAL AND TIBIAL TUNNEL PLACEMENT
One or two bundle reconstruction ?**

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Study of ACL reconstruction failures shows that half of them are due to technical faults . This is true for all types of transplants and specially for those involving synthetic materials, which are less tolerant than autogenous tissues .

As a whole the ACL is not isometric. It is globally taut in extension and relaxed for a 90° knee flexion . However, some transitional fibers are close to isometry as it has been shown by many authors(Daniel-Abbink-Bradley).

We performed anatomical and radiological studies on cadavers knees and intra operatively . The femoral isometric zone F is located at the center of the femoral attachment in between the antero medial and postero lateral bundles and is the center of a 140° circular arc which is formed on every human knee by the posterior border of the lateral condyle . The radius of this circle varies from 17 to 26 mm ; On average point F is located at 59% of the antero-posterior length of the condyle , measured on a line parallel to the Blumensaat line and starting from the top of the posterior condyle . It is remarkable that this arc of a circle of 140° corresponds to the human knee average range of motion . By geometrical definition the center of this arc is the only point that stays at same distance from the periphery of the posterior condyle during full motion , making logical that there is no change in length and tension of the fibers which are attached to this point .

Same studies were done on the tibial side . . They show that the center of the tibial attachment (average 19mm long) corresponds to the center of the total antero-posterior length of the tibial plateau as it appears on a lateral Xray , or 42% from the front of the medial plateau .

On a radiological study on 50 normal knees , the distance between the femoral center and the tibial center does not vary of more than 2mm in 98% of the cases from extension to flexion , strongly suggesting that fibers inserted at this place are isometric .

Conclusion :

- 1) Each knee is different as the radius of the femoral circle varies with patients . It means that intra-operatively the same landmarks should not be used for everyone as far as isometry is concerned . It is easy to have a pre operative Xray lateral view to determine where is the center of that specific arc of a circle for this specific patient.
- 2) The usual techniques drilling the femoral tunnel close to the posterior wall, favour the reconstruction of the antero medial bundle . It is totally inappropriate when using synthetic fibers . With autogenous transplants It explains why appeared recently the need to make a double bundle reconstruction to improve the stability for each position of the knee .
- 3) To our opinion , it might be as efficient but easier and safer to perform a one bundle isometric reconstruction .