

**Endoscopic  
anatomic  
landmarks for  
tunnel placement  
in ACL  
reconstruction  
and their  
relationship to  
7 year clinical  
outcome.**

LA Pinczewski FRACS  
LJ Salmon PhD  
WFM Jackson FRCS(T&O)  
RPB von Bormann MD  
P Haslam FRCS(T&O)  
S Tashiro MD

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**OBJECTIVES**

The aim of this study was to assess the reproducibility of intra-operative landmarks for tunnel placement in single bundle ACL reconstruction and, to examine the relationship between tunnel placement and long term clinical outcome.

**METHODOLOGY**

200 patients undergoing isolated 4 strand single bundle ACL reconstruction with hamstring tendon autograft were prospectively followed for 7 years. Radiographic tunnel position was assessed from digitalized postoperative radiographs in the sagittal and coronal planes. The relationship between the radiographic location of the tunnels and the clinical outcome at 7 years after surgery was examined.

**RESULTS:**

Two hundred patients were included in a longitudinal prospective study. Post operative radiographs were available on 184 patients (92%).

Pivot shift testing was significantly associated with the coronal graft inclination on logistic regression analysis ( $p=0.01$ ), but no other tunnel placement parameter. The mean coronal graft inclination for those with a Grade 0 pivot shift test was 19.3 compared to 16.8 degrees for those patients with a Grade 1 pivot shift test ( $p=0.04$ ).

If the tibial tunnel was placed >50% posterior from the anterior tibial plateau in the sagittal plane then the incidence of graft rupture was 17% (11/66) versus 7% (8/115) if the graft was placed = or less than 50% anterior to the tibial plateau ( $p=0.04$ ).



Figure 1: Recommended radiological tunnel placement in the sagittal plane

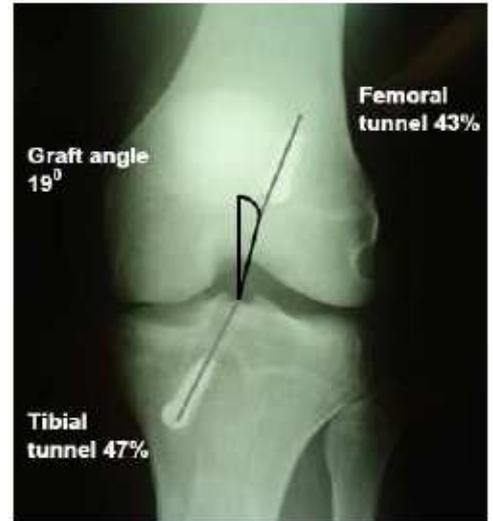


Figure 2: Recommended tunnel position in the coronal plane

Optimal clinical outcome at 7 years is associated with radiological tunnel placement in the following orientation based on those patients who achieved an "ideal" clinical outcome (see Figure 1 and 2). The centre of the femoral tunnel should be located 86% posterior along Blumenstaats line on the lateral radiograph, and 43% lateral to the lateral femoral condyle on the AP radiograph. The tibial tunnel should be 48% posterior along the anterior tibial plateau on the lateral radiograph.

**CONCLUSION**

The use of specific intraoperative landmarks described in this series result in reproducible tunnel placement and excellent clinical outcomes 7 years after surgery. We have determined that even small changes in tunnel position can adversely affect outcome. Vertical graft inclination is associated with increased rotary instability, and radiographic osteoarthritis. Posterior placement of the tibial tunnel beyond 50% of the tibial plateau is associated with increased incidence of ACL graft rupture. We believe that if tunnels are placed using the technique and landmarks described consistent tunnel placement and optimal clinical outcomes can be expected.