Technical Note

Revision Anterior Cruciate Ligament Surgery Using the Over-the-Top Femoral Route

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Abstract: Primary anterior cruciate ligament (ACL) reconstruction is considered a successful surgical procedure, but the results reported for revision ACL surgery are less satisfactory. The most common cause of technical failure in primary reconstruction is tunnel misplacement, particularly on the femoral side, although an anterior placement of the tibial tunnel may lead to graft impingement and failure. Several technical problems are encountered during revision procedures. We describe a technique for revision ACL surgery using a special jig for preparing the tibial tunnel that references the apex and roof of the intercondylar notch and an over-the-top routing for proximal femoral placement. This combination avoids graft impingement at the tibial tunnel exit and circumvents the problems associated with further femoral tunnel preparation. **Key Words:** Anterior cruciate ligament—Knee—Over-the-top route—Revision.

Misplacement of the femoral and tibial tunnels are the most common reasons for iatrogenic technical failure during primary anterior cruciate ligament (ACL) reconstructions.[1-4] During revision surgery, removal of retained fixation hardware, usually interference screws, may be difficult to perform, and repositioning of the femoral tunnel may require extensive bone grafting and a staged procedure. Avoiding this step by taking the new graft over-the-top (OTT) of the femoral condyle significantly reduces the technical difficulty, operating time, and morbidity encountered with revision surgery.

OTT graft placement is not a new concept and was used commonly in the past for primary ACL reconstruction with both biological and synthetic graft materials. Its use, however, has been largely superseded by arthroscopically performed femoral tunnel placement, particularly when a bone block is used in conjunction with bone–patellar tendon–bone grafts. However, hamstring tendon lends itself to being suitable for OTT placement. Results comparing hamstring reconstruction placed either OTT or via a femoral tunnel report no difference in clinical results.[5-7]

We describe a technique of revision ACL reconstruction that employs a reproducible siting for the tibial tunnel, using a special jig that acts as a fixed navigational aid.[8] OTT proximal, femoral fixation is undertaken, avoiding the necessity for redrilling, repositioning, or bone grafting of a previously sited femoral tunnel. This report reflects our experience and practice after revising failed primary procedures mostly performed with prosthetic scaffold implants.

SURGICAL TECHNIQUE

Revision surgery was undertaken in patients with recurrent instability who had failed to respond to

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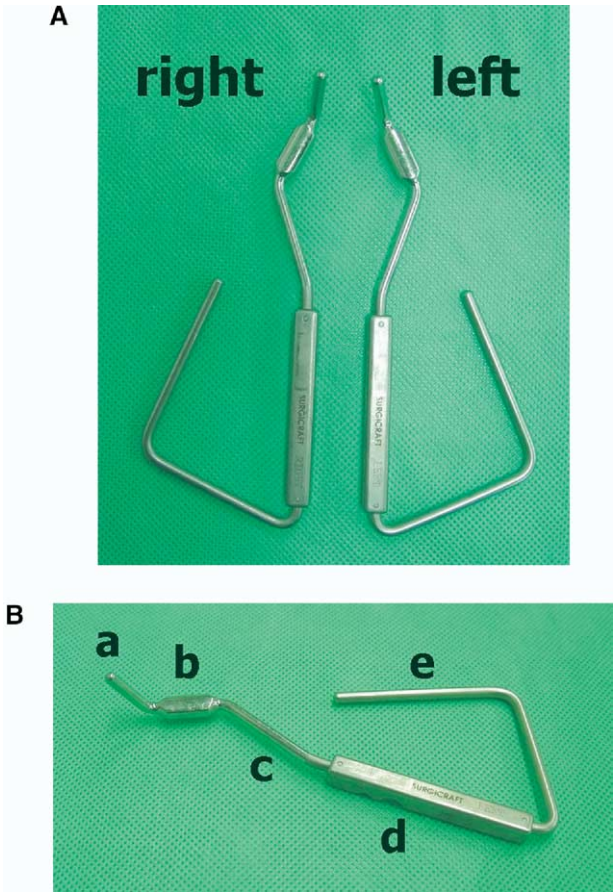

Figure 1. (A) There are 2 offset probes available for the right and the left knee, respectively. (B) The offset probe consists of an intra-articular and an extra-articular portion. The intra-articular portion consists of the upturned tip (a), the baffle (b), and the curved portion (c). The extra-articular portion consists of the attachment site (d) and the aiming device (e).

conservative treatment. We favored an unstaged approach with preparation of a fresh tibial tunnel using a specialized jig and an OTT femoral routing.

Before fresh preparation of the tibial tunnel, if an interference screw has been used in the primary procedure it must be located and removed. Again, if a screw has been used for femoral tunnel fixation it should be removed if the screw head is prominent; otherwise it can be ignored.[10]

After removal of the existing torn or stretched graft substitute, attention is directed toward the preparation of a fresh tibial tunnel and, to facilitate this step, a special jig (the Mayday Rhinohorn Jig) was used. The jig consists of a shank that accepts interchangeable right and left probes depending on the side involved. The offset probes have the following features (Fig 1). The intra-articular portion consists of an upturned tip that engages the apex and roof of the intercondylar notch. Behind the tip is a thickened portion or baffle that serves to centralize the probe in the notch when the knee is extended. Behind the baffle, the probe is curved either to the right or to the left to avoid probe impingement by the medial femoral condyle when the knee is extended. The extra-articular portion consists of a section designed for attachment to the jig (Fig 2A) and a further extension provides an aiming device, which is aligned with the baffle and the upturned tip and provides an external guide to the orientation of the probe and jig.

After it has been attached to the jig, the appropriate left or right probe is passed into the joint through an anteromedial arthroscopic portal with the knee in 60° of flexion. The upturned tip engages the apex and roof of the intercondylar notch (Fig 2B). The knee is then fully extended with the foot in neutral; the baffle on the probe ensures that it is centered in the notch, avoiding wall impingement. The shank of the jig lies parallel and anteromedial to the long axis of the tibia and an adjustable rotating cam at the lower end of the shank aids this. The offset nature of the probe ensures that in the sagittal plane the angle of the tunnel is 60° to the long axis of the tibia and in the coronal plane the tunnel is angled approximately 20° medial to lateral. The aiming device on the probe, which is orientated perpendicular to the midpoint of the patella and long axis of the femur, fine tunes this position. This orientation ensures that the graft follows the anatomic course of the natural ACL and avoids impingement by the apex and roof of the notch in the sagittal plane and the lateral wall of the notch in the coronal plane when the knee is extended.

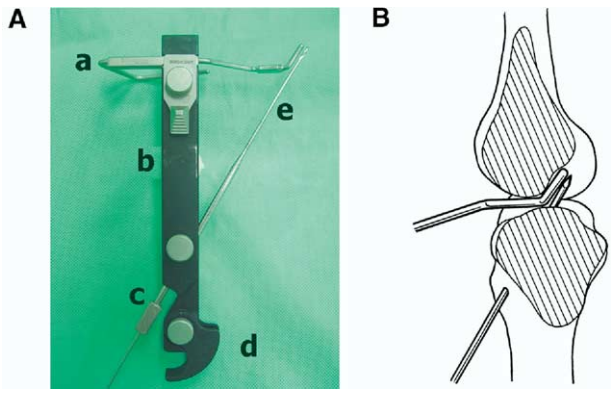

Figure 2. (A) The Mayday Rhinohorn jig consists of the offset probe (a), the shank (b), the guidewire sleeve (c), the guidewire (d), and the rotating cam (e). (B) The upturned tip of the jig engaging the roof of the intercondylar notch and a guidewire is drilled that exits 3 mm posterior to the tip. Overdrilling of the guidewire produces a tibial tunnel in an impingement-free site.