Trans-lateral ACL reconstruction. A new technique for anatomical anterior cruciate ligament reconstruction.

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Abstract

Currently, the most common method for drilling the femoral tunnel in anterior cruciate ligament reconstruction (ACLR) employs a trans-tibial technique. A new technique, utilising anteromedial portal drilling has been shown to produce a more anatomical placement of the femoral tunnel than trans-tibial (1). A further recent development is the concept of anatomical anterior cruciate ligament reconstruction, which makes use of an accessory medial portal to allow medial viewing (2). We describe a new technique, which involves the use of a single medial viewing portal and a single lateral working portal. The Translateral approach requires no accessory medial portal and allows excellent visualisation. Furthermore the entire procedure is carried out with the knee at 90 degrees; there is no requirement for hyper flexion. We believe the Translateral approach will make anatomical ACLR a far safer, more reproducible and accurate procedure than the currently accepted surgical techniques.

Introduction

Arthroscopically assisted anterior cruciate ligament reconstruction (ACLR) was first performed in 1980 by Dandy (3). Trans-tibial ACL reconstruction remains the most popular way for carrying out the procedure. Although this technique has good outcomes and has been shown to restore excellent knee function, the procedure has been shown to be non anatomic. In particular the position of the femoral tunnel is dictated by the tibial tunnel, which results in a relatively vertical position of the femoral tunnel (4). This fails to restore normal knee kinematics (5), which in turn may lead to early onset osteoarthritis (6).

With anteromedial portal drilling, independent drilling of the femoral and tibial tunnels is possible. With this technique all viewing is done through the lateral portal and the femoral tunnel position is referenced from "the over the top position" or back of the medial wall of the lateral femoral condyle (LFC) using the clock referencing system. Lateral viewing can make distinguishing between the resident's or intercondylar ridge and the over the top position difficult which in turn may lead to anterior placement of the graft. In addition anteromedial portal drilling requires the knee to be hyper-flexed when drilling the femoral tunnel, which changes the normal perspective of the notch and can be disorientating. This can lead to poor femoral tunnel placement. (7)

Recently the concept of anatomical or footprint ACLR has been introduced. In its current form anatomical femoral preparation is carried out by both viewing and working from the medial side at the same time. Viewing is carried out through an accessory medial portal

(2). This allows excellent visualisation of the ACL femoral footprint and the bony landmarks, namely the intercondylar and bifurcate ridges. Simultaneous preparation and drilling of the femoral tunnel is then carried out through the central medial portal.

We describe a new technique for anatomical ACLR which we have termed the Translateral approach. This technique utilises a single medial viewing portal and all work including lateral wall preparation and drilling is done via the lateral portal. In order to facilitate this technique the senior author has developed a series of instruments that allow lateral wall preparation and drilling of the femoral tunnel. These instruments are designed to navigate around the distal aspect of the LFC and not impinge on the patella tendon medially. They include a specially shaped Opes radiofrequency probe™ (Arthrex Ltd, Naples, Florida, USA) for soft tissue debridement, a modified curette, a novel marking device (fig1) that allows direct measurements to be made of the length and height of the lateral intercondylar wall to facilitate accurate positioning of the femoral tunnel. Femoral retro-drilling is then undertaken from inside to out (fig2) using the FlipCutter™ (Arthrex Ltd, Naples, Florida, USA) (fig3) and a novel aiming device which is also inserted through the lateral portal (fig1).

Technique

The patient is positioned supine with the knee flexed to 90 degrees. A side support and footrest are employed. A tourniquet is used throughout. A modified lateral portal is used

which is slightly lower and more medial than the traditional high anterolateral (AL) portal position. A 30° side viewing arthroscope is inserted through the AL portal. A low anteromedial (AM) portal is then made under direct vision. Routine arthroscopic assessment is made and appropriate surgery carried out to address any chondral or meniscal pathology. The notch is inspected to confirm the diagnosis of ACL rupture.

A Semitendinosus Hamstring is harvested in the standard fashion through an oblique medial incision centred on the pes anserinus. The hamstring graft is quadrupled and prepared with 2 ACL TightRopes™ (Arthrex Ltd, Naples, Florida, USA). The graft diameter is determined and an appropriately sized flip cutter selected. The arthroscope is then swapped to the medial portal for the remainder of femoral preparation. Lateral preparation is carried out with the knee flexed to 90° and no hyper flexion is required.

The medial wall of the lateral femoral condyle is prepared using the curved Opes radiofrequency device. This allows soft tissue debridement whilst preserving the intercondylar and bifurcate ridges and the femoral ACL footprint.

A novel curved marking device (fig1) is then inserted through the lateral portal. This can be used to measure the width and height of the medial face of the lateral femoral condyle to facilitate anatomical positioning. It has a sharp point, which allows the surgeon to mark the correct femoral tunnel position. An all inside technique is then employed. The FlipCutter aiming device is inserted through the lateral portal and positioned at the pre-marked anatomical femoral origin. The FlipCutter (fig2) is then drilled from outside to in

with the knee at 90 degrees of flexion, entering the joint under direct vision (fig3). The depth of the femoral tunnel is determined from the external portion of the FlipCutter. Typically the retro-socket is drilled to a depth of 20 or 25mm. The FlipCutter is then used to create a tibial retro-socket, which is typically 25 or 30 mm in length. The graft is then introduced though the medial portal and first pulled up into the femoral socket and tensioned with the femoral ACL TightRope. Finally the graft is pulled into the tibial tunnel and fixed with the second ACL TightRope.

Discussion

Traditional techniques with lateral viewing and transtibial or medial portal drilling have been shown to produce good clinical results. Patients return to good or excellent levels of function. However these techniques are not anatomical and therefore do not restore normal knee kinematics (5). This in turn has been shown to increase the risk of developing early onset osteoarthritis (6). As a result anatomical ACLR has been undertaken with simultaneous medial viewing and medial portal drilling.

It is now well established that to achieve an anatomical position for the femoral tunnel, medial viewing is essential. Current techniques for anatomical ACLR employ the use of a central medial working and an accessory medial viewing portal. This makes anatomical ACLR a challenging procedure. The two portals are in close proximity and this creates significant problems due to crowding of the instruments (fig4). With medial portal

drilling, hyper-flexion of the knee is required for femoral tunnel drilling. This can cause disorientation and viewing of the lateral wall can be obscured. Hyper-flexion may also increase the problem of instrument crowding. (8)

The Translateral approach is a new technique for anatomical ACLR. The single anteromedial portal affords excellent visualisation and therefore identification of the relevant anatomy and femoral ACL footprint. There is no requirement for the accessory medial portal. The new instruments allow all preparation of the lateral wall to be carried out through the modified anterolateral portal. The FlipCutter allows accurate drilling from inside to out without the need for hyper flexion.

The trans-lateral approach confers significant advantages over previously described techniques. We believe it will make anatomical ACLR a more straightforward, reproducible and accurate procedure.

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Figures

Fig 1, Jig, FlipCutter and stepped sleeve.

Fig 2, FlipCutter device,
A) Combined
Bi) undeployed
Bii) Undeployed within joint
Ci) Deployed
Cii) Deployed within joint

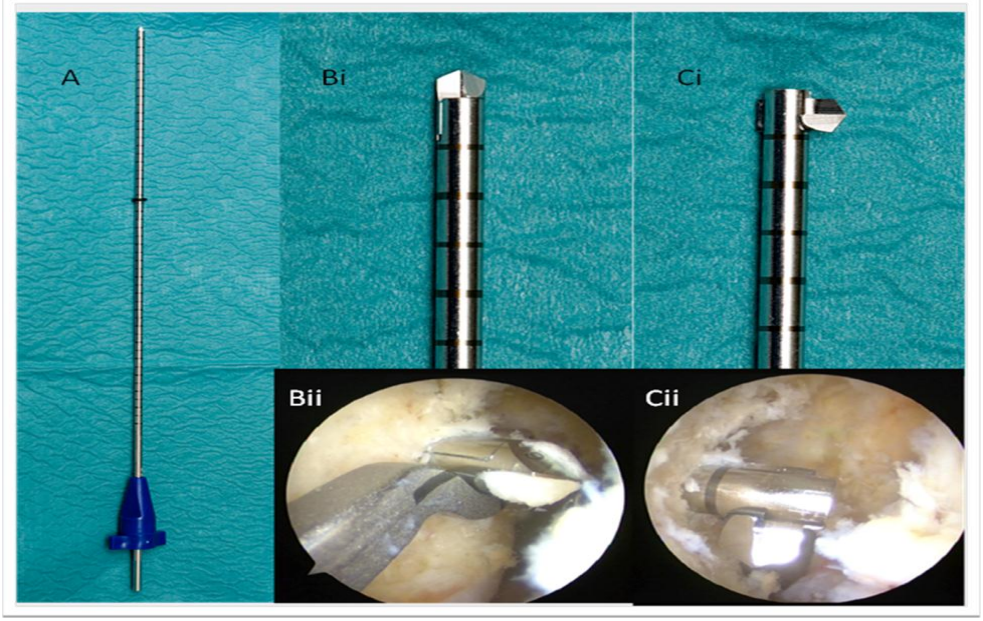

Fig 3, Lateral drilling with FlipCutter, note screen showing modified aiming device in position and superimposed image of FlipCutter hitting target.

Fig 4 demonstration of instrument crowding with accessory medial portal.