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Research paper

Anterior cruciate ligament reconstruction with 70° arthroscope and flexible reamers – Early operative experience

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ABSTRACT

Anatomical graft position for anterior cruciate ligament (ACL) reconstruction is desirable. However, visualisation and positioning are challenges with the standard technique. It is known that graft integration can be improved by maximising femoral tunnel length and graft failure reduced by limiting bending angle. We planned to evaluate the use of new techniques whilst monitoring femoral tunnel length and angle.

A 70° arthroscope, through the anterolateral portal, provided improved footprint visualisation without the need to switch to a medial portal. A flexible reamer system created the femoral tunnel without hyperflexion of the knee. Femoral tunnel length was measured intra-operatively using the graduations on the reamer, and femoral tunnel angle was assessed on the post-operative radiograph (using a digital measuring tool).

In a single-surgeon, consecutive series, 55 patients were treated. When compared to the surgeon's 65 previous cases, femoral tunnel length increased significantly by 3.11 mm (40.1 (±3.49)° vs. 36.9 (±3.87)°; $p < 0.05$) with no significant change in femoral tunnel angle (37.8 (±4.97) mm vs. 39.6 (±5.11) mm; $p = 0.075$).

We discuss this technique with reference to potential advantages and disadvantages of this technology.

1. Introduction

Achieving an anatomically positioned graft has been shown to be one of the most important technical goals in anterior cruciate ligament (ACL) reconstruction with increased failure in non-anatomic grafts.[1,2] However, the surgical technique required, to accurately perform this, has proved challenging. The use of a 70° arthroscope, to visualise the ACL footprints, and flexible reamers, to create the femoral tunnel without the need for hyperflexion, offers some potential benefits.[3] However, improvements in technique must be balanced against the desire to minimise graft failure. Decreasing the femoral tunnel length and changing the graft-bending angle have both been shown to result in increased failure rates.[4] Therefore, we set out to assess our ability to use these new techniques without adversely affecting the femoral tunnel parameters.

2. Methods and materials

2.1. Patients

55 consecutive single-bundle primary ACL reconstructions (using the 70° arthroscope and flexible reamers) were compared to the 65 consecutive previous cases (using a 30° arthroscope and straight reamers). The data was prospectively collected in a database derived from the operation notes. Radiological data was added prospectively following completion of the post-operative radiographs. The group demographics are displayed in Table 1 demonstrating good age- and sex-matching.

Table 1
Patient demographics in study groups.

	Group	
	Using straight reamers	Using flexible reamers
Total number	65	55
Mean age (yrs)	29	32
Sex	44M:21F	39M:16F

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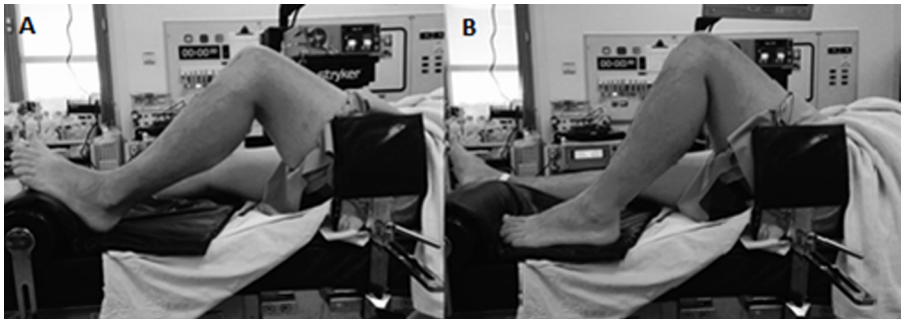

Fig. 1. Photographs of set-up showing: (A) 90° flexed position for arthroscopy and preparation and (B) 90–100° position needed for reaming with the flexible system.

2.2. Surgical technique

After induction of anaesthesia and administration of prophylactic antibiotics, an examination was performed of both knees. A high tourniquet was applied and the limb was prepared and draped. The leg was positioned at 90°, using a cylindrical prop under the foot, and a lateral support. This allowed for an additional small amount of flexion without moving the props (Fig. 1).

Autologous hamstring graft was used in all cases. After harvesting and sizing of the graft, the two portals were established (Fig. 2). The anterolateral (AL) portal was positioned high and close to the lateral edge of patella tendon. A low anteromedial (AM) portal (slightly away from the medial edge of the patella tendon) was then made under direct vision, just above the medial meniscus.

Systematic arthroscopy was performed (using a 30° arthroscope) and treatment for any co-existing pathology was completed. At this stage, the 30° arthroscope was changed to the 70° arthroscope. This was achieved swiftly using a Clinicon quick-change camera drape (P3 Medical, Bristol, England), meaning only one camera was required (Fig. 3).

The tibial tunnel was prepared first and blocked to limit loss of fluid. To drill the tibial tunnel, the 70° arthroscope (via the high AL portal) provided a bird's eye view of the footprint. The posterior border of the anterior horn of the lateral meniscus (PBAHLM) was used, as a landmark, as the senior author believes this to be the most consistent and easily identifiable landmark for remnant preserving ACL reconstruction. The tunnel was centred either at the same level as the PBAHLM or just anterior to it (depending on preoperative magnetic resonance imaging (MRI) assessment).

To drill the femoral tunnel, the footprint was identified based on the remaining stump and the bony landmarks (intercondylar and bifurcate ridges). There was no need to hyperflex the knee. The entry point for the femoral tunnel was marked with a microfracture awl. We then used the Stryker VersiTomic Flexible Reaming System (Kalamazoo, MI). The curved guide was used to position the flexible guidewire (Fig. 4). This compensates for the decreased flexion used by allowing curvature in the wire prior to the entry point (the wire is straight within the femur). The angle and direction of the guide, along with the degree of knee flexion, dictates the length and the angle of the tunnel and also the aperture shape (round or elliptical) of the tunnels.

Fig. 2. Photograph of standard portal position for right knee. Anterolateral – high and medial (close to patella tendon). Anteromedial – low and medial just about the medial meniscus.

Fig. 3. Stryker camera (Kalamazoo, MI) covered with Clinicon drape and Olympus 30° and 70° arthroscopies (Center Valley, PA).

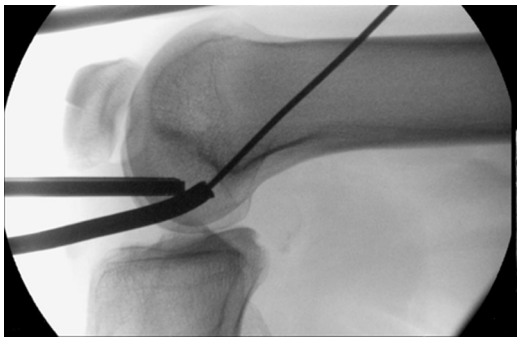

Fig. 4. Lateral radiograph showing curved guide within the knee and guidewire straight within the femur.