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To co- relate between tibial intercondylar eminence distance and ACL graft thickness in arthroscopic ACL reconstruction using quadrupled semitendinosus tendon graft

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Background

- In past decade, improved knowledge in anatomy, biomechanics and biology of Anterior Cruciate Ligament (ACL)led to various modifications in ACL reconstruction with emergence of preservation of ACL remnant.

- Preserving ACL remnant potential benefits.

Improved vascularity--- enhance graft vascularization and graft integration

Proprioception---------- improve recovery of joint positioning and rehabilitation.

- With this goal we describe a technique where the intercondylar eminence distance (ICDE)(in mm) on Tibia was measured, and Tibial tunnel is drilled 1mm or less to ICDE which will preserve ACL remnant and its positive benefits.Tibia Drilling Done with 2mm serially starting from 6mm.

Purpose

To co- relate between tibial intercondylar eminence distance and ACL graft thickness in arthroscopic ACL reconstruction using quadrupled semitendinosus tendon graft

Materials and Methods

This prospective study was conducted on a total of 100 patients with a mean average of 32.7 years undergoing ACL ligament reconstruction with quadrupled Semitendinosus autograft with Double suspensory fixation.

Pre-operative parameters taken into consideration were sex, height, weight. Intra-operatively, tibial intercondylar eminence distance(ICED) was calculated using Arthrex measuring probe(Arthrex 70 degree Mesurement probe AR-4070-70S) during knee diagnostic scopy and a quadrupled semitendinosus graft length and diameter were taken into consideration after measurement.

Operative Technique

Patient in supine, with side support, with a lateral post just proximal to the knee, at the level of the padded tourniquet, and a foot roll positioned with the knee at 90^{o} of flexion.

Standard Anterolateral made, Diagnostic scopy done, Anteromedial portal established, ACL tear confirmed, Semi-Tendinosus graft is harvested in standard manner and prepared with double suspensory fixation implants, thickness measured with sizer.
Femoral Tunnel made with retrograde manner using flip cutter (*fig.1*)up to 15mm length and graft width results in circular tunnel at the foot print (*fig.2*).

Causes of tunnel widening

Biological: Seepage of synovial fluid in to tunnel which contains osteolytic Cytokines. → Prevented by **Retrograde reaming (with flip cutter)** circular femoral tunnel – providing snug fit with no seepage of synovial fluid into femoral tunnel

Mechanical: longitudinal (Bungee effect) and Transverse graft motion (windshield wiper effect) → **Double suspensory fixation** – prevents both the longitudinal and transverse graft motion

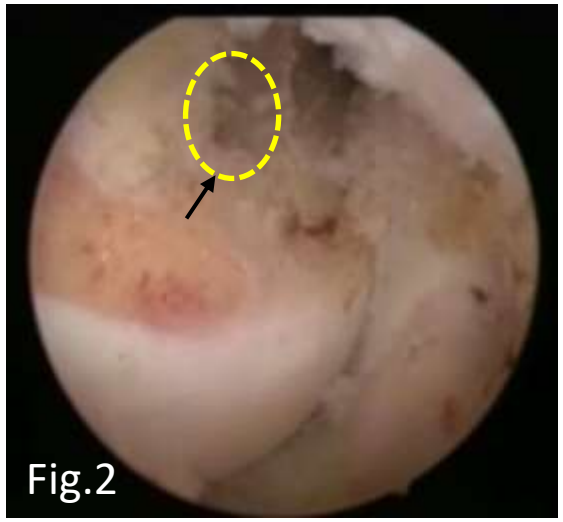
Operative Technique

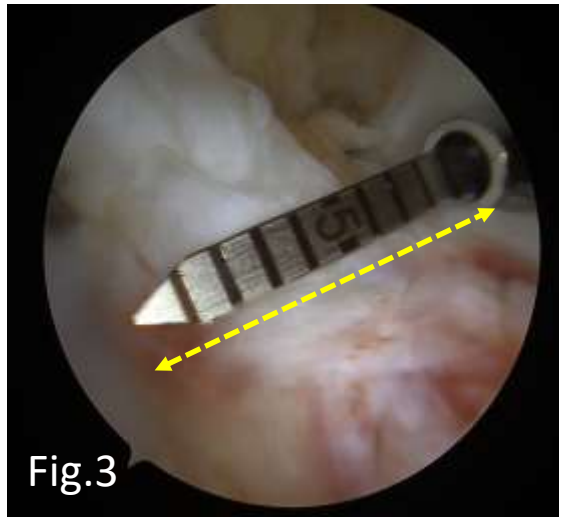
Tibial tunnel: Intercondylar eminence distance(ICDE) is measured with the Arthrex measuring probe (*AR-4070-01*)(*fig.3*) and attempt is made to ream 1mm less or more of this measurement.

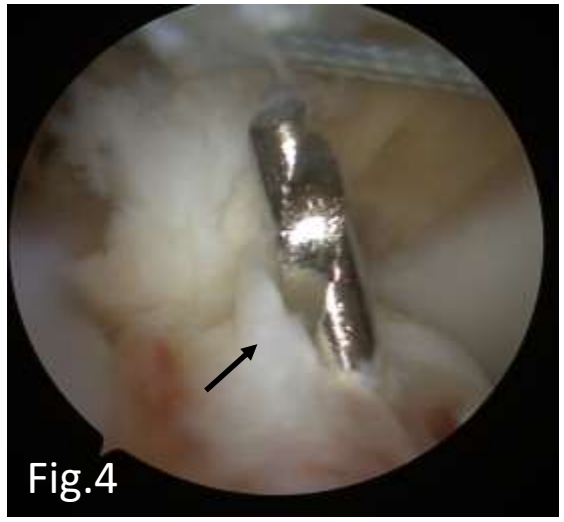
Tunnel preparation made in standard manner (outside- in) with tibial ACL zig elbow aimer (smith and Nephew)with 65^{o} angle targeting to exit in the center of Native ACL foot print*(fig.4)* and serial reaming done starting with beath pin, 6mm and 8mm drill bits till the desired tunnel width is achieved

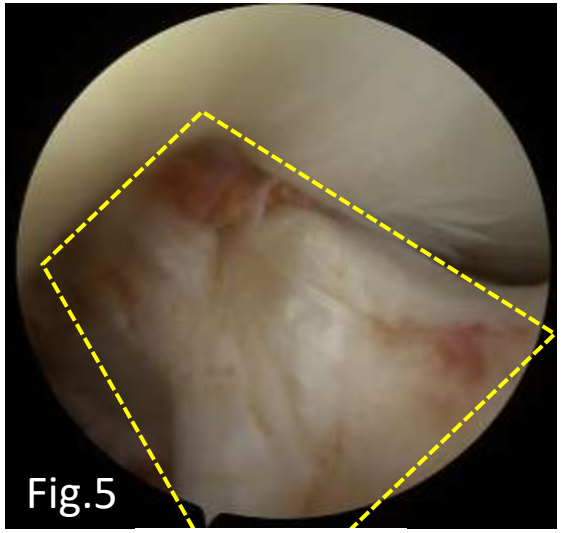
Serial reaming prevents the chances of breaking the medial tibial condyle while reaming.
Graft is then shuttled from tibial tunnel in to the femoral tunnel under arthroscopic view, Femoral button is then flipped on the femur. Graft is tensioned so that the 15mm mark on the graft will be just at the mouth of the tunnel.

Tibial side is fixed with Arthrex ABS tight rope on ABS button and graft is tensioned. Knee is checked for stability and wounds closed in standard manner over a intra-articular drain.









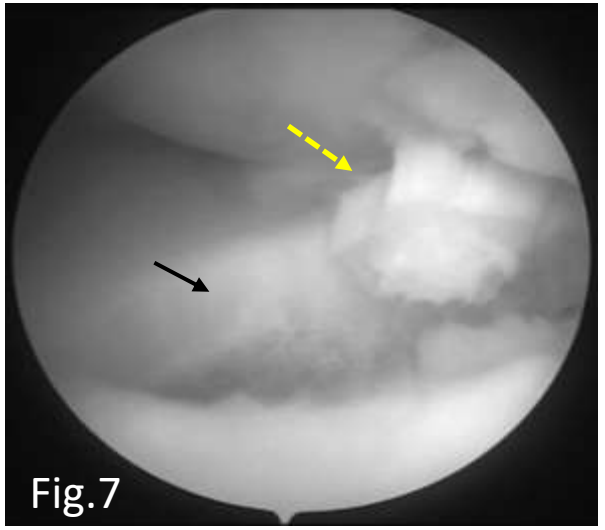
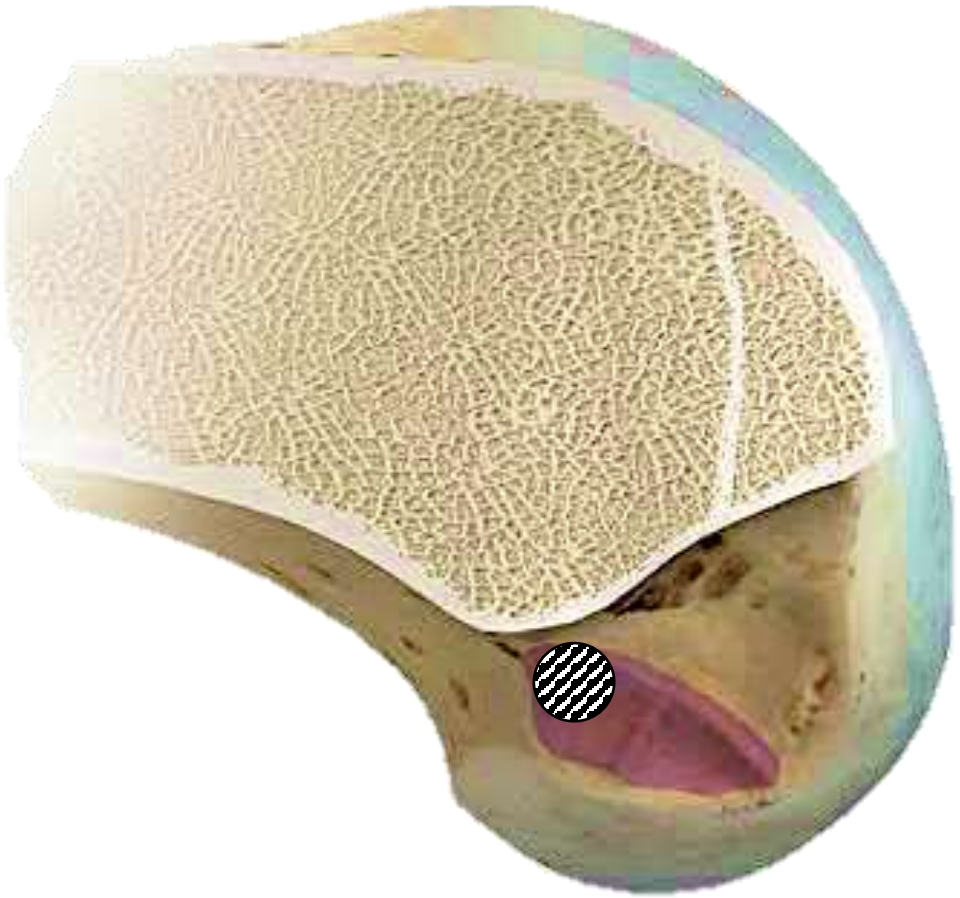


Fig.1 Retrograde reaming with flip cutter, Fig.2 Circular Femoral tunnel, Fig.3 measuring Intercondylar eminence distance (ICDE) with measuring probe,
Fig.4, Guide pin at the center of native ACL remnant, Fig.5 Final graft picture covered completely by native ACL remnant, Fig.6 Post op radiographs.
Fig.7 Osteochondral fracture in medial tibial condyle due to over reaming (another case); black arrow showing defect, yellow dash arrow showing fracture fragment.



I.D.E.A.L Femoral Tunnel position

- **I**sometric
- **D**irect Fibers
- **E**ccentric , **E**quidistant
- **A**natomic
- **L**ow tension flexion pattern

Results

There was significant amount of ACL footprint preserved and the graft was positioned within the remnant, providing circular synovial coverage and the quadrupled semitendinosus graft was sufficient enough for ACL reconstruction. With serial reaming we can avoid the tibial tunnel encroaching into the medial tibial condyle which is very common while reaming with a bigger reamer. Also while retaining the remnant ACL we can avoid synovial fluid seepage and in turn avoid tunnel widening.

Conclusion

Intra operative measurement of the intercondylar eminence distance and creating of a tibial tunnel 1mm less or more with a quadrupled semitendinosus graft found to have preserving ACL remnants leading to positive effect in graft healing and preservation of the native mechanoreceptors resulting in better proprioception allowing accelerated rehabilitation.

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