Double Bundle PCL Reconstructions are Easy and the Future is now

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Posterior Cruciate Ligament Current Evidence

I. Anatomy – 2 bundles
   a. ALB/PMB – femur separated by 12.1 mm
   b. ALB on roof, PMB on wall
   c. Need 2 tunnels to reconstruct
   d. Tibial attachment = compact so one tibial tunnel

II. Clinically Relevant Biomechanics
   a. Defined individual and collective function of PCL bundles (Kennedy 2013)
   b. Provides a framework for evaluating SB vs. DB PCL reconstructions
   c. Both ALB and PMB resist PD through all knee flexion
      i. “co-dominant relationship”
   d. Synergistic function + load sharing through 0° to 120°

III. SB vs. DB Reconstruction (Wijdicks 2013)
   a. Anatomic DB reconstruction more closely approximated native kinematics
   b. Greater restraint to PD at flexion angles 15° to 120°
   c. Less internal rotational laxity at 90° to 120°
IV. PCL Intra-op Fluoroscopy (Johannsen 2013)
   a. PCL tibial tunnel was 1.5 mm distal to joint line
   b. PCL tibial attachment center = 5.5 mm superior to CGD on tibia
   c. Avoid superior placement (meniscal root injury – Kennedy 2014)

V. Endoscopic DB PCL Reconstruction Technique
   a. AL bundle graft from Achilles tendon allograft
      i. 11 mm diameter, 25 mm long calcaneal bone plug
   b. PM bundle graft from semitendinosus allograft
      i. 7 mm diameter
   c. Femoral attachments of AL & PM bundles marked with coagulator
   d. Closed socket femoral tunnels (25 mm deep) via anterolateral portal
   e. PCL tibial attachment site debrided distally along PCL facet until popliteus muscle fibers visualized
   f. Tibial guide pin placement
      i. Enter anteromedial tibia, 6 cm distal to joint line
      ii. Exit 6-7 mm proximal to “champagne glass” drop-off at the bundle ridge
      iii. Verify with C-arm
   g. 11 mm tibial tunnel reamed under direct posterior arthroscopic visualization and with a curette providing protection
   h. Grafts passed into femoral tunnels
      i. PM bundle graft fixed with 7 mm bioabsorbable interference screw
      j. AL bundle graft bone plug fixed with 7 mm titanium interference screw
   k. Grafts pulled down tibia, knee cycled
      i. Verify normal tibiofemoral step-off
      ii. AL bundle fixed at 90º, neutral rotation
      iii. PM bundle fixed at 0º, neutral rotation

VI. Principles of Rehabilitation
   a. Minimize posterior sag
   b. Initiate early Quads activation
   c. Initiate early prone knee flexion
   d. Dynamic PCL brace (Rebound brace)

VII. Outcomes Following DB PCLR (LaPrade 2011)
   a. 39 pts; average follow-up = 2.5 years (2.0 – 4.3 years)
   b. Overall Subjective Patient Outcomes
      i. Pre-op IKDC = 39.3 → Post-op IKDC = 74.3 (p<.0001)
      ii. Pre-op Cincinnati Score = 34.5 → Post-op Cincinnati Score = 73.4 (p<.0001)
c. Overall PCL Stress X-rays:
   i. Pre-op = 15 mm
   ii. Post-op = 0.9 mm (p<.001)

d. Acute PCL Stress X-rays:
   i. Pre-op = 15.6 mm
   ii. Post-op = 0.7 mm (p<.0001)
e. Chronic PCL Stress X-rays:
   i. Pre-op = 14.5 mm
   ii. Post-op = 1.0 mm (p<.001)

References

- Wijdicks CA, Kennedy NI, Goldsmith MT, Devitt BM, Michalski MP, Årøen A, Engebretsen L, LaPrade RF. Kinematic analysis of the posterior cruciate ligament, part 2:

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