



6th Advanced Course on Knee Surgery

January 31st – February 5th, 2016 Val d'Isère - France

How strong is fixation needed after
repaired/reconstructed ligament?

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Val d'Isère

More Research



More Research



More Research



Essence

The initial fixation needs to be strong enough to stabilize the ligament or graft during initial rehabilitation until incorporation occurs



Jacques Menetrey

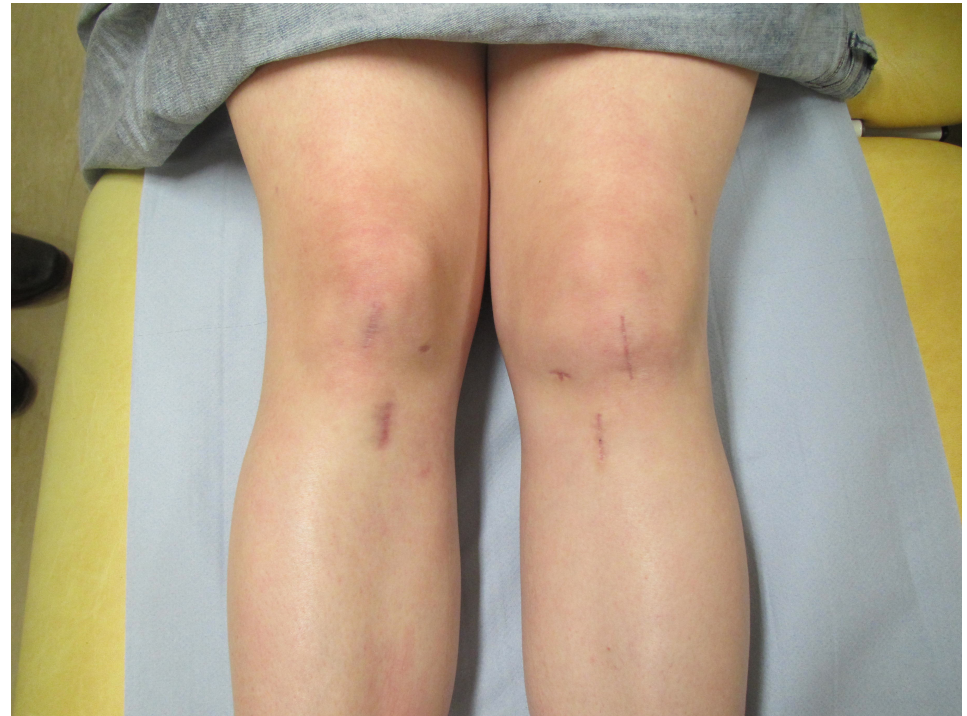
- Time frame of graft healing
- Bone-Patellar tendon-Bone
 - 6-8 weeks
- Hamstring
 - 8-12 weeks



Rodeo JBJS Am 1993
Clancy JBJS Am 1981

Key aspects rehabilitation

- Reduction of Pain
- Reduction of Swelling
- Improve Range Of Motion
- Normalize Strength
- Normalize Dynamic Stability
- Functional Return to Play



Key aspects rehabilitation

- Reduction of Pain
- Reduction of Swelling
- Improve range of motion
- Normalize strength
- Normalize dynamic stability
- Too much load > graft rupture
- Too little load > inadequate stimulus healing > graft rupture

Problems

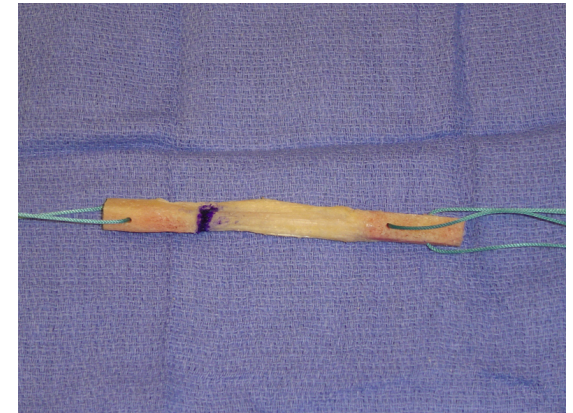
- Little literature on in vivo studies
- Typically non-athletic population
- ACL strain difficult to measure
- Invasive, time consuming & costly
- Accuracy
 - Many variations of squat, stance, hip rotation, trunk position

Problems

- Experimental biomechanical knee models
- Allow wide range exercises/resistance/ROM
- In-expensive
- Non-invasive
- BUT not direct measurement only an estimate
- May be limited to a single plane of motion
- Not representative of poor core control

Problems Donor Tissue

- Bone-Patellar tendon-Bone
 - Quadriceps inhibition due pain & swelling
 - Limits voluntary quads strengthening
- Hamstrings
 - Allow recovery of harvest site



Seated knee extension (ROM)

- Peak loading level walking = NWB seated isometric & isokinetic
 - Peak 3.2-4.4% Strain
 - 10-30° knee flexion
 - 150-350N
-
- Seated knee flexion
 - Isometric & isokinetic
 - No loading ACL
 - Loading Hamstrings



Beware active recovery extension



Unopposed quadriceps-
passive extension



Passive extension



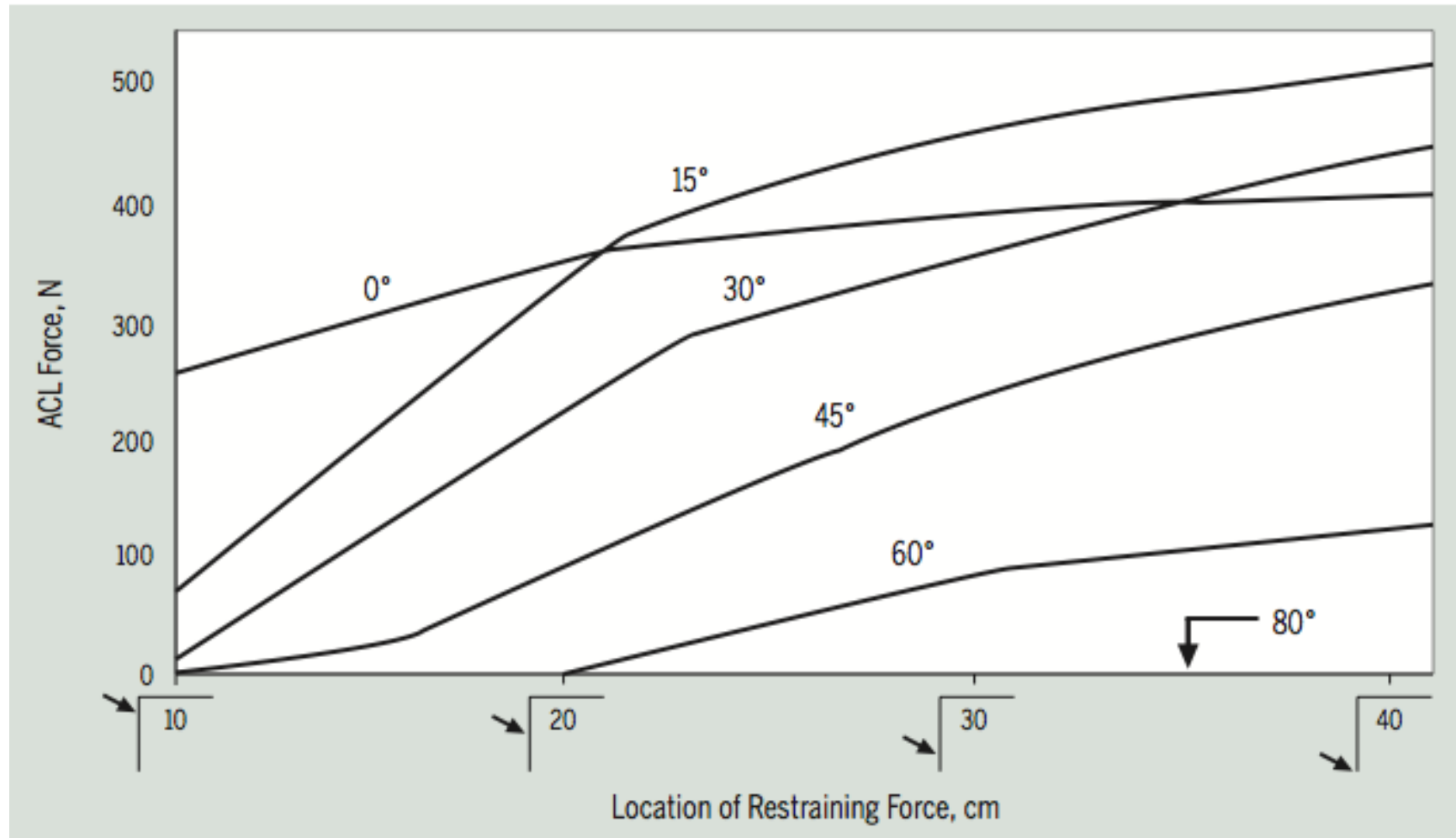
Load beneath heel, weight beneath knee

Seated Knee Extension with addition of weight (Strengthening)



Location of the resistance pad is important

Strain vs. location force distal knee



Weight Bearing vs. Non-Weight Bearing

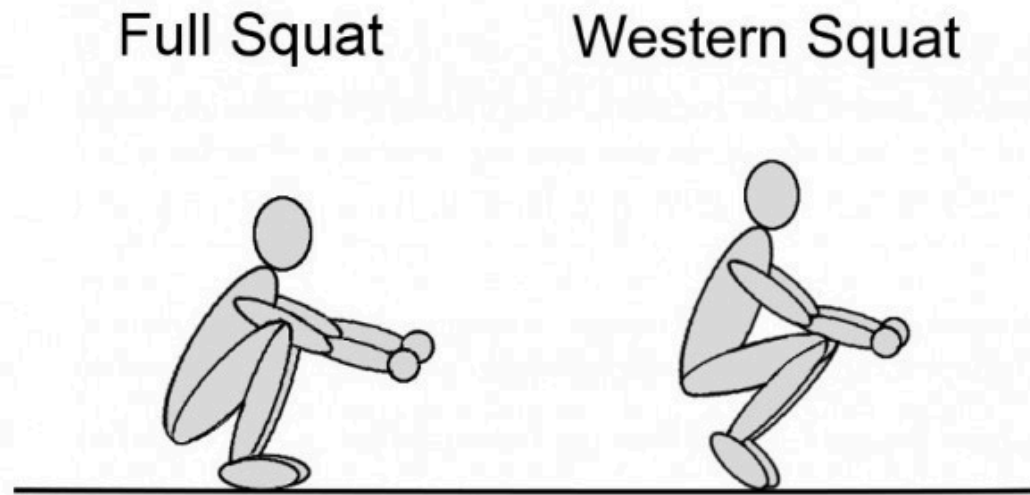
- More functional
- Multi Joint
- Effective hip & thigh musculature
- Walking ground level
- 300N opposite toe off
- Knee 10-20° flexion
- Single squat 59N





Forward lunge low ACL load as Hamstring activation 150N

Squats



- Increase hamstrings activity > unloading ACL
- Peak force = 200N
- Trunk position forward flexion > Decrease loading
- Heels off ground > Increased loading ACL tibial plateau

Summary

- Fixation adequate for rehab
- Consider ROM
- Closed kinetic chain
- Weight bearing
- Functional exercises
- Only until graft incorporates





Merci de votre
attention