

ACL INJURIES – WHEN TO OPERATE

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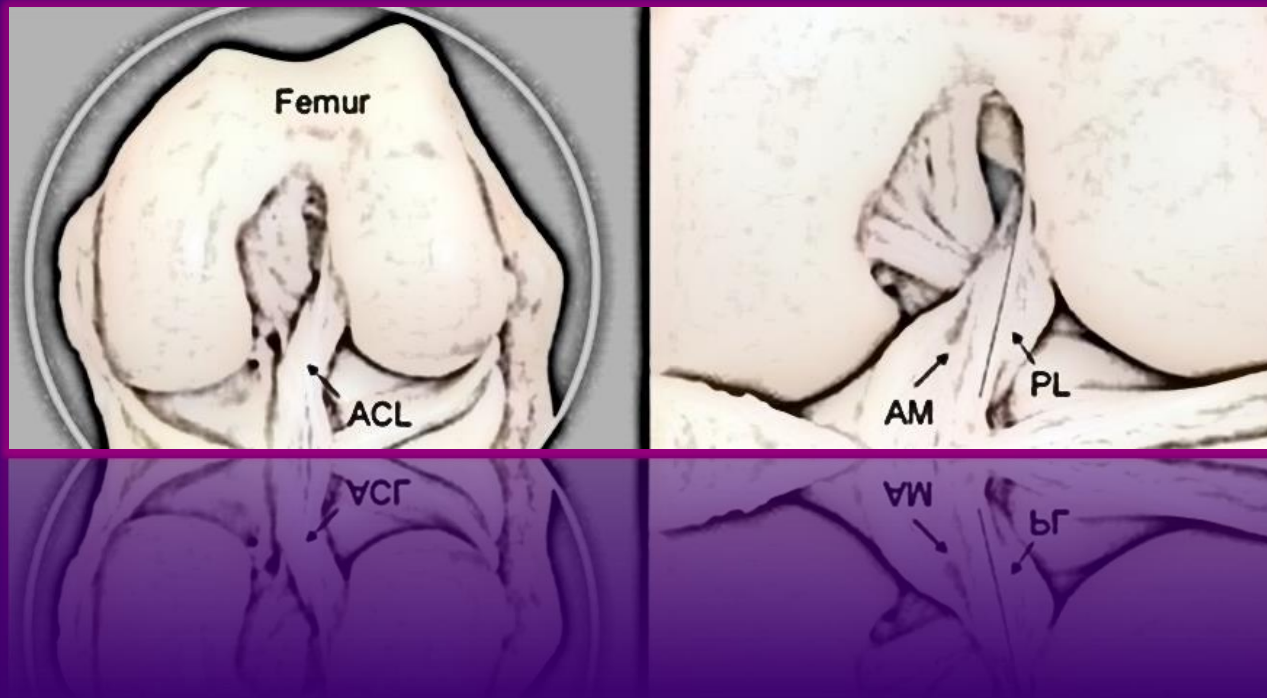
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AIMS

- ACL injuries
- When to Operate
- On Field Management
- Take Home Messages

Anterior Cruciate Ligament

Anatomy



Anterior Cruciate Ligament

Pathology

- ACL injuries
 - Deceleration with cutting, twisting, pivoting.
 - Awkward landing
 - Direct Contact

Anterior Cruciate Ligament

Pathology

- ACL injuries – Partial or Full
- Associations
 - Meniscal Injuries
 - Chondral Damage
 - Other ligament injuries

Anterior Cruciate Ligament

Aetiology

- Relatively Common Injury
- Second most Common Knee Ligament Injury

- 70% Non-Contact
- 30% Contact

Anterior Cruciate Ligament

Gender

- ACL injuries increased incidence in females
 - Pelvis and lower extremity (leg) alignment,
 - Increased ligamentous laxity,
 - Effects of oestrogen on ligament properties
 - Differences in physical conditioning,
 - Muscular strength,
 - Neuromuscular control.

Anterior Cruciate Ligament

Natural History

- Does not heal after injury
- Resemble fibrocartilage cells not fibroblasts

Anterior Cruciate Ligament

- If untreated
 - Instability
 - Complex Meniscal Tears
 - Not amenable to repair
 - Degenerative changes (Jomha et al 1999)
 - 90% on XR at 5-9 yrs
 - Medial > Lateral

Natural History

Anterior Cruciate Ligament

Initial Treatment

- Twisting Injury,
- Immediate Swelling,
- ?Audible Pop
- Cannot Carry on Playing,

- Difficult to assess because of pain and swelling

Anterior Cruciate Ligament

Initial Treatment

- ABCs
- Splint Knee
- Get off the Field

Anterior Cruciate Ligament

Initial Treatment

- Assess
 - ?Neurovascular Deficit
 - ?Open Injury
 - ?Dislocated
- Xray
- Knee Brace, Crutches
- Scan

Anterior Cruciate Ligament

Examination

- Drawer test (ACL/PCL)
- Modified drawer (anteromedial and lateral instability)
- Lachman test (ACL)
- Pivot shift test (ACL)

Anterior Cruciate Ligament

Lachman

Anterior Cruciate Ligament

Anterior Drawer

Anterior Cruciate Ligament

Pivot Shift

Anterior Cruciate Ligament

Meniscus



Anterior Cruciate Ligament

Postero-lateral corner

Anterior Cruciate Ligament

Non-Operative Treatment

- Physio
- Closed chain exercises
- Satisfactory results in low demand patients (80% or more patients)

Anterior Cruciate Ligament

Operative Treatment

- Aim
 - Restore functional stability, without compromising ROM
- Indications
 - **Symptomatic Instability**
 - Unstable repairable meniscal lesion plus ACL insufficiency (Gilquist 1992)
 - Grade III MCL or LCL (Spindler and Walker)
 - To prevent OA (Shelbourne, Johnson)
 - High Level Athlete

Anterior Cruciate Ligament

Operative Treatment

Patient Selection

- **Young active individual**
- **No Malalignment due to medial compartment OA**
- **No associated patholaxities ie posterolateral corner**
- **Excellent predictable results in 90% plus**
- **Drive - Brake Reaction Time equivalent to controls in 4-6/52. Nguyen et al (2000), Gotlin et al (2000)**
- **Sport – 1 year**

Anterior Cruciate Ligament

Other Key Factors

Occupation

People who spend a lot of time on knees
eg carpet layers and tilers

Sports

Patellar tendinopathy,
common in basketball and
tennis players

Sex

Age

Several authors confirmed
the safety of hamstring grafts
across growth plates (Lo et al
1998)

Which Bundle

Increased Risk of ACL injury
Hamstrings used due to ease of
harvest, cosmesis, lack of PF
problems, easier rehab.
BUT, results significantly
worse in women wrt men
(Noojin et al AJSM 2000)

Anterior Cruciate Ligament

Other Key Factors

Occupation

?Sedentary job,
Active

Do they play sport

Anterior Cruciate Ligament

Other Key Factors

Sports

- ?Patellar tendinopathy, common in basketball and tennis players
- ?Straight line sports
- ?Elite Athlete

Anterior Cruciate Ligament

Other Key Factors

Age

?Over 50

?under 15

Anterior Cruciate Ligament

Other Key Factors

Sex

Increased Risk of ACL injury
Hamstrings used due to ease of harvest, cosmesis, lack of PF problems, easier rehab.
BUT, results significantly worse in women wrt men
(Noojin et al AJSM 2000)

Anterior Cruciate Ligament

Other Key Factors

Which Bundle?

Antero medial or posterolateral

Anterior Cruciate Ligament

Operative Treatment

Timing

- Critical in prevention of stiffness
- Need full ROM
- Minimal swelling and inflammation
- In practice around 2-4 weeks (Shelbourne 1991)
- But this could be in the first week (Johnson 2003)

Anterior Cruciate Ligament

Operative Treatment

Type of Surgery

- Direct repair
 - Avulsion Fractures
- Extra-articular Reconstruction
- **INTRA-ARTICULAR RECONSTRUCTION**

Anterior Cruciate Ligament

Operative Treatment

Type of Graft

- AUTOGRAFT
 - Patellar tendon
 - Hamstrings
 - Quadriceps (Fulkerson)
- ALLOGRAFT
 - Achilles Tendon
 - Patellar Tendon
- SYNTHETIC

Anterior Cruciate Ligament

Operative Treatment

Type of Graft – BPTB

ADVANTAGES

- Early bone to bone healing (6/52)
- Consistant size and shape of graft
- Ease of harvest

DISADVANTAGES

- Anterior knee pain (upto 40%)
- Patellar tendonitis
- Fracture
- IBSN

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Operative Treatment

Type of Graft – Hamstrings

ADVANTAGES

- Stronger and stiffer (3x normal ACL and 2x BPTB (Brown et al 2002))
- Less Donor site morbidity

DISADVANTAGES

- Slower tendon to bone healing (10-12/52)
- ?Fixation (in past) –now no difference in pullout strength or outcome (Pinczewski 1994, Weiler 1999)
- Saphenous nerve injury
- ?Hamstring weakness

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Operative Treatment

Type of Graft – Quadriceps

ADVANTAGES

- Larger cross-sectional area of graft
- Less donor site morbidity than BPTB

DISADVANTAGES

- Bone block at one end

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Operative Treatment

Type of Graft – Allograft

- **ADVANTAGES**

- No donor site morbidity
- Available off shelf

- **DISADVANTAGES**

- Risk of disease transmission
- Weak graft
- Longer time to incorporate
- expensive

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Operative Treatment

Side of Graft

- **Ipsilateral**
- **Contralateral** graft harvest of BTPB
 - 662 consecutive reconstructions
 - 3 yr period
 - Superior results upto 2 yrs in group who had graft harvested from contralateral knee
(Shelbourne AJSM 2000)

Anterior Cruciate Ligament

Operative Treatment

Which Graft?

Anterior Cruciate Ligament

Operative Treatment

Which Graft?

Metaanalysis Data

- Seems to back the use of BPTB
- Yunes (2001) Arthroscopy
 - 18% increased ability to return to sport at same level with BPTB
- Freedman et al (2003) AAOS
 - BPTB had better patient satisfaction, stability and lower failure rates
 - But increased anterior knee pain and MUA and lysis of adhesions

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Operative Treatment

Which Graft?

Metaanalysis Data

- Various flaws with metaanalyses in general
- Initial poor fixation methods of Hamstrings perhaps influenced results
- Now superior fixation methods
- “No difference in ability to get back to Australian Rules Football” Bartlett et al 2001

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Operative Treatment

Which Graft?

Randomised Controlled Trials

- “No difference at 2 years between BPTB and Hamstrings”
 - Janssen et al AAOS 2003

- “No difference in Lysholm, single hop, Tegner, IKDC, ROM or subjective knee pain or ability to knee walk at 2 years” “Significant difference with respect to objective knee pain and ability to knee walk”
 - Ejerhed et al AAOS 2003
 - O’Neill et al JBJS (Am) 2001
 - Aglietti et al 2000, Marder et al, 1999

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Operative Treatment

Which Graft?

Hamstrings have less complications with similar functional results and better rehabilitation

Anterior Cruciate Ligament

Operative Treatment

The Operation

In terms of functional success graft choice is not critical

The most important factor is correct placement of tunnels and adequate fixation of the soft tissues

Anterior Cruciate Ligament

Operative Treatment

The Operation

Femoral Tunnel

- 10 O'Clock in right knee,
- 2 O'Clock in left knee,
- At back of the intercondylar notch.

If too anterior

- Restriction of flexion,
- Permanent loss of motion,
- Graft failure due to stretching.

Anterior Cruciate Ligament

Operative Treatment

The Operation

Tibial Tunnel

- Posterior 1/3 of the ACL tibial footprint

If too anterior

- Block to extension,
 - Impingement,
 - Graft Rupture.
-
- After fixation of one end of the graft, need to cycle knee thru full ROM to ensure no XS graft movement or impingement

Anterior Cruciate Ligament

Operative Treatment

Technical points

Commonest problems with BPTB is related to harvesting graft

Best results by harvesting via 2 transverse incisions

(Sivardeen et al 2004)

Boat shaped bone graft prevents # patella (Johnson 2003)

Anterior Cruciate Ligament

Operative Treatment

Technical points

Care with Hamstrings

Cut bands to gastrocnemius

The Dropped Graft

Anterior Cruciate Ligament

Operative Treatment

Other Factors

- **Age and Degenerative changes** should not be contraindication (Shelbourne AJSM 1993)
- No real difference between **arthroscopic and mini-arthrotomy** technique (Shelbourne Arthroscopy 1993)
- No need for routine **thromboprophylaxis**
- Important for **short time** on waiting list (Shelbourne AJSM 2000)

(Best Practice BOA 2001)

Anterior Cruciate Ligament

Operative Treatment

Rehabilitation

Critical to optimise results of surgery and prevent complications

Pre-op	Optimise ROM, proprioception and strength
6/52	Pre-Gym: Swelling and ROM
6/52-3/12	Gym: Strength and Proprioception
3/12-6/12	Functional Phase
6/12-12/12	Return to Sport

Take Home Messages

**Treatment of ACL - physio then ?op
if still symptomatic**

**Operation NOT indicated for
everyone with an ACL rupture**

**However some groups do well with
ACL reconstruction**

Take Home Messages

**Critical to assess alignment and other
evidence of ligament laxity**

Take Home Messages

**Type of Graft is not crucial,
but position is ...**

Take Home Messages

**Lots of factors in the decision
making process**

Thank You