Revision ACL Surgery

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**Categories of failure**
Graft failure is the most common cause of failed ACL surgery. However, other non-graft related problems such as loss of motion, extensor mechanism dysfunction, and degenerative arthritis can lead to an unsatisfactory outcome after ACL surgery.

**Mechanism of graft failure**
Errors in surgical technique, trauma, failure of graft incorporation. Most common errors in surgical technique are non-anatomic tunnel placement, and failure to recognize and treat associated ligamentous laxities. Traumatic reinjury can occur as a result of return to sport before the knee is fully rehabilitated, over aggressive rehabilitation, and significant trauma after initial stability was restored.

**Technical issues**
Bone tunnels most challenging part of the procedure. If a new anatomically positioned tunnel without tunnel overlap cannot be drilled, then the original tunnel should be bone grafted and the revision staged. Status of secondary restraints and lower limb alignment important. Failure to address the secondary restraints and correct lower limb alignment second most common cause of failed ACL surgery.

**Rehab**
Avoid accelerated rehabilitation. Rehab program dictated by bone quality, type of graft fixation used, and associated surgery.
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Introduction
- Reported success rate of primary ACL reconstruction 75 - 93%
- Little agreement on what qualifies as a “failed” ACL
- Johnson and Fu have defined a failed ACL reconstruction as:
  - Knee with recurrent patholaxity that was present prior to surgery
  - Stable knee with ROM 10° to 120° that is stiff and painful with ADL

Categories of Failure
Although graft failure is the most common cause for failed ACL surgery it is important to remember that other non-graft related problems can lead to an unsatisfactory outcome after ACL surgery
- Loss of motion
  - Impingement
  - Capsulitis
  - Cyclops lesion
  - Concomitant ligament surgery
  - Non-anatomic graft placement
  - Immobilization
  - Regional pain syndrome
  - Infection
- Extensor mechanism dysfunction
  - Anterior knee pain
  - Donor site pain
  - Quadriceps muscle weakness
  - Patellar tendinitis
  - Patellar fracture
  - Extensor mechanism rupture
- Degenerative Arthritis
  - Initial traumatic event (bone bruise)
  - Meniscectomy
  - Damage secondary to recurrent giving way
- Graft failure

Mechanisms of graft failure
- Errors in surgical technique
  - Non-anatomic graft placement
  - Graft impingement
  - Graft tension
  1. undertensioning = patholaxity
  2. overtensioning = overconstraint of the joint & delayed graft incorporation
- Inadequate graft fixation
- Inadequate strength of the primary ACL graft
  1. Double strand hamstring tendon grafts
  2. Irradiated allografts (> 2 Mrads)
- Failure to address secondary restraints at the time of the primary reconstruction

  • Failure of Graft Incorporation
    - Biological (failure of the graft to revascularize)
    - Immunologic rejection

  • Trauma
    - Traumatic reinjury
      1. Return to sport before the knee is fully rehabilitated (knee abuser)
      2. Significant trauma after initial functional stability was restored and full activities resumed
    - Aggressive rehabilitation

**Preoperative Evaluation**

  • Must first determine if the cause of the patient’s complaints are truly due to a failed ACL graft
  • Indications for revision ACL surgery
    - Instability with ADL
    - Instability with athletic activities
    - Pathological laxity which reproduces the patient’s sensation of giving-way

  • History
    - Cause of primary injury
    - Symptoms (pain vs instability)
    - Primary graft type
    - Operative technique (one-incision vs two incision)
    - Type of graft fixation
    - Postoperative rehabilitation program used
    - Ability and time patient returned to preinjury level
    - History of reinjury

  • Physical examination
    - Lower extremity alignment (varus alignment)
    - Gait (varus thrust, hyperextension)
    - Range of motion
    - Extensor mechanism
      1. Donor site pain
      2. Patellofemoral pain
      3. Patellar tendinitis
      4. Infrapatellar contracture
      5. Ligament examination (important to check for associated ligamentous laxity especially posterolateral corner)
      6. Previous incisions

  • Radiographic examination
    - Standing AP and PA 45° flexion views
    - AP view
- True lateral view in maximum hyperextension (tunnel placement)
- Merchants view
- Standing long films of both lower extremities (lower extremity alignment)
- MRI scan (not necessary in most cases)
- 3-D CT scan (helpful to evaluate bone tunnel enlargement)
- Bone scan (OA, infection, RSD)

**Preoperative Planning**

- Patient compliance and motivation
- Patient must be given realistic expectation of the outcome of revision surgery
  1. Revision surgery favorable in terms of restoring stability
  2. Revision surgery unpredictable in terms of returning patient to preinjury activity levels
  3. Revision surgery cannot relieve pain secondary to extensor mechanism dysfunction or pain secondary to articular cartilage injury
- Success of revision surgery influenced by:
  1. Etiology of the primary failure
  2. Preoperative laxity of the knee (secondary restraints)
  3. Status of the menisci, articular cartilage, and secondary restraints
- Important preoperative factors:
  1. Range of motion
  2. Placement of previous incisions
  3. Type of graft used in the primary reconstruction
  4. Type and location of fixation hardware
  5. Size and location of bone tunnels
  6. Presence of associated ligamentous laxities
- Staged procedure performed when there is:
  1. Loss of motion (must address loss of motion prior to revision surgery)
  2. Bone tunnel enlargement (bone grafting)

- **Graft selection (controversial)**
  - Primary procedure patellar tendon autograft
    1. Hamstrings from the same knee
    2. Patellar tendon autograft from the opposite knee
    3. Allograft
  - Primary procedure hamstring tendon autograft
    1. Patellar tendon from the same knee
    2. Quadriceps tendon from the same knee
    3. Allograft

**Technical issues of ACL revision surgery**

- Hardware/prosthetic ligament removal: don’t underestimate have appropriate instrumentation available
- Bone tunnels most technically challenging part of the procedure. If the original tunnels are located more than one diameter of the size of the revision ACL graft from the anatomically correct position, it is usually possible to drill new tunnels in the anatomically correct position without tunnel overlap. If a...
new anatomically positioned tunnel without tunnel overlap cannot be drilled, then the original tunnel should be bone grafted and the revision staged.

- Graft fixation (the surgeon must be knowledgeable and proficient with all fixation options for bone and soft tissues)
- Associated surgery
  1. Posterolateral/posteromedial reconstruction
  2. Meniscus allograft (helps control AP translation)
  3. Articular cartilage surgery (microfracture, mosaicoplasty)
  4. Osteotomy (mechanical malalignment)

Rehabilitation

- Avoid accelerated rehabilitation
- Rehab program dictated by graft size/length, bone quality, and type of fixation, and associated surgery
- In general 4 weeks on crutches
- Soft tissue grafts, suture/post fixation require more and longer postoperative protection
- Minimum 9 month return to sports

References