Examination and Treatment Algorithm for Patellar Dislocation or Malalignment

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Overview

- Discuss differences between acute and chronic dislocators
- Evaluation of the patellofemoral joint
- Our approach to treatment
  - Surgical
  - Non-surgical
- Rehabilitation

Introduction

- Many different treatment approaches to patellar dislocation, including non-operative rehabilitation
- Surgical options:
  - Proximal, soft tissue
  - Distal, bony realignment
  - Proximal and distal
- For PF instability, we need to customize our treatment based on the underlying problem

Introduction

- In young competitive athletes, surgical treatment for patellar dislocation is not as common as ACL tears
- In 30 years of practice devoted to treatment of knee injuries
  - – 6000 ACL reconstructions and only 500 patellar realignment procedures

Introduction

- General orthopaedic surgeon who may treat 50 patients for ACL injuries per year may see only 10 patellar dislocations in the same period
  - Trend is the same for PTs and Athletic Trainers
- Without a high number of patients with patellar dislocation, it is difficult to arrive at a treatment algorithm

Introduction

- In the 1980's, we performed a Trillat procedure for all patellar dislocations showing significant lateral alignment of the patella
  - Medialize tibial tubercle
- As we have systematically researched our patients with long-term follow-up, we began to sort out the anatomical differences in patients with patellar dislocation
- Treatment approach has been refined based on the research results

Introduction

- Not all patellar dislocations are the same
  - Traumatic vs. atraumatic
  - Unilateral vs. bilateral malalignment or injury
  - Normal patella height vs. patella alta
  - Many factors to consider

Patellofemoral Instability 2 Main Categories

- Acute, traumatic dislocations
  - Patient without any previous PF instability in either knee
- Chronic/Recurrent Instability
  - Often non-traumatic mechanism of injury
  - Bilateral instability common

Patellofemoral Instability

- Most often, patients with recurrent or bilateral instability have congenital alignment problems that predispose them to dislocations
  - Lateral patella
  - Proximal patella (alta with J-sign)
  - Combined lateral and proximal alignment

Evaluation

- We evaluate the following factors:
  - Height of the patella on physical exam
  - Integrity of medial retinaculum
  - Position of the patella in relationship to the trochlea (radiograph)
  - Height of patella and length of the patella tendon on radiographs

Evaluation

- Comparison to the opposite patella is critical
  - Observe for asymmetries between the patellae
  - In patients with unilateral instability, you have a guide as to what the alignment of the involved patella should be
  - When the patient has congenital malalignment or bilateral instability, the alignment of the opposite patella may not be normal

Clinical Examination

- J-sign
  - Patient sits on the side of an examination table with knees bent
  - Observe the movement of the patella during active knee extension
  - Positive J-sign occurs when the patella moves out of the trochlea laterally
  - Indicates patella alta

J-Sign

Clinical Examination
Patella Hei

Patella Height and VMO Size

- It has been our experience that patients with long patella tendons have smaller VMO muscle mass
- Patients with short patella tendons have larger VMO muscle mass
- We don't believe that the smaller size of the VMO leads to PF instability
- BUT, patients with instability often have patella alta and hence, small VMOs

Clinical Examination: Patella Tilt

- Patella Tilt
  - Move the patella medially and gently lift the medial aspect of the patella with your finger tips
  - Observe for increased laxity of medial retinaculum compared to opposite side

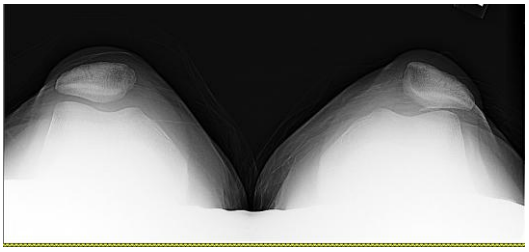
Radiographic Examination

- Merchant view
- Lateral view (60 degrees)
- Lateral view with knee extended and quadriceps contracted
- Bilateral films

Merchant View

- Assesses the relationship of the patella to the trochlear groove
- Provides a direct comparison to the opposite knee
- Observe for presence of an avulsion fracture

Merchant View



Lateral View

- Patella Tendon Length
  - Inferior pole of patella to tibial tubercle
- Normal Values
  - 45 mm for females
  - 50 mm for males

Lateral View

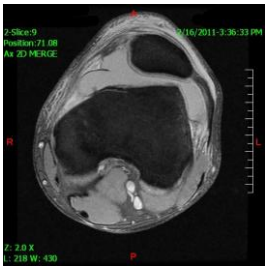
- Patella Height
  - Inferior tip of patella chondral surface to Blumensaat's line

Quad Contraction Lateral view

- Evaluate the height of the patella in relationship to the trochlear groove
- Inferior tip of patella chondral surface to superior edge of trochlea

MRI

- Used primarily to assess
  - integrity of the medial retinaculum
  - status of the articular cartilage



Surgical Treatment

- In general, proximal procedures are for traumatic problems in previously normal knees
  - Soft tissue corrections
- Distal procedures are done to correct underlying congenital problems
  - Procedures involving tibial tubercle

Treatment Algorithm

- Use the subjective history and evaluation of the patient to categorize patients
  - Dislocations without preexisting congenital malalignment
  - Dislocations in patients with preexisting congenital malalignment
    - Lateral patellae, normal patella height
    - Lateral and proximal patellae
    - Centered, but proximal patellae

Acute patellar dislocations

- Treatment is straightforward when knee was normal prior to dislocation

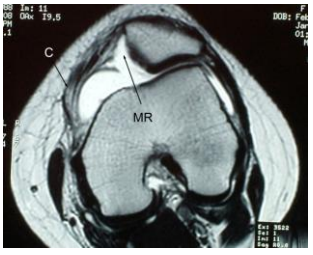
Acute patellar dislocations
Nonoperative treatment

- Symmetric Merchant view with both patellae centered in trochlea
- Focus on reducing effusion and regaining symmetric ROM and strength prior to functional progression back to sport
  - Patients tend to have large effusion and problems with quad control initially
  - Flexion loss due to effusion
  - Usually don't have extension ROM loss (if so, it is easily regained)

Acute patellar dislocations

- Exception is competitive athlete with MRI showing medial retinaculum tear despite the patella being centered
- Often require surgery to be able to return to sports without instability because the medial retinaculum cannot heal if it is badly torn

MRI: Torn Medial Retinaculum



Acute patellar dislocations
Operative Treatment

- Surgery done subacutely- ↓ swelling and ↑ ROM 1st
- Medial retinaculum imbrication and open lateral release (MI/LR)
  - Clear asymmetry between the two patellae on Merchant view x-ray
  - Contralateral patella centered within trochlea
- Elmslie-Trillat procedure (with MI/LR)
  - Clear asymmetry between two patellae
  - Contralateral patella is not centered within the trochlea

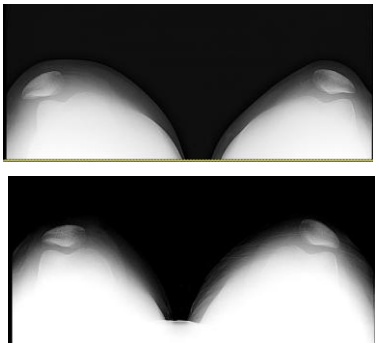
Acute patellar dislocations Operative Treatment

- Surgery is not done until swelling resolves and symmetric ROM is restored
- Pre-op rehab and patient education is very important
- Focus on
  - ROM, swelling control, quadriceps control, normal gait pattern

Medial Imbrication and Lateral Release

- Arthroscopy performed to evaluate articular cartilage status
- Open lateral release performed through a small incision on the lateral side of the patella leaving synovium intact
- Parallel incision made on medial side
- "Pants over vest" technique to imbricate the medial retinaculum

Medial Imbrication/Lateral Release: Merchant View



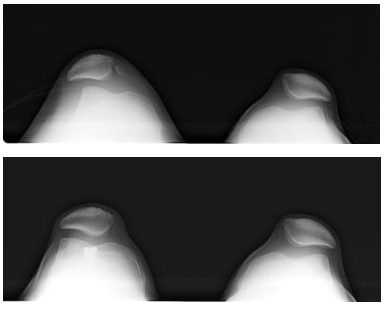
Elmslie-Trillat Procedure

- Lateral release
- Medialize tibial tubercle
- Medial retinaculum imbrication

Elmslie-Trillat Procedure

- Medial imbrication and lateral release is done to repair the acute injury
- Medialization of the tibial tubercle corrects the preexisting congenital abnormality: lateral patella alignment

Trillat/ Medial Imbrication/ Lateral Release



Trillat/ Medial Imbrication/
Lateral Release

Chronic Patellar Dislocation

- Patients grouped into the following categories:
  1. Normal patella height, patellae centered on Merchant view
  2. Normal patella height, patellae not centered on Merchant view
  3. Patella alta

Chronic Patellar Dislocation

- Category 1
- Despite normal Merchant view x-rays and normal patella height, some patients will experience chronic instability
- Indicates laxity of medial retinaculum
  - Detected by comparing medial patellar tilt to opposite knee or by MRI
- Treated with medial imbrication and lateral release

Chronic Patellar Dislocation

- Category 2
- Patients with lateral patellae on Merchant view and normal patellar height
- Treated with an Elmslie-Trillat procedure combined with medial imbrication and lateral release

Chronic Patellar Dislocation

- Category 3
- Patella Alta
  - Positive J-sign
  - Observable patella alta
  - Patella tendon length longer than normal
  - Increased patella height
  - Increased knee flexion allows patients to “W sit” between their heels

W Sitting

Normal vs. Long Patellar Tendon Length

Patella Alta

Chronic Patellar Dislocation Patella Alta

- Our previous treatment theory
  - All chronic instabilities were treated with Elmslie-Trillat procedure between 1982-1998
  - Research follow-up revealed that a small percentage of those patients experienced recurrent instability after surgery
  - This group of patients with recurrent instability had significantly longer patellar tendons
  - Theorized that medialization procedure only corrected part of their anatomic problem

Chronic Patellar Dislocation Patella Alta

- Distalization procedures have been used in the past, but became unpopular due to a high incidence of patellofemoral OA (Hauser)
- Historically, these were done indiscriminately for all instability problems without looking at patella tendon length or patella height
- When done as a correction for longer-than-normal patella tendons this procedure restores the normal anatomy, correcting the patella alta and positive J-sign abnormalities

Chronic Patellar Dislocation Patella Alta

Treatment for recurrent dislocations w/ patella alta

	Distalize Tubercle	Elmslie-Trillat	MI/LR
Centered patellae Medial retinaculum intact	X		
Lateral patellae Medial retinaculum intact	X	X	
Lateral patellae Medial retinaculum torn	X	X	X

Chronic Patellar Dislocation Patella Alta

- Our current treatment
  - Our experience has shown that patients perceive an asymmetry between their knees when only one patella is distalized
  - We now recommend bilateral tubercle distalization in this patient population to restore stability while maintaining symmetry

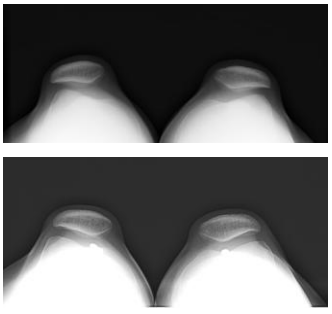
Distalization Procedure

- Amount of distalization is determined pre-operatively based on radiographic measurements
  - Height of patella above Blumensaat's line
  - Height of patella above the trochlear groove
  - Patella tendon length

Distalization Procedure

- Similar surgical approach to the Elmslie-Trillat procedure
- Tubercle is transferred to a distal, or distal and medial, position

Pre-op and Post-op Trillat with Distalization



Pre-op and Post-op Trillat with Distalization

Rehabilitation 1st Week Post-op

- Prevent hemarthrosis
  - Continuous use of a cold/compression device
  - Anti-embolism stockings
  - CPM machine to keep knee elevated above the heart
  - Patients remain on bed rest, except for bathroom privileges, for 5-7 days

Case TE

- 15 y/o male
- Freshman football / wrestling athlete
- History of bilateral knee pain for many years
- Some feeling of patella slipping in both knees through the years
- Previous physicians suggested he reduce sporting activity

Case TE

- Had injury to left knee with wrestling; patella slipped out of place and back in
- Had mild swelling but was able to continue sports
- Had another injury August 2008 doing a blocking drill in football
- Patella dislocated; had significant pain and swelling

Case TE

- Saw another physician
  - Used an immobilizer to wear briefly
  - 3 weeks of rehab
  - Went back to playing football

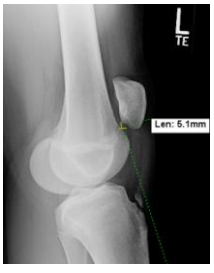
Case TE

- First evaluation by me Feb 2009
- Patient continued to have problems with PF pain of both knees and unstable left patella
- Physical exam
  - + J-sign
  - + patella tilt
  - + patella alta

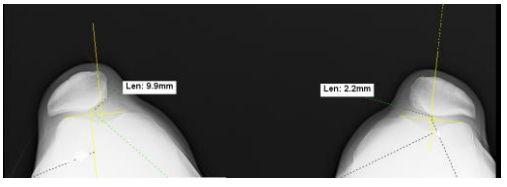
Patella Alta: Radiographs

Patella Alta: Radiographs

Hyperextension quad contraction lateral view



Patella Alta: Radiographs



Case TE

- Treatment provided
  - Pre-op physical therapy for evaluation and testing
    - 90% strength (Cybex/leg press evals) pre-op
  - Bilateral scopes, medial imbrication, medial and distal tibial tubercle transfer (March 2009)

Case TE

- Surgery rationale
  - Patient wanted to be active with high school competitive sports
  - Had a long-term problem with both patellae
  - Recent dislocation of left patella making patella more unstable and patella aligned more lateral than opposite knee – needed medial imbrication for correction
  - Because of patella alta, distalization of tibial tubercle needed to provide stability

Case TE

- Surgery rationale
  - Prior experience has shown us that distalizing one side and not the other makes it difficult to make the knees feel equal with rehabilitation

Case TE

Case TE

Case TE

Case TE

- Post-op rehab provided as described above
- Outcome
  - 3 months post-op
    - ROM: 4-0-152 bilaterally
    - Quad strength: 95% on Cybex
    - Beginning to do some football drills

Case TE

- Outcome
  - 4 months post-op
    - Playing football some
    - Has soreness with intense practice
    - Quad strength increased on both legs to greater than pre-op strength, but strength now higher in left than right; 84% side-to-side
    - Instructed to concentrate on right leg strengthening to equalize strength

Case TE

- Outcome
  - 6 months post-op - Playing football without restrictions

Conclusions

- Our treatment algorithm has been developed after years of consistent observation and long-term research follow-up
- The treatment needs to be directed to resolving the underlying pathology
- Primary goal is to obtain symmetry between knees

Conclusions

- Rehabilitation should focus on early ROM
  - Knee flexion works as a "centering device" for the patella
  - As swelling resolves, knee flexion will continue to improve
- Promote quadriceps muscle control
  - Regain protective control as soon as possible
- Once these goals are achieved, begin functional progression for return to sports