Patellofemoral OA – Elizabeth A. Arendt, MD - Agenda

**Speaker #1**
Liza Arendt. Introductory statements, 5 minutes.

**Speaker #2**
Julian Feller. Case history, early patellofemoral arthrosis with narrowing of lateral patellofemoral joint space.

**Speaker #3**
Philip Schoettle. Patient with grade 4 central groove trochlear defect.

**Speaker #4**
David DeJour. Young female with trochlear dysplasia.

**Speaker #5**
Camille Azar. An elderly patient with end-stage patellofemoral arthrosis and satisfactory tibiofemoral joint.

**Speaker #6**
Gilberto Camanho. A patient with complicated malalignment issues.

I will give a 5 minute introduction. We will have 5 case histories, which will be 5-7 minutes for each person. The panel discussion after each case history will be 5-7 minutes long. This will add up to 75 minutes, and then my 5 minute introduction, so we will have 10 minutes for questions from the audience.
Patellofemoral Arthritis

Elizabeth A. Arendt, M.D.
Julian Feller, M.D.
Camilo Azar, M.D.
David Dejour, M.D.
Gilberto Camanho, M.D.
Philip Schoettle, M.D.

ICL #16, 5/18/2011

Patellofemoral Arthritis

• Loss of articular cartilage on one or both surfaces of the patella and trochlear groove.

PF Arthritis: How Prevalent is it?

PF Arthritis: 9.2% of all knee OA
Davis et al., CORR 2002

Isolated symptomatic PF arthritis:
24% females, 11% males
McAlindon et al., Ann Rheum, 1997

Patellofemoral Arthritis

• Reviewed 31,516 arthroscopies
  – 4% had isolated Grade IV cartilage lesions
    – MFC (33%)
    – Patella (21%)
    – LFC (19%)
    – Trochlear (15%)
    – LTP (6%)
    – MTP (4%)

Curl et al., Arthroscopy, 1997

PF Arthritis: How Prevalent is it?

Patellofemoral arthritis in arthroplasty population: 5.8%

Isolated PF arthritis: 1.3%

Mayo data base of 3500 knees

Patellofemoral Arthritis

• Anatomic Presentation
  – Lateral facet arthrosis
    • Shows the greatest incidence of wear both clinically and in autopsy series

Clin Ortho Rel Res (1978)
J Anat (1973)
Commonwealth Fund (1942)
Fulkerson & Hungerford (1990)
**Isolated P-F arthritis**

<table>
<thead>
<tr>
<th>Method</th>
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<tbody>
<tr>
<td><strong>Isolated P-F arthritis</strong></td>
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<tr>
<td>No femoro-tibial joint line narrowing</td>
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<td>X-rays</td>
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<tr>
<td>Monopodal WB (AP &amp; True profile) Schuss if &gt; 45 years old Axial view 30°</td>
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- **Stage I**: Femoro-patellar remodeling
- **Stage II**: Joint line narrowing > 3 mm
- **Stage III**: Joint line narrowing < 3 mm
- **Stage IV**: Bone on bone one facet

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**French Orthop. Academy 2003**

**Isolated Patello-femoral arthritis**

David Dejour (Lyon)- Jérôme Allain (Paris)

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**578 Patients**

- Amiens: P. Mertl, A. Gabrion, W. Meunier, F. Tranvan
- Créteil: J. Allain, G. Mathieu, O. Manicom
- Strasbourg: JY. Jenny, C. Boeri
- Lille: H. Migaud, F. Gougeon, S. Guibert, F. Remy
- T. Brosset, S. Bolzer, M. Limousin, Y. Pinoit
- Lyon: D. Dejour, P. Neyret, N. Jacquot, J. Barbosa, T. Tavernier
- Paris: D. Huten, D. Godefroy
- Marseille: JN. Argenson, H. Vinel
- Rouen: F. Duparc, N. Mazirt

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**Introduction**

**Material: 578 patients**

- 367 Conservative or Replacement treatment
- 80 Natural history
- 35 Operated Patellar instability 14 years FU

Multicentric retrospective study

Prospective rotational CT scan study
Factors → Arthritis

- Trochlear dysplasia 78%
  - Control population 3%
  - Patellar instability Pop. 96%

Arthritis factors

Arthritis stage and trochlear dysplasia stage
- 55% type B, C, D
  - P = 0.0046

- Trochlear proeminence increase
- Compressive forces in flexion

Arthritis factors

Arthritis stage and patellar dysplasia stage
- 42% Wiberg II
  - P < 0.0001

- P< 0.001

- Not Significant

Arthritis factors

Torsional deformity ???

- Isolated patello femoral arthritis - 44 patients

- Not Significant

Arthritis factors

Isolated patello femoral arthritis

- 66% Subluxation
- Cartilage wear
- Trochlear Dysplasia

Correlation
  - Arthritis stage p <0.0001
  - Dysplasia stage p = 0.003
  - Wiberg stage p = 0.001

- High correlation to patellar instability factors
- PF Arthritis in younger age (than TFA)
- No correlation Symptoms / arthritis stage
- Well tolerated, many respond to non-op management
- Indication for P-F Joint but also for TKA

Role of Lateral Retinacular Release

• Consider its role in the Balance Challenge
• Release only when necessary to create balanced forces.
• Release if lateral tightness on exam after patella relocation

Role of (Isolated) Lateral Retinacular Release

Consider when
• lateral facet arthrosis
• tilt without subluxation
• no instability
• partial lateral patella facetomy

Role of Medial Tibial Tubercle Transfer

Increase in medial compartment arthrosis compared to opposite knee in patients who have medialization of the tibial tubercle.

Sanfridsson et al., Acta Radiologica 2001 and Kuroda, ISSACUS Meeting, 2001

Tibial-Tubercle Medialization Caution!

Q angle
• difficult to measure
• significant intra / inter variability
• “normal” value variable in literature
• TT-TG or tubercle-sulcus angle better

Role of Medial Tibial Tubercle Transfer

Biomechanical studies
• Has greatest effect on internally rotating the tibia and altering patella rotation.
• Does not effect PFL ligament force

Arendt et al., AOSSM Summer Meeting, 1997

Role of Anterior Tibial Tubercle Transfer

Clinical studies:
– trochlear groove lesions do less well with pain relief
– best pain relief when lesion is inferior / lateral (when we move the tubercle ant / med it shifts the weight bearing forces superior and medial)

Fulkerson, JBJS 1999

Role of Anterior Tibial Tubercle Transfer

• In vitro lab studies look 1° at patella forces (not much is known about tib/fem forces or trochlear groove forces)

Goodfellow et al., JBJS 1976
Hungerford et al., CORR 1979
Huberti & Hayes et al., JBJS 1984
Ahmed et al., JOR 1987
Haut, JOR, 1989
Soft Tissue Realignment Procedures

- Medial restraint must be addressed.
  - Reconstruction / Imbricate MPFL
- Lateral release only if lateral tightness on exam after patella centralization
- Tibial tubercle transfer – anterior alone vs. anteromedialization vs. nothing

Role of Uni-compartment Resurfacing (PFA)

Criteria for PFA

- Trochlear dysplasia
- Patella fracture
- Age < 60

"middle aged patients w/ PF arthritis and instability 2° to trochlear dysplasia …"

Newman, Orthopedics 2007

Criteria for PFA

- the presence of trochlear dysplasia and / or lateral patella malalignment
- specific isolated patellofemoral compartment arthritis secondary to known trauma
- age??
“Pseudo” Malalignment Pattern
Lateral Malalignment on the axial views are (in part) due to Grade IV chondral loss in the lateral PF compartment.

Surgical Decision Making
Prosthetic restoration of the trochlear and lateral facet surface volume recreates more normal tracking.

Component Malpositioning
- Notching
  - Potential for femoral fracture
  - Potential for notch impingement in flexion

Potential Technical / Design Problems
- Patella component contact with femoral cartilage in deep flexion.
- Patella impingement against the tip of the trochlear prosthesis in deep flexion.

Surgical Decision Making
- Lateralize Trochlear Component: need design that makes an anterior cut

Potential Technical / Design Problems
- Femoral flange must accommodate patella alta.

Surgical Decision Making
- Increase valgus by 3 - 6 degrees
- Too much external rotation will decrease lateral trochlear wall → ? Dislocation?

(Ideal) Uni- PFA Patient
- Isolated patellofemoral arthritis
- No or minimal co-existing arthritis of TFJ
- No malalignment of the TFJ
- No chondrocalcinosis / systemic naturopathies
- (+) trochlear dysplasia / PF malalignment
(Ideal) Uni-PFA Patient

- Reasonable function expectations
  - Sedentary work style
  - Limited kneeling demands
- Functionally aligned patellofemoral joint – with or without surgical attention

Advantages of uni PFA vs. TKA:

1. Less surgical dissection
2. Removes less bone
3. Preserves the tibial femoral joint / cruciate ligament(s)
4. Blood transfusions / surgical anemia rare
5. Rehabilitation (typically) quicker
6. (Potentially) less expensive (shorter hospital stay / less OR time)
7. (Potentially) quicker return to function / work

Advantages of uni PFA vs. TKA:

*Ease of revision to Total Knee Arthroplasty without compromise of the end result*

- 12 patients revised from PFA TKA F/U 3+ years
  Lonner et al., JBJS (A) 2006
- 13 patients revised from PFA TKA Case controlled study with TKA patients F/U 5+ year
  Van Jonberger et al., Acta Orthop. 2009

PF Arthritis
Case Presentation

- Each panel member will present a case of PF arthritis
  - History
  - Exam
  - Imaging work up
  - Their treatment algorithm
Case Study: A patient with early onset lateral patellofemoral arthritis and a lateral osteophyte

Julian A Feller, Australia

The patient described might have an X-ray that looks like this:

The management will depend on many factors, including the patient's age, gender and activity level, whether they are overweight, and their general medical health.

Let's assume that the patient is a 45 year old female who is not overweight, but is struggling to play tennis and has difficulty with stairs, prolonged sitting and driving. She has worked with a physiotherapist to strengthen her quadriceps, has tried NSAIDs with little benefit and uses occasional simple analgesia (paracetamol).

In my practice the surgical options include arthroscopy, lateral release, lateral patellar facetectomy, medial (+/- anterior) tibial tuberosity transfer, patellofemoral replacement and total knee replacement.

I would immediately exclude total knee replacement on the basis of her young age. Similarly I would not contemplate a patellofemoral replacement at this stage because of both her young age and the fact that she has not tried simpler surgical interventions.

Let's assume that her Q angle is normal. If I think she does have increased lateralization of the tibial tuberosity I would arrange for CT measurement of the tibial tuberosity trochlear groove distance. Again, we will assume this is normal (if elevated, I would consider a medial tibial tuberosity transfer in combination with either a lateral release or a lateral patellar facetectomy).

Arthroscopy alone probably has little to offer. Debridement of unstable articular cartilage may provide some transient relief, but is unlikely to be dramatic or enough to get our patient back to tennis.

This leaves us with lateral release or lateral facetectomy. In essence they do the same thing - unload the lateral half of the patellofemoral compartment and increase the mobility of the patella in a medial direction. But the key in this case is the overhanging lateral osteophyte. I believe this mitigates against lateral release alone. On this basis I would offer our patient a lateral patellar facetectomy.

From a technical point of view I would do this entirely arthroscopically, but an open approach is quite acceptable. It is important to warn the patient that recovery is slow (3 months) and that there will be considerable swelling. I always use a drain tube and keep the patient in hospital until the next morning.
Until now, more than 150 different techniques are described for the treatment of patellofemoral instability. However, to restore patellofemoral instability correctly, it is essential to understand its static, passive and active stabilizers properly. In consequence of different techniques, such as medial reefing, lateral release and medialisation of the tuberosity, not only persisting instability but also patellofemoral pain could occur.

To avoid these problems, one has to understand that instability of the patellofemoral joint is a multifactorial problem. Patellar stability relies on the limb alignment, the osseous architecture of the patella and the trochlea, the integrity of the soft-tissue constraints, and the interplay of the surrounding muscles. For the correct treatment of patellar instability, an understanding of these relationships and the correct evaluation has to be understood.

Therefore, an exact case history, a detailed clinical and radiological examination putting the main focus on the apprehension test in different degrees of flexion, eventual valgus and/or rotational leg deformity, location of the pain, and scars is demanding. Therewith, a clear definition of the pathomorphology of PFI, such as insufficiency of the medial patellofemoral ligament (MPFL), grade of trochlear dysplasia, and malalignment is possible and a grade of instability can be determined. Due to these findings, a classification of different instabilities and treatment options can be determined.

Nowadays, a mild instability can be defined with a possible apprehension close to extension and early flexion due to an insufficient MPFL, a mild
trochlear dysplasia and normal alignment, as well as a normal or nearly normal tibial tuberosity trochlear groove (TTTG) distance. These cases can be treated in most of the cases with an isolated MPFL reconstruction. A more severe instability is determined by a positive apprehension up to 60° of flexion, a flat or even convex trochlear (dysplasia type B, C, or D), a more or less normal limb alignment and an increased TTTG. In these cases, a treatment of the MPFL in combination with a trochleoplastic to treat the obvious causing pathology, the dysplastic trochlea, has to be taken in consideration. A severe instability is determined by an ongoing instability from early flexion down to 90° of flexion. In these seldom cases, not only an insufficiency of the MPFL and an eventual trochlear dysplasia, but a drastic malalignment of the lower limb with either valgus deformity adn/or internal femoral derotation has to be expected – as these pathologies can deplace the trochlear groove far medial so that the patella can not find any bony guidance at all and is riding on or lateral to the lateral trochlear facet. In these cases, an extended radiological examination with rotational CT scan and long leg axis is demanding and surgical treatment has to adress the bony alignment as well – at the femur and/or the tibia, depending on the radiological findings. Additionally, eventual previous insufficient surgery has to be restored, such as a resuturing of a lateral opening or a retransfer of the tibial tuberosity in cases of a persistent instability or additional pain.
In conclusion, PFI treatment is a „menu à la carte“ treatment, which has to respect ALL underlying factors to reach a satisfying results concerning stability and function.
ICL PF OA :Case 5
Discussion

Camilo Azar Saba, M.D.
CHILE
HISTORY

• Male, 74 y.o.
• Arterial Hypertension, dyslipidemia, coronary heart disease (3 by-pass).
• 2 years of anterior knee pain (mostly right).
• Unable to function at ADL.
• No improvement after 6 month of physical therapy
Physical Exam

- Mild symmetrical valgus
- Tracking PF: rather lateral and painful
- PF audible painful crepitus
- Rom: 0-125°
- Unable to stand up from a chair – Unable to squat
- No medial - no lateral joint pain
- Lateral retinaculum very sensitive
- Mild knee effusion
- Stable knee
What to do?
PF Replacement vs Total
Treatment

• Patellofemoral Arthroplasty (Avon®)
Results

• Now 4 years post-op
• No pain
• Full function (walk 10 blocks, up & down 6 stairs)
• P.E.: arc from 0 – 135 degrees