

## **PATELLAR INSTABILITY**

The majority of patients with complaints of patellar instability will have abnormalities of the extensor mechanism and patella-femoral joint. These include

1. A shallow trochlea
2. An increased quadriceps angle (Q-angle)
3. Patella alta or infera
4. A vastus medialis obliquus (VMO) deficiency

Increase in the Q angle itself from any cause (e.g., internal femoral torsion, external tibial torsion, genu valgum) increases the lateral vector on the patella.)

The lateral tethering of a tight lateral retinaculum can also increase the lateral force on the patella, producing the tilt frequently seen radiographically.

A high-riding patella (patella alta) will also increase patellar instability because it articulates in the more shallow superior portion of the sulcus for any given degree of knee flexion compared to the normal

### **Clinical findings**

1. Most occur with the noncontact
2. Patellar dislocation result in a sense of giving way, pain, hemarthrosis.
3. Catching or locking [rule out Internal derangement of the knee]
4. Pain: Usually anteromedial [confusion with torn meniscus]

Cinema sign [pain on prolonged sitting]

**Going down stairs** is more painful than going up stairs

5. Instability: May describe dislocation or subluxation of the knee

Buckling or collapsed or went forward

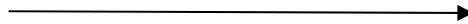
6. Look for joint mouse

General examination: Ligament laxity [Wilkinson's criteria]

Causes: Marfans, Ehrlers syndrome, osteogenesis imperfect

## Signs

1. **Standing:** Genu valgum is not uncommon

2. Patellar Squint: 

Indicate torsional deformity in femur

Internal femoral torsion and external tibial torsion cause the patellae to “squint” and produce the “miserable malalignment”.

3. Comment on Quad wasting [Vastus Medialis]


4. Swelling

5. Look for flat foot



## Sitting Examination

Look for squinting of patella

Assess the tubercle–sulcus angle 

Normal is 0°; compare later with the Q angle



## J Sign

Watch the patella during its excursion through the trochlea in active extension and flexion. Normally it translate, tilt, and rotate laterally at terminal extension. Excessive lateral shift is a J sign.

## Injury to the MPFL

It can be inferred from tenderness at its origin at the adductor tubercle

**Standard evaluation of the knee ligaments** should be performed to rule out concurrent injury.

### **Deficient vastus medialis obliquus**

Ask the patient to extend the knee against a fixed resistance at about 30°.

The resultant quadriceps contraction will make the defect more apparent.

Normally the VMO should reach and insert into the upper third of the patella.

### **The patellar glide tests**

Moving the patella medially and laterally with the knee relaxed and flexed 30° demonstrates retinacular contracture or laxity.

(Tip: Palpate the patellar tendon to determine if the patient has relaxed the quadriceps or not. If not, try performing this test with the patient supine and the knee relaxed over a pillow or bolster.)

The patella should move about one fingerbreadth in each direction. Excessive lateral glide means medial laxity, even rupture of the medial patellofemoral ligament, and may evoke the “apprehension response” as the patient feels the familiar sensation of dislocation. Restricted medial glide means a tight lateral retinacular tether

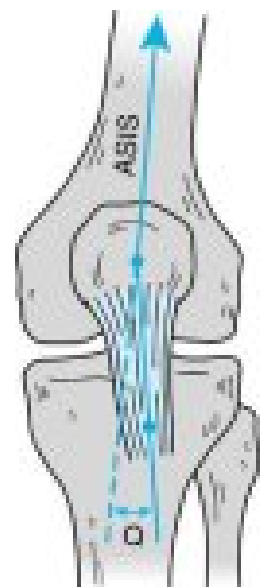
Increased medial glide is found in hyperlax individuals (e.g., Ehlers-Danlos) and after a lateral release.

### **Q angle:**

The patient supine, the knee extended  
Measure from the anterior superior iliac spine to the midpatella  
Draw a line from midpatella to the tibial tubercle.

The average is about  $15^\circ \pm 5^\circ$ .  
[14° in Men; 17° in Women]

More than 25° Q angle, requires a tubercle transfer



## RADIOGRAPHY

Radiographs must be used in context with all the rest of the clinical data to reach a differential diagnosis, the final diagnosis, and a reasonable treatment plan.

In a patellofemoral problem, the axial view will provide the most radiographic information.

### Anteroposterior View

100% weight-bearing (standing on one leg) exposure on a long film demonstrates narrowing in case of early arthritis.

The postero-anterior 45° flexion weight-bearing view described by Rosenberg is more sensitive and specific in assessing articular cartilage.

### Lateral View

Assessment of patellar height relative to the joint line: patella alta or infera.

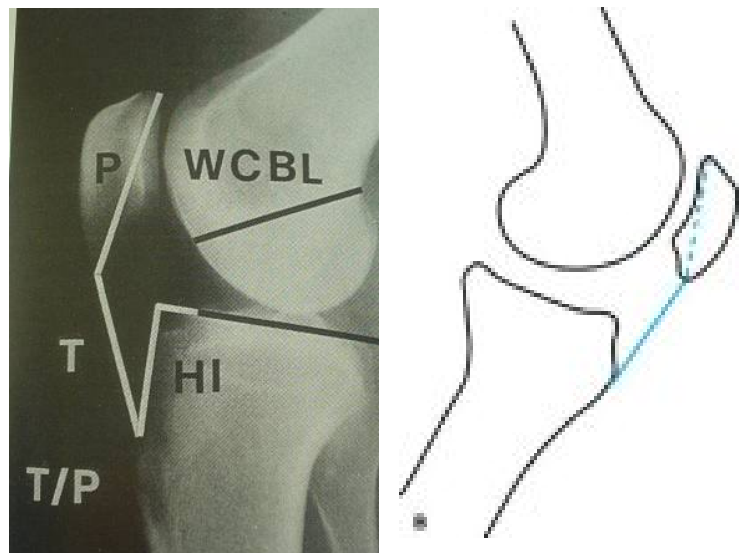
A. The **Blackburne-Peel ratio** is more accurate

B. The **Insall-Salvati** measurements

Both ratio: 1:1 (20%)

<0.8 = Baja

>1.2 = Alta

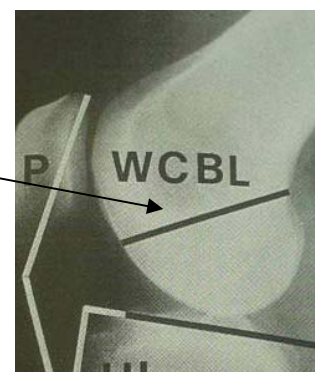


### Blumensaat's line

Lateral X ray in 30° flexion

Line projected anteriorly from the intercondylar notch

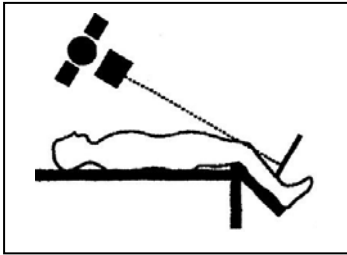
Lower pole of the patella at this line



## Axial View

Axial or skyline view of Patello-femoral joint

[Merchant view]



45° flexion of the X ray tube at 30° to the horizontal

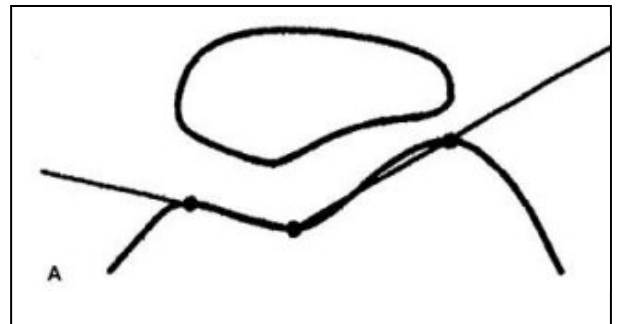
Measures: Sulcus angle and congruent angle

### 1. Sulcus angle

Seen in Merchant view

Angle BAC ; N = 138° [-/+6]

Correlates well with instability

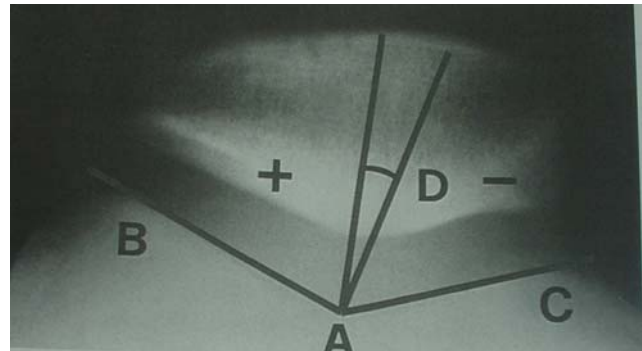


### 2. Congruence angle [ in a merchant view]

Line bisecting BAC and II line to the patellar ridge.

If ridge is lateral = positive angle

Normal: -6 °



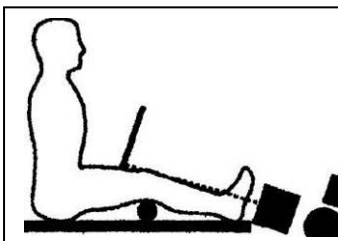
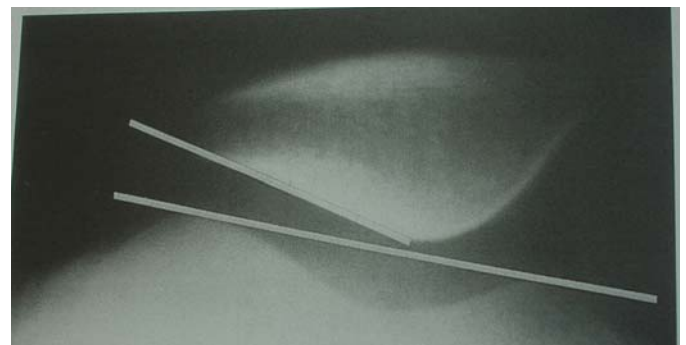
### 3. Lateral Patello-femoral angle

Laurin view

Knee flexed 20° and cassette held by the patient

Angle between lateral facet and line joining two condyles

Normal: 97% opens laterally and 3% parallel

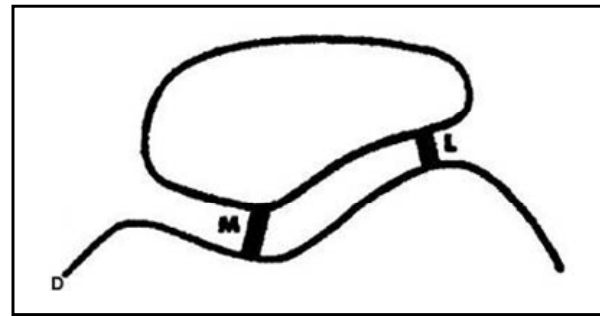


#### 4. Patellofemoral index

M = the closet distance between the articular ridge and the medial condyle;

L = Distance between the lateral facet and condyle

Ratio M/L = 1.6 or less. (Laurin, et al.)



|                    | Normal | Patella Pain | Patella instability |
|--------------------|--------|--------------|---------------------|
| Insall T/P         | 1.06   | 1.09         | 1.30                |
| Sulcus angle       | 138 °  | 138 °        | 153 °               |
| Congruence angle   | -6.7 ° | -9.2 °       | +16.6 °             |
| Lateral P-F angle  | 20 °   | 39 °         | 3 °                 |
| P-F index          | 1.4    | 1.4          | 3.2                 |
| CT                 |        |              |                     |
| Congruence angle   | 13 °   | -5.7 °       | +4.2 °              |
| Patella tilt angle | 15 °   | 14 °         | 4.85 °              |

CT is important

CT cuts: 0, 30° knee flexion

2 cuts middle of the patella and tibial tuberosity

Interpretation Patellar tilt only

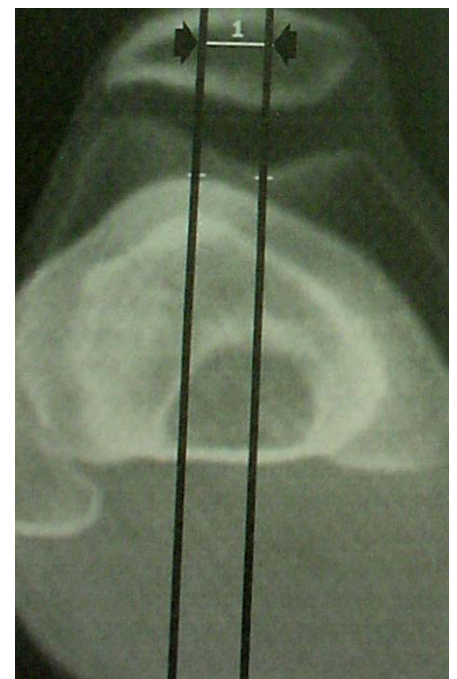
Subluxation only

Tilt and subluxation

#### Tibial tuberosity – Sulcus femoralis distance [TT-SF]

This distance is more accurate measurement than Q angle

More than 20 mm is pathological



## **MRI**

Useful to assess cartilage and ligaments

Location of injury to the MPFL

## **Arthroscopy**

### **Tracking**

Patellar ridge in the groove at 30° of flexion is normal

Centralisation more than 50° is abnormal

Removal of loose fragment

## **Treatment**

### **Acute patellar dislocation [First time]**

1. MRI: 80% may show tear of MPFL ligament
2. Bone bruise/osteochondral fractures in 87% lateral femoral condyle and 30% of patella
3. Prognosis: Redislocation 30%
4. Incidence is high in young female; More so when bony abnormality with alignment is present
5. Traditional treatment [Insall] **Conservative:**

Reduce the dislocation

X ray including skyline and rule out fracture bone fragment.

Knee brace for 3 weeks

Physio for Vastus medialis isometric exercised

Explain about 30% recurrent problem and surgery will not produce normal knees in 100%

**Controversy:** Early repair of MPFL. MRI is useful in localizing areas of MPFL damage. Injury to the ligament may occur at the adductor origin. Most surgeons: do not operate acutely

## Treatment for recurrent dislocation

### Facts

1. Generalized lax ligament in 60% of subluxation [10% in Normal population]
2. Radiological: Insall's index and Sulcus angle are important
3. TT-ST distance: Normal knees 12.7° and subluxation 20° in 60%
4. Risk factors

#### a. Local Bony (Static Stability)

Shallow femoral trochlea

Hypoplastic lateral femoral condyle

Patella Shape

Patella Alta

#### b. Malalignment [External tibial torsion, Increase. femoral anteversion or genu valgum]

Increase Q angle (unreliable)

#### c. Soft Tissue (Dynamic stability)

Ligamentous laxity

Distal oblique portion of vastus medialis muscle is critical

Tight lateral structure

Tear of MPFL

### Treatment

1. Vastus medialis strengthening. Elevate with internal rotation
2. McConnell taping
3. Braces
4. Surgery



## a. Proximal alignment

### i) Lateral retinacular release : rarely done alone

Dandy in 1987 reported 90% success with lateral release alone. However this has not been reproduced by others and presently it is successful in less than 50% and is not recommended.

### ii) Insall's proximal alignment is popular

2 incision

I Lateral release: complete

II Medial incision: Medial Vastus medialis is advanced downwards and lateral over patella.

I suture: Distal part of the vastus medialis is brought distally and laterally overlapping the superior border of the patella

II suture: from the distal pole of the patella to the medial retinaculum as tight as possible but should allow 90 of flexion without suture breaking

Insall: reported 90% satisfactory results

## b. Distal alignment

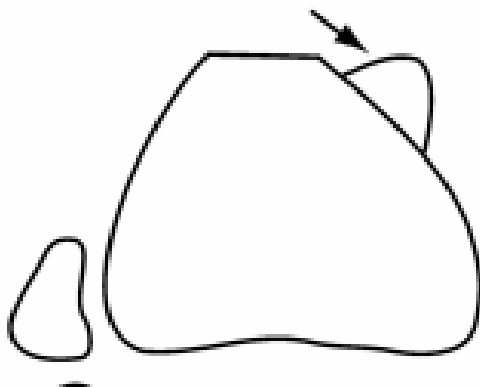
Bone procedure

Historical Distal realignment

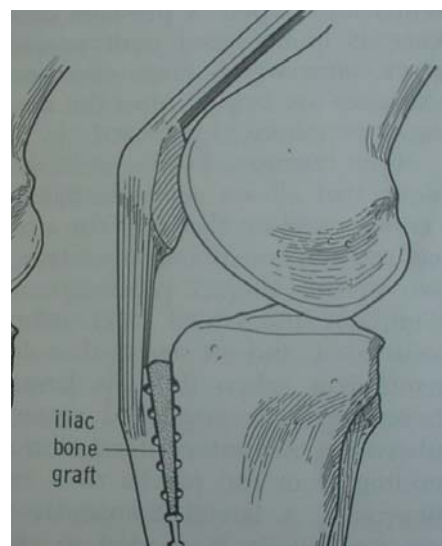
i) Hauser Procedure,

ii) Maquet Procedure

Hauser's



Maquet's



## Contemporary

### 1. Elmslie-Trillat Procedure:

Well established

Tibial tubercle transferred only medially



Elmslie Trillat

### 2) Fulkerson procedure

Anteromedial translation of the tibial tubercle

Fulkerson's procedure is presently enjoying popularity.

He suggested that transferring the tubercle 8 mm anteriorly and medially can reduce contact pressures on the lateral facet by 30% and that transferring the tubercle 15 mm anteriorly and 8 mm medially can reduce pressure by 65%.



Fulkerson

### Goldthwaite-Roux Procedure

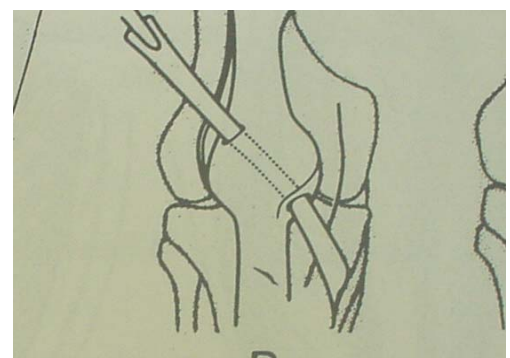
The patella tendon is split and the lateral half is passed under the medial half and is attached to the periosteum on the tibia in a medial position.



Goldthwaite- Roux

### Galleazzia Procedure

Semitendon tenodesis. Semitendonosis is sutured through patella

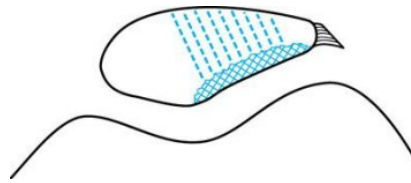


## LATERAL COMPRESSION PATELLAR SYNDROME

Condensation (sclerosis) of the subchondral bone of the lateral patellar facet.

Lateralization of trabeculae (perpendicular to the lateral facet rather than to the transverse plane of the patella).

Lateral traction spurs.



C

1. Knee pain: aggravated by flexion activities like: Sitting, squatting, climbing stairs.

2. Catching momentarily

3. Clinically: Half squat test

Tightness of the lateral retinaculum: at 30° Flexion

Patella mobility

Increase in Q angle [normal in instability]

Medial compression test: 30° flexion

Push medial facet against femoral condyle causes pain

4. X ray Skyline view and tilt

5. CT: Patellar tilt without subluxation on CT.

6. Treatment

Reduce activity

Quad training: Strengthen Vastus medialis

Knee brace with patellar cut out

NSAID

Refractory to non-operative at 6 months: Lateral retinacular release

7. Surgical release:

Lateral release

Disadvantages

1. Hematoma [From Superior Genicular Artery]

2. Medial patellar instability