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PATELLOFEMORAL MALALIGNMENT

By

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Introduction

Patellofemoral joint problems are one of the most frequent complaints in orthopeadics and sports medicine *(Beaconsfield etal 1994)*. Current investigations has been directed toward more accurate diagnosis of patellofemoral pain with special attention directed toward assessing patellar alignment and articular changes *(Scuderi 1992)*. Patients with patellofemoral malalignment are noted to have subluxation alone, tilt alone, tilt with subluxation or recurrent dislocation *(Fulkerson and Hungerford 1990)*. Soft tissue changes associated with recurrent dislocation of the patella include patella alta, generalized ligamentous laxity, laxity of medial retinaculum, hypoplasia of the vatus medialis obliquus, and retraction of lateral retinaculum. Bony abnormalities include a flat femoral trochlea, dysplastic patella, lateralization of the tibial tubrosity, increased femoral anteversion with compensatory external tibial rotation, and genu valgum. The unstable patella is difficult to mange. Over 130 different operations had been described to realign the extensor mechanism but no single procedure has own widespread approval. The procedure currently used are either soft tissue correction, bony procedures or a combination of both.The ideal operation should be based on mechanical principles in order to correct factors predisposing to a subluxation or dislocation.The complications of surgical treatment include osteoarthritis of the patellofemoral joint, loss of flexion, tenderness over screw or staple fixation, detachment of patellar tendon and genu recurvatum after distal realignment before growth is completed *(Dandy and Griffiths 1989)*.

Aim of Work

- Fifty patients with a history of patellofemoral malalignment syndromes will be studied.
- Patients with isolated chondromalecia patellae and hypermobile patella will be excluded.
- All patients will be exposed to:

1) Thorough clinical and radiological examination: including plain X ray(A.P , Lateral & Axial views).
2) C.T or MRI when indicated.

- All patients will be treated initially conservatively for 3-6 months.

- **Surgery will be done when: 1)conservative treatment failed to significantly improve the symptoms. 2) when associated pathology such as a torn meniscus or an osteochondral fracture was present. The types of surgical treatment are *1)* lateral release, *2)*proximal realignment, *3)*distal realignment and *4)*combined proximal &distal realignment.**
- **Follow up in OPD in 2,4,6,12,24 months, with subjective and objective evaluation of the results.**

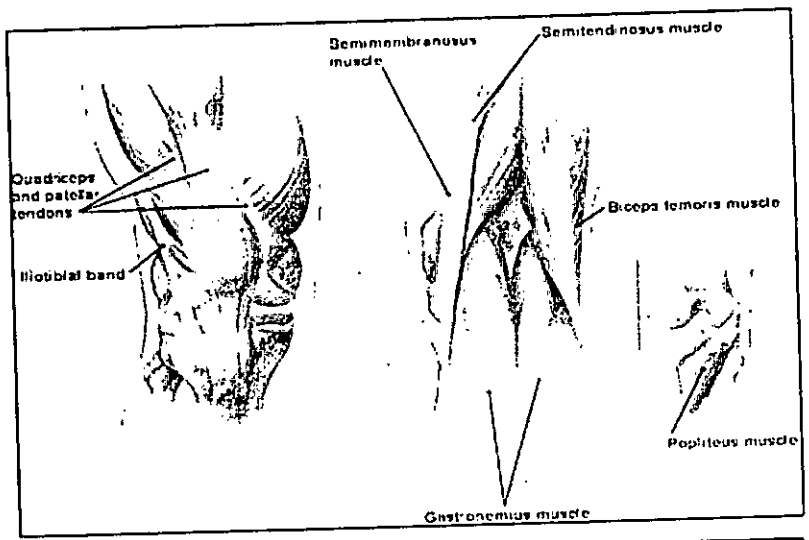
ANATOMY OF PATELLOFEMORAL JOINT

THE PATELLA:

The patella is roughly is an oval bone with a rounded point inferiorly and a transverse diameter slightly larger than the longitudinal one *fig(1)*. The anterior surface is convex in both proximodistal and mediolateral directions. The upper two third (the triangular base) receives the insertion of the quadriceps tendon. The V shaped lower third receives the insertion of the patellar tendon.

An anatomic study of patellar specimens revealed the following dimensions: height of anterior surface 4.5cm (range 3.8 - 5.3), Width, 4.7 cm (range 4.0 –5.5), height of articular surface, 3.5cm (range 3.0 – 3.9), and thickness, 2.3cm (range 1.9 –2.6). The posterior surface of the patella can be divided into articular upper three fourths and non-articular lower forth, the articular superior surface is oval with the greatest diameter in the transverse plane. The articular surface is divided into facets by several ridges. A major vertical ridge divides it into medial and lateral facets. Second vertical ridge near the medial border isolates a narrow strip known as the odd facet. A definitive transverse ridge divides the lateral and medial facets into unequal large superior and small inferior segments *(Rieder etal 1981).*

Classification of patellar morphology *fig.(2)* includes Wiberg type 1: has a medial and lateral facet roughly the same size, both gently concave. Wiberg type 2: has a medial facet smaller than the lateral and it is flat or slightly convex. Wiberg type 3: has a markedly reduced medial facet compared with the lateral and it is convex and almost vertical *(Wiberg 1941).* Type 4: is described as the (Jeagerhut) shape without central ridge or medial facet *(Baumgartl 1944).* It can be seen that on moving from type 1 to type 4, there is increase prevalence of the lateral facet over medial. If it is assumed that the final shape of the patella is determined by the stresses imposed on it, type 3 and4 should be the result of a lateralized gliding of the patella into the sulcus, while type1 should develops when the medial and lateral facets are loaded symmetrically *(Insall etal 1993).* Also there is a correlation between the Wiberg type 3 shape and the width of patellofemoral joint. This suggests that the thick lateral retinuclum causes lateral patellar tracking and hence a patellar shape with lateral predominance.



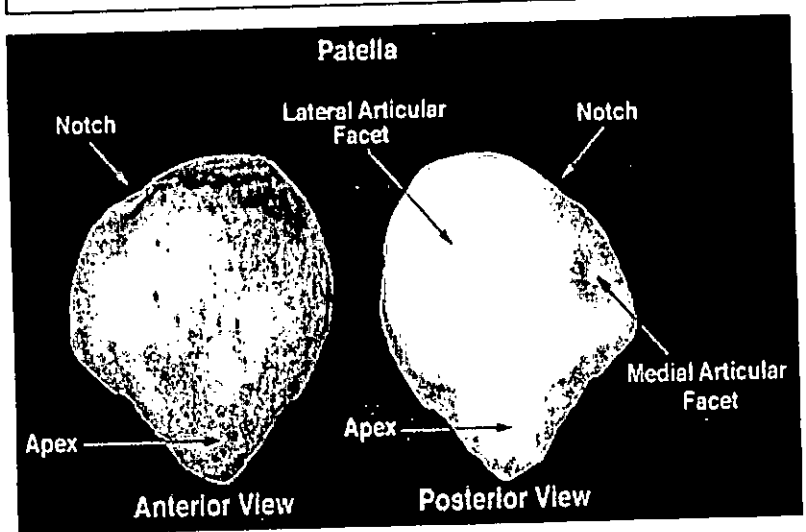


FIGURE 1: Anterior and posterior views of the extra-articular tendinous structures and muscles associated with the knee. (MARK & JUHN 1999)

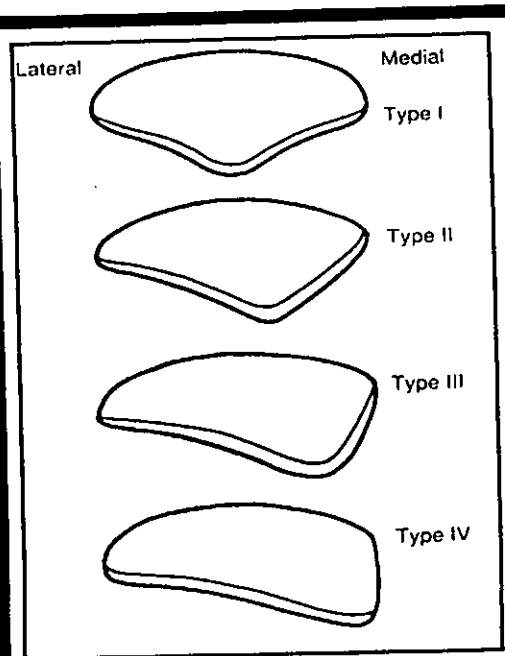


FIGURE 2. Classification of patella morphology, according to Wiberg and Baumgart. Type1 has medial and lateral facets of roughly the same size, both gently concave. Type II has a medial facet smaller than the lateral facet, and it is flat or slightly convex. Type III has a markedly reduce medial facet, compared to the lateral facet, and it convex and almost vertical. Type IV was described by Baumgart as the "jaegerhut" shape, without central ridge of patellar facet. *(Insall 1993)*

FEMORAL TROCHLEA

The anterior portion of the femur consists of a sulcus, lateral and medial facet. The sulcus continues distally with the interchondylar notch. The medial and lateral facets are in continuity with the femoral condyles. The junction between the trochlear and condylar surfaces is usually marked with a shallow groove, which is determined by contact with the menisci in the fully extended knee. The medial and lateral facets of the femoral trochlea are asymmetrical in that the lateral facet is few millimeters more prominent than the medial facet in the normal knee. The height of the lateral facet and the congruence between the trochlear sulcus and the central ridge of the patella are contributory factors in the stabilization of the patella (osseous stabilizers). The sulcus is significantly flatter in knees with patellar instability, so that the stabilizing function of the osseous surface is lost to a variable extent *(Insall etal 1993)*.

QUADRICEPS TENDON

The four components of the quadriceps muscle *fig.(1)* joint distally into the quadriceps tendon. Three muscles are monoarticular, vastus medialis, vastus lateralis and vastus intermedius, while the fourth, rectus femoris is biarticular spanning both the hip and the knee joints. The quadriceps tendon is formed of three layers, the most superficial fibers of the rectus femoris run over the patella and joint the patellar tendon while the deeper layers insert into the base of the patella.The vastus medialis and lateralis unite to form the middle layer of quadriceps tendon which inserts into the base of the patella.These muscles also send fibers to the corresponding patellar retinucula. The vastus intermedius inserts into the base of the patella through the third deepest part of the quadriceps tendon.The vastus medialis muscle has been described as consisting of two portions, vastus medialis obliquus (VMO) and vastus medialis longus. The vastus medialis obliquus arise from the most distal fibers of the adductor magnus tendon and to somewhat off adductor longus tendon *(Zappala etal 1992)*. The fibers of vastus