# CHAPTER 13

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# Nonsurgical and Surgical Management of the Lateral Patellar Compression Syndrome

AO:

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#### INTRODUCTION

'Syndrome d' hyperexpression externe de la rotule' or the lateral patellar compression syndrome has been described as a symptomatic cluster secondary to impairment of patellar kinematics.<sup>1</sup> In the 1960s patellar malalignment was considered one of the causative factors for the anterior knee pain.<sup>2</sup> Insall in 1979 emphasized that in most young athletes, patellar malalignment syndrome was the major reason of the pain rather than the patellar chondral injury.<sup>3</sup> The long list of the nonsurgical modalities and surgical treatment options described for patellar mal-alignment and lateral patellar compression syndrome is an indirect evidence of our struggle for developing an ideal treatment strategy for patellofemoral (PF) pain.<sup>4-6</sup> Anatomical peculiarities of the patella, complex interplay of the static and dynamic components governing patellar kinematics are the factors which make managing PF pathologies a difficult task.

#### PATHOANATOMY

The PF joint differs from other joints as the patella is a sesamoid bone involved in the joint. With knee in full extension, patella is seated high and slight lateral to the trochlea. With the initiation of knee flexion, the patella is directed medially and inferiorly in the trochlea and then follows a gentle curve with the concave part facing laterally during further knee flexion. At the same time during the flexion, the patella rotates medially (patellar tilt) with the medial retinaculum as a guiding force until the patella is engaged in the trochlea at about 30 degrees of flexion. Beyond 30 degree angle, lateral trochlear facet is the principle factor determining the patellar tilt. It is during the initial 30 degrees of knee flexion where imbalance between the mediolateral forces can cause the lateral patellar compression syndrome.<sup>7,8</sup>

Lateral patellar instability is more common than the medial patellar instability. It is due to a functional lateral shift of the patella due to increased lateral forces, decreased medial balancing forces or both.<sup>9</sup> Such lateral shift of the patella during the knee range of motion can lead to increased lateral patellar cartilage wear and knee pain. Increased lateral pulling force has been attributed to the tight lateral retinaculum.<sup>10</sup>

The lateral retinaculum is roughly divided into three layers, i.e. superficial, intermediate and the deep layer. Superficial layer is formed by the deep fascia of the thigh whilst the deep

layer is formed by the joint capsule. The intermediate layer is the thickest of all the layers and is formed by the iliotibial band (ITB) and the quadriceps aponeurosis.

The intermediate layer and deep layer are functional lateral stabilizers for the patella and consist of three principle structures

- a. Lateral patellomeniscal ligament (LPML)b. Lateral patellafemoral ligament (LPFL)A In the deep layer of lateral retinaculum
  - The LPFL and LPML can be demonstrated in the Figure 13.1.
- c. The ITB to patella fibers—In the intermediate layer of lateral retinaculum

Of all these, the iliotibial patella fibers are the strongest and are responsible for transmitting most of the load in-vivo to the patella<sup>11-13</sup> (Fig. 13.2).

The lateral pulling effect of the ITB patella fibers is approximately 3 times that of LPFL and 6 times that of LPML. Several studies describe the role of transversely oriented ITB-patella fibers in patellar tracking.<sup>11</sup>



Fig. 13.1: Anatomical specimen showing LPFL and LPML

Image Courtesy: Azhar M Merican, Sanjay Sanghavi, Farhad Iranpour, Andrew A Amis :Musculoskeletal Surgery Department, Imperial College London, Charing Cross Hospital, London, UK University of Malaya Medical Centre, Malaysia. Abbreviations: LPFL—lateral patellofemoral ligament; LPML—lateral patellomoral ligament



**Figs 13.2A and B:** Anatomical specimen showing contribution of ITB to the lateral patellar retinaculum. The figure shows attachment of the iliotibial band over the GT and thick ITB-P *Image Courtesy:* Azhar M Merican, Sanjay Sanghavi, Farhad Iranpour, Andrew A Amis Musculoskeletal Surgery Department, Imperial College London, Charing Cross Hospital, London, UK University of Malaya Medical Centre, Malaysia. *Abbreviations:* GT—Gerdy's tubercle; ITB–P, iliotibial band-patella fibers; ITB, iliotibial band

Hence, the role of the ITB as the principle lateral force vector affecting patellar tracking has been well documented and many treatment modalities have been developed which include both surgical and nonsurgical techniques.<sup>14</sup> These have central principle of decreasing the lateral force vector which causes lateral patellar instability thus, leading to patellar chondral damage and anterior knee pain.

# DIAGNOSING THE LATERAL PATELLAR COMPRESSION SYNDROME

The following clinicoradiological parameters should be considered for the diagnosis of the lateral patellar compression syndrome (LPCS).

- a. *History of anterior knee pain*: Patients with PF pain describe increased pain while going down stairs, kneeling, squatting as in this position there is higher PF joint reaction force.
- b. History of catching might suggest presence of cartilaginous debris from the patellar chondral damage.
- c. Modified patellar glide test or patellar shift test:<sup>15-19</sup>

Classical test describes checking mobility of the patella medially and laterally with knee in extension and limb in neutral position (Figs 13.3A and B). Figure 13.3A demonstrates neutral limb position and Figure 13.3B demonstrates medial patellar mobility of up to 2 quadrants which is considered within normal limits.

But the ITB which is an important lateral force is not actively involved in the patellar mobility with knee in full extension and neutral rotation. Hence, to demonstrate the tightness of lateral retinacular structures, affected extremity is crossed over the other thus attaining a position of around 10 degrees of knee flexion, hip adduction and slight tibial internal rotation (Fig. 13.4A). In this position the ITB if tested for tightness and if tight, it leads to decreased patellar shift, i.e. less than 1 quadrant of medial patellar mobility (Fig. 13.4B).

- d. Radiographic signs:<sup>1</sup> Increased density of the lateral patellar facet cancellous bone, lateralization of the lateral patellar facet trabeculae, medial patellar facet osteopenia (Figs 13.5 and 13.6).
- e. MRI evidence of patellar chondral injury (Fig. 13.7) or signs of ITB inflammation suggesting tight lateral retinacular structures.



Figs 13.3A and B: ???





Figs 13.4A and B: ???



Fig. 13.5: ???



Fig. 13.6: Skyline view showing radiological sign of the lateral patellar compression syndrome

#### NONSURGICAL MANAGEMENT OF LATERAL PATELLAR COMPRESSION SYNDROME

Jenny McConnell in 1984 described patellar maltracking as a factor contributing to anterior knee pain and subsequently described the McConnell program for managing patellofemoral pain syndrome.<sup>20</sup>

The PF program described by McConnell describes use of corrective taping for treating the patellofemoral pathologies. Various other studies have shown better results with taping combined with therapeutic exercises, muscle strengthening exercises, muscular stretching exercises, electrotherapy and knee bracing.

Basic principle behind these nonsurgical modalities is to balance medial and lateral forces thus improving patellar maltracking. Mediolateral patellar force imbalance can be either an excessive lateral pull or an inadequate medial pull. To treat the inadequate medial pull, patellar taping, VMO strengthening, etc. have been used while to decrease the lateral pull patellar taping, ITB stretches, ITB rolls, etc. have been used.<sup>20-23</sup>

Patellar taping affects the patellar tracking maximally in the initial 10 degrees of knee flexion.<sup>24-26</sup> Kujala et al. in 1989 described 10 degrees of knee flexion as the optimal position for detecting patellar instability using MRI.<sup>27</sup> Since patellar taping affects the patellar tracking in this vital 0-10 degree knee range of flexion, it has an important role in management of patellar maltracking and lateral patellar compression syndrome. This is also the reason why modified patellar shift test should be performed in 10 degrees of knee flexion.

Two types of taping techniques are popular: Kinesiotaping and McConnell taping.



Fig. 13.7: MRI of the knee showing patellar lateral facet chondral injury

#### Kinesiotaping

- □ Was introduced by Kenzo Kase in 1990
- Consists of waterproof, ventilative material. It is preferred by the patients since its mechanical properties make it easier to use and it has no allergic potential
- □ Based on 2 principles:
  - Tape applied in the direction of the muscle contraction, i.e. from muscle origin to insertion facilitates contraction of the muscle
  - Tape applied in the opposite directions of the muscle contraction, i.e. from insertion to the origin prevent muscle overuse or tension
- □ In PF pain syndrome, kinesiotaping on VMO is applied to facilitate the muscle contraction and proprioception, while the ITB, vastus lateralis and tensor fascia lata can be taped to inhibit muscle contraction
- □ Kinesiotaping when applied to the skin increases space between muscle and fascia and also increases local blood flow thus contributing to pain relief
- □ The main disadvantage of the kinesiotaping is that it is ineffective in correcting the patellar malalignment adequately with even 50% or 85% tension applied to the tape.<sup>27,28</sup> Thus though kinesiotaping may help reduce the pain in patellofemoral compression syndrome, it might not correct the patellar maltracking completely.

# **McConnell Taping**

- Consists of under tape that exerts no tension on the skin of the patient and a rigid over tape to correct the patellar positioning
- □ Involves use of several rigid tapes, such as Hypafix, Endura Fix, Leukotape, etc.
- □ The basic principle of this taping is to manually correct the patellar displacement and taping done to hold the patella in corrected position (Fig. 13.8)
- Tapes are applied with patient in supine, relaxed position with patella pushed medially



Fig. 13.8: McConnell Taping for patellofemoral compression syndrome

- The McConnell taping improves the patellar alignment, angulation and tracking but its role in improving the proprioception and motor function is controversial. Hence, McConnell taping has to be used with therapeutic exercises like VMO strengthening
- The other advantage of combining McConnell taping with therapeutic exercises is that McConnell taping reduces the anterior knee pain because of patellar unloading and thus, further increases efficacy of strengthening exercises<sup>29</sup>
- □ McConnell taping has to be removed after doing the strengthening exercises because prolonged use of the tape is known to have side effects like skin discomfort, allergic reactions
- □ The taping technique must be individualized based on the degree of patellar shift, patellar tilt and patellar rotations of the individual. The most abnormal component of the tracking should be tackled first except in cases of posterior patellar tilt in which case the tape has to be applied superiorly first because inferiorly applied tape in such cases causes fat pad irritation and aggravation of the pain.<sup>20,24,29</sup>

Therapeutic exercises which are to be combined with taping:

- VMO training and active stretches of lateral retinaculum:
  - Training should be done so that VMO stimulation should come prior to the vastus lateralis stimulation while initiating knee flexion<sup>30,31</sup>
  - Weight-bearing activities should be commenced early in the program to facilitate VMO stimulation.
- Adductors activation:
  - For patients who are unable to improve on their VMO stimulation, adductor stimulation and strengthening should be started
  - It has been proven that stimulating adductor magnus more than 20% of its maximal leads to differential increase in the VMO activity over vastus lateralis (Hodges, Richardson 1993).
- Pelvic stability and hip abductors strengthening:
  - These are integral part of stair climbing training of patients with PF pain syndrome. These are crucial, since stair climbing is one of the most painful situation for the patients with LPCS
  - Pelvic stability exercises help to maintain limb alignment thus, unloading the knee joint
  - Strengthening the hip abductors especially posterior fibers of gluteus medius help diminish contraction of tensor fascia lata and help in decreasing the tightness of the iliotibial band.
- □ Electric stimulation:
  - Electric stimulation of musculature might be required in patients who are unable to perform therapeutic exercises.

## SURGERY

#### **Inclusion Criteria**

- a. Tenderness on the lateral facet of the patella on palpation
- b. Pathological patellar tilt test: Patella can not be lifted from the lateral femoral condyle over horizontal plane by examiners with patient's knee in extension
- c. Pathological medial patellar guide test (modification)

## **Exclusion Criteria**

- a. Hypermobile patients as per Beighton criteria
- b. Patellar instability by means of patellar medial and lateral patellar glide tests of more than 3 quadrants with history of patellar dislocation
- c. Pathological femoral anteversion and pathological tibial torsion<sup>32,33</sup>
- d. Lower limb frontal malalignment: Q angle more than 20 degrees or tuberculo-sulcus angle more than 10 degrees<sup>33</sup>
- e. Less than three months of controlled nonsurgical treatment including the Mc-Connell program.
- f. Significant radiological PF arthritis of medial facet of the patella
- g. Patients with patella alta, trochlear dysplasia
- h. Associated cruciate or collateral ligamentous instability when the instabilities should be tackled primarily.

#### **SURGICAL PROCEDURE**

#### Arthroscopic Chondroplasty and Open Iliotibial Band Release

- Anesthesia: Either spinal or general anesthesia
- Examination under anesthesia (modified patellar shift testing) done
- Tourniquet inflated
- Arthroscopic patellar chondroplasty done and associated pathologies, such as chondral loose bodies, associated meniscal lesions addressed. Patellar maltracking noted by arthroscopic examination (Fig. 13.9).



Fig. 13.9: Knee arthroscopic picture showing lateral patellar facet chondral injury

With knee in 20–30 degree of flexion, hip is held in around 10 degree adduction which stretches the ITB (Fig. 13.10). A 2–3 cm vertical incision is taken just proximal to the lateral epicondyle of the femur. Skin and subcutaneous tissue are incised (Fig. 13.11). ITB is visualized and palpated to confirm the tightness (Fig. 13.12). The ITB is incised and released using an electrocautery (Figs 13.13 and 13.14). Completeness of the release is checked and reconfirmed by doing modified patellar shift test (Fig. 13.15).

Tourniquet deflated and hemostasis achieved. After giving thorough wound lavage, wound closure done.

#### **Postoperative Protocol**

- Patient is given antibiotics for 3 days and a course of anti-inflammatory medications for 3 weeks along with cryotherapy, ice packs
- On postoperative day 2 knee range of motion physiotherapy started. Quadriceps and hamstring strengthening started. Patient is allowed to do weight bearing as tolerated



Fig. 13.10: Position of the knee. Lateral view of the affected knee



Fig. 13.11: Incision over the Iliotibial band



Fig. 13.12: Tight Iliotibial band visualized



Fig. 13.13: The ITB is released using an electrocautery perpendicular to the direction of the fibers



Fig. 13.14: Complete release of the Iliotibial band



Fig. 13.15: Modified patellar shift test which demonstrates improved medial patellar mobility

- For first week, extremes of knee flexion while weight bearing are to be avoided to decrease the ITB pain and inflammation
- Gentle ITB stretches can be started after 1st postoperative week to avoid further adhesions and re-stiffening of the iliotibial band.

## DISCUSSION

## Advantages of doing Open Iliotibial Band Release

- a. Completeness of release can be assured.
- b. Minimal chances of medial patellar instability since ITB is released proximal to the patellar level. In contrast releases of the lateral retinaculum done by lateral para patellar approach at the level or distal to the patella have higher chances of medial patellar instability.<sup>11</sup>
- c. Minimal chances of hemarthrosis since ITB release is done proximal to the joint capsule in contrast to the earlier-described procedures.
- d. Better decompression of the lateral femoral compartment compared to arthroscopic lateral capsular ligamentous release since ITB contributes to the stiffness of lateral retinaculum compared to the capsular ligaments.
- e. Technically simple, reproducible procedure with less patient morbidity and cosmetic approach.
- f. Faster postoperative recovery and early patient mobilization.

## Advantages of the Patellar Chondroplasty

The debris of the patellar cartilage is known to produce synovitis.<sup>34</sup> Only arthroscopic lavage helps to wash out the debris but in presence of persistent roughened patellar cartilage unstable fragment this can give a temporary relief. While arthroscopic patellar chondroplasty involves removal of damaged area thus decreasing the shedding of the debris and removal of an abnormal stress on the subchondral bone.<sup>34,35</sup>

#### Advantages of the Lateral Retinacular Releases

To correct the patellar maltracking and PF pain, several procedures which are aimed at reducing the lateral force vector have been described since 1888 till today which include lateral retinacular release (open and arthroscopic), lateral patellar facetectomy, etc. many of these have reported complications, such as worsening of the patellofemoral arthritis, medial patellar instability, etc. and many of these required medial ligamentous reconstructions.<sup>36</sup>

Poor patient selection has been an important factor in determining the lateral retinacular release.<sup>37</sup> Hence its of utmost importance to follow the inclusion and exclusion criteria.

With the above mentioned results comparable to lateral retinacular lengthening procedure can be seen while open ITB release being much simpler procedure to perform with better compliance.

Role of preoperative and postoperative physiotherapy program is vital and is an integral part of the management of the lateral patellar hypercompression syndrome.

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