The patellar compression syndrome: Treatment by miniopen lateral retinacular release results and review of literature

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Citation

Abstract
The purpose of this study was to evaluate the result of lateral retinacular release in patellar compression syndrome, which is a painful compression syndrome arthropathy of the lateral facet of the patella. 187 knees of 120 patients, were included in this study. The criteria for inclusion were the presence of complaints of anterior knee pain without instability. Clinical signs pointing to lateral retinacular tightness and radiological evidence of lateral patellar tilt with minimal subluxation in 187 knees of 120 patients, 130 knees were treated conservatively and 56 knees of 33 patients operatively by lateral retinacular release, those patients were selected after they failed to respond to a minimum of 3 months of conservative treatment that entailed isometric quadriceps strengthening exercises, restrictions of activities that requires prolonged knee flexion and administration of anti-inflammatory agents. The lateral retinacular release was performed through a 3 centimeter skin incision. A satisfactory result was achieved in over 75% cases. The complication rate was low or negligible. No complications of haemarthroses were found postoperatively. The data indicated that better results can be achieved in patients who have patellar tightness, lateral para patellar tenderness, a positive medial patellar glide test and positive medial apprehension test. Poor results are to be expected in patients with severe arthritic changes involving the lateral patellar facet.

INTRODUCTION
Anterior knee pain is a very common complaint among active individual specially adolescents and young adults in many of these patients trauma and substantial anatomical misalignment are important cause of patellar pain, in this age group more ever, in another group of patients with anterior knee pain, no predisposing trauma or subluxation can be identified. In this group, Fulkeran et al identified a population of patients who had lateral patellar tilting in their axial radiograph without marked subluxation and with chronic peripatellar pain. Larson and colleagues attributed the pain in this area of patients to tightness of the lateral retinaculum which leads to increased pressure on the lateral surface of the patella in the femoral sulcus. Hence; they introduced the term patellar compression syndrome (pcs).

BIOMECHANICS
The lateral retinaculum is a richly innervated fibrous connective tissue structure located on the lateral side of the knee. It is composed of two layers, a superficial and deep layer. The superficial layer is composed of oblique fiber from iliotibial band inserting primarily into the lateral border of the patella and interdigitating with longitudinal fiber of the vastus lateralis and patellar tendon. The deep layer is mainly composed of dense transverse fiber that connect the deeper portion of the fascia lata directly to the lateral patella. Two distinct ligamentae-epicondylotapellar and patello-tibial ligament are located at the superior and inferior border of the deep layer tethering the patella to the lateral epicondyle and anterolateral tibia respectively, through the contribution of the iliotibial band in the formation of the lateral retinaculum. A posterolateral force is exerted on the lateral aspect of the patella as the knee is flexed. this is consistent with the clinical observation that many patients with anterior knee pain tolerate prolonged knee flexion poorly furthermore, this posterolateral force is primarily exerted in a posterior direction and therefore release the lateral retinaculum mainly removes a posterior restrain (tilt) on the lateral patella and to a lesser degree, lateral restrain (subluxation) is decreased. Accordingly, lateral release corrects patella tilt more than lateral subluxation (Figure 1 and 2).
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Figure 1
(Figure-1)- The lateral patellofemoral angle, Line A-A1 passes through the limits of the femoral sulcus and line B-B1, through the limits of the lateral patellar facet. The lateral patellofemoral angle is formed by the lines A-A1 and B-B1. Note that the lateral patellofemoral angle is always situated anterior to (above) line A-A1.

Figure 2
(Figure 2) The congruence angle: To measure the congruence angle: Find the highest point of the medial (B) and lateral (C) condyle and the lowest point of the intercondylar sulcus (A). (A clear plastic straight-edge is helpful) The angle BAC, is the sulcus angle. Bisect the sulcus angle to establish the zero reference line AO. Find the lowest point on the articular edge of the patella (D). (A straight edge held parallel to the horizontal axis of the patella helps) Project line AD. The angle DAO is the congruence angle. All values medial to the zero reference line AO are designated as minus and those lateral, as plus. Mean = -6 Degrees, standard deviation = ±11 degrees.

The cause of knee pain in pcs seems to be multifactorial. Primarily, abnormal tightness of the lateral retinaculum leads to increased compressive forces exerted on the patella when the knee is flexed. Subcondral irritation and basal cartilage degeneration also contribute to the occurrence of pain; furthermore, clinical data have demonstrated that in some cases of pcs, pain originates from the sensory nerves supplying the lateral retinaculum due to degenerative neuropathy leading to perineural fibrosis with some loss of myelination. Fortunately, regardless of the cause of pain, many of these patients respond well to conservative treatment. Many authors have reported positive results in over 80% of their patients. On the other hand, when these conservative measures fail, surgical release of the lateral retinaculum can be successful in alleviating the pain associated with PCS.

The aim of the present study was to evaluate the results of surgical release of the lateral retinaculum in cases of patellar compression syndrome.

PATIENTS AND METHODS
33 cases of pcs for whom 56 knees were treated by lateral retinacular release; this study was conducted in the arthritis clinic in the department of orthopedics, MGM Medical
College, Indore from December 1999 to June 2001. There were 26 females and 7 males the average age at operation was 35 years (ranging 25 to 40 years). 22 of them patients had bilateral release. 5 patients on right side and 7 patients on left side. The average duration of symptoms prior to surgery was one and half years.

**CLINICAL FINDINGS**

(I) History - Anterior knee pain is exerted by prolonged flexion (as sitting and squatting) was experienced in 187 knees (100%), Giving way was experienced in 151 knees (80.74%). Swelling was present in 112 (60%) knees. 

(II). Examination - physical examination involved the following:-

- Soft tissue tenderness: Tenderness over the lateral parapatellar soft tissue was present in 119 knees (64.11%) 
- Lateral retinacular tightness was 187(100%), direct compression over the patella: revealed tenderness in 119 (64.11%). The medial patellar glide test this evaluates the degree of tightness of the lateral retinaculum. It was performed by manually pushing the patella medially with the knee in extension. Medial translation of less than one quadrant is considered abnormal and is consistent with a tight lateral retinaculum. The test was positive in 151 knees (80.74%) The medial apprehension test: this measures knees discomfort and active resistance to medial patellar displacement with the test was positive in 151 knees (80.74%) 

(III). Radiological examination: Imaging can confirm a diagnosis of patellar malalignments while further qualifying and quantifying it. Standing anteroposterior and lateral views of the knee were obtained to check for signs of articular damage, patella alta and baja, and other associated conditions. More importantly, axial tangential views of the patellofemoral joint, as proposed by Merchant, were obtained for each patient to evaluate patellar alignment. The Merchant radiograph has emerged as the standard, as it allows for proper imaging of patellar articulation with the trochlea. Also, it does not artificially compress the patella as do radiographs made with the patient prone. The radiographs were obtained with the knees flexed 45 degrees with the X-ray tube tilted 30 degrees from the horizontal; with the quadriceps muscle relaxed in order not to reduce an existing tilt or subluxation (figure 3, 4).

Two measures of patellar malalignment were assessed on the axial radiograph, namely medial-lateral displacement and patellar tilt. These two parameters are independent of each other. Lateral displacement (subluxation) was measured with use of the congruence angle (Table-1) This angle is formed by a line that bisects the sulcus angle and
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In the normal knee, the congruence angle is usually negative if it opened medially or was parallel. In this study, the diagnosis of the patellar compression syndrome (PCS) was made when the clinical setting consisted of complaints of anterior knee pain with no predominant instability, clinical signs pointing to lateral retinacular tightness, and radiological evidence of lateral patellar tilt with minimal subluxation. Patients fulfilling those criteria were subjected to a comprehensive medical program consisting of progressive isometric quadriceps strengthening (tip lies medial to the bisector) with a mean value of -6 degrees. Any lateral deviation of the angle of more than +16 degrees denotes subluxation. Patellar tilt was measured using the lateral patellofemoral angle. This is the angle formed between the lateral facet of the patella (drawn as a straight line joining the lateral and inferior ridges of the patella) and a line joining the highest points on the medial and lateral femoral condyles. The lateral femoral condyles. The lateral patellofemoral angle was considered normal if it opened lateral abnormal opening exercises, restriction of activities that require more than 90 degrees of knee flexion, periodic administration of anti-inflammatory agents, and a program aiming at maintaining improved muscle strength. If noncooperative management for a minimum of 3 months has failed, lateral retinacular release was indicated. Q ANGLE: is increased in 19 knees (10%).

**TECHNIQUE OF SURGERY**

The procedure was performed under tourniquet control. Diagnostic arthroscopy of the knee joint was routinely done before the release, to confirm the clinical impression of patellar malalignment; to rule out associated meniscal, synovial, and tibiofemoral pathologic conditions; and to evaluate the degree of patellofemoral articular degeneration. Next, the miniarthrotomy was done through a 3 cm longitudinal incision approximately 2 cm lateral to the patella. The skin and subcutaneous tissues were retracted and the proximally and distally, by blunt dissection. All layers of the retinaculum were incised midway between the lateral border of the patella and the lateral femoral condyle. At the superolateral border of the patella, the fatty plane between the vastus lateralis and vastus lateralis obliquus muscles on the fascial side of the dissection was identified of the vastus lateralis. Mayo scissors were inserted into the apex of the retinacular incision at this fatty plane and were pushed proximally for about 4-5 cm to completely divide the lateral retinaculum (figure 5, 6).

**Figure 5**
Table 1 X ray findings Merchant view (specific measurement)

<table>
<thead>
<tr>
<th>No. of cases</th>
<th>Patellofemoral index</th>
<th>Patellofemoral angle</th>
<th>Sulcus angle</th>
<th>Congruence angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCS</td>
<td>103 (55%)</td>
<td>187 (100%)</td>
<td>51 (27.2%)</td>
<td>136 (72.7%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>131 (70%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>56 (50%)</td>
<td></td>
</tr>
</tbody>
</table>

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then performed to the level of the tibial tubercle by incising the retinacular and capsular layers only to avoid injury to the anterior portion of the lateral meniscus. The skin incision was then mobilized proximally or distally to inspect all portions of the re-release site. A successful release was confirmed by the ability to evert the patella 90 degrees. The tourniquet was then released and meticulous hemostasis obtained with particular attention to the lateral superior geniculate vessels which lie close to the vastus lateralis insertion. Postoperatively, a Jones-type compression bandage was used. The involved knee was kept elevated for 48 hours and thereafter weight bearing was encouraged as tolerated by each patient. This was followed by active range of motion exercises with particular concentration on quadriceps isometric exercises in extension. As soon as peripatellar tenderness disappeared, isotonic quadriceps exercises were instituted. Most of the patients were allowed to return to athletic activity after the sixth postoperative week assessment were done monthly for the first 3 postoperative months and then every 3 months until the final assessment.

**Figure 8**
Table-2 Efficacy Assessments

The period of follow-up ranged from 12 to 37 months with an average of 17 months.

**Figure 9**
Table-3 ARA Functional Class

**ASSESSMENT OF RESULTS**

In our study 56 knees were treated by lateral retinacular release in which 75% knees were given excellent results and 21.48% knees were given good result and 3.75% knees were given fair results, one case of Pcs was treated with Maquet’s procedure that had given excellent result. (Table-4, 5)

**Figure 10**
Table-4 Patients Global Evaluation of Condition
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**DISCUSSION**

The patellar compression syndrome (PCS) points to a group of symptoms arising from minor abnormalities in the extensor mechanism causing increased pressure over the lateral patellar facet.\(^4,14,21\) This pressure is accentuated during flexion, explaining the intensification of pain with activities requiring prolonged knee flexion. A review of the literature points to the fact that other terms were also given to this syndrome; thus Ficat and Hungerford\(^31\) used the term “excessive lateral pressure syndrome,” Johnson\(^11\) “lateral facet syndrome of the patella,” LaBrier and O’Neil\(^22\) “patellofemoral pain syndrome” and others\(^15,16,18\) “patellofemoral stress syndrome.”\(^4,30,31\) In this syndrome, the lateral retinaculum becomes excessively tight, resulting in lateral tilting of the patella. As knee flexion progresses, the patella is forced into a congruent reduction in the femoral trochlea, which then stretches the shortened lateral retinaculum. Pain in the lateral retinaculum results from stretching of this tightened tissue. Furthermore, tilting of the patella increases the stresses across the lateral facet, which may eventually lead to cartilage breakdown.\(^11\)

Johnson\(^11\) has stressed the importance of thorough history taking and clinical examination for correct diagnosis of the syndrome. A complaint of dull achy anterior knee pain exacerbated by prolonged knee flexion (sitting or squatting) or resisted knee extension (as in stair climbing) in a young adult should raise some suspicion of the syndrome. If this is combined with positive physical signs indicating lateral retinacular pathology and positive radiological findings in the axial views, the diagnosis can be made with confidence.\(^11,14\) In the present study, the presence of well localized tenderness over the lateral retinaculum was highly associated with a satisfactory result. This is expected because it pinpointed to the tight or degenerative retinaculum as the source of the problem and hence a satisfactory outcome following surgical release. Abnormal lateral retinacular tightness was measured by the medial patellar glide test. The presence of a positive test was correlated with a correct diagnosis of the syndrome and hence a satisfactory end result. In addition, apprehension to passive medial patellar displacement proved to be a significantly prognostic test. Arthroscopic evidence of articular degeneration of the lateral patellar facet cor-related with the end result. None of the knees with severe degeneration (Outer-bridge grades III and IV) attained a satisfactory result. Conversely, 93% of the knees with milder degeneration attained a satisfactory result. Osborne

**RESULTS**

According to mention criteria 42 knees (75%) were rated as excellent, 12 knees (21.5%) good, 2 knees (3.57%) fair and 0 knee (0%) poor. For the purpose of statistical analysis, the excellent and good results were grouped as satisfactory and poor results were grouped as unsatisfactory, therefore, a satisfactory result was achieved in 54 knees (96.5%), whereas, the fair and poor results were grouped as unsatisfactory, therefore, a unsatisfactory result was achieved in 2 knees (3.57%) (Table 4,5)

**COMPLICATIONS**

Mild swelling only after vigorous activity. No extension lag of motion 10 degrees less than of opposite knee. The patellar compression syndrome: Treatment by miniopen lateral retinacular release.

**RADIOLOGICAL FINDINGS**

Preoperatively, all knees had an abnormal patellar tilt in their axial views as measured by the lateral patellofemoral angle. The angle opened medially in 50 knees) and was parallel (zero degrees) in another 6. Following release of the tight retinaculum, the angle was restored back to normal (i.e., opened laterally) in all the knees.

Before operation, the mean congruence angle was -5 degrees (range, +35 to -15 degrees) preoperatively compared with -7 degrees (range, +25 to -10 degrees) postoperatively. The average correction (medialization) was 2 degrees (mean 1 degree). However, no significant statistical association could be detected between the amount of radiological correction following release and the end result.

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and Fulford showed poor results in all patients with Outer-bridge grades III and IV after lateral retinacular release. Ogilvie-Harris and Jackson noted good results in 85% of a group of patients with Outer bridge grade I and II compared with only 65% in those with more significant articular degeneration. The explanation for these findings might be that as articular cartilage break-down becomes manifest in PCS, collapse in the lateral facet occurs. Hence, lateral release may fail to restore the patella to normal alignment because the patella and femoral trochlea are no longer congruent. The primary objective of lateral release is to reduce the compressive and tilting forces imposed on the patella. This can be done either by endoscopic or open techniques. The miniopen procedure followed in this study produced a satisfactory result in over 84% of the cases. This matches with the satisfactory results reported by O‘Neill (88%), Metcalf, (86%), Betz (83%), Dzio-ba (83%) and Larson et al. (82%). On the other hand, Gecha and Torg reported only 57% satisfactory results and attributed this to the inclusion of cases with overt subluxation in their series. They consequently cautioned against performing retinacular release in cases with marked subluxation or dislocation.

The complication rate in this study was very low. The most significant complication was medial subluxation of the patella that occurred in a single knee. This iatrogenic mishap happens when the tendon of the vastus lateralis is mistaken for intramedullary veins in the release. Therefore, intraoperatively, the fatty plane between the vastus lateralis and vastus lateralis obliquus muscles should be clearly identified and only the obliquus slip should be released. A review of the literature points to haemarthroses as the most common complication of lateral release. However, the total prevalence of haemarthroses after open release was reported to be much lower than after arthroscopic techniques in which the incidence of haemarthroses was over 10% in some series. Some authors have even done surgery by arthroscopy and no complications were identified.

Therefore, on the one hand, the miniopen technique was abandoned in favor of the miniopen method. Further-more, the absence of post-operative haemarthroses in the present series may be attributed to the fact that in each case the tourniquet was released before closure to accomplish meticulous hemostasis with special attention to lateral superior geniculate vessels. A capsular release caused a further reduction in medial stability has been documented recently.

CONCLUSION

Miniopen retinacular release proved to be a simple and effective method for treating patients suffering from the patellar compression syndrome. It combines the advantages of satisfactory exposure of the release field, thorough hemostasis and at the same time leaves a very small scar. Arthroscopic examination of the joint should always be included in the procedure, and if advanced arthritic changes are encountered, release should better be avoided.

References

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