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Review Article

Habitual dislocation of patella: A review

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ABSTRACT

Habitual dislocation of patella is a condition where the patella dislocates whenever the knee is flexed and spontaneously relocates with extension of the knee.

It is also termed as obligatory dislocation as the patella dislocates completely with each flexion and extension cycle of the knee and the patient has no control over the patella dislocating as he or she moves the knee¹. It usually presents after the child starts to walk, and is often well tolerated in children, if it is not painful. However it may present in childhood with dysfunction and instability. Very little literature is available on habitual dislocation of patella as most of the studies have combined cases of recurrent dislocation with habitual dislocation. Many different surgical techniques have been described in the literature for the treatment of habitual dislocation of patella. No single procedure is fully effective in the surgical treatment of habitual dislocation of patella and a combination of procedures is recommended.

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1. Introduction

Habitual dislocation of patella is a condition where the patella dislocates whenever the knee is flexed and spontaneously relocates with extension of the knee.

It is also termed as obligatory dislocation as the patella dislocates completely with each flexion and extension cycle of the knee and the patient has no control over the patella dislocating as he or she moves the knee.¹ It usually presents after the child starts to walk, and is often well tolerated in children, if it is not painful. However it may present in childhood with dysfunction and instability.

Very little literature is available on habitual dislocation of patella as most of the studies have combined cases of

recurrent dislocation with habitual dislocation. Many different surgical techniques have been described in the literature for the treatment of habitual dislocation of patella. No single procedure is fully effective in the surgical treatment of habitual dislocation of patella and a combination of procedures is recommended.

2. Presentation

Lateral dislocation or subluxation of the patella in children can present in three different forms. It can be recurrent when dislocation is episodic, habitual when it occurs during each flexion movement of the knee and permanent when it persists in all positions of the knee.²

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The displacement is painless in habitual dislocation, in marked contrast to recurrent dislocation which occurs as isolated episodes, often in response to trauma and is accompanied by pain and swelling. Permanent dislocation is usually congenital and refers to an irreducible dislocation present since birth and associated with a lateral position of the entire quadriceps mechanism. The distinction between these groups is important as the surgical treatment for each group is quite different.³

Habitual dislocation of patella is never obvious in the young, fat-covered knee and may be missed unless actively sought.^{2–5} It usually presents after the child starts to walk, and is often well tolerated in childhood. It is usually asymptomatic and is often detected by the parents as an odd looking knee or is detected on routine examination in many children. However it may present in childhood with features of dysfunction and inability to run because of instability.^{3,4}

It is usually symptomatic when detected in adults with major symptom of patella-femoral pain and weakness during running or climbing stairs, crepitus, and joint effusion.⁶

The cardinal physical sign in habitual dislocation is that if the patella is forcibly held in the midline it is impossible to flex the knee more than 30–70°. Further flexion is then possible only if the patella is allowed to dislocate, when a full range of motion is readily obtainable.^{3,4}

3. Pathophysiology

Various pathological factors have been described in the pathogenesis of habitual dislocation of patella. The most important factor is contracture of soft tissues lateral to patella.

Jeffreys in 1963 described an abnormal attachment of the iliotibial tract to the patella, producing habitual dislocation in flexion.⁷ Later, Gunn in 1964 described the association of quadriceps fibrosis with intramuscular injections to the thighs. He also put forward the idea that quadriceps contracture may sometimes give rise to dislocation of the patella.⁸ This association was later confirmed by Gammie (1963), Lloyd-Roberts and Thomas (1964), Williams (1968) and Alvarez et al. (1980).^{4,9–11} Groves and Goldner in 1974 described that local trauma of the injection itself could produce muscle necrosis and fibrosis and, introduction of large volumes of liquid could produce raised pressure within muscle bundles resulting in capillary obstruction, oedema and muscle ischaemia. The irritant quality of the solution varied with its components, pH and osmotic pressure.¹²

The histological studies in cases of habitual dislocation of patella have consistently shown degeneration of striated muscle and replacement with varying amounts of fibrous and adipose tissue.^{9–11,13} An MRI study performed on 28 patients with recurrent or habitual dislocation found signs of fibrosis of the vastus lateralis in patients with insidious onset of dislocation. It was not seen in cases with history of trauma. The fibrosis was evident as low signal intensity cords on T2 weighted images. Histological examination in these cases revealed inflammatory cell infiltration, fibrosis and muscle fibre degeneration.¹⁴

Williams reported clinical presentations and pathophysiology in patients with quadriceps contractures. He reported that quadriceps contracture patients may present in a variety of ways. At birth they may present with a stiff extended knee or congenital recurvatum or congenital dislocation. In later childhood they present with habitual dislocation of the patella. In adults there may be a painful knee due to habitual dislocation and arthritis. He reported that his patients with habitual dislocation had contractures of all parts of quadriceps except vastus medialis. The contractures were mainly seen in the vastus lateralis (the main contributor in over half the cases) and rarely in the iliotibial band or rectus femoris. Stretching of the vastus medialis tendon was associated with the laxity of the medial capsule in these patients. Abnormal bands and connections in the tendinous insertion of the quadriceps were found, and were thought to be of congenital origin. Other abnormalities including a shallow femoral groove, hypoplastic lateral femoral condyle, and lateral insertion of the patella tendon were also noted. A number of patients had history of intramuscular injections in the thigh in the neonatal period leading to contractures later on. Late presentation in all these cases was caused by unequal growth of muscle and bone so that the effect on the knee was not apparent for a number of years. Most cases presented between the ages of 5 and 12 years when the femur is growing disproportionately to the quadriceps. Family history of dislocation was positive in a few patients and other abnormalities were noticed in some cases.

He also noted that quadriceps fibrosis involving the rectus femoris and vastus intermedius alone would result in an elevated and hypoplastic patella. When the vastus lateralis and the iliotibial tract are involved there is great tendency for habitual dislocation of the patella to occur on flexion of the knee. He noted that habitual dislocation was not seen in all cases in which vastus lateralis and the iliotibial tract were contracted. Whether or not habitual dislocation occurred depended on factors extrinsic to the quadriceps such as femoral torsion, dysplasia of the lateral femoral condyle, genu valgum, a laterally placed patellar tendon insertion and ligamentous laxity.^{3,4}

Bakshi described the difference in the pathology of recurrent and habitual dislocations. In recurrent dislocations, there were no contractures of the soft tissue lateral to the patella, but medial stabilisation was found to be weak. In habitual dislocation, where flexion of the knee was always associated with displacement of the patella, both lateral contractures and medial laxity were present. Genu valgum, defects of the patella and femoral condyles were also present in a few cases of habitual dislocations. He noted that in recurrent dislocation, the medial stabilization of the patella was poor because of weakness of the vastus medialis, dysplasia, generalized joint laxity, or post traumatic medial capsular laxity. In habitual and permanent dislocations of patella, the superolateral muscle contracture was the primary pathology. Whether it was idiopathic or due to injection fibrosis; medial laxity or weakness of the medial stabilizers of the patella was secondary.

He noted that a number of bony deformities can be associated with dislocations of the patella, but may not be the actual cause. Corrective osteotomy for genu valgum

associated with lateral dislocation of the patella, often failed to control the dislocation; and many patients with severe genu valgum did not suffer from dislocation of the patella. Bone factors probably had only a small role in the dynamic stability of the patella. EMG studies of vastus lateralis, vastus medialis and pes anserinus muscles were performed in all cases. Weak activity of vastus medialis and fair activity of the vastus lateralis was seen in patients with habitual dislocations.^{2,15}

Similar findings were reported by other authors showing contractures of quadriceps mechanism in cases of habitual dislocation of patella.^{11,16} In a series of six cases by Joo et al., all patients were found to have contractures of lateral structures with severe generalized ligamentous laxity and aplasia of the trochlear groove along with convex intercondylar notch. All patellae were small, hypoplastic and hypermobile but no patient had patella alta.⁵ A study by Shen (2007) on 12 adult patients with 13 symptomatic knees presenting with habitual dislocation of patella showed fibrosis and contractures of the quadriceps muscle mainly involving vastus lateralis and the ilio-tibial band along with several predisposing factors that aggravated the patellar instability, including trochlear dysplasia, insufficiency of the MPFL, patella alta, abnormal Q angle and genu valgum.⁶ In a case report published by Satoshi Ohki (2010), initial patella dislocation was shown to progress gradually to habitual dislocation. He recommended cautious physical examination regarding patella tracking since radiological examinations, including skyline view do not always show the pathophysiology of patellar instability.¹⁷

4. Treatment

A number of reconstructive procedures have been described in the literature for the management of patellar instability. No single procedure has shown to be effective in the management of habitual dislocation of patella and a combination of procedures involving proximal and distal reconstruction are recommended.^{2–4,6,15–17} Where the articular surface of the patella is healthy or shows mild degenerative changes, different reconstructive procedures are indicated. When patella or femoral condyles show severe degenerative changes, patellectomy is advocated (Macnab, 1952).¹⁸ However, patellectomy without quadriceps-plasty may result in recurrent dislocation of the tendon and soft tissue realignment is necessary (West and Sotth-Hall, 1958).¹⁹

Traditionally, habitual dislocation has been treated in the same way as recurrent dislocation except for the need for lengthening of the quadriceps tendon. Most authors have reported habitual dislocation in association with shortening of the quadriceps muscle, and consider that lengthening of the tendon is an essential part of the procedure to allow the patella to remain reduced after the realignment.

Williams (1968) described the surgical procedure for realignment of soft tissues in habitual dislocation of patella. He advocated division of abnormal attachment of the fascia lata to the patella followed by division of dense contracted bands within the tendon of attachment of vastus lateralis. This is followed by complete dissection of vastus lateralis from its attachment to the patella and the lateral side of rectus femoris. If full flexion of knee is possible at this stage, vastus is

repaired and the wound is closed. If full flexion is still not possible, either the vastus intermedius tendon requires division or the tendon of rectus femoris needs elongation. If patella still dislocates after full flexion is achieved, distal realignment is added.⁴

In a later publication, Williams (1988) said that habitual dislocation of the patella always required releases proximal to the patella and quadriceps lengthening was an essential part of treatment and must be performed proximally. During surgery, he found that there were well defined bands, or muscular contractures within the quadriceps in each case. Vastus lateralis was involved in 72% cases. This generally comprised a dense, fibrous band running along its lower border. An abnormal attachment of the iliotibial tract to the patella was seen in 58%. This band had a rolled anterior border that sweeps forward to the patella rather than having its main attachment to the tibia.

During surgery the tight lateral bands were released from the patella and the incision was continued proximally, lateral to the rectus femoris tendon, thus fully releasing the vastus lateralis. Vastus intermedius was inspected and divided if tight. When necessary, rectus femoris was lengthened at the musculotendinous junction (37% cases). Depending on the pathology; medial plication, advancement of vastus medialis across the anterior surface of the patella, patellar tendon transfer or transfer of sartorius to the patella was added. Extensor lag was always present whenever rectus femoris was lengthened which resolved in due course of time with physiotherapy.

A few complications were seen that included wound haematoma, lateral popliteal nerve palsy and wound dehiscence. A flat patellar undersurface and flat femoral groove were commonly seen at review but did not prevent a successful outcome. Redislocation was seen in a few cases and was due to either rectus lengthening not being performed at initial surgery or failure to realign distally when a lateral patellar tendon insertion was detectable clinically, or reformation of contractures.

They recommended that distal procedures alone are certain to fail, and if the procedure involves distal advancement of the tibial tendon the condition will actually be made worse. In other words it is essential to lengthen the quadriceps above the patella rather than to shorten it below the patella.³

Bakshi (1993) published a series of 98 cases of patellar dislocations treated surgically. The corrective surgery for habitual dislocation involved release of any superolateral contracture, until the patella remained in the intercondylar groove in the fully flexed position of the knee. This was not necessary in patients with recurrent dislocation in whom no such contractures were demonstrated. If it was not possible to fully flex the knee at this stage, rectus femoris with or without vastus intermedius was lengthened to achieve reduction in full flexion of the knee. He advocated pes anserinus sling procedure and showed that pes anserinus sling was stronger than a vastus medialis advancement to the lateral border of the patella as described by Madigan et al.,²⁰ since this muscle is weak and functionally inefficient in cases of permanent and habitual dislocation. He said that tibial tuberosity transplant might be useful in adults, but in

Fig. 1 – Case 1: Tight fibrous bands between Iliotibial tract and patella.

Fig. 4 – Case 1: Advancement of vastus medialis over patella.

Fig. 2 – Case 1: Patella reduced after release of Iliotibial tract and vastus lateralis.

Fig. 3 – Case 1: Patella reduced after release of Iliotibial tract and vastus lateralis.

Fig. 5 – Case 2: Dislocated patella on flexion of knee.

children it could cause genu recurvatum from premature closure of the anterior part of the epiphysis and distal migration of the tibial tubercle and traction spur. A few recurrences were seen. At re-exploration in each case, recurrent contracture was apparent in the line of the original vastus lateralis, and there had been incomplete elongation of rectus femoris or vastus lateralis.²

Gao et al. (1990) also showed satisfactory results in 87% cases with extensive lateral release, medial plication and transfer of lateral half of the patella tendon. Lengthening of the rectus femoris tendon was also required in many cases in their series.¹⁶

Joo et al. (2007) performed four in one procedure which included lateral release, proximal tube realignment of the patella, semitendinosus tenodesis and transfer of the patella tendon. They found that vastus medialis was so deficient that muscle advancement was not possible. In contrast to other studies, they found that normal patellar tracking was maintained without lengthening of the quadriceps tendon in all cases. They recommended early surgery and showed gradual improvement in the development of the femoral trochlear groove in response to the re-centering of the patellar

Fig. 6 – Case 2: Tight fibrous bands between Iliotibial tract and patella.

mechanism. They believed that even in the presence of severe ligamentous laxity, development of the trochlear groove could be expected during the remaining growth when the patella is realigned at a young age.⁵

Shen (2007) performed combined proximal and distal procedure in 12 adult patients with habitual dislocation of patella. The surgery included lateral release, advancement of medial retinaculum, and the anteromedial tibial tubercle transfer. The average age at surgery was 25.4 years. They performed arthroscopy in all cases and found that chondromalacia of the patella (grade III to grade IV) was present in all cases. Erosion of the corresponding lateral femoral condyle was noted in all cases. The major intra-operative finding was contracture of the lateral patellar retinaculum with fibrotic bands in the superolateral aspect of patella. Second look arthroscopy performed after 1 year of surgery showed no obvious deterioration of the patellar cartilage. Most of their patients had satisfactory result with great improvement in function after surgery. Pain related to degenerative changes in the patello-femoral joint was seen at long term follow up in 12% of patients treated for habitual dislocation of patella. The main

Fig. 7 – Case 2: Final picture after proximal and distal realignment.

Fig. 8 – Case 3: Full Flexion at follow up with relocated patella.

cause of this deterioration was the onset or worsening of patella-femoral joint pain, but no patellar instability. They also recommended that various soft tissue procedures are necessary in combination for the correction of habitual dislocation of patella in adults with high grade patella-femoral chondromalacia.⁶

Benoit (2007) published their series of 12 cases of habitual dislocation of patella with patella alta. The surgical procedure involved proximal realignment which included lateral release and a medial advancement of the VMO with a new technique of distal realignment which addressed patella alta. The patellar height was restored to normal by distal advancement of patellar tendon. He showed good results with improvement of sulcus angle at follow up.²¹

Figs. 1–4 show the abnormal pathology in the form of abnormal lateral bands between iliotibial tract and patella. The patella has been stabilized with extensive proximal release and vastus medialis advancement.

Figs. 5–8 show abnormal pathology and final stabilization of patella with proximal release and distal bony realignment (Fulkerson modification of Elmslie-Trillat procedure) with good function.

5. Conclusion

- No single procedure is fully effective in the surgical treatment of habitual dislocation of patella.
- The pathology is primarily proximal: hence proximal procedures are done before distal procedures which are required only in older children.
- Extensive proximal lateral release is a must in all cases.
- Decision to be taken intra-op for the correct combination of procedures required.
- Operate early as the magnitude of surgery increases with late presentation.
- Development of the trochlear groove is expected during the remaining growth when the patella is realigned at a young age.

Treatment Algorithm for habitual Dislocation of Patella

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