

Case Report

Restoring stability - 4 in 1 quadriceps plasty for habitual patella dislocation in a ten-year-old child: a case report

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ABSTRACT

Complex clinical and surgical challenges accompany both congenital or fixed dislocations and obligatory or habitual patellar dislocations. Habitual dislocation of the patella is the most severe type of patellar instability and frequently call for surgical intervention. Various surgical procedures have been documented to address habitual patellar dislocation. Since no approach is 100% effective, a combined approach of techniques is recommended for the surgical treatment of habitual patellar dislocation. This article aims to describe the 4-in-1 quadriceps plasty procedure used to stabilize a 10-year-old child's fixed and habitual patellar dislocation.

Keywords: Habitual patellar dislocation, Quadricepsplasty, Patellar stabilization, Patella, Soft tissue surgery

INTRODUCTION

A condition known as habitual dislocation of the patella occurs when the patella dislocates during knee flexion and relocates when the knee is extended. Since the patient has no control over the patella dislocating when they move their knee, it is also known as obligatory dislocation.¹ Habitual dislocation of patella regularly occurs in the first decade of life. It is commonly seen among children as they begin to walk. It is often well tolerated and usually unnoticed by the child's parents. The child may present with symptoms like frequent falls, genu valgum, knee deformity, abnormal gait, giving way episodes. Conservative treatment, physical therapy, and bracing reduce symptoms but do not resolve patellar instability. Various surgical techniques have been proposed to treat pediatric population. Surgery should not be delayed as there is risk of painful arthrosis, Trochlea remodeling.² We present a case of ten-year-old child with habitual patella dislocation treated by 4 in 1 quadriceps plasty.

CASE REPORT

Ten-year-old male child presented with complaints of outward slipping of the patella during knee movements

since two months. The child recalls a history of jumping off a compound wall sustaining an injury to the left knee following which he complained of outward slipping of the patella. Examination of the knee joint showed that patella was in a normal position in extension and moved outwards on flexion of the knee. The patellar glide test was positive such that the patella moved three quadrants laterally at 20 degrees flexion of the knee. Patella tracking was found to be negative at 45 degrees to complete extension of the knee joint. Standard radiographs (Figure 1) and computed tomography (CT) scans were done. Caton deschamps ratio was 1.04, Insall-Salvati ratio was 1.5 and Blackburne – Peel ratio was 1.2. The Sulcus angle was 164 degrees. Patello femoral instability was noted. TT-TG ratio was 20 mm.

Operative procedure

A 10-cm anterior midline knee incision was performed while the patient was in the supine position under general anesthesia (Figure 2a). Lateral para-patellar arthrotomy and wide lateral releases were carried out (Figures 2b-d). The medial retinaculum and VMO was released and brought over the patella and quadriceps tendon before being sutured to the inferolateral part of the patella.

Quadriceps tube plasty was done as described (Figure 2e). Further on, Roux Goldthwait procedure was performed as follows (Figure 2f). The lateral half of the patellar tendon was split and passed medially. The tendon was then sutured to the tibial tuberosity. Quadriceps tendon

lengthening was achieved by pie crusting. Patellofemoral tracking was evaluated intra operatively through the range of motion (Figure 2g). With the knee in 15-20 degrees of flexion, an above-knee cast was applied.



Figure 1: Pre-operative radiograph: antero-posterior and skyline view.

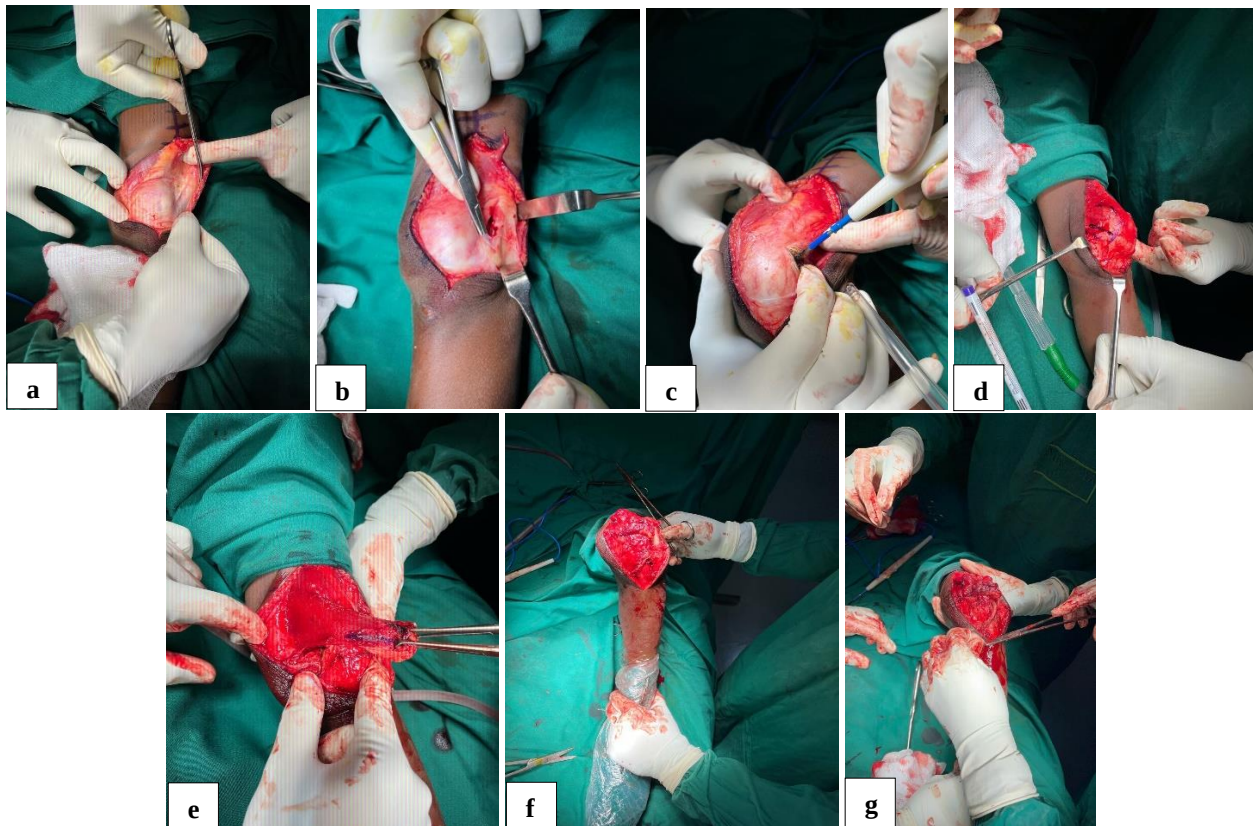


Figure 2: Intra-operative images of the patient (a) anterior midline knee incision, (b) lateral retinacular release and arthrotomy, (c) lateral retinacular release and arthrotomy, (d) lateral retinacular release and arthrotomy, (e) proximal tube quadricepsplasty, (f) Roux Goldthwait procedure with split patellar tendon, and (g) Patello-femoral tracking done intraoperatively.

Rehabilitation

Following surgery, weight-bearing was permitted with a walker or crutches. At three weeks, the cast was taken off. The next step consisted of physical therapy to help with range of motion. A follow-up radiograph of the patient's knee was taken one month after surgery (Figure 3a and b). After that, the range of motion, especially knee flexion, continued to improve (Figure 4a and b).



Figure 3: Postoperative radiographs anteroposterior and lateral views of (a) immediate postoperative period, and (b) at one month follow up.



Figure 4: (a) Flexion of the knee at follow up with relocated patella, and (b) complete extension of the knee joint with patella in position.

DISCUSSION

Several factors contribute to the development of obligatory patellar dislocation, with the key pathological issues being insufficiency of the medial soft tissues and contracture of the lateral soft tissues, occasionally the quadriceps and atrophy of the vastus medialis obliquus. Bony abnormalities, including underdevelopment of the femoral trochlear groove, genu valgum, increased femoral anteversion or external tibial torsion, and a high-riding patella, also contribute to the risk factors.³ In obligatory patellar dislocation, the extensor mechanism lacks sufficient length and flexibility to enable full knee flexion with the patella in a centered position, primarily due to quadriceps contracture.

As a result, the patella is pulled laterally along a restricted path of the extensor mechanism, permitting knee flexion only when the patella is displaced laterally.⁴

Numerous quadricepsplasty procedures have been mentioned in the literature.⁵⁻⁷ Historically, habitual dislocation has been managed similarly to recurrent dislocation, with the notable exception of requiring quadriceps tendon lengthening. Most researchers have noted that habitual dislocation is commonly associated with a shortening of the quadriceps muscles and believe that lengthening the tendon is vital for maintaining the patella's proper alignment after realignment.⁸

In a growing child, surgical choices for transferring the origin of the patellar tendon are constrained by the presence of open growth plates.⁴ According to some researchers, the approach should be tailored based on the extent of quadriceps dysfunction and may involve a combination of lateral retinacular release, medial vector augmentation, and patellar tendon realignment.⁹⁻¹¹

Fondren et al suggested using the modified Roux-Goldthwait technique for patients exhibiting an increased Q-angle.¹² Marsh et al achieved favorable outcomes by incorporating this technique along with a lateral retinacular release for treating recurrent patellar dislocation in adolescents.¹³

Step-wise, targeted release and controlled lengthening of sections of the lateral retinaculum and quadriceps tendon allows for sufficient elongation while minimizing the risk of iatrogenic over-lengthening, which could lead to extension lag.¹⁴

Universal midline incision was used. No bony procedures were required. Ensuring there was at least 90 degrees of flexion intraoperatively, reduces the risk of complications including extensor lag and knee stiffness. To prevent eversion of patella, the undersurface of the medial flap was sutured to the medial patella, lateral stabilization was achieved through lengthening and release of the lateral retinaculum, and the lateral half of the patellar tendon was transferred.

The benefits of the approach outlined here include its specific design for treating habitual patellar instability, the provision of a standardized, stepwise method for both evaluation and treatment, and its respect for dissection planes and innervation. It also maintains tendon continuity through reattachment and/or tendon-to-tendon suturing (ensuring no tendon is fully released). Additionally, it achieves an optimal balance between the medial and lateral soft tissues.

CONCLUSION

Structures can be carefully extended and tissue tension can be adjusted by step-by-step procedures. The patellar tendon's intact medial half would preserve the extensor mechanism. Additional benefits of this technique include its physseal respectful nature, eliminates the need for implants, fluoroscopy, and drilling, which makes it suitable for situations with minimal resources.

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