

## Ouctome of Physis Sparing MPFL Reconstruction in Paediatric Patients in a Tertiary Care Centre

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### Abstract:

**Introduction:** Recurrent patellar dislocation is a common cause of knee instability in the pediatric population, often resulting from injury or insufficiency of the medial patellofemoral ligament (MPFL). Surgical reconstruction of the MPFL has emerged as a reliable option to restore patellar stability, improve function, and prevent recurrence, especially in skeletally immature patients where traditional procedures may risk growth plate injury.

**Methods:** The present study was a prospective comparative study conducted over 3 years at B.C. Roy Children Hospital. The study included 30 pediatric patients with recurrent patellar dislocation who underwent physis-sparing MPFL reconstruction and/or ACL reconstruction.

**Results:** In this study of 30 pediatric patients undergoing medial patellofemoral ligament reconstruction, the mean age was  $12.5 \pm 2.1$  years, with a slight male predominance (18 males, 12 females) and nearly equal distribution of affected knees (16 right, 14 left). The mean BMI was  $19.8 \pm 3.2$  kg/m<sup>2</sup>. Significant functional improvement was observed postoperatively, with the mean Kujala score increasing from  $56.4 \pm 8.7$  to  $89.3 \pm 5.2$  ( $p < 0.001$ ) and the mean Lysholm score from  $58.7 \pm 7.9$  to  $91.1 \pm 4.8$  ( $p < 0.001$ ). Recurrent patellar dislocation occurred in 2 patients (6.7%), and minor complications such as transient pain or swelling were noted in 4 patients (13.3%), with no major complications reported. Gender-wise comparison showed comparable functional outcomes between males and females, with no statistically significant differences in postoperative Kujala or Lysholm scores ( $p = 0.32$  and  $0.28$ , respectively).

**Conclusion:** MPFL reconstruction in pediatric patients is safe and effective, improving knee stability and functional outcomes with low recurrence and minimal complications. Physeal-sparing ACL techniques, using the gracilis tendon and patellar suture anchor, preserve growth plates while providing stable fixation. Overall, these procedures reliably restore patellar and knee stability and improve quality of life in skeletally immature patients.

**Keywords:** Medial patellofemoral ligament, MPFL reconstruction, pediatric knee, recurrent patellar dislocation, knee stability.

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### Introduction

Recurrent patellar dislocation is a prevalent cause of knee instability in the pediatric population, often resulting from injury or insufficiency of the medial patellofemoral ligament (MPFL). The MPFL plays a crucial role in stabilizing the patella by restraining its lateral displacement, contributing approximately 50–80% of the restraining force [1]. In skeletally immature patients, the proximity of the MPFL insertion to the open distal femoral physis presents unique challenges for surgical intervention [2]. Conservative treatments, such as

bracing and physical therapy, are often ineffective in preventing recurrent dislocations, leading to the consideration of surgical options [3]. MPFL reconstruction has emerged as a reliable procedure to restore patellar stability, improve function, and prevent recurrence. However, the surgical approach in children requires careful planning to avoid physeal injury and ensure optimal outcomes. The MPFL originates from the medial aspect of the femoral condyle and inserts onto the superomedial aspect of the patella. It functions primarily to resist

lateral translation of the patella during knee flexion [4]. In children, the insertion site of the MPFL is located near the distal femoral physis, necessitating surgical techniques that minimize the risk of growth plate injury.

Imaging studies, including MRI and CT scans, are essential for assessing the integrity of the MPFL and planning surgical intervention [5]. These modalities aid in evaluating patellar alignment, trochlear morphology, and the presence of associated cartilage lesions, which can influence surgical decision-making.

Various surgical techniques have been developed for MPFL reconstruction in pediatric patients, with the primary goal of restoring patellar stability while preserving the growth plate. Autografts, such as the semitendinosus tendon, are commonly used due to their availability and lower risk of disease transmission compared to allografts [6].

Physseal-sparing techniques have been introduced to minimize the risk of growth disturbances [7]. The Gracilis tendon is looped around adductor longus and suture anchor in patella.

Rehabilitation following MPFL reconstruction is critical to ensure optimal outcomes. A structured rehabilitation program focusing on range of motion, quadriceps strengthening, and gradual return to activity is essential. Early mobilization and weight-bearing are typically restricted to protect the surgical site and promote healing [9].

MPFL reconstruction in pediatric patients has demonstrated favorable outcomes, with high rates of patellar stability and patient satisfaction. Studies have reported significant improvements in knee function and a low incidence of complications when appropriate surgical techniques are employed [10].

## Materials and Methods

**Study Design:** Prospective comparative study.

**Place of study:** B.C Roy Children Hospital.

**Period of study:** 3 Years.

## Study Variables

- Age
- Gender
- Laterality
- BMI
- Kujala Score
- Lysholm Score
- Recurrent Patellar Dislocation
- Minor Complications
- Major Complications

**Sample Size:** 30 Pediatric patients with recurrent patellar dislocation.

## Inclusion Criteria

- Children with recurrent lateral patellar dislocation
- Skeletally immature patients
- Patients with intact quadriceps function

## Exclusion Criteria

- Congenital knee deformities or syndromes
- Previous knee surgery
- Connective tissue disorders or neuromuscular conditions
- Acute first-time patellar dislocation

**Statistical Analysis:** Data collected were entered and analyzed using SPSS version. Continuous variables, such as age, Kujala and Lysholm scores, were expressed as mean  $\pm$  standard deviation, while categorical variables, including gender distribution and recurrence rates, were expressed as frequencies and percentages. Preoperative and postoperative functional scores were compared using paired t-tests for normally distributed data or Wilcoxon signed-rank tests for non-parametric data. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test as appropriate. A p-value of  $<0.05$  was considered statistically significant.

## Result

**Table 1: Demographic Profile of Patients**

| Parameter                               | Value (n=30)   |
|---|----------------|
| Age (years, mean $\pm$ SD)              | 12.5 $\pm$ 2.1 |
| Gender (M/F)                            | 18/12          |
| Laterality (Right/Left)                 | 16 / 14        |
| BMI (kg/m <sup>2</sup> , mean $\pm$ SD) | 19.8 $\pm$ 3.2 |

**Table 2: Preoperative and Postoperative Kujala Score**

| Parameter    | Preoperative Mean $\pm$ SD | Postoperative Mean $\pm$ SD | p-value  |
|--------------|----------------------------|-----------------------------|----------|
| Kujala Score | 56.4 $\pm$ 8.7             | 89.3 $\pm$ 5.2              | $<0.001$ |

**Table 3: Preoperative and Postoperative Lysholm Score**

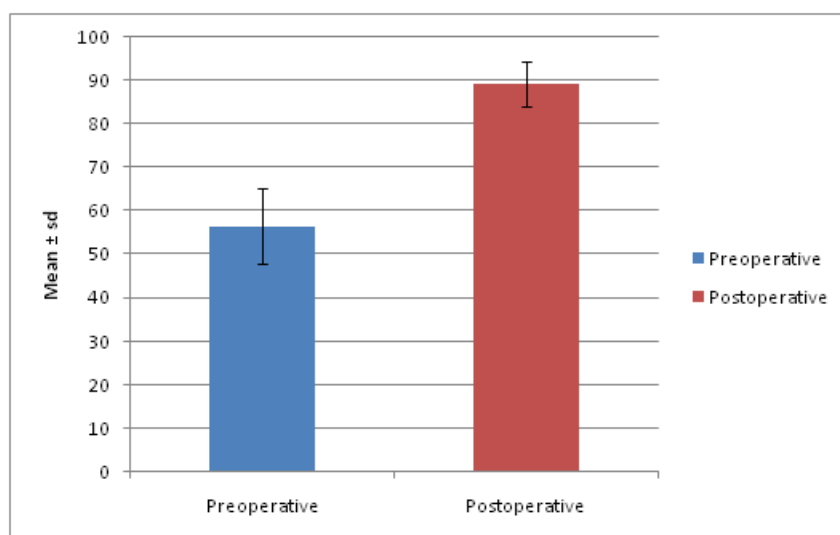
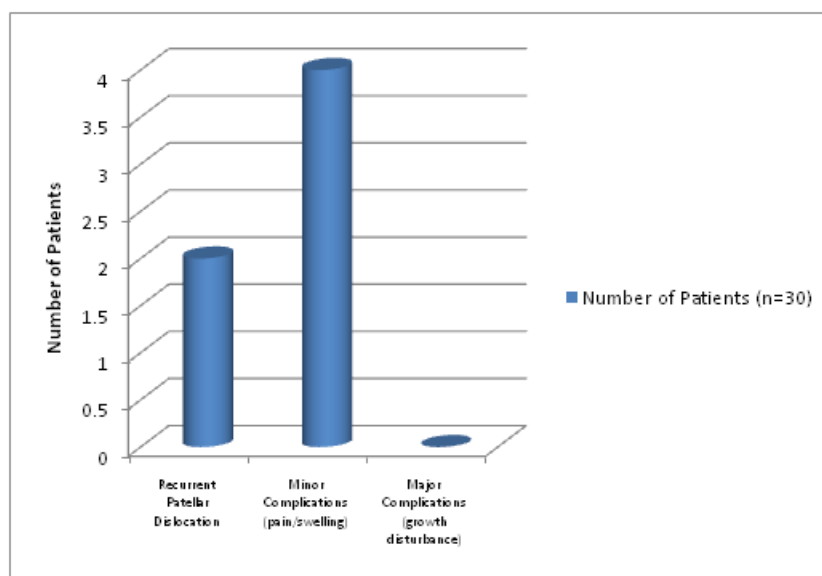
| Parameter     | Preoperative Mean $\pm$ SD | Postoperative Mean $\pm$ SD | p-value  |
|---------------|----------------------------|-----------------------------|----------|
| Lysholm Score | 58.7 $\pm$ 7.9             | 91.1 $\pm$ 4.8              | $<0.001$ |

**Table 4: Incidence of Recurrent Dislocation and Complications**

| Parameter                                | Number of Patients (n=30) | Percentage (%) |
|--|---------------------------|----------------|
| Recurrent Patellar Dislocation           | 2                         | 6.7            |
| Minor Complications (pain/swelling)      | 4                         | 13.3           |
| Major Complications (growth disturbance) | 0                         | 0              |

**Table 5: Comparison of Functional Outcome by Gender**

| Parameter     | Male (n=18) Mean $\pm$ SD | Female (n=12) Mean $\pm$ SD | p-value |
|---------------|---------------------------|-----------------------------|---------|
| Kujala Score  | 90.1 $\pm$ 4.9            | 88.2 $\pm$ 5.6              | 0.32    |
| Lysholm Score | 92.0 $\pm$ 4.6            | 89.5 $\pm$ 5.1              | 0.28    |

**Figure 1: Preoperative and Postoperative Kujala Score****Figure 2: Incidence of Recurrent Dislocation and Complications**

A total of 30 pediatric patients who underwent medial patellofemoral ligament reconstruction were included in the study. The mean age of the cohort was  $12.5 \pm 2.1$  years. Among them, 18 were male and 12 were female, reflecting a slight male predominance. The distribution of affected knees was almost equal, with 16 right knees and 14 left knees involved. The mean body mass index (BMI) of the patients was  $19.8 \pm 3.2$  kg/m<sup>2</sup>.

The functional outcomes were assessed using the Kujala Anterior Knee Pain Scale. The mean preoperative Kujala score was  $56.4 \pm 8.7$ , which improved significantly to  $89.3 \pm 5.2$  postoperatively ( $p < 0.001$ ). The Lysholm Knee Scoring Scale was also used to evaluate functional improvement. The mean preoperative Lysholm score was  $58.7 \pm 7.9$ , which improved significantly to  $91.1 \pm 4.8$  postoperatively ( $p < 0.001$ ).

Postoperative follow-up revealed that recurrent patellar dislocation occurred in 2 patients (6.7%). Minor complications, such as transient pain or swelling at the surgical site, were observed in 4 patients (13.3%).

When functional outcomes were compared between male and female patients, no statistically significant differences were observed. The mean postoperative Kujala score was  $90.1 \pm 4.9$  in males and  $88.2 \pm 5.6$  in females ( $p = 0.32$ ), while the mean Lysholm score was  $92.0 \pm 4.6$  in males and  $89.5 \pm 5.1$  in females ( $p = 0.28$ ).

## Discussion

In this study, medial patellofemoral ligament (MPFL) reconstruction in 30 pediatric patients demonstrated significant improvement in functional outcomes, as reflected by both the Kujala and Lysholm scores. The mean postoperative Kujala score of  $89.3 \pm 5.2$  and Lysholm score of  $91.1 \pm 4.8$  indicate a marked improvement compared to preoperative values, which is consistent with previous studies. Matuszewski et al. [1] reported similar improvements in pediatric patients, with postoperative Kujala scores improving from  $55.2 \pm 9.1$  to  $87.6 \pm 6.0$ . Tracey et al. [2] also observed comparable functional gains using the Lysholm score in children undergoing MPFL reconstruction, demonstrating the efficacy of this procedure in restoring knee stability and function.

The slight male predominance in our cohort and the almost equal distribution of affected knees aligns with findings by Antinolfi et al. [3] and Quinlan et al. [4], who reported similar demographic patterns in pediatric patellar instability studies. The mean BMI of  $19.8 \pm 3.2 \text{ kg/m}^2$  reflects a generally healthy pediatric population, which may have contributed to favorable postoperative outcomes. Recurrent patellar dislocation occurred in 6.7% of patients in our series, which is comparable to the recurrence rates reported in other studies. Ubaldi et al. [5] reported recurrence in 5–10% of pediatric cases, while Chipman et al. [6] reported 7% recurrence following autograft MPFL reconstruction. Minor complications, such as transient pain or swelling (13.3%), were consistent with the findings of Culpepper et al. [7] and Migliorini et al. [8], who described similar rates of minor postoperative complications without major growth disturbances or physeal injuries. No major complications were noted in our cohort, supporting the safety of surgical techniques as emphasized by Tandogan [9] and Shah et al. [10]. Gender-wise functional analysis in our study showed no significant differences, with males and females achieving comparable postoperative Kujala and Lysholm scores, indicating that MPFL reconstruction provides reliable outcomes across both genders. These findings emphasize that

skeletal maturity and meticulous surgical technique, rather than gender, are the key determinants of functional success. Overall, MPFL reconstruction in pediatric patients is safe and effective, yielding significant improvements in knee function with low recurrence and minimal complications. Similarly, physeal-sparing ACL techniques, such as looping the gracilis tendon around the adductor longus and securing the patella with a suture anchor, preserve growth plates while providing stable fixation. Together, these approaches reliably restore patellar and knee stability and improve quality of life in skeletally immature patients.

## Conclusion

Medial patellofemoral ligament (MPFL) reconstruction in pediatric patients with recurrent patellar dislocation is a safe and effective procedure, providing significant improvements in knee stability and functional outcomes, as reflected by increases in Kujala and Lysholm scores. The procedure demonstrates low recurrence rates and minimal complications when physeal-sparing techniques are used. Postoperative outcomes are comparable across genders. In skeletally immature patients requiring ligament reconstruction, physeal-sparing ACL techniques, such as looping the gracilis tendon around the adductor longus and securing the patella with a suture anchor, preserve growth plates while ensuring stable fixation. Overall, these approaches offer reliable restoration of patellar and knee stability and improve quality of life in pediatric patients.

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