

Patellar Dislocation: A Comparative Study of Outcomes Following Different Combined Surgical Stabilisation Techniques

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Abstract

The Patellar dislocation is a multifactorial disorder with high prevalence in young people and, in most cases, leads to recurrent instability and impairment of function. To restore patellofemoral stability, different combined surgical methods are used, but not much comparative evidence has been done on their results. This is a prospective observational study consisting of fifteen patients with patellar dislocation undergoing a surgical intervention within the period of September 2022 and August 2024. The patients were divided into three categories: the reconstruction of the medial patellofemoral ligament (MPFL) using medial patellar retinaculum (MPR) plication, the lateral patellar retinaculum (LPR) release using MPR plication, and the MPFL reconstruction using the LPR release. Due to functional outcomes, the International Knee Documentation Committee (IKDC) and Lysholm scores were used as evaluation instruments, whereas in radiological results, the congruence angle, patellar tilt angle, lateral patellofemoral angle, and lateral patellofemoral index were taken into account. The outcome of all surgical modalities was a great enhancement of radiological alignment and functional score at the follow-up. Intergroup comparison showed that there were greater IKDC and Lysholm scores of the MPFL reconstruction with the LPR release group in comparison with other groups ($p < 0.05$). The method of combined surgical stabilisation procedures is effective in the treatment of patellar dislocation, and MPFL reconstruction in association with the lateral patellar retinacular release has better functional results.

Keywords: Patellar dislocation; MPFL reconstruction; Lateral retinacular release; Medial retinacular plication; IKDC score; Lysholm score

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1. Introduction

Patellar instability is a common knee condition that is more often observed in children, adolescents, and young adults and includes a continuum of clinical presentations, with acute traumatic dislocation on one end and recurrent and habitual instability on the other end (Sanders et al., 2017). Patellar instability aetiology is multifactorial and involves traumatic injury, congenital skeletal anomalies, neuromuscular imbalance, ligamentous laxity and transformed patellofemoral alignment. These factors can either work alone or in combination to interfere with normal tracking of the patella in the trochial groove, leading to instability, pain, and disruption of functions.

According to Patellar dislocation, it is the detachment of a section of the patella that has not been fractured along the trochlea of the femur and is most likely to be dislocated on the lateral side. It is regarded as the second cause of knee traumatic hemarthrosis, the most common of them (Duthon, 2015; Garrett & Grundill, 2021). The incidences have also been observed to be between 5.8 and 77.8 per 100,000 population, with the highest incidence rate recorded to be among adolescents and young adults involved in sporting or physically demanding activity (Gravesen et al., 2017). The clinical effects of patellar dislocation are not limited to the acute scenario but also include repetitive instability, chronic pain, swelling, decreased range of motion, and restriction of daily and athletic activities. Recurring

dislocations are linked to progressive cartilage damage and a higher risk of patellofemoral osteoarthritis, which results in a decrease in functional status in the long run and deterioration of quality of life (Nomura & Inoue, 2005; Sanders et al., 2017).

In case the primary patella dislocation is poorly treated, it can advance to recurrent patellofemoral instability and long-term patellofemoral pathology. The management approaches are to take into account various patient-specific and anatomical factors like age, level of activity, number of dislocations, chronicity, position of lower limbs, and the integrity of both soft tissue stabilisers and articular cartilage. Conventionally, non-operative management has been proposed to be used where the first-time dislocation of the patella is without osteochondral injury. Nevertheless, several studies have indicated high redislocation rates and lingering symptoms after the conservative treatment, leading to concerns about the effectiveness of this method, especially in the young and active population (Erickson et al., 2015; Zhang et al., 2020).

Better knowledge of patellofemoral anatomy and biomechanics has resulted in a paradigm shift in surgical stabilisation in selected cases. The medial patellofemoral ligament (MPFL) has been suggested as the main passive restraint of the lateral patellar displacement, which includes about 50-60% of the restraining force at the first 20-30 degrees of knee flexion (Nomura & Inoue, 2005; Thompson & Metcalfe, 2019). Damage to the

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MPFL is usually noted in the aftermath of patellar dislocation, and the inability to resume the functional capacity has been linked heavily to the occurrence of re-injury. Besides MPFL insufficiency, anatomic risk factors, including trochlear dysplasia, tibia alta, and expanded tibial tuberosity-trochlear groove (TT -TG) distance, and taut retinacular tightness, contribute to patellar maltracking and instability (Dejour et al., 1990, 1994).

Various classification systems have been suggested to classify patellar instability based on anatomical and clinical severity. Dejour et al. have determined that there are significant anatomical risk factors that have a strong correlation with instability, such as trochlear dysplasia, patella alta, patellar tilt and widening of the TT-TG distance (Dejour et al., 1994). Classification models like WARPS and STAID have more recently identified the difference between atraumatic and traumatic instability, as a consequence of poor neuromuscular control and that of anatomically normal knees, respectively, and this illustrates the heterogeneity of patellar instability and the necessity of tailored approaches to its treatment (Hiemstra et al., 2017).

The patellar instability has undergone a change in surgical management whereby isolated soft tissue operation has been replaced by combined surgical procedures that will help in restoring not only the static but also the dynamic stabilisers of the patellofemoral joint. Some of the most commonly used procedures are MPFL reconstruction, lateral patellar retinaculum (LPR) release and medial patellar retinaculum (MPR) plication, as a singleton or a combination procedure based on underlying pathology. In totality, isolated lateral release, which has been commonly used, has been proven to be inadequate and even destabilising when done in isolation (Thompson & Metcalfe, 2019). Conversely, MPFL reconstruction has become a benchmark surgical operation in the case of recurrent patellar dislocation, and it has shown good results in regaining patellar stability and functional ratings (Ahmad et al., 2009; Matic et al., 2014).

Although the use of surgical interventions is growing, no agreement has been reached concerning the most effective combination of interventions to deal with patellar dislocation. Although MPFL reconstruction is also required to correct medial soft tissue insufficiency, additional surgeries, including LPR release surgery or MPR plication, can be required to overcome the lateral tightness or medial laxity to attain balanced patellar tracking. Some comparative analyses of the various combined surgical options have indicated inconsistency in both functional and radiological outcomes, showing the necessity of further research (Du et al., 2017; Wang et al., 2025).

In this respect, this study was conducted to assess the nature of patellar dislocations, as well as compare the results of different combined treatment modalities in surgery. In particular, this research was intended to evaluate and compare clinical, functional, and radiological outcomes after MPFL reconstruction and MPR plication, LPR release and MPR plication, and

MPFL reconstruction and LPR release. Through prospective assessment of these surgical methods, the study aims to make a contribution to evidence-based optimisation of surgical decision-making and better patient outcomes in patellar dislocation.

2. Materials and Methods

2.1 Study Design and Setting

The present prospective observational study was conducted in the Department of Orthopaedics in one of the teaching hospitals in Telangana, India, in the period between September 2022 and August 2024, which is 24 months. The study aimed at comparing clinical, functional and radiological outcomes of different combined surgical modalities which are applied to treat patellar dislocation.

2.2 Study Population

The patients with a first-time or recurrent patellar dislocation and whose admission time is within the study period were eligible to be included in the research. The inclusion criteria included patients with both clinical and radiological diagnoses of patellar dislocation who could not be considered unfit to undergo the surgical intervention. The patients who had related fractures to the knee, had neurovascular injury, open wounds, or were contraindicated to be subjected to surgery were not included in the study.

Fifteen patients that fitted the eligibility criteria were enrolled through convenience sampling. All subjects gave informed consent in writing before participation. The research was conducted in accordance with the principles of the Declaration of Helsinki, and ethical consent to the study was received in the institutional ethics committee.

2.3 Surgical Interventions

The participants were assigned to one of the three combined surgical intervention groups through elaborate clinical evaluation, radiology tests, and surgical results. Standardised operative procedures were used to accomplish all the operations done under the care of experienced orthopaedic surgeons to restore the patellar stability by correcting medial stabilising insufficiency as well as lateral soft-tissue imbalance.

The initial group was undergoing medial patellofemoral ligament (MPFL) repair and medial patellar retinaculum (MPR) plication. Recreation of the MPFL was done with the help of an autologous tendon graft, mostly the semitendinosus tendon, which was removed, prepared and fixed intraoperatively. The graft was placed anatomically as an extension of the patella and femur to recreate the primary medial restraining response against lateral translation of the patella. Placement of the tunnel of the femur was done by considering geometrical landmarks to ensure there was almost no isometric graft behaviour during knee flexion. After MPFL reconstruction, medial patellar retinaculum plication was performed in those who had medial laxity or imbalance of patellar tracking, and this enhanced medial soft-tissue tension and patella alignment.

Patellar Dislocation: A Comparative Study of Outcomes Following Different Combined Surgical Stabilisation Techniques

The second group was subjected to lateral patellar retinaculum (LPR) release and medial patellar retinaculum plication. Lateral retinacular release was done to correct excessive tightness of the lateral retinacular, patellar tilt, and maltracking laterally. This has been done to enable better centralisation of the patella in the trochlear groove and minimise the over-lateral tethering forces. After proper lateral release, medial retinacular plication was done to provide reestablished medial-lateral soft-tissue tension, especially in patients who exhibited medial laxity following a lateral decompression.

The third group had a combined treatment of lateral patellar retinaculum release with the addition of MPFL reconstruction. Lateral release was first done in this group to treat lateral maltracking of the patella and retinacular contracture. This was then marginally followed by MPFL reconstruction to reinstate the primary medial stabilising restraint among patients who had recorded insufficiency of the MPFL, especially

those who had recurrent patellar dislocation. The combination of methods was to optimise patellar tracking through a reduction of lateral forces and reinforcement of medial stabilising structures.

Figure 1 presents representative intraoperative and perioperative pictures of the major steps of the surgical methods used in the present study. In panel A, medial patellofemoral ligament reconstruction is evident, including the radiographic evaluation made before surgery, graft harvesting, patellar tunnel preparation, and fixation of the femur. The illustration of panel B demonstrates the surgical procedure of MPFL reconstruction with semitendinosus graft, graft preparation, and intraoperative fixation. Panel C shows a medial plaque of the knee joint, which is plated, with a focus on correcting the laxity of the medial soft tissues to increase the stability of the patella. These were done individually or together, depending on the case pathology of the patient and intraoperative evaluation.

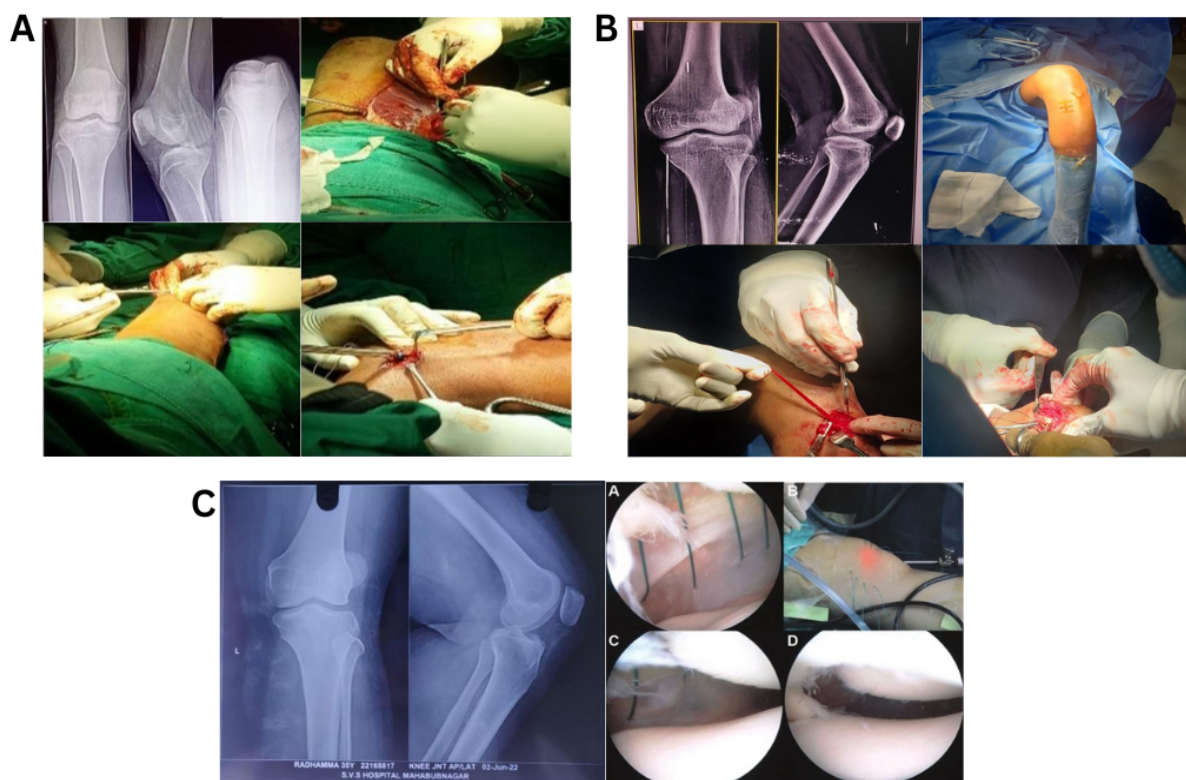


Figure 1. Representative intraoperative and perioperative images demonstrating surgical techniques used for patellar stabilisation: (A) Medial patellofemoral ligament reconstruction, (B) MPFL reconstruction using a semitendinosus autograft, and (C) medial patellar retinaculum plication.

2.4 Outcome Measures

All participants were recorded in terms of demographic data, such as age and sex. The clinical examination involved an elaborate history, recording of the duration of the symptoms and the number of dislocation episodes before the operation. The International Knee Documentation Committee (IKDC) subjective knee evaluation form and the Lysholm knee scoring scale were used to evaluate the functional outcomes. These

outcomes were measured preoperatively and at follow-up.

Radiologic evaluation included regular anteroposterior radiographs and side lateral radiographs of the knee as well as skylining. In clinically suitable cases, magnetic resonance imaging has been performed. The radiological variables included congruence angle, patellar tilt angle, lateral patellofemoral angle and lateral patellofemoral index. Baseline and follow-ups were done.

2.5 Follow-up Protocol

A standardised rehabilitation protocol was used to follow all the patients during the postoperative period. Functional, clinical, and radiological examinations were also done once the patient had followed the treatment to measure the improvement of patellar alignment, stability, and knee functioning. All participants were required to have a minimum follow-up period of six months.

2.6 Statistical Analysis

The information was placed in a structured database and analysed using IBM Statistical Package of Social Sciences (SPSS) version 20. Mean and standard deviation were used to depict the quantitative variables, frequencies and percentages were used to depict the categorical ones. The Kolmogorov–Smirnov test was used to determine the normal distribution of data. ANOVA was used in comparing groups that had continuous variables, and chi-square was used in comparing groups with categorical variables. Paired t-tests were used to compare the values of within-group comparisons between baseline and follow-ups. All analyses were taken as being statistically significant with a two-tailed p-value of ≤ 0.05 .

3. Results

3.1 Patient Demographics and Baseline Characteristics

Fifteen patients were enrolled to take part in the study, and five patients were enrolled in each of the groups of surgical interventions. The average age of the study population was between 23.40 and 25.20 years in the three groups. The difference in age distribution of the groups was not statistically significant ($p = 0.623$). The largest proportion of the study population in all groups was female patients, and there were no significant differences in gender distribution across groups ($p = 0.435$).

The average period of dislocation in the knee before surgery was between 16.40 and 18.20 months, and the average number of dislocation episodes was between 3.40 and 4.60 in terms of groups. No statistically significant differences were observed in either duration or frequency of dislocation among the three surgical modalities, indicating baseline comparability of clinical severity. Table 1 and Figure 2 indicate baseline demographic and clinical characteristics, such as age and gender distribution among the three surgical groups.

Table 1. Demographic and Clinical Baseline Characteristics of the study participants

Variable	MPFL Reconstruction + MPR Plication	LPR Release + MPR Plication	MPFL Reconstruction + LPR Release	p-value
Age (years), mean \pm SD	23.40 \pm 3.36	24.80 \pm 2.68	25.20 \pm 2.95	0.623
Male, n (%)	2 (40%)	1 (20%)	2 (40%)	0.435
Female, n (%)	3 (60%)	4 (80%)	3 (60%)	
Duration of dislocation (months), mean \pm SD	18.20 \pm 7.09	17.40 \pm 3.65	16.40 \pm 4.51	0.866
Number of dislocations, mean \pm SD	4.60 \pm 2.41	4.20 \pm 2.17	3.40 \pm 1.34	0.245

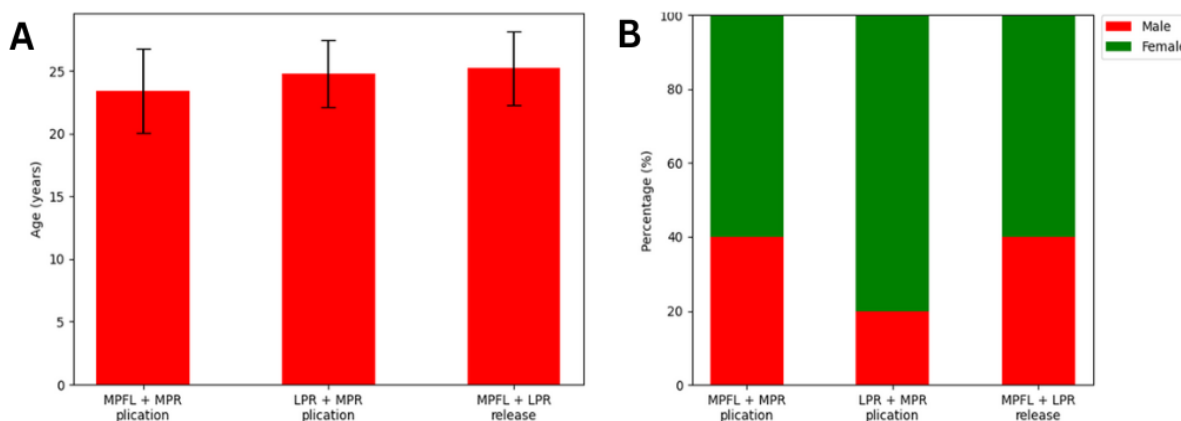


Figure 2. Baseline demographic characteristics of the study population: (A) Age distribution across surgical intervention groups; (B) gender distribution across surgical intervention groups.

3.2 Baseline Radiological and Functional Assessment

Pre-test radiology showed that all three groups had similar patellofemoral alignment. There was no significant difference between groups in mean congruence angle, patellar tilt angle, lateral patellofemoral angle and lateral patellofemoral index at presentation. The IKDC and Lysholm scores of

functional evaluation showed that all the intervention groups had similar knee dysfunction with no significant difference among the interventions.

These measurements proved the homogeneity of baseline anatomical alignment and impairment of functions before surgery. The three surgical groups were

similar in terms of parameters and functional scores of baseline radiological alignment (Table 2).

Table 2. Baseline Radiological and Functional Parameters

Parameter	MPFL + MPR Plication (Mean ± SD)	LPR + MPR Plication (Mean ± SD)	MPFL + LPR Release (Mean ± SD)	p-value
Congruence angle (°)	31.97 ± 5.33	31.13 ± 5.26	30.95 ± 1.96	0.928
Patellar tilt angle (°)	11.62 ± 2.00	12.06 ± 4.94	11.99 ± 1.91	0.974
Lateral patellofemoral angle (°)	-3.36 ± 1.11	-3.30 ± 0.83	-3.18 ± 0.53	0.940
Lateral patellofemoral index	2.22 ± 0.41	2.34 ± 0.40	2.40 ± 0.34	0.758
IKDC score	52.20 ± 11.71	53.40 ± 3.29	50.60 ± 7.70	0.868
Lysholm score	66.60 ± 7.99	68.20 ± 8.26	62.60 ± 11.01	0.623

3.3 Follow-up Radiological Outcomes

All three surgical groups showed that radiological parameters of alignment showed improvement at the follow-up. The mean values of congruence angles were significantly decreased in groups and showed a better position of the patella in the trochlear groove. There were also postoperative changes of patellar tilt angle, lateral patellofemoral angle and lateral patellofemoral index that also showed improvement in all groups.

At the follow-up, intergroup comparison did not show statistically significant differences in radiological parameters, which indicated that each of the combinations of surgeries was effective in restoring patellofemoral alignment. Table 3 and Figure 3 present postoperative changes in patellofemoral alignment parameters, comprising changes in the congruence angle across the surgical groups.

Table 3. Follow-up Radiological Parameters

Parameter	MPFL + MPR Plication (Mean ± SD)	LPR + MPR Plication (Mean ± SD)	MPFL + LPR Release (Mean ± SD)	p-value
Congruence angle (°)	11.39 ± 1.36	13.74 ± 1.96	12.55 ± 0.26	0.060
Patellar tilt angle (°)	8.07 ± 0.54	7.56 ± 1.65	7.96 ± 0.43	0.719
Lateral patellofemoral angle (°)	8.46 ± 0.88	7.30 ± 0.91	7.68 ± 0.43	0.090
Lateral patellofemoral index	1.94 ± 0.21	1.90 ± 0.19	1.86 ± 0.18	0.809

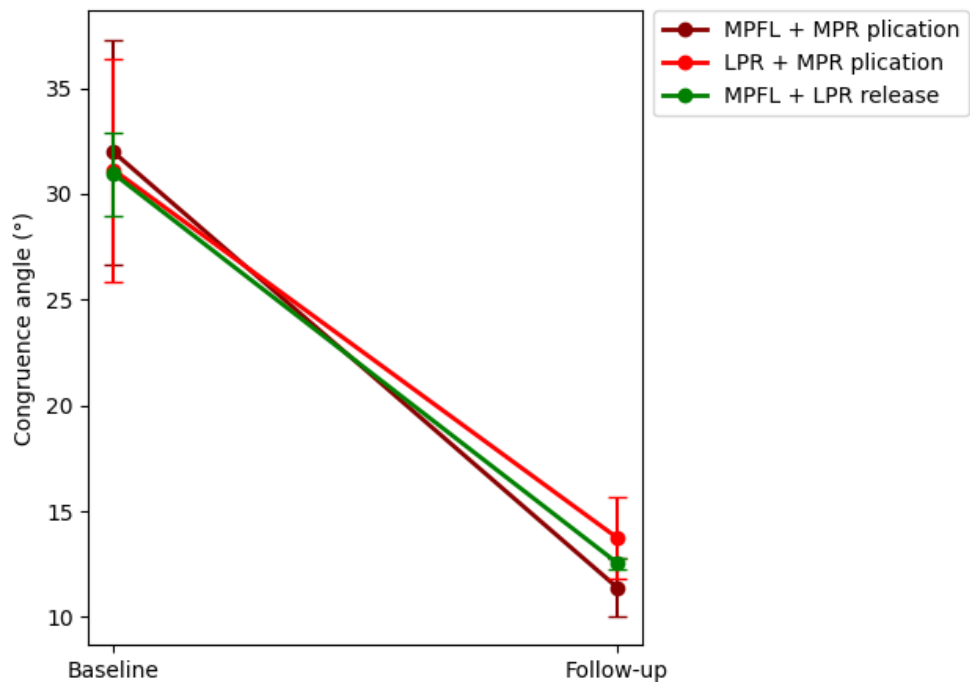


Figure 3. Comparison of the congruence angle improvement across groups

3.4 Follow-up Functional Outcomes

Statistically significant differences were found in functional outcomes of the three surgical groups at follow-up. The average IKDC score was the greatest in MPFL reconstruction with LPR release and subsequently followed by MPFL reconstruction with MPR plication, and the least was LPR release with MPR plication. The intergroup comparison showed that there was a statistically significant difference in the IKDC scores ($p < 0.001$).

Equally, the Lysholm scores were significantly different among the three groups at follow-up. The MPFL reconstruction and LPR release group had the best mean Lysholm score, whereas the LPR release and MPR plication group had relatively lower functional scores. The statistical significance of the difference between groups was significant ($p = 0.003$). Table 4 and Figure 4 demonstrate intergroup comparison of functional outcomes at follow-up based on the IKDC and Lysholm scores.

Table 4. Follow-up Functional Outcome Scores

Outcome Measure	MPFL + MPR Plication (Mean ± SD)	LPR + MPR Plication (Mean ± SD)	MPFL + LPR Release (Mean ± SD)	p-value
IKDC score	88.60 ± 3.85	81.40 ± 2.79	93.60 ± 3.05	<0.001
Lysholm score	84.60 ± 3.44	78.80 ± 4.55	90.20 ± 4.21	0.003

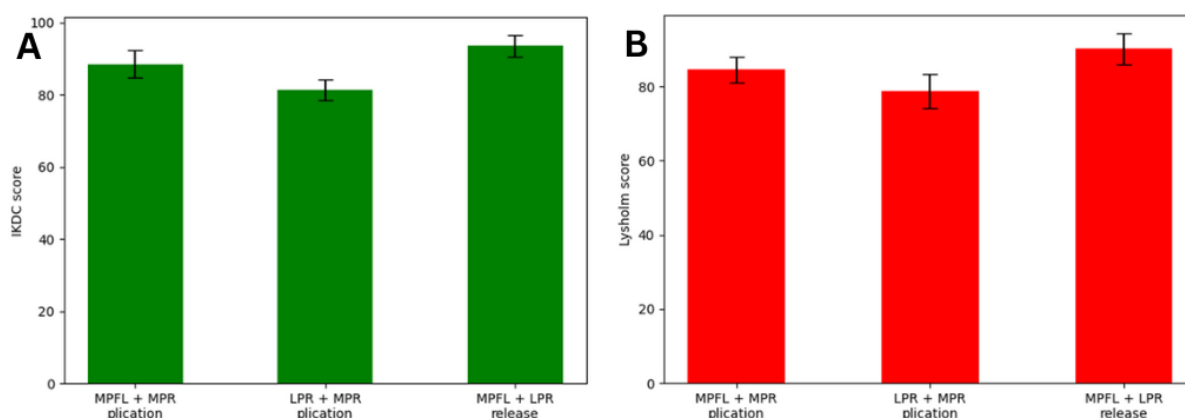


Figure 4. Comparison of functional outcomes at follow-up: (A) IKDC scores and (B) Lysholm scores across the three surgical intervention groups

3.5 Within-Group Comparison of Baseline and Follow-up Outcomes: MPFL Reconstruction with MPR Plication

Within the MPFL reconstruction with MPR plication group, statistically significant improvements were observed in all assessed radiological and functional parameters at follow-up compared to baseline. The congruence angle, the patellar tilt angle, the lateral

patellofemoral angle and lateral patellofemoral index improved significantly. The functional outcome of IKDC and Lysholm scores also indicated significant improvement in the functional outcome of the participants between the baseline and functional outcomes. Table 5 demonstrates the baseline to follow-up radiological and functional outcomes changes in the MPFL reconstruction with MPR plication.

Table 5. Baseline to Follow-up Changes in MPFL Reconstruction with MPR Plication Group

Parameter	Baseline Mean ± SD	Follow-up Mean ± SD	p-value
Congruence angle (°)	31.97 ± 5.33	11.39 ± 1.96	0.001
Patellar tilt angle (°)	11.62 ± 2.00	8.07 ± 1.65	0.009
Lateral patellofemoral angle (°)	-3.36 ± 1.11	8.46 ± 0.91	0.036
Lateral patellofemoral index	2.22 ± 0.41	1.94 ± 0.19	0.049
IKDC score	52.20 ± 11.71	88.60 ± 2.79	0.003
Lysholm score	66.60 ± 7.99	84.60 ± 4.55	0.024

3.6 Within-Group Comparison of Baseline and Follow-up Outcomes: LPR Release with MPR Plication

LPR release plus the MPR plication group showed statistically significant radiological alignment parameter improvements at the follow-up. There were significant changes in the congruence angle, patellar tilt angle, and lateral patellofemoral angle, and lateral patellofemoral index. The functional assessment showed that the IKDC and Lysholm scores were significantly increased compared to the baseline scores. Table 6 describes the base to follow-up changes in outcome of the patellar retinaculum lateral release with MPR plication group.

Table 6. Baseline to Follow-up Changes in LPR Release with MPR Plication Group

Parameter	Baseline Mean ± SD	Follow-up Mean ± SD	p-value
Congruence angle (°)	31.13 ± 5.26	13.74 ± 1.96	<0.001
Patellar tilt angle (°)	12.06 ± 4.94	7.56 ± 1.65	0.030
Lateral patellofemoral angle (°)	-3.30 ± 0.83	7.30 ± 0.91	<0.001
Lateral patellofemoral index	2.34 ± 0.40	1.90 ± 0.19	0.043
IKDC score	53.40 ± 3.29	81.40 ± 2.79	<0.001
Lysholm score	68.20 ± 8.26	78.80 ± 4.55	0.040

3.7 Within-Group Comparison of Baseline and Follow-up Outcomes: MPFL Reconstruction with LPR Release

This MPFL reconstruction using LPR release group showed statistically significant improvement in all measures of radiological and functional outcomes. Significant decreases in the congruence angle and patellar tilt angle were found after the operation, as well as improvements in the lateral patellofemoral angle and

index. No improvements were greater in localised outcome measures than in the functional outcome measures, which had a significant increase in IKDC and Lysholm. An overview of the improvements in the MPFL reconstruction with lateral patellar retinaculum release group on radiological and functional parameters recorded in the baseline and in the follow-up is presented in Table 7.

Table 7. Baseline to Follow-up Changes in MPFL Reconstruction with LPR Release Group

Parameter	Baseline Mean ± SD	Follow-up Mean ± SD	p-value
Congruence angle (°)	30.95 ± 1.96	12.55 ± 0.26	<0.001
Patellar tilt angle (°)	11.99 ± 1.91	7.96 ± 0.43	0.030
Lateral patellofemoral angle (°)	-3.18 ± 0.53	7.68 ± 0.43	<0.001
Lateral patellofemoral index	2.40 ± 0.34	1.86 ± 0.18	0.043
IKDC score	50.60 ± 7.70	93.60 ± 3.05	<0.001
Lysholm score	62.60 ± 11.01	90.20 ± 4.21	0.040

A graphical representation of the within-group comparison demonstrated significant improvement in functional scores from baseline to follow-up across all three surgical modalities is illustrated in Figure 5.

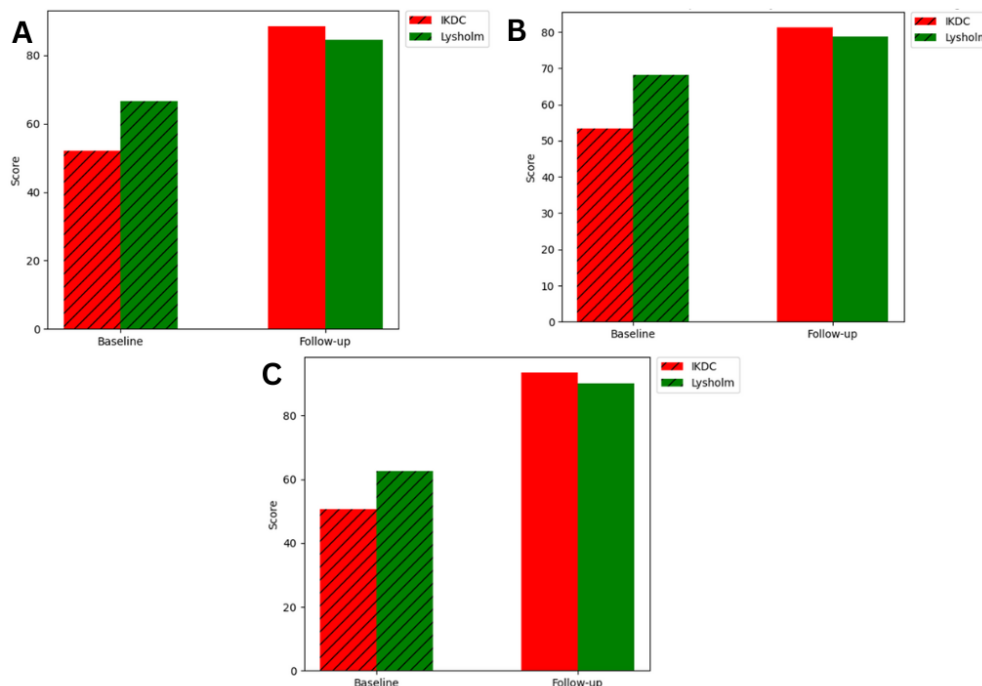


Figure 5. Within-group functional improvement following surgery: (A) MPFL reconstruction with medial patellar retinaculum plication, (B) lateral patellar retinaculum release with medial patellar retinaculum plication, and (C) MPFL reconstruction with lateral patellar retinaculum release

4. Discussion

Patellar dislocation is a complicated clinical phenomenon with a multifactorial aetiology, with the interaction of bony morphology, soft-tissue restraint, and

dynamic neuromuscular control. Despite the description of a variety of surgical methods, the most effective combination of the operations that ensures the restoration of patellofemoral stability remains a

controversial issue. The current study compared three widely used combined surgical procedures and showed that all of them showed a significant reduction in radiological alignment and functional outcomes, with better outcomes being achieved in patients undergoing an MPFL reconstruction and LPR release.

The age structure of the research group, most of whom are young adults with a larger percentage of women among patients, is in line with the previous epidemiological studies of patella instability (Lee & Yau, 2017; Sillanpää et al., 2008). Increased Q-angle, ligamentous laxity, and variation of neuromuscular control have been cited as anatomical and biomechanical factors that increase the incidence of lateral patellar instability in females (Gao & Yang, 2018). Notably, the baseline demographic and clinical characteristics were similar in all three groups, so that the differences in outcomes after the operations were likely to be due to the surgical operations and not other factors.

The findings of the present study, based on radiological assessment, showed that there was a substantial postoperative increase in congruence angle, patellar tilt angle, lateral patellofemoral angle and lateral patellofemoral index across all surgical groups. These results highlight the significance of management of the patellar maltracking by correction of medial insufficiency and subsequent lateral tethering forces. The idea that isolated soft-tissue surgeries can be inadequate in the event of treatment of patellar instability is supported by similar radiological outcomes of combined stabilisation procedures in the past (Allen et al., 2018; Dannawi et al., 2010).

IKDC and Lysholm score functional outcomes were significantly better in all groups, which indicated the effectiveness of symptom relief and restoration of knee function. Nevertheless, the MPFL reconstruction coupled with LPR release group recorded the highest gains in terms of functional gains. This result is consistent with previous research that indicates that reconstruction of the primary medial stabiliser, which is used with selective lateral decompression, is clinically better than the medial or lateral reconstruction procedures alone (Bitar et al., 2011; Trisolino et al., 2023). The synergistic action of reinstatement of medial restraint and a reduction in the excessive lateral forces is probably the reason behind the improved results found in this group.

The contribution of the MPFL as the main restraint to the sideways patellar movement during initial knee flexion has been well determined. Inability to repair this structure has been linked with intractable instability and inefficient functional results (Andrish, 2008). In the current research, those groups where MPFL reconstruction was performed had better functional scores relative to those groups where no ligament reconstruction was implemented, which is in line with the progressively gained understanding that MPFL reconstruction is an essential procedure in the surgical treatment of recurrent patellar dislocation (Elmajee et al., 2020). Moreover, the lateral tension exceedance was probably alleviated by the incorporation of LPR release

in certain cases, which allowed better centring of the patella in the trochlear groove.

Conversely, patients treated by LPR release combined with MPR plication reported comparatively lower scores in functional assessments, although the scores improved significantly compared to baseline. Although medial plication is useful in improving medial soft-tissue tension, various researchers have warned against the application of retinacular procedures only, as they do not replicate the biomechanical role played by the native MPFL (Coons & Barber, 2006; Nam & Karzel, 2005). These results indicate that although retinacular balancing is supportive, anatomical ligament reconstruction cannot be substituted in patients with reported MPFL deficiency.

It is noteworthy that all three forms of surgery demonstrated significant clinical and radiological benefits, with an overall emphasis on the fact that surgical intervention or approach to specific pathology may be effective in treating patellar instability. This helps to promote the concept of personalised surgery planning, which considers anatomical risk factors, intraoperative results and functional needs (Askenberger et al., 2018). The lack of instances of dislocation over the course of the follow-up also points to the short-term efficacy of combined stabilisation procedures, but more follow-up is necessary to determine the long-term efficacy and probability of late recurrence (Zhao et al., 2012).

The results of this study should be viewed against some limitations. The small sample size and single-centre design can make the generalisation problematic, and the rather short period of follow-up does not allow for measuring the long-term consequences, including, but not limited to, redislocation rates and the progression of patellofemoral osteoarthritis. However, the potential design, standardisation of surgery procedures, and the use of validated measures of outcomes make the results reliable.

In conclusion, the present study demonstrates that combined surgical approaches yield significant improvements in patellar alignment and knee function in patients with patellar dislocation. Among the modalities evaluated, MPFL reconstruction combined with lateral patellar retinacular release provided the most favourable functional outcomes, supporting its role as an effective strategy for restoring patellofemoral stability. These findings contribute to the evolving evidence base guiding surgical decision-making in patellar instability and underscore the importance of addressing both medial ligamentous insufficiency and lateral soft-tissue imbalance.

5. Conclusion

Patellar dislocation is a complicated clinical problem because its aetiology is multifactorial, with a combination of both bony and soft-tissue imbalance. The given study assessed and compared the results of three widely used combined surgical modalities used to stabilize patella. The results show that every surgical strategy led to a considerable change in the position of

the patella and knee functionality, which points to the positive impact of surgical intervention with the appropriate choice on patients with patellar dislocation. Out of the three of the studied modalities, the medial patellofemoral ligament reconstruction (with lateral patellar retinacular release) produced the most positive functional results, with an increase in IKDC and Lysholm scores at follow-up. This implies that medial stabilising insufficiency and excessive tension of the lateral retinacular should be treated together to offer a better restoration of patellar tracking and functional restoration. Although the use of medial retinacular plication procedures also showed significant improvement, the results were relatively poor in the absence of ligament reconstruction. These findings demonstrate the necessity of personalised preoperative surgical planning according to a clinical examination, radiography, and intraoperative diagnosis. The prospective design and standardised assessment of outcome make the results valid, even though a small sample size and brief duration of follow-up limit the validity of the study. More research on bigger groups of individuals and extended follow-up is needed to establish long-term effects and rates of relapse. On the whole, this study proves MPFL reconstruction combined with lateral retinacular release to be a good surgical option in the treatment of patellar dislocation.

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