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Surgical Outcome of Patella Stabilization for Recurrent Dislocation

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Abstract

Background: Patellar instability encompasses conditions from intermittent subluxations to dislocations. Acute patellar dislocations often result from trauma, such as a non-contact twisting injury or a direct blow. Women have a higher incidence due to anatomical and hormonal factors. Symptoms include knee pain, swelling, and instability. Nonoperative treatment is primary, but 30% of patients face recurrent instability. Surgical interventions are required for better outcomes.

Aim of the study: This study aims to evaluate the surgical outcomes and effectiveness of patellar stabilization techniques in preventing recurrent patellar dislocation.

Methods: Between January 2015 and December 2023, 25 female patients treated for recurrent patellar dislocation at the Department of Orthopedics in Prime Medical, Dubai, UAE, were included in this study. All patients had a history of laterally displaced patella, tenderness of the medial retinaculum, knee effusion or hemarthrosis, and a positive apprehension test. Inclusion criteria were limited to female patients with recurrent patellar dislocation. Exclusion criteria included primary dislocation, coexistent tibiofemoral ligament injury, bone abnormalities, TT-TG distance >20 mm, and lower limb fractures or polymyositis sequelae. Statistical analysis was conducted using SPSS, with significance set at $P<0.05$.

Result: The mean age of participants was 27.5 years; 36% were under 25, and 64% were 25 or older. The average BMI was 27.9 kg/m². Recurrent right knee dislocations occurred in 56% of participants. Most (92%) had no prior surgery. Dislocation frequencies were 2-3 times (44%), 4-5 times (36%), and over six times for the remainder. The mean follow-up was 3.5 years. MPLR was the most common surgery (48%), followed by lateral release (24%), tibial tubercle transfer (16%), and patellofemoral stabilization (12%). Post-surgery, 92% had partial stability, and swelling varied from none (48%) to severe (4%). The mean VAS score decreased from 6.6 to 2.7. Most returned to normal activities in 6.5 weeks. Complications were minimal, with high patient satisfaction: 48% rated outcomes as excellent.

Conclusion: The study demonstrates that patella stabilization surgery effectively improves knee stability and patient satisfaction in recurrent patellar dislocation cases. Most patients reported significant pain relief, minimal complications, and quick returns to normal activities. With 92% achieving partial stability post-surgery and 48%, these findings emphasize the importance of timely surgical intervention.

Keywords: Surgical outcome; Patellar dislocations; Stabilization

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Introduction

Patellar instability encompasses a broad range of conditions, from intermittent subluxations to full dislocations. Acute patellar dislocations typically result from trauma, often caused by non-contact twisting injuries to the knee or a direct blow to its medial side. A common mechanism involves external tibial rotation with the foot anchored to the ground. Additionally, patellar dislocations may occur in individuals with generalized ligamentous laxity, though these patients are more prone to recurrent subluxations rather than complete dislocations [1]. It is estimated that patellar dislocation accounts for 2% to 3% of orthopedic knee presentations, with an annual incidence of lateral dislocations ranging from 6 to 30 per 100,000 in the general population, particularly prevalent during adolescence [2]. Notably, active-duty military personnel, as a high-demand and high-risk subgroup, face more than double the risk of dislocation compared to the general teenage population [3]. Patellar dislocation is more common in women than men due to several anatomical and biomechanical factors. Women typically have a broader pelvic structure, which contributes to an increased Q-angle. This angle is defined by the alignment between the quadriceps muscles and the patellar tendon, and it is generally more pronounced in females due to their wider pelvis. A larger Q-angle places more lateral force on the patella, making it more prone to dislocation [4]. Hormonal differences, such as the influence of estrogen on ligament laxity, may also play a role in the higher incidence of patellar dislocation in women [5]. Symptoms of patella dislocation include sudden knee pain, visible displacement of the kneecap, swelling, difficulty straightening the leg, and an unstable or "giving way" sensation in the knee [6]. Advanced imaging, particularly magnetic resonance imaging (MRI), is typically advised at the time of the first dislocation due to the high prevalence of associated osteochondral lesions. Studies indicate that osteochondral loose bodies are present in up to 58% of cases, although only 29% of these are detectable on standard radiographs [2,7,8]. The risk of significant articular damage increases with recurrent dislocations [2]. Moreover, over 85% of initial dislocations are accompanied by a partial or complete tear of the medial patellofemoral ligament (MPFL), the key stabilizer against lateral patellar displacement [9-11]. Consequently, the loss of this protective mechanism during the first dislocation heightens the risk of recurrent instability and subsequent osteochondral injuries, potentially progressing to arthritis [12]. While nonoperative treatment remains the first line of management for initial dislocations, approximately 30% of patients experience recurrent instability, and 10% eventually require surgical intervention [13,14]. Factors contributing to the likelihood of recurrent instability include trochlear dysplasia, younger age, patella alta, and lateralization of the tibial tubercle [2]. MPFL reconstruction, often combined with other realignment procedures such as tibial tubercle osteotomy, has been shown to improve patellar stability and patient outcomes [15]. Despite the advancements in surgical techniques, postoperative outcomes can vary, and complications such as persistent instability, stiffness, and patellofemoral pain are still reported in some patients [16]. Factors such as age, skeletal maturity, and the presence of anatomical abnormalities like trochlear dysplasia may influence the success of the surgery [17]. Therefore, understanding the factors that contribute to successful surgical outcomes remains essential for optimizing treatment strategies in patients with recurrent patellar dislocation. This study aims to evaluate the surgical outcomes and effectiveness of patellar stabilization techniques in preventing recurrent patellar dislocation.

Methodology and Materials

Between January 2015 and December 2023, 25 patients who were treated for recurrent patellar dislocation with non-overlap-region injuries, meeting the study's inclusion and exclusion criteria, were enrolled. All patients had a confirmed diagnosis of recurrent patellar dislocation, characterized by a history of lateral patellar displacement. Clinical findings included tenderness over the medial retinaculum, knee effusion or hemarthrosis, and a positive apprehension test on physical examination. The study was carried out at the Department of Orthopedic Surgery, Prime Medical Center, Dubai, UAE. Prior to surgery and data collection, written informed consent was obtained from each participant, and the study received ethical approval from the institutional ethics committee.

Inclusion criteria:

- Only female patients.
- Patients with recurrent patellar dislocation.

Exclusion criteria:

- Patients with primary patellar dislocation.
- Patients presenting with concurrent tibiofemoral ligament injuries in the affected knee.
- Radiological findings indicating bone abnormalities.
- A tibial tuberosity to trochlear groove (TT-TG) distance exceeding 20 mm.
- Patients with a lower limb fracture or residual effects from polymyositis.

The initial radiographic assessment for each patient included both anteroposterior and lateral knee views, with MRI utilized to confirm and classify the injury. All MRIs were retrospectively reviewed by two experienced orthopedic surgeons within three weeks of the injury. In cases of disagreement, the images were further evaluated by a sports medicine specialist in orthopedics, and a consensus was reached.

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Patient demographic data, including age, sex, body mass index, and clinically documented ligamentous laxity, were recorded using standardized data collection forms. These forms were completed by orthopedic residents based on documentation provided by board-certified orthopedic surgeons and analyzed through a comprehensive epidemiologic healthcare database (R.E.P.). Clinical and surgical records were also reviewed to identify episodes of recurrent instability and to determine patients who underwent patellar stabilization procedures, including lateral retinacular release, medial retinacular imbrication, and MPFL (medial patellofemoral ligament) repair or reconstruction.

Statistical Analysis

The data were systematically arranged into Tables and Figures, accompanied by comprehensive explanatory notes to improve clarity. Statistical analyses were conducted using SPSS software (version 26) on a Windows platform. Continuous variables were presented as mean ± standard deviation (SD), and categorical variables were summarized as frequencies and percentages, enabling a thorough interpretation of the results.

Result

The mean age of the participants was 27.5 years, with 36% of the population being younger than 25 years and 64% aged 25 years or older. The average BMI of the participants was 27.9 kg/m² (Table 1). 56% of the participants experienced recurrent dislocation in the right knee. The majority (92%) had not undergone surgery before. Regarding the frequency of previous dislocations, 44% had experienced 2-3 dislocations, 36% had 4-5 dislocations, and the rest of the participants had more than six dislocations. The average follow-up period for the participants was 3.5 years (Table 2). The types of surgery performed in the study showed that MPLR was the most common procedure, accounting for 48% of cases. The lateral release was performed in 24% of cases, followed by tibial tubercle transfer in 16% and patellofemoral stabilization in 12% (Figure 1). 92% of the participants experienced partial stability following surgery, while 8% remained unstable. In terms of swelling, 48% of the participants had no swelling, 36% experienced mild swelling, 12% had moderate swelling, and 4% reported severe swelling (Table 3). The mean pre-operative VAS score was 6.6, which decreased to 2.7 post-operatively (Figure 2). Participants, on average, returned to normal activities in 6.5 weeks after surgery. Regarding complications, 80% had no complications, 12% experienced recurrent dislocation, and 8% encountered hardware-related issues, with no cases of infection reported. Patient satisfaction levels were high, with 48% rating their outcome as excellent, 32% as good, 16% as fair, and only 4% reporting a poor outcome (Table 4).

Table 1: Demographical characteristics of the study population (N=25).

Variables	Frequency (n)	Percentage (n)
Age in years		
<25	9	36
≥25	16	64
Mean±SD	27.5±6.2	
Gender		
Male	0	0
Female	25	100
BMI (kg/m²)		
Mean±SD	27.9±7.5	

Table 2: Clinical characteristics of the study population (N=25).

Variables	Frequency (n)	Percentage (n)
Laterality		
Left	11	44
Right	14	56
History of previous knee surgery		
Yes	2	8
No	23	92
Previous dislocations		
45353	11	44
45416	9	36
>6	5	20
Follow-up (in years)		
Mean±SD	3.5±1.5	

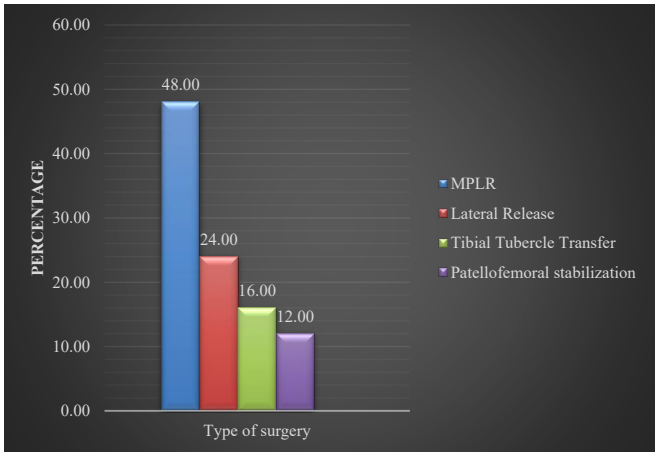

Figure 1: Type of Surgery Performed (N=25).

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Table 3: Clinical assessments.

Variables	Frequency (n)	Percentage (n)
Partial stability		
Stable	23	92
Unstable	2	8
Swelling		
None	12	48
Mild	9	36
Moderate	3	12
Severe	1	4

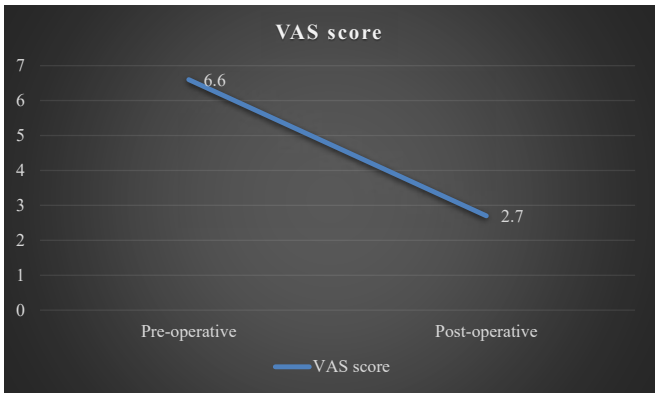

Figure 2: Pre-and post-operative visual analog scale pain scores.

Table 4: Surgical outcome of the study population.

Surgical Outcome	Frequency (n)	Percentage (n)
Return to normal activities in weeks (Mean±SD)	6.5±1.6	
Complication		
None	20	80
Infection	0	0
Recurrent dislocation	3	12
Hardware problems	2	8
Patients' satisfaction		
Excellent	12	48
Good	8	32
Fair	4	16
Poor	1	4

Discussion

Recurrent patellar dislocation is a common orthopedic condition, particularly affecting young, active individuals, often leading to chronic instability and functional limitations. Repeated dislocations can result in progressive damage to the cartilage, increasing the risk of osteoarthritis and further impairing knee function. Surgical stabilization is commonly indicated for patients with recurrent dislocation who do not respond to conservative management, such as physiotherapy or bracing. Despite the variety of surgical approaches, the outcomes depend on factors such as the severity of the dislocations, patient-specific anatomy, and the type of surgery performed [18-20]. This study aims to assess the surgical outcomes, complications, and patient satisfaction following different patellar stabilization techniques for recurrent dislocation. In our study, the mean age of the participants was 27.5 years, with a standard deviation of 6.2 years, indicating that most patients were young adults. Zhou et al. [20] also found the average age of 27.2 years with a standard deviation of 5.8 years. This finding aligns with previous research, which indicates that the rate of recurrent dislocation is notably higher in patients under 15 years of age (52%-60%) compared to those aged 15-18 years (26%-33%). Furthermore, studies have consistently shown that adolescents are at a significantly greater risk for patellar instability than older adults [21-23]. The gender distribution was striking, with 100% of the participants being female, indicating the higher prevalence of recurrent patellar dislocation in women, which is well-documented in previous studies [2,24]. Many patients were overweight in our study with mean BMI of 27.9 kg/m². Sieroń et al. [25] found that the severity of patellofemoral chondromalacia significantly depends on BMI level and there is a stronger correlation between the degree of patellofemoral chondromalacia and BMI in women than in men [25]. We observed that the dislocations affected the right knee slightly more frequently than the left knee, though the difference was not substantial which is similar to other the finding of other studies [20,26]. A significant portion of the participants (92%) had no prior history of knee surgery, indicating that most of the patients in this cohort were undergoing patella stabilization as their first surgical intervention. This aligns with the typical treatment pathway for recurrent patellar dislocation, where conservative management is often attempted before surgical options are explored. Two to three dislocations were reported by 44% of patients, four to five dislocations by 36%, and more than six dislocations by 20%. This wide range suggests that recurrent patellar dislocation can manifest with varying severity, with some patients requiring surgical stabilization after relatively fewer dislocations, while others experience more frequent episodes before seeking surgical intervention. The mean follow-up period of 3.5 years (±1.5) is significant for evaluating long-term outcomes of the surgical procedures. This follow-up period provides adequate time to assess the durability of the surgical stabilization, as well as the recurrence of dislocations or other complications over time. Marigi et al [27] concluded similar results [27]. In this present study, the most commonly reported surgery types were MPLR and Lateral release, and Tibial tubercle transfer and patellofemoral stabilization were less commonly reported. The findings of this study are comparable with the study of Marigi et al. [27]. According to our study, the majority of patients (92%) were classified as stable post-surgery,

demonstrating the success of the surgical intervention in restoring knee stability for most individuals. Nearly half of the patients (48%) reported no swelling, suggesting a favorable recovery for many individuals. However, 36% experienced mild swelling, which could be a normal post-operative response that subsides over time. A smaller proportion of patients reported moderate (12%) or severe (4%) swelling, which may indicate localized inflammation or complications, such as joint irritation or infection, that need to be addressed during follow-up care. Another study noted that the majority of patients (82.4%) experienced either no ongoing symptoms or only occasional episodes of swelling. In contrast, the remaining 17.6% reported the development of a limp following extended physical activity [20]. The Visual Analog Scale (VAS) scores of this study indicates substantial pain relief and improvement in patient comfort after patella stabilization surgery. The surgical outcomes for patella stabilization in this study population demonstrate generally favorable results, with most patients returning to normal activities within a mean of 6.5 weeks (±1.6). This recovery period is relatively short, suggesting that the surgery effectively restores knee function and allows patients to regain their pre-dislocation activity levels in a reasonable timeframe. Regarding complications, 80% of patients experienced no post-surgical complications, which is a positive indicator of the safety and success of the procedure. No cases of infection were reported, further supporting the efficacy of the surgical technique and post-operative care. However, a small percentage of patients experienced recurrent dislocation (12%) and hardware-related issues (8%). Regarding patient satisfaction, nearly half (48%) reported an "Excellent" outcome, with 32% rating it as "Good." Only a small fraction had a "Fair" (16%) or "Poor" (4%) experience, suggesting the majority were pleased with their results. Overall, the data supports the efficacy of the procedure with few complications. The outcomes of our study are consistent with other similar study [24]. Overall, patella stabilization surgery for recurrent dislocation proved to be highly effective in restoring knee stability, with the majority of patients achieving favorable outcomes, according to our study.

Limitations of the study: The main limitations of this study are its small sample size and the exclusive focus on female patients, potentially restricting the findings' applicability to a broader population in the UAE. Additionally, the relatively short follow-up period may not capture long-term complications or recurrences. The study also does not consider variations in surgical techniques or surgeon expertise, which could affect outcomes.

Conclusion and Recommendations

The study concludes that patella stabilization surgery is highly effective for patients with recurrent patellar dislocation, resulting in significant improvements in knee stability and patient satisfaction. Most patients experienced substantial pain relief, minimal complications, and a swift return to normal activities. The most common procedures, MPLR and lateral release were particularly successful. The study highlights the importance of surgical intervention for restoring knee function and preventing further dislocations, with 92% of patients achieving partial stability post-surgery and high satisfaction rates. These findings underscore the need for early surgical consideration in managing recurrent patellar dislocation.

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Ethical approval: The study was approved by the Institutional Ethics Committee.

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