

A Review of Risk Factors for Postoperative Failure after Isolated Primary Medial Patellofemoral Ligament Reconstruction

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Introduction

- Medial patellofemoral ligament reconstruction (MPFL-R) is a surgical treatment for patellar instability [1].
- Cases of post-operative recurrent dislocation and persistent instability may occur due to preexisting anatomic risk factors and technical errors in the procedure.
- Current rates of recurrent dislocation are reported to be up to 20% [2].
- **Research Question:** What anatomic and technical risk factors are associated with increased rates of recurrent dislocation after primary MPFL-R?

Aims and Objectives

The aim of this project is to find the risk factors in the current literature that are most commonly associated with increased rates of post-operative failure following MPFL-R, and to consolidate this information into a systematic review

Methods

- A systematic review was performed following PRISMA guidelines.
- Search terms: PubMed and MEDLINE databases were searched on October 13th, 2024 using the terms “medial patellofemoral ligament reconstruction” and “MPFL reconstruction.”
- 1628 abstracts were reviewed by three authors.
- Data collected: Study design, patient demographics, injury characteristics, physical exam findings, anatomic features, operative technique, and post-operative outcomes.
- Any risk factor attributed to post-op failure was recorded.

TABLE 1: All postoperative failures

Failures	N
Recurrent dislocation	86
Recurrent dislocations	41
Redislocation	45
Recurrent subluxation	78
Recurrent subluxation	5
Recurrent instability	73
Surgical failure/requiring revision/residual graft laxity	73
Recurrent Apprehension	8
	245



Figure 1: Schottle's point for anatomic position demonstrated on lateral knee x-ray [3].

TABLE 2: All risk factors associated with postoperative failures

	# of Failed Knees with Risk Factor	
Risk Factor for Failure	Kocachewala et al 2023 Alm et al 2017 Brake et al 2019 Bryuk et al 2023 Cvetkovic et al 2022 Chalabian et al 2017 Fackell et al 2020 Hamada et al 2016 Hirata et al 2019 Hoppe et al 2019 Iwakura et al 2014 Kim et al 2020 Kraus et al 2022 Liu et al 2018 Najjar et al 2014 Parkki et al 2013 Savarese-Wilson et al 2015 Stappert-Merle et al 2019 Tschopp et al 2016 Wagner et al 2013 Yoon et al 2020 Zhang et al 2023 Zhao et al 2020 Zimmermann et al 2021	Total # Fails Knees per Risk Factor
Patient Risk Factor: Chronic instability		
Patient Risk Factor: Generalized ligamentous laxity		
Patient Risk Factor: Patient age at time of surgery		
Anatomic Risk Factor: Lateral quadriceps vector (total)		
Anatomic Risk Factor: Tibial tuberosity-trochlear groove distance>20mm		
Anatomic Risk Factor: Tibial tuberosity-trochlear groove distance<15mm		
Anatomic Risk Factor: Elevated tibial tuberosity-midcondyle distance		
Anatomic Risk Factor: Trochlear dysplasia (total)		
Anatomic Risk Factor: Trochlear dysplasia A		
Anatomic Risk Factor: Trochlear dysplasia B		
Anatomic Risk Factor: Trochlear dysplasia C		
Anatomic Risk Factor: Trochlear dysplasia D		
Anatomic Risk Factor: Trochlear dysplasia A-B		
Anatomic Risk Factor: Trochlear dysplasia B-D		
Anatomic Risk Factor: Trochlear dysplasia C-D		
Anatomic Risk Factor: Trochlear dysplasia unspecified		
Anatomic Risk Factor: Trochlear bump >5mm		
Anatomic Risk Factor: Increased sulcus angle		
Anatomic Risk Factor: Patella alta (total)		
Anatomic Risk Factor: Patella alta with Caton-Deschamps≤1.3		
Anatomic Risk Factor: Patella alta with Caton-Deschamps>1.4		
Anatomic Risk Factor: Patella alta with Insall-Selvati<1.2		
Anatomic Risk Factor: Preoperative J-sign		
Anatomic Risk Factor: Presence of ≥2 ARFs ^a		
Anatomic Risk Factor: Increased femoral anteversion		
Anatomic Risk Factor: Valgus malalignment		
Technique Risk Factor (total)		
Technique Risk Factor: Gracilis autograft		
Technique Risk Factor: Modified aductor sling technique		
Technique Risk Factor: Nonanatomic femoral tunnel		
Technique Risk Factor: Single bundle graft		
Technique Risk Factor: Tendon-tendon graft fixation		
Technique Risk Factor: Transosseous patellar tunnel		
Total # of Failed Knees per Study		

***Note:** A knee that had failure after primary MPFL reconstruction can be associated with more than one risk factor for failure.

a The paper reports age at time of surgery is associated with worse surgical outcomes and lower BPII scores for each 10-year increase in age, with the group of 11 failed knees having a higher average age.

b The paper reports a higher average femoral anteversion angle but does not report the exact number of failed knees that meet a specific criteria or angle of increased femoral anteversion.

cThe paper reports a higher average associated with 10 failed knees but does not report the exact number of failed knees that meet a specific criteria of increased sulcus angle

d The paper reports a higher average tibial tubercle-midpicondyle (TT-ME) distance in 8 failed knees, but does not report the exact number of failed knees that meet a specific criteria for elevated TT-ME

a The number of knees with trochlear bump was not counted, but the paper reports the patient cohort by trochlear bump size, demonstrating that a bump ≥ 5 mm equated to poorer surgical outcomes. There were a total of 4 failures in this study.

g The average distance from the anatomic position was higher in the group with failed knees. However, the exact number of knees in the failure group with tunnels malpositioned over 10mm from the anatomic position was not provided.

Results

- 28 papers were included: 2195 surgeries with 245 total failures reported (11.2% of all surgeries).
- These included 86 recurrent dislocations, 78 recurrent subluxations, and 81 failures of other types (Table 1).
- **Anatomic risk factors**
 - Trochlear dysplasia – 92 failures (37.6% of all failures)
 - Preoperative J-sign – 31 (12.7%)
 - Femoral anteversion – 30 (12.2%)
 - Patella alta – 25 (10.2%)
 - Lateral quadriceps vector – 24 (9.8%)
- **Technical risk factors:**
 - Nonanatomic femoral tunnel – 69 (28.2%)
 - Transosseous patellar tunnels, gracilis autograft, modified adductor sling technique – 38 (15.5%)
- Trochlear dysplasia had a negative impact on patient-reported outcome measures (PROMs) in 2 studies.

Discussion and Conclusions

- Nonanatomic femoral tunnel placement is the most common technical error associated with post-operative failure in MPFL-R
- Severe trochlear dysplasia, pre-operative J-sign, and femoral anteversion are anatomic risk factors most commonly associated with failure.
- MPFL-R continues to be a reliable intervention for patellar instability.
- Recommendations: Femoral tunnel should be anatomically positioned. Consideration of key anatomic risk factors is needed to guide possible concomitant procedures alongside MPFL-R.
- Limitations: There was inconsistency in reported measures between the included studies. Also, no risk factor can be completely isolated.

References

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