Physiotherapy Management Following Medial Patellofemoral Ligament Reconstruction in a Patient with Generalised Joint Hypermobility

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Abstract:

Background: Medial patellofemoral ligament (MPFL) reconstruction restores mechanical patellar stability after recurrent lateral dislocation, but rehabilitation outcomes can be influenced by coexisting generalised joint hypermobility, hormonal fluctuation, and kinesiophobia. Literature on physiotherapy management in patients with these complicating factors remains limited.

Case Presentation: A woman in her twenties with a history of recurrent patellar dislocation and generalised joint hypermobility sustained a twisting fall injury resulting in lateral dislocation of the right patella and disruption of the MPFL. She underwent closed reduction followed by MPFL reconstruction one month later, and was referred for physiotherapy approximately one month after surgery. At initial assessment she had marked quadriceps weakness, a 20-degree extensor lag, restricted knee range of motion, a Beighton score of 9/9, and pronounced kinesiophobia (Tampa Scale score 45). Baseline patient-reported outcomes were poor (Kujala Patellofemoral Scale 12/100; Norwich Patellar Instability Score 43%).

Outcome: With structured, criterion-based physiotherapy, right knee flexion improved from 20-45 degrees to 120-125 degrees, the extensor lag resolved fully, hip and knee strength improved, and functional performance progressed from an inability to perform sit-to-stand or stair climbing to

independent completion of both. The Kujala score improved from 12/100 to 88/100 and the Norwich Patellar Instability Score fell from 43% to 34%, while the Tampa Scale for Kinesiophobia improved only marginally, from 45 to 41.

Conclusion: Individualised, criterion-based physiotherapy can produce substantial functional recovery after MPFL reconstruction in a patient with generalised joint hypermobility, though persistent kinesiophobia despite good mechanical recovery highlights the need to address psychological readiness alongside physical impairments.

Keywords: Patellar Dislocation; Patellofemoral Joint; Joint Instability; Joint Hypermobility; Physical Therapy Modalities; Kinesiophobia.

BACKGROUND

Lateral patellar dislocation is one of the most common causes of acute knee injury in young adults, most often resulting from twisting movements, direct trauma, or underlying anatomical risk factors such as an increased Q-angle, trochlear dysplasia, patella alta, an increased tibial tubercle-trochlear groove distance, femoral anteversion, and generalised joint hypermobility [1,2]. The medial patellofemoral ligament (MPFL) is the primary passive soft-tissue restraint against lateral patellar displacement, contributing approximately 50-60% of the restraining force during early knee flexion,and is disrupted in 90-100% of first-time lateral dislocations [3,4,5]. Once torn, the MPFL predisposes to recurrent instability, apprehension, pain, and functional limitation, and reconstruction using autograft or allograft tissue is commonly indicated after recurrent dislocation or significant ligament injury [6].

Generalised joint hypermobility is a recognised risk factor for patellar instability, because excessive laxity of the medial soft-tissue restraints reduces passive resistance to lateral displacement, and hypermobile individuals rely more heavily on dynamic muscular stabilisation to maintain patellofemoral stability [7,8]. This has direct implications for rehabilitation, which must place greater emphasis on proprioceptive training, neuromuscular control, and closed-chain strengthening [8]. Sex hormones, particularly oestrogen and relaxin, can further modulate ligament laxity and neuromuscular function across the menstrual cycle, potentially affecting exercise tolerance and rehabilitation adherence in female patients [9,10].

Rehabilitation-focused literature on MPFL reconstruction in patients with coexisting generalised joint hypermobility remains limited, and most reports emphasise surgical technique and mechanical outcomes rather than the physiotherapy management of complicating factors such as systemic joint laxity, kinesiophobia, or hormonal influences on exercise tolerance. This case report addresses that gap by detailing physiotherapy assessment, intervention, and

functional outcomes in a young woman with pre-existing generalised joint hypermobility following MPFL reconstruction.

Case Presentation

A woman in her twenties, working as a receptionist, presented with a right-sided knee injury. She sustained a twisting fall at home on 25 October 2025, resulting in trauma to the right knee and elbow, with sudden onset of right knee pain, swelling, and restriction of movement, aggravated by any knee movement. She was taken to hospital, where magnetic resonance imaging revealed lateral dislocation of the patella, disruption of the MPFL, and a grade I sprain of the medial and lateral collateral ligaments. She underwent closed reduction of the right patella with application of a gutter slab andlong knee brace the same day. On 26 November 2025 she underwent right MPFL reconstruction under spinal anaesthesia, with graft fixation using an 8x25 mm interference screw, and was subsequently mobilised non-weight-bearing with a walker. She was referred for physiotherapy on 27 December 2025.

Her past history was notable for two episodes of right patellar dislocation roughly a decade earlier, ongoing bilateral knee instability, and generalised joint hypermobility. She was one of two income earners in her household and had paused work as a receptionist since the injury. Her home was single-storey with a Western toilet, tiled floors, and adequate lighting, but with an uphill approach, stairs without handrails, and uneven terrain, presenting practical barriers to her functional goals. She reported high fear of reinjury and injury to the contralateral limb, reduced motivation during the initial phase of rehabilitation, and was a young working woman motivated to return to independent work.

Diagnostic Assessment

Preoperative MRI had confirmed lateral subluxation of the patella with bone contusion at the medial patellar facet and the anterior aspect of the lateral femoral condyle, loss of continuity of the MPFL, a grade I sprain of the medial and lateral collateral ligaments, and joint effusion extending into the medial, lateral, and suprapatellar recesses. Operative records confirmed MPFL reconstruction with interference-screw graft fixation.

At initial physiotherapy assessment, a Beighton score of 9/9 confirmed generalised joint hypermobility [11,12]. Patient-reported outcome measures were markedly abnormal: the Kujala Patellofemoral Scale score was 12/100, indicating severe functional limitation; the Norwich

Patellar Instability Score was 43%, indicating moderate-to-severe symptomatic instability; and the Tampa Scale for Kinesiophobia score was 45, indicating a high level of fear of movement and reinjury. Functional testing at baseline showed she was unable to perform a five-times sit-to-stand test, stair climbing, or a step-down test, and could complete only five supported calf raises in 30 seconds.The diagnosis of MPFL disruption had already been established radiologically and confirmed surgically before physiotherapy referral, so diagnostic reasoning at this stage centred on the causes of her persistent postoperative weakness, pain, and extensor lag. Considerations included arthrogenic muscle inhibition secondary to pain and effusion, and graft-related factors such as tunnel positioning or tensioning [13,14]. The absence of increasing effusion, mechanical locking, or instability on examination, together with intact sensory and reflex findings, argued against graft failure or a neurological complication, and her presentation was judged most consistent with expected postoperative quadriceps inhibition and deconditioning, compounded by joint hypermobility and fear-avoidance behaviour [15].

Timeline

Time period	**Clinical event and management**
25 October 2025	Twisting fall injury at home; lateral patellar dislocation with MPFL disruption confirmed on MRI; closed reduction with gutter slab and long knee brace.
26 November 2025	Right MPFL reconstruction performed under spinal anaesthesia with interference-screw graft fixation; mobilised non-weight-bearing with a walker.
27 December 2025	Referred for physiotherapy; comprehensive assessment performed, confirming generalised joint hypermobility (Beighton 9/9) and poor baseline outcome scores.
Rehabilitation, early phase	Patient education, pain and oedema control, patellar and tibiofemoral mobilisations, neuromuscular electrical stimulation for quadriceps activation, hip strengthening, and progressive range-of-motion exercises.

Rehabilitation, progression phase	Standing terminal knee extension, progressive sit-to-stand and gait retraining, closed-chain strengthening, core and pelvic stability work, and graded stair-climbing practice.
Reassessment	Marked improvement in range of motion, strength, girth, and functional test performance; residual kinesiophobia noted.

Physiotherapy Assessment

At initial assessment, the right lower limb was held in slight knee flexion with toe-touch weight-bearing. A well-healed surgical scar was present over the anterior aspect of the right knee, with additional arthroscopic portal scars, and there was visible swelling with shiny overlying skin. Bilateral genu valgum was noted. Postural assessment showed a left-sided head tilt and shoulder elevation, bilateral genu valgum, and left knee hyperextension (genu recurvatum), with protective unloading of the right leg and a compensatory trunk lean. Gait analysis with walker assistance showed a four-point, step-to pattern with forward and left lateral trunk lean; the right knee was maintained in extension throughout stance and swing with reduced flexion during limb advancement, consistent with a protective, pain-avoidant gait pattern.

Palpation revealed warmth around the right knee and grade 2 tenderness over its medial and anterior aspects, without oedema. Right knee active/passive flexion was 20-45 degrees/20-55 degrees with an empty end-feel, and a 20-degree extensor lag was present on active extension. Hip and ankle range of motion on the right were mildly reduced relative to the left. Manual muscle testing showed weakness of right hip extension, abduction, and adduction (grade 3+ to 4-) and of ankle dorsiflexion and plantarflexion (grade 4), with resisted isometric testing weak and painful for right hip flexion and knee flexion/extension. Joint-play assessment demonstrated reduced tibiofemoral and patellofemoralglide on the right, compared with markedly increased mobility on the unaffected left knee, a pattern suggestive of generalised ligamentous laxity. Sensory examination, reflexes, and myotomes/dermatomes were intact bilaterally, and limb-length measurements were unremarkable. Girth measurement showed increased circumference of the right thigh and knee compared with the left, most pronounced around the knee joint, consistent with residual postoperative oedema.

Using the International Classification of Functioning, Disability and Health framework, she showed impairment at the level of body structure and function (pain, restricted range of motion, extensor lag, weakness, joint hypermobility), activity limitation (difficulty with weight-bearing, sit-to-stand, stair climbing, and step-down activities), and participation restriction (inability to return to work as a receptionist, travel independently, or ride a scooter), indicating the need for comprehensive, criterion-based rehabilitation.

Therapeutic Intervention

Physiotherapy was initiated once she was medically stable for exercise and progressed in accordance with her pain, range of motion, and neuromuscular recovery. Management began with patient education regarding the nature of her surgery, expected rehabilitation trajectory, weight-bearing status, and the importance of adherence, prioritised to build rapport and reduce fear-avoidance given her pronounced apprehension toward movement.

The early phase focused on pain and oedema control, protected weight-bearing, and restoration of range of motion. This included active ankle and toe movements to promote circulation and reduce venous stasis; patellar mobilisations in all directions to prevent peri-patellar adhesions and restore terminal extension and flexion [13]; tibiofemoral anteroposterior and posteroanterior mobilisations to address hypomobility; straight-leg raises with neuromuscular electrical stimulation combined with passive terminal knee extension to address quadriceps inhibition and the extensor lag [15]; and hip strengthening (side-lying abduction with extension, prone hip extension) to improve pelvic stability and femoral control [8]. Heel slides, prone knee bending, assisted hip-and-knee flexion, and supportedwall slides were used to progressively restore flexion range, and sit-to-stand practice was initially performed with the affected leg forward to minimise loading while confidence was established.

From approximately three weeks, as pain and range of motion allowed, treatment progressed to standing terminal knee extension against resistance, sit-to-stand practice in symmetrical and then affected-leg-backward positions to increase loading through the operated limb, and forward and backward walking to normalise gait and improve quadriceps control. Closed-chain strengthening (wall squats, lunges), bridging and table-top exercises for core and pelvic stability, and graded stair-climbing practice were subsequently introduced to restore functional lower-limb strength and coordination. Exercise progression was individualised throughout according to symptom severity; participation was intermittently reduced during menstruation

because of severe dysmenorrhoea and low back pain, and sessions were adjusted accordingly rather than progressed on a fixed timeline.

Outcome and Follow-up

Reassessment following the rehabilitation programme showed substantial improvement. Right knee active/passive flexion improved from 20-45 degrees/20-55 degrees to approximately 120-125 degrees/125-130 degrees, and the 20-degree extensor lag resolved to full active extension. Hip flexion range improved from 50 degrees/65 degrees (active/passive) to 90 degrees/95 degrees, with internal and external rotation reaching 45 degrees and 40 degrees respectively with the knee flexed. Hip muscle strength improved from grade 3+ to grade 4-, and knee flexor/extensor strength improved to grade 4-, with resisted testing becoming pain-free. Girth differences compared with the unaffected side reduced from a maximum of 6 cm to 4 cm around the knee, with smaller residual differences proximally and distally, indicating resolution of most postoperative oedema.

Functional performance improved from an inability to perform sit-to-stand, stair climbing, or step-down testing at baseline to completing a five-times sit-to-stand test in 10 seconds, climbing 23 stairs in 30 seconds, and performing 28 unsupported calf raises. No falls, wound complications, or signs of graft failure were noted during the rehabilitation period. Continued outpatient physiotherapy wasrecommended to further address residual kinesiophobia and to support progression toward return to occupational and community activities.

Outcome Measures

Assessment Tool	**Pre-intervention**	**Post-intervention**
Right knee flexion (active/passive)	20°-45° / 20°-55°	120°-125° / 125°-130°
Knee extensor lag	20°	0° (full active extension)
Hip flexion (active/passive)	50° / 65°	90° / 95°
Hip muscle strength (MMT)	Grade 3+	Grade 4-
Knee flexor/extensor strength (MMT)	Grade 3+ to 4-	Grade 4-

Knee girth difference (vs unaffected side)	6 cm	4 cm
Five-times sit-to-stand	Unable to perform	10 seconds
Stair climbing (30 seconds)	Unable to perform	23 stairs
Unsupported calf raises	Unable to perform	28 repetitions
Kujala Patellofemoral Scale	12/100	88/100
Norwich Patellar Instability Score	43%	34%
Tampa Scale for Kinesiophobia	45/68	41/68

DiscussionThis case illustrates several factors that can complicate rehabilitation after MPFL reconstruction beyond the mechanical restoration of patellar stability. Shah et al. and Parikh et al. both highlighted that incorrect graft positioning or excessive graft tension can alter patellar tracking and produce pain, stiffness, or recurrent instability, and that complications including graft failure, reinjury, and unaddressed anatomical risk factors are recognised outcomes of MPFL reconstruction[14,16]. Careful attention to patellar and tibiofemoral joint mobilisation and gradual, criterion-based loading was therefore used in this case to minimise these risks while restoring range of motion.

Generalised joint hypermobility, confirmed here by a Beighton score of 9/9, is well recognised to affect proprioceptive function and dynamic joint control. Malfait et al. note that hypermobility may occur as an isolated finding or as part of a hereditary connective tissue disorder spectrum such as hypermobile Ehlers-Danlos syndrome or hypermobility spectrum disorder[17], and Smith et al. found reduced joint proprioception in people with benign joint hypermobility syndrome[18]; Juul-Kristensen et al. emphasise that standardised scoring, as used in this case, remains important for consistent clinical recognition of the condition[19]. Because passive restraint is reduced in hypermobile individuals, rehabilitation must place greater emphasis on active neuromuscular control, reflected here through progressive closed-chain strengthening and proprioceptive training.

Hormonal fluctuation was also clinically relevant: this patient's rehabilitation participation was intermittently reduced during menstruation because of severe dysmenorrhoea and low back pain. McNulty et al. and Perez-Paredes similarly found that menstrual cycle phase affects muscle activation onset, motor control, and exercise performance in women[20,21], supporting an individualised, symptom-guided approach to rehabilitation progression in female patients rather than a fixed timeline.

Despite substantial gains in strength, range of motion, and patient-reported patellofemoral function, this patient's kinesiophobia improved only marginally. Hysing-Dahl found that persistent fear of movement after patellar stabilising surgery is associated with poorer self-perceived knee function and quality of life even when mechanical stability is successfully restored[22], underscoring the importanceof addressing psychological readiness alongside physical impairments. Consistent with the criterion-based rehabilitation protocols described by Wilk et al. and Sipes et al. for MPFL reconstruction, progression in this case was guided by objective functional milestones, including quadriceps strength, symmetrical function, dynamic balance, and absence of patellar apprehension, rather than by time alone[15,23].

This report is limited by its single-case design, the absence of a comparison group, and follow-up restricted to the physiotherapy episode of care described here, which limits conclusions about the durability of functional gains and the trajectory of her residual kinesiophobia. Even so, the findings support the value of individualised, criterion-based physiotherapy that accounts for generalised joint hypermobility, hormonal variation, and psychological readiness in the rehabilitation of patients following MPFL reconstruction.

Patient Perspective

The patient described considerable fear of reinjury and apprehension about moving her knee in the early stages of rehabilitation, particularly given her earlier episodes of patellar dislocation, but reported gradually increasing confidence as her pain and swelling settled and her range of motion improved. She valued the gradual, structured progression of her exercise programme and the explanation given at each stage, which she felt helped her tolerate exercises she would otherwise have avoided. She remained motivated throughout by her goal of returning to independent mobility and to her work as a receptionist, and acknowledged that symptoms around her menstrual cycle occasionally limited her participation in sessions. She expressed

continued some apprehension about reinjuring the knee or injuring her other leg, which she hoped to keep addressing in ongoing rehabilitation.

Learning Points

- Generalised joint hypermobility (Beighton 9/9) is a significant risk factor for both patellar dislocation and its recurrence, and rehabilitation in these patients must rely more heavily on active neuromuscular control than on passive restraint.
- Postoperative quadriceps inhibition, extensor lag, and range-of-motion deficits after MPFL reconstruction can be substantially reversed with structured, progressive physiotherapy addressing pain, mobility, and neuromuscular activation in sequence.
- Menstrual cycle-related symptoms such as dysmenorrhoea can transiently reduce rehabilitation participation in female patients; progression should be individualised and symptom-guided rather than fixed to a time-based protocol.
- Kinesiophobia can remain elevated even after marked improvements in objective strength, range of motion, and patient-reported function, highlighting fear of movement as a distinct target for intervention alongside physical rehabilitation.
- Criterion-based progression, using measures such as quadriceps strength symmetry, dynamic balance, and absence of patellar apprehension, is preferable to time-based progression when guiding return to activity after MPFL reconstruction.

CONCLUSION

MPFL reconstruction is generally effective in restoring mechanical patellar stability, but functional recovery depends on rehabilitation that addresses more than the graft itself. This case shows that individualised, criterion-based physiotherapy, accounting for pre-existing generalised joint hypermobility, hormonal fluctuation, and persistent kinesiophobia, can meaningfully improve strength, range of motion, and patient-reported patellofemoral function following MPFL reconstruction, while highlighting fear of movement as an area that may need continued attention beyond the point of good mechanical and functional recovery.

CONSENT

Written informed consent was obtained from the patient for publication of this case report and any accompanying clinical data. Every effort has been made to protect the patient's identity, and no personal identifiers have been disclosed in this manuscript.

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