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Case report

Physiotherapeutic approach post-quadricepsplasty for habitual patellar dislocation with patella alta in a paediatric patient: a case report

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ABSTRACT

Habitual patellar dislocation (HPD) with patella alta in children is rare and severely affects mobility and quality of life. Patella alta delays engagement of the patella in the trochlear groove, predisposing it to recurrent lateral dislocation during knee flexion. A 9-year-old female presented with habitual lateral dislocation of the left patella since age 4, progressively worsening and restricting physical activity. Pre-operative assessment revealed patella alta, trochlear dysplasia (Dejour Grade C), complete medial patellofemoral ligament tear, increased Q-angle, quadriceps weakness, and proprioceptive deficits. Conservative management failed, and she underwent a 4-in-1 quadricepsplasty comprising lateral release, vastus medialis oblique (VMO) advancement, distalization of the patellar tendon, and quadriceps lengthening. post-operative physiotherapy commenced three weeks after surgery using a structured, phase-wise protocol. Interventions included cryotherapy, neuromuscular electrical stimulation for quadriceps reactivation, gradual range of motion exercises, isometric and isotonic strengthening, proprioceptive retraining, balance training, and gait re-education. Continuous parent and patient education were integral components. Over 10 weeks, the patient progressed from partial weight-bearing to independent ambulation. Knee ROM improved from 16–53° to 0–130°, quadriceps strength increased from MMT grade 2+ to 4+, and functional outcomes showed significant improvement (LEFS: 24→70; TSK: 38→22). Pain, oedema, and Kinesio phobia decreased, while proprioception and dynamic balance were restored. Early, individualized physiotherapy following quadricepsplasty in paediatric HPD with patella alta yields excellent recovery. A progressive rehabilitation program emphasizing neuromuscular re-education, strength, balance, and family involvement is crucial to reduce recurrence and promote safe return to activity.

Keywords: Habitual patellar dislocation, Patella alta, Quadricepsplasty, Proprioceptive training.

INTRODUCTION

Patellar instability in paediatric populations represents a unique clinical challenge, encompassing a spectrum from first-time dislocations to fixed or habitual dislocations. Habitual patellar dislocation (HPD) is a rare but significant condition in children, characterised by consistent lateral dislocation of the patella during each episode of knee flexion, which typically relocates during extension without external assistance or trauma [1]. Unlike acute or recurrent dislocations, HPD often arises from congenital or developmental factors and is commonly bilateral [2].

Anatomical abnormalities are central to the pathogenesis of HPD, with patella alta being one of the most critical contributing factors[3]. Patella alta refers to the abnormally high positioning of the patella relative to the femoral trochlear groove, commonly assessed radiologically using the Insall-Salvati Index (values >1.2 indicate high

patella) [4]. This malalignment delays or prevents normal engagement of the patella with the trochlear groove during early flexion, increasing the risk of lateral subluxation or dislocation [5].

Other predisposing factors include trochlear dysplasia, lateral retinacular tightness, quadriceps fibrosis or contracture, ligamentous laxity, and underdevelopment of the vastus medialis obliqus (VMO) [6]. The combination of these abnormalities compromises dynamic and static stabilizers of the patella, especially during flexion beyond 30°, when lateral vector forces on the patella increase [7].

Children with HPD often present with symptoms such as knee pain, difficulty squatting, limping gait, and avoidance of stairs or sports activities [8]. Prolonged dislocations may result in extensor lag, compensatory gait patterns, psychological distress, and eventually patellofemoral joint degeneration if left untreated [9].

Although conservative management (e.g., bracing, quadriceps strengthening, taping, activity modification) is often attempted initially, outcomes are typically poor in cases with significant anatomical abnormalities or fixed dislocations [10]. Surgical correction is thus the standard of care in persistent or fixed HPD, particularly when associated with patella alta and quadriceps tightness [11].

One of the most effective surgical techniques in such cases is the 4-in-1 quadricepsplasty, which addresses multiple pathological components simultaneously:

Lateral retinacular release

Medialization or advancement of the VMO

Distal realignment or lengthening of the patellar tendon

Quadriceps lengthening (usually via Z-plasty) [12]

This technique is especially suited to the skeletally immature population, providing functional alignment without compromising the growth plates [13]. Postoperative immobilisation is typically followed by a carefully structured rehabilitation program, which is essential for regaining ROM, neuromuscular control, and muscle strength, while also preventing fibrosis, extensor lag, and recurrence[14].

Paediatric rehabilitation requires tailored progression, play-based strategies, and family involvement. The focus is on pain management, quadriceps reactivation, proprioceptive retraining, and progressive weight-bearing, ensuring that the child returns to normal functional and recreational activities.

This case report presents the rehabilitation journey of a 9-year-old girl with habitual patellar dislocation and patella alta, treated surgically with quadricepsplasty, highlighting each phase of recovery with detailed protocols aimed at restoring full functional independence.

Case presentation

A 9-year-old right-handed school-going girl was brought to the VPMH Musculoskeletal physiotherapy department following referral from an orthopaedic surgeon after undergoing corrective surgery for habitual patellar dislocation of the left knee. The primary complaint was frequent lateral dislocation of the left patella, which occurred consistently during knee flexion activities such as squatting, running, or stair climbing and spontaneously relocated with knee extension. These symptoms had been observed since the age of 4, initially painless but becoming progressively uncomfortable over the last 2 years. The patient experienced increasing difficulty performing functional activities involving knee flexion and began avoiding playground games and sports. Despite no history of trauma or acute injury, the dislocations became more pronounced with growth.

Prior to surgery, conservative management was attempted, which included quadriceps strengthening, vastus medialis obliquus (VMO) re-education, bracing, and McConnell taping techniques. However, compliance was suboptimal due to the child's discomfort and limited understanding of exercise instructions. These conservative efforts failed to correct the underlying biomechanical issues, and the child was eventually referred for surgical intervention. At the age of 9, she underwent a quadricepsplasty using the 4-in-1 technique, which involved lateral retinacular release, VMO advancement, distalization of the patellar tendon, and quadriceps lengthening, specifically indicated due to associated patella alta and lateral patellar tracking.

The post-operative course included immobilization of the knee in full extension using a cast for three weeks. Following cast removal, the child was referred for structured physiotherapy. There were no significant perinatal or developmental concerns; her birth and gross motor milestones were achieved on time. There was no family history of similar musculoskeletal disorders, generalized ligamentous laxity, or connective tissue diseases. Socially, the child is active, with good family support, and shows strong motivation to return to recreational play and school-

based on physical activity. Academic performance was reported as above average, and the family was cooperative and engaged in the rehabilitation process.

Table1: Timeline

Event	Date
Date of Fall / Aggravation	21-09-2024
Date of Hospital Admission	23-09-2024
Date of Surgery (Quadricepsplasty)	25-09-2024
Date of Physiotherapy Referral	10-01-2025

Clinical findings

Before the examination, proper consent from the patient was obtained. The patient was evaluated in the supine lying position.

Clinical Parameter	Findings
Surgical Side	Left knee
Gait Pattern	Guarded, partial weight-bearing with assistive device (walker/crutches)
Posture	Slight forward lean; reduced knee flexion on affected side
Patellar Alignment	Patella centralised; mild post-op edema; no visible dislocation
Surgical Site	Healing incision; mild local warmth and tenderness
	Extension: Full (16°); slight quadriceps lag
Q-Angle	20° Lt side and 15° Rt side
Pain (VAS Scale)	6/10 at rest; 8/10 during passive ROM or palpation
Swelling/Edema	Mild peri-patellar swelling present
Patellar Apprehension Test	Mild apprehension at 30° flexion
Proprioception	Impaired on affected side; poor single-leg stance on left
Functional Limitation	Difficulty with sit-to-stand, stair negotiation, and unsupported ambulation
Balance	Reduced static and dynamic balance on the left
Endurance	Poor lower limb endurance; early fatigue with exercises
Psychological Status	Anxious but motivated; mild fear of movement (kinesiophobia)

Table 2: Range of motion assessment on 1st Physiotherapy session

Joint & Motion	Right AROM (°)	Right PROM (°)	Left AROM (°)	Left PROM (°)
Hip Flexion	0–110	0–120	0–70	0–85
Hip Abduction	0–40	0–45	0–35	0–40
Knee Flexion	0–130	0–135	16–53	0–57
Knee Extension	130--0	135--0	53--16 (lag)	57—0
Ankle Dorsiflexion	0–18	0–20	0–12	0–15
Ankle Plantarflexion	0–45	0–50	0–40	0–45
Ankle Inversion	0–30	0–35	0–25	0–30
Ankle Eversion	0–20	0–25	0–15	0–20

Table 3: Manual muscle testing assessment on 1st Physiotherapy session

Muscle Group	Right Side (MMT Grade)	Left Side (MMT Grade)
Hip Flexors	Grade 5/5	Grade 3-/5
Hip Abductors	Grade 5/5	Grade 3-/5
Knee Extensors	Grade 5/5	Grade 2+/5 *(Post-quadricepsplasty)*
Knee Flexors	Grade 5/5	Grade 3-/5
Ankle Dorsiflexors	Grade 5/5	Grade 4/5
Ankle Plantarflexors	Grade 5/5	Grade 4/5

Table 4: Pain Pressure Threshold sensitivity assessment on 1st Physiotherapy session

Region	Palpation Site	Right PPT (N)	Left PPT (N)
Anterior-Medial	Vastus medialis / Medial joint line	30 N	23 N
Anterior-Lateral	Vastus lateralis / Lateral retinaculum	44 N	29 N
Posterior	Popliteal fossa / Hamstring insertion	34 N	20 N

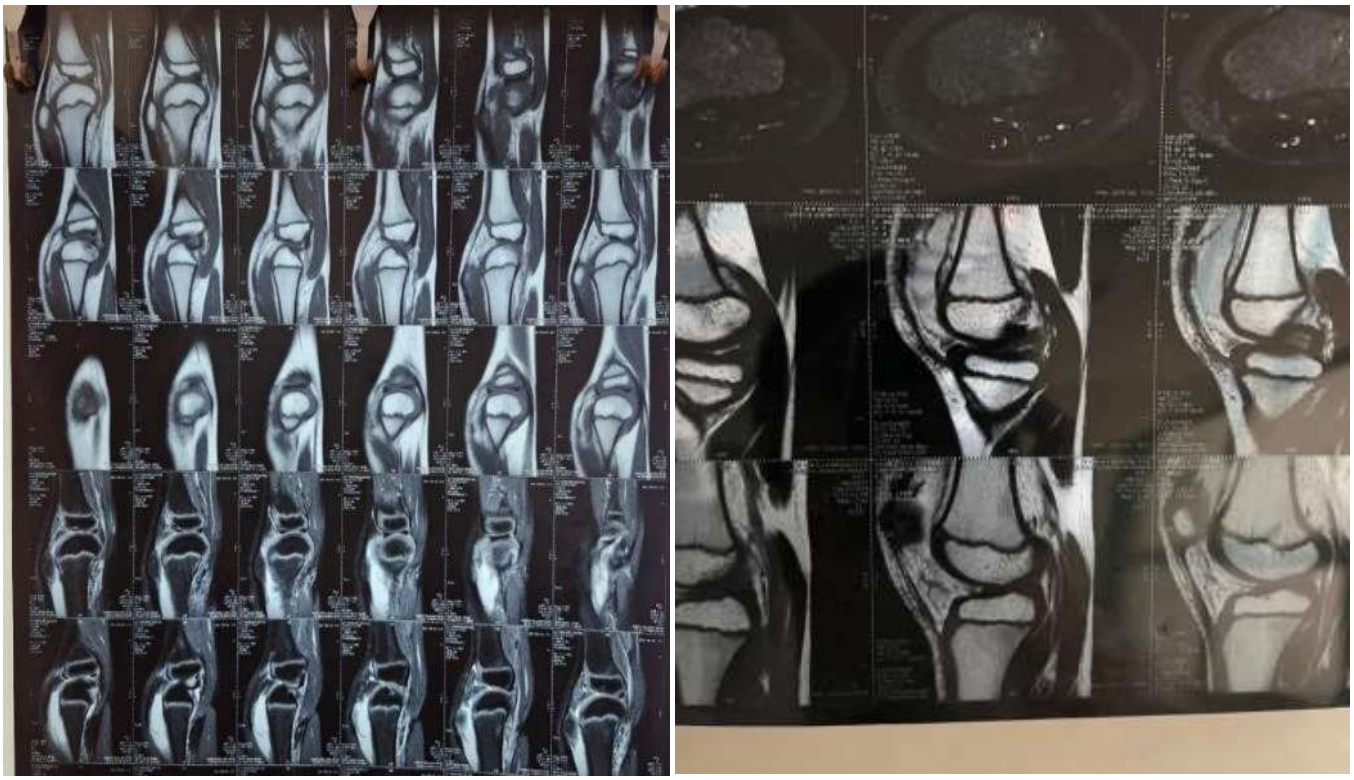
Table 5: Muscle Girth assessment on 1st Physiotherapy session

Level	Right Side (cm)	Left Side (cm)
5 cm Above Patella	24.5 cm	24.5 cm
10 cm Above Patella	28 cm	24 cm
15 cm Above Patella	32 cm	26 cm
5 cm Below Patella	22 cm	21 cm
10 cm Below Patella	21.5 cm	20.5 cm
15 cm Below Patella	20 cm	18 cm

Table 6: Outcome Measures

Outcome Measure	Pre-Intervention Score	Post-Intervention Score	Interpretation
Tampa Scale for Kinesiophobia (TSK)	38/68	22/68	↓ Indicates reduced fear of movement post-therapy
Lower Extremity Functional Scale (LEFS)	24/80	70/80	↑ Indicates significant functional improvement

Figure 1,2: MRI of left Knee joint radiological findings



Impression

Trochlear facet asymmetry with high lateral facet and hypoplastic medial facet suggestive of Grade C trochlear dysplasia. (Dejour classification) it is associated with lateral subluxation of patella.

-Patella alta

-Complete tear MPFL.

-Moderate knee joint effusion with suprapatellar extension.

-Anterior cruciate ligament sprain.

Medical management

The surgery aimed to correct mal-tracking and stabilize the patella. Under general anesthesia, a medial parapatellar approach was used. A lateral retinacular release was performed to relieve lateral tethering, and medial plication was done to improve medial support. A quadriceps lengthening procedure (likely V-Y plasty) was carried out to reduce tension on the patella. Postoperatively, the knee was immobilized in extension, and the patient was prescribed analgesics and antibiotics. Physiotherapy referral was made for gradual mobilisation and strengthening to prevent re-dislocation and restore knee function.

Physiotherapy management

PHASE 1- Acute post-operative pain (0-2 weeks)

Goals

Reduce swelling, reduce pain, and maintain the range of motion, protect the surgical site, and prevent complications.

Positioning & Protection

Knee brace or immobiliser in full extension (as per surgeon's instruction)

Leg supported in elevated position with pillows under the heel (not under the knee)

Non-weight bearing or toe-touch weight bearing with walker/crutches (as per surgeon's protocol)

Pain and Swelling Management

Cryotherapy: 15–20 minutes every 2–3 hours

Compression bandaging (if advised)

Elevation to reduce swelling

Monitor incision site for signs of infection or hematoma.

Muscle Stimulation.

To cover the extension-lag, neuromuscular electrical stimulation for VMO was started.

Parameter	Setting
Current Type	Surged faradic current
Pulse Duration	0.1–1 ms (preset in most machines)
Frequency	50 Hz (typical for tetanic contraction)
Surge Duration	10 seconds
Surge Interval	30 seconds
Intensity	Visible, strong but comfortable contraction
Total Duration	15 minutes
Electrode Placement	Over VMO belly and proximal thigh (rectus femoris area)
Patient Position	Supine or long sitting, knee in 20–30° flexion

Figure 3,4: Electrical muscle stimulation for vastus medialis obliques for left knee joint

Exercises (Day 1 Onwards, within pain limits)

Ankle Pumping
10–15 repetitions/hour

Static Quadriceps Contractions (Isometrics)
Tighten the front thigh muscle without moving the knee

Hold for 5–10 seconds, 10 reps, 3–4 times/day.

Began with minimal resistance and progressed gradually.

Static Gluteal Contractions
Contract buttocks, hold for 5 seconds 10 reps, 3 sets/day.

Passive and Assisted Knee Flexion (If Allowed by Surgeon)
0° to 30–45° of gentle passive knee flexion by therapist or caregiver.

Only if incision is healing well and no active inflammation

Supine heel slides (assisted).

Figure 5: 45 Degree ROM for left knee joint

Hip Mobility Exercises
Hip abduction/adduction in supine (within comfort)

Straight leg raises (if no extensor lag or surgical restriction)

All done without straining the knee

Figure 6: Left SLR with 7 Degree extension lag

Precautions
Avoid active knee extension against gravity initially

Avoid sitting with knees bent for long periods

No kneeling, squatting, or stairs

Do not discontinue brace unless advised by surgeon

Patient and Parent Education

Importance of brace compliance

Wound care instructions

Correct use of assistive devices

Ice and elevation techniques.

Phase 2: Early Mobilization Phase (2–4 Weeks Post-op)
Goals

Begin gentle restoration of knee range of motion (ROM)

Initiate active-assisted and active exercises

Prevent muscle atrophy

Improve neuromuscular control

Continue pain and swelling management

Promote safe partial weight-bearing if allowed by the surgeon

Positioning and Brace Use

Knee brace may still be in use (locked in extension or gradually unlocked as per surgeon)

Elevate the leg when at rest to control swelling

Emphasise neutral hip and foot alignment during rest and movement

Ambulation Training

Partial weight bearing with crutches or walker

Focus on: Heel strike–toe-off pattern, maintaining upright posture

Gradual transition to full weight bearing toward the end of week 4 (as advised)

Pain and Oedema Management

Continue cryotherapy post-exercise or 2–3 times daily (15–20 mins)

Compression garments or bandage if swelling persists

Exercises

Range of Motion (ROM)

Goal: 0°–60° or more of knee flexion

Passive knee flexion using:

Heel slides (supine or seated)

Wall-assisted slides

Active-assisted ROM

Use of towel/band under foot for self-assisted flexion

Gradual progression based on pain and stiffness

Muscle Activation and Strengthening

Quadriceps isometrics (progressing to inner range quads at 30°–45°)

Straight Leg Raises (4 directions: flexion, abduction, adduction, extension)

Terminal knee extension in sitting or supine

Gluteal isometrics and bridging (for pelvic stability)

Proprioception and Neuromuscular Re-education

Weight shifting in standing (supported)

Mini-squats on wall (if pain-free and within ROM limit)

Balance board (static) or firm foam support (double-leg stance only)

Hip and Ankle Joint Mobility

Ankle ROM exercises: Dorsiflexion and plantarflexion

Hip abduction/adduction in side-lying or supine

Focus on maintaining normal joint motion proximally and distally

Patient & Parent Education

Emphasize brace adjustment schedule

Importance of adherence to home exercise program (HEP)

Early signs of infection, swelling, or overuse to be reported

Monitor for compensatory movements (hip hike, toe walking)

Expected Functional Goals by End of Phase 2

Knee flexion: ~60–90 degrees (passive and active-assisted)

Begin active control of quads

Improved weight tolerance

Effective brace use and ambulation with aids.

Phase 3: Intermediate Phase (3-4 Weeks Post-op)

Goals

Achieve at least 90°–110° knee flexion

Initiate full active ROM

Begin closed-chain exercises

Improve functional muscle strength

Promote independent gait with or without assistive device

Enhance proprioception and balance

Brace and Weight-Bearing

Brace may be unlocked or removed gradually (as per surgeon protocol)

Transition to full weight-bearing

Progress from walker/crutches to stick or independent gait

Range of Motion Goals

Achieve full knee extension

Knee flexion up to 110–120°

Continue passive-assisted ROM exercises:

Heel slides (in supine and sitting)

Seated knee flexion

Wall-assisted flexion

Emphasize controlled active knee extension

Figure 7: 112 Degree of hip -knee flexion of left side

Strengthening Exercises
Quadriceps Strengthening
Inner-range quadriceps (30–0°) with resistance band

Progressive straight leg raises with ankle weights

Mini squats with wall support (0°–45°)

Closed Kinetic Chain Exercises
Weight-shifting in standing

Wall sits (begin with short holds: 10–15 secs)

Step-ups (2–4 inches height) on unaffected and affected leg

Partial lunges (if tolerated)

Hip and Core Strengthening
Side-lying hip abduction/adduction

Bridging with progression (double to single leg)

Supine leg lifts and abdominal activation

Balance and Proprioception Training
Single-leg stance (with support)

Wobble board or balance mat (double-leg stance)

Reaching activities while standing on affected leg

Ball catching in partial squat

Gait Training
Emphasize heel strike and push-off phase

Focus on symmetry, stride length, and step-through pattern

Progress from stick to independent gait

Pain & Swelling Management
Ice after exercise sessions if any signs of inflammation

Elevation if post-exercise swelling occurs

Patient and Parent Education
Avoid deep squatting, running, or high-impact activities

Reinforce the importance of correct movement patterns

Encourage regular participation in home exercise program

Expected Outcomes by End of Phase 3
Knee flexion: ~110–120°

Full active extension

Independent ambulation (no assistive device)

Initiation of functional movement patterns

Beginning of muscle reconditioning.

Phase 4: Advanced Strengthening Phase (6 Weeks Post-op)
Goals
Regain full, pain-free ROM

Restore functional lower limb strength

Improve dynamic balance and neuromuscular control

Promote gait normalization

Begin low-level functional and age-appropriate physical activities.

Patient Status Assessment
Check ROM, gait, pain levels, and quadriceps activation before initiating advanced exercises

Ensure knee flexion is ≥120° and good static balance is achieved

ROM & Mobility
Continue with:

Active knee flexion/extension (full range)

Hamstring and quadriceps muscle stretches

Hip mobility drills (circles, controlled leg swings)

Progress wall slides from 45° to 60°–90°

Strengthening Exercises
Open Chain Strengthening
Resistance band or cuff weight exercises:

Knee extension (within safe arc: 90° to 30°)

Hip abduction, flexion, and extension

Ankle dorsiflexion and plantarflexion with resistance

Closed Chain Strengthening
Step-ups and step-downs (progress height gradually)

Mini to full squats (as tolerated)

Lunges (forward, backward, and lateral with support if needed)

Wall sits with longer holds (30–45 seconds)

Core and Gluteal Strengthening
Single-leg bridges

Side planks with leg raises

Bird-dog

Dynamic bridging on exercise ball

Proprioception & Balance Training
Single-leg stance on foam with reaching tasks

Wobble board squats

Tandem walking (forward and backward)

Eyes closed balance drills

Obstacle course for neuromuscular challenge

Gait Re-education & Functional Training
Emphasis on
Heel strike and toe-off pattern

Avoiding compensation (hip hike, circumduction)

Walking on uneven surfaces, grass, and inclines

Stair climbing practice: up with good leg, down with affected leg initially → then full weight transfer.

Light Functional Activities
Begin age-appropriate low-impact games (light ball passing, dribbling, cycling)

Avoid jumping, pivoting, or impact sports at this stage

Pain/Swelling Management
Use ice post-exercise if signs of overload

Modify exercise intensity based on pain and fatigue.

Parent & Patient Education
Educate about proper landing technique

Continue home program daily

Caution against premature return to sport or intense activity

Expected Outcomes by End of Phase 4

Full pain-free ROM

Near-normal quadriceps and gluteal strength

Independent and efficient gait

Improved balance and coordination

Ready for light sport-specific training in the next phase.

Table 7: Range of motion assessment after all Physiotherapy sessions

Joint & Motion	Right AROM (°)	Right PROM (°)	Left AROM (°)	Left PROM (°)
Hip Flexion	0–110	0–120	0–103	0–110
Hip Abduction	0–40	0–45	0–40	0–42
Knee Flexion	0–130	0–135	2-112	0–120
Knee Extension	130--0	135--0	112-2	120-0
Ankle Dorsiflexion	0–18	0–20	0–15	0–18
Ankle Plantarflexion	0–45	0–50	0–40	0–45
Ankle Inversion	0–25	0–30	0–24	0–30
Ankle Eversion	0–20	0–25	0–18	0–20

Table 8: Pain Pressure Threshold sensitivity assessment after all Physiotherapy sessions

Region	Palpation Site	Right PPT (N)	Left PPT (N)
Anterior-Medial	Vastus medialis / Medial joint line	30 N	28 N
Anterior-Lateral	Vastus lateralis / Lateral retinaculum	44 N	38N
Posterior	Popliteal fossa / Hamstring insertion	34 N	29 N

Table 9: Manual muscle testing assessment after all Physiotherapy sessions

Muscle Group	Right Side (MMT Grade)	Left Side (MMT Grade)
Hip Flexors	Grade 5/5	Grade 4/5
Hip Abductors	Grade 5/5	Grade 4/5
Knee Extensors	Grade 5/5	Grade 4/5
Knee Flexors	Grade 5/5	Grade 4/5
Ankle Dorsiflexors	Grade 5/5	Grade 4/5
Ankle Plantarflexors	Grade 5/5	Grade 4/5

Table 10: Muscle Girth assessment after all Physiotherapy sessions

Level	Right Side (cm)	Left Side (cm)
5 cm Above Patella	24.5 cm	24.5 cm
10 cm Above Patella	28 cm	26 cm
15 cm Above Patella	32 cm	29 cm
5 cm Below Patella	22 cm	21 cm
10 cm Below Patella	21.5 cm	20.5 cm
15 cm Below Patella	20 cm	19 cm

Figure 8, 9: Complete hip knee flexion of left side, complete knee extension

DISCUSSION

This case describes the post-operative physiotherapeutic rehabilitation of a 9-year-old female with habitual patellar dislocation (HPD) and patella alta following corrective surgery using the 4-in-1 quadricepsplasty technique. Preoperatively, the child demonstrated a history of consistent lateral patellar dislocation during flexion since the age of four, progressive discomfort, avoidance of knee flexion activities, and functional limitations in squatting, stair negotiation, and play activities. Objective findings revealed increased Q-angle (20° on the affected side), impaired proprioception, extensor lag, reduced knee flexion (16°–53° AROM), significant quadriceps weakness (MMT 2+/5), and muscle atrophy as indicated by reduced girth above the patella. Pain levels were high (VAS 7/10), and balance and endurance were markedly compromised. Radiological assessment confirmed trochlear dysplasia (Grade C, Dejour classification), patella alta (Insall–Salvati index >1.2), complete MPFL tear, aligning with established structural predispositions to HPD in pediatric patients [1,2]

Patella alta has been widely reported as a critical risk factor for patellar instability due to delayed engagement of the patella in the trochlear groove during early flexion, allowing

unopposed lateral vector forces to cause displacement [3,4]. In our patient, this was compounded by lateral retinacular tightness and underdeveloped VMO, both of which reduce medial stabilization [5]. The surgical approach addressed these through lateral retinacular release, VMO advancement, distalization of the patellar tendon, and quadriceps lengthening, which are effective in skeletally immature knees without compromising growth plates [6,7].

Postoperatively, early physiotherapy intervention was implemented three weeks after surgery, consistent with the literature advocating timely but protected mobilization to prevent stiffness, arthrofibrosis, and muscle atrophy while protecting the surgical repair [8,9]. Our acute-phase program incorporated cryotherapy, elevation, compression, and patient/parent education for swelling control, and NMES for VMO activation to address quadriceps inhibition [10], who demonstrated that medial quadriceps function significantly influences patellar tracking.

The gradual progression of ROM (from 0°–45° flexion in the early phase to >120° by week 7) followed a criterion-based approach, avoiding excessive early loading on the repair, which aligns with protocols for extensor mechanism reconstruction [11]. Objective gains in knee flexion (+67°), full active extension, and elimination of extensor lag by Phase 4 reflect both surgical correction and effective rehabilitation sequencing.

Strengthening progressed from isometric quadriceps activation in Phase 1 to open-chain resistance and closed-chain functional drills by Phase 4, targeting quadriceps, gluteal, and hip stabilizers. These were complemented by proprioceptive and balance retraining (static → dynamic → perturbed stance), addressing the preoperative proprioceptive deficits. Similar phased strengthening and proprioceptive re-education have been shown to improve stability and reduce recurrence in paediatric patellar instability [12].

Functional outcomes by the end of 8 weeks included

Independent ambulation without aids

Full, pain-free ROM (0°–120°)

Quadriceps strength improved from 2+/5 to 4/5

Restored static and dynamic balance

Return to light recreational activities.

Pain reduced from VAS 8/10 to 1/10, and muscle girth improved, indicating reversal of atrophy. Improvement in proprioceptive performance (single-leg stance time) suggests restoration of neuromuscular control — a key preventive factor against radiolocations (Cash & Hughston, 1988).

The key determinants of the successful outcome in this case included:

Comprehensive surgical correction addressing both soft tissue and bony contributors.

Early initiation of neuromuscular re-education, particularly VMO activation via NMES.

Criterion-based ROM and loading progression, minimizing surgical site stress.

Integration of proprioceptive and functional training to facilitate safe return to activities.

Strong parent involvement ensuring adherence to the home program, as emphasized in paediatric rehabilitation literature (Tscholl et al., 2018).

This case supports existing evidence that post-quadricepsplasty rehabilitation in paediatric HPD must be highly individualised, progressive, and multidisciplinary. Combining orthopaedic correction with targeted physiotherapy yields optimal outcomes in terms of ROM restoration, strength recovery, proprioception, and return to age-appropriate activity, while minimising recurrence risk (Arendt & Dejour, 2013; Danino et al., 2020).

The patient was initially advised of a second surgery for genu valgum correction through distal femoral osteotomy. However, with focused physiotherapy—emphasising quadriceps and hip abductor strengthening, gait retraining, and proprioceptive exercises—progressive improvement in alignment and functional stability was achieved. As a result, the planned osteotomy was cancelled, highlighting the effectiveness of rehabilitation in managing paediatric genu valgum conservatively.

CONCLUSION

Early, structured physiotherapeutic intervention following quadricepsplasty for habitual patellar dislocation with patella alta in a pediatric patient resulted in significant improvements in range of motion, quadriceps strength, proprioception, and functional independence. A phased rehabilitation protocol emphasising pain control, quadriceps reactivation, gradual ROM restoration, closed-chain strengthening, and proprioceptive retraining facilitated a safe and effective return to daily activities. Integration of parent education and adherence to a home exercise program were

critical in achieving optimal outcomes and minimising recurrence risk.

Conflict of Interest

The authors declare no conflict of interest related to this case report.

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