

The Rehabilitation Following Medial Patellofemoral Ligament Reconstructions

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Citation

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Abstract

This retrospective single case-report presents the physiotherapy rehabilitation of a patient following a medial patellofemoral ligament (MPFL) reconstruction for recurrent patellar dislocations and instability. A 24 year old woman with a 10 year history of recurrent patellar dislocation to her left knee underwent a MPFL reconstruction. The protocol presented employed cryotherapy, gait re-education, hydrotherapy and exercise-based treatments. Outcomes measured included knee range of movement assessed by goniometry, patient's subjective evaluation and Kujala Score. At 12 month follow-up, the patient reported no further patellar dislocations or instability, full knee range of movement, improved Kujala Score from 59 to 81, and was completely satisfied with the outcome. Further areas of investigation are suggested to determine the optimal rehabilitation of patients following a MPFL reconstruction.

INTRODUCTION

Patellar instability is an umbrella term for patellar subluxation and dislocation.¹ It may occur as a result of: - weakness of the medial muscles such as the VMO; torn medial soft tissues such as the medial patellofemoral ligament (MPFL); tight lateral soft tissues such as the lateral retinaculum, vastus lateralis or the iliotibial band; or patella alta.^{2,3}

The MPFL is the primary stabiliser of the patella, limiting lateral patellar translation and providing between 53 and 67% of the medial soft tissue restraint.^{4,5,6,7} It lies deep to the vastus medialis muscle, attaching from the posterior part of the medial epicondyle, to the superomedial patella, the under-surface of the vastus medialis, and the quadriceps tendon.⁸

In the majority of patellar dislocations the MPFL is disrupted.^{9,10,11} The re-dislocation rate of primary patellar dislocations managed non-operatively is between 15 to 44%.^{7,12,13,14} Accordingly, several authors have suggested that repair or reconstruction of the MPFL may reduce this high incidence of recurrent dislocation.^{7,15,16}

Various different methods of reconstructing the MPFL have been described, harvesting different soft tissues to reconstruct the ligament. These have included using the adductor magnus,^{17,18} quadriceps tendon,^{7,15} and

semitendinosus.^{19,20,21}

Following a review of the literature, no detailed descriptions were identified on how to rehabilitate patients following a MPFL reconstruction. Accordingly, the purpose of this paper is to present such a physiotherapy protocol (Table 1). To illustrate this, a patient who underwent a MPFL reconstruction treated using this programme is presented. The patient was selected as she was operated on over 12 months ago. This allowed us to present her treatment progression and outcomes over a prolonged period. Signed informed consent was obtained from the patient to present her management in this case study.

Table 1: A rehabilitation protocol for patients following a medial patellofemoral ligament reconstruction

Figure 1

Phase I - In-Patient Physiotherapy		
Day 0-1	Exercises	Active and active assisted flexion encouraged using a sliding board/sheet once the patient feels comfortable. Patient is to increase range of movement as much as tolerated. Static, inner range quadriceps and straight leg raises taught to patients to promote quadriceps strength. Active ankle dorsiflexion and plantarflexion instructed.
	Exercises	Exercises reviewed and encouraged to independently perform.
	Cryotherapy	Ice applied intermittently if knee is grossly swollen.
	Gait	From 2 hours post-operatively: FWB mobilisation with 2 elbow crutches. Heel-toe gait and reciprocal gait pattern encouraged. An extension splint is applied for walking if the patient is unable to straight leg raise. Step and stairs practice with elbow crutches for safe discharge.
Phase II - Out-Patient Physiotherapy		
Day 4 - 3 weeks	Assessment	Full objective and subjective musculoskeletal assessment, particularly assessing quadriceps function, soft tissue length and range of movement.
	ROM	Review active, active assisted and passive knee flexion exercises. Introduce double-leg wall-slide and hinges. Commence low resistance static bike exercises. Teach hamstring, quadriceps, gastrocnemius and soleus stretches as indicated. Manual therapies such as Mulligan mobilisations, Mulligan mobilisations-with-movement and Proprioceptive Neuromuscular Facilitation.
	Strength	Review isometric hamstring and quadriceps exercises. Teach straight-leg raises, active and resisted hip extension and abduction, double-leg mini-dips and step-up/down exercises, biasing operated leg.
	Gait	Progress from 2 crutches to 1 crutch to no crutches as soon as possible, maintaining correct gait pattern. Improve confidence and fear avoidance of further patellar dislocations.
	Cryotherapy	Ice for swelling as indicated.
Phase III - Late Out-Patient Physiotherapy		
Weeks 3 - Discharge	ROM	Continue active knee flexion, double-leg wall squats, full hinges, progressing to single-leg exercises. Static bike activities, increasing distance. Continue knee dip exercises and stretches as indicated.
	Strength	Increase static bike resistance, distance and introduce speed intervals. Stair walker and stepping activities, increasing speed and repetitions, with and without rucksack. Leg press. Resisted SLR and hamstring exercise-band exercises. Plyometric activities - two legs, one leg, jumping, hopping, triple jump. Mini-tramp - walking, running, jumping whilst throwing and catching. Prone knee hangs with and without weight and hamstring curls. Standing heel raises - double to single leg support. Progress double-leg mini-dips and step-up/down exercises to single-leg dips, increasing size of dip, speed, repetition and direction of step-up/down activities.
	Gait	Acceleration/deceleration shuttle test. Quick walk to jogging to running. Interval training. Walking and running on varied surfaces, uphill, downhill and slopes. Change of direction activities.
	Sport Related Rehab	Individualised to patients but may include more - plyometrics with and without ball/racket/bat as indicated. Drills such as jogging, running, sprinting, cone and slalom activities. Cutting, twisting and turning activities recreating sporting scenarios. Specific sporting activities such as rugby scrumming, football tackling, tennis serving, cricket bowling, working on endurance, technique, and speed as required. Fear avoidance with respect to apprehension of patella dislocation during recreational and sporting activities. Return to contact or non-contact sports when patient feel comfortable and confident with operated knee.

FWB - Full Weight-Bearing ROM - Range of Movement SLR - Straight Leg Raise

THE PATIENT

The patient was a 24 year old woman who worked in the catering industry. She had a 10 year history of bilateral recurrent patellar dislocation; her left knee was subjectively reported as worse than her right. She reported that her knee functionally limited her, and that she felt that her patella would “pop out of place” during everyday activities such as getting into a car or dancing. She was unable to run.

The patient was referred by her General Practitioner to a specialist orthopaedic knee surgeon. At her initial consultation with the surgeon, she presented with full range of movement to both knees, but bilateral positive apprehension test and J-shaped tracking to both patella. A computed tomography (CT) scan was undertaken of her left knee, reporting a shallow trochlear groove with lateral patella tracking. The surgeon recommended a left MPFL reconstruction.

SURGICAL PROCEDURE

A MPFL reconstruction was performed using a

semitendinosus free graft. A longitudinal incision was made over the patella. The patella was accessed, and a bony tunnel was made in its upper medial border. The graft was passed through this, tunnelled through the second layer of the medial retinaculum and “whip-stitched” together. A second incision was made over the medial femoral condyle. A pit was formed at the medial femoral condyle, at the origin of the MPFL, and the graft was held in this femoral pit using a screw. The knee was then assessed arthroscopically to ensure that the patella was lying correctly within the femoral trochlear and that there was no instability on flexion and extension of the knee. The incisions were closed and the knee was dressed in gauze, wool and crepe bandage. Figure 1 illustrates the 2 incisions required for graft fixation from the patella, to the medial femoral condyle.

Figure 1: The MPFL Reconstruction Incisions.

Figure 2



The post-operative instructions permitted knee range of movement exercises after 2 hours post-operatively, to mobilise full weight-bearing and out-patient physiotherapy.

IN-PATIENT PHYSIOTHERAPY

After having her operation in the morning, the patient was seen by an orthopaedic physiotherapist that afternoon. The patient reported that her knee was painful. After being administered oral analgesia by the nursing staff, she was taught an exercise programme including: unlimited range active and active assisted knee flexion and extension exercises; static and inner range quadriceps; and ankle dorsiflexion and plantarflexion exercises. She was encouraged to perform these as often as possible, and

continue on discharge at home. The patient's knee range of movement was minimal, from approximately 0 to 40°, limited by pain.

The patient was instructed on how to begin walking using 2 elbow crutches. She was encouraged to weight-bear through her left knee as much as possible; this was however, limited by pain. A reciprocal gait pattern was taught and she could mobilise in excess of 20 metres. She was shown how to, and safely negotiated stairs using her crutches.

Out-patient physiotherapy was arranged to commence as soon as possible, and the patient was discharged home the day after her operation.

OUT-PATIENT PHYSIOTHERAPY

Following the protocol presented in Table 1, a full musculoskeletal assessment was performed on the patient's initial out-patient appointment. Through this, the patient reported a constant ache to the anterior aspect of her knee, limiting her knee range of movement to minus 55° extension and to 60° flexion when assessed using a long-arm goniometer. Significant generalised quadriceps wasting was noted. She reported that the pain was disturbing her sleep up to 4 times each night, and to relieve this, she was sleeping with a pillow underneath her knee. She was taking up to 6 codeine based painkillers per day to help manage her symptoms. She had not continued the post-operative exercises she was shown in hospital. The patient was still walking with the aid of 2 elbow crutches, toe-touch weight-bearing due to pain.

The patient was seen on an outpatient basis on 8 occasions over 4 weeks. Initial outpatient treatment included advice regarding self-management of pain using heat,²² mobilisations-with-movements using lateral glides into flexion,²³ and a home exercise programme. This included active assisted and active knee flexion and extension exercises, straight-leg raises and static quadriceps activities. The objective of these were to restore full active and passive range of motion, regain good quadriceps contraction and control, and full early weight-bearing as soon as possible.²⁴ In an attempt not to unduly load the patellofemoral joint, and to encourage functional movement, there was a bias towards closed-chain activities.²⁵

Although by the fourth treatment session the patient was progressing well, she still had limited knee extension at minus 10°, and only 110° flexion limited by pain. Accordingly, she was transferred to our Hydrotherapy class

where the heat of the water, in addition to the therapeutic effects of exercising with or against buoyancy,²⁶ were introduced to improve the patient's pain and range of movement.

She attended her hydrotherapy classes 4 times over 2 weeks. Activities performed included further gait-re-education against the resistance of water, squat and lunge exercises, resisted and assisted knee flexion activities. The patient continued with her home exercises on non-gym days, and was discharged from the Physiotherapy Department 3 months post-operatively.

OUTCOME

Following this programme, when reviewed 6 months post-operatively, the patient reported that her left knee felt stronger, with no recurrent patellar dislocations, and was completely satisfied with her surgery. She had increased confidence in the use of her knee, full range of motion, and had returned to her normal home and work activities. She had regained full pain-free range of movement and had good quadriceps control. Her Kujala score improved from 59 to 81.²⁷ These outcomes were maintained at a 12 months post-operatively review. She had a MPFL reconstruction to her right knee the following year.

DISCUSSION

This paper has presented a physiotherapy rehabilitation protocol for patients following a MPFL reconstruction, illustrated using a case-study. This patient reported a successful outcome with the resolution of her patellar instability. Such a successful outcome mirrors the findings from previously presented case-series.^{17,18,19,20,28,29}

This paper presents the rehabilitation of a specific individual. As with all rehabilitation programmes, the patient's management should be tailor-made, to meet both patient's and physiotherapist's objectives.³⁰ For example, the patient presented in this case was not sports orientated. Accordingly, the sports-related rehabilitation detailed in the protocol was not necessary. Nonetheless, MPFL reconstruction patients do participate in sports post-operatively,¹⁹ and this should be assessed and incorporated into the rehabilitation of both amateur and elite sports-people who undergo a MPFL reconstruction. Therefore, the rehabilitation protocol described is recommended to simply guide physiotherapy during their clinical decision-making.

The case presented in this paper exhibited limited knee range of movement and significant pain control issues when she

attended her initial out-patient appointment. Subsequent cases treated in our department have presented with similar problems during this early phase in their rehabilitation. In response to this, it is critical that patients who follow this accelerated rehabilitation programme require early out-patient physiotherapy, preferably within the first few days following their in-patient discharge. We feel that this is paramount to help prevent and limit early restriction in range of movement and pain issues which was presented in this case report.

The protocol described does not immobilise knees, and encourages the return to functional activities as soon as possible. Accordingly, patients are encouraged to exercise and strengthen muscles, particularly the quadriceps, from the day of their operation. By not immobilising the knee, contrary to other author's suggestions,^{17,18,19,28} the likelihood of the detrimental effects of immobilisation such as joint stiffness, articular degeneration, muscle atrophy and can be minimised.^{31,32,33} Similarly, weight-bearing is not restricted, unlike previously described post-operative instructions.^{18,19,28} Further study is indicated to investigate whether bracing or weight-bearing status can influence outcomes such as quadriceps strength, function, patient satisfaction and post-operative complications after a MPFL reconstruction.

Prolonged recurrent patellar instability is the most frequently cited indication for this procedure.^{21,34} Accordingly, patients become apprehensive about the stability of their knees. This can be a significant factor, and providing reassurance and incorporating activities which the patients had previously avoided, can be an important part of their rehabilitation.

CONCLUSION

This single-case study has described and presented the physiotherapy management of a patient following a MPFL reconstruction. The early objectives after this procedure are to regaining full range of motion and strength. Following this, patients are rehabilitated further to optimise their outcome, and to return to daily and sporting activities without fear of recurrent dislocation. It is intended that a case-series of patients rehabilitated using this protocol shall be presented as a future publication, to assess the outcomes of this accelerated rehabilitation programme for a larger number of patients. Further research is suggested to determine the optimal rehabilitation of patients following a MPFL reconstruction.

Ethical Approval: Signed consent was obtained from the patient presented in this case study.

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