

Functional Outcome of Medial Patello-femoral Ligament Reconstruction in Recurrent Patella Dislocation using Semitendinosus tendon auto-graft.

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ABSTRACT

Objective: To determine the functional outcome of medial patella-femoral reconstruction in recurrent patella dislocation using Semitendinosus tendon auto-graft and cross-tunnel technique.

Methods: This descriptive study was conducted in Orthopaedic department Liaquat National Hospital Karachi from 16th October 2016 to 20th October 2021. Patients of both gender and age 18 to 45 years with recurrent patella dislocation fulfilling the inclusion criteria were enrolled in this study. The recurrent patella dislocation was treated with medial patella-femoral ligament reconstruction (MPFL) with a novel technique using the semitendinosus tendon auto-graft that was tunneled into the patella and fixed onto the distal femur. Post operative functional outcome at one year was assessed with International Knee Documentation Committee scores (IKDC). Comparison between pre-operative and post-operative IKDC score was done with non-parametric Wilcoxon signed-rank tests and parametric *t* test for dependent variables. *P* value < 0.05 was considered significant.

Results: The total number of patients were 48 patients with mean age 24.2 ± 11.4 years. Male patients were 17(35.4%) and female 31(64.6%). Isolated MPFL injury was present in 29 (60.4%) patients while MPFL and medial Meniscal injury was noted in 19 (39.6%). Right sided recurrent patella dislocation was noted in 30(62.5%) and left sided in 18(37.5%) patients. The mean IKDC score improved from pre-operative value of 42.4 ± 9.3 to post operative 86.3 ± 12.6 at one year follow up ($p < 0.05$). No statistically significant difference in the functional outcome was noted between gender, side of injury and MPFL reconstruction with and without Meniscal injury ($p > 0.05$)

Conclusion: Medial Patellofemoral ligament(MPFL) reconstruction using Semitendinosus tendon auto-graft and cross-tunnel technique is a novel surgical technique for recurrent patella dislocation as excellent functional outcome has been achieved in majority of our patients. We recommend this technique as operation of first choice for recurrent patella dislocation in selected patients.

Keywords: Hamstring, IKDC, Medial patella-femoral ligament, Recurrent Patella dislocation.

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INTRODUCTION

Patellar instability is one of the rare disabilities specially in younger patients.^{1,2} Causes of patellar

instability are multifactorial and may include pathology of bony and soft tissue constraints around the knee.³ Biomechanical studies have shown that

lateral displacement of patella is mainly prevented by medial patella-femoral ligament (MPFL) that acts as the main soft tissue stabilizer.⁴ The frequency of isolated recurrent lateral patellar dislocations is 15 to 80%⁵ and injury to MPFL is often considered as the quintessential lesion.⁶⁻⁸ Around 55% of these patients never return to their pre-injury level of functional activity.⁹ In patients with severe recurrent patellar dislocation anatomical reconstruction of MPFL is a surgical procedure where the band of tissue which extends from the medial epicondyle of femur extend up to superior pole of patella is restored. Several surgical techniques have been described previously to treat patellar instability and includes both bony and soft tissue procedures like medial patellofemoral ligament (MPFL) reconstruction but variable clinical outcome has been reported.¹⁰

Recurrent patella dislocation is treated in our institution as per consultant expertise and no standard uniform guidelines exist. The objective of our study was to determine the functional outcome of medial patella-femoral reconstruction in recurrent patella dislocation using the semitendinosus tendon auto-graft. The results of our study would help to formulate standard guidelines for treating recurrent dislocation of patella in our institution.

METHODS

We conducted this descriptive study in Orthopaedic department Liaquat National Hospital Karachi from 16th October 2016 to 20th October 2021. All patients with both gender and age 18 to 45 years with unilateral recurrent patella dislocation and MPFL tear with or without meniscal injury detected clinically and confirmed by MRI (MPFL tear) were enrolled in our study. All the participants had Tibial tuberosity to trochlear groove (TT-TG) distance < 15 mm and Insall – Salvati ratio between 0.8 to 1.2 radiologically. Patients with associated Osteoarthritis knee, fractures around the knee, ligaments injury and generalized ligamentous laxity were excluded. In the included subjects complete history and clinical examination was carried out and relevant investigations (Radiographs, CT, MRI) were obtained. Pre operative functional assessment was documented with the International Knee Documentation Committee (IKDC).¹⁰ The study was approved by the Ethical committee of our hospital and informed written consent was taken from all the participants of our study. Factors assessed included age, gender, mode of injury (Motor vehicle accident, sports injury, fall, others), timing and type of injury (isolated medial patellofemoral ligament injury, associated meniscal

injury). Indications for surgery were clinically and radiologically confirmed cases of MPFL injury. Medial patellofemoral reconstruction (MPFL) was performed in all patients who had documented recurrent patellar dislocation or even had constant feeling of patellar instability. Associated medial meniscal pathology was treated with either meniscectomy or meniscal repair using meniscal cinch.

Surgical Technique

Under general or spinal anesthesia and tourniquet control with the patient in supine position clinical examination was once again done to confirm recurrent patella dislocation due to torn MPFL (Fig. I). This was followed by arthroscopy for meniscal injury and treated with either meniscectomy or repair (Arthrex Meniscal Cinch™). A 3cm oblique incision was given at the pes anserine insertion and semitendinosus graft was harvested and tacked with Vicryl 1 on both ends (Fig. II). Another 5cm longitudinal incision was given at the medial patella border. Two tunnels were drilled in patella, one from superior-medial and other from inferior-medial direction at 1 O'clock and 5 O'clock positions respectively and drilled with 5 mm cannulated drill under fluoroscopy and intersecting at the centre of the patella (Fig. III). With help of 16-gauge IV cannula, a Prolene No.2 was introduced from the superomedial tunnel and extracted from inferomedial tunnel by using another self-made hook shaped 16-gauge cannula needle (Fig. IV). Later this Prolene No.2 was used for directing the graft into placement within the patella (Fig. V, VI).



Fig I: Positive Apprehension sign.

Another 5mm tunnel was drilled transversely in distal femur from medial epicondyle at the junction of line intersecting posterior femoral cortex and Blumensaat's line (Fig. VII). The two ends of the graft were then stretched within the tunnel in the medial epicondyle at 30 degree of flexion and anchored using a bioabsorbable interference screw (Karl Storz

Mega Fix®), making sure patella is not over-tight medially to allow controlled patellofemoral gliding. (Fig. VII, VIII, IX)

Injection bupivacaine was infiltrated at the arthroscopy portals and harvested hamstring and femoral anchoring sites after surgery. Post operatively, intravenous antibiotic and analgesic were given to all the patients for 48 hours. All the patients were discharged with oral cefuroxime antibiotic and analgesic for 1 week.



Fig II: Semitendinosus graft

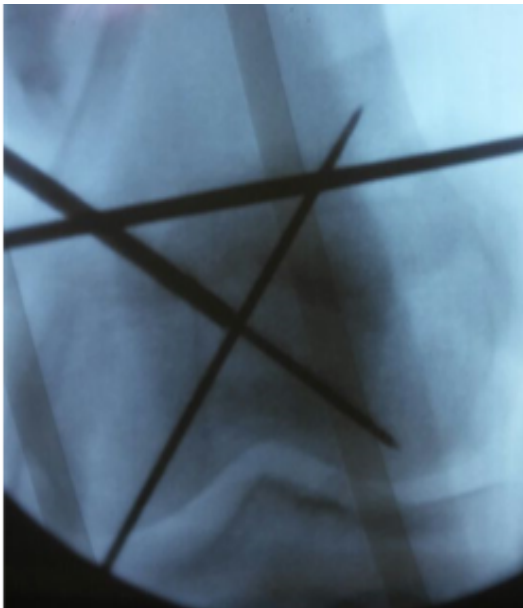


Fig III: Patella cross-tunnelling



Fig IV: 16-gauge cannula selfmade hooks



Fig V: Prolene loop via cannula



Fig VI: Graft looped into patella tunnel



Fig VIII: Graft at femoral site



Fig VII: Femoral graft anchoring site



Fig IX: Final graft anchorage

All patients were followed at 2nd, 4th, 6th weeks initially and then at 3rd, 6th and 12th months. Staples were removed at 2 weeks. Post operative Functional assessment was recorded with International Knee Documentation Committee(IKDC) at one year follow up. During the first 6 weeks full weight bearing with the help of a knee immobilizer and crutches was allowed. Patients with concurrent meniscal repair were instead kept non-weight bear for initial 6 weeks followed by full weight bearing after 6 weeks. Initially we allowed active flexion and passive extension knee range of motion and quadriceps sets. After another 6

weeks crutches and immobilizer were discontinued. Patients were then advised to begin progressive resistance quadriceps strengthening exercises.

We analyzed our data with SPSS version 23.0. Categorical variables were represented as frequencies and percentages while continuous variables were presented as means and standard deviations (SD). Comparison between pre-operative and post-operative IKDC score was done with non-parametric Wilcoxon signed-rank tests and parametric *t* test for dependent sample variables. P value <0.05 considered significant.

RESULTS

We operated 48 patients of recurrent patella dislocation with Semitendinosus tendon auto-graft and cross-tunnel technique. The mean age of our sample was 24.2 ± 11.4 years. Female patients were in majority (64.6%, n=31) while male patients were 17 (35.4%). Isolated MPFL injury was present in 29 (60.4%) patients while MPFL and medial Meniscal injury was noted in 19 (39.6%). Right sided recurrent patella dislocation was noted in 30 (62.5%) and left sided in 18 (37.5%) patients. Sports related injuries were responsible for recurrent patella in 26 (54.1%) patients, fall in 12 (25%) patients and road traffic

accidents in 10 (20.8%) patients. Majority (68.8%, n=33) of our patients were giving pre operative history of guarded walking, locking in 18 (37.5%), sports or activity related pain in 17 (35.4%) and instability or giving way in 4 (8.3%) patients. Clinical examination revealed positive Patella Apprehension sign in 39 (81.3%) patients, medial Patella tenderness in 26 (54.2%), knee flexion loss in 22 (45.8%) and medial femur condyle tenderness in 13 (27.1%) patients. Time of presentation since injury was 0 to 6 months in 22 (45.8%) patients, 6 to 12 months in 18 (37.5%) and > 12 months in 8 (16.7%) patients. The mean IKDC score improved from pre operative value of 42.4 ± 9.3 to post operative 86.3 ± 12.6 at one year follow up ($p < 0.05$). No statistically significant difference ($p > 0.05$) in the functional outcome was noted between gender, side of injury and MPFL reconstruction with and without Meniscal injury (Table I). However, patients presenting after 12 months of injury had significantly lower mean improvement in final IKDC scores as compared to those presenting within 6 months ($p < 0.05$). Superficial surgical site infection was noted in 3 (6.2%) patients which was treated with antibiotics and dressing. No major complications like redislocation was reported in our study.

Table I: Multivariate Analysis of Pre & postoperative mean IKDC score.

Time of presentation (Months)	Pre op IKDC score	Post Op IKDC score
0-6	49.1 ± 9.2	89.9 ± 10.2
6-12	41.9 ± 12.9	81.3 ± 9.7
>12	35.3 ± 7.8	72.5 ± 15.8
Gender		
Male	49.7 ± 8.3	89.8 ± 7.9
Female	39.2 ± 13.6	81.3 ± 11.6
Age (years)		
18-30	41.9 ± 7.0	87.9 ± 9.7
30-45	38.6 ± 11.6	79.5 ± 16.9
Type of Injury		
Isolated MPFL injury	47.2 ± 10.2	89.4 ± 10.2
MPFL+Meniscus injury	33.7 ± 17.1	81.1 ± 9.3

DISCUSSION

Medial patello-femoral ligament (MPFL) reconstruction has been proven to be successful in managing patella-femoral instability by restoring the deficient primary medial patellar soft tissue restraint. In our descriptive study we reported the functional outcome of 48 patients who had MPFL reconstruction for recurrent patellar dislocation in a tertiary care hospital. In developing countries like Pakistan where appropriate facilities and experts are not easily

available many of these patients are managed conservatively resulting in early osteoarthritis and loss of knee function.¹¹ Patellar dislocation if treated non-operatively is associated with over 50% chance of recurrence.¹² Non-MPFL soft tissue techniques, such as lateral patella-femoral release, are associated with increased risk of disturbing native patella-femoral biomechanics. Therefore, these procedures are not being successful in the long term follow up.¹³ This study revealed that MPFL reconstruction

provides superior functional outcome with less peri-operative morbidity. We used semitendinosus hamstring tendon auto-graft as a first choice in all patients. A review regarding the use of hamstring tendon as an auto-graft found that in about 28.4% of previous published articles good success rate has been reported,¹⁴ but there are variations in the position and number of tunnels made in the patella and femur along with number of graft bundles and methods of fixation. Despite these variations excellent to good functional outcome following MPFL reconstruction have been reported.¹⁵ We used interference screw (Karl Storz Mega Fix®) of size 7mm×25mm as method of fixation in the current study and achieved good functional outcome. Our results are comparable with the results observed by Howells and Barnett¹⁶ in his study who also utilized interference screw as method of fixation and achieved satisfactory outcome. Despite these encouraging results the principles and biomechanics of Medial Patello-femoral Ligament must be clearly understood while reconstructing MPFL. Graft isometry is also crucial for reconstructed MPFL to function as a native ligament in tension from 0° to 30° of flexion acting as a check rein to deliver patella from full extension into the central trochlea and then remain relaxed during the rest of the knee flexion.

Post-operatively majority (73.3%) of our patients had excellent outcome (IKDC >80%). These findings are comparable with the findings mentioned by Nomura and Inoue¹⁷ who reported 66% excellent results after MPFL reconstruction. Howells¹⁴ noted that women had significantly worse outcome than men especially with a traumatic recurrent dislocation. This is contrary to our study as we did not find any significant difference in outcome in either gender.

Ercan and colleagues¹⁸ treated 40 patients of recurrent patella dislocation with single tunnel Semitendinosus tendon auto-graft and 40 with double tunnel. At two years functional outcome was assessed with IKDC score, Tegner score, Lysholm score and Kujala score while radiological outcome was determined by measuring Congruence angle and Patellar Tilt Angle in both groups. These authors concluded that although statistically significant functional improvement was noted in both the groups but no difference in outcome was noted when single tunnel technique was compared with double tunnel transpatellar technique. We utilized single bundle of Semitendinosus and achieved excellent functional outcome without any failure. Placella and Speziali¹⁹ biomechanically showed that double bundle converging tunnel restored the anatomy of the native

ligament more accurately than single bundle technique. Moreover these authors found that single bundle technique was associated with fracture of patella and failure in 11% of cases. Other studies^{20,21} also favored double bundle Semitendinosus tendon auto-graft for reconstruction of MPFL in patients of recurrent patella dislocation. We utilized semitendinosus autograft for MPFL reconstruction in our study. Because of the excellent functional outcome this graft has been preferred over Gracilis in one systematic review in literature.²²

Our study had a descriptive design with a small sample size and shorter follow up period. We therefore recommend further studies so that the usefulness of our surgical technique is further verified.

CONCLUSION

Medial Patellofemoral ligament (MPFL) reconstruction using Semitendinosus tendon auto-graft and cross-tunnel technique is a novel surgical technique for recurrent patella dislocation as excellent functional outcome has been achieved in majority of our patients. This technique is relatively safe with fewer complications. We recommend this technique as operation of first choice for recurrent patella dislocation in selected patients.

Conflict of Interest: None

Grants/Funding: None

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