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Functional outcome of medial patella femoral ligament reconstruction: a prospective study of novel hamstring sparing technique without patella anchors

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ABSTRACT

Background: A composite graft made of medial retinaculum and quadriceps tendon can be used instead of hamstring graft for medial patellofemoral reconstruction in recurrent dislocation of patella. Our study aims at determining the functional outcome of MPFL reconstruction with this composite graft.
Methods: This is a unicentric, prospective observational study conducted in 60 patients with recurrent dislocation of patella with normal Q angle and without trochlear dysplasia. A composite graft composed of medial patella retinaculum and quadriceps was harvested, one end was sutured at medial superior 2/3rd junction of patella with ethibond. The other end of graft fixed at schottles point with a bio screw. Patients were followed up at 6 weeks, 3 months, 6 months and then yearly. A preoperative and post operative Lysholm score and Kujala score were used for comparison.
Results: There was a significant improvement in Kujala and Lysholm scores. Only 3 out of 60 patients developed further instability that was managed non surgically. There was no statistically significant association with ligamentous laxity and the outcome.
Conclusion: Considering the donor site morbidity and patella fracture this novel hamstring sparing MPFL reconstruction is superior, and outcomes are comparable with previous techniques.

Keywords: Recurrent dislocation patella, MPFL, Hamstring sparing graft

INTRODUCTION

The incidence of primary patellar dislocation is 43 per 1,00,000 people and the recurrence is approximately 40%.[1] Recurrent dislocation results in ongoing restrictions and patient outcomes are poor. The medial patellofemoral ligament (MPFL) is one of the primary stabilizers of the patella. About 94%-100% develops MPFL rupture after patella dislocation.[2] Other causes are Trochlear dysplasia, increased Q angle, genu valgum, external tibial torsion, paella alta.[3] Thus, isolated MPFL reconstruction is the main stay of surgical treatment in recurrent dislocation of patella without any trochlear dysplasia and with normal TT:TG distance.[4] Most common autografts used for MPFL reconstruction is hamstring graft. Cossey and Paterson introduced a newer method of MPFL reconstruction using medial patellar retinaculum in 2005.[5]

In our study a modified technique using composite graft composed of medial patellar retinaculum and quadriceps

were used without drilling the patella. Our objective of the study was to find the functional outcome of MPFL reconstruction using this novel technique. We used Kujala and Lysholm knee score for comparing the preoperative and post operative score.

METHODS

Our study was a unicentric, prospective observational study done in Lourdes Hospital Ernakulam from January 2012 to January 2022.Ethical committee approval sought prior to study from Lourdes Hospital Ethical Committee. The study included 60 patients with recurrent dislocation of patella with isolated MPFL tear. We excluded recurrent dislocation of patella patients with concomitant trochlear dysplasia, patella alta, Q angle of more than 20 degrees, revision surgeries MPFL reconstruction with other ligament surgeries and patient not willing to participate in the study.

Patients with recurrent dislocation of patella were evaluated in OPD clinically with apprehension test, patella glide test, test for ligamentous laxity and measured the Q angle. Then patients were sent for radiographic evaluation with x ray knee anteroposterior, lateral view and skyline view of the patella. MRI with CT cuts of the knee were obtained for assessing the MPFL status, trochlear anatomy, TT:TG distance and other ligament status. Patients with isolated MPFL tear were selected for the study after getting written informed consent. The preoperative Lysholm score, Kujala score were evaluated.

Surgical technique

All patients were given spinal anaesthesia. Patient was positioned supine. The involved lower limb was scrubbed, painted and draped. A diagnostic arthroscopy was done, to assess the patella tracking. A longitudinal incision was put medial to the patella (Figure 1). A composite graft composed of medial patellar retinaculum and quadriceps tendon of dimension 8×1 cm was harvested with no: 10 blade (Figure 1). To the distal end of the graft a whip stitch was put with a no 5 ethibond (Figure 2). The proximal end of the graft was sutured on medial border of patella at junction of lower 2/3rd and upper1/3rd with a no: 5 ethibond (Figure 2). A 1 cm incision is put over the medial epicondyle (Figure 3).

Figure 1: (a) Medial parapatellar incision; (b) composite graft harvesting.

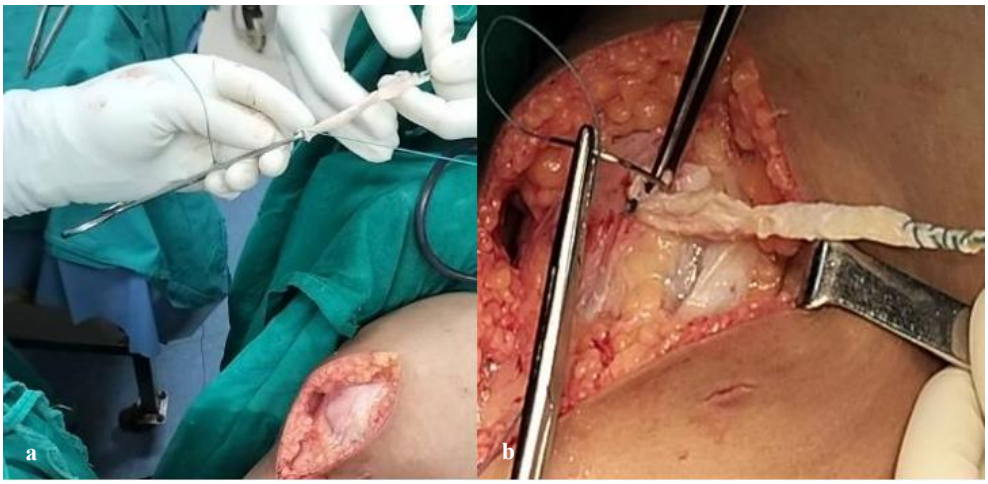

Figure 2: (a) Graft preparation; (b) suturing at patellar periosteum.

Figure 3: (a) Incision over medial epicondyle; (b) guide wire at schottles point.

The graft was passed through the second and third layer of retinaculum and pulled out through the second incision. Schottles point was identified using an image intensifier, a guide wire was passed at this point direction medially and upwards at 30-degree angulation (Figure 3). A cortex breaker(6mm) was passed and the graft shuttled through this and fixed with 7×30 mm bio screw. While tightening the knee was positioned in 30-degree flexion. By closing the defect medially, medial plication and VMO advancement can also be achieved. Wound closed with no 2 vicryl and skin with stapler. A diagnostic arthroscopy was performed at the end to confirm the patellar tracking.

Post operatively a knee brace was given and non-weight bearing mobilisation started. First 2 weeks knee bending was gradually increased up to 30 degrees. Up to 1 month knee bending allowed was 90 degree and at 6 weeks 120 degree. Weight bearing ambulation started on day one with knee brace in extension. At 6 weeks VMO strengthening exercises and weight training started. Return to sports was allowed when the thigh circumference comparable to the normal limb, usually at 6 to 9 months. The knee scores were repeated at 6 weeks, 3 months, 6 months and there after yearly. Post operative complications were recorded and followed up regularly.

Statistical analysis

All data were recorded systematically in a data collection form. Quantitative data was expressed in mean and standard deviation. Continuous variables were compared by student's t test between two parameters, and analysis of variance (ANOVA) test when parameters were more than two.

RESULTS

The longest period of follow up was 12 years and shortest period was 2 years with average period of follow up of 5.8 years. Most of our study population was between age group 21- 30 years (38.3%) youngest was 14 years of age and oldest with 45 years.

The average age of study population was 26.83 +/- 9.127 (Table 1). 65% of our study population was female and rest were males (Figure 4).

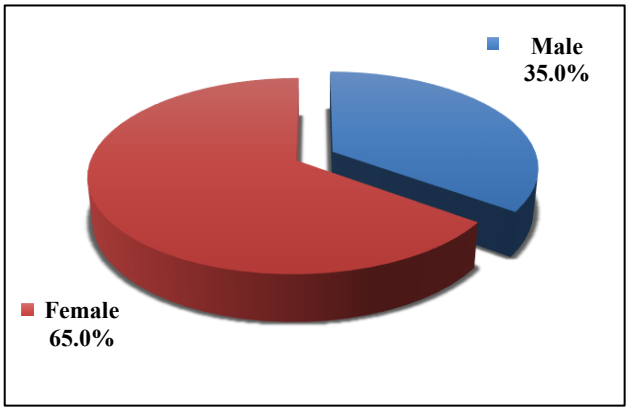

Figure 4: Gender distribution.

Table 1: Distribution of study population.

Age (in years)	Frequency	%
≤20	18	30.0
21–30	23	38.3
31–40	12	20.0
41–50	7	11.7

The mean preoperative Kujala score was 53.22+/-3.289. The mean preoperative Lysholm score was 59.55+/-3.739. The patient was followed up at 6 weeks, 3 months, 6 months and then yearly. In each study period the scores were assessed. There was a statistically significant improvement in preoperative and post operative Kujala score (p value< 0.05) in each study period (Table 2). There was a significant improvement in preoperative and post

operative Lysholm score too in every period of follow-up (Table 3)

We compared the outcome in each age group patients. The age group 21-30 years had statistically significant improvement in Kujala score compared to age group above 40 years (Table 4). Thus, from our study younger age group had better outcome.

Comparing the post operative outcome among patients with and without ligamentous laxity there was no significant association (Table 5). Kujala score is almost same in cases with no ligamentous laxity (39.25±9.745) and with ligamentous laxity (39.50±8.071).

The post operative complications were assessed. In 86.6% patients had no complications, 3 patients developed further subluxation (5%), one developed superficial infection and stiff knee (Table 6). Superficial infection subsided by antibiotic administration. Three patients with subluxation had poor compliance to physiotherapy. All of them were treated conservatively with intense physiotherapy. Patient with stiff knee needed manipulation under anaesthesia and further physiotherapy.

Table 2: Preoperative and post operative Kujala score.

Kujala score	N	Mean	SD	% Change	P value
Pre-op	60	53.22	3.289		
6 weeks	60	59.07	6.996	11.0	<0.001
3 months	60	67.37	9.553	26.6	<0.001
6 months	60	80.05	10.55	50.4	<0.001
1 year	60	91.08	7.805	71.2	<0.001
2 years	60	92.58	7.988	74.0	<0.001
3 years	56	92.88	7.614	74.4	<0.001
4 years	37	94.62	6.426	78.9	<0.001
5 years	31	94.00	6.077	77.5	<0.001
6 years	18	93.78	2.238	80.0	<0.001
7 years	17	93.65	2.737	79.5	<0.001
8 years	17	93.53	2.764	79.3	<0.001
9 years	17	93.53	2.764	79.3	<0.001
10 years	13	92.15	3.484	74.6	<0.001

Table 3: Preoperative and postoperative Lysohlm score.

Lysholm score	N	Mean	SD	% Change	P value
Pre-op	60	59.55	3.739		
6 Weeks	60	82.07	6.438	37.8%	<0.001
3 Months	60	86.23	6.099	44.8%	<0.001
6 Months	60	88.18	5.516	48.1%	<0.001
1 Year	60	93.53	3.735	57.1%	<0.001
2 Years	60	93.73	5.480	57.4%	<0.001
3 Years	56	94.27	3.590	58.9%	<0.001
4 Years	37	94.62	2.861	58.8%	<0.001
5 Years	31	94.65	3.006	59.7%	<0.001
6 Years	18	93.22	1.700	57.4%	<0.001
7 Years	17	92.53	1.179	55.7%	<0.001
8 Years	17	92.53	1.179	55.7%	<0.001
9 Years	17	92.53	1.179	55.7%	<0.001
10 Years	13	92.69	1.316	54.9%	<0.001

Table 4: Comparison of Kujala score in each age group.

Age (in years)	N	Mean	SD	P value
≤20	18	42.67	5.456	0.004
21-30	23	37.96	8.819	
31-40	12	42.67	6.880	
41-50	7	29.86	12.65	

Table 5: Ligementous laxity and post operative outcome.

Ligamentous laxity	N	Mean	SD	P value
Absent	32	39.25	9.745	0.915
Present	28	39.50	8.071	

Table 6: post operative complications.

Complications	Frequency	%
Nil	52	86.6
Superficial infection	3	5.0
Pain	1	1.7
Stiff Knee	1	1.7
Subluxation	3	5.0

DISCUSSION

Medial patellofemoral reconstruction is the mainstay of surgical treatment of recurrent dislocation of patella.[6] Isolated MPFL reconstruction is only required if there is normal Q angle, no shallowing of trochlear grove, TT:TG distance is normal. There are many surgical techniques for MPFL reconstruction, most commonly using a hamstring autograft and using fixation device over the patella. Cossey et al and Patterson et al developed a technique of MPFL reconstruction using a composite graft composed of medial patellar retinaculum. The study was conducted in 21 knees and followed up for 2 years. In our study longest period of follow up was 10 years. In our study the mean age was 26.8. Most of the patients were between age group 21-30 years and had a better outcome compared to the older age groups. Hiemstra et al noted that younger age at the time of surgery had a significant post operative outcome.[7]

The post operative knee scores improved in every period of study and was also statistically significant. The improvement in post operative knee scores were comparable to the MPFL reconstruction with hamstring grafts. Bellal et al had similar results with hamstring graft and had similar post operative outcome measures.[8]

Shah et al, conducted a meta-analysis based on the complications and failures associated with MPFL reconstruction.[9,10] In the study they concluded that that the most severe complication of MPFL reconstruction was patella fracture. Since our technique was anchorless patella fixation, this dreaded complication was out of question. Knee stiffness was another complication, but in our study only one patient developed it and managed with intense physiotherapy. Dislocation after the surgery was another complication. In our study subluxation was present in 5% of patients that too managed conservatively.

We compared the outcome of MPFL reconstruction in patients with and without ligamentous laxity and it showed no significant relationship. Thus, this surgical technique can also be used for habitual patella dislocation.

The biomechanical property of hamstring graft was studied by Haupt et al, they noted that a 7 mm hamstring graft had an average tensile strength of 2179.44 N.[11] But the native MPFL has a tensile strength of 208 N.[12,13] In our technique we harvested medial patella retinaculum has similar tensile strength of native MPFL.

CONCLUSION

The functional outcome of novel technique of medial patellofemoral reconstruction is comparable with conventional techniques. It has added advantage of medial plication and VMO advancement. In our technique the subluxation rate is low, no incidence of patella fracture as it is an anchorless technique and no donor site morbidity. Since it does not require anchor on the patella it is cost effective also.

Still longer follow-up is required to account for development of patellofemoral osteoarthritis. We excluded patients with trochlear dysplasia who underwent MPFL reconstruction include limitations of our study.

Recommendations

This hamstring sparing, anchorless technique of MPFL reconstruction is easy, has no donor site morbidity and subluxation rate is less.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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