

Functional Outcome in Arthroscopic ACL Reconstruction with Immediate Full Weight Bearing Mobilization- Retrospective Study

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Abstract

Rehabilitation following anterior cruciate ligament surgery continues to evolve, with the current emphasis being on immediate weight bearing and range of motion, and progressive muscular strengthening, proprioception, dynamic stability, and neuromuscular control drills.

In this study we evaluate the functional outcome of Immediate full weight bearing mobilization following arthroscopic ACL (Anterior Cruciate Ligament) reconstruction with quadrupled hamstring graft using endobutton and bioscrew.

With the advancement of fixation techniques immediate weight bearing mobilization after arthroscopic ACL reconstruction can give better functional outcome and improved patient satisfaction. Although further large volume multicentric research is needed for establishing a standardized rehabilitation protocol following arthroscopic ACL reconstruction, immediate weight bearing doesn't cause any complications and has better outcome as per our study

Keywords: Arthroscopic reconstruction; ACL; Immediate weight bearing.

Introduction

Rehabilitation following anterior cruciate ligament surgery continues to evolve, with the current emphasis being on immediate weight bearing and range of motion, and progressive muscular strengthening, proprioception, dynamic stability, and neuromuscular control drills. The rehabilitation program should be based on scientific and clinical research and focus on specific drills and exercises designed to return the patient to the desired functional status and activity level as safely and as early as possible. Earlier surgeons used to advocate partial weight bearing mobilization for 4-6 weeks followed by full weight bearing mobilization. Advanced fixation techniques allow for immediate post-operative weight bearing [1].

In this study we evaluate the functional outcome of Immediate full weight bearing mobilization following arthroscopic ACL (Anterior Cruciate Ligament) reconstruction with quadrupled hamstring graft using endobutton and bioscrew

Materials and Methods

Study Population: All patients admitted for arthroscopic ACL reconstruction at Aster Medcity Kochi from 2014-2019

Study design: Retrospective observational Study

Sample size – 129

Duration of study – 1-year post operative follow up

Inclusion Criteria

1. Persons who underwent arthroscopic ACL reconstruction from 2014-2019
2. Young and middle-aged, active, patients.
3. A normal contralateral knee.
4. The acute inflammatory phase of the injury has subsided and full range of motion and good quadriceps strength has been regained with no extensor lag (usually after 4-6 weeks of injury)

Exclusion Criteria

1. Associated medial collateral ligament and lateral collateral ligament tear.
2. Bilateral anterior cruciate ligament deficiency.
3. Presence of fractures around the knee (tibial plateau, patella, femoral condyles).
4. Patients with obesity, sedentary lifestyle, not keen on pursuing sports in future.

Method

All patients with ACL deficient knee who underwent arthroscopic ACL reconstruction with quadrupled hamstring graft, with bioscrew and endobutton between 2014–2019 was included in the study.

Surgical method- All surgeries were done by the same surgeon

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Anteromedial portal technique. Arthroscopic ACL reconstruction with single bundle quadrupled semitendinosus tendon autograft from ipsilateral limb using Endobutton (Smith and Nephew), cortical suspensory fixation method for femoral side and Bioabsorbable interference screw (Smith and Nephew), Aperture fixation method with bioscrew for tibial side.

Immediate post-operative complications like post-operative swelling, compartment syndrome, neurological damage and vascular injury was looked for. Patients were hospitalized for 1 day post operatively full weight bearing walker assisted mobilization was done for all, and were discharged and reviewed for suture removal and at 6 weeks, 3 months, 6 months and 1 year.

Rehabilitation protocol includes immediate full weight bearing mobilization with hinged knee brace and elbow crutch on opposite side, range of movement 0- 90 for 2 weeks, gradually increased to full range by 4 weeks. Discontinue Crutch after 3 weeks and brace after 8 weeks. Quadriceps closed chain and open chain, hamstring exercises for 3 months post operative. Stair climbing at 1 month post operative and sporting activity (contact sports) at 6 months post operative.

Lysholm and Tegner scoring was done at 3 months 6 months and 12 month post operative. Any complications which occurred were also noted.

Outcome Measurements

Primary Outcome

1. Assessment of Knee stability Pre operative and at 1 year post operative- lachmann anterior drawer and Pivot shift test.
2. Knee Rom pre operative and 1 year post operative.
3. Tegner Lysholm Knee score at 3, 6, 12 months post operative.
4. Tegner Activity Level Pre operative and 1 year Post operative.

Secondary Outcome

1. Any complications

Lysholm score [7] for knee ligament surgery evaluates knee surgery outcome based on knee movement in activities like walking, climbing stairs or squatting. Score out of 100 was obtained.

1) Limp

- a) No limp when I walk. (5 points)
- b) Have a slight or periodical limp when I walk. (3 points)
- c) Have a severe and constant limp when I walk. (0 points)

2) Using cane or crutches

- a) use a cane or crutches. (5 points)
- b) use a cane or crutches with some weight-bearing. (2 points)
- c) Putting weight on my hurt leg is impossible. (0 points)

3) Locking sensation in the knee

- a) no locking and no catching sensation in my knee. (15 points)
- b) I catching sensation but no locking sensation in my knee. (10 points)
- c) knee locks occasionally. (6 points)
- d) knee locks frequently. (2 points)
- e) knee feels locked at this moment. (0 points)

4) Giving way sensation from the knee

- a) Knee never gives way. (25 points)
- b) knee rarely gives way, only during athletics or vigorous activity. (20 points)
- c) knee frequently gives way during athletics or other vigorous activities. In turn I am unable to participate in these activities. (15 points)
- d) knee occasionally gives way during daily activities. (10 points)
- e) knee often gives way during daily activities. (5 points)
- f) knee gives way every step I take. (0 points)

5) Pain

- a) no pain in my knee. (25 points)
- b) intermittent or slight pain in my knee during vigorous activities. (20 points)
- c) marked pain in my knee during vigorous activities. (15 points)
- d) marked pain in my knee during or after walking more than 1 mile. (10 points)
- e) marked pain in my knee during or after walking less than 1 mile. (5 points)
- f) constant pain in my knee. (0 points)

6) Swelling

- a) no swelling in my knee. (10 points)
- b) swelling in my knee only after vigorous activities. (6 points)
- c) swelling in my knee after ordinary activities. (2 points)
- d) swelling constantly in my knee. (0 points)

7) Climbing Stairs

- a) no problems climbing stairs. (10 points)
- b) slight problems climbing stairs. (6 points)
- c) climb stairs only one at a time. (2 points)
- d) Climbing stairs is impossible for me. (0 points)

8) Squatting

- a) no problems squatting. (5 points)
- b) slight problems squatting. (4 points)
- c) cannot squat beyond a 90 degree Bend in my knee. (1 point)
- d) Squatting is impossible because of my knee. (0 points)

Tegner activity level scale [8]

This is an activity level scale that scores mobility before and after knee surgery in terms of the activities the subject was then and is now able to perform.

The 11 levels and their descriptors are presented below:

- Level 10 Competitive sports- soccer, football, rugby (national elite);
- Level 9 Competitive sports- soccer, football, rugby (lower divisions), ice hockey, wrestling, gymnastics, basketball;
- Level 8 Competitive sports- racquetball or bandy, squash or badminton, track and field athletics (jumping, etc.), down-hill skiing;
- Level 7 Competitive sports- tennis, running, motorcars speedway, handball; Recreational sports- soccer, football, rugby, bandy, ice hockey, basketball, squash, racquetball, running;
- Level 6 Recreational sports- tennis and badminton, handball, racquetball, down-hill skiing, jogging at least 5 times per week;
- Level 5 Work- heavy labour (construction, etc.) Competitive sports

- cycling, cross-country skiing; Recreational sports - jogging on uneven ground at least twice weekly;
- Level 4 Work- moderately heavy labour (e.g. truck driving, etc.);
- Level 3 Work- light labour (nursing, etc.);
- Level 2 Work- light labour; walking on uneven ground possible, but impossible to back pack or hike;
- Level 1 Work- sedentary (secretarial, etc.);
- Level 0- Sick leave or disability pension because of knee problems.

Methods of Statistical Analysis

Statistical analysis was done using IBM SPSS 20. (SPSS Inc, Chicago, USA). For all the categorical variables, the results are given as percentage. To test the statistical significance of the comparison of Lysholm score at different time point, Repeated measurement ANOVA test was used.

Results

Among 129 samples, there are 108 (83.7%) patients with Severe (> 10 mm) tear and 21 (16.3%) patients with Moderate (5 – 10 mm) tear in Pre Knee Stability Anterior Drawer Test.

Among 21 patients have moderate tear in pre-test, all of them came to normal in the post (1-year) test and in 108 patients have Severe tear in pre-test, 72 (66.7%) are Normal tear and 36 (33.3%) are having mild tear in post 1-year test.

So we can conclude from here that treatment of Knee Stability Anterior Drawer Test among 129 Samples most of them have shown Improvement after a duration of one year.

On comparison of pre and post Knee Stability Lachmann Test in 129 samples, 21 patients have Moderate tear in pre-test, all of them are came to normal in the post 1-year test and none of the patients are having Mild tear in post1-year test. And among 108 patients have Severe tear in pre-test, 73 (67.6%) are Normal and 35 (32.4%) are having mild tear in post 1-year test.

So we can conclude from here that post Knee Stability Lachmann Test among 129 Samples most of them have shown Improvement after a duration of one year.

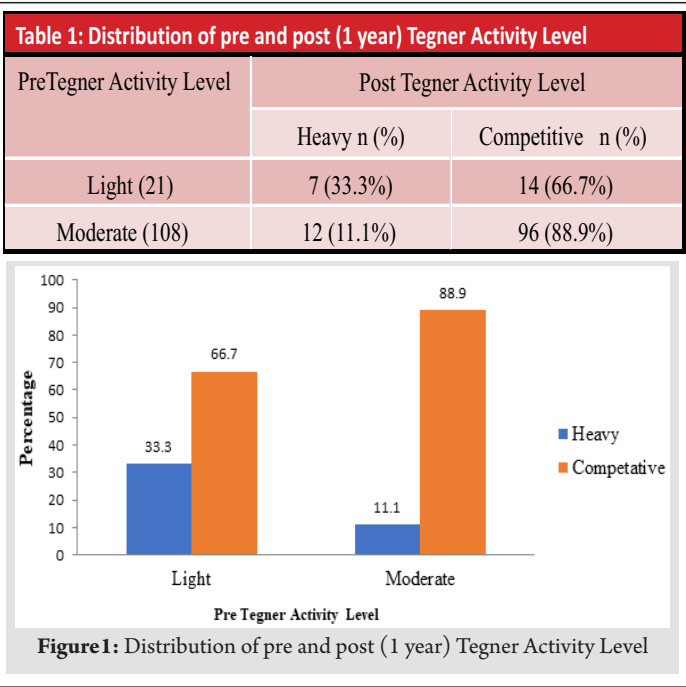
On pre and post comparison of Knee Stability Pivot Shift Test among 129 samples, among 20 patients have Abrupt Reduction in pre-test, all of them came to be normal in post1-year test and 109 patients having Locks in subluxated position before reduction in pre-test, 108 (99.1%) are normal and 1 (0.9%) are having Smooth Glide in post 1 year test.

There were 84.5% patients with Locks in subluxated position and 15.5% patients with Abrupt Reduction, Pre Knee Stability Pivot Shift Test and post-test 99.2% patients recovered and 0.8% patients have improved to Smooth Glide.

So we can conclude from here that post treatment of Knee Stability Pivot Shift Test among 129 Samples most of them have shown Improvement and recovery after duration of one year.

On pre and post comparison of Range of Movement among 129 samples, 34 patients with 0-90 degree movement in pre-test, 28 (82.4%) patients have improved post1-year test and 6 (17.6%) patients have not improved in the post 1 year test.

Among 48 patients with 0-100 degree range of movement and 47 patients with 0-110 degree range of movement in pre-test, all of them are came to have improved at post 1-year test and there is none to



show no improvement post 1-year test.

So we can conclude from here that post treatment of Range of Movement among 129 Samples most of them have shown Improvement after duration of one year.

(Table No: 1)(Figure No. 1)

On pre and post comparison of Tegner Activity Level among 129 samples, there were 108 (83.7%) patients with Moderate Activity level and 21 (16.3%) patients with Light Activity Level in Pre Tegner Activity Level Test. Among 21 patients with Light Activity Level in pre-test, 14 (66.7%) patients have improved and 7 (33.3%) patients have improved to Heavy Activity Level in the post 1-year test. And 108 patients with Moderate Activity Level in pre-test, 96 (88.9%) have improved to Competitive Activity Level post 1-year test and 12 (11.1%) have improved to Heavy Activity Level in post 1-year test.

So we can conclude from here that post treatment of Tegner Activity Level among 129 Samples most of them have shown Improvement after duration of one year.

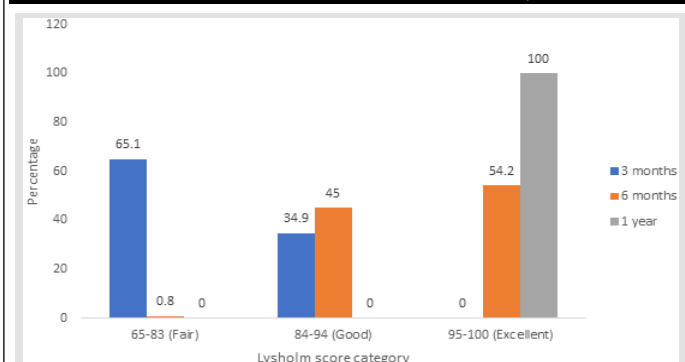
Table No: 2 represents the comparison of Lysholm score at different time points (for 3 months, 6 months and 1 year). The Mean Lysholm

Table 2: Comparison of Lysholm score for 3 Months, 6 Months and 1 Year

Duration	Lysholm Score n=129		p value
	Mean	SD	
3 Months	82.02	4.075	< 0.001
6 Months	91.95	5.024	
1 Year	98.43	1.044	

Table 3: Distribution of Lysholm score categorized at different time periods (3 Months, 6 Months and 1 Year)

LysholmScore	3 months	6 months	1 year
	n(%)	n(%)	n(%)
65-83 (Fair)	84 (65.1)	1 (0.8)	0(0%)
84-94 (Good)	45 (34.9)	58 (45.0)	0(0%)
95-100 (Excellent)	0(0%)	70 (54.2)	129 (100%)

**Figure 2: Distribution of Lysholm score categorized at different time periods (3 Months, 6 Months and 1 Year)**

Score at 3 months was 82.02 ± 4.075 , 91.95 ± 5.024 at 6 months, and 98.43 ± 1.044 at 1 year. The comparison of Lysholm Score at different time interval was found to be statistically significant (p value < 0.001).

The multiple comparison test shows that the statistically significant difference between at 3 months with 6 months and 1 year and also 6 months with 1 year with p value < 0.001 .

The Lysholm Score evaluation clearly shows that the score was high after completion of one year and it shows a clear improvement in patients after one year. (Table No: 3) Figure no: 2

There were 84 (65.1%) patients who scored 65–83 (Fair), 45 (34.9%) who scored 84–94 (Good) at 3 months Lysholm score Group Test. After 6 months 70 (54.2%) patients scored 95–100 (Excellent), 58

(45.0%) patients scored 84–94 (Good), and only one patient (0.8%) scored 65–83 (Fair) Lysholm score Group Test. At Post 1 year 100% patients scored 95–100 (Excellent) in Lysholm score Group Test.

Discussion

Immediate weight bearing has been advocated after anterior cruciate ligament reconstruction and is thought to enhance the return of quadriceps muscle activity and knee extension range of motion without jeopardizing graft integrity. Certain studies [9] have found potential risk of significant postoperative femoral bone tunnel enlargement of the posterolateral bundle.

Post-operative rehabilitation protocols including the immobilization period and the non-weight-bearing period in the acute phase after surgery depend on each surgeon or institute, and they are not clearly standardized. Aggressive Post-operative rehabilitation has been implicated in bone tunnel enlargement, with some studies suggesting a decrease in graft micromotion and tunnel enlargement with nonaggressive rehabilitation [10]. As per studies [2] immediate weight bearing did not compromise knee joint stability and resulted in a better outcome with a decreased incidence of anterior knee pain.

We retrospectively analysed the functional outcome of the immediate full weight bearing mobilization following arthroscopic ACL reconstruction for a period of 1 year follow up and found that it has a good result in terms of functional outcome and activity level, knee stability or range of movement was not compromised due to weight bearing. In our study Lysholm score was excellent for all patients at 1 year post operative.

Conclusion

With the advancement of fixation techniques immediate weight bearing mobilization after arthroscopic ACL reconstruction can give better functional outcome and improved patient satisfaction. Although further large volume multicentric research is needed for establishing a standardized rehabilitation protocol following arthroscopic ACL reconstruction, immediate weight bearing doesn't cause any complications and has better outcome as per our study.

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