

Rehabilitation of ACL injuries after surgical reconstruction- Comparison of supervised vs unsupervised rehabilitation

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Abstract

Introduction: Anterior Cruciate Ligament (ACL) injury is the most common ligament injury of the knee and is common in persons playing regular sports. Complete ACL tear leads to instability which in most cases is noncompliant with competitive sports. As much as surgery, post-op rehabilitation of these patients also play equally important role in successful clinical outcome. We have compared supervised vs unsupervised rehabilitation post arthroscopic ACL reconstruction in this study.

Materials and Methods: Patients operated between June, 2014 and January, 2016 for isolated ACL reconstruction and falling in the age group of 20-45 years were included in our study. Patients having multiple trauma, medical comorbidities were excluded. Patients were given free choice to select the rehabilitation program they preferred. Outcomes were compared by tegner lysholm and IKDC scoring at 1 year follow-up.

Results: After initial period of 1-3 months post-surgery, outcomes in supervised group was significantly better ($p < 0.05$) than that of unsupervised group in terms of tegner lysholm, IKDC scoring, Quadriceps girth, single leg standing, jump performance and subjective and objective instability.

Conclusion: Early instituted supervised rehabilitative treatment after surgical reconstruction of ACL aimed at rapid improvement of muscle function is of decisive role in the long term course of these patients.

Keywords: Knee joint, Anterior cruciate ligament, Rehabilitation, Physiotherapy.

Introduction

Anterior cruciate ligament injury is the most common ligament injury in the knee. Anterior cruciate ligament injuries occur due to unsuccessful postural adjustments and abnormal dynamic loading, i.e., inter-segmental loads in the knee joint.⁽¹⁾ The majority of the ACL injuries (about 70%) occur in a non-contact situation and during sports.⁽²⁾ Non-contact injuries often occur with the knee close to extension during a sudden deceleration or landing motion. Contact injuries are frequently the result a contact blow to the lateral aspect of the leg or knee, a motion that causes a valgus collapse.

An ACL rupture leads to increased laxity in the knee. In the ACL deficient knee, anterior tibial translation is limited by secondary restraining structures, such as the posterior joint capsule, the collateral ligaments, and the menisci. The injury leads to loss of mechanoreceptor feedback and loss of reflex muscular contractions. Furthermore, the ACL injury often results in perceptions of instability in the knee joint. Giving way is common, and this is described as the knee buckles or a feeling as if the knee would not hold the patient's weight. The patients frequently describe low confidence in their knee joint. Individuals are often forced to lower their activity level and prematurely end their career in sports owing to inadequate rehabilitation post reconstructive procedure. Thus proper rehabilitation is the mainstay of treatment in these patients. This research paper aims to compare supervised versus unsupervised rehabilitation program post arthroscopic ACL reconstruction.

Methods and Materials

This is a prospective cohort study of 81 patients who underwent arthroscopic ACL reconstruction surgery at our tertiary care centre from 1st July 2014 to 1st Jan 2016.

Inclusion Criteria:

- Unilateral, isolated, complete ACL tear
- Age- 20 to 45 years
- Reconstruction with hamstring autograft

Patients were excluded if they had additional injury or previous surgery to the lower extremities and if they had associated comorbidities which contributes to muscle weakness like Diabetes Mellitus, myopathies, Prolapse intervertebral disc. All ACL injuries were verified by MRI and Arthroscopy.

Participants were given an option to undergo rehabilitation under institute's supervised rehabilitation program or at home and follow up was done at 1 month, 4 months and 6 months. 34 patients volunteered to undertake institute's supervised rehabilitation program and 47 patients volunteered for rehabilitation at home without supervision due to geographic or work restraints. patients had their functional status assessed using Lysholm, Tegner and IKDC (International knee Documentation committee) scores before surgery, immediate post op, after 1 month, 4 months and after 6 months. The Lysholm score were used to evaluate subjective knee function in the patients with ACL deficiency or reconstruction. The Lysholm score consists of 8 different items on a 100 point scale with 25 points each attributed to instability and pain. The level of

activity was determined with the Tegner score, which grade activities regarding the demands put on the knee. The score meets basic criteria for outcome measures. Objective measurements of instability is done using pivot shift test and lachmans test. Passive and active range of motions was measured using goniometer. Mid-

thigh girth (quad girth) was used to assess quadriceps and hamstring muscle hypertrophy/atrophy. Muscle strength was assessed with single leg standing at end of 1 month and jump performance in injured leg at end of 4 & 6 months.

Observation

Table 1: Lysholm score comparison of 2 groups

	Average lysholm score				
	Pre injury	Immediate post op	1 month	4 month	6 month
Supervised	40	46	68	74	90
At home	46	48	66	70	78
P value	0.14	0.62	0.63	0.32	0.0001

Table 2: Tegner score comparison of 2 groups

	Average tegner score				
	Pre injury	Immediate post op	1 month	4 month	6 month
supervised	2.7	2.4	4.4	5.6	6.7
At home	2.5	2.5	3.8	4.3	4.8
P value	0.658	0.658	0.0093	0.0001	0.0001

Table 3: IKDC score comparison of 2 groups

	Average IKDC score				
	Pre injury	Immediate post op	1 month	4 month	6 month
supervised	47.1	51.6	67.1	78.1	83.2
At home	52.1	53.4	63.3	66.8	77.2
p-value	0.08	0.24	0.15	0.0001	0.0001

Table 4: Comparison of functional outcome of 2 groups

	Quad girth within 1 cm of uninjured leg at end of 1 month	single leg standing for >30 seconds at end of 1 month	>80% jump performance in injured leg at end of 4 & 6 months.	
			4 month	6 months
Supervised	94%	100%	74%	88%
At home	93%	82%	63%	68%
P value	0.09	0.004	0.003	0.004

Table 5: Instability comparison of 2 groups

	Presence of instability				
	Pre injury	Immediate post op	1 month	4 month	6 month
supervised	100%	-	52%	22%	6%
At home	100%	-	64%	48%	24%
p-value	-	-	0.28	0.06	0.032

Results and Discussion

As shown in the tables above, there is significant improvement in all the criteria measured in supervised group at 6 months which are Tegner and Lysholm scoring; IKDC scoring; Quadriceps girth, single leg standing, jump performance and objective instability. The p value for each is shown in the respective tables.

The rehabilitation of patients with ACL deficiency aims to improve the dynamic stability.⁽³⁾ The main goal of the rehabilitation after reconstruction is to restore knee function by enhanced neuromuscular control, which can

be achieved by obtaining adequate muscle strength, coordination, and proprioceptive ability. Neuromuscular training programs for patients with ACL reconstruction aim to improve muscle activation, increase dynamic joint stability, and relearn movement patterns and skills used during daily activities and sports activities.^(4,5)

Treacy *et al* reported data over the 6 months from two groups of patients in his retrospective study and found that there was no change in lysholm score, patients satisfaction and preoperative activity level in the two groups.

Fischer *et al* found equivalent outcome scores on Lysholm score, health status questionnaires and knee ROM on all patients of their trial.

Hohmann *et al.* also found similar results finding no difference in home based and supervised programme of physiotherapy on basis of Lysholm and Tegner score.

Beard *et al* evaluated post-operative outcomes in a group of patients who attended regular supervised sessions of physical therapy supplemental to a basic individual training, compared with those of patients fully exercising at home on their own. Lysholm scores, modified Tegner Scores and IKDC scale score recorded equivalent values for both approaches.

In our study, there was no difference in functional scores till after 1 month of injury in both groups but as time progressed the Fear of their knee giving way when exercising and pain persisted significantly in unsupervised group as compared to the supervised group. This correlated with the persistence of muscle weakness and instability in the unsupervised group after 1 month of rehabilitation as compared to the supervised group.

Weakness of the thigh muscles, especially the quadriceps, is a common consequence after knee trauma.⁽⁶⁾ Joint pathology can cause inhibition of muscle activity. Moreover, immobilization results in decreased muscle volume and function. Even after one or two weeks of immobilization the muscle is adversely affected.⁽⁷⁾ Muscle strength is developed through neural adaptations and morphological changes in the muscle. This causes the hypertrophy of individual muscle fibres rather than development of new fibres. Once muscles adapt to a stimuli, additional load needs to be placed on these structures to achieve further strength gains.⁽⁸⁾ A comprehensive rehabilitation program, with emphasis on continuous progression in load and degree of difficulty of the exercises, performed three days/week in four months, led to good muscle strength and knee function for most patients in the present study.

The ACL reconstruction reduced the static tibial translation. The dynamic translation was also reduced during the exercises compared to the translation in the ACL deficient knee.⁽⁹⁾ This may be explained by the increased static stability together with changed muscle activation that stabilized the knee joint.

An accelerated protocol can limit muscle weakness as a consequence of immobilization after surgery.⁽¹⁰⁾ This approach has led to that patients can return to activity and sports after a considerable shorter rehabilitation period.

Conclusion

Early instituted supervised treatment after surgical reconstruction of ACL aimed at rapid improvement of muscle function is of decisive role in the long term course of these patients. Supervised rehabilitation post-arthroscopic ACL reconstruction provides better clinical

outcomes and must be offered to and chosen by all the patients whenever feasible.

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