

A Comparison of Walking Aids in Patients with Anterior Cruciate Ligament Rehabilitation

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Abstract

Background: Ligament reconstruction is the current standard of care for active patients with an anterior cruciate ligament (ACL) rupture. Although the majority of ACL reconstruction (ACLR) surgeries successfully restore the mechanical stability of the injured knee, postsurgical outcomes remain widely varied. However functional outcomes after ACLR are poor, thus it is a necessary to investigate the out comes of different usage of walking aids in patients with ACLR.

Methods: Total 60 subjects of post ACLR with mean age of 32 ± 5.2 were participated in the study. Subjects were divided into groups A, B and C for rehabilitation with single, double elbow crutches and walker respectively, along with conventional exercises for 6 weeks. After 4th week walking aids were discarded for all groups. Interventional outcomes were assessed by static, dynamic stability and knee functional score at 4th and 6th weeks for all three groups.

Results: All three groups showed improvement in static and dynamic stability at 4th and 6th weeks, however elbow crutch groups showed highly significant difference ($p < 0.001$). Whereas lysholm score at 4th week was non-significant for all three groups $p = 0.54$, although it had improved at 6th week $p = 0.02$.

Conclusion: Study concluded that knee Stability (static and Dynamic) and lysholm functional knee score were improved in all walking aids groups along with conventional rehabilitation of post ACLR, however study outcomes were more significantly effective with single elbow crutch training than double and walker training groups.

Key words: ACL Repair, Lysholm Knee Score, Elbow Crutch, Knee Stability.

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Introduction

The anterior cruciate ligament (ACL) is the important ligament to stabilize the knee. The rupture of the ACL is a common injury in recreational and competitive sports, as well as other activities. When the affected knee is left with substantial instability during sport and/or daily activities, a ruptured ACL is a risk factor for meniscal and cartilage injury linked to later osteoarthritis¹. Anterior cruciate ligament reconstruction (ACLR) is standard practice for individuals that desire to return to high-level activities, but excellent outcomes are not as commonplace as previously reported^{2,3}. Recent literatures advocate a more *oblique ACLR* to more closely recreate normal knee kinematics and eliminate pathologic rotational laxity. A supervised and intensive rehabilitation program is necessary to achieve desired results. A more *oblique* placement of the ACL graft has been related to better control of rotatory knee stability. Femoral fixation with a transverse system might injure its posterolateral structures⁴. Currently, success after ACLR is measured using return-to-sport rates. Abnormal movement patterns and below normal knee function are characteristic of athletes in the months following ACLR and often persist up to

two years in spite of extensive rehabilitation^{3,5}.

It has been reported that patients who were rehabilitated with the help of elbow crutches immediately after ACLR could achieve to their previous level of activity sooner than those who use brace after ACLR⁶. Studies have been done on elbow crutch training separately on early mobilization after ACLR^{7,8}. It is also described that there is no difference in pain or any of the secondary outcomes when elbow crutches are given immediately after ACLR⁹. As there has been much advancement in the ACLR in terms of graft used, femoral tunnel placement according to which rehabilitation of the patient and ability to bear weight should also be changed¹⁰. Some authors demonstrated that immediate weight bearing with the help of two elbow crutches after reconstruction helps the patient to return to non-pivoting sport at 4 months and also there are no deleterious effects of early weight bearing on stability or function of vastus medialis^{8,11}.

A key predictor for ACLR outcome is rehabilitation. Current data support the principles of accelerated rehabilitation protocols including early weight-bearing and range of motion training. The purpose of this study was to see the stability and

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functional knee score responses with different walking aids, which are used for gait training immediately after ACLR along with conventional physiotherapy management.

Materials and Methods

Current study was included the subjects of post ACLR done with hamstring graft. All cases were unilateral involvement and had isolated ACL tear. These procedures were performed by one of two surgeons in one clinic. The subjects who not met the inclusion criteria were excluded from the study such as patellar tendon graft, age beyond 30 years, any abnormality in knee, vertical fixation in the graft and double bundle ACLR. Each subject was clearly explained about the study and informed consent was collected from the patient as well as the orthopaedic surgeon, and also obtained ethical committee clearance from parent organization. Total 60 subjects with age of 20-40 years (32 ± 5.2) were included in the study. Subjects were randomly divided into groups A, B and C for rehabilitation with single, double elbow crutches and walker respectively ($n=20$ in each group), along with conventional exercises for 6 weeks. After 4th week walking aids were discarded for all groups. Interventional outcomes were assessed by static, dynamic stability and knee

functional score at 4th and 6th weeks for all three groups. Cryotherapy was applied before and after exercises. Rehabilitation started day one after the repair, after ACLR subjects were given walking aids given for respective group for 4 weeks. Total duration of the study was for 6 weeks, after 4th weeks walking aids were discarded for all study groups. Rehabilitation outcomes were assessed by static, dynamic stability and the lysholm knee score for post intervention at 4th and follow-up at 6th weeks post operatively for all groups.

Results

Collected data were analyzed by SPSS 17 version software. A t-test was used to compare the difference between 4th and 6th week in the static and dynamic stability and lysholm knee score within the each groups showed significant difference (Table1.), however single elbow crutch groups found more significant improvement ($p < 0.001$) than double and walker groups (Figure 1.). Whereas lysholm score at 4th week was non-significant for all three groups $p=0.54$, although it had improved at 6th week $p=0.02$.

Discussion

The current study was designed to see the effect on stability and functional score

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after giving gait training with different walking aids immediately after ACLR. According to the results, All three groups showed improvement in static and dynamic stability at 4th and 6th weeks, however elbow crutch groups showed highly significant difference ($p < 0.001$). Whereas lysholm score at 4th week was

non-significant for all three groups $p = 0.54$, although it had improved at 6th week $p = 0.02$, along with conventional rehabilitation of post ACLR, however study outcomes were more significantly effective with single elbow crutch training than double and walker training groups.

Variables	Single	Double	Walker	P value
4 th week SS	5.2±1.1	3.7±1.4*	3.1±1.2*	<0.001
4 th week DS	34.5±8.2	31.3±7.5	21.9±7.4*	<0.001
4 th week LKFS	50.9±10.2	49.5±10.1	47.4±9.6	0.54
*Represents group is significantly different from Single; #Represents group is significantly different from Double				
6 th week SS	8.1±1.4	6.2±1.8*	5.9±1.8*	<0.001
6 th week DS	47.3±8.6	43.3±9.3	35.4±9.1*#	<0.001
6 th week LKFS	90.5±5.7	82.9±10.1*	84.3±9.6	0.02

Table: 1 Between groups comparison

It was also observed that knee stability and functional score improved by early mobilization with double elbow crutches and walker independently, although there is no significant difference between double elbow crutches and walker⁸. Whereas study also reported that stability and functional score more significant in single elbow crutch group than walker and also recommended early weaning off walking aids for faster outcomes during rehabilitation of post ACL repair⁷. The reason could be with the patients were unable to gain knee functional score in the

initial four weeks might be due to pain, slight weakness and decrease in confidence level. When static and dynamic stability were compared between groups 4th and 6th week, it was seen that single and double elbow crutch groups showed $p < 0.001$ at 4th week and at 6th week. This means that the patients who were using elbow crutches gained static and dynamic stability at 4th week post operatively and patients who used walker were more stable at 6th week.

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There reason of gaining stability in the 4th week and improved lysholm knee score in the patients with elbow crutches could be due to the surgical advancements in the ACLR in terms of femoral tunnel

placement and the graft used in the reconstruction procedure. The pain was evaluated using lysholm knee score and demonstrated a greater improvement in the patients with early weight bearing¹¹.

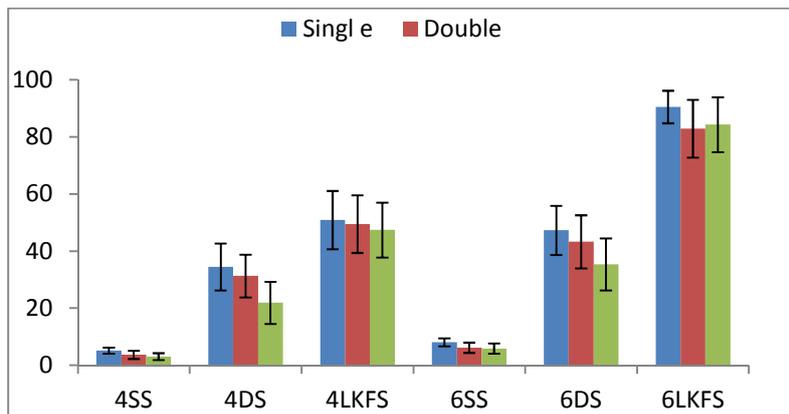


Figure 1. Between groups comparison

There is still a lot of controversy concerning the use of braces in rehabilitation following ACLR. Some provide their patients with soft braces or bandages¹², while other surgeons believe bracing to be unnecessary or, in certain cases, even harmful¹³. The studies, though, also admit that the protective value ceases as soon as the stress on the joint is increased¹⁴. It is reported that use of crutches after ACLR reported decrease in the incidence of pain and swelling in the patients with ACLR. This method of rehabilitating a patient immediately after ACLR proved beneficial as it helped in the earlier recovery of the patients⁹.

The reason for insignificant result with walker could be supported by previous observations, has been established that ambulation with a cane of any type slows gait compared to ambulating with no cane^{15,16}, cognitive and physical demands to ambulate with a more cumbersome device, the mechanical nature of the cane, and the complexity of striking all four tips on the ground while walking. One of the actions healthcare professionals can take is to screen for and prescribe the proper use and type of canes based on the needs of the individual¹⁷. The other factors contributed to the current result could be conventional physical therapy regime used in this study consisted of isometrics, open chain isotonic such as active range of motion

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with the weight of the ankle, and straight leg rises. These exercises are generally low load and independently may not prevent the disuse muscle atrophy that affects the knee joint. The goal in the early rehabilitation period is the progression of the weight bearing process. Again, a range of weight bearing progression exists in current protocols, some of which advocate immediate full weight-bearing in a locked extension brace, while others advocate the use of crutches for upwards of four to five weeks. The concept of immediate full weight bearing programs has prevailed with the thought that the weight bearing facilitates faster extensor mechanism return. Thus usage of walking aids still a controversial topic among surgeons and physical therapist however it needs more scientific supports than personal choice of rehabilitation specialist.

Conclusion

According to the current study results, it is concluded that knee Stability (static and Dynamic) and Lysholm functional knee score were improved in all walking aids groups along with conventional rehabilitation of post ACLR, however study outcomes were more significantly effective with single elbow crutch training than double and walker training groups.

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