Comparison of double Peroneus Longus with Quadrupled Hamstring in Primary Anterior Cruciate Ligament Reconstruction.

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ABSTRACT

Objective: To compare the functional outcome of double Peroneus Longus with Quadrupled Hamstring in primary isolated Anterior Cruciate Ligament Reconstruction(ACL)

Methods: This randomized trial was conducted in Orthopaedic department Allied Hospital Faisalabad from 23rd March 2015 to 23rd March 2020.All adults patients with ACL tear fulfilling the inclusion criteria were randomly and equally divided into group A(double Peroneus Longus) and group B(Quadrupled Hamstring) and operated arthroscopically.Post operative functional outcome was assessed with Tegner-Lysholm score and International Knee Documentation Committee (IKDC) and American Orthopaedic Foot and Ankle Society Score(AOFAS) at 12th months follow up and compared with pre operative values. P value was calculated with paired t test for statistical significance. P value < 0.05 was considered significant.

Results: A total of 62 patients were enrolled in this study but 56 completed the study. Both group A and B had 28 patients each. Male patients were 26(92.85%) in group A and 27(96.42%) in group B. Female patients were 2(7.14%) in group A and 1(3.57%) in group B. The mean age of group A was 39.4±6 years and group B 39.6±2 years. Right ACL was ruptured in 17(60.71%) in group A and 19(67.85%) in group B. The mean Tegner-Lysholm score improved from preoperative 69.1 + 2.9 to post operative 92.2 + 2.5 at 12 months in group A while in group B it improved from 70.5 + 1.5 to 91.4 + 1.7(P >0.05).The mean IKDC score improved from 40.7±3 to 91.4±1 in group A while group B had pre operative IKDC score of 42.5±5 and improved to 92.7±3(P >0.05) at 12 months. The mean pre-operative AOFAS score of group A was 100 and post-operative score was 98.4 ± 2.1(P >0.05).

Conclusion: Both double Peroneus Longus autograft and Quadrupled Hamstring was effective in treating ACL reconstruction. No statistically significant difference however was noted in the functional outcome of double Peroneus Longus autograft when compared with Quadrupled Hamstring for primary Anterior Cruciate Ligament Reconstruction(ACL) at 12 months follow up.

Keywords: Anterior Cruciate Ligament, Arthroscopy, Hamstring, Peroneus Longus

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INTRODUCTION

The incidence of ACL tear is 1 in 3500 in general population.[1] Untreated ACL injuries can lead to meniscal injuries and ultimate osteoarthritis.[2] In United States 100,000 primary ACL reconstruction surgeries are performed annually.[1] Autograft or allograft can be utilized for ACL reconstruction and bone patellar tendon bone graft,, Hamstring autograft, Iliotibial band, fascia lata and Quadriceps

tendon all have been used for the reconstruction of ACL with variable results.[3,4] Consensus has yet to be achieved regarding the best autograft for ACL reconstruction.[5] Allografts are costly and disease transmission, immune reactions and delayed graft incorporation have been reported with allografts.[6] Use of bone patellar bone autograft is associated with knee pain, patella fracture, contracture of the patellar tendon, and fibrosis of the fad pad.[7-11] Moreover the length of this autograft is not in the control of surgeon and shortening and lengthening can be expected if inadequate bone cut is taken.[7] Due to the above mentioned complications associated with conventional autografts we searched for the alternative and safe autografts and noticed that Hamstring tendon(HT) and Peroneus Longus tendon(PLT) can be the safe alternative for ACL reconstruction. It should be noted that any autograft used for ACL reconstruction loses 50% of its strength after recollagenation and revascularization.[12] Therefore an autograft substituting ACL must be stronger than native ACL.[6] The normal ACL has the tensile load of 2020± 264 N,[13] bone patellar bone tendon 2300 N[12] and quadruple hamstring has tensile load of 4090±265 N.[13] The double peroneus longus tendon however has the highest tensile load of 4268±285 N making this tendon an efficient alternative to ACL.[13] Although the diameter of autograft used in ACL reconstruction has been shown to affect the failure rates the optimum diameter is still not clear.[6] Superior results have been achieved with diameter of autograft greater than 8.5 mm and restoration of 60% to 80% cross section area at the insertion site.[14,15] A comparison of quadruple HT and PLT diameter have shown that the mean difference of 0.5 mm for PLT yielded better results than quadruple HT.[16] PLT is easily harvested at ankle level without significant donor site morbidity because PLT and Peroneus Brevis tendons have synergistic actions and Peroneus Brevis has been shown to be more effective evertor than PLT.[17] Hamstring autograft has minimal donor site morbidity but the graft size is unpredictable and decrease in Hamstring power has been reported in athlets.[18]

The objective of our study was to compare the functional outcome of double PLT with Quadrupled HT in primary isolated Anterior Cruciate Ligament(ACL) reconstruction. Our hypothesis was that PLT autograft has better functional outcome than HT autograft when used for the reconstruction of ACL.

METHODS

We conducted this randomized trial in Orthopaedic department Allied Hospital Faisalabad from 23rd March 2015 to 23rd March 2020.All adults patients of both gender and any age with isolated ACL tear presented within 6 to 8 weeks of sustaining ACL tear were included. Patients with fractures of the knee and previously surgically treated for ACL tear were excluded. The study was approved by the ethical committee of our hospital. Informed consent was taken from all the patients. Complete history physical examination, radiographs and MRI was done in all the patients. Lachman test and anterior drawer test was checked and confirmed positive in all the patients. Pre surgery functional outcome was assessed with Tegner-Lysholm score[19] and International Knee Documentation Committee (IKDC),[20] and ankle function was assessed with American Orthopaedic Foot and Ankle Society Score(AOFAS).[21] All patients were randomly divided into two equal groups with the help of computer generated random numbers. Group A patients were treated with double PLT autograft while group B with Quadrupled HT autograft. The surgeries were done arthroscopically under general or spinal anaesthesia by same team of Orthopaedic surgeons. PLT was harvested and prepared with the help of a technique described by Budhiparama.[22] (Fig. I) Hamstring autograft was harvested from ipsilateral knee using technique of Vinagre and Kennedy.[23] Graft fixations were done with endobutton and interference screws. Post operative supervised physiotherapy was started on first post operative day. Patients were regularly followed in OPD at 2nd week,4th week initially and then every third month for one year. At one year follow up functional outcome was assessed with Tegner-Lysholm score and International Knee Documentation Committee (IKDC) and compared with pre operative values. Ankle function was evaluated in group A with American Orthopaedic Foot and Ankle Society Score(AOFAS).Data was analyzed with SPSS version 23.Mean and standard deviation was calculated for quantitative variables while frequency and percentage was calculated for qualitative variables. P value was calculated with paired t test for statistical significance. *P* value < 0.05 was considered significant. We reported our trial as per CONSORT guidelines.[24]

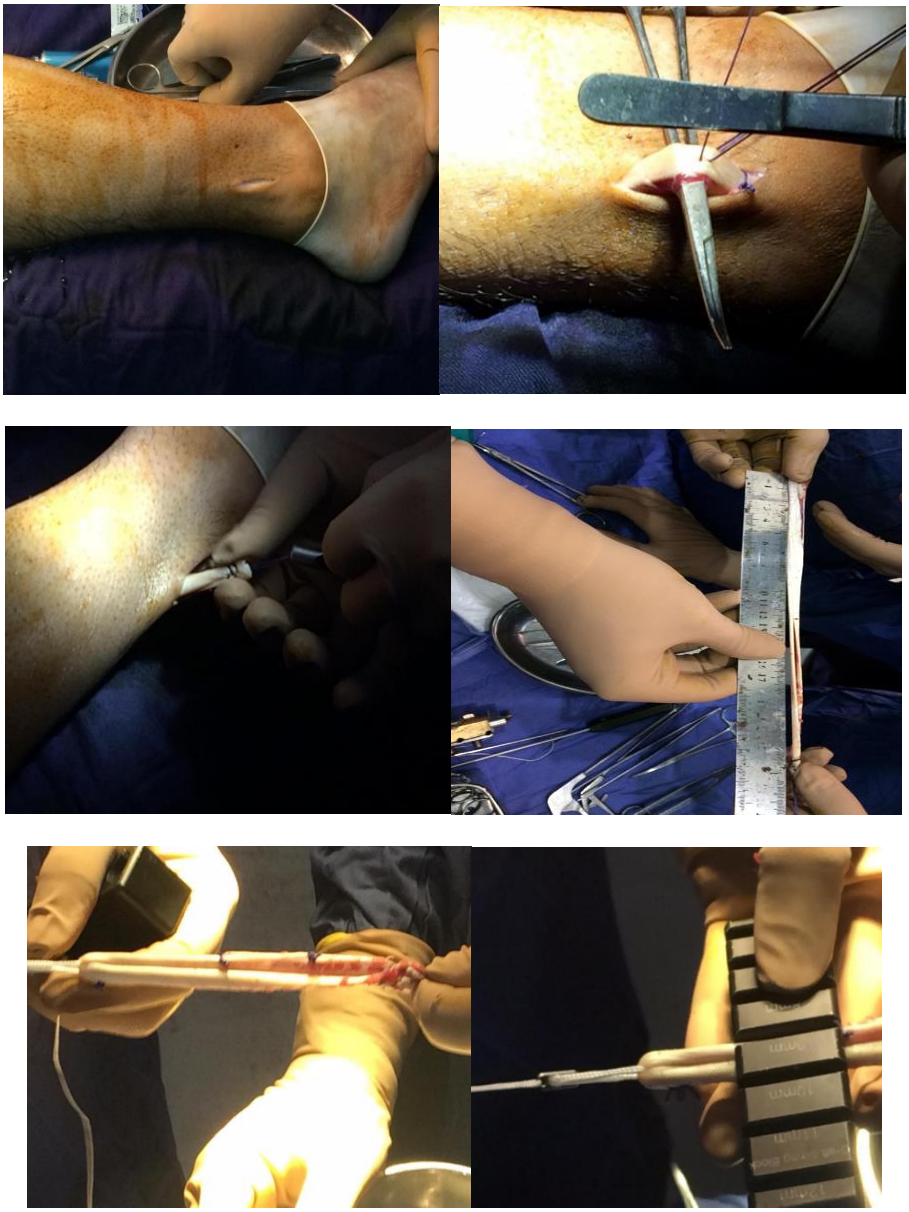

Fig I: Peronus longus harvesting and preparation technique.

RESULTS

We assessed 72 patients of ACL tear for enrollment in our study but 62 patients were eligible for our study and 56 completed the study.(Fig II) Both group A and B had 28 patients each. There was no statistically significant difference in the baseline characteristics of both groups(p>0.05) The mean age of group A was 39.4±6 years and group B 39.6±2 years. Right ACL was ruptured in 17(60.71%) in group A and 19(67.85%) in group B. Road traffic accident was the cause of ACL rupture in 22(78.57%) patients in group A and 23(62.14%) patients in group B. The mean graft diameter of PLT was 8.9 + 0.7 mm and HT 8.5 + 0.5 mm. The mean Tegner-Lysholm score improved from preoperative 69.1 + 2.9 to post operative 92.2 + 2.5(excellent score) at 12 months in group A while in group B it improved from 70.5 + 1.5 to 91.4 + 1.7(P >0.05). The mean IKDC score improved from 40.7±3 to 91.4±1 in group A while group B had pre operative IKDC score of 42.5±5 and improved to 92.7±3(P >0.05) at 12 months. The mean pre-operative AOFAS score of group A was 100 and post-operative score was 98.4 ± 2.1.(P >0.05).All the patients in both groups had negative Lachman test and anterior drawer test at one year follow up.No complication was noted in any group.

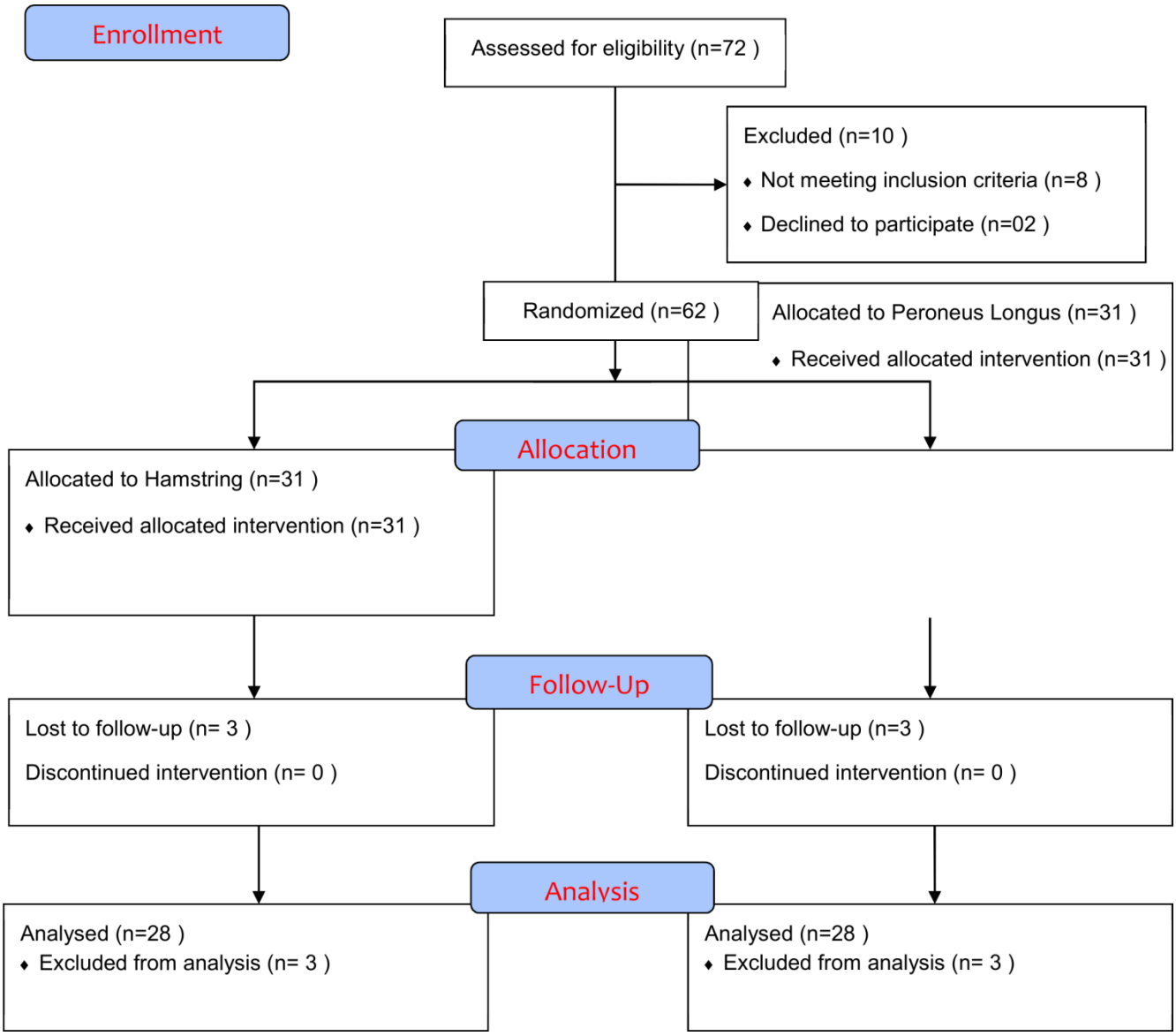

Fig II: CONSORT flow diagram of our patient enrollment.

DISCUSSION

In our study we documented comparable functional outcome of ACL reconstruction with PLT and HT. A slight decrease(p >0.05) AOFAS score however was noted in PLT group. Similar to our results He and Tang[25] conducted a systematic review and meta-analysis utilizing 23 studies and 925 patients. PLT group revealed better IKDC score and Lysholm score than HT.PLT group had slightly lower AOFAS score at last follow up. These authors concluded that PLT and Hamstring autograft had comparable functional outcome. In our study no significant difference in the IKDC score was observed in PLT and HT groups. In another study Rhatomy [16] compared the functional outcome of 24 patients of ACL reconstruction with PLT and 28 with Hamstring. The mean diameter of PLT tendon was 8.8±0.7mm and hamstring 8.2±0.8mm. At one year follow up no significant differences in the functional outcome was noted in the both groups. The assessment tools were Lysholm score, Modified Cincinnati and IKDC.T he ankle score as per AOFAS and FADI was 97.3±4.2 and 98±3.4 respectively in the PLT group. A significant decrease in the circumference of thigh was noted in the Hamstring group(p=0.002). Contrary to the above studies Purboyo and colleagues [26] conducted a meta analysis utilizing 10 studies comparing 182 PLT and 362 HT for the reconstruction of ACL. They

concluded that although functional outcomes of both PLT and PLT were excellent(IKDC score>80), HT group had better IKDC score than PLT. Due to the donor site morbidity and complications PLT can be used as an alternative to HT in ACL reconstruction. Phatama27 compared the results of 15 patients with PLT and 16 with HT .At 2 years follow up no significant difference was documented in pain and crepitus between the two groups. The functional outcome as assessed with Kujala score was significantly higher($p<0.0001$) in PLT group than in Hamstring group. Angthong and colleague[28] treated 24 patients with PLT.The mean post operative AOFAS score at 6th month was 96.0±9.6.The isokinetic testing however revealed significant reduction of inversion and eversion of operated ankle when compared with non operated ankle. These authors did not recommend PLT as autograft of first choice for primary isolated ACL reconstruction.

Many authors reported encouraging results of PLT autograft and advocated the use of PLT as an alternative to HT and other autografts. Yu and Deng [29] treated 35 patients(mean age 43.4 years) with ipsilateral peroneus longus autograft. At 14.2 months follow up anterior drawer test, Lachman test and Pivot Shift test was negative in all patients. Functional outcome as assessed with Lyscholm score, International Knee Documents Committee(IKDC) and Knee Injury and Osteoarthritis Score(KOOS) showed significant($p<0.05$) improvement at three,six and twelve month when compared with pre surgery. Cao30 treated 35 patients with mean age 31.8 years with PLT autograft. At 15 months follow up the mean Lysholm score was 97.2 with excellent Lysholm score in 25 patients, good in 6,fair in 3 and poor in 1 patient. Majority(88.6%) of patients had excellent and good KT-3000 arthrometer assessment. The mean AOFAS score was 96.3.These authors recommend PLT as an excellent alternative to ACL without any donor site morbidity. Joshi and colleague[6] treated 48 patients with PLT autograft. The mean diameter of double PLT was 7.9mm.At 24 months post operative follow up the mean IKDC score was 78.16±6.23 .The mean AOFAS score was 98.4±4.1.These authors advocated the use of PLT for ACL reconstruction because of its safety and efficacy. Kumar[31] treated 25 patients of ACL reconstruction with PL. The mean graft thickness was 8.74mm. He reported Mean IKDC score of 98.53 at the end of three months follow up. Post operative ankle functions were evaluated with Medical Research Council Grading(MRC) and was 5.Kumar concluded that PLT used for ACL reconstruction yielded excellent functional outcome without any adverse affect on ankle movements and stability.

Our study had a small sample size but that was due to our strict inclusion criteria of isolated ACL rupture. Our follow up period was short. We recommend further studies to confirm our results.

CONCLUSION

Both double Peroneus Longus autograft and Quadrupled Hamstring were effective in treating ACL reconstruction. No statistically significant difference however was noted in the functional outcome of double Peroneus Longus autograft when compared with Quadrupled Hamstring for primary Anterior Cruciate Ligament Reconstruction(ACL) at 12 months follow up.

Conflict of Interest: None

Grants/Funding: None

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