Original Research Article

All Inside Anterior Cruciate Ligament Reconstruction Augmentation with Suture Tape

Debobrato Saha[1*], Debashish Mishra[2], Shakti Prasad Das[3],Saswat Samant[4],Sourav Kumar Pal[5],Amlan Dash[6]

[1]Post Graduate Resident, Department of Orthopaedics KIMS, Bhubhaneshwar, Odisha,India
[2]Associate Professor,, Department of Orthopaedics KIMS, Bhubhaneshwar, Odisha,India
[3]Assistant Professor, Department of Orthopaedics KIMS, Bhubhaneshwar, Odisha,India
[4]Assistant Professor, Department of Orthopaedics KIMS, Bhubhaneshwar, Odisha,India
[5]Post Graduate Resident, Department of Orthopaedics KIMS, Bhubhaneshwar, Odisha,India
[6]Senior Resident, Department of Orthopaedics KIMS, Bhubhaneshwar, Odisha,India

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Abstract

Purpose: To access the short term outcome for anatomic anterior cruciate ligament reconstruction (ACLR) using the all-Inside translateral technique with suture tape augmentation.**Methods:** Patients undergoing ACLR using the all-Inside technique between August 2018 and September 2020 with minimum 1-year follow-up were included in this study. Functional outcome measures were IKDC, Lysholm, and Tegner Activity Scale, VAS Scale for Pain assessment a period of 1, 3, 6, and 12 Months Respectively.**Results:** Total 20 patients who underwent primary all-Inside ACLR with suture tape augmentation follow-uped till 1 year. There were 17 men and 3 women with a mean age of 29 years (range, 21 to 35 years). The International Knee Documentation Committee score (40 v 90.7, P < .0001), visual analogue scale score (6.2 v 0.2, P < .001), and Tegner activity score (2.4 v 6.6, P < .001) showed a significant improvement between baseline and final clinical followup. **Conclusion:** Augmentation of the graft with Good functional outcome and rate of graft failure is zero in the short term. Similar functional outcome of ACLR in anatomic all Insidetranslateral technique. Knee stability with contralateral knee has no difference and return to pre-injury activity level was satisfactory.

Keywords: Level IV, retrospective case series.

Introduction

Anterior Cruciate Ligament (ACL) Reconstruction has been dynamic in the past decade. Various new techniques have been described but the cause of failure is still being debated. Many new advancements to its technique have been described and each has its advantage and disadvantage [1]. ACL revision surgery varies from 10-15%[1] and has been evaluated with time Many factors influence the ACL reconstruction outcome which includes pre-injury laxity, secondary stabilizers; articular cartilage, and meniscus status whereas surgical aspect includes graft selection, surgical technique, rehabilitation, and patient's compliance.Various etiological causes of failure has been documented and have been classified under broad headings like instability, stiffness, and pain.[2] They have been sub-classified under various factors[2]. It can be traumatic or atraumatic[3]. Among atraumatic factors, the Technical factor remains the topic of interest as it constitutes about 70% of failure rate, others are inadequate diagnosis[3].Biomechanical being 2nd most common factor being biomechanical cause i.e failure of graft fixation or failure of fixation method [4]. It has also been sub-classified as a). Failure of graft tension b). Failure of graft isometry c). Failure of graft selection d). Failure of graft incorporation e. Failure of graft due to infection.[4] Graft fixation failure can also be defined as a failure in the completion of the ligamentization[8] process, leading to an atonic, disorganized, and non-viable graft, a). Graft strength b). diameter of Graft c). Size of Graft d).Type of Graft and e). Synthetic graft[4].The weakest point of fixation is immediate during the postoperative period. Thus a solid fixation is important to prevent change in the position of the graft Inside the socket.[5] Brace and delayed weight-bearing after ACLR have a negative influence on long-term functional outcomes.[8]Incorporating graft factor as the cause of failure we did our study to analyze the role of graft augmentation with suture tape reduces the chance of ACL failure and also give early aggressive rehabilitation and better functional outcome as compared to the standard technique.

**Correspondence*
Dr. Debobrato Saha
Department of Orthopaedics, Kalinga Institute of Medical Science, Bhubhaneshwar,India
E-mail: debobratosaha@gmail.com

Methods

This is a prospective observational study conducted in KIMS and PBMH, Bhubaneswar from 1st September 2018 to 31st August 2020. The recruitment period was for 1 year till 31st August 2019.

The inclusion criteria were: a**).** Age18-50year with clinical and radiological diagnosis of ACL injury full grade tear. b). ACL reconstruction done within 1 year of injury as the risk of Medial Meniscus injury is high in ACL deficient knee. c).Surgical procedure all Inside translateral approach using sliding loop. d).Unilateral injury as bilateral cases would have delayed Rehabilitation and it wound alter the functional outcome. e). Patient giving consent for the study. f). a minimum 1-year follow-up.

Exclusion criteria were: a**)**.Other associated major ligament injuries in the ipsilateral knee requiring surgical intervention (Meniscus, Posterior Cruciate Ligament, Posterolateral Corner injury, and Medial collateral Ligament). b**)**.Any fractures associated with a ligament injury. c**)**. Pathological tear (Degenerative due to Mucoiddegeneration.). d**)**. Articular Damage greater than grade 3 as per Outerbridge criteria. e**)**. Joint laxity Beighton score >5, coronal

deformity >10 degrees. f**).** Grade III pivot shift as associated with posteromedial and postero-lateral corner Injury. g). Previously operated ACL surgery.

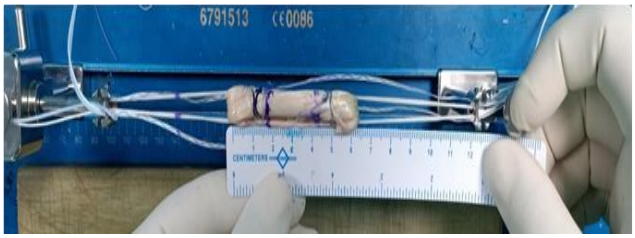

Fig 1:Graft Length 6.5cm, Diameter 8mm, Quadrupled Graft, Graft Link Technique Added With Suture tape as Brace

Graft preparation technique

A 3-4cm oblique skin incision is made over pesanserinus starting 5 cm below the medial joint line and around 1cm medial to the tibial tuberosity. The oblique incision is preferred as it gives a wider exposure of pesanserinus and there is less chance of injury to the infrapatellar branch of the saphenous nerve. It is planned to do the graft harvest and tibial tunnel drilling through the same incision. The superior border of the pesanserinus is identified using the finger rolling. This superior border is lifted and the fascia incised. The tendons can be felt with fingers running from above downwards. The lowest one felt is the semitendinosus tendon. After the hamstring tendons are identified, the sartorius fascia is divided along the course of the tendons (gracilis and semitendinosus), taking care to preserve the deep layer containing the Medial Collateral Ligament. With the help of right-angled artery forceps, then the semitendinosus is hooked out. The tendon ends were tied with a double loop knot to aid in traction. The knee is placed in 90 degrees of flexion and proximal dissection of the tendons were done using blunt dissection by fingers till the musculotendinous junction thereby releasing adhesions and accessory bands, while continuous traction was being applied through the threads. The main band which connects the medial head of gastrocnemius is usually cut with the help of scissors. It is confirmed that as the tendon is pulled distally, there should be no dimpling posteriorly over the gastrocnemius. The distal end of the tendon is freed with the scissors. Then a tendon stripper is advanced over the tendon in line with it maintaining firm, steady and gentle pressure and at the same time applying traction by holding the threads. If there is any resistance felt, then the stripper is withdrawn, adhesions removed and again the stripper is advanced and tendon harvested. The gracilis is usually more muscular appearing than the semitendinosus. The harvested graft is then placed on the Graft preparation board. The tendons are removed of any residual muscle fibers with the help of blunt end of the blade. The tendon ends are trimmed to achieve uniform size. A krackow is placed at both ends of the tendons. Around 2 cm of both the ends of the tendon were stitched together. The two tendons are looped over sliding loop and quadrupled. Then the graft is stitched with the 4 strands with fiber wire (Graft link technique). The composite graft is then passed through the graft sizer. The diameter of the tunnel to be made is equal to the smallest sizing sleeve through which the quadrupled graft passed with minimum friction. Suture tape is augmented to graft in the double loop over endobutton of the sliding loop with free ends on the tibial end. The graft length to be placed Inside the femoral tunnel is marked to ensure the correct placement of graft within the femoral tunnel while being viewed arthroscopically. The loop of the four-strand graft is tied to the posts in the graft preparation board and pre-tensioning is done by applying a pressure of about 80N covering with saline gauge for a minimum of 15 minutes. (Figure 1)

Surgical Procedure

The anatomic all-Inside translateral ACL reconstruction technique as described by Adrian in 2013.[9] The brief description of surgical Procedure: Graft is harvested and prepared. After identification of the bony anatomic landmarks at the native ACL footprint, namely the bifurcate and intercondylar or “resident’s” ridge, the femoral socket was created by a FlipCutter (Arthrex) to create a “socket” (not full tunnels with cortical preservation) by outside-in drilling at the center of the native ACL footprint, at the midpoint between the Anteromedial and posterolateral bundle. The socket was routinely drilled to a depth of at least 20 mm. The tibial socket was created using the same technique, with the tibial aiming device placed in the midbundle position, resulting in an average socket length of 20 mm. The tunnel size was based on the measured diameter of the soft-tissue graft. Through the Anteromedial portal, the femoral side sliding loop was pulled through to fully seat the graft within the femoral socket. The tibial side sliding loop was then passed through the tibial tunnel and the graft link was pulled into the tibial socket. Final cortical suspensory fixation and tensioning of the GraftLink was performed at a knee flexion angle of 15 to 20 and fiber tape is tightened in full extension (Figure 2). A standardized ACL rehabilitation protocol was used for all patients, with a focus on achieving immediate full knee extension equal to the preoperative measurement, return to running at 3 months, and return to cutting and pivoting sports at 6 months.

Fig 2: Brace tightened in extension

Results

Table 1: Demographic

Age	**29(21-35)**		
Gender	Male-17		Female – 3
Mechanism of Injury	Sports- 16	RTA-3	Fall-1
Side	Right-18		Left-2
Associated Pathology	None		

Total 20 patients who underwent primary all-Inside ACLR with suture tape augmentation follow-uped till 1 year. There were 17 men and 3 women with a mean age of 29 years (range, 21 to 35 years) (Table 1). The International Knee Documentation Committee score (40 v 90.7, P < .0001), visual analogue scale score (6.2 v 0.2, P < .001), and Tegner activity score (2.4 v 6.6, P<.001) (figure 3) showed a significant improvement between baseline and final clinical followup.

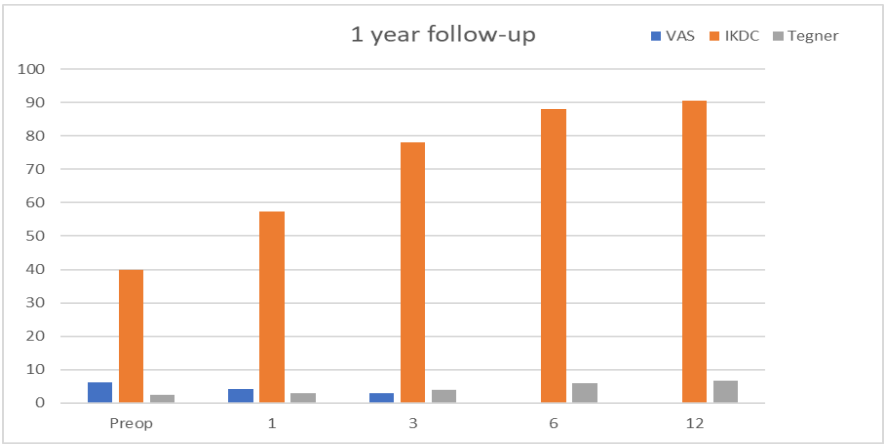

Fig 3:Visual Analogue scale(VAS), International knee documentation committee(IKDC), Tegner Activity scale preoperatively, 1,3,6 and 12 months respectively.(20 Patients)

Discussion

The Outcome of anatomic all-Inside ACLR with suture tape augmentation had good results with no cases of failure which has been documented up to (12.7%) in all-Inside technique.[10,13] The Post-operative VAS score was average 4.2(2-6) immediate and early return to rehabilitation postoperative (D0).The IKDC, Tegner activity scale, VAS, was compared with preoperative data and was found significant and helped in the early restoration of function and back to activity of daily living.Knee stiffness is one of the grave complications due to inappropriate physiotherapy due to fear of the risk of failure. Optimum loading on graft rather helps in graft healing and helps in ligamentization so early aggressive rehabilitation is important for favourable outcomes. The suture Tape is hypothesized to help in integration of graft thus helps graft in healing to ligamentization.[12]Sukur et al [21] in a randomized study compared the AM and TT drilling techniques for ACL reconstruction. Their results for the AM tunnel technique were IKDC 93.1, Lysholm 95.4, Tegner 6.3, and In TT drilling 91.4, 93.9, 6.1 respectively which is comparable to our study IKDC, Lysholm and Tegner i.e. 93, 95 and 6 respectively.All-Inside ACL reconstruction is around 18% more expensive than standard ACL reconstruction [14]. All-Inside ACL technique creates the closed-sockets which may have protective effects and helps in decreased tunnel expansion and bone preservation [15, 16]. Inferior biomechanics and clinical outcomes are reported in suspensory fixation compared to screw fixation in some studies but there has not been reported in biomechanical and early-term clinical outcomes studies utilizing an all-Inside ACL technique with suspensory fixation. [17-19]The role of anatomic placement of the femoral tunnel helps in the prevention of graft failure which is common with the non-anatomic placement of the graft. More horizontal graft helps in providing stability in the rotatory and transitional movement. Outside-in technique a superior outcome than transtibial and anteromedial portal drilling as the risk of revision surgery is 2 times higher in anteromedial than transtibial , Outside-in technique produces more oblique and anatomically correct femoral tunnel and it also covers larger area of posteromedial fibers on femoral attachment.[20]The advantage of "All-Inside technique" is that the graft length can be as small as 6.5 cm with the majority of patients being operated with a single tendon graft leading to a decrease in graft site morbidity. The cost factor remains the most debatable but single surgery is always cheaper than the revision surgery.

Limitations

The Study conducted is a level 4 study constitutive of case series with a study period of only 1 year. It also did not include other pathology associations which are commonly observed with ACL pathology. There was no comparison with other modality of treatment.

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