



OUTCOME OF ISOLATED AVULSION FRACTURES TREATED WITH "SUTURE IN BUTTON" FIXATION TECHNIQUE

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ABSTRACT

Backgrounds: Management of Anterior cruciate ligament (ACL) avulsion fractures have been described in literature from closed reduction, to both open and arthroscopically assisted fixation. The Purpose of the study is to evaluate clinical and radiological outcomes of new technique of arthroscopic "suture on button" fixation in treating tibial eminence fracture.

Methods: This is retrospective study includes 10 patients with ACL avulsion fractures between 2012 and 2015. All patient underwent arthroscopic "suture on button" fixation by the single orthopedic surgeon. The inclusion criteria were a displaced ACL avulsion fracture (Meyer and McKeever Types III and IV), with a minimum follow-up of 18 months. A preoperative MRI was done in all patient to confirm the fracture. Lysholm and IKDC score was used clinical assessment.

Results: Clinical assessment none of the patient had complains of Instability. Range of motion measurement showed a mean extension deficit of 2° (0–3) and a mean flexion deficit of 4° (2–6) when compared with the unaffected knee. The average Lysholm knee score was 97 (96–100).

Post-operative radiograph in all the patients showed reduction of fracture fragment/s. Radiographic union was achieved in all the patients at 3 months postoperative.

Conclusion: The results of the study showed arthroscopic "suture on button" fixation procedure results in good outcome for treatment of ACL avulsion fractures.

KEYWORDS : PCL avulsion, Screw fixation, Delayed presentation

INTRODUCTION:

Tibial eminence avulsion fractures are rare injuries occurring mainly in adolescents and young adults. Tibial avulsion fractures of anterior cruciate ligament (ACL) can lead to instability and inadequate refixation can cause extension and flexion limitation of the range of motion(1, 2) Regardless of patient age, anatomic reduction and stable internal fixation are mandatory for fracture healing and accurate restoration of normal knee biomechanics. Management of Anterior cruciate ligament (ACL) avulsion fractures have been described in literature from closed reduction, to both open and arthroscopically assisted fixation (3,4,5). Arthroscopic treatment is the gold standard nowadays and has replaced open techniques (4). Various arthroscopically assisted fixation methods with sutures, anchors, wires, or screws have been described but can be technically demanding, thus elongating operative times (3-9).

The purpose of this article is to present a technical variation of arthroscopic fixation of anterior cruciate ligament avulsion fractures using "suture on button".

METHODS

The inclusion criteria were a displaced ACL avulsion fracture (Meyer and McKeever Types III and IV) in skeletally mature patients. These patients were treated with arthroscopic "suture on button fixation" and followed with minimum period of 18 months. Patient were called for follow up at 1 month, 2 months, 3 months 6 months one year and 18 months. Antero-posterior and lateral radiographs were obtained immediate postoperative, at one month and at 3 months postoperatively to assess fracture healing. At 18 months after surgery, all patients were evaluated by clinical examination like anteroposterior laxity (Lachman and anterior drawer tests). Knee range of motion was evaluated actively and passively with a goniometer. The Lysholm and International Knee Documentation Committee (IKDC) scores evaluated knee function. Knee radiographs in standing anteroposterior, standing lateral, and Merchant views were examined for alignment, joint space narrowing, and degenerative knee changes.



Image 1. Preoperative Radiograph of Knee Joint Antero-posterior and Lateral view showing ACL avulsion (Meyer and McKeever Types III)

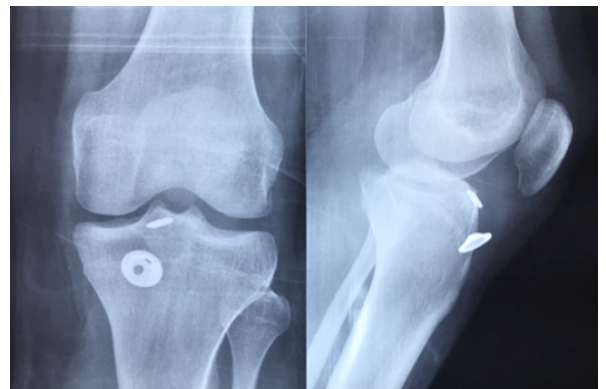


Image 2. Post-operative Radiograph after fixation of ACL avulsion by "Suture on button" technique

SURGICAL TECHNIQUE

The patient is positioned supine with a thigh tourniquet and the affected limb placed on a standard leg holder allowing full knee

range of motion. By use of a 30°, 4.0-mm arthroscope, standard anteromedial (AM) and anterolateral (AL) portals are used. The knee joint is evaluated, hematoma is evacuated, and fracture debris or other interposed tissues are removed. Concomitant meniscal tears or other lesions are assessed and addressed before fracture treatment. In most cases the transverse intermeniscal ligament is interposed between the superior displaced fragment and the tibia, obstructing accurate reduction. By use of a probe from the AM portal, the ligament is pulled anteriorly and over the tibial eminence fragment, facilitating the achievement and maintenance of reduction. The reduction is temporarily fixed with a K-wire. Then, with the help of ACL guide zig guide wire is passed through the avulsed fragment. Over this guide wire endo-button reamer 4.5 mm is drilled. Shuttle-suture is passed through this tunnel with use of reverse bidth pin and suture is retrieved through antero-medial portal. Now endo-button with fibre suture No. 2 is shuttled through the drilled tunnel. In full extension the suture is tightened over the suture wheel by Duncan loop and 5half hitches. The reduction is again checked arthroscopically and assessed through range of motion. Closure of arthroscopy portals is done. RJ bandage applied and long knee brace is given.

POSTOPERATIVE REHABILITATION

Postoperatively, the knee is immobilized in full extension in a brace for 4 weeks. The brace was then adjusted to allow gradual flexion to regain complete range of movement. Partial weight bearing in the brace is allowed as tolerated with crutch support until the second week, and full weight bearing was allowed until 4 weeks. Isometric quadriceps muscle exercises were performed throughout the immobilization period to minimize disuse atrophy. Nonimpact activities are allowed at 8 weeks (e.g., swimming and cycling). Return to sports was permitted at 6 months postoperatively, after knee stability, range of motion, muscle strength, and proprioception were restored.

RESULTS:

On clinical assessment none of the patient had complains of Instability. Lachman and Anterior drawer tests were negative in all 10 patients.

Range of motion measurement showed a mean extension deficit of 2° (0–3) and a mean flexion deficit of 4° (2–6) when compared with the unaffected knee. The average Lysholm knee score was 95 (92–98). Overall, the IKDC grade was A (normal) in 8 patients (80%), B (nearly normal) in 2 patients (20%).

Post-operative radiograph in all the patients showed reduction of fracture fragment/s. Radiographic union was achieved in all the patients at 3 months postoperative.

Table 1. Patient Details

Age/sex	SIDE	GRADE	FOLLOW-UP MONTHS	LYSHOLM SCORE		IKDC SCORE	
				PRE	POST	PRE	POST
31/M	RIGHT	III	22	18	95	34	96
14/F	RIGHT	IV	18	27	97	42	98
25/M	LEFT	IV	26	34	92	32	97
20/M	RIGHT	III	30	26	93	34	96
16/M	LEFT	III	32	32	95	39	95
23/M	RIGHT	IV	34	16	98	19	97
11/M	RIGHT	III	19	29	96	26	96
19/F	LEFT	IV	23	32	92	24	95
17/M	RIGHT	IV	27	40	94	18	96
18/M	LEFT	III	30	26	98	23	94

DISCUSSION

Displaced ACL avulsion fracture can lead to instability of knee joint and functional compromise. Arthroscopic surgery allows complete visualization of the joint, a thorough assessment of the injury, and other concomitant injuries, as well as early mobilization, and faster rehabilitation.^[10,11] McLennan, in 1982, was the first to report the advantages of arthroscopically assisted reduction, which included

less invasiveness than open surgery and rapid recovery of knee function.^[12]

Different arthroscopic methods have been described in literature, including screw fixation, suture fixation, or tightrope fixation. Boutsiadis *et al.* reported a novel 4-point suture fixation method in December 2014 with promising results.^[13] Verdano *et al.* reported good to very good results in their study using arthroscopic suture fixation method.^[14] Ahn and Yoo reported a LysoIm score of 95.6 in their study on acute and chronic tibial spine fractures using arthroscopic suture fixation technique.^[15] Song *et al.* performed a study on clinical outcome of ACL avulsion fracture between children and adults using suture anchors and reported a LysoIm score of 89.5.^[16] Seon *et al.* compared fixation of ACL avulsion fracture using two different techniques, screw versus suture fixation, and reported a LysoIm score of 91.7 and 92.7, respectively.^[17]

In our study, the mean LysoIm score was 95, which is comparable and equivalent to previous reported studies. Moreover, all patients included in our study were able to resume previous athletic and sporting activities at the end of 6 months.

There is literature about a few postoperative complications using arthroscopic reduction techniques. In 1993, Berg reported two cases of postoperative arthrofibrosis.^[18] Montgomery *et al.* reported more than 50% of their patients unable to regain complete mobility in knee range of motion.^[19] Osti *et al.* reported 30% of their patients to have postoperative laxity.^[16] In the present study, range of motion measurement showed a mean extension deficit of 2° (0–3) and a mean flexion deficit of 4° (2–6) when compared with the unaffected knee.

CONCLUSION:

The present study demonstrates that ACL avulsion fractures can be effectively treated using arthroscopic “suture on button” fixation technique and restores the joint stability and function.

CONFLICT OF INTEREST:

Nil.

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