The Knee 21 (2014) 1185–1190

Contents lists available at ScienceDirect

The Knee

Repair of a radial tear in the posterior horn of the lateral meniscus

Hyun-Seok Song, Tae-Yong Bae, Bum-Yong Park, Jungin Shim, Yong In *

Department of Orthopaedic Surgery, College of Medicine, The Catholic University of Korea, Seoul, Republic of Korea

ARTICLE INFO

Article history:
Received 18 March 2014
Received in revised form 5 July 2014
Accepted 21 July 2014

Keywords:
Knee
Meniscus
Radial tear
Repair device
FasT-Fix

ABSTRACT

Background: There have been no studies evaluating the clinical results after repair of a radial tear in the posterior horn of the lateral meniscus (PHLM) using the FasT-Fix system. This study was undertaken to evaluate the clinical outcomes after repair of a radial tear in the PHLM using the FasT-Fix system in conjunction with anterior cruciate ligament (ACL) reconstruction.
Methods: Between September 2008 and August 2011, 15 radial tears in the PHLM identified during 132 consecutive ACL reconstructions were repaired using the FasT-Fix meniscal repair system. We classified the radial tears into three types according to the tear patterns: simple radial tear, complex radial tear, and radial tear involving the popliteal hiatus. Postoperative evaluation was performed using the Lysholm knee score and Tegner activity level. Second-look arthroscopy was performed in all cases.
Results: The mean follow-up period was 24 months. None of the patients had a history of recurrent effusion, joint line tenderness or a positive McMurray test. The meniscal repair was considered to have a 100% clinical success rate. At the final follow-up, the Lysholm knee score and Tegner activity level were significantly improved compared to the preoperative values. On the second-look arthroscopy, repair of radial tears in the PHLM in conjunction with ACL reconstruction using the FasT-Fix device resulted in complete or partial healing in 86.6% of cases.
Conclusion: Clinical results after meniscal repair of a radial tear in the PHLM by using the FasT-Fix system were satisfactory.
Level of evidence: Case series, Level IV.

1. Introduction

A radial tear of the meniscus has been known to significantly increase the tibio-femoral contact pressure [1,2]. This process predisposes to premature osteoarthritis (OA) of the knee [3–5]. Badlani et al. [6] reported that knees with untreated radial tears that spanned at least one third of the meniscus were at a greater risk for the later development of radiographic OA. A radial tear in the posterior horn of the lateral meniscus (PHLM) is often accompanied with an anterior cruciate ligament (ACL) tear [7–9]. Meniscal repair should be considered if possible when treating a meniscal tear. However, some surgeons have thought that the radial tear of the PHLM is not repairable [10,11]. A few articles focused on the arthroscopic repair of a radial tear in the PHLM in combination with ACL reconstruction [7,8]. Ahn et al. [7] repaired a radial tear using the all-inside technique with the No. 0 polydioxanone suture which was delivered through a suture hook during ACL reconstruction. Anderson et al. [8] also reported good results after arthroscopic repair of the radial tear in the PHLM and simultaneous ACL reconstruction. An inside-out repair was the mainstay of their technique. However, the all-inside repair technique for a radial tear in the PHLM is technically demanding, and the inside-out technique is difficult to perform due to the neurovascular structures in the posterolateral compartment of the knee.

Meniscal repair devices allow all-inside meniscal repair that eliminates the need for accessory incisions and decreases the risk of neurovascular injury [12]. In its early days, tacks, screws, and staples were introduced. Recently, newer self-adjusting suture devices have gained popularity. RapidLoc (DePuy Mitek, Raynham, MA) and FasT-Fix (Smith & Nephew, Andover, MA) represent this category of meniscal repair devices. The FasT-Fix meniscal repair system consists of two 5-mm long polymer suture bar implants which allow two-point fixation by tightening a pre-tied self-sliding knot of No. 0 nonabsorbable braided polyester suture material. Clinical results after meniscal repair for longitudinal tears within the red–red or red–white zones using the FasT-Fix system are promising [13,14].

We performed meniscal repair using the FasT-Fix meniscal repair system for radial tears in the PHLM in conjunction with ACL reconstruction. We arthroscopically analyzed and classified tear patterns during the operation. We evaluated meniscal healing by second-look arthroscopy in all cases. The purpose of this study was to report the clinical results and to assess the healing status of the repaired meniscus confirmed by second-look arthroscopy. We hypothesized that repaired radial tears in the PHLM would heal without complications.

* Corresponding author at: Department of Orthopaedic Surgery, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, 222 Banpo-Daero, Seocho-Gu, Seoul 137-701, Republic of Korea. Tel.: +82 2 2258 2838; fax: +82 2 535 9834.
E-mail address: iy1000@catholic.ac.kr (Y. In).

http://dx.doi.org/10.1016/j.knee.2014.07.018
0968-0160/

2. Patients and methods

Approval for this retrospective study was obtained from the Institutional Review Board of our hospital (date: January 17, 2013, number: KC13RISI0008). Between September 2008 and August 2011, 132 ACL reconstructions were performed by a single surgeon at a university medical center. The indication for ACL reconstruction was a definite anterior instability on physical examination, and the abnormal findings of the torn ACL were checked by preoperative magnetic resonance imaging (MRI). There were 48 medial meniscus (MM) tears and 54 lateral meniscus (LM) tears. Twenty-three knees had both MM and LM tears. Among the 54 LM tears, 15 were radial tears in the PHLM. All of these 15 radial tears were repaired arthroscopically using the FasT-Fix meniscal repair system and included in this study. There were 12 men and three women in this study. The mean age at operation was 34.5 years (range, 18–56 years). The mean timing of surgery after injury was 3.3 months (range, 1.5–12 months).

Before the ACL reconstruction procedures, the patterns of radial tear in the PHLM were meticulously evaluated by probing the tear sites. All 15 radial tears extended to the outer third of the PHLM. Among them, five tears were simple radial tears involving the outer third of the meniscus radially. Six tears were complex tears which consisted of radial tears and longitudinal tears. The remaining four radial tears were complex tears but the tear extended to the popliteal hiatus. These tears were severely displaced and unstable. Based on our arthroscopic examination findings, radial tears in the PHLM were classified into the following three types according to the complexity and stability of the tear: 1) a simple radial tear, 2) a complex radial tear, and 3) a radial tear involving the popliteal hiatus (Fig. 1A, B, C).

A patient was placed in supine position with the knee flexed and the hip externally rotated and abducted position. A simple radial tear was treated by side-to-side repair (Fig. 2A, B). Meniscal repair was done from the ipsilateral anterolateral portal while viewing was carried out from the contralateral anteromedial portal. Both edges of the tear were freshened using an arthroscopic motorized shaver. A rehearsal to predict the position and insertion angle of a suture anchor was done with a probe. A needle tip was penetrated into one side of the meniscus to deliver the suture bar anchor at a level at which the sleeve was trimmed according to the depth of penetration. After removing the needle tip from the first anchor site, a button was pushed to deploy the second suture bar anchor. The second penetration was done across the tear site at the opposite end of the meniscus. After second deployment, the suture was pulled and the pre-tied sliding knot was advanced with the aid of knot pusher–suture cutter. The suture was cut by pushing a trigger in the knot pusher–suture cutter. The stability of the radial tear of the meniscus was checked with a probe. If needed, the same procedure was repeated. The FasT-Fix system is considered to be beneficial in repairing a complex radial tear, which needs to be managed with both the side-to-side repair and menisco-capsular repair (Fig. 3A, B). Menisco-capsular repairs were performed by deploying two suture bar anchors into the capsule and the side-to-side repair was completed by tightening the pre-tied knot. When the longitudinal portion of the tear was large, the decision of performing additional menisco-capsular repair was made by probing the unstable longitudinal portion of the tear. A radial tear involving the popliteal hiatus (Fig. 4A) was the most unstable. The first bar anchor was deployed into the less unstable posterior horn. The needle for the second anchor was inserted only into the meniscus that was more unstable and transferred to an appropriate position for menisco-capsular repair. Finally, the needle was inserted into the capsule to deploy the second bar anchor. The tear edges were matched by pulling the self-adjusting suture. In all cases, additional fixation was needed to provide stability around the popliteal hiatus (Fig. 4B). Caution was exercised so as not to injure the popliteus tendon or neurovascular structures during the procedure. The basic surgical technique of ACL reconstruction was the same for all knees. ACL reconstruction was performed using a quadrupled semitendinosus and gracilis tendon autograft. We used the Endobutton CL (Smith & Nephew, Andover, MA) for suspensory femoral fixation. A bioabsorbable interference screw and a metal screw and washer were used for tibial fixation. Postoperatively, a limited motion brace was applied in full extension. A gentle passive flexion exercise using the continuous passive motion (CPM) machine was started, and flexion was gradually increased from 0° to 90° in four weeks. Weight bearing was not permitted until 4 weeks postoperatively, and partial weight bearing was allowed after 4 weeks. Full weight bearing ambulation was allowed from the postoperative sixth week.

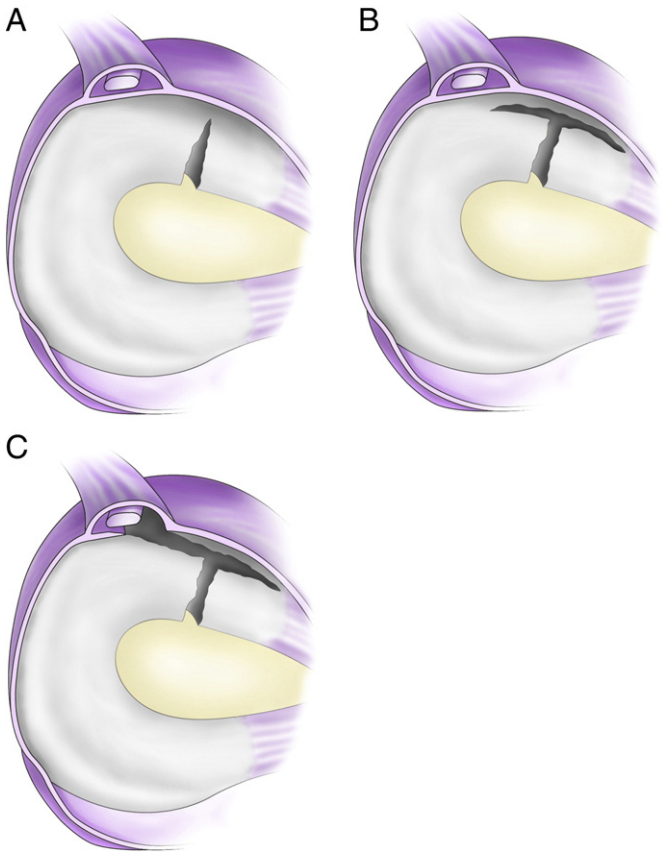

Fig. 1. Radial tears in the posterior horn of the lateral meniscus (PHLM) were classified into three types. A. A simple radial tear. B. A complex radial tear. C. A radial tear involving the popliteal hiatus.

All patients were assessed preoperatively and at two months, six months and one year postoperatively, and annually thereafter. Meniscal healing was evaluated by both the subjective and objective measures. These included absence of symptoms such as locking, catching, or giving way; no history of effusion; no joint-line tenderness; and a negative McMurray test [15]. Lysholm knee score and Tegner activity level were evaluated. The Shapiro–Wilk test was used to verify the normality of the data. In order to compare the preoperative and postoperative Lysholm knee scores and Tegner activity level, Student's t-test for paired samples was applied. The result was considered to be statistically significant if the P value was less than 0.05. Statistical software, SPSS version 13.0 (SPSS Inc., Chicago, IL), was used to analyze the data.

The metal screw and washer for tibial fixation were routinely removed at one year after surgery. All patients agreed to undergo second-look arthroscopy during the screw and washer removal procedure. The repair integrity of the meniscus was evaluated by second-look arthroscopy. During the second-look arthroscopy, the healing status and stability of meniscal repair were evaluated by probing the repaired site. We used Scott et al.'s criteria [16] for the evaluation of meniscal healing. A meniscus was considered to have healed if the residual cleft at the tear site was less than 10% of the thickness of the meniscus. A partially healed meniscus was characterized by a residual cleft