



Research Article

ARTHROSCOPIC ALL-INSIDE MENISCAL REPAIR- A PROSPECTIVE FOLLOW UP STUDY OF 2 YEARS

Dr. Suresh Perumal *, Dr. Prakash Ayyadurai and Dr. Arumugam.s

Department of Arthroscopy and Sports Medicine Sri Ramachandra Institute of Higher Education and Research, Chennai

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Aim: The meniscus is the key in normal knee function. Recently, meniscal repair has become a common treatment for meniscal tears. Arthroscopic meniscal repair has become popular because of shorter duration of the surgery, the smaller incision. Arthroscopic view gives better accessibility to the torn portion, which is particularly difficult during open surgery. Inside-out, outside-in, and all-inside are arthroscopic techniques widely used. Arthroscopy by all inside meniscal repair has the lowest neurovascular injury rate. In this study we have evaluated clinical outcomes of arthroscopic all inside meniscal repair technique with a minimum follow up of 2 years.

Methods: This study prospectively evaluated 48 patients consecutively treated by arthroscopic meniscal repair using the Fast Fix repair system. Average age of patients at the time of surgery was 24. The inclusion criteria for this study were: vertical full thickness tear more than 10 mm in length; meniscal tear at the menisco-capsular junction, no previous meniscus surgery; and no signs of arthritis during arthroscopy, absence of complex meniscal tear. Associated Anterior cruciate ligament (ACL) tears were reconstructed using a hamstring auto graft or BTB graft at the time of the meniscal repair. Follow-up examinations consisted of IKDC score, Lysholm knee score, Tegner activity score.

Results: After a minimum of 2 years follow-up, no symptoms of meniscal tears were found in 44/48 of the cases. For patients with isolated meniscal repair or concurrent ACL reconstruction, IKDC score, Lysholm and Tegner activity scores had improved significantly postoperatively. One patient in our series had re-tear for which partial medial meniscectomy was done. No neurovascular or other major complications occurred with the use of this system.

Conclusions: Arthroscopic all-inside repair using the all inside device appears to be a safe and effective surgery with promising results and allows to save the meniscus restoring the normal anatomy.

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INTRODUCTION

Meniscus is the key in normal knee function. Recent understanding of the anatomy and function of the meniscus has increased significantly, hence preserving the meniscus after injury is more important unlike thought before. Meniscal repair was first performed more than 100 years ago by Annandale(1), but it was not popularly practiced until the last couple of decades. Hiroshi Ikeuchi was the first orthopedic surgeon to perform meniscal repair using arthroscopic techniques about 40 years ago.(2). Arthroscopic meniscal repair has become popular because of the shorter duration of surgery, the smaller incision, and the improved accessibility and visualization to the tear portion, which is cannot be done during open surgery.

Improvements in arthroscopic techniques and instrumentation in recent years have simplified the procedure. Presently, three arthroscopic techniques are widely used inside out, outside in, and all inside.

Furthermore, the use of biodegradable products for the all-inside approach has become very popular because it is less time consuming and reduces the risk of neurovascular complications.(3,4) However, several reports have mentioned some complications that are directly associated with these devices are iatrogenic chondral damage and synovitis.(5-8) Another concern is the inferior strength of these devices compared with vertical sutures, which may be a critical factor that contributes to meniscal healing according to some previous biomechanical studies.(9-11) Currently, wide range of devices for all-inside meniscal repair are available. Most of these have been tested in vitro; however, clinical results are not available for most of the devices. The devices we used in

*Corresponding author: **Dr. Suresh Perumal**

Department of Arthroscopy and Sports Medicine Sri Ramachandra Institute of Higher Education and Research, Chennai

this study is the Fast-Fix 360 meniscal repair system (Smith & Nephew, Andover, MA, U.S.A.).

This system can be used for vertical, horizontal, or oblique meniscal tears. The aim of this study was to evaluate the clinical results and complications of arthroscopic All inside meniscal repairs with the Fast-Fix meniscal repair system in a consecutive series of 48 patients at Sri Ramachandra Medical center.

MATERIALS AND METHODS

From Jan 2016 to march 2017, 48 arthroscopic All inside meniscal repairs were performed using the Fast-Fix Meniscal Repair Suture System (Smith & Nephew). This prospective study, included pre operative assessment of any effusion, the joint's range of motion, knee stability, the joint line tenderness, and a positive McMurray test. All patients had a magnetic resonance imaging study of the injured knee.

The inclusion criteria for this study were (1) a vertical full-thickness tear greater than 10 mm in length, (2) the presence of meniscal tear at the meniscocapsular junction, (3) All inside meniscus repair with the Fast-Fix system, (4) no prior meniscus surgery, and (5) no arthritic changes during arthroscopy.

Anterior cruciate ligament (ACL) deficient knees were reconstructed using a hamstring auto graft or BTB graft at the time of the meniscal repair. All patients gave their informed consent to participate in the study.

Surgical technique

All patients underwent the procedure under General Anesthesia. A diagnostic arthroscopy was done initially, to note the pattern of the meniscus tear along with the tear length and the rim width. Dislocated bucket-handle tears were reduced. Tear edges were freshened with a Diamond rasp and shaver. Each Fast-Fix 360 device contains two 5-mm polymer suture bar anchors with a pre-tied self-sliding knot of No. 0 non-absorbable USP braided polyester suture material. In addition, a split cannula facilitates easy insertion of the device into the knee joint. Using a meniscal depth probe, the desired length of penetration was determined and the depth limiter was set accordingly, this was followed by introduction of the Fast-Fix 360 delivery needle through the split cannula. The needle was then withdrawn from the meniscus using a smooth motion. The trigger was then slid forward to advance the second implant. After the second implant had been inserted, the delivery needle was removed from the knee joint, such that the ends of the sutures were left free. The pre-tied self-sliding knot was tensioned with the aid of the knot pusher-suture cutter. If the patient had experienced an ACL injury, arthroscopic reconstruction was conducted after the meniscus repair using hamstring tendon or BTB graft.

Postoperative rehabilitation

After the procedure, all the patients who underwent meniscal repair put non-weight-bearing walking immediately and full weight bearing was started at 6 weeks postoperatively. Knee brace was used for all patients for the first 10 days. Non-weight-bearing range of motion was restricted to 0–60° from the tenth post op day and full ROM allowed from then onwards. Full weight bearing was permitted after 6 weeks. Jogging was permitted after week 10. Unrestricted activity was

permitted at 6 months for patients with isolated meniscal repair and at 9 months for patients with meniscal repair along with ACL reconstruction.

Follow-up evaluation

Each patient received follow-up, which included both clinical and radiographic evaluations, at regular intervals. All patients had been evaluated preoperatively and this was repeated postoperatively at one month, six months and one year, and annually thereafter. According to Barrett's criteria,⁽¹²⁾ a repaired meniscus was considered healed if there is no joint-line tenderness or effusion was observed and if the McMurray test was negative at the most recent follow-up. If one or more of these criteria was not met, the technique was classified as a failure. The follow-up clinical outcome was evaluated by the following scoring systems: Lysholms score,⁽¹³⁾ Tegner activity score⁽¹⁴⁾ and the International Knee Documentation Committee (IKDC) guidelines.

RESULTS

The prospective series consisted of 48 patients. No patient loss occurred during follow-up in this series. The average age at the time of meniscal repair was 24 years (range, 17-31 years). The average follow-up period was 30 months (range, 10-48 months). 22 (46%) meniscal tears were rated acute (injury-to-repair interval \leq 3 weeks), and 26 (54%) tears were rated chronic (injury-to-repair interval $>$ 3 weeks). There were 12 (25%) isolated meniscal tears, and 36 (75%) tears were combined with arthroscopic ACL reconstruction. The number of Fast-Fix anchors used averaged 2 (range, 1-3).

At the most recent follow-up, no symptoms of meniscal tears were observed in 44 (91%) cases. One patient reported tenderness on joint-line palpation hence considered failure. Another patient had re-tear following injury after surgery for which partial medial meniscectomy was done. No patient had any locking episodes. Overall, the Lysholm score increased to a mean value of 91.5 compared with the preoperative mean value of 66.7 ($p < 0.0001$). 44 patients (91%) had an excellent or good outcome, 2 patient (4.5%) had a fair result and 2 patient (4.5%) had poor result resulted in re-surgery. Preoperatively, the mean Tegner activity score was 3.5 whereas the postoperative mean value was 6.2 ($p < 0.0001$). IKDC score significantly increased from grade C pre operatively to grade A or B in 91% of patients. All patients had returned to normal work and there were no neurovascular or other major complications directly associated with the device.

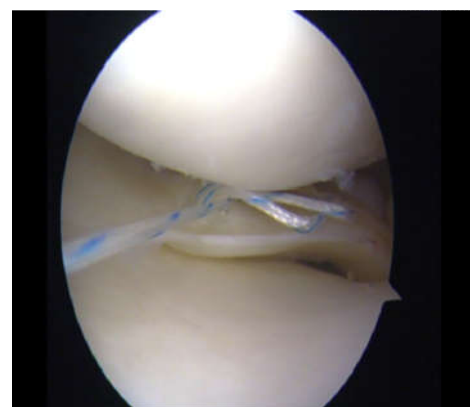


Fig 1 Intra operative picture



Fig 2 6 months post operative outcome

DISCUSSION

The process of meniscal healing is mainly dependent on the blood supply to the meniscus. The peripheral 20- 30% of the medial meniscus and the peripheral 10- 25% of the lateral meniscus make up the vascular zone.⁽¹⁵⁾ However, the inner 1/3 of each meniscus is an avascular zone and is nourished by synovial fluid diffusion. The middle 1/3 zone obtains nourishment from both the blood and synovial fluid. Recent studies have shown that the peripheral blood supply is able to produce a healing response similar to that of other connective tissues. This tissue gradually matures to fibrocartilage over several months following the completed healing process.^(16,17)

The arthroscopic all-inside technique for meniscal repair has the advantages of less surgical time and ease of performance. This technique has become more popular in of recent meniscus repair treatment. There are many kinds of all-inside meniscal repair devices on the market including meniscal arrows, darts, screws, staples, and other suture devices. Jesus *et al.* have performed an evidence-based review of the outcomes of all-inside meniscal repair devices,⁽¹⁸⁾ and the failure rates ranged from 0% to 43.5%. The success rate for the Meniscus Arrow ranges from 88% to 95%, according to the most recent studies. The healing rate with the T-Fix system has been reported to be nearly 90% according to Asik M *et al.*⁽¹⁹⁾ whereas in our study success rate was 91.6%.

Kotsovolos *et al.* reported the clinical results of 61 menisci repaired using the Fast-Fix meniscal repair system after an average follow-up period of 18 months.⁽²⁰⁾ The success rate in their series was 90% (55 clinically healed menisci out of 61) according to the criteria of Barrett *et al.*,⁽¹²⁾ and 51 patients (88%) had an excellent or good result. Andrew *et al.* used Fast-Fix for 47 meniscal tears in 37 patients with at least a 2-year follow-up.⁽²¹⁾ Five of these cases were considered a clinical failure and there were no cases with intra-articular or extra-articular complications such neurovascular injury. Both prospective studies showed that all inside meniscal repair devices a safe and has high success rate. In the present series, evaluation of meniscal healing was difficult without MRI or a secondary arthroscopic evaluation. We acknowledge that a meniscal repair without symptoms postoperatively does not always reflect the true status of the meniscus and that only second-look arthroscopy can verify healing of the meniscus or

not, this is a limitation of the our study. However, strict criteria like joint-line tenderness, McMurray test, effusion were used to identify a clinical result as a success. Morgan *et al.* showed that a clinical examination is a reliable method of evaluating the status of repaired menisci.⁽²²⁾ In that study, clinical examination accurately predicted all failures identified by second-look arthroscopy, with no false positives. The clinical results of the present series were also similar to previous reports. Finally, postoperative Lysholm and Tegner activity scores had improved significantly compared to pre-operative data.

It has been reported that the risk of arthrofibrosis is increased in this type of surgery.⁽²³⁾ 36 patients in the present series underwent anterior cruciate ligament reconstruction at the same time as meniscal repair. None have complained of any episode of instability, difficulty in motion. These results demonstrate that ACL reconstruction at the time of all inside meniscal repair is able to achieve successful knee function and stability. However, the principal disadvantages of the present study are the small case number, the lack of a control group.

There were no complications directly associated with Fast fix 360 device in the present series, such as broken implants, synovitis, or migration of the implants, as has been reported. This demonstrates that using the these devices has a steep learning curve. Pre-measurement of the desired depth using a meniscal depth probe is required and should be followed by pre setting the depth-limitation in the device gives more accurate results. Inappropriate use of the instrumentation may prolong surgical time and result in iatrogenic meniscal or cartilage injury. Therefore, it is important for every surgeon to use the instrument and devices appropriately. Arthroscopic all-inside repair devices appears to be a safe and effective procedure with a high success rate. There were no neurovascular or other major complications directly associated with the use of the device.

CONCLUSIONS

Arthroscopic all-inside repair using the all inside device appears to be a safe and effective surgery with promising results and allows to save the meniscus restoring the normal anatomy.

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