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All Inside Meniscal Repair- A Prospective Study

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Abstract

Introduction

The meniscus plays a pivotal role in the proper functioning of the knee joint. Presently, meniscal repair has emerged as the foremost treatment for meniscal tear. Arthroscopic meniscal repair has garnered popularity due to its relatively shorter operation time, smaller incision, and enhanced accessibility to the tear portion, which is comparatively challenging during open surgery. Among the three widely utilized arthroscopic techniques, namely inside-out, outside-in, and all-inside, the objective of this prospective study was to assess the outcomes of arthroscopic meniscal repair by employing the FasT-Fix repair system.

Methodology

Between 2017 and 2019, a total of 40 patients with a mean age of 34.2 years underwent meniscal repairs utilizing the FasT-Fix meniscal repair system. patients were followed up for 24 months. The tears in all cases were longitudinal in nature and were located within the red/red or red/white zone. Clinical assessments were conducted with the goal of evaluating the absence of joint-line tenderness, and a negative McMurray test. The Lysholm score was utilized as part of the clinical evaluation process.

Additionally, all patients underwent preoperative magnetic resonance imaging to further evaluate their condition.

Results

The study's average follow-up duration was 24 months, patients were assessed using the Lysholm score preoperatively and at 12 and 24 months postoperatively. During which 2 out of 40 repaired menisci were deemed failures based on our criteria. Thus, the success rate stood at 95%. Following the surgery, most patients encountered no limitations in sports activities. Moreover, the mean Lysholm significantly improved from 42.3 preoperatively to 88.4 at 12 months and 91 at 24 months postoperatively ($P < .001$). Furthermore, 30 patients achieved excellent or good results according to the Lysholm knee score.

Conclusion

In conclusion, our findings illustrate that arthroscopic meniscal repair utilizing the FasT-Fix repair system produced a high rate of meniscus healing, and proved to be safe and effective for this specific cohort of patients.

Introduction

Meniscal resection is a frequently performed procedure compared to repair, however, in recent times, there has been a shift towards meniscal preservation and repair [1]. The meniscus is capable of enduring diverse forces such as tension, shear, and compression, and it plays a vital role in load-bearing, load transmission, and shock absorption. An up to 20% decrease in the contact area of a tibiofemoral joint surface may occur after a partial meniscectomy, and a 50-70% decrease could result from a total meniscectomy. Consequently, the escalation of contact stresses leads to the progression of degenerative arthritis after meniscectomy [2]. The onset of arthritis following meniscal resection surgery may require 10-15 years for a medial meniscus, while it could take as little as 2 years for a lateral meniscus [3].

Due to the potential peril of neurovascular damage, particularly to the saphenous nerve in medial repairs and peroneal nerve in lateral repairs, as well as the prolonged operating time and the requirement for additional posterior medial and posterior lateral incisions, all-inside meniscal repair instruments have been developed. The initial of these all-inside devices were bioabsorbable implants in tack and arrow configurations. The benefits of these devices were believed to be associated with their user-friendliness, versatility in accommodating numerous tear patterns, shortened surgical duration, and decreased surgical complications. However, with the increasing employment of these implants, there emerged numerous reports of complications associated with their use. [4,5]

With the escalating interest in sports-related activities, there has been a notable increase in the incidence of meniscal injuries. According to recent estimates, the occurrence rate of meniscal tears is approximately 60 cases per 100,000 individuals [6]. Nonetheless, this estimate is likely to be considerably underestimated. Existing literature provides evidence that meniscal injuries may result in the premature onset of osteoarthritis [7]. A study conducted by Jarraya et al. also revealed that over 75% of patients with symptomatic osteoarthritis have a meniscal injury [8]. In the past, due to patient unawareness, only 10%

of meniscal tears were reparable, and total meniscectomy was the preferred treatment option [8]. However, as the meniscus plays a critical weight-bearing role, the biomechanics of the knee joint are disrupted by meniscectomy, leading to early degenerative changes [9]. To overcome these limitations, meniscus preservation surgery has been introduced. Meniscal repairs have been relatively successful, with a failure rate of less than 10%. Recently, various techniques, such as the inside-out technique, meniscal fixators, all-inside technique, and outside-in technique, have been developed for meniscal repairs [10]. The primary objectives of meniscal repair surgeries are to alleviate pain, restore pre-injury levels for daily living activities, and prevent early degeneration of the knee joint.

Materials and Methods

From June 2017 to October 2019, a total of 40 arthroscopic meniscal repairs were conducted using the FasT-Fix Meniscal Repair Suture System. In this prospective examination, the pre-operative assessment encompassed an evaluation of any effusion in the affected knee joint, the range of motion of the joint, the stability of the knee joint, the tenderness along the joint line, and the administration of the McMurray test. Magnetic resonance imaging (MRI) studies of the injured knee were performed for all patients. The inclusion criteria for this investigation consisted of (1) a vertical full-thickness tear exceeding 10 mm in length, (2) a meniscal tear location less than 6 mm away from the menisco-capsular junction (3) exclusive fixation of the meniscus using the FasT-Fix system, (4) absence of any prior meniscus surgeries, (5) concurrent anterior cruciate ligament (ACL) injuries without any other ligamentous injuries, and (6) absence of arthritis during arthroscopy. In cases where there were isolated ACL deficient knees without concomitant collateral ligamentous injuries, a peroneus longus autograft was employed for reconstruction during the meniscal repair. Prior to commencing the study, approval from the Institutional Review Board was obtained. All patients provided informed consent to participate. The Lysholm questionnaire, were administered to each patient before surgery, at 12 and 24 months post-operatively, . The all-inside meniscal repair and simultaneous anterior cruciate reconstruction were carried out in cases where it was deemed necessary.

Results

The study's average follow-up duration was 24 months, patients were assessed using the Lysholm score preoperatively and at 12 and 24 months postoperatively. during which 2 out of 40 repaired menisci were deemed failures based on our criteria. Thus, the success rate stood at 95%. Following the surgery, most patients encountered no limitations in sports activities. Moreover, the mean Lysholm significantly improved from 42.3 preoperatively to 88.4 at 12 months and 91 at 24 months postoperatively ($P < .001$). Furthermore, 30 patients achieved excellent or good results according to the Lysholm knee score (Table 2).

Time	Lysholm score	P-value
Pre-op	42.3	-
12 months	88.4	< .001
24 months	91	< .001

Table 1: shows the lysholm scores on follow up.

Discussion

The healing process of the meniscus heavily relies on its blood supply. The vascular zone, which constitutes approximately 20-30% of the medial meniscus and 10-25% of the lateral meniscus, plays a crucial role in this process. Conversely, the avascular zone, comprising the inner 1/3 of each meniscus, receives nourishment through synovial fluid diffusion. The middle 1/3 zone, on the other hand, obtains nourishment from both blood and synovial fluid. Recent research indicates that the peripheral blood supply can elicit a healing response similar to that observed in other connective tissues. Over the course of several months, this tissue gradually transforms into fibrocartilage, marking the completion of the healing process [11].

In terms of meniscal repair, the arthroscopic all-inside technique offers several advantages, such as reduced surgical time and ease of execution. Consequently, it has become the primary approach in recent meniscus repair treatments. Various all-inside meniscal repair devices are available on the market, including meniscal arrows, darts, screws, staples, and other suture devices. Jesus et al. conducted an evidence-based review of the outcomes associated with all-inside meniscal repair devices, revealing failure rates ranging from 0% to 43.5% [12].

Barber and colleagues [13] conducted a study wherein various all-inside meniscal repair devices were utilized on adult porcine menisci to assess their biomechanical strength. The vertical or horizontal FasTFix devices exhibited superior results in comparison to other devices such as Darts, RapidLoc, and Arthrotek sutures. In a study by Borden et al [14] cadaver knees were employed to evaluate the biomechanical strength of FasT-Fix and Meniscal Arrows under cyclic loading. It was found that FasT-Fix demonstrated greater strength during cyclic loading as compared to the Meniscal Arrows.

Similarly, [15] also obtained favorable results in terms of biomechanical strength when utilizing FasTFix in a cadaver study. The aforementioned results indicate that FasT-Fix possesses greater strength and durability under cyclic loading, surpassing other currently available all-inside repair devices [16] presented the clinical outcomes of 61 menisci that were repaired using the FasT-Fix meniscal repair system, with an average follow-up period of 18 months. According to the criteria established by [17] the success rate in their series was 90% (55 menisci clinically healed out of 61), with 51 patients (88%) achieving an excellent or good result.

The technique of arthroscopic all-inside for meniscal repair offers the benefits of reduced surgical time and ease of execution. This particular technique has emerged as the primary approach in the recent treatment of meniscus repair. The market provides a variety of all-inside meniscal repair devices, such as meniscal arrows, darts, screws, staples, and other suture devices. Jesus et al. conducted an evidence-based evaluation of the outcomes of all inside meniscal repair devices, revealing failure rates ranging from 0% to 43.5%. Recent studies indicate that the Meniscus Arrow boasts a success rate between 88% and 95%, as per the most up-to-date information. [18]

In our study 2 out of 40 repaired menisci were deemed failures based on our criteria. Thus, the success rate stood at 95%. Following the surgery, most patients encountered no limitations in sports activities. Moreover, the mean Lysholm significantly improved from 42.3 preoperatively to 88.4 postoperatively ($P < .001$). Furthermore, 30 patients achieved excellent or good results according to the Lysholm knee score. An important finding in our study was that there were very low complication rates directly associated with the device in the present series, such as broken implants, synovitis, or migration of the implants, as compared to complication rates of other devices.

Conclusion

In summary, it can be deduced that arthroscopic all-inside repair employing the FasT-Fix apparatus exhibits indications of being a secure and efficient protocol yielding a notable triumph rate. The appliance's utilization did not give rise to any notable neurological, vascular, or other substantial complications.

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