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The outcome of all-inside meniscal repair with relation to previous anterior cruciate ligament reconstruction

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ABSTRACT

Background: Arthroscopically assisted all-inside meniscal repair has become a popular treatment for meniscal tears. Previous studies have suggested a beneficial effect of concomitant anterior cruciate ligament reconstruction on meniscal repair outcomes. The effect of prior cruciate ligament reconstruction (predating the meniscal injury) on meniscal repair success is unreported. The aim of this study was to assess the success of meniscal repair in our practice. Further aims were to analyze the effect of concomitant- and past-anterior cruciate ligament reconstruction on meniscal repair outcomes.

Methods: Retrospective review of all patients undergoing arthroscopic meniscal repair during a 53 month period was performed. Mean followup was 13.5 months (mean 6–50). The primary outcome measure was meniscal reoperation.

Results: Sixteen of 104 patients required reoperation, giving an overall meniscal repair success rate of 85%. Patients undergoing concomitant anterior cruciate ligament reconstruction enjoyed significantly improved outcomes (91%, $p = 0.049$), while those with a past history of anterior cruciate ligament reconstruction had significantly worse meniscal repair success rates (63%, $p = 0.016$).

Conclusions: Arthroscopic meniscal repair in a selected patient group offers good success rates, especially when performed with concomitant anterior cruciate ligament reconstruction. We have identified a subgroup of patients, those with a past history of anterior cruciate ligament reconstruction predating the meniscal injury, who appear to have relatively poor outcomes from meniscal repair. Potential reasons for this finding are discussed.

Level of Evidence: Level IV, case series.

1. Background

Arthroscopically assisted all-inside meniscal repair has become a standard technique for managing meniscal tears. With technological advances in repair devices, studies in recent years have shown equivalent biomechanical properties and success rates to those of the traditional gold standard inside-out suture technique [1–3]. Potential benefits of the all-inside technique include shorter operative time, and a lower risk of nerve injury [2]. Recent articles have documented success rates of 77% to 86% when failure is defined as meniscal reoperation [4–7]. Some investigators have noted higher success rates in patients undergoing concomitant anterior cruciate ligament (ACL) reconstruction [7–10], although other studies have shown no effect of ACL reconstruction on meniscal repair outcomes [11–13]. Another factor which may influence the success of meniscal repair is laterality (higher reoperation rates are seen following medial compared with lateral meniscal repair [5]). Central (red–white and white–white avascular zone) tears have traditionally been observed to show poorer healing potential following repair, although repair success rates of 68–75% have been reported for avascular zone tears in recent years [14,15]. Patient age seems to be important, with poorer outcomes following repair of degenerate tears in older patients. Conversely, good outcomes from meniscal repair have been reported in children, regardless of the morphology and the vascular zone of the injury [16].

The aim of this study was to determine the success rate of arthroscopically assisted all-inside meniscal repair using reoperation as a primary outcome measure. Secondary aims were to examine outcomes of meniscal repair in patients undergoing concomitant ACL reconstruction, and also in patients with a history of ACL reconstruction predating the meniscal injury.

2. Patients and methods

Patients undergoing arthroscopic meniscal repair surgery between October 2007 and May 2012 in the Royal Devon and Exeter Hospital

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Knee Reconstruction Unit were identified. Two senior surgeons with subspecialty interest in soft tissue knee reconstruction (VM and PS) performed the procedures. Patients with fewer than six months postoperative followup were excluded.

Aspects of both preoperative and intraoperative assessment were used to decide whether to repair a torn meniscus. Factors taken into consideration included the location of the tear (red–red and red–white tears being more likely to be repaired than white–white), the tear shape (longitudinal and horizontal tears more likely to be repaired than radial or complex patterns), quality of the meniscus, and concomitant anterior cruciate ligament (ACL) injury. Repairs were performed arthroscopically using all-inside devices, in accordance with the manufacturers' technique guidelines. RapidLoc (Mitek, Norwood, MA) were used until May 2009, after which FasT-fix (Smith & Nephew Endoscopy, Andover, MA) were used. The decision to change to the FasT-fix implant followed agreement between both senior authors based on preference of the newer implant in terms of ease of use. Prior to deployment of the device, an arthroscopic shaver was used to prepare the tear edges. Between one and five devices were used depending on the extent of the tear. In patients with concomitant ACL injury, ACL reconstruction was performed either at the same sitting or within six weeks of meniscal repair. For patients with locking of the knee, early arthroscopic meniscal repair was performed, allowing range of knee motion to be recovered prior to undergoing ACL reconstruction within six weeks. ACL reconstruction was performed using gracilis and semitendinosus tendon autograft, passed through bone tunnels and secured in the femur using an Endobutton device and in the tibia with an RCI interference screw (Both from Smith and Nephew Endoscopy, Andover, MA) after tensioning.

Postoperatively, all patients were supplied with a hinged brace limiting knee flexion to 90° for six weeks. Within this range, weight bearing according to comfort was permitted from the outset, and a specialist physiotherapist supervised a course of closed chain exercises.

Patients were seen at two weeks, six weeks and six months postoperatively, at which stage they were discharged with advice if asymptomatic with normal knee function. Symptoms of persistent joint line pain, swelling or locking prompted repeat arthroscopy for a presumed diagnosis of failure of repair.

The primary outcome measure was failure of repair, as defined by the requirement for reoperation of the meniscus (partial meniscectomy or revision repair). Other information collected included the meniscus involved (medial versus lateral), details of any prior knee surgery such as ACL reconstruction, presence of concomitant ACL injury, and details of the surgery performed. SPSS® Statistics Version 21.0 (IBM®, Armonk, NY) was used for data analysis. To test for a significant difference in reoperation rates between groups of patients (such as those not having undergone prior surgery versus those having undergone prior ACL reconstruction) either a chi-squared test or a Fisher's exact test was used (depending on expected numbers of patients in each category). To compare means between two groups (such as mean age of patients requiring reoperation versus those not requiring reoperation) an unpaired *t*-test was used.

3. Results

During the study period, 125 all-inside meniscal repairs were performed in 116 patients. In three cases both medial and lateral menisci of the same knee were repaired. One hundred and four (83%) cases were followed up to at least 6 months postoperatively. The 21 (17%) cases lost to follow up resulted from patients moving to a different geographical region, or repeatedly failing to attend planned appointments. The mean age of the resulting group was 26.6 years (range 9–47). Seventy-three (70%) cases were in male patients. Sixty-three per cent of tears were of the medial meniscus. Tears were predominantly of longitudinal shape (92%) and involved the posterior and/or middle portions of the meniscus (98%). Mean duration of followup was 13.5 months (range 6–50).

Table 1 shows the rates of meniscal repair failure requiring reoperation. Overall 16 (15.4%) patients required reoperation, at a mean of 14.5 months after the index meniscal repair. Fifteen of these patients underwent excision of the torn portion of the meniscus. One patient underwent revision repair. This was a 20 year old male patient with pain following a new twisting knee injury 20 months after asymptomatic recovery from repair of a peripheral bucket handle lateral meniscus tear. In light of the young patient age, the peripheral tear location, and a history suggesting a new acute injury on a background of uneventful recovery from the initial meniscal repair, the decision was taken to attempt revision meniscal repair. Six months postoperatively this patient underwent partial meniscectomy for persistent pain and intraoperative findings of failure of meniscal repair. There were trends towards higher reoperation rates in males, medial meniscal tears, and repairs using the RapidLoc system, although these did not reach statistical significance. There was no significant difference in the mean age of patients undergoing successful meniscal repair compared to those requiring reoperation (26.9 years vs 24.9, unpaired 2-tailed *T*-test p = 0.47).

Table 1
Outcome of meniscal repair.

	Required reoperation	p-Value
All cases (n = 104)	16 (15.4%)	
Gender:		
Male (n = 73)	14 (19.2%)	
Female (n = 31)	2 (6.5%)	0.139[a]
Laterality:		
Medial Meniscus (n = 65)	12 (18.5%)	
Lateral Meniscus (n = 39)	4 (10.3%)	0.262[b]
Repair device:		
RapidLoc (n = 13)	3 (23.1%)	
FasT-Fix (n = 91)	13 (11.0%)	0.417[a]
ACL reconstruction at time of meniscal repair:		
No concomitant ACL reconstruction (n = 48)	11 (22.8%)	
Concomitant ACL reconstruction (n = 56)	5 (8.9%)	0.049[b]
Past ACL surgery prior to meniscal injury:		
No previous ACL reconstruction (n = 88)	10 (11.4%)	
Previous ACL reconstruction (n = 16)	6 (37.5%)	0.016[a]

[a] Fisher's Exact Test (2-tailed).
[b] Chi Squared Test (2-tailed).

Patients with ACL-deficient knees undergoing reconstruction either at the same sitting or within six weeks of meniscal repair (n = 56) had a significantly lower risk of requiring reoperation (8.9% vs 22.8%, p = 0.049).

A group of patients (n = 16) gave a history of previous knee trauma resulting in ACL reconstruction prior (mean 53 months, range 13–216 months) to the event of meniscal tear. This group had a reoperation rate over three times higher than those without prior ACL injury (37.5% vs 11.4%, p = 0.016). Within this group, five patients had graft failure requiring revision ACL surgery (meniscal reoperation required in 1 patient, 20%) and 11 patients were found to have an intact ACL graft (meniscal reoperation required in 5, 45.5%). The difference in reoperation rates was not statistically significant due to low patient numbers in these subgroups.

Of the 11 patients with an intact ACL graft, blinded retrospective review of radiographs by the senior author was used, according to the measurement technique and tunnel position standards used by Topliss and Webb [17]. Unsatisfactory ACL tunnel position was identified in eight patients, with either a posteriorly-sited tibial tunnel, or an anteriorly-sited femoral tunnel resulting in a relatively vertical ACL graft. Meniscal reoperation was required in five (63%) of this group, compared with 0 of the three patients with well-placed ACL grafts.

Overall five patients reported persistent knee symptoms but did not undergo reoperation. Subsequent magnetic resonance imaging did not show appearances of failure of meniscal repair in these cases. Three suffered “catching” sensations, of which all were noted at the time of meniscal repair surgery to have articular surface chondral damage. The other two complained of persistent joint line tenderness, and both showed improvement between serial examinations at the follow up clinic.

No infections and no peripheral nerve injuries occurred in the study participants.

Table 2
Characteristics of case groups according to ACLR surgery predating the meniscal tear.

	No past history of ACL reconstruction (n = 88)	Past history of ACL reconstruction (n = 16)	p-Value
Mean age	26 (sd 9.6)	31 (sd 8.6)	0.065[a]
% Male	69%	75%	0.772[b]
% Medial meniscus	58%	88%	0.025[c]
% RapidLoc	13%	13%	0.633[b]

[a] *T*-test (unpaired, 2-tailed).
[b] Fisher's Exact Test (2-tailed).
[c] Chi Squared Test (2-tailed).