

Repeat tears of repaired menisci after arthroscopic confirmation of healing

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We undertook 114 arthroscopic meniscal repairs in 111 patients and subsequently carried out second-look arthroscopy to confirm meniscal healing at a mean of 13 months after repair. Stable healing at the repaired site was seen in 90. Of these, however, 13 had another arthroscopy later for a further tear. The mean period between the repair and the observation of a repeat tear was 48 months. Of the 13 patients, 11 had returned to high activity levels (International Knee Documentation Committee level I or II) after the repair.

An attempt should be made to preserve meniscal function by repairing tears, but even after arthroscopic confirmation of stable healing repaired menisci may tear again. The long-term rate of healing may not be as high as is currently reported. Second-look arthroscopy cannot predict late meniscal failure and may not be justified as a method of assessment for meniscal healing. Young patients engaged in arduous sporting activities should be reviewed regularly even after arthroscopic confirmation of healing.

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With an increasing awareness of meniscal function¹⁻⁴ and an improved understanding of the operative procedure,^{5,6} arthroscopic meniscal repair has become a widely accepted

treatment for symptomatic, peripheral, meniscal tears. Second-look arthroscopy has identified a healing rate of between 71% and 94%.⁷⁻¹² The success rate of arthroscopic meniscal repair is greater when both patient selection and the operative procedure are appropriate. In 1991, after careful evaluation of the results of meniscal repair at our institution, 90% of the repairs were judged to be healed at second-look arthroscopy. This healing rate was similar to those reported in previous studies.^{7,9} When this series of patients was followed over an extended period, however, several repeat meniscal tears were subsequently found. This was despite the earlier, second-look arthroscopy which had shown healing. We therefore considered that arthroscopic assessment of meniscal healing may not be as reliable as once thought and that the long-term prognosis for a meniscal repair cannot be accurately predicted.

We have reviewed the long-term results of arthroscopic meniscal repair, with particular attention being paid to the late failure of repaired menisci.

Patients and Methods

Between 1986 and 1994, we undertook 167 arthroscopic meniscal repairs on 161 patients. They were all for chronic tears with a minimum period of two months between the injury and surgery. The indication for a meniscal repair was a vertical or vertical-oblique tear more than 1 cm in length at the periphery which could be displaced excessively by probing and was judged to be unstable. One hundred and thirty-five tears could be displaced beyond the femoral condyle and were regarded as bucket-handle tears. Chronic displacements of bucket-handle fragments into the intercondylar notch were not repaired. Meniscal repair was also not attempted for radial, horizontal, or complex tears. The length of the tear was measured intraoperatively to the nearest 5 mm with a curved probe which carried a millimetre scale. The mean length of tear which was repaired was 20 mm (10 to 40) (Fig. 1). During the period of study, 63 meniscal tears which were less than 10 mm in length and stable on probing were left alone. In addition, 332 arthroscopic partial meniscectomies were carried out for chronic meniscal tears.

The technique which we used for repair was the inside-out method, with a combined posterior incision, as descri-

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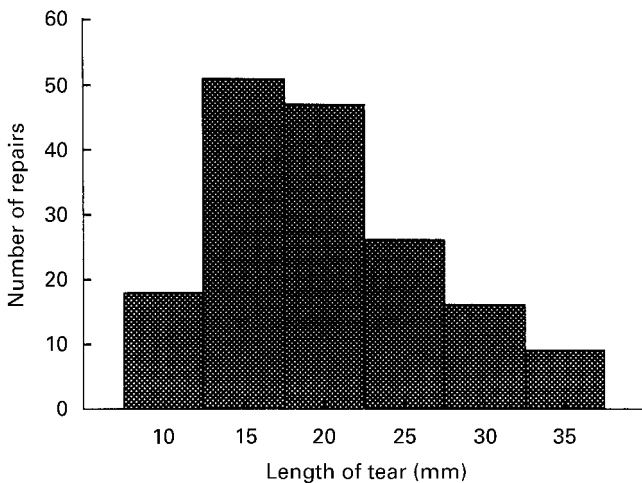


Fig. 1

Distribution of the tear length of the repaired menisci measured to the nearest 5 mm.

bed by Scott et al.¹² We abraded the meniscosynovial junction at the site of the repair with a rasp or curette. We used a 2-0 non-absorbable suture and a cannula system. If the vascularity of the site of the repair was in doubt, we used autogenous fibrin clots to enhance healing. In 140 patients, repair was concurrent with reconstruction of the anterior cruciate ligament (ACL) using an autogenous bone-patellar-tendon-bone graft. We carried out 21 isolated meniscal repairs in 21 patients.

Between 1986 and 1988 we immobilised all the knees for one to three weeks after operation. From 1989, we used an immediate movement programme after repairs associated with reconstruction of the ACL. Regardless of the

postoperative regime, partial weight-bearing began at four weeks after surgery and full weight-bearing at six weeks. All the patients who had a meniscal repair were told of the importance of a second-look arthroscopy to confirm meniscal healing even in the absence of symptoms. During the follow-up period, 111 patients consented to a second-look procedure and 114 repairs were thus evaluated; 102 had undergone a combined ACL reconstruction and had the second-look procedure in conjunction with removal of internal fixation. The remaining nine who had had isolated meniscal repair consented to simple confirmation of meniscal healing by second-look arthroscopy. We assessed 79 medial and 35 lateral menisci in 45 men and 66 women with a mean age of 21 years (14 to 37). The mean interval from meniscal repair to second-look surgery was 13 months (2 to 32). The status of the repair site was classified as either stably healed or not healed. Patients who had a second-look arthroscopy were reviewed clinically at a mean of 54 months (17 to 84) later. Those who developed recurrent meniscal symptoms underwent a further arthroscopy to assess the status of the repair site.

Statistical analysis. The Mann-Whitney U test was used to compare the difference between menisci with and without repeat tears. A p value <0.05 was considered to be significant. We used StatView software (SAS Institute Inc, Cary, North Carolina).

Results

Of the 114 menisci evaluated arthroscopically, 90 (79%) showed stable healing at the repair site and were clinically asymptomatic; 13 of these subsequently had recurrent meniscal symptoms and underwent a further arthroscopy. Repeat tears of the repaired sites were verified. Five menis-

Table I. Details of patients with repeat tears of stable healed menisci

Case	Gender	Age at surgery (yrs)	Side	IKDC activity level		ACL status	Postop stability*	Rim width†	Length of the tear (mm)	Duration from repair to repeat tears (mths)	Trauma
				Preop	Postop						
1	F	16	M	I	I	Reconstr	2	1	15	36	+
2	M	15	M	I	I	Reconstr	1	1	15	84	-
3	M	30	M	III	III	Reconstr	1	1	15	36	-
4	F	14	L	II	II	Reconstr	1	2	20	80	+
5	M	19	M	I	I	Reconstr	1	1	10	28	-
6	F	16	M	I	I	Reconstr	1	1	20	38	+
7	F	17	M	II	II	Reconstr	1	1	30	17	-
8	F	16	L	I	I	Reconstr	1	1	25	36	-
9	F	13	M	III	III	Reconstr	1	1	25	80	-
10	F	16	M	II	II	Reconstr	1	1	25	31	-
11	F	20	M	II	II	Reconstr	1	1	25	48	+
12	M	14	L	I	II	Intact	1	1	15	60	+
13	M	28	L	II	II	Intact	1	1	30	44	-

* R-L differences manual max KT measurements 1, <3 mm; 2, ≥3 mm

† 1, <4 mm; 2, ≥4 mm

ci tore after a further injury and no significant re-injury was found in the remaining eight.

There were five men and eight women, with a mean age of 18 years (14 to 30) at the time of repair. Repairs of the medial meniscus tore in nine. The repair had been combined with an ACL reconstruction in 11. One of these showed recurrent deficiency of the ACL and had a side-to-side difference of 5 mm when measured by a KT-1000 arthrometer (MEDmetric, San Diego, California). There was a positive Lachman test with a soft endpoint and a positive pivot-shift sign. The remaining ten patients, with combined reconstruction of the ACL, showed adequate stability. The Lachman test was negative with a firm endpoint and the pivot-shift sign was also negative. The width of the rim between the meniscosynovial junction and the site of the tear was 0 to 4 mm except for one meniscus. Repeat tears at the previous site alone were seen in nine menisci. In the remaining four, tears were seen both at the site of the repair and elsewhere in the joint. The mean interval between the initial repair and the repeat tear was 48 months (17 to 84). Of the 13 patients with repeat tears, 11 (8.5%) maintained a high level of sporting activity (International Knee Documentation Committee level I or II) after the repair. The mean length of the original tear was 21 mm (10 to 30). The details are given in Table I.

In order to identify the factors associated with repeat tears, we compared these patients with those without meniscal symptoms, after confirmation of stable healing at the second-look arthroscopy. Those with repeat tears were significantly younger than those without (18.0 v 21.9 years; $p = 0.0023$). Although it was not statistically significant, patients with repeat tears tended to have higher levels of postoperative activity than those without. Other factors such as gender, vascularity at the site of the repair, the length of the tear, the meniscus affected, or the presence of instability of the knee did not correlate with the incidence of repeat tears. After arthroscopic confirmation of a repeat tear, partial meniscectomy was carried out in 11 patients and a further meniscal repair was attempted in two. The final result at 68 months showed that 77 menisci (68%) had stable healing and 37 (32%) did not.

Discussion

The high rate of success of arthroscopic meniscal repair has made it the treatment of choice for peripheral meniscal tears. Previous studies on the arthroscopic evaluation of meniscal repair, however, reported relatively short-term results.^{7,9} The long-term performance and integrity of the repaired tissue are still unknown. Egli et al¹³ found that 96% of their MR scans demonstrated an abnormal signal at a mean follow-up of more than seven years. Cannon⁸ used an inside-out technique for meniscal repair and showed an increased rate of failure with time, from 8% in 1991 to 24% in 1996. Our results correlate with his findings. Of the 90 menisci which at one time showed stable healing at the site

of the repair, 13 (14%) had subsequent further tears. In experimental studies in rabbits, Veth et al¹⁴ observed that blood vessels were not seen in or adjacent to the repaired meniscal tissue. Previous studies^{15,16} in dogs have shown that a defect created in the body of the meniscus could heal, but that histological examination of the reparative tissue indicated that it was different from the normal (adjacent) meniscal tissue, even at six months after operation. These studies showed that, even after arthroscopic confirmation of healing, the repaired menisci can fail. Consequently, arthroscopic assessment of a repaired meniscus may not be a reliable indicator of the strength of the repaired tissue. Of our 13 patients with repeat tears, there was no significant further injury in eight cases. Nine had medial meniscal tears associated with chronic injuries of the ACL. Although a combined ACL reconstruction was successfully carried out, altered knee kinematics may have imposed excessive stress on the weak reparative tissue. Cannon and Vittori¹⁷ noted that older patients healed better than younger. This agrees with our findings. Although the potential for healing is lower in older individuals, non-athletic patients may have repeat tears of the menisci which are asymptomatic and thus clinically satisfactory.^{17,18} The combination of young age and high levels of postoperative activity, as shown in our study, may cause increased stress at the site of the repair. Furthermore, any degeneration or concealed tears at the site of the repair, or in the body of the meniscus away from it, can affect the healing strength of the repaired tissue.⁹ Chronic tears with repetitive re-injuries are especially liable to further damage. Histological examination of the return meniscus in one patient showed collagen degeneration near the torn edge, which may have been responsible for the failed repair (Fig. 2). This suggests that degeneration of the body of the meniscus may not always

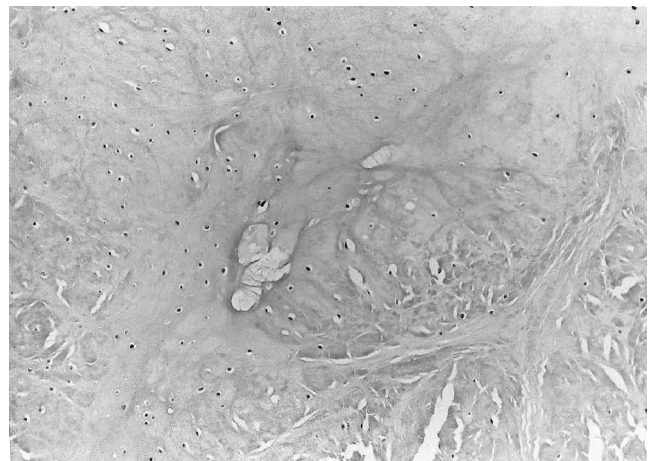


Fig. 2

Photomicrograph showing a disorganised orientation of collagen fibres and randomly distributed fibrochondrocytes with degeneration of the myxoid matrix in the excised meniscus of a patient after a repeat tear. Degenerative changes in the body of the meniscus were detected near the torn edge (haematoxylin and eosin $\times 115$).

be detected by arthroscopic examination carried out before meniscal repair. Clinically, an attempt should be made to preserve meniscal function by the repair of tears. It is, however, important to recognise that some repaired menisci can fail later despite earlier confirmation of apparent healing. The long-term rate of healing may not be as high as is currently reported. Younger patients, with higher levels of sporting activity, should be followed carefully even after arthroscopic confirmation of healing. It should be noted that second-look arthroscopy does not accurately predict late meniscal failure and may not be justified as a method of assessment for meniscal healing.

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