ARTHROSCOPIC, OPEN PARTIAL, AND TOTAL MENISCECTOMY

A COMPARATIVE STUDY

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The results of three different types of meniscectomy have been compared in 219 knees, 71 treated by arthroscopic partial meniscectomy, 45 treated by open partial meniscectomy, and 103 treated by open total meniscectomy, with a mean follow-up of 4.3 years. Knees which had undergone previous operations or had other simultaneous operative procedures or ligamentous damage were excluded. Knees with chondromalacia were included provided that this did not amount to frank osteoarthritis. Simple indicators were used for the rate of early recovery from the operation, and the Tapper and Hoover scale was used to record the symptomatic results in the longer term. It was found that knees treated by arthroscopic partial meniscectomy did considerably better than the others by all the criteria used. In most parts of the study there was a clear gradation between the results of the three types of treatment: arthroscopic techniques did better than open operations, and partial meniscectomy did better than total meniscectomy.

Although meniscal lesions are very common and an important source of disability, significant recent changes in their surgical management have been supported by relatively few studies comparing different methods. For example, partial meniscectomy is now often preferred to total meniscectomy and although a recent review of the literature (Jackson and Rouse 1982) supports this preference, comparative studies are remarkably few (Tapper and Hoover 1969; Bauer 1971; Cargill and Jackson 1976; Jackson and Dandy 1976; McGinty, Geuss and Marvin 1977) and there are none in which both procedures have been carried out by one surgeon. Arthroscopic meniscectomy, since its inception by Watanabe in 1962 (Watanabe, Takeda and Ikeuchi 1969), has been gaining in popularity, and represents a further major change in treatment. As is common with innovative surgical methods, however, the literature refers mainly to technical details (Ikeuchi 1976; O'Connor 1977; Guhl 1979; Casscells 1980; McGinty 1980), and in most of the papers that refer to results these have had a rather brief mention with the main emphasis on the immediate or early effects of the operation. We have

been able to trace only one paper giving any directly comparative data (Oretorp and Gillquist 1979); while their results are certainly encouraging, they depended on a very small number of cases with a follow-up of no more than nine months. It was felt, therefore, that there was a clear need for a direct comparison of the results of the different forms of meniscectomy.

MATERIAL AND METHODS

The patients in this study came from two sources, one English and one Canadian. The English series included all patients treated personally by one of us (DJD) by arthroscopic meniscectomy (but with major exclusions described below) up to the end of 1978. The Canadian series included all patients treated personally by another of us (RWJ) in Toronto by total meniscectomy, open partial meniscectomy or by arthroscopic partial meniscectomy, with the same exclusions, up to the end of 1977. Close co-operation over several years ensured that the surgical techniques used were closely comparable. The English part of the study was carried out approximately one year after the Canadian part, enabling one reviewer (MDN-B) to assess personally all the patients.

All knees were subjected to an initial examination under anaesthesia and diagnostic arthroscopy, either shortly before or immediately preceding meniscectomy. So as to concentrate entirely on the results of the meniscal surgery, a knee was included in the study only (1) if there was no ligamentous laxity, judged either clinically or arthroscopically; (2) if it had had no previous operation; (3) if no other surgical procedure was carried out on it at the same time; and (4) if there were no marked

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degenerative changes. Patients with chondromalacia of one or more compartments were, however, included, provided that this was not surgically treated. This rigorous exclusion process left 71 knees treated by arthroscopic partial meniscectomy, 45 knees treated by open partial meniscectomy, and 103 knees treated by total meniscectomy.

Follow-up. An attempt was made to see and examine personally as many of the patients as possible in the three groups. Many had, however, moved and these patients were sent a reply-paid questionnaire with a covering letter. The questionnaire was deliberately kept as simple as possible to encourage response. A very small number of patients were interviewed by telephone. In the Canadian part of the study further details from two earlier studies, one of which has been previously reported (Jackson and Dandy 1976), were accepted after critical perusal where patients had subsequently become untraceable. Reliable information was thus obtained for 94 per cent of the group undergoing arthroscopic partial meniscectomy, 89 per cent of those having open partial meniscectomy and 74 per cent of the group who had total meniscectomy.

Fig. 1

Histogram showing the age of the patients at operation in the three groups: APM, arthroscopic partial meniscectomy; OPM, open partial meniscectomy; TM, total meniscectomy.

The overall mean length of follow-up was 4.3 years. The minimum and mean follow-up for the three groups separately were 2.1 years and 3.0 years after arthroscopic partial meniscectomy; 1.0 year and 4.5 years after open partial meniscectomy; 1.2 years and 5.2 years after total meniscectomy. While it would clearly have been scientifically desirable to have exactly the same length of follow-up for all three groups, a gradual move from total meniscectomy to partial meniscectomy over several years, succeeded by a rather rapid change to arthroscopic meniscectomy, made some compromise inevitable. Available evidence (Tapper and Hoover 1969), however, and data from within this study itself, strongly suggests that the relatively slight differences accepted have no

bearing on the results; thus, for example, the results of arthroscopic partial meniscectomy were actually slightly better in those knees with a follow-up of more than three years than in those with less, though this difference did not reach statistical significance.

Assessment. Each knee was classified as excellent, good, fair or poor according to criteria used by Tapper and Hoover (1969). An excellent knee was effectively completely normal. A good knee had minor symptoms such as aching or swelling after vigorous activity, but caused no disability. With a fair knee the patient had definite symptoms and some disability, preventing him from doing vigorous sport; while with a poor knee the symptoms interfered with everyday existence. Information was also sought on specific symptoms, such as aching, swelling, giving way and locking, and on the rate of recovery of the knee after the operation.

Comparison of the three groups

Sex and side affected. The male to female ratios were similar in the three groups undergoing meniscectomy: arthroscopic partial, 6.7 to 1; open partial, 5.2 to 1; and total, 5.8 to 1. The numbers of right and left knees were: arthroscopic partial, right 35, left 36; open partial, right 26, left 19; and total, right 54, left 49.

Age. The ages of the patients are shown in Figure 1. Those undergoing total meniscectomy were, on average, a little older (38.8 years) than the others, but not greatly so (arthroscopic partial, 33.6 years; open partial, 30.1 years).

Meniscal lesions. Operation notes were available for every patient, and from these the meniscal lesions were analysed and classified into five groups: longitudinal or bucket-handle tears, which included peripheral separations and longitudinal tears confined to the posterior part of the meniscus; flap tears in the anterior third; flap tears in the middle third; flap tears in the posterior third; and torn discoid menisci. The few purely radial tears were placed in the appropriate groups.

The meniscal lesions treated are classified in Table

Table I. Analysis of meniscal lesions

	Arthroscopic partial meniscectomy		Open partial meniscectomy		Total meniscectomy	
	Medial	Lateral	Medial	Lateral	Medial	Lateral
Longitudinal or bucket-handle tears	29	12	26	7	35	12
Anterior flap	1	8	5	3	3	3
Mid-third flap	1	1	—	—	—	4
Posterior flap	16	3	4	—	29	7
Torn discoid meniscus	—	—	—	—	1	4
Unclassified	—	—	—	—	3	2
TOTAL	47	24	35	10	71	32

I. It is seen that the ratio of longitudinal tears to the remainder (about 4 to 3) is similar in those knees treated arthroscopically to those treated by open operation (partial plus total combined), confirming again the comparability of these groups.

Chondromalacia was noted to some degree in the patellofemoral compartment or in one or both tibio-femoral compartments in about one third of the knees in each group (arthroscopic partial, 38 per cent; open partial 29 per cent; and total meniscectomy 28 per cent). The distribution of changes within the three compartments is shown in Table II.

Table II. Number of patellar, lateral or medial compartments affected by chondromalacia in the three groups

Site of chondromalacia	Arthroscopic partial meniscectomy		Open partial meniscectomy		Total meniscectomy	
	Medial	Lateral	Medial	Lateral	Medial	Lateral
Patella	10	5	3	2	15	7
Lateral compartment	2	3	1	1	2	6
Medial compartment	14	5	5	1	11	3

RESULTS

From Table I it can be seen that while the arthroscopic and open total techniques can be applied to the great majority of knees requiring meniscectomy, partial meniscectomy using an arthrotomy can seldom be performed except on longitudinal or frank bucket-handle tears. Removal of flaps at open operation is mainly confined to the rare easily accessible lesions in the anterior two-thirds.

Rate of recovery

Information was obtained about the time spent in hospital, the use of walking aids, and the time before return to work and, if applicable, to sport. The hospital times and the time to return to work were, however, found to be rather too dependent on social and economic circumstances and on differences between England and Canada to be useful as indicators of the rate of recovery; these figures are, therefore, not given here.

Walking aids. The mean time for which walking aids were used by the patients treated arthroscopically (one stick for 2.1 days) was considerably less than the mean time for those treated by open partial meniscectomy (crutches for 11.7 days), and this in turn was considerably less than the mean time for those treated by open total meniscectomy (25.3 days). From Figure 2 it can be seen that the greatest difference was between the arthroscopic cases and those treated by open operation, rather than between the open partial and the open total groups. The difference in the means between these latter groups was mainly due to a comparatively small number of patients

treated by total meniscectomy who required crutches for a prolonged period.

It would appear that a major difference in the rate of recovery of the knee is occasioned by the very small size of the capsular and synovial incisions with the

Fig. 2
Use of walking aids.

arthroscopic technique, and that a further but less significant gain is occasioned by the lack of dissection around the periphery of the meniscus necessitated by a total meniscectomy.

Return to sport. Although a patient is likely to return to sporting activities gradually after operation, most patients who had taken part regularly in sport before their knee trouble were able to state fairly precisely how long it was after operation before they started again. It will be seen in Figure 3 that patients in this category who had had an arthroscopic partial meniscectomy tended to go back to sport more quickly than those who had had an open partial meniscectomy, and these in turn tended to

Fig. 3
Histograms showing times of return to sport. Heights of columns refer to percentages of the number of patients returning to sport in each group.

go back earlier than those who had had an open total meniscectomy. Only after an arthroscopic procedure did anyone return to sport within the first week, although only five such patients actually did so. The mean times for the three groups were: arthroscopic partial meniscectomy, 5.1 weeks; open partial, 10.8 weeks; open total 13.7 weeks. These figures again reflect the amount of surgical trauma to the skin, capsule, synovium and meniscal rim in the three types of operation.

Late symptomatic results. The symptomatic grades for all knees seen at review are shown in Figure 4. A clear

Fig. 4

Results of meniscectomy (all cases): E, excellent; G, good; F, fair; P, poor.

gradation is seen in the quality of the results, with excellent or good results in 90 per cent after arthroscopic partial meniscectomy, in 85 per cent after open partial meniscectomy, and in 68 per cent after total meniscectomy.

Two inferences can be drawn from these results. First, supposing that one is in a position to perform open surgery only, then the results of partial meniscectomy, when this is possible, are substantially better than those of total meniscectomy. Secondly, the combined results of open partial and open total meniscectomy (excellent 40 per cent, good 34 per cent, fair 21 per cent and poor five per cent) are clearly inferior to those following arthroscopic surgery for the same meniscal lesion, so that there is a substantial advantage in performing the operation arthroscopically.

Results according to meniscal lesions

Longitudinal or bucket-handle tears. The results for these lesions alone are shown in Figure 5 and the same gradation between the three types of operation is seen as when all meniscal lesions are combined. The difference between the results of the two types of open operation, although quite small, agrees with the conclusion of Cargill and Jackson (1976). The difference between the satisfactory results after open partial meniscectomy (82 per cent) and those after arthroscopic partial meniscectomy (91 per cent) is again small, but a striking difference is seen

in the ratios of excellent to good results: thus three-quarters, rather than just under half, of the patients felt that the knee was symptomatically completely normal.

Flap tears. The comparative results for the arthroscopic removal of a flap tear with local saucerisation of the rim, and the treatment of the same lesion by open removal of the whole meniscus, showed a similar ratio between satisfactory (arthroscopic 90 per cent; total meniscectomy 69 per cent) and unsatisfactory results (arthroscopic 10 per cent; total meniscectomy 31 per cent) as for bucket-handle tears. This difference, however, arose from the good group (arthroscopic 60 per cent; open total 33 per cent), excellent results being at least as uncommon with arthroscopic partial meniscectomy (30 per cent) as with total meniscectomy (36 per cent). The very few cases of flap removal at open operation did very well but the numbers were too small for analysis.

Table III. Ratio of satisfactory (excellent plus good) to unsatisfactory (fair plus poor) results in knees without and with chondromalacia at operation

	Arthroscopic partial meniscectomy	Open partial meniscectomy	Total meniscectomy
Without chondromalacia	12 to 1	6 to 1	2.9 to 1
With chondromalacia	7.3 to 1	4.5 to 1	1.2 to 1

Chondromalacia. The ratios of satisfactory to unsatisfactory results in the three groups in those knees without chondromalacia and in those knees with chondromalacia at the time of their original operation are shown in Table III. A much higher ratio is seen in each group in those knees without chondromalacia, and its presence or absence in any compartment at the time of the original meniscectomy certainly appears to be a major factor in determining the ultimate symptomatic result. It may also be noted that the ratio is higher for open partial meniscectomy in those knees with chondromalacia than for total meniscectomy in those knees without such changes, and similarly that the ratio for arthroscopic partial meniscectomy in those knees with chondromala-

Fig. 5

Results for bucket-handle tears.

cia is higher than that for open partial meniscectomy in those knees without chondromalacia. Thus it seems that the effects of degenerative change within the knee can be minimised both by meniscal conservation and by the use of the arthroscopic technique.

Meniscus affected. The results of the three types of operation for lesions of the medial meniscus and those for lesions of the lateral meniscus are shown separately in Table IV. In each case the same gradation is seen in the results as in the remainder of this study. For the lateral meniscus, however, the differences between the results for the three types of operation are particularly marked, with only 58 per cent satisfactory results for total meniscectomy, compared with 75 per cent for open partial meniscectomy and 95 per cent for arthroscopic partial meniscectomy.

DISCUSSION

The results of this study support the view that partial meniscectomy carried out by a closed technique under arthroscopic control represents a substantial advance in the treatment of the great majority of symptomatic meniscal tears. A small minority of torn menisci, often in knees with other damaged structures, will certainly still require some other form of treatment. In the present study, for example, the indication for total meniscectomy

Table IV. Results according to meniscus affected (percentages)

	Arthroscopic partial meniscectomy	Open partial meniscectomy	Total meniscectomy
<i>Medial</i>			
Satisfactory	88	87	71
Unsatisfactory	12	13	29
<i>Lateral</i>			
Satisfactory	95	75	58
Unsatisfactory	5	25	42

was never the widespread nature of the meniscal damage, though this still remains a valid indication, if a very rare one; meniscal reattachment is another procedure that may occasionally have a place. It is not, therefore, our intention to suggest that arthroscopic partial meniscectomy is the preferred treatment for every meniscal lesion. Nevertheless, it can be said with some confidence that the absolute indications, or technical necessity, for an arthrotomy to deal with purely meniscal lesions are likely to become increasingly rare; and for the common types of meniscal tear, our results strongly suggest that arthroscopic partial meniscectomy, when practicable, should be the treatment of choice.

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