

Outcome of arthroscopic meniscectomy

A 13-year physical and radiographic follow-up of 43 patients under 23 years of age

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We reexamined 43 patients with stable knees at a mean of 13 years after arthroscopic meniscectomy. The patients had a maximum age of 22 years at the operation and no patient had had previous surgery on the involved knee. At the follow-up examination, no differences in range of motion, muscle strength or tibial A/P displacement were seen between the operated and the nonoperated knees and 36 patients had no problem with their knee in daily life. Radiographic changes were found in the operated knee in 20 patients and in the nonoperated knee in

5 patients. 8 patients had a reduction of the joint space on the involved side, but none had more severe changes. Cartilage fibrillation at the index arthroscopy did not increase the radiographic changes at follow-up, but radiographic changes were commoner after subtotal meniscectomy (7/8) than after partial meniscectomy (17/35). These findings are similar to previous studies of arthroscopic meniscectomy of medium duration and do not differ considerably from studies of open meniscectomy.

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Since long-term follow-up studies of open total meniscectomy showed a high frequency of arthrosis (Fairbank 1948, Tapper and Hoover 1969, Appel 1970, Johnson et al. 1974, McGinty et al. 1977, Jørgensen et al. 1987), meniscus surgery has become more conservative during the last 20 years. With the introduction of arthroscopy, partial meniscectomy became the standard operation (O'Connor 1977, Metcalf 1981, Gillquist and Oretorp 1982). Follow-up reports on arthroscopic meniscectomy of medium duration have shown promising results (Sommerlath 1991, Covall and Wasilewski 1992, Faunø and Nielsen 1992, Bolano and Grana 1993), but no study with follow-up beyond 10 years seems to exist. Since the effect of meniscectomy has been shown to be more deleterious in young patients (Medlar et al. 1980, Zaman and Leonard 1981, Abdon et al. 1990), we studied the functional and radiographic outcome of arthroscopic meniscectomy in 43 patients below 23 years of age, with a minimum follow-up time of 11 years.

Patients and methods

From 1978 to 1981, 519 patients had arthroscopic meniscectomy in our department. 54 of them had

stable knees, no previous surgery on the involved knee and a maximum age of 22 years at operation. 43 patients were reexamined at a mean of 13 (11-15) years after surgery. 3 patients could not be traced, 7 refused examination and another was excluded because of repeated knee injuries.

In the follow-up group of 43 patients, 37 were men. The mean age at operation was 19 (15-22) years. 33 patients were initially active in sports on a competitive level and 7 on a recreational level. Sports accidents accounted for 33 of the ruptured menisci. The median time between injury and operation was 2.5 (0-39) months.

Index operation

At the index arthroscopy, all findings concerning meniscus pathology, ligament and cartilage changes were classified and recorded on a special form (Lundberg et al. 1984). Cartilage changes were classified according to a modified Outerbridge scale (Lysholm et al. 1987). At the arthroscopy, half of the knees had cartilage fibrillation (grade I) on the injured side, but none had more severe changes. Fibrillation was more frequent in horizontal cleavage and radial tears, but there was no correlation between the duration of symptoms and fibrillation. The meniscectomy was partial or subtotal. Subtotal

meniscectomy is defined as resection of the posterior, middle and anterior part of the meniscus preserving a small rim at the periphery (Table 1).

The mean (SD) operative time was 47 24 min. The postoperative course was without complications. 30 patients had 1 outpatient visit or none, 12 had 2–3 visits and 1 patient who also had a loose body removed 4 months after the meniscectomy had 4 follow-up visits. Most of the patients were students or in military service and therefore no sick leave was recorded. A majority of the patients who were employed had a sick leave for a maximum of 1 week.

During the follow-up period, 4 patients underwent repeat arthroscopic meniscectomy on the same meniscus, 3 patients during the first year and one 10 years after the first operation. A further 2 patients had arthroscopic meniscectomy on the other meniscus (same knee) 7 and 9 years after the first operation. Thus 36 of 43 patients had no further surgery.

Follow-up examination

Knee function was evaluated by the Lysholm score (Lysholm and Gillquist 1984). A score of more than 94 is regarded as normal knee function, 85–94 corresponds to knee symptoms during sporting activities and less than 85 indicates problems in daily life. The activity level before injury, postoperatively and at follow-up was rated by the Tegner scale (Tegner et al. 1985) consisting of 11 levels of activity. Levels 0–3 correspond to daily activities, levels 4–6 to physical fitness sports and levels 7–10 to competitive sports. The patients' own assessment was measured on a semantic differential scale consisting of a line with a length of 100 mm. The patient was asked to estimate his disability and put a mark on the line where 0 mm indicates no remaining disability and 100 mm a severe disability (Snider and Osgood 1969).

A manual knee examination was performed regarding range of motion, stability, swelling, tenderness, thigh muscle atrophy and McMurrays test. Knee stability was also evaluated by measuring the anteroposterior (A/P) tibial displacement in 20° of flexion at 90 N load with the OSI laxity tester (Orthopedic Systems Inc., Hayward, CA., U.S.A.). The thigh muscle strength was estimated according to Appel (1970). The patient was asked to stand on one leg and bend the knee from the extended position to a squatting position from which he could rise without supporting himself with his hands or with the other leg. The angle between the straight and the squatting positions was measured. The test was performed on both the operated and the nonoperated

leg. Varus-valgus alignment of the femorotibial axes was examined in the standing position.

Radiographic examination

Anteroposterior radiographs were taken of both knees in the slightly flexed weight bearing position according to Ahlbäck (1968) as well as a lateral projection of the involved knee without weight bearing. The radiographs were reviewed blindly and arthrosis were graded according to Ahlbäck (1968). Ahlbäck described 5 grades of arthrosis where grade 1 is a 50 percent reduction of the joint space and grade 2 is a total obliteration of the joint space. Ridge formation, narrowing of the joint space and flattening of the femoral condyle were also registered, as described by Fairbank (1948).

Joint fluid analysis

Joint fluid was collected from the affected knee joint under sterile conditions. No knee had an effusion. 20 mL of sterile physiologic saline was injected into the joint and mixed with the synovial fluid by repeated active extension-flexion movements. The fluid was then aspirated and stored at –20 °C until analyzed. Proteoglycan fragments were quantified as sulfated glycosaminoglycan by a precipitation with Alcian blue, using chondroitin-6-sulfate as standard (Björnsson 1993).

Statistics

The statistical evaluation was performed with Statistica (Statsoft Inc., Tulsa, OK, U.S.A.). An ANOVA was performed first and then post hoc *t*-tests with correction for multiple comparisons. For nonparametric data, the Mann-Whitney U-test was used. Proportions were tested with the Chi-square or Fischer's exact test.

Results

Physical examination

There were no differences between the operated and the nonoperated knees in range of motion (145° 7° vs 147° 6°), muscle strength or tibial A/P displacement (4.0 2.2 vs 3.5 2.2 mm). 22 patients had a varus knee alignment, 5 a valgus and 16 a neutral knee alignment.

Subjective complaints

8 patients complained of joint line tenderness and the McMurray test was positive in 5. Patellofemoral tenderness was present in 5 patients. 27 patients marked

Table 1. 44 meniscus lesions in 43 patients and their treatment. 1 patient was operated on for tears of both menisci and had a flap-tear on the medial side and a horizontal cleavage-tear on the lateral side

Meniscus tear	Medial	Lateral	Subtotal	Partial
Transverse	0	4	0	4
Longitudinal-vertical	3	2	2	3
Horizontal-cleavage	1	4	2	3
Bucket handle	16	3	4	15
Flap	5	6	0	11
Total	25	19	8	36

< 10, 7 between 10 and 19 and 9 > 20 mm on the semantic differential scale. No one marked more than 40 mm.

Radiographic findings

10 patients who had a meniscectomy on the other knee during the follow-up period were excluded, leaving 33 patients for comparisons between the knees. One or more Fairbank changes were found in the operated knee in 20 of 33 patients and on the nonoperated side in 5 patients (P 0.003). 8 operated knees had Ahlbäck grade 1 changes, but only one of the nonoperated knees (Figure 1). More degenerative changes were seen after subtotal meniscectomy than after partial meniscectomy (P 0.03), but there was no difference between medial and lateral meniscectomy. Cartilage fibrillation at the index operation did not increase the risk of radiographic changes at follow-up.

Joint fluid analysis

The concentration of proteoglycan fragments varied between 3.6 and 40 (mean 19.9) $\mu\text{g/mL}$. No difference was found between men and women, after medial or lateral meniscectomy or after subtotal or partial meniscectomy. The radiographic findings at follow-up did not correlate with the concentration of proteoglycan fragments.

Knee function and activity

The mean Lysholm score was 91.9. 36 patients had no knee problems in daily life (score > 84) and 20 reported normal knee function (> 94). Only 7 patients had a Lysholm score of 84 or less. The knee function score after subtotal meniscectomy was lower than after partial meniscectomy, 86.7 vs 92.9 (P 0.02), and also lower with an Ahlbäck grade 1 on radiographs (P 0.001).

34 patients had been active in competitive sports (Tegner activity level 7–10) before injury, 4 of them

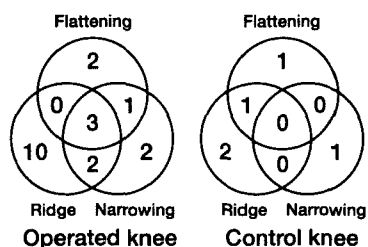


Figure 1. Radiographic changes, according to Fairbank (1948), after meniscectomy in 33 patients with a maximum age of 22 years at surgery. 10 patients had meniscectomy in both knees and are excluded in this figure.

had reduced their sport activity to a recreational level after injury and operation. None of the 9 patients who had an activity level less than 7 changed activity.

At the follow-up, 9 patients were still active in competitive sports and 24 were active on a recreational level. 10 patients had stopped sports altogether. None had changed occupation because of problems from the operated knee.

Discussion

Our study confirms that the disability period after arthroscopic meniscectomy is short (Gillquist and Hagberg 1976, Dandy 1978, Gillquist and Oretorp 1982, Hamberg and Gillquist 1984). The short term results were good. The frequency of re-resections was similar, as previously described by Sommerlath (1991) in a 7-year follow-up and by Faunø and Nielsen (1992) in a 9-year follow-up. For open meniscectomy, 4–33-year results have been presented by Appel (1970) among others, but no study of arthroscopic meniscectomy with follow-up beyond 10 years has been available. Previous studies with an average observation period of 5–9 years have shown good function but radiographic changes in half of the cases (Sommerlath 1991, Covall and Wasilewski 1992, Faunø and Nielsen 1992, Bolano and Grana 1993). It seems from our study that knee function remains good also with a longer follow-up. More than four fifths of the patients had no knee problems in daily life. Sports activity did not diminish after the operation and at the follow-up about 1/4 were still active on a competitive level.

The concentration of proteoglycan fragments was measured as an additional method to detect early signs of arthrosis (Lohmander et al. 1989, Dahlberg et al. 1992, Messner et al. 1993). No correlation was found between the concentration of proteoglycan

fragments and radiographic changes or problems from the knee. Roos et al. (1993) have shown that the value of a single measurement is questionable, because it tends to vary with the time of day and the activity. These findings, in addition to ours, make the use of a single measurement of the concentration of proteoglycan fragments to detect early arthrosis questionable.

The frequency of radiographic changes after open meniscectomy varies between 30 and 96 percent (Fairbank 1948, Tapper and Hoover 1969, Appel 1970, Allen et al. 1981, Jörgensen et al. 1987). In children it has been reported that Fairbank changes occur in a high percentage of the knees in long-term follow-up studies after meniscectomy (Zaman and Leonard 1981, Abdon et al. 1990). The Fairbank classification involves changes that are subtle and their relation to posttraumatic arthrosis remains unclear. These changes may also be seen in the opposite nonoperated knee, as shown in this study and in others (Allen et al. 1981, Abdon et al. 1990, Faunø and Nielsen 1992).

Appel (1970) found grade I Ahlbäck changes in 9 percent and grade II or III in 3 percent 4–33 years after open meniscectomy in 480 patients and Abdon et al. (1990) found 9 percent Ahlbäck grade II or III in 89 children with a 17-year follow-up. In our study, arthroscopic meniscectomy was followed by Fairbank signs in 2/3 and joint space narrowing (Ahlbäck grade I) in about 1/5 of the patients. However, no patient had grade II changes or higher.

Our results are like those in previous studies of arthroscopic meniscectomy with a follow-up of medium duration (Sommerlath 1991, Covall and Wasilewski 1992, Faunø and Nielsen 1992, Bolano and Grana 1993). In comparison to the studies of open meniscectomy, it seems that arthroscopic meniscectomy did not substantially reduce the frequency of radiographic changes. The frequency of degenerative changes in the operated knee were 4 times higher than in the normal knee.

Several authors stress the importance of saving as much as possible of the meniscus (Cox et al. 1975, McGinty et al. 1977, Fukubayashi and Kurosawa 1980). Hede et al. (1992) randomized 200 patients with meniscus tears to either total or partial open meniscectomy and found after 8 years a better subjective knee function after partial meniscectomy, but they found no influence on the radiographic findings. The few patients with subtotal meniscectomy in this study had the worst results both in terms of radiographic changes and knee function, but it is not possible to draw any definite conclusions because of the small number.

Covall and Wasilewski (1992) found in a follow-up of medium duration that, when radiographic changes were present at the time of meniscectomy, these changes progressed more rapidly. In another follow-up of arthroscopic partial meniscectomy of similar duration, Bolano and Grana (1993) showed that patients with degenerative changes at the index arthroscopy had more unsatisfactory results. In our study, cartilage fibrillation concomitant with the meniscus rupture did not correlate to later degenerative changes. Our observations suggest that the main cause of meniscus rupture in a young population is the trauma and not a preexisting degenerative process.

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