

Arthroscopy of the knee in children

Diagnostic arthroscopy was performed in 174 consecutive patients under the age of 18 years. Eight arthroscopies were bilateral. The clinical diagnosis was confirmed in only three of 17 knees in children under aged 14 years and in 44 per cent of the knees in older children. The most commonly disproved diagnoses were torn meniscus and chondromalacia patella. Arthroscopy seldom changed the diagnosis in cases of osteochondritis dissecans. In 38 per cent of the knees, arthroscopy revealed no surgical treatable abnormality, and unnecessary arthrotomy was avoided.

Arthroscopy in acute hemarthrosis revealed that ligamentous tears are rather common in children; in nine of 25 knees a partial or complete tear of the anterior cruciate ligament was demonstrated at arthroscopy. The clinical diagnosis was confirmed in eight knees in cases of hemarthrosis. There was no significant difference between the hemarthrosis group and the remaining group as regards a disproved clinical diagnosis. We conclude that arthrotomy should always be preceded by diagnostic arthroscopy in children and adolescents if the clinical diagnosis leaves any doubt.

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The value of arthroscopy in the diagnosis of knee disorders in children is less well established than in adults, and there are few reports of its value (Eilert 1976, Ziv & Carrol 1982, Bergström et al. 1984, Suman et al. 1984). The difficulty of making a correct clinical diagnosis of knee problems in children is partly due to the communication barrier between the doctor and the child, and partly due to less specific physical signs. This may indicate that arthroscopy in a child or adolescent may be even more useful than in an adult.

We have analyzed the indications and usefulness of arthroscopy in the management of juvenile and adolescent knee problems.

Patients and methods

From January 1981 to December 1984, 182 knees were examined in 174 patients (75 boys and 99 girls); 8 patients had bilateral symptoms. Their ages ranged from 1 to 18 (median 15) years, with 25 children under aged 14. All patients with acute hemarthrosis were examined arthroscopically on the day following injury, whereas some other patients were examined after several years. The arthroscopy was performed by one of the consultant

orthopedic surgeons or senior registrars. All the arthroscopies were carried out under general anesthesia, and with the exception of acute hemarthrosis knees, a pneumatic tourniquet was used. Today, most arthroscopies are performed under local anesthesia, and most 17–18 year-old patients can be managed as out-patients.

Initially, the 3.6 mm Storz arthroscope was used, but later the 5.0 mm arthroscope was employed in most instances, as it has no disadvantages and its greater range of vision facilitated orientation. A hook was used to ascertain an uncertain arthroscopic diagnosis or to exclude a possible pathologic lesion (rupture of the posterior horn of the medial meniscus, rupture of the anterior cruciate ligament, etc.) when the findings were otherwise normal, but the use of a hook was not mandatory. In all cases of doubtful stability and hemarthrosis, the stability of the knee was tested under general anesthesia before the arthroscopic examination was conducted.

A 30° telescope was routinely employed with occasional use of a 70° telescope. In most cases the inferior anteromedial approach was used, but other portals, including that lateral to the patellar ligament and centrally through its substance, were used when necessary.

Only a few minor therapeutic procedures were performed arthroscopically (removal of loose bodies, forage, etc.).

Results

The patients were divided into two age groups (Tables 1 and 2), and acute hemarthrosis was considered separately. Seventeen patients without acute hemarthrosis were 0–13 years of age. The clinical diagnosis was confirmed at arthroscopy in three knees and disproved in 14 knees. The second group (aged 14–18 years) included 140 patients with eight bilateral arthroscopies. The clinical diagnosis was confirmed at arthroscopy in 62 knees (44%) and disproved in 78 knees (56%).

The difference between the age groups regarding a disproved diagnosis was significant ($P < 0.05$, chi-square test). In both groups the most frequently disproved clinical diagnosis was torn meniscus, followed by chondromalacia patellae.

A normal arthroscopy was encountered in 42 knees (23%), and in 69 knees no surgically treatable abnormality was found at arthroscopy (38%). Eighty arthrotomies were performed, and the arthroscopic diagnosis was confirmed in 71 knees.

Twenty-five arthroscopies were carried out in patients who had acute hemarthrosis of the knee. Eight of these patients were under 14 years of age and 17 were older. In only eight knees was the clinical diagnosis confirmed at arthroscopy. Nine patients, 6 who were aged 14–15 years and 3 younger, had a complete or partial tear of the anterior cruciate ligament; 7 patients had a dislocation of the patella; 2 had a rupture of the medial collateral ligament; and three knees appeared normal.

There was no significant difference concerning the number of disproved diagnoses between the hemarthrosis group and the remaining patients.

Discussion

Our study confirms the poor accuracy of the clinical diagnosis in children: arthroscopic confirmation in less than half. Albeit uncertain, clinical diagnosis is better in adults (Dandy & Jackson 1975, DeHaven & Collins 1975, Falstie-Jensen et al. 1983). This indicates that the use of arthroscopy improves the diagnostic accuracy to a greater extent in children and adolescents than in adults. The diagnostic accuracy in our series equals that of other reports (Ziv & Carrol 1982,

Table 1. The association between clinical and arthroscopic diagnosis in children aged 0–13 years

Clinical diagnosis	Number of cases	Arthroscopic diagnosis	Number of cases
Torn meniscus	6	Nonspecific synovitis	3
		Normal	2
		Synovial plica	1
Osteochondritis dissecans	5	Normal	2
		Osteochondritis dissecans	2
		Torn meniscus	1
Arthritis	5	Normal	2
		Dislocated patella	2
		Chondromalacia patellae	1
Chondromalacia patellae	1	Chondromalacia patellae	1

Table 2. The association between clinical and arthroscopic diagnosis in patients aged 14–18 years

Clinical diagnosis	Number of cases	Arthroscopic diagnosis	Number of cases
Torn meniscus	76	Torn meniscus	34
		Normal	20
		Nonspecific synovitis	12
		Dislocated patella	4
		Chondromalacia patellae	3
		Synovial plica	2
		Rupture of the anterior cruciate ligament	1
Chondromalacia patellae	37	Chondromalacia patellae	11
		Nonspecific synovitis	11
		Normal	10
		Dislocated patella	2
		Synovial plica	2
		Osteochondritis dissecans	1
Dislocated patella	10	Dislocated patella	5
		Normal	3
		Chondromalacia patellae	1
		Nonspecific synovitis	1
Osteochondritis dissecans	8	Osteochondritis dissecans	8
Synovial plica	6	Synovial plica	4
		Nonspecific synovitis	1
		Normal	1
Tear of the medial collateral ligament	2	Normal	2
Rupture of the anterior cruciate ligament	1	Torn meniscus	1

Morrisy et al. 1982, Suman et al. 1984). The diagnostic accuracy improved more in our youngest age group, confirming Morrisey et al. (1982) and the tendency illustrated by Suman et al. (1984). The communication barrier between child and doctor certainly increases with decreasing age of the child, and this might explain the above-mentioned difference between the two age-groups.

Torn meniscus and chondromalacia patellae were the two single diagnoses that most often were erroneous on arthroscopy, as observed by others (Hayes & Nageswer 1977, Ziv & Carrol 1982, Bergström et al. 1984). Arthroscopy was found to be less valuable in the diagnosis of osteochondritis dissecans. Radiographs supplemented the clinical examination with good results in these cases. However, arthroscopy was successfully used therapeutically in osteochondritis dissecans.

In 38 per cent of the cases, no surgically treatable abnormality was found at arthroscopy. On the basis of clinical diagnoses, it seems probable that the majority, if not all of these patients, would have undergone arthrotomy or even more injurious procedures (meniscectomy) had not arthroscopy been applied. In our series, only one partial meniscectomy was undertaken in a child under 13 years of age. It is, of course, desirable to avoid unnecessary meniscectomies in children (Vahvanen & Aalto 1979, Medlar et al. 1980).

There was no discoid meniscus in the entire series. This correlates well with other series (Bergström et al. 1984). Quite a few patients had no demonstrable pathology or had a nonspecific synovitis on arthroscopy and were managed with rest and a quadriceps training program. Perhaps chronic overloading is the dominating factor in knee pain in these patients (Fairbank et al. 1984).

In cases of acute hemarthrosis, we have con-

firmed that ruptured ligaments are rather common in children (Clanton et al. 1979, Bergström et al. 1984). Bergström et al. (1984) described injury to the anterior cruciate ligament in nearly half of the knees with hemarthrosis. In our series, nine of the 25 knees with hemarthrosis had a partial or complete rupture of the anterior cruciate ligament. Acute hemarthrosis indicates serious intraarticular damage, but three of our knees were interpreted as normal knees. It is possible that we could have missed something, for blood, even for the expert, disturbs the arthroscopic examination. However, when the 3 patients were seen approximately 2 weeks after the arthroscopic examination, nothing indicated any serious damage. The diagnostic accuracy of the clinical diagnosis in the hemarthrosis group did not differ from the remaining group.

Arthrography has been reported to be unreliable also in children (Vahvanen & Aalto 1979), and Gillquist & Hagberg (1978) have pointed out the generally low reliability of a negative arthrogram. Thus, we do not consider arthrography as an alternative to arthroscopy.

In children, arthroscopy is often easy to perform because of relative joint laxity. This might explain why the 5-mm arthroscope has no disadvantages.

We conclude that arthroscopy in children increases the diagnostic accuracy to a greater extent than in adults; and in approximately one third of the cases, an unnecessary arthrotomy can be avoided. Serious intraarticular knee disorders can be diagnosed with great accuracy and relevant therapy instituted. Thus, serious and irreversible cartilage damage can be avoided. Arthroscopy is an indispensable implement in the diagnosis of knee disorders in children and adolescents. Arthrotomy should always be preceded by arthroscopy in children and adolescents.

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