TRANSIENT SYNOVITIS OF THE HIP
ITS INCIDENCE, EPIDEMIOLOGY AND RELATION TO PERTHES' DISEASE

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In a prospective five-year study, 294 episodes of acute transient synovitis of the hip were diagnosed in 275 children. The average annual incidence was 0.2% and the accumulated risk of suffering at least one episode was 3%. The risk of recurrence was 20 times greater than the risk of having a single episode.

Perthes' disease was diagnosed from one to five months after the acute attack of synovitis in 10 cases (3.4%). Review of the initial radiographs revealed signs of avascular necrosis in three of the 10 cases, and an increased joint space in five. Only two cases had had completely normal radiographs. The value of routine radiographs taken after three months was minimal. Factors associated with the incidence of Perthes' disease included prolonged time in traction before the range of hip movement became normal, increase in joint space on the initial radiographs and the recurrence of hip symptoms after initial relief.

Transient synovitis of the hip is a clinical diagnosis which is confirmed by excluding potentially more severe causes for symptoms, such as septic arthritis, osteomyelitis, slipped femoral epiphysis, Perthes' disease, juvenile rheumatoid arthritis, injuries and tumours. The symptoms and signs have been well described (Spock 1959; Hardinge 1970; Jacobs 1971; Vidigal and da Silva 1981; Sharwood 1981; Illingworth 1983) but although it is the most common cause of hip pain in children, its true incidence has not been reported. It is known to resolve completely in most cases but has also been associated with the risk of subsequent Perthes' disease; this has been reported to occur in 1% to 20% of cases (Spock 1959; Salter 1970; Jacobs 1971; Sharwood 1981). For this reason, clinical and radiographic review is usually recommended 2 to 18 months after an episode (Spock 1959; Kemp and Boldero 1966; Jacobs 1971; Tachdjian 1972).

We have studied the epidemiology, incidence and risk of recurrence in a large unselected series of cases of transient synovitis of the hip derived from a well-defined population, and tried to calculate the risk of subsequent Perthes' disease with a view to evaluating the efficacy of routine follow-up three months after the onset.

PATIENTS AND METHODS
For more than a decade the population of Malmö (230 000 in January 1983) has been continuously monitored so that the age and sex distribution within it are known for every single year. There is, in addition, agreement among orthopaedic surgeons, paediatricians and general practitioners in the city that all children with a limp or other hip symptoms should be referred as emergency cases to the Department of Orthopaedic Surgery at Malmö General Hospital.

From 1978 to 1982, a total of 275 children resident in Malmö were treated for 294 episodes of transient synovitis of the hip. Whether they were admitted or treated as outpatients, arrangements were made for clinical and radiographic follow-up three months after the onset of symptoms, but only 178 attended (65%). For the remaining patients a special follow-up examination was arranged 2 to 9 years after onset with the aim of determining the incidence of avascular necrosis of the proximal femoral epiphysis. Eighty children were reviewed in this way but the parents of 12 children refused, stating that their child's hip had been completely free of symptoms after the acute episode. One patient had emigrated and four could not be traced. Thus, follow-up was completed in 94% of the series, and some information was obtained from 98% of the cases.

All patients gave a one to seven-day history of pain in the hip, knee or anterior thigh with a limp or
reluctance to put weight on the affected limb. Sometimes an upper respiratory, gastro-intestinal or urinary tract infection had preceded the symptoms and in some cases the patients, or their parents, attributed the symptoms to minor trauma. A varying degree of restriction of movement at the hip was found clinically and slight pyrexia was occasionally present.

An anteroposterior radiograph of the pelvis and frog-lateral views of the hips were taken on first presentation and were assessed by a junior radiologist, being reviewed on the following day by a senior radiologist. No pathological changes were reported in any of the cases at the time of this screening procedure.

On admission the affected hip was usually placed in extension with skin traction of 1 to 3 kg according to body weight. However, 106 of the 294 episodes were treated by bed rest alone; 85 of them at home supervised as outpatients. All these were less severe cases with minor restriction of hip movement.

Routine tests for haemoglobin concentration, erythrocyte sedimentation rate, and white cell count were performed. Titres of antistreptolysin, C-reactive protein and antibodies against *Yersinia enterocolitica* and *Shigella* were also recorded for the cases which were admitted. Throat swabs and urine specimens were cultured for bacteriology.

Children were discharged from hospital when they were pain free and had regained unrestricted hip movement and a normal gait. They were all reviewed clinically two weeks after discharge. Patients treated in their own homes were reviewed in the outpatient department at short regular intervals until the range of hip movement was normal.

For the purpose of this study the initial radiographs were all reviewed. The distance between the bony structure of the proximal femoral epiphysis and the acetabulum, was measured (Kemp and Boldero 1966) to give the apparent joint space both medially and above the head (Fig. 1). The height and width of the bone of the proximal femoral epiphysis on both the healthy and the affected side were measured.

**RESULTS**

**Incidence.** The annual age-specific incidence is shown in Figure 2. The average annual incidence in each of the age groups from 1 to 13 years was 20.3 per 10 000 (0.2%), and the accumulated incidence from birth to age 14 was 269.7 per 10 000. This means that the risk of being affected by at least one episode of acute transient synovitis of the hip was 3%. The ratio of boys to girls was 2.6:1 and male predominance was seen in every age group.

**Risk of recurrence.** One patient had four episodes of transient synovitis (the maximum number seen), though not all were within the five years of the study. The risk of recurrence was calculated from the number of children with more than one episode separated by more than one
month and the years at risk during the period under study. The annual incidence of recurrence was 400 per 10 000 (4%) as compared to the overall annual incidence of 0.2%, showing therefore a twenty-fold greater risk of recurrence than that of being affected by a first episode. Seasonal variation. The seasonal variation is shown in Figure 3. Assuming that the occurrence of the syndrome follows a Poisson distribution, there were significantly more cases than average in October (p < 0.01) and fewer in February (p < 0.05).

Perthes' disease. In 10 cases (3.7%) the diagnosis of Perthes' disease was confirmed 1 to 5 months after the onset of symptoms (Table 1). However, in three of these (Cases 1, 2 and 3) retrospective study of the radiographs showed a subchondral translucency in the anterolateral portion of the femoral epiphysis when the patient first presented with symptoms; and two of these also showed increased joint spaces medially and superiorly. These cases had clear radiological signs of avascular necrosis, which had been missed at the time of first presentation. Of the remaining seven cases, five (Cases 4 to 8) had increased joint spaces and in three of these the bony nucleus of the epiphysis was smaller in the affected hip. Thus, when the radiographs were critically reviewed, only two (Cases 9 and 10) were completely normal. In six cases the initial radiographs had been lost but in the remaining 278 who made a complete recovery there were no differences between the joint spaces or the epiphyseal sizes on involved and normal sides.

During the period of the study, in addition to the 10 cases who initially presented as transient synovitis, 14 children from the same population were seen with unequivocal radiographic signs of Perthes' disease at first presentation. Thus, a total of 24 cases of Perthes' disease were diagnosed during the five-year period under study. Of these, only two had completely normal radiographs at the time of seeking medical advice, suggesting that only 10% of all cases of Perthes' disease had been preceded by an attack of transient synovitis.

None of the 80 patients examined two to nine years after their episode of transient hip synovitis had had any subsequent hip symptoms. All the hips were clinically normal and radiographs showed no late signs of Perthes' disease, growth deformity of the femoral neck (Wolinski et al. 1984) or coxa magna (Nachemson and Scheller 1969).

Of the 10 patients in whom Perthes' disease was diagnosed later, nine had been immobilised in traction. Their time in traction before the range of hip movement recovered to normal was longer (mean 6 days, range 1 to 13) than that for the other cases in traction (mean 3.3 days, range 1 to 7; p < 0.001). In six patients the hip was aspirated because of severe limitation of the range of movement and extreme tenderness on palpation. None of these patients developed Perthes' disease.

Other diagnoses. Rheumatoid arthritis was diagnosed in two patients who had presented with hip pain as the earliest manifestation of the disease. Six patients received antibiotic treatment because of significant bacterial growth: two had urinary tract infection (Klebsiella, Proteus mirabilis), three had a growth of a beta-haemolytic streptococcus from throat swabs and one had elevated titres of antibodies against Yersinia enterocolitica, which was cultured later from stool specimens. The C-reactive protein level was raised in 16 patients and elevated antistreptolysin titres were also found in 16 patients. There was no correlation between the time for recovery and the results of the serological tests.

DISCUSSION

When the incidence of transient synovitis of the hip is compared with that of fractures in the same population of children, it is found to be equivalent to that of fracture of the clavicle, which is the fourth most common skeletal injury from birth to 16 years (Landin 1983). This calculated incidence should be regarded as a minimum since some cases, despite easy access to medical services, may have escaped being recorded at the Department of Orthopaedic Surgery. The high proportion of children treated in their own homes reflects the unselected nature of the series and the number with less severe disease, since it was not our preference to treat these cases as outpatients.

Recurrence of transient synovitis of the hip has been studied by Illingworth (1983), who found no difference in the aetiology or clinical course between cases with a single attack and those with recurrence. Therefore, if one
is considering a bacterial or viral aetiology, the risk of recurrence reflects the risk of repeated infection in children who are prone to this.

In Scandinavia, respiratory infection is more common in the autumn and winter, so the finding of a seasonal variation with most cases in October supports an infectious aetiology rather than one related to trauma, since the peaks of incidence of fractures in children in the same population occur in May and September (Landin 1983). Bacteriological and serological screening in this series did not help to provide a key to aetiology or treatment. Hardinge (1970) also found no evidence for a viral aetiology for the syndrome.

The radiographic finding of an increased joint space has been regarded as an early, possibly the earliest, sign of Perthes' disease (Waldenström 1938) but has also been commonly found in cases with transient synovitis who did not develop avascular necrosis (Ferguson 1954; Jacobs 1971; Vidigal and da Silva 1981). Eyring, Bjornson and Peterson (1965) measured the distance between the lateral margin of the so-called pelvic tear drop and the medial border of the proximal femoral metaphysis in 535 normal children, aged from six months to 11 years and found that the difference between the two sides was 1 mm or less in 96% of the cases. In 38 cases with unilateral Perthes' disease the difference was 1 mm or less in only 30%. A difference of 2 mm or more between the two sides therefore appears to be highly

Table 1. The clinical course and radiographic findings in the 10 cases which developed Perthes' disease

<table>
<thead>
<tr>
<th>Case number</th>
<th>Age (years)</th>
<th>Duration of symptoms (days)</th>
<th>Time in traction (days)</th>
<th>Initial radiographic assessment</th>
<th>Results of review of initial radiographs</th>
<th>Clinical course and later radiographic findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>F</td>
<td>21</td>
<td>2 &quot;Widening of the joint space&quot;</td>
<td>Discrepancy in joint space, superior 2 mm, medial 1 mm; PFE - subchondral translucency, sizes equal</td>
<td>Repeat radiograph after one month because of persistent limp revealed clearly visible subchondral translucency</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>M</td>
<td>1</td>
<td>Bed rest &quot;Normal&quot; at home</td>
<td>Discrepancy in joint space, superior 1 mm, medial 0 mm; PFE - subchondral translucency, size 22 mm x 8 mm (unaffected hip 22 x 10 mm)</td>
<td>Repeat radiograph after one month because of recurrent hip pain showed anterolateral collapse and increased subchondral translucency</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>M</td>
<td>7</td>
<td>5 &quot;Normal&quot;</td>
<td>Discrepancy in joint space, superior 1 mm, medial 0 mm; PFE - subchondral translucency, sizes 41 x 16 mm (42 x 19 mm)</td>
<td>Readmitted after one month because of persistent limp and hip pain. Radiograph showed progression of Perthes' disease</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>M</td>
<td>7</td>
<td>6 &quot;Normal&quot;</td>
<td>Discrepancy in joint space, superior 2 mm, medial 0 mm; PFE size 26 x 13 mm (26 x 14 mm)</td>
<td>Persistent symptoms for 6 weeks when the diagnosis of Perthes' disease was confirmed</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>M</td>
<td>1</td>
<td>6 &quot;Normal&quot;</td>
<td>No discrepancy in joint space; PFE size 28 x 16 mm (30 x 15 mm)</td>
<td>Routine radiographs at 3 months showed signs of avascular necrosis, described by Meyer (1964) as localised epiphyseal dysplasia. No symptoms either at this stage or later</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>M</td>
<td>7</td>
<td>1 &quot;Normal&quot;</td>
<td>Discrepancy in joint space, superior 1 mm, medial 2 mm; PFE sizes equal</td>
<td>Intermittent limp. Routine radiograph after 3 months revealed Perthes' disease</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>M</td>
<td>7</td>
<td>11 &quot;Slight widening of the joint space&quot;</td>
<td>Discrepancy in joint space, superior 2 mm, medial 2 mm; PFE sizes equal</td>
<td>Did not settle, readmitted after 6 weeks because of hip pain and limp. Repeat radiographs showed anterolateral collapse of the PFE</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>M</td>
<td>1</td>
<td>4 &quot;Normal&quot;</td>
<td>Discrepancy in joint space, superior 2 mm, medial 3 mm; PFE size 32 x 17 mm (34 x 19 mm)</td>
<td>Recurrence of limp. Routine radiograph at 3 months showed unequivocal signs of avascular necrosis</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>M</td>
<td>3</td>
<td>2 &quot;Normal&quot;</td>
<td>No difference between sides</td>
<td>Routine radiograph normal at 3 months. Five months after onset symptoms recurred and radiographs showed Perthes' disease</td>
</tr>
<tr>
<td>10</td>
<td>7</td>
<td>M</td>
<td>14</td>
<td>14 &quot;Normal&quot;</td>
<td>No difference between sides</td>
<td>Normal 3-month follow-up. Five months after initial onset, symptoms recurred and radiographs showed Perthes' disease</td>
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PFE, proximal femoral epiphysis

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indicative of a pathological change in the hip with the larger distance.

Kemp and Boldero (1966) found experimental and clinical evidence that the first radiographic changes in the course of Perthes' disease were lateral displacement of the proximal femoral epiphysis and flattening of this epiphyseal nucleus, giving the impression of widening of both the medial and the superior joint space. In some cases they found that the changes were reversible; this has been confirmed by Anderson and Stewart (1970) who found lateral displacement in the femoral epiphysis, with disparity of the joint space of 2 mm or more, in 20% of the cases of transient synovitis.

Recently, Wingstrand et al. (1985) and Kallio and Ryöppy (1985) have demonstrated that immobilisation of the hip in extension in the presence of a joint effusion causes the intra-articular pressure to rise well above the arterial blood pressure, and threatens the blood supply to the femoral epiphysis. The lowest intra-articular pressures were recorded with the hip in 45° of flexion; this, with slight lateral rotation, is the position preferred by children with hip effusions. All but one of the hips in this series which subsequently developed indisputable avascular necrosis had been immobilised in extension by skin traction. Theoretically, it is possible that this outcome could have been avoided in those cases without bony change at first diagnosis of transient synovitis if the hips had been immobilised in flexion or even if the children had been treated with bed rest alone.

By and large, our follow-up programme proved ineffective since most of the children who developed Perthes' disease either never became asymptomatic and were diagnosed early, or developed hip pain after the three-month review and were diagnosed at an even later stage. The poor rate of attendance is another factor which makes such a programme less attractive. We have therefore modified our programme, abandoning the examination at three months but retaining a clinical examination two weeks after the child has left hospital so as to detect early recurrence.

In such recurrent cases, in those with early and questionable radiographic signs of Perthes' disease and in those who needed prolonged bed-rest to regain a normal range of movement we shall use 99mTc-MDP scintimetry. In consideration of the low frequency of Perthes' disease in this series we do not consider that bone scans are indicated for routine screening in clinical practice, but when a child is discharged from the clinic, the parents will be informed of the risk and the symptoms of Perthes' disease and urged to seek urgent medical advice should there be any relapse. This should avoid the risk of significant delay in diagnosis and spare the vast majority of the children from radiographic examination of the hips and the associated hazards of ionising radiation.

REFERENCES


