THE ETIOLOGY OF TRANSIENT SYNOVITIS OF THE HIP IN CHILDHOOD

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The purpose of this paper is to assess the various factors that have been suggested in the etiology of the transient synovitis of the hip, and to determine the place of antibiotics. The benign self-limiting nature of this condition, which has also been called observation hip, irritable hip, coxitis fugax, coxitis serosa seu simplex and acute transient epiphysitis, has made it difficult to establish the cause. However, the condition is generally conceded to be the commonest cause of a painful hip in childhood (Wiles 1951, Ferguson 1954).

CLINICAL FEATURES

Transient synovitis mainly affects children under the age of ten years. Boys are more commonly affected than girls, in some series accounting for 80 per cent. One hip is not affected more often than the other, and affection of both has not been described. The onset may be abrupt or insidious. Symptoms vary in severity. They usually last for one to a few days, but sometimes for several weeks. The presenting symptom is pain in the hip, thigh or knee, or a limp. In the acute phase the child holds the leg in abduction and flexion. Hip movements are restricted in all directions, notably extension, abduction and lateral rotation. Tenderness over the hip joint is inconstant.

Radiographs do not show any abnormality but serve to exclude more serious conditions. Capsular thickening with lateral bulging and swelling of the surrounding muscles with disappearance of the intermuscular septa have been described (Drey 1953, Hermel and Sklaroff 1954) but they are variable and inconsistent.

HYPOTHESES ON ETIOLOGY

Lovett and Morse (1892) described a “short-lived and ephemeral form of hip disease which presents at first the characteristics of common hip disease, but the symptoms of which disappear in a few months instead of continuing for years”. They thought it probable that a focus of tuberculous disease was situated in a part of the epiphysis remote from the joint, caused symptoms of joint irritation and then became quiescent or drew away from the joint. Treatment consisted in bed rest with immobilisation. Todd (1925) discussed “contusion of the hip” or “simple synovitis” which settled quickly with rest or improved spontaneously; he suspected that trauma played a part. Fairbank (1926) suggested that in many cases there was subacute or chronic infection of the joint due to a mild strain of staphylococci. Miller (1931) reported seventy-seven cases of “acute transient epiphysitis”. He found an obvious focus of infection in nearly every case; 80 per cent of these were dentsis. Butler (1933) found a normal temperature in most of his thirty-four patients, and favoured an infective process “that had never become sufficiently localised and well defined to show changes in the bone on a radiograph”. Finder (1936) favoured an infective agent, but stated that any one of several factors might be the cause of the syndrome. Edwards (1952) reviewed thirteen personal cases and found four patients with a history of allergy: he suggested that the condition was due to an allergic hypersensitivity of the synovial membrane. He administered antihistamines to two cases with “dramatic” results. Rothschild, Russ and Wasserman (1956)
supported the idea of an allergic factor, citing the rapid response of most of their patients to intramuscular injections of adrenocorticotropic hormone. Rosenberg and Smith (1956) favoured an abortive septic condition. Caravias (1956) found no evidence to suggest that there was a single etiological factor. Spock (1959) attempted to isolate an infective agent. He found evidence of active streptococcal disease running concurrently with the symptoms of transient synovitis in 8 per cent of his patients. Antibiotics were given to three-quarters of his patients for an average of eight days, but they did not appear to influence the clinical course. Tudor (1960) believed that the joint capsule was involved, with a mild antibody reaction to some bacterium. He administered antibiotics routinely in 118 cases. Adams (1963) reported fifty patients from South Africa: he found trauma to be an antecedent factor in only a few cases, in spite of the fact that slight injuries are common in childhood. Valderrama (1963) found that the predominant role of the upper respiratory infection claimed by some authors (Miller 1931, Spock 1959) was not significant in his series.

Koch (1891) defined the criteria upon which a particular disease could be ascribed to a particular organism. 1) The organism should be found in all cases of the disease in question, and its distribution in the body should be in accordance with the lesions observed. 2) The organism should be cultivated outside the body of the host in pure culture for several generations. 3) The organism so isolated should reproduce the disease in other susceptible animals. In no case of transient synovitis of the hip reported in the literature has any bacterium ever been isolated from joint biopsy or joint aspiration. We now recognise more delicate tests that may indicate a causal relationship between a micro-organism and a disease, of which one of the most valuable is the demonstration of specific antibodies in abnormally large amounts in the blood, or an abnormally high degree of specific immunity to the infecting agent in a recently recovered patient.

THE PRESENT STUDY

In an attempt to determine the relative importance of these alleged etiological factors affected children were admitted to hospital for haematological and bacteriological assessment and close clinical supervision. In an eighteen-month period in 1966–68 sixty-five patients were studied, the diagnosis having been reached by clinical and radiographic examination.

Serological and bacteriological methods—The following laboratory investigations were performed: 1) full blood count and erythrocyte sedimentation rate (Wintrone and Landsberg 1935); 2) throat swabs; 3) antistreptolysin titre “0” (Rantz and Randall 1945); 4) antistaphylolysin titre; 5) chest radiography; 6) urine analysis; 7) Mantoux testing; 8) latex fixation for rheumatoid arthritis.

A further 100 patients, three to ten years old, were used as controls. These patients had been admitted either for elective operations (seventy) or for limb fractures (thirty). Investigations in this control group were confined to: 1) full blood count and erythrocyte sedimentation rate; 2) throat swabs; 3) antistreptolysin titre “0” and antistaphylolysin titre; 4) chest radiography; and 5) urine analysis.

Antibiotics were not administered to patients with transient synovitis, except for one patient who had coincidental acute follicular tonsillitis.

Resolution of symptoms and signs took place in one day to seventeen days (average of six days). These figures resemble those in other reported series, in most of which antibiotics had been given (Donaldson 1955, Thulin 1957).

RESULTS

The leucocyte counts for both groups are shown in Figure 1. Differential counts are not indicated in the figure but these did not show significant abnormality. Normal values for this age group are 5–10,000 (Kolmer, Spaulding and Robinson 1951).
The erythrocyte sedimentation rates for both groups are shown in Figure 2. Normal values for this age group lie between 0 and 20 millimetres in the first hour, though 5 per cent of healthy children show figures above 20 millimetres (Hollinger and Robinson 1953).

The titres for antistreptolysin “O” and antistaphylolysin are shown in Figures 3 and 4. Normal values are under 200 Todd units per millilitre and 0–2 units per millilitre respectively (Todd 1932).

![Graph of Leucocyte Count](image)

**Fig. 1**
The leucocyte count in patients with transient synovitis and in controls. The series of sixty-five patients has been adjusted to 100 to aid comparison.

![Graph of Erythrocyte Sedimentation Rates](image)

**Fig. 2**
Erythrocyte sedimentation rate in millimetres per hour in patients with transient synovitis and in controls. The series of sixty-five patients has been adjusted to 100 and inverted to aid comparison.

The results of culture from throat swabs for both groups are shown in Figure 5. Mantoux testing with Koch’s Old Tuberculin, carried out in the study group, was negative in all cases. Latex fixation for rheumatoid arthritis carried out in the study group gave “false positives” in two cases, the remainder being negative.

Blood culture was performed in the eight patients who showed pyrexia (above 37.8 degrees Centigrade) in addition to muscle spasm and limp. No growth was obtained.

Allergic conditions in the study group were confined to bronchial asthma (five patients) and hay fever (three patients).
In summary, haematological and serological examinations showed no important difference between the two groups. Nor was there any difference between the two groups with regard to the results of culture of throat swabs. These results correspond closely to those of other investigators (Jacobs 1968). The incidence of allergic disease in the practice of paediatricians was reported by Crook, Harrison and Crawford (1958) to be 13 per cent, which compares with our incidence of 12 per cent. This similarity, coupled with the natural history of transient synovitis and the constant absence of eosinophilia, tends to rule out an allergic etiology.

CONCLUSIONS

Serological investigation does not support the proposition that streptococci and staphylococci are involved in the pathogenesis of transient synovitis. The negative results of culture of pathological specimens, and the normal leucocyte counts, show that the disease is not bacterial in origin. Furthermore, there is no evidence that the disease is allergic in nature.
VIRUS INFECTION

The fleeting nature of transient synovitis, the occasional malaise and the infrequent occurrence of pyrexia of over 37.8 degrees Centigrade are suggestive of a mild viral infection (Bruce-White 1968). Spock (1959) found that some of his cases of transient synovitis of the hip were associated with an upper respiratory tract infection and others have suggested that a "common cold" (Tyrrell 1965) in the preceding three weeks may be a precipitating factor (Judge 1967, Thomas 1968). In our series there was an incidence of "common cold" of 9 per cent in the cases of transient synovitis and of 12 per cent in the control group, in the three weeks before admission.

![Chart](image)

**Fig. 5**
The results of culture of throat swabs in patients with transient synovitis and in controls. The series of sixty-five patients has been adjusted to 100 to aid comparison. Where *Neisseria catarrhalis* was found in association with haemolytic streptococci, only the latter was recorded.

MATERIAL AND METHODS

Twenty-two patients with transient synovitis of the hip were admitted to the Royal Liverpool Children's Hospital in the months March to September 1968 inclusive. This investigation was confined to twenty of these patients. A control for each patient of the same sex and age was obtained, these controls being in all cases children with limb fractures.

Samples of venous blood, throat swabs and samples of faeces were obtained from each patient and from each control on the day of admission. Further samples were obtained from these patients after twenty-one days, save for one patient who was lost to follow-up. This patient was excluded from the investigation together with two controls in whom second samples were not obtained until the twenty-seventh and thirtieth days.

After separation the serum was stored at -20 degrees Centigrade. All serum specimens from a particular subject were examined for antibodies to a particular agent under the same experimental conditions by the complement fixation method described by Grist, Ross, Bell and Stott (1966). A fourfold or greater rise in antibody levels between consecutive specimens is required as evidence of recent infection.

Each serum specimen was examined for antibodies to the following viruses: influenza A, influenza B, influenza C, Sendai, respiratory syncytial, adenovirus, R. burnetii, M. pneumonia, psittacosis L. G. V., mumps V, mumps S, herpes simplex, measles, poliomyelitis I, poliomyelitis II, poliomyelitis III, Paul Bunnell (infective mononucleosis).
In addition complement fixation tests for Brucella abortus were done. Neutralisation tests were performed for rubella, parainfluenza 3, leptospira and toxoplasma. Cell-free extracts of the throat swabs and faeces were inoculated into newborn mice and cultured on the following tissues: human amnion, human embryo lung, monkey kidney cells, "H.E. p2" and "R.K. 13" standard media.

RESULTS

One patient showed a titre of 1/320 for mumps V in the acute and convalescent stage, indicating mumps infection "within the past few months". There were no significant changes in titre to any of the viruses listed above in either group. Save for the possible mumps infection in one patient there were no high titres for the other viruses in either group.

One of the patients showed a positive toxoplasma serology dye test at +1/32. Between 20 and 40 per cent of normal adults give a positive dye test at titres \( \frac{1}{8} \). A titre of \( \frac{1}{8} \) may be expected in about 1 per cent of adults. Any titre, however low, is regarded as indicating infection with toxoplasma some time in the past.

Concusion—There is no evidence to suggest that infection with the common viruses is concerned in transient synovitis of the hip.

TRAUMA

Children often fall and injure themselves: some injury is often recalled when a child with pain in the hip or a limp is brought. Todd (1925) considered trauma an important contributory factor whereas Adams (1963) did not. It is clearly impracticable to investigate the place of trauma in a prospective study, and the importance of this factor can only be inferred by indirect methods.
During the period July 1958 to July 1968 there were 257 admissions to the Royal Liverpool Children's Hospital of patients with a history of pain in the hip or a limp, with limitation of joint movement and without bony changes in the radiographs, in whom a diagnosis of transient synovitis of the hip was made. In Figure 6 the ages of these 257 patients are compared with those of 823 patients with fracture of the tibia who were treated at the same hospital during the same period. In Figure 7 the monthly incidence of the two conditions is compared. Transient synovitis occurred on the right side in 56 per cent of cases, fracture of the tibia in 61 per cent. Boys accounted for 73 per cent of the cases of transient synovitis and for 66 per cent of those of tibial fracture.

**Conclusion**—There is a loose similarity between the age and monthly incidence of transient synovitis and fracture of the tibia, but the epidemiology of both conditions is not sufficiently specific for firm conclusions to be drawn.

**SUMMARY**

A careful study of children with transient synovitis of the hip has failed to establish any connection with infection by staphylococci or streptococci, with allergy, with viral infection and with trauma.

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**REFERENCES**


