TYPHOID OSTEITIS IN INFANCY

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(RECEIVED FOR PUBLICATION JULY 21, 1952)

In 1835 Maisonneuve first recognized osteomyelitis as a complication of typhoid and since then this bone lesion, although well known, has been reported only occasionally. Murphy (1916) collected 164 cases of typhoid periostitis and osteitis occurring in 18,840 cases of typhoid infection reported by 15 authors, an incidence of 0.82% of bone involvement. Veal (1939) also found osteitis in less than 1% of typhoid infections.

In discussing the age incidence Murphy (1916) reported six cases (0.9%) of typhoid periostitis occurring in the age-group 1 to 10 years in a total of 68 cases at all ages. By comparison, in a series of 411 cases of septic osteomyelitis at all ages he found 108 (26%) in the first decade. Winslow (1923) found 101 proven cases in the literature and he added two of his own. Four of these occurred in the first decade, the youngest being 2 years old. Of this series 68 had one and 23 had two bones involved. Veal (1939) also recorded multiple bone involvement in less than 5% of cases. Typhoid lesions tend to remain localized in contrast to paratyphoid B infections which tend to spread through the length of the bone. Webb-Johnson (1917) illustrated the extreme rarity of bone involvement in paratyphoid B infections, recording only two instances in a study of 1,038 examples of this disease.

There may be a wide variation in the latent period between the acute illness and the subsequent bone involvement. In Winslow's 101 cases the bone manifestations occurred during the acute attack in nine, at an unspecified date during convalescence in 53, and months or years after convalescence in 20 cases. The tibia appears to be the bone most commonly affected. Morse and Geiser (1950) reported a case of typhoid osteomyelitis treated with chloramphenicol.

Typhoid bone lesions are extremely rare in infancy and we wish to record two cases.

Case Reports

Case 1. W.R., a boy 6 months old, was admitted to hospital on April 3, 1951. He had had a pyrexial illness

for 17 days before admission. Four days after the onset he developed a macular skin eruption suggestive of a 'rose' rash. For six days he was treated with sulphadiazine and penicillin, when the pyrexia subsided. After another six days it was noticed that the infant resented any interference with the left shoulder, apparently due to pain. Four days later the right shoulder became affected and he was admitted to hospital. In the four days before admission he again became pyrexial.

The pregnancy and labour were normal and the parents and one sibling were healthy. The birth weight was 7 lb. 6 oz. and there had been no illness before the present one. He had been vaccinated two months, and immunized against pertussis one month before admission.

On examination he appeared a well nourished infant weighing 19 lb. 10 oz. The temperature was 101° F., pulse rate 124 per minute, respiration 26 per minute. Nothing abnormal was detected in the cardiovascular, respiratory or central nervous systems. The liver and spleen were not palpable. The child resented handling of both shoulders. He would not move his arms and this refusal appeared to be due to pain and not to muscular weakness. There were palpable lymph nodes in both axillae.

INVESTIGATIONS. A blood count gave: haemoglobin, 9.4 g. %; colour index, 0.87; erythrocytes, 3,500,000 per c.mm.; leucocytes, 13,700 per c.mm. (neutrophils, 55%, monocytes, 3.5%, lymphocytes, 41%, eosinophils, 0.5%). The sedimentation rate was moderately increased. The cerebrospinal fluid was normal. The Wassermann reaction of both cerebrospinal fluid and blood was negative. Blood culture in broth and bile grew no bacteria. No pathogenic bacteria or animal parasites were isolated from the stool on repeated examination. The urine contained no albumin, sugar or acetone and *S. typhi* was not isolated from the urine. The Mantoux reaction was negative. *S. typhi* was not isolated from a sternal marrow culture. The agglutination reaction for *S. typhi* O antigen was positive at a titre of 1 in 800, with a trace at 1 in 1,600. This was obtained 17 days after admission to hospital. A further positive reaction to the same antigen in a titre of 1 in 400 was obtained a month later. Agglutination reactions for *S. typhi* H and Vi were negative, as were those for *S. paratyphi* A, B and C, and *Brucella abortus* and *melitensis*. The intracutaneous Brucella skin test yielded a negative result.

RADIOLOGICAL EXAMINATION. Radiographs of both shoulders taken three days before admission to hospital

were normal. Two days after admission the right shoulder was still normal, but on the left the deltoid region was swollen, with oedema of the musculo-subcutaneous plane (Fig. 1), and there was a narrow band of rarefaction in the metaphysis of the head of the humerus parallel to the epiphyseal line.

There was also swelling of the lymph nodes in the axilla.

On the following day this area of rarefaction was larger and more irregular (Fig. 2) and there was a similar area in the head of the right humerus. One week later the lesion in the right head was more obvious (Fig. 3) and that in the left was a little larger and better defined. After a further week marginal sclerosis could be detected about the area of erosion on both sides and there was bilateral minimal subluxation. At the end of the sixth week these changes were well developed (Fig. 4). During the next month the area of sclerosis gradually encroached on the area of rarefaction, which on the right side developed a coarse trabeculation (Fig. 5), while the epiphyses of the head became smaller and almost completely disappeared. Thereafter the

FIG. 1.—(Case 1, 5.4.51.) Radiographs taken on April 4 showing right shoulder radiologically normal; left shoulder with soft tissue swelling of the deltoid region, oedema of the musculo-subcutaneous plane, enlargement of the axillary lymph nodes and a band of minimal (not reproducible) rarefaction in the metaphysis.

lesions became more sclerotic and the epiphyses reappeared in a fragmented fashion suggesting ossification in multiple centres. On the right side the epiphysis of the greater tuberosity appeared prematurely. The subluxation on the right disappeared but it persisted on the left side.

This infant presented with an acute pyrexial illness

associated with a rose-rash suggesting an acute typhoid infection. It was soon followed by involvement of the left and then the right shoulder, causing pain and immobilization at these sites. The radiological examination at first suggested an acute metaphyseal osteitis, but the subsequent course was unusually slow. The epiphyseal changes were due to direct invasion or to avascular necrosis consequent upon the metaphyseal involvement or to hyperaemia. The first was thought to be the more likely as avascular necrosis following infection usually leads to complete resorption or extrusion of the epiphysis and reossification after hyperaemia is not multicentric. It cannot be determined without aspiration, which was not performed here, whether the joint was actually

FIG. 2.

FIG. 2.—An increase in size and irregularity of the area of rarefaction is seen in the left metaphysis on April 6. The musculo-subcutaneous plane is now well defined. A similar but less marked area of rarefaction on the right side could not be reproduced.

FIG. 3.—The area of rarefaction in the right head is now (April 12) clearly visible.

FIG. 3.

infected or not. The initial blood count showed an anaemia with a neutrophilia, and the diagnosis of typhoid osteitis was determined by the initial illness and the positive agglutination reactions to *S. typhi* O antigen in titres of 1 in 1,600 and 1 in 800. A diagnostic titre for this antigen for the Witwatersrand area, where this case occurred, has been determined by Lewin (1938) to be 1 in 200.

This child had two courses of chloramphenicol therapy, in a dosage of 250 mg. every six hours first for 13 days, and subsequently for 11 days.

Case 2. A.M., a girl 10 months old, was admitted to hospital on August 15, 1951. She had been perfectly well until three weeks before admission. She then developed a fever and would not move the left arm. The temperature remained raised for two weeks during which time she still would not move the arm. She was born normally at term after a normal pregnancy. The parents and six siblings were all well.

On examination the patient was seen to be a well nourished infant weighing 18 lb. The temperature was 98° F., the pulse rate 110 per minute and respiration 26 per minute. Nothing abnormal was detected in the cardiovascular, respiratory or central nervous systems. The spleen and liver were not palpable. There was a hot, tender swelling of the upper half of the left arm. Movement at the shoulder was resisted because of pain.

FIG. 4.—Radiograph on May 17 showing gross destructive changes with irregularly sclerotic margins in the metaphyses and minimal subluxation of the head on both sides.

There was full movement of the elbow and wrist, and the other limbs were normal.

INVESTIGATIONS. A blood count gave: haemoglobin, 9.9 g. %; colour index, 0.92; erythrocytes, 3,500,000 per c.mm.; leucocytes, 8,400 per c.mm. The red cells showed anisocytosis. The sedimentation rate was 60 mm. in one hour. The packed cell volume was 30%. The modified Ide test and the Mantoux reaction were negative. The cerebrospinal fluid was normal. Agglutination tests for *S. typhi* O showed a positive reaction in a serum dilution of 1 in 25 and a doubtful reaction in a dilution of

1 in 200. This test was repeated after a week and a positive reaction was obtained at a titre of 1 in 800.

RADIOLOGICAL EXAMINATION. On the day of admission radiographs of the left shoulder showed soft tissue swelling with oedema of the musculo-subcutaneous plane. The epiphysis for the greater tuberosity on this side was not visible. There was a band of rarefaction in the metaphysis. Three days later the soft tissues appeared normal, and the area of rarefaction was more clearly defined (Fig. 7).

Seventeen days later the area of rarefaction was slightly larger and better defined, with a linear sclerotic margin. There was also a minimal periosteal reaction. After a further 18 days the erosion was smaller, the area of sclerosis had increased and the periosteal reaction had subsided. Finally, three and a half

FIG. 5.—Radiograph on June 28 showing further sclerosis of the margins of the areas of erosion. On the left it is encroaching on the area of destruction. On the right the area of rarefaction is becoming coarsely trabeculated. The subluxation persists. Note almost complete disappearance of epiphyses of heads.

FIG. 6.—Radiograph on November 19, 1951. The areas of erosion are now completely recalcified. On the left the sclerotic margin is less evident and on the right there is no sclerosis. Note the coarse trabeculation, more marked on the right. Note also the fragmentation of the epiphyses, and the early appearance of the epiphysis for the greater tuberosity on the right. Subluxation is still evident on the left.

months after the initial examination, there was complete restitution to normal.

This infant presented with a pseudo-paralysis of the left arm. Neither the mother nor the child had had T.A.B. vaccine injections or obvious enteric fever. The child had anaemia and the diagnosis of typhoid osteitis was suggested from the radiograph which closely resembled that of Case 1, and it was confirmed by the rise in titre of the agglutination reactions. Chloramphenicol was given in a dosage of 250 mg. every eight hours for 12 days. The subsequent radiological examination showed a regression with a tendency to healing. The final radiograph showed complete restitution to normal.

Discussion

Both these infants, a boy and a girl, were under 1 year of age. In the first the diagnosis was suggested by the clinical history, the failure to respond to penicillin, the unusually slow course of the lesions as shown radiographically and the positive agglutination reactions in extremely high titre. In the second case the close resemblance of the initial radiograph to that of the first patient raised the suspicion of a similar aetiology, and the high and rising titres of the agglutination reactions confirmed this. Both presented with pseudoparalysis, one bilateral, and with pyrexia. Both were anaemic, and one had an initial neutrophilia with a total leucocyte count of 13,700 cells per c.mm. Both were treated with chloramphenicol. The second patient, with the single lesion, in whom the diagnosis was made earlier in the course of the disease, showed complete resolution of the lesion in three and a half months, but in the first child there was still evident deformity without disability after eight months,

suggesting that early effective treatment prevented irreversible changes in the bone in the second case.

The question arises whether there is anything characteristic about the bone lesions that should arouse suspicion and so lead to earlier diagnosis. The oedema of the musculo-subcutaneous plane is a well known early manifestation of osteitis, and it was the first sign in two of these three affected shoulders, although it was not observed in the right shoulder in Case 1. Such localized oedema in the absence of direct trauma or an injection is suggestive of acute osteitis. It has not been reported in con-

genital syphilitic lesions, which had to be considered here once the metaphyseal rarefaction became visible. However, at the stage at which syphilis produces a pseudoparesis it almost invariably also causes a well marked periosteal reaction, with a metaphyseal notch and epiphyseal displacement. The distribution of the lesions and the serology also excluded syphilis. Tuberculous osteitis also was considered, but both the course of the lesions and their appearance were unlike tuberculosis which readily

FIG. 7.—Radiograph (Case 2) on August 18 showing area of rarefaction in the metaphysis on the left side. The soft tissues at this stage appeared normal.

crosses the epiphyseal line or, in infants, spreads to the joint with gross destruction. The negative Mantoux reaction was regarded as conclusive in this respect. Pyogenic osteitis could not be excluded initially, but it was thought unlikely in the absence of clinical response to penicillin and of periosteal reaction in the presence of marked destruction in the medulla. It is therefore suggested that a pseudo-paresis associated with a subacute bone lesion resembling an acute osteitis, but taking a slower course and showing little periosteal reaction, should arouse a suspicion of typhoid infection.

Summary

Two cases of typhoid bone lesions in the first year

of life are reported. The metaphysis of the upper end of the humerus was affected in both cases. In one case the lesion was bilateral, in the other unilateral. One case also developed bilateral osteochondritis, osteitis or hyperaemic deossification of the epiphyses, with subsequent reformation and slight deformity. The other case, diagnosed earlier, showed complete return to normal. Chloramphenicol therapy was used in both cases. The literature is briefly reviewed.

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