EXTRA CENTRE OF OSSIFICATION FOR THE MEDIAL MALLEOLUS IN CHILDREN

Incidence and Significance

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The incidence and significance of extra centres of ossification in the human foot have been investigated by many workers during the past fifty years, but little attention has been paid to the existence of such centres for the malleoli. This paper draws attention to an extra centre of ossification for the medial malleolus.

PREVIOUS INVESTIGATIONS

Fairbank (1923, 1925) found three girls each aged ten years who had an extra centre in each ankle. In two children the centre was unilateral. Mouchet (1923) reported the case of a boy whose ankle was radiographed three times at six-monthly intervals. The extra centre, visible on the first occasion, was larger on the second, and in the third had fused completely into the normal medial malleolus. Lapidus (1933) saw a man of twenty-three years with a sprained right ankle who gave a history of a similar incident eight years before. Radiographs on the latter occasion showed bilateral separate ossicles in the medial malleoli. He also reported the case of a boy of nine with bilateral extra centres of ossification. He differentiated between the os subtibiale, seen in his first patient, and an "inconstant ossification centre" seen in the second. Watkins (1937) stated that a separate tip of the medial malleolus was occasionally found, and Rigler (1937) reported a separate medial malleolar ossicle in each of individual triplets.

Trolle (1948) attributed the term os subtibiale to Bircher (1918); he suggested the alternative term of talus accessorius, and showed the radiograph of a man of forty-seven with bilateral ossicles. In a large series of human embryos the os subtibiale was never found as an independent cartilaginous element, and Trolle regarded it as a false accessory bone. He also stated that among fully grown vertebrates the os subtibiale has so far been found only in adult humans. O’Rahilly (1953) stated that this ossicle is seen mostly in children, and in many cases appears to be a malleolar epiphysis. Caffey (1956) found a separate centre on one or both sides in a small proportion of healthy children who had no sign of disease near the ankles.

Hoed (1925) published the results of his radiological findings in 150 healthy Dutch children aged six to twelve, in each of whom one ankle was examined radiologically as part of another investigation. In twenty-one of these 150 ankles there was a separate centre for the tip of the medial malleolus, fourteen in boys and seven in girls.

CASE REPORTS

Case 1—A boy of twelve attended the orthopaedic clinic of the Royal Manchester Children’s Hospital in February 1959, complaining of pain and swelling of his right ankle for a few weeks, with no known antecedent injury. He had no limp, but the medial malleolus was tender. The right medial malleolus appeared unduly prominent, there was no discomfort over the tendon of tibialis posterior, no local oedema or heat, and movements of the ankle and foot were equal to those on the other side. Radiographs showed separate centres of ossification
for each medial malleolus (Fig. 1). He wore a crêpe bandage for two weeks without benefit, and was then given an injection of 25 milligrams of hydrocortisone acetate at the site of tenderness. Two weeks later his pain and tenderness had entirely disappeared. Further

radiographs taken five months after his original attendance (Fig. 2) showed that the extra centres in both ankles were becoming incorporated in the normal lower tibial epiphyses.

Case 2—A boy of twelve attended the orthopaedic clinic of the Royal Manchester Children’s Hospital in December 1957 complaining of aching in both ankles for a few weeks, especially after playing football, with no history of any preceding injury. There was slight swelling on the inner side of the right ankle. Erythrocyte sedimentation rate was 4 millimetres per hour, and Mantoux test was negative at 1 per 10,000. His mother at that time was attending her local chest clinic with a healed tuberculous lesion. Radiographs of the ankles showed separate centres of ossification for each medial malleolus, and a separate centre at the tip of the right lateral malleolus (Fig. 3). He was seen at intervals in the clinic; in March 1959
his right ankle was entirely symptomless, and radiographs (Fig. 4) showed normal medial malleoli of much more adult appearance, with no separate ossification centres any longer visible; the separate centre for the right lateral malleolus was still visible.

![Fig. 3](image)

**Fig. 3**
Case 2—Right and left ankles of a boy of twelve showing extra centres of ossification for both medial malleoli, and a separate centre for the right lateral malleolus. He complained of aching in both ankles.

![Fig. 4](image)

**Fig. 4**
Case 2—Right and left ankles fifteen months later. On the right side the extra centre for the lateral malleolus remains separate.

**ADDITIONAL MATERIAL FOR STUDY**

In view of the high incidence of these centres shown in Hoed's paper (1925), and the uncertainty shown by other authors as to the significance of the finding of a separate centre at the medial malleolus, an investigation was carried out at the Royal Manchester Children’s Hospital. One hundred children (fifty-one boys and forty-nine girls) being radiographed for many different reasons, none in any way connected with an injury to or known disease of either ankle joint, had radiographs taken of both ankles. These hundred children were in
no other way specially selected, except that those examined were between six and twelve years old, and no particular attempt was made to select an equal number of boys and girls (Table I).

**TABLE I**

**ANALYSIS OF MATERIAL STUDIED**

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Number of children</th>
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<tbody>
<tr>
<td></td>
<td>Boys</td>
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<tr>
<td>6</td>
<td>1</td>
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<tr>
<td>7</td>
<td>7</td>
</tr>
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<td>8</td>
<td>3</td>
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<td>11</td>
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<tr>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
</tr>
</tbody>
</table>

Twenty of these children (twelve boys and eight girls) showed extra centres, bilateral in thirteen and unilateral in seven. They were found in every yearly age group except in the twelve-year-old children (Fig. 5). There was a slight preponderance of boys among those affected (Fig. 5). Representative appearances for each year are shown in Figures 6 to 11.

**DISCUSSION**

Caffey (1956) stated: "It is a pity that, sixty years after Roentgen's discovery of x-rays, knowledge of the normal is still so defective—a deficiency which can be overcome only by comprehensive radiologic study of large groups of healthy infants and children of all ages." Most of the reports of separate medial malleolar centres of ossification in children have described only one or two cases, or have implied that such centres are not often present. The only paper found which attempts to define the incidence more accurately is that by Hoed (1925), and his observations were confined to the one ankle in each child. However, his finding of separate centres in 14 per cent of those examined agrees closely with the present observations on the ankles of 100 children in whom 13 per cent showed extra centres in both ankles, and another 7 per cent showed separate centres in one ankle only.

Thus an extra centre of ossification for the medial malleolus (and to a much lesser extent a corresponding centre for the lateral malleolus—in agreement with Caffey (1956)) occurs in
Right and left ankles of six-year-old girl showing extra centres of ossification for both medial malleoli.

Figure 7—Right ankle of seven-year-old girl showing extra centre of ossification for medial malleolus. The left ankle was also affected. Figure 8—Left ankle of eight-year-old girl showing extra centre of ossification for medial malleolus. (Bilateral affection.)

Figure 9—Left ankle of nine-year-old boy showing extra centre of ossification for medial malleolus. The right ankle was similarly affected. Figure 10—Right ankle of ten-year-old boy showing extra centre of ossification for medial malleolus. (Bilateral affection.)
a substantial proportion of normal children in the six to twelve age groups. But although these centres are often present, they rarely give rise to symptoms sufficient to warrant radiographic examination.

Examination of the radiographs of both ankles of fifty adults with no known previous ankle injury or disease showed four with separate ossicles (Fig. 12), these being bilateral in one patient. This suggests that most of these extra centres fuse in the normal malleolus in adolescence, as is seen in the second case reported here and in those recorded by Mouchet (1923) and Fairbank (1959). Lapidus (1933) thought that these centres occasionally remained separate into adult life, although the evidence for distinguishing between a separate epiphysis
and an os subtibiale is unconvincing. Köhler (1956) shows several examples of these extra centres in adults.

A centre remaining unfused in adult life could cause confusion if found in an ankle which had recently been injured, and might be regarded as evidence of a previous unrecognised injury at the same site. Watkins (1937) referred to the medico-legal implications of this possibility.

**SUMMARY AND CONCLUSIONS**

1. Two boys complaining of pain in the ankle were shown to have centres of separate ossification for the medial malleoli. These were present bilaterally, but discomfort was unilateral.

2. In one, followed for fifteen months, the extra centre became wholly incorporated into the normal lower tibial epiphysis.

3. In a series of 100 children between the ages of six and twelve, without any known disease or injury of the ankles, radiographs showed that 20 per cent had a separate medial malleolar centre on one side. In 13 per cent this finding was present bilaterally. In one child a separate lateral malleolar centre was also found.

4. The significance of this finding is discussed, and it is considered to be a normal variant.

5. Occasionally one of these centres may remain unfused into adult life. Attention is drawn to the possible implications of this persistence.

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**REFERENCES**


