

## Research Article



## Abnormal Coalition of Calcaneus, Talus, Cuboid and Navicular Bone in Foot

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### ABSTRACT

Coalition and synostosis of adjacent bones in different regions of human body have been known for several centuries. But only within last five decades these have been associated with certain clinical entity. These bony anomalies have been frequently overlooked, especially in young patients presenting with symptoms of local relentless pain, stiffness and diminished range of movements. It is not uncommon to see the fusion of two adjacent bones as an incidental finding in adulthood. But an occurrence of fusion of four different bones in the foot is a rare phenomenon and has been reported very rarely. The current report is an attempt to extrapolate a similar incidental finding of 'Tarsal Coalition' of calcaneus, talus, cuboid and navicular bone.

**Keywords:** Synostosis, calcaneus, talus, cuboid and navicular bone

### INTRODUCTION

The knowledge of congenital anomalies, variations, skeletal maturation and lower extremity alignment may prove to be helpful to an orthopedician in evaluation and management of the patients coming to the clinics. The fusion between the tarsal bones is not commonly seen, many radiologists might not have come across fused tarsal bones. As special oblique views need to be taken to find out the osseous bar of bone extending between adjoining tarsals<sup>1</sup>. The incidence of tarsal coalition as reported in several studies ranges between 0.03-1% of normal population. Out of the various types, the fusion between navicular and cuboid being extremely rare, the more common are talo-calcaneal, calcaneo-navicular and talo-navicular coalitions<sup>2</sup>. Navicular is perhaps the most interesting tarsal, as it can mould and show variation in its shape because of the pull exerted on it by the structures attached to it. It is late in its ossification and affected by the increased level of activity of children.

Some of the previous authors have stated that the navicular can articulate with the anterior end of the calcaneum<sup>3</sup>. In the normal foot, there may or may not be a synovial joint between navicular and cuboid. Sometimes an accessory bone known as Os cuboidum secundarium is found on the plantar aspect of the foot at the point of contact between cuboid, navicular calcaneum and talus<sup>4</sup>.

Fusion between cuboid and navicular through an osseous bar is very rare, although it has been described in literature<sup>5</sup>.

The present case is reported here because of the rarity of such coalition of calcaneus, talus, cuboid and navicular bone which has a facet on its proximal aspect. It may prove to be helpful to the orthopedicians in managing their patients with such anomalies.

### Case Reports

This report began with the incidental finding of four unusual bony fusions which were discovered in the skeleton of an unknown individual, which was undertaken for the anatomical dissection Examination in SCB Medical College, Cuttack, India. In the dissected body, tarsal bones were studied which showed fusion of cuboid, navicular calcaneum and talus were observed, in one side of the skeleton. The bony fusion observed was photographed at various profiles i.e. Superior, Inferior, Medial and Lateral. The observations were documented and presented in the following presentation (Fig 1). In the Xray of the bone also showed the fusion of the bone (Figure 2). An accessory bone known as Os cuboidum secundarium is found on the anterior aspect of the foot at the point of contact between cuboid, navicular calcaneum and talus.



Figure 1: Image of fused bone at different positions





Figure 2: X ray of the fused bone

## DISCUSSION

In Fused tarsal bone, the fusion may be either congenital or acquired<sup>6</sup>. It is difficult to identify the case of tarsal synostosis, whether it is congenital or acquired without sufficient clinical data and case history to support the findings. Tarsal fusion anomalies are likely to be associated with disturbance of Pax-1 gene expression in the developing foot<sup>7</sup>. Acquired tarsal synostosis is generally associated with diseases like tuberculosis, other infections, juvenile rheumatoid arthritis and trauma. All these abnormalities may lead to clinical signs and symptoms which are: osseous malformation (synostosis), and signs of peripheral nerve irritation such as pain, burning sensations and cramps, signs of nerve compression such as hyperaesthesia / anaesthesia, weakness/paralysis<sup>8</sup>. Coalition of the tarsal bones has been known for several centuries. But it is often overlooked as a cause of foot pain in patients presenting with complaint of non-traumatic foot pain. Baffon was probably the first to recognize the tarsal coalition, although the undated specimen in museum of Royal College of Surgeons of England described by John Hunter probably dated from 1760-1770.<sup>9</sup> The talo-calcaneal fusion was first described.<sup>10</sup> It was described coalitions as fibrous (syndesmosis), cartilaginous (synchondrosis), and osseous (synostosis).<sup>11</sup> The most common types of coalitions are calcaneonavicular, talonavicular, calcaneocuboidal, cubonavicular and talocalcaneal. Incidence of talocalcaneal fusion is <1% to 1%. In the same year proposed the theory of impaired segmentation and undifferentiating of primordial mesenchymal tissue which resulted in coalitions.<sup>12</sup> One another study described the congenital type as an extension of an accessory ossicle into adjacent tarsal bones. Tarsal Coalition is mostly a congenital condition.<sup>13</sup> Most eventually it is inherited as a disorder of autosomal dominant inheritance. It occurs due to the failure of segmentation of mesenchyme with the absence of normal joint formation. It becomes a problem since it restricts the movements of other joints of foot which are

disturbed. These abnormal movements increases stress on other joints of foot leading to wear and tear of joint eventually causing pain. Also, muscles in relation to these joints undergo spasm due to stress of abnormal movements leading to pain and restriction of movement of limb. Sanghyeok, classified talocalcaneal coalition into four different types by using CT and MRI, these are: Type I- Linear with or without posterior hooking Type II- Talar overgrowth Type III- Calcaneal overgrowth Type IV- Complete Osseous.<sup>14</sup> But, the present report was done in loose skeleton of an unknown person whose relevant case history or clinical findings were not available. Thus, the findings cannot be further studied using any radiological modalities of investigation. Findings on observation show a more or less Type IV coalition in the bones.

## CONCLUSION

The fusion between the tarsal bones may cause pain and stiffness in foot especially in case of children with congenital flat foot, after the ossification of the tarsal bones are complete, which might be pronounced by injury.

So, while considering the causes of flat foot, orthopedicians must keep in mind such coalition as one of the differential diagnosis.

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