TALONAVICULAR SYNOSTOSIS

by

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CONGENITAL fusion of two or more bones of the tarsus is referred to as tarsal coalition and affects some 2% of individuals. All forms of coalition from involvement of two adjacent bones to massive tarsal fusion have been recorded. Tarsal fusion was well recognised by anatomists long before attention was drawn to its clinical significance. Slomann (1921) and Badgley (1927) were first to describe the association of fusion of the calcaneum and navicular with a rigid form of flat foot. Harris and Beath (1948) in their classical paper on peronealspastic flat feet found that a large proportion were due to a bridge of bone arising from the medial side of the talus, crossing the subtalar joint and joining a mass of bone on the medial side of the calcaneum.

One of the less common forms of tarsal coalition is fusion of the talus and navicular referred to as talonavicular synostosis. This paper reports the first example of talonavicular synostosis in twins and describes three cases all occurring in the one family.

CASE REPORTS

Case One:—A twelve year old boy presented to the orthopaedic clinic with a six month history of pain in the dorsum of his right foot. The pain was not well localised and was not severe. It occurred after exercise and did not interfere with any of his activities. Clinically, he was tall and overweight for his age. He had slight loss of the medial longitudinal arch of both feet. Movements at the midtarsal joint were markedly restricted. X-ray (Figures 1 and 2) showed fusion of the talus and navicular with a large flattened square head at the naviculocuneiform joint. There were identical changes in the other foot.

Case Two:—The asymptomatic non-identical twin brother of the boy in case one was also examined. A similar clinical picture existed. X-rays also showed talonavicular synostosis with the suggestion of a demarcation line at the site of the expected talonavicular joint.

Case Three:—The mother of the twin boys was also examined. She, too, was overweight with a mild degree of rigid flat feet. She was symptom free. X-rays also showed talonavicular synostosis.

The thirteen year old sister of the twin boys was also X-rayed and found to have normal feet. The twins maternal grandfather apparently had flat feet all his life but had no symptoms and was never X-rayed during his life.

X-rays of the carpal bones in all three cases were normal.
Figure 1. Lateral X-ray of the left foot of a twelve year old boy showing talonavicular synostosis.

Figure 2. Oblique projection of same foot.
DISCUSSION

In 1879, Dr. R. J. Anderson, a Demonstrator of Anatomy in the Queen’s College, Belfast reported the first case of an astragalo-scaphoid bone in man. He recorded in great detail the anatomical findings of the fused bones during the dissection of the feet in a thirty-four year old man.

Holland in 1918 reported the first case of talonavicular synostosis diagnosed on X-ray, in the feet of a 21 year old female with multiple bone fusions. Six single case reports were described up to 1935, when Rothberg recorded the first series of cases occurring in the one family. In Boyd’s series of four cases, three were of bilateral involvement spanning three generations of one family.

Schreiber in 1963 reported five cases, with one patient also having a ball and socket ankle joint. Geelhoed, Neel and Davidson described in 1969 two families with the hereditary syndrome of symphalangism and tarsal coalitions of the talonavicular type. Another family was observed by Challis in 1974.

In 1979, Channon and Brotherton, writing on the ball and socket ankle joint, found fusion of the talus and navicular in two of their patients and fusion of the talus, navicular and calcaneum in another four.

As in most of the recorded cases the patients in this series had no outstanding complaints and no treatment was necessary. Talonavicular synostosis presents with mild pain in the foot or as a prominence along the medial border. Loss of the medial arch is not often a significant feature. Diagnosis is made on X-ray with absence of the talonavicular joint or a faint demarcation line representing its expected position. The abnormality can easily be missed on first inspection of a standard lateral X-ray of the foot. None of the cases on record have required surgical intervention, symptoms most often being relieved by wearing a supportive insole.

Evidence on the hereditary transmission of tarsal coalitions is accumulating. Rothberg, Feldman and Schuster (1935) and Boyd (1944) have shown a definite hereditary factor in bilateral talonavicular synostosis. Talocalcaneal coalition in two sisters has been reported by Webster and Roberts (1951). Wray and Herndon (1963), writing on another form of tarsal coalition, a calcaneonavicular bar, believed that transmission is by a specific gene mutation behaving as an autosomal dominant. Leonard (1974) examined ninety-eight first degree relatives of patients with a talocalcaneal bridge or a calcaneonavicular bar and found that almost half had some form of tarsal coalition. Geelhoed’s (1969) families with talonavicular synostosis and symphalangism adds support to the autosomal dominant type of inheritance. Proximal symphalangism of the fingers of the hand is known to be dominantly inherited and has the longest pedigree of any human genetic anomaly known (Drinkwater, 1917), Bersani and Samilson (1957) recorded massive familial tarsal synostosis in the feet of a boy, his sister and mother. Nixon (1978) in his paper on the multiple synostoses syndrome, or what was formerly called the Nievergelt-Pearlman syndrome (tarsal and carpal fusions, symphalangism, and elbow dysplasia) states that inheritance is by an autosomal dominant trait of variable penetrance and probably caused by a single gene abnormality. This present series of non-identical twin brothers and their mother with talonavicular synostosis supports the autosomal dominant mode of inheritance. Perhaps the last word should go to Anderson who, in his original paper, observed that talonavicular fusion was normal.
in crocodiles and believed that tarsal coalition represented a return to a more primitive type of development.

SUMMARY

Talonavicular synostosis is an uncommon tarsal abnormality. Three cases occurring in the one family are reported and the mode of inheritance discussed.

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