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Esat Kıter · Mehmet Erduran · İzge Günal

Inheritance of the accessory navicular bone

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Abstract The accessory navicular bone is one of the most symptomatic bones of the foot. Although it has been reported to be present in various members of the same family, there is a lack of knowledge about its inheritance in the literature. We examined three families and suggest that it has an autosomal dominant trait with incomplete penetrance.

Introduction

The accessory navicular bone (AN) is one of the supernumerary bones located posteriorly and inferiorly to the posteromedial tuberosity of the tarsal navicular bone and may be normally present in the foot. It has been reported that 10%–14% of normal feet have an AN [3], which can be symptomatic and even require surgical treatment in severe cases. Irritation of the bony prominence and the frequently associated pes planus are responsible for the symptoms [4]. It has been classified into three types: type one is a small sesamoid bone embedded within the distal portion of the posterior tibial tendon; type two is an accessory bone united to the navicular by a 1–3 mm thick synchondrosis [5]; and type three is a fused form of type two. The last two comprise 70% of all AN and are usually involved when symptoms are reported [10].

The inheritance of AN is considered autosomal dominant in McKusick's *Mendelian inheritance in man* [7], but a review of the literature revealed no data to support this conclusion, so we investigated three families with special reference to its inheritance.

E. Kıter · M. Erduran · İ. Günal
Dokuz Eylül University, Medical Faculty,
Department of Orthopaedics,
İzmir, Turkey

İ. Günal (✉)
Rüzgar Sokak Çankaya Apt. 51/13
35330 Balçova-İzmir, Turkey
e-mail: gunali@cs.med.deu.edu.tr,
Tel.: +90-2322790329, Fax: +90-2322775211

Patients and methods

Three families were investigated for the inheritance of AN. First, all individuals were examined for AN clinically, and x-rays were obtained of feet with a suspicion of AN. A detailed family history was recorded in order to construct a pedigree. In each family three generations were examined.

Chromosome analyses of the individuals were performed by the standard lymphocyte culture technique. The metaphases were banded using the GTG- and C-banding techniques, and at least ten metaphases were evaluated for each case.

Results

We examined 57, 10, and 6 members of the three families, and found AN in 12, 3, and 2 members, respectively. All had type two AN. Their ages ranged from 7 to 63 years (mean 34.7 years).

The pedigrees of the families were consistent with an autosomal dominant inheritance with incomplete penetrance (Fig. 1). Chromosome analyses showed that the individuals concerned have a normal karyotype.

Discussion

In the literature, there is no clear evidence about the inheritance of AN. In 1920, Monahan put forth an evolutionary theory suggesting that it is a direct descendant of the sixth toe in lower vertebrates [8]. In contrast, Cobey and Cobey stated that there was no evidence of AN in one family they researched until two generations back, so they hypothesized that AN is inherited as an autosomal recessive [2]. However, the family they studied lacked the

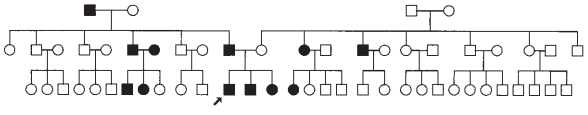

Fig. 1 Pedigree of the first family. *Arrow* indicates proband

characteristic features of AN, due to the presence of a true prehallux, an entire great toe arising from the medial border of the scaphoid bone [2].

Chater and Mygind have attempted to constitute a syndrome according to phenotype and foot structure in patients with AN [1, 9]. Macnicol and Voutsinas stated that they had encountered AN in three members of the same family [6]. Finally, McKusick found the inheritance to be autosomal dominant, without referring to any family studies [7].

AN is one of the most symptomatic accessory bones of the human skeleton, and various aspects have been investigated, but data are lacking about the mode of its inheritance. Our study demonstrated an autosomal dominant type inheritance with incomplete penetrance (Fig. 1). Thus, physicians should consider examining the other members of the proband's family who are prone to foot pain.

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