Familial microtia in four generations with variable expressivity and incomplete penetrance in association with type I syndactyly

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SUMMARY: Balcı S, Boduroğlu K, Kaya S. Familial microtia in four generations with variable expressivity and incomplete penetrance in association with type I syndactyly. Turk J Pediatr 2001; 43: 362-365.

Familial microtia with external ear canal atresia and conductive deafness is rarely reported. Autosomal dominant and recessive inheritance have been suggested depending on various family reports. Cases with other malformations in addition to microtia have been described, although the microtia generally is an isolated finding. Here we report a family with microtia, external auditory canal atresia and conductive deafness in four generations. The mode of inheritance of the disease was autosomal dominant within this family. Also, variable expressivity, incomplete penetrance and generation skipping are evident in the pedigree. Association of microtia with type I syndactyly, which has never been reported previously, was present in the index case.

Key words: familial microtia, auditory canal atresia, conductive deafness, autosomal dominant inheritance, type I syndactyly.

Hereditary malformations of the external ear, such as microtia and atretic auditory canal, without other congenital defects, are rarely reported[1]. Although microtia with meatal atresia might be a finding of some syndrome such as Goldenhar's or Treacher Collins', it is usually an isolated malformation[2]. Only a few familial cases have been described. Both autosomal recessive and dominant inheritance have been suggested[3,4]. The first familial case from Turkey was reported by Balcı[5] in a father and son with unilateral microtia and meatal atresia.

Here we report a family in which microtia and meatal atresia were observed in four generations. The proband, his father, his paternal grandmother and her grandmother were affected with microtia, suggesting autosomal dominant inheritance. An interesting finding was that the child also had syndactyly between the 3rd and 4th fingers on the left hand. As far as we know this is the first familial microtia case in association with type I syndactyly.

Case Report

A five-year old boy (Case V-1), admitted to our hospital because of bilateral microtia and atresia of the external auditory canal was the first child of consanguineous parents. The mother was 22 and the father was 27. The second child was a two-year-old healthy boy. There was no history of exposure to radiation, infection or drug ingestion during the pregnancy. The delivery was uneventful and the birth weight was 3600 g.

On physical examination his weight was 18 kg (50th percentile), height 106 cm (25th percentile) and head circumference 52 cm. He had microtia and external meatal atresia on both sides (Figs. 1a and 1b). There was partial cutaneous syndactyly between the 3rd and 4th fingers on the left hand, and the first toes were larger than normal on both feet (Fig. 2). Although intelligence was normal, speech delay was evident. Audiogram revealed conductive hearing loss on both sides. Cranial tomography and abdominal ultrasonography were both normal. Peripheral blood chromosome analysis revealed 46,XY karyotype.

Patient was operated under general anesthesia to create an external ear canal. Three months after this successful operation, a 35 dB gain in hearing levels was achieved.

Family history revealed that some other members of the family were affected (Fig. 3).

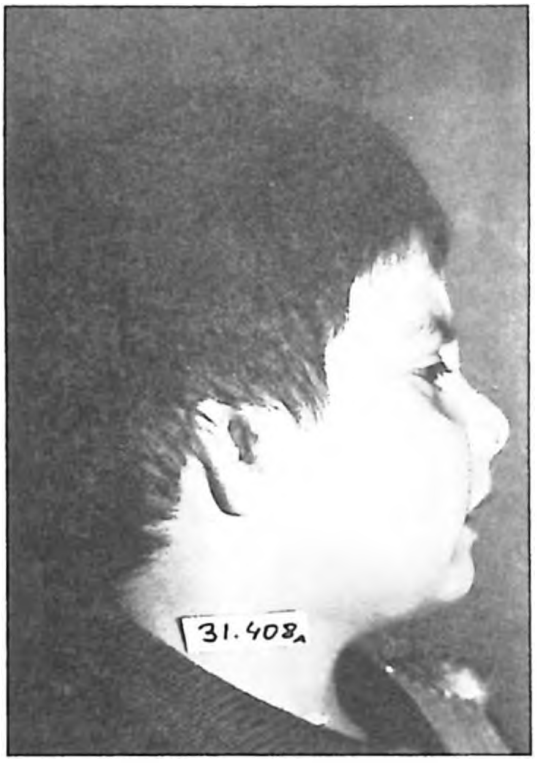

Fig. 1a. Lateral view of the index case (V-1), showing microtia on the right side after the operation.

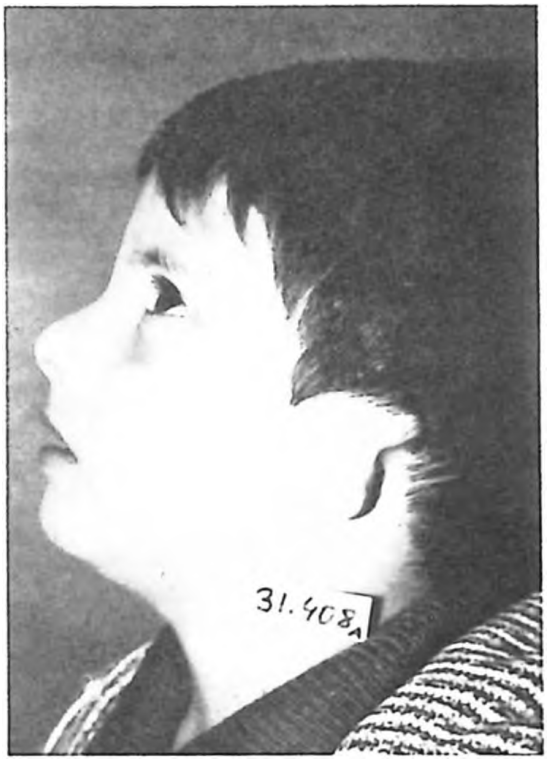

Fig. 1b. Lateral view of the index case (V-1), showing microtia on the left side.

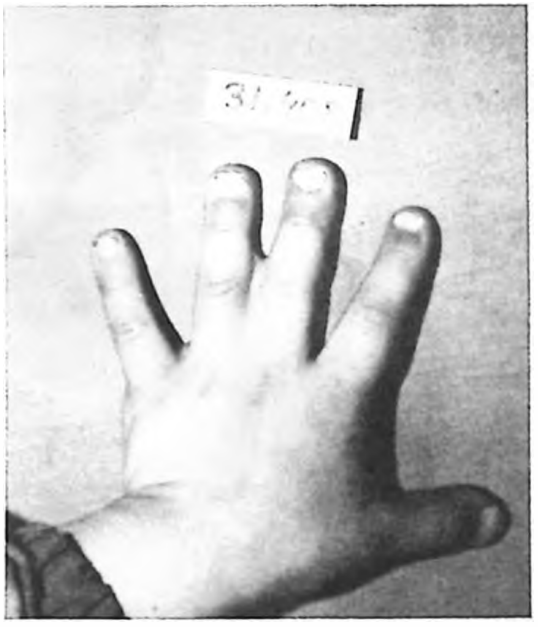

Fig. 2. The left hand of the proband showing cutaneous syndactyly between the third and fourth fingers.

The right ear of the father (Case IV-3) was cup-shaped and the ear lobe was absent. The auditory canal was not atretic (Fig. 4). The paternal grandmother (Case III-3) had findings quite similar with the child on the right ear. There was microtia with atresia of the external meatus and conductive hearing loss (Fig. 5). Abdominal ultrasonographies of both the father and the grandmother were normal. The maternal grandmother of the grandmother (Case I-1) was also reported to have right-sided microtia and external meatal atresia, but her medical reports were not available and a photograph of her could not be obtained. Fingers and toes of Cases IV-3, III-3 and I-1 were normal.

Discussion

Microtia and meatal atresia with or without middle ear involvement can be observed sporadically, associated with some syndromes, or as a multifactorial or a hereditary trait (autosomal recessive or dominant)[2-4,6]. A male preponderance and right-sided involvement are evident in familial cases. Among familial cases transmission is almost always from father to child[6].

In their epidemiological study, Mastroiacovo et al.[1] identified 172 cases with microtia-anotia among 1,173,794 births, of which 66.2% were isolated cases. The occurrence of familial microtia with meatal atresia and conductive deafness in more than one sibling was reported by Ellwood et al.[7], Dar et al.[8], and Schmid et al.[9] but Balcı[5] first reported familial microtia in two generations.

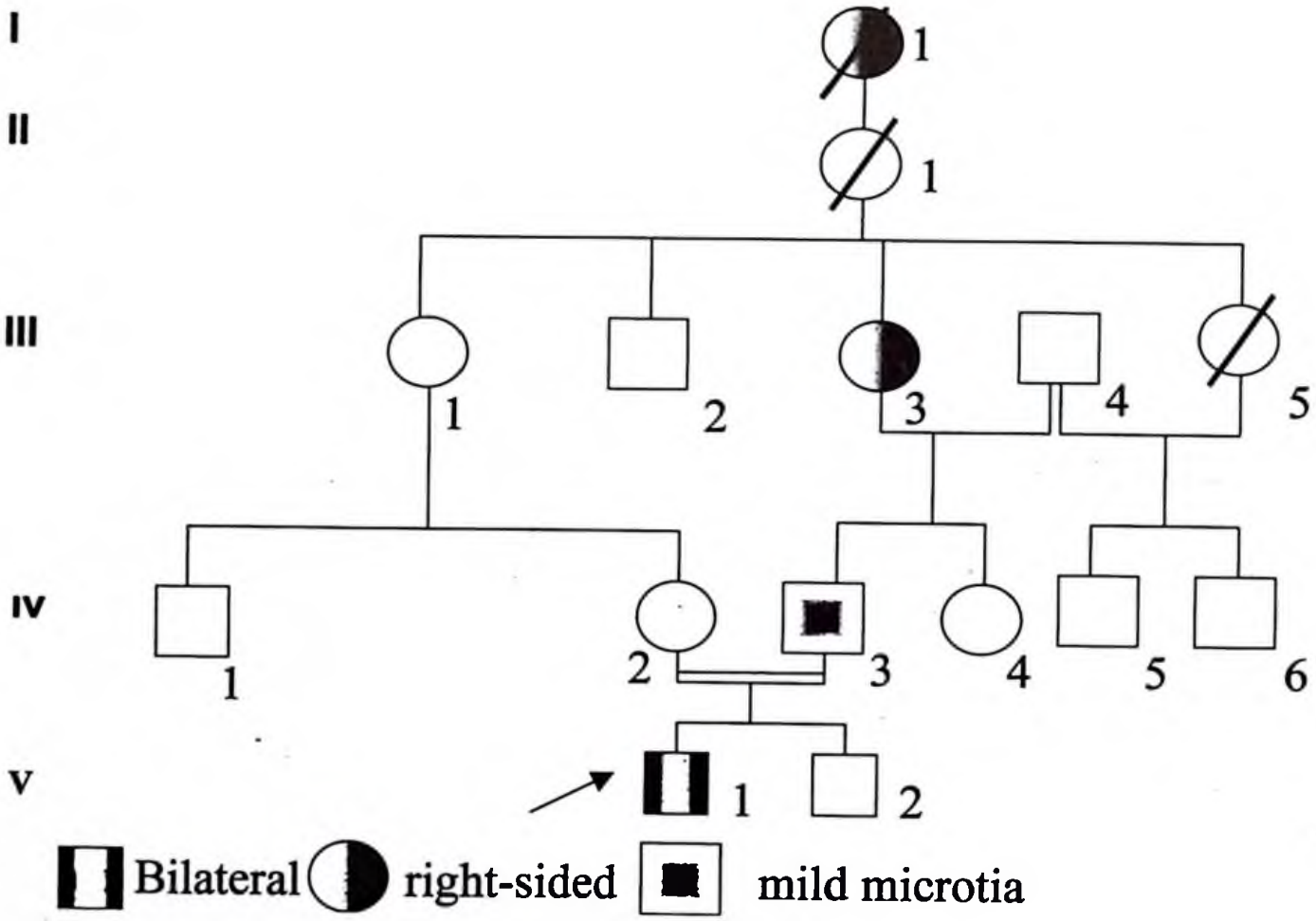

Fig. 3. Pedigree of the family.

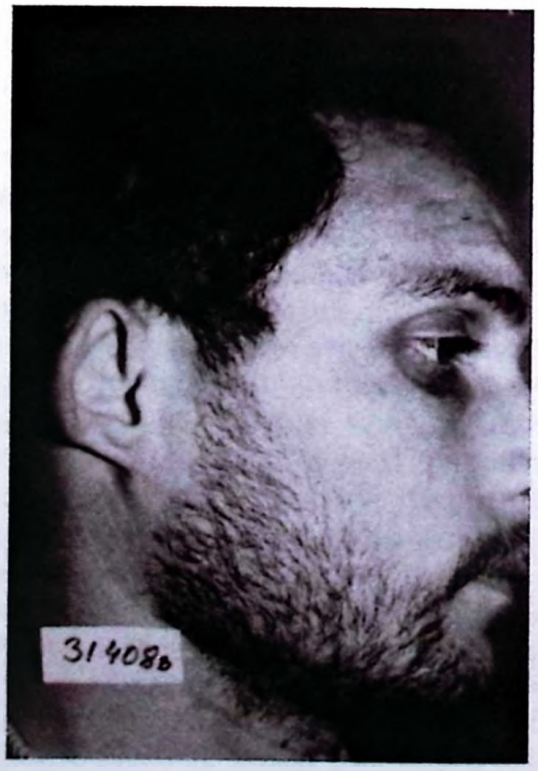

Fig. 4. Rudimentary right auricle of the father (Case IV-3).

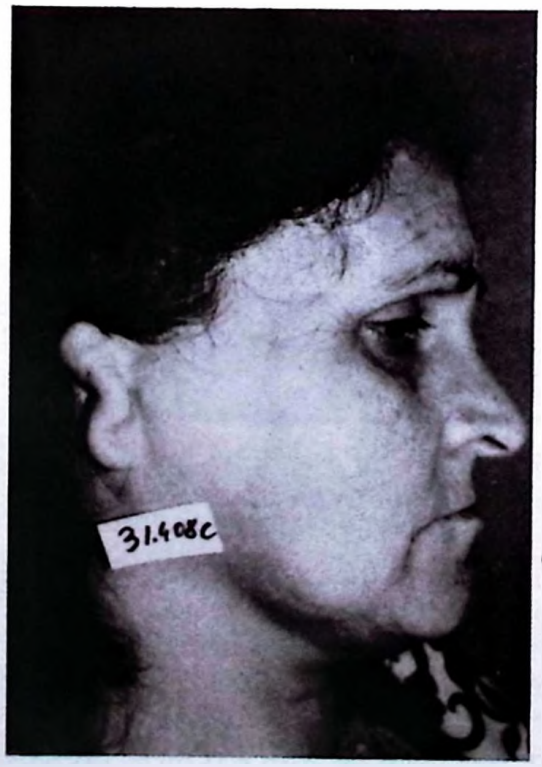

Fig. 5. The right-sided microtia of the paternal grandmother (Case III-3).

Orstavik et al.[3] reported right-sided microtia and conductive hearing loss with variable expressivity in three generations, and they suggested autosomal dominant inheritance as in our family. In our family the father had a slightly malformed ear cup, but his mother had unilateral right-sided microtia and meatal atresia and his son had bilateral microtia and meatal atresia. All three cases were affected in varying severity, confirming the autosomal dominant mode of inheritance with variable expression. At the same time, examples of transmission from mother to son, from father to son and from mother to daughter can all be seen within the same family, and this has not been reported before.

The fourth case in this family was the maternal grandmother of Case III-3. We could not obtain any photograph of her but she was said to have right-sided microtia and meatal atresia, as her granddaughter. However, her daughter was not affected and she had normal ears. Thus, the ear malformation in this family shows incomplete penetrance as well as variable expression. Generation skipping is another property of autosomal dominant diseases.

In a collaborative study, Castilla et al.[10] reported an incidence of syndactyly in 174 of 599,109 consecutive newborn infants (3 per 10,000). In 133, syndactyly was the only diagnosed anomaly. The most common type was isolated syndactyly of toes 2 and 3, the second most frequent form was isolated syndactyly of fingers 3 and 4, and the third was isolated syndactyly of toes 4 and 5[10]. All three fall into the category of type I syndactyly. However, association of type I syndactyly with microtia has never been reported previously.

Consequently, this is an interesting family with regard to the mode of inheritance of microtia and its association with type I syndactyly. In every case of microtia a detailed family history should be taken to determine other members of the family who might have milder or different forms of malformation. While doing so, one must keep in mind that generation skipping and variable expressivity are frequently seen in inheritance of familial microtia and external canal atresia. Awareness of this is also crucial for genetic counselling of these families.

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