

WAARDENBURG I SYNDROME: AN AUDIOMETRIC AND OPHTHALMOLOGICAL STUDY

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ABSTRACT

Audiometric and ophthalmological studies were performed in a large series of patients with Waardenburg I syndrome, belonging to two distinct Northeastern Brazilian kindreds. Sensorineural hearing loss of variable degrees was detected in a much higher percentage (67%) than that reported in the literature (36%).

INTRODUCTION

The association of congenital sensorineural deafness with telecanthus, hyperplastic nasal root and eyebrows and hypopigmentation, involving the skin, hair and eye, was first recognized as a specific syndrome in 1951 by Waardenburg. More than 1,000 published cases were mentioned in the review article by Hageman and Delleman (1977). Brazilian patients were reported by several authors (Basile, 1965; Oliveira and Garcia, 1968; Carakushanski and Berthier, 1975; Lessa and Carreirão, 1981; Ramalho and Arena, 1982; Romiti *et al.*, 1987; Antunes *et al.*, 1988). Waardenburg syndrome (WS) is genetically heterogeneous, encompassing two autosomal dominant types

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(Arias, 1971; Hageman and Delleman, 1977) and one possible autosomal recessive variant (Shah *et al.*, 1981; Farndon and Bianchi, 1983; Kulkarni *et al.*, 1989). Patients with the classical (waardenburg I) syndrome (WIS) have telecanthus and patients without this defect have Waardenburg II syndrome (WIIS).

Causative factors are identified in 60-80% of children with hearing loss (Lenzi and Zaghis, 1988; Newton, 1988). According to Nora and Fraser (1989), in about 80% of the cases of congenital deafness the etiology is monogenic. Among institutionalized individuals with congenital deafness, frequencies of WS varying between 0.9 and 3% were reported in several studies (Waardenburg, 1951; DiGeorge *et al.*, 1960; Partington, 1964; Reed *et al.*, 1967; Hageman, 1978; Sellars and Beighton, 1983). The specific auditory pathology of WS is not well defined. In some works (Jensen, 1967; Marcus, 1968), tomographic studies of the inner ear of deaf patients with WS showed hypoplasia of the cochlea, aplasia or hypoplasia of the posterior semicircular canal, abnormal vestibule and absence of the oval window. Nemansky and Hageman (1975) performed similar roentgenographic examinations in 24 WS patients (three with bilateral deafness, six with unilateral deafness and 15 without deafness) and reported a normal anatomic situation in all of them. The examination of the whole auditory pathway of an affected girl, who was profoundly deaf and who died at the age of 3^{1/2} years of bronchopneumonia, showed absence of the organ of Corti and atrophy of the spiral ganglion and nerve (Fisch, 1959). This report seems to be unique in the literature.

In this paper, we report the results of the audiometric and ophthalmological examinations performed in a large series of Northeastern Brazilian patients with WIS.

PATIENTS AND METHODS

A tone audiogram, by means of Dicton Cat and Peters audiometers, was performed on 39 Northeastern patients with WIS, belonging to two distinct kindreds, one from the State of Rio Grande do Norte (kindred 1, 23 patients) and the other from Pernambuco (kindred 2, 16 patients). Ocular examination (visual acuity, ocular motility, pupillary reflexes, biomicroscopy, tonometry, refraction and funduscopy) was performed on 30 patients of kindred 1 and 16 patients of kindred 2. The inner and outer intercanthal distances were measured in order to verify the presence of telecanthus.

The ages of the patients ranged from 3 to 72 years. The typical facies of four patients are shown in Figure 1.

The genetic aspects, other clinical data and the pedigrees of both kindreds are described in detail elsewhere (da Silva, in press).

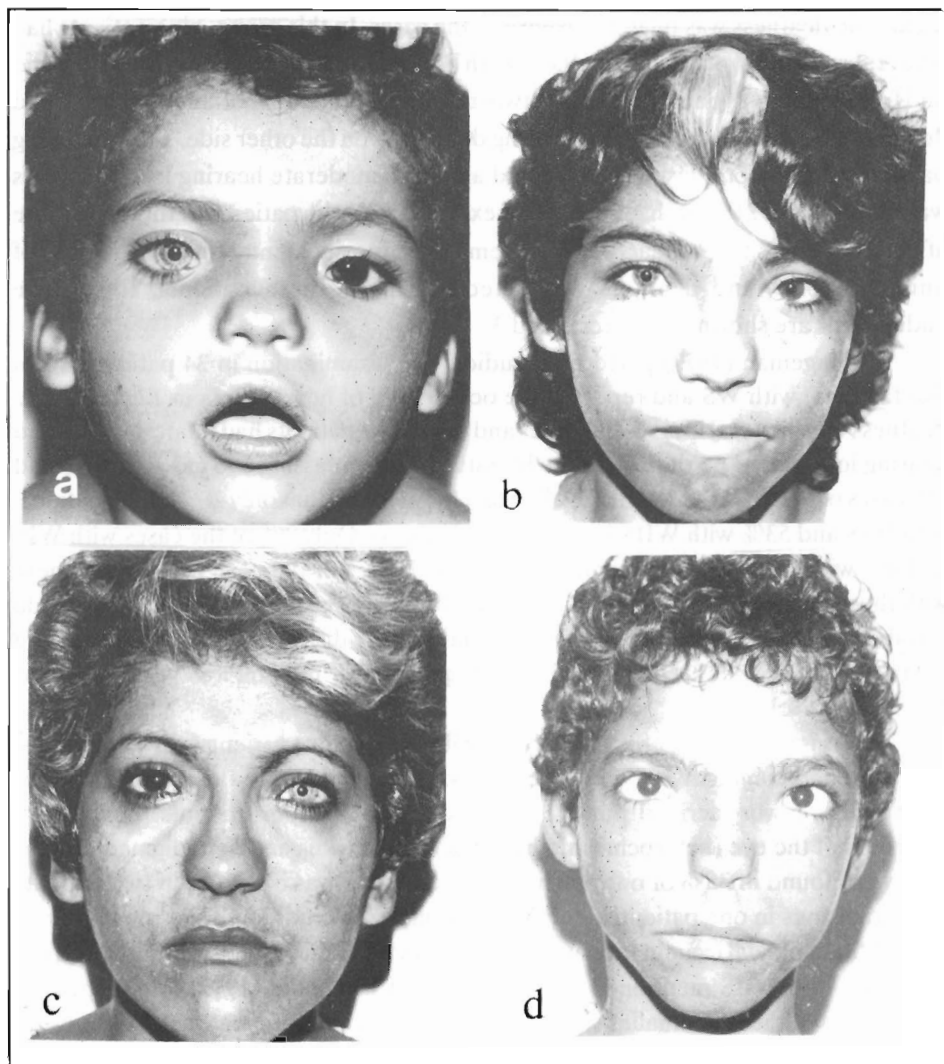


Figure 1 - Typical facies of four patients with Waardenburg I syndrome (*a* and *b* are members of kindred 1, and *c* and *d* are members of kindred 2). Note the presence of telecanthus in all of them, heterochromia iridis in three patients (*a*, *b* and *c*) and white forelock in two (*b* and *c*).

RESULTS AND DISCUSSION

Hearing loss is the most serious symptom of WS. Among the 39 investigated patients, sensorineural hearing loss of variable degrees was detected in 26 (67%) of them. The deafness was bilateral in 46% of the cases. In this group, nine patients had bilateral congenital profound deafness, with bilateral hearing remnants in the low and mid frequency areas being detected in two individuals, and four patients had profound deafness in one ear and moderate hearing deficiency on the other side. The remaining patients with bilateral lesions manifested a mild to moderate hearing loss. Deafness was unilateral in 21% of the cases. In all except one of the patients in this group, the affected side was the left ear, but this seems to be a coincidental finding. No case of unilateral profound deafness was detected among these patients. Illustrative audiograms are shown in Figures 2 and 3.

Hageman (1977) performed audiometric examination in 34 patients (from five families) with WS and reported the occurrence of hearing loss in 12 cases. The deafness was bilateral in six of these cases and only three patients had bilateral profound hearing loss. Based on data from the literature, encompassing 276 cases of WIS and 159 cases of WIIS, Hageman and Delleman (1977) found that only 28% of the patients with WIS and 53% with WIIS had bilateral deafness. Only 8% of the cases with WIS and 4% with WIIS had unilateral hearing loss. Thus, our data are not in agreement with those described in the literature. This difference is probably related to the wide variability in the expressivity of WS, especially when distinct affected kindreds are compared. In our kindreds 1 and 2, the frequencies of hearing loss were 78% and 50% respectively.

As is expected in affected persons with WIS, all our patients had telecanthus. Epiphora and conjunctivitis were frequent symptoms related to the lateral displacement of the lower lacrimal puncta observed in most of our patients. Pigmentary disorders of the eye (heterochromia/hypoischromia iridis and hypopigmented fundus) were found in 35% of our patients. Iris coloboma was observed in two patients and strabismus in one patient, all of them belonging to kindred 1. The remainder of the ophthalmological examination was normal. Among the 276 cases with WIS and the 159 cases with WIIS mentioned by Hageman and Delleman (1977), the respective frequencies of these anomalies were 40% and 46%. Iris coloboma was also reported by Waardenburg (1951) in his original publication. Delleman and Hageman (1978) performed ophthalmological examination on 26 patients, 23 with WIS and three with WIIS, and reported the occurrence of convergent strabismus in five of them. The authors considered the frequency (19%) higher than in the general population and

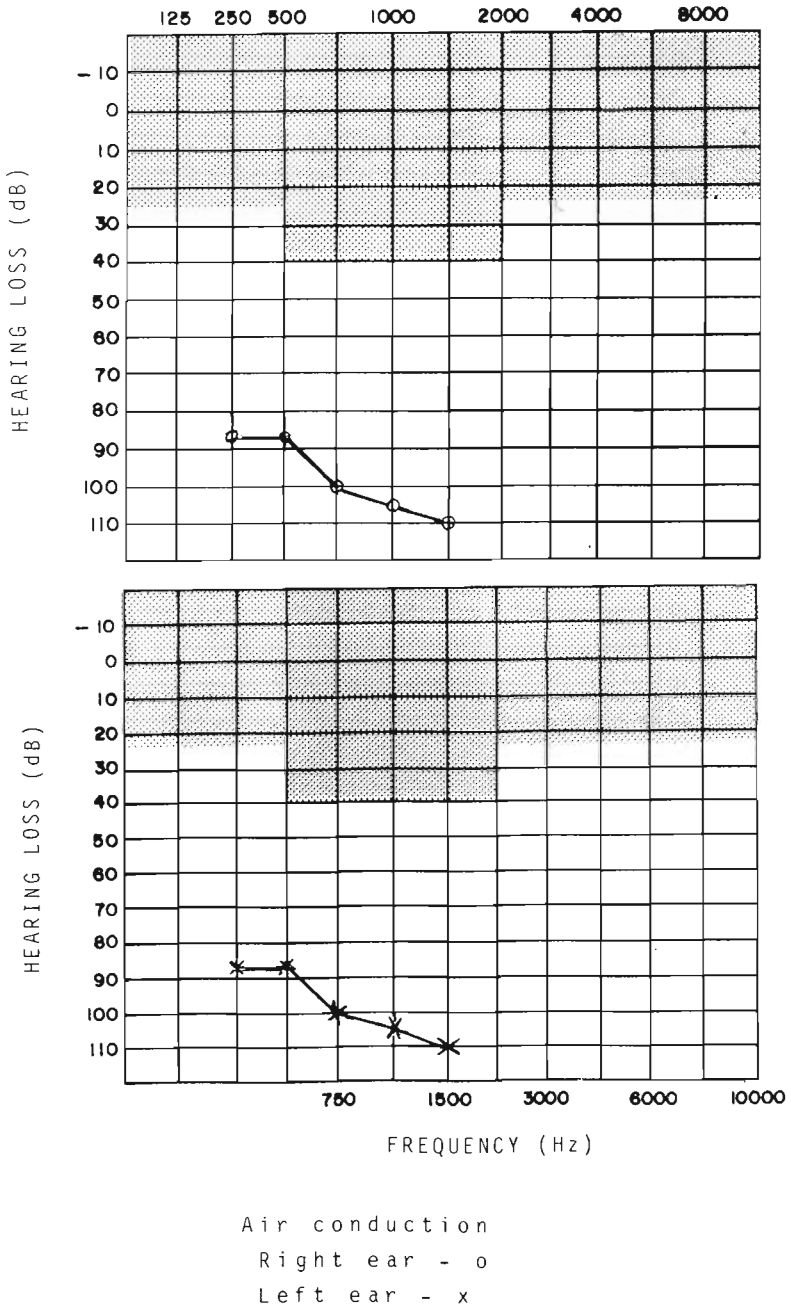


Figure 2 - Tone audiogram showing bilateral profound hearing loss in a patient of kindred 1.

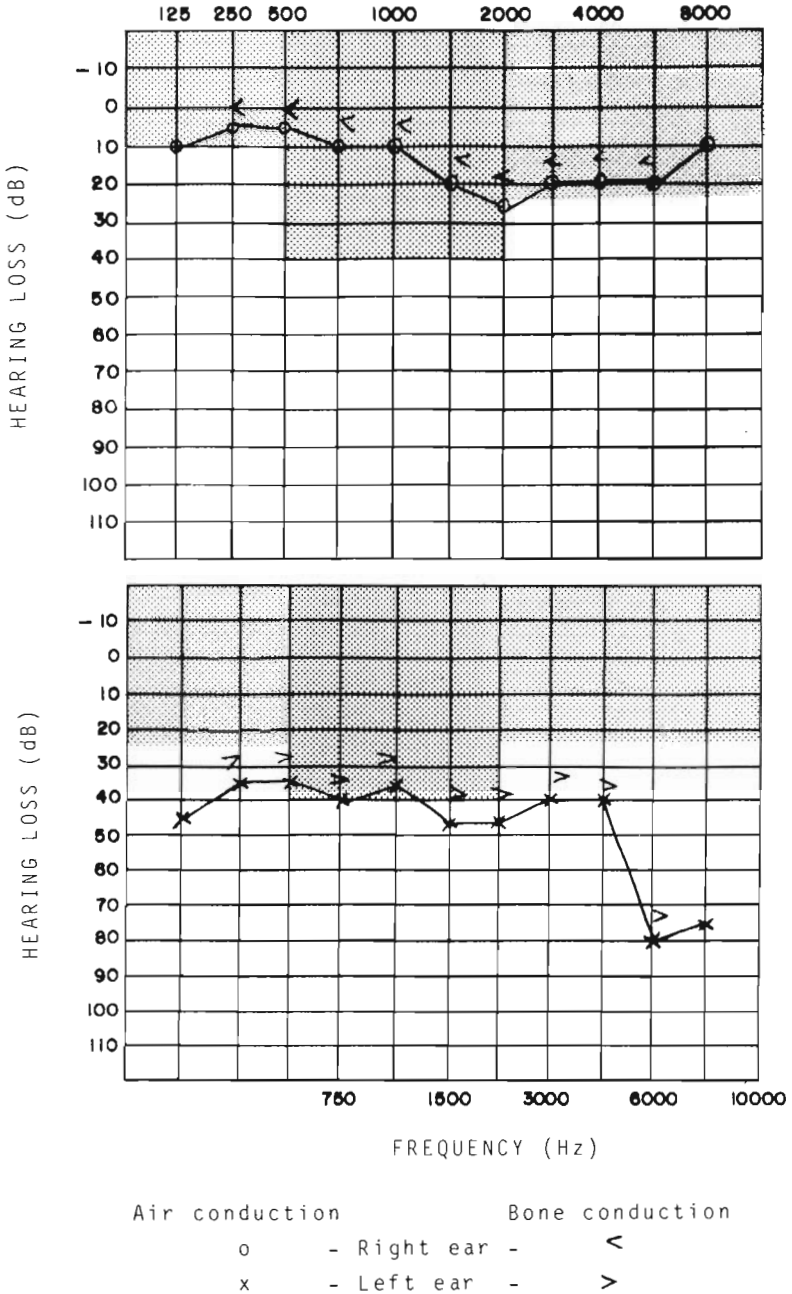


Figure 3 - Tone audiogram showing unilateral sensorineural hearing loss (left ear) in a patient of kindred 2.

suggested that this may indicate a relationship between strabismus and WS. However, our data do not support this conclusion.

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RESUMO

Estudos audiométricos e oftalmológicos foram realizados em um grande número de pacientes com a síndrome de Waardenburg I, pertencentes a duas famílias nordestinas distintas. Deficiência auditiva neurossensorial de graus variáveis foi detectada em nossos pacientes com uma porcentagem muito mais alta (67%) do que a relatada na literatura (36%).

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