



Brazilian Journal of OTORHINOLARYNGOLOGY

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CASE REPORT

Unilateral malformation: adaptation of the frequency modulation system ☆,☆☆



Malformação unilateral: adaptação do sistema de frequência modulada

Maria Fernanda Capoani Garcia Mondelli^{a,*}, Regina Tangerino de Souza Jacob^a,
Larissa Germiniani dos Santos^b, Vanessa Luiza Destro Fidêncio^b

^a Faculdade de Odontologia de Bauru, Universidade de São Paulo (USP), Bauru, SP, Brazil

^b Post-Graduate Program in Speech Therapy, Faculdade de Odontologia de Bauru, Universidade de São Paulo (USP), Bauru, SP, Brazil

Received 16 September 2014; accepted 23 November 2014

Available online 14 January 2015

Introduction

Sensory deprivation due to a unilateral ear malformation can result in a delay in the acquisition and development of language, affecting the individual's social, psychological, and educational development.¹

Ear malformations are abnormalities that occur during the embryonic development period and may affect the external, middle, and/or internal ear. Hearing loss is one of the most common clinical findings in these patients, which may vary in type and degree, depending on the degree of involvement.¹

Among the most common complaints reported by individuals with unilateral hearing loss are the difficulty in understanding speech in noisy environments and, consequently, a greater effort in the school environment.²

In these cases, the intervention consists of providing sound amplification to favor auditory stimulation; thus,

there are new alternatives such as the bone conduction hearing aid, the bone anchored hearing aid (baha), and the frequency modulation system (FM).

The FM system allows sending wireless sound information, causing the signal received by the transmitter microphone to be sent directly to the individual, eliminating the loss of auditory information caused by the distance from the sound source and background noise.

This clinical study evaluated the effectiveness of the FM system in a case of unilateral malformation.

Case presentation

K.A.S., born on 08/16/2002, has severe malformation and hearing loss on the right. In 2013, she sought help due to the difficulty in understanding speech in the classroom. She underwent FM system adaptation (PHONAK) with ISense™ receiver and Inspiro™ transmitter on the left ear (normal hearing).

System check was carried out using the following procedures:

1. Hearing in noise test (HINT): adaptive speech perception test, which requires the individual to recognize and repeat simple sentences in silence and in noise, performed according with the recommendation of the AAA (American Academy of Audiology) guide³ at 180°.

☆ Please cite this article as: Mondelli MF, Jacob RT, dos Santos LG, Fidêncio VL. Unilateral malformation: adaptation of the frequency modulation system. Braz J Otorhinolaryngol. 2015;81:222–3.

☆☆ Institution: Faculdade de Odontologia de Bauru, Universidade de São Paulo, Bauru, SP, Brazil.

* Corresponding author.

E-mail: mfernandamondelli@hotmail.com (M.F.C.G. Mondelli).

Table 1 Results of the hearing in noise test.

HINT 180°	Silence	Noise
Without FM	42.1 dBA	−4.7 S/N dB
With FM	39.8 dBA	−15.7 S/N dB

HINT, hearing in noise test; FM, frequency modulation system; dB, decibel; dBA, A-weighted decibel; S/N, signal/noise ratio.

- Classroom participation questionnaire (CPQ): subjective evaluation of student participation in the class,⁴ completed by the students themselves. The questionnaire contains 28 listening situations, divided into four subscales, which are scored as 1 (almost never); 2 (sometimes); 3 (normal); and 4 (almost always).

The results indicated that after the use of the FM system for a period of three months, the score regarding “teacher understanding” increased from 16 to 24, “student understanding” increased from 8 to 13, “positive aspects” increased from 9 to 15, and “negative aspects” decreased from 16 to 12, indicating the patient’s participation improvement in class (Table 1).

Discussion

The patient had learning difficulties as a result of hearing loss secondary to her ear malformation. Environmental noise hinders oral communication and can generate physical, emotional, and educational losses, in addition to losses in learning, as the student may miss some of the content that is taught, or even receive a distorted message.

The greatest benefits of the FM system can be observed in the academic environment, as it ensures the best access to information and knowledge that is transmitted directly to the auditory sensory device.

Based on the results, it was observed that the patient showed satisfactory performance at the HINT, confirming the FM system’s proposal to improve the signal-noise ratio, corroborating data from a study performed with a population aged 7–13 years.⁵

The CPQ score indicated benefits in the classroom, as higher scores are desirable, except for the “negative aspects” scale, in which an inverted score is expected.

Individuals with unilateral hearing loss have hearing difficulties and can benefit from amplification⁶ and, among the possibilities, from the FM system.

Final comments

The FM system facilitated the perception of speech and participation in class.

Conflicts of interest

The authors declare no conflicts of interest.

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