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The assessment of the Newborn Hearing Screening Program in the Region of Murcia from 2004 to 2012

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ABSTRACT

Objectives: Newborn (NB) auditory deficit has a prevalence of 1–2% in the world. Since the 1990s different screening programs have been put into practice. The Newborn Hearing Screening Program has been in operation since 2002 in our hospital (HCUVA) in Murcia (Spain) and two years later it was introduced into the whole of the Autonomous Community of the Region of Murcia as part of universal healthcare. The objective of this study was to analyze and assess its results.

Method: The newborn (NB) population is divided into two groups: not-at-risk NBs and at-risk NBs. In the first case we carry out acoustic otoemissions (AOEs) 48 h after birth and depending on the result the child is either discharged or, in negative cases, the infant undergoes a series of tests in a period of 30–45 days to confirm or rule out the existence of hearing anomalies.

In the at-risk group we combine AOEs with brain trunk potentials (BERA) following the stages in a decision tree diagram similar to the ones for not-at-risk children in order to provide a clinical diagnosis in the first three months of life.

Results: The screening performance was assessed for the 156,122 children studied, of which 151,258 belonged to the group of not-at-risk children; and 4864 to the group at risk of hypoacusia. As a result of the screening only 410 (0.26%) were sent to consultation, 213 in the not-at-risk group (0.14%) and 197 (24.7%) in the at-risk group. A total of 7452 false positives were identified (4.7%), 6951 (4.5%) in the not-at-risk group; and 501 (10.3%) in the group with risk factors; and there were 53 false negatives (0.03%). Sensitivity in the screening program was 88.5%, with a specificity of 95%.

Conclusions: The Region of Murcia has a Newborn Hearing Screening Program with tests that provide a high level of sensitivity and specificity in accordance with the findings of the literature. Our results endorse the program and the patients were treated in a way that met the objective of providing a correct diagnosis and the appropriate therapeutic action.

1. Introduction

The diagnosis and treatment of hypoacusia is, in many cases, very complex. If hypoacusia is the only disease the child has, that is, it is isolated, the diagnosis is very difficult; whereas if it presents associated with other problems, it is occasionally underestimated or ignored. This problem is even more serious if we consider that severe consequences can be prevented if the hearing problems are dealt with at an early stage [1–3].

The prevalence of this disease is between 1 and 2% in the whole world. Therefore, it is very important to detect and treat it early on, basing treatment on the application of a program for the early detection of hypoacusia, as a part of universal healthcare, and providing even more care in the case of children with risk factors for hypoacusia [4–6].

For many years, the professionals involved, otorhinolaryngologists and pediatricians, as well as the families of the Spanish Confederation of Families of the Deaf (FIAPAS) [7], all made an absolute commitment to the early diagnosis of deafness and undertook a collaborative joint study to introduce comprehensive

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hearing *screening* as part of universal healthcare in our country. In the year 2000, the Spanish Commission for the Early Detection of Hypoacusia (COPEDEH) presented the protocol for the early detection and diagnosis of hearing loss in children before the National Healthcare Council [8]. This scientific study culminated in the design of the Program for the Early Detection of Infant hearing loss, which was finally approved by the Plenary meeting of the Inter-territorial Healthcare Council in 2003, for its implementation in the whole country. The COPEDEH then issued a document entitled "*Quality control in a Program for the Early Detection and Treatment for Hypoacusia in newborns*", that establishes quality standards for each one of the phases of these programs: detection, intervention and follow-up, both at a quantitative and qualitative level. And, together with the Ministry for Health and Consumption, the "*White Paper on Hipoacusia. The Early Detection of Hypocausia in newborns*." *was published.* Recently, using the experience accumulated during the development of the Program, the COPEDEH [9] has issued a new document of recommendations related to the implementation of early detection programs, with different updated elements regarding screening, diagnosis, treatment and follow-up, and also the quality of the program, as well as offering operational proposals regarding its organization and implementation.

In the year 2000, the Otolaryngology (ENT) Service at the Hospital Clínico Universitario "Virgen de la Arrixaca" (HCUVA) was given the task of putting into place a Universal Regional Hypoacusia *Screening* Program in the Region of Murcia. Our Region is divided into nine healthcare areas with a total population of 1,600,000 inhabitants.

2. Material and method

The key aspect in the process for identifying patients with hypoacusia is the Program for the Early Detection of Hypoacusia in the Region of Murcia. Its main characteristics are its universal coverage, covering both public and private maternity units; and that all the data are reported to the HCUVA and the Local Healthcare Authority thanks to a online system that has been established in all hospitals from outlying ones to the HCUVA (Fig. 1). The following quality criteria were established for the program: to study both ears in at least 95% of all children; all cases of audition >40 dB should be detected (or at least 80% of them); to have a rate of false positives equal to or lower than 3% and the rate of false negatives at 0%; and to have a revision of hearing loss study and diagnostic confirmation rate of <4%.

Using this program it was intended to detect deafness in the first days of life through hearing *screening* carried out on all newborns and based on the application of 2 techniques: acoustic otoemissions (AOE), and brainstem auditory-evoked potentials (BERA). The implementation of these techniques should allow us to detect any hearing problem before the 1st month of life, its diagnosis before 3 months, and to allow audio-prosthetic and logopedic intervention after about 6 months [4,5,8].

All maternity units in Murcia were provided with a transient-evoked acoustic otoemissions apparatus, the Ecocheck® model by the GAES company, with the test being carried out in the first 48 h of the newborn's life. The discharges at the weekend were corrected by the child being given an appointment on the following Monday afternoon, thus preventing the loss of cases.

AOE's are objective, and can only be positive (green) or negative (red). In the negative cases, uni or bilateral ones, the international indications were followed, and these were later adopted by the National Healthcare System, with the test being repeated a month later. If at this point it changed to positive, the discharge was given and the newborn was monitored by the pediatrician, but if it remained negative another appointment was made two months later with new otoemissions and a BERA was requested together with an appointment with the pediatric otolaryngologist. If the negativity of the otoemissions with normal BERA persisted, the normality in hearing was explained to the parents and the child was remitted to the pediatrician. If the BERA was pathological, the type of hypoacusia was determined, if possible, and both the treatment to be followed and the child's follow-up were indicated (Fig. 2).

In the case of children with risk factors, the *screening* protocol is different because, together with the otoemissions, there is an automatic request for the BERA and an appointment with the otolaryngologist, proceeding to a protocol that is similar to that of normal cases depending on the results of the tests.

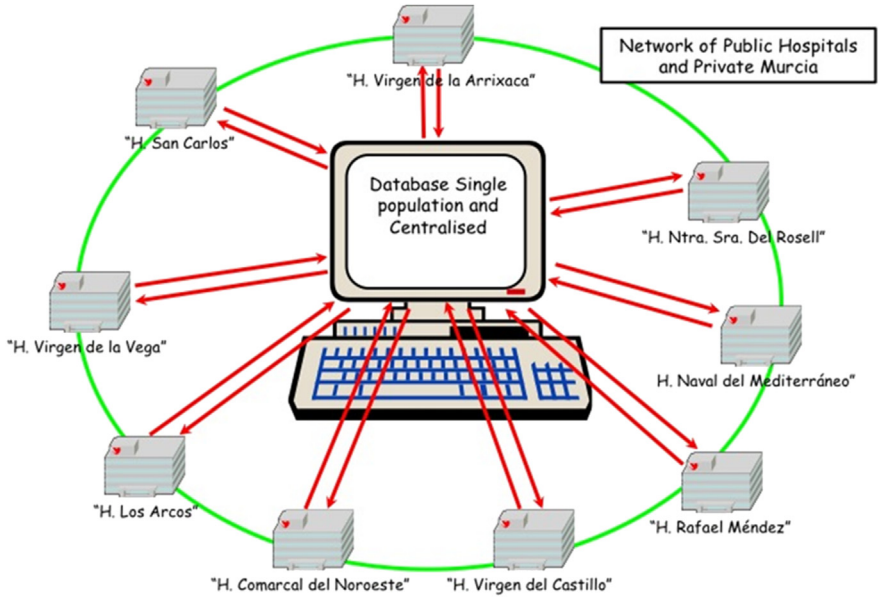

Fig. 1. Diagram showing the operational structure of the data network for the neonatal *screening* program in the Region of Murcia.