BIAP Recommendation 12/8

Part 12/8.0 Audiometric procedures in the first year of life Introduction and Overview

General foreword

This document presents a Recommendation by the International Bureau for Audiophonology BIAP. A BIAP Recommendation provides a reference standard for the conduct of an audiological or phonological intervention that represents, to the best knowledge of BIAP, the evidence base and good practice concerning the stated methodology and scope of the document at the time of publication.

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Comments on this document are welcomed and should be sent to the Secretary-General of the International bureau for Audiophonology BIAP. The address can be found on the BIAP website at www.biap.org.

Introduction

Most UNHS screening programs require a full diagnostic assessment for children, who failed the screening as early as possible before 3 months of age and the beginning of early intervention and hearing aid fitting as soon as possible at least before the age of 6 months. As babies at that age cannot actively cooperate in the assessment and intervention process, the diagnostic and intervention process needs a maximum of professional expertise and experience as well as a close cooperation of different professionals and institutions (s. BIAP Recom. 12/5).

To make the early diagnosis of a hearing loss as reliable as possible all diagnostics means have to be utilized. Additional challenges in the assessment process can be:

- Persisting middle ear ventilation problems
- Very narrow and even collapsing ear canals
- Maturation problems of the auditory pathways
- Dyssynchrony of the fibers in the auditory pathways
- Auditory synaptopathie
- ABR limitations because of a limited measuring time interval as the child awakes to early, restless child, lack of proper sedation, internal and external artifacts, technical limitations for a frequency specific ABR threshold especially <1000Hz or for bone conduction ABR measurements (including unsolved calibration issues) ….
- Interfering additional health problems
- Additional constrains of the family, like time, financial, emotional, cultural …
- Accessibility of diagnostics centers: getting a timely appointment, distance, means of transport, language …

The aim of this paper is it to recommend best practice guidelines for the diagnostic procedures involved in the audiological assessment and hearing aid fitting process of babies after UNHS. Any of these procedures provides another valuable piece of the diagnostic puzzle. The professionals should be able to select the procedures that are adequate to the developmental age of the child. At the end of the diagnostic process the professionals should be able to fit the different pieces of information together to form a meaningful picture of the child's hearing capacities and the family's ability to cope with the situation. It is also the task of the professional to recognize mismatches in the diagnostic results and add meaningful further testing to resolve the mismatches.

Fig1.: Example how to summarize and crosscheck the hearing test results of a child with a moderate-severe hearing loss:

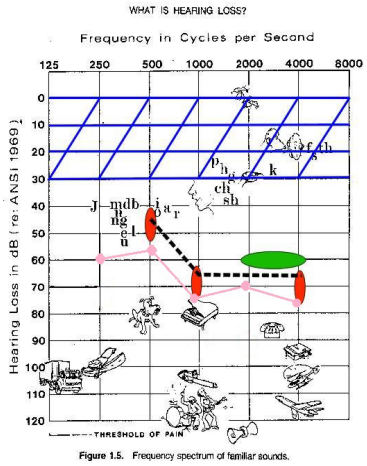


Figure based on Figure 1.5 from JL Northern, MP Downs, Hearing in Children, Williams&Wilkins, 1979

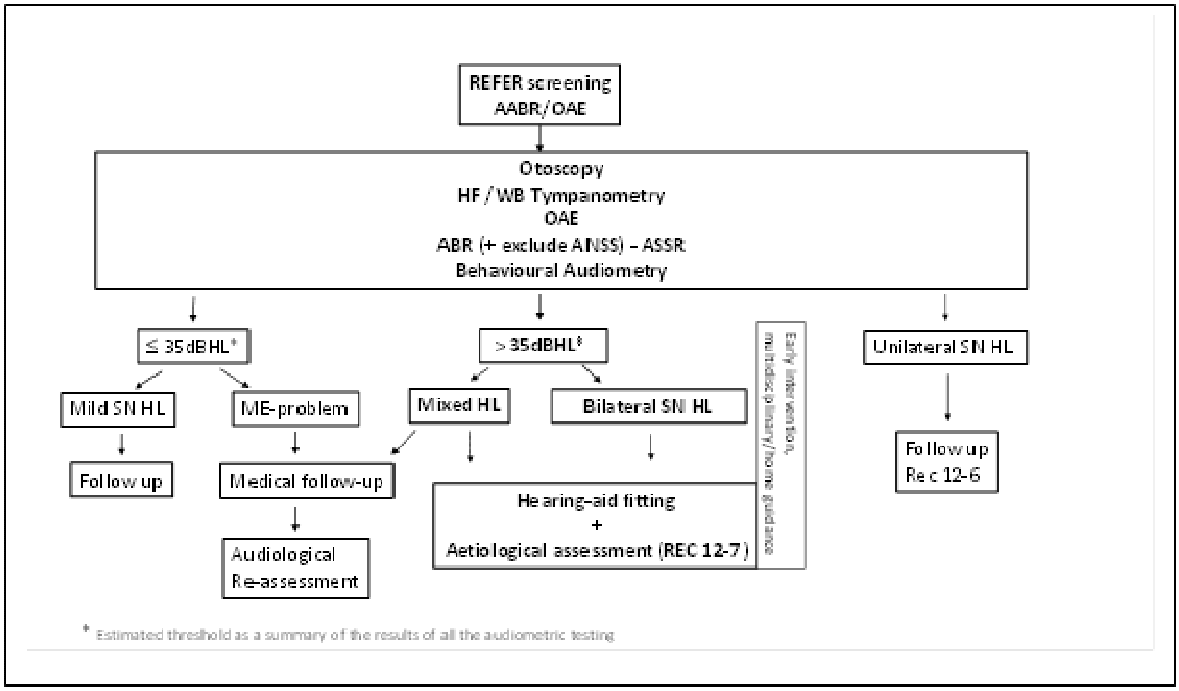
Developmental age 0-6 month

The early diagnosis and the early hearing threshold are based on a meaning set of diagnostic test results, like:

OAE
Click-ABR
frequency specific ABR
BOA subjective reactions

With such an approach a "Working Diagnosis" or a "Diagnosis in Progress" can be achieved for most of the children even before the of age 3 month that is reliable enough to provide a hearing threshold that can be used to start a hearing aid fitting and an early intervention. But all test results have to be confirmed during an ongoing assessment and rehabilitation process. Keep your mind always open to sudden new and unexpected results. For this recommendation, we consider an estimated threshold of more than 35dB for a child younger than 6 months as a cut-off level for considering a hearing aid fitting.

Fig. 2 Flowchart: Audiological assessment after UNHS to determine the hearing threshold of children 0-6(12) month with a hearing loss of more than 30 dB, which may need amplification



The diagnostic procedures that will be described in this recommendation are:

1. Diagnostic options at the age of 0-6 month:
    1. otoscopy or preferable: ear microscopy
    2. impedance measurement
        a. tympanometry 1000 Hz
        b. Wide Band tympanometry
        c. stapedius reflexes
    3. otoacoustic emissions
        a. TEOAE,
        b. DPOAE
    4. ERA
        a. Click-ABR
        b. frequency specific ABR (AC and BC)
        c. ASSR

    5. Behavioral observation audiometry (BOA)
    using unconditioned and conditioned behavioral reactions to sound
        a. bone conduction
        b. insert earphones
        c. aided hearing reactions (if a hearing loss is confirmed and the child is fitted with hearing aids)

2. Additional diagnostic options at the age of 6-12 month:
    1. Visual reinforcement audiometry (VRA) to achieve a reliable hearing threshold using behavioral reactions to sound conditioned by highly attractive visual reinforcers (like well-lit moving toys behind a smoke glass screen or video-clips)
        a. loudspeaker
        b. insert earphones if possible coupled to the child´s ear mould
        c. aided thresholds
    2. speech sound detection and discrimination, e.g.: A§E with an oddball-paradigm and VRA

Abbreviations:

ABR; Click-ABR: Auditory Brainstem Response; Click evoked ABR

AC: Air Conduction

ASSR: Auditors Steady State Response

A§*E*®: Auditory Speech Sounds Evaluation

BC: Bone Conduction

BOA: Behavioural Observation Audiometry

ERA: Evoked Response Audiometry

OAE; TEOAE; DPOAE: Otoacoustic Emissions; Transient-OAE; Distortion Product-OAE

UNHS: Universal Newborn Hearing Screening

VRA: Visual Reinforcement Audiometry

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This recommendation was created and approved in a multidisciplinary cooperation between professionals of all audiophonologic disciplines, which are medicine, pedagogy, speech therapy, psychology and hearing instrument audiology.

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