Guidelines in Sudden Sensorineural Hearing Loss

Thierry MOM
CLERMONT-FERRAND (France)
IFOS COURSE
HO CHI MIN CITY
NOVEMBRE 2019
DEFINITION AND BACKGROUND

• SUDDEN SENSORINEURAL HEARING LOSS $\geq 30$dB
• EXCLUDE ALL CASES OF ACTIVE OTITIS MEDIA
• THE CAUSE IS MOST OFTEN UNKNOWN

• 45-55 YO M $\approx$ F, NORMAL TYMPANIC MEMBRANE
• WITH OR WITHOUT VERTIGO

• SPONTANEOUS RECOVERY CAN OCCUR
  • 1/3 OF CASES FOR Ortman and Nelly 2012
  • SOMETIMES LATE SPONTANEOUS RECOVERY: 9 MONTHS (Ortman and Nelly 2010)
DEFINITION AND BACKGROUND

• SEVERITY OF INITIAL SNHL IS CORRELATED WITH PROGNOSIS
  • THE POORER THE HEARING, THE POORER THE CHANCE OF RECOVERY

• THIS HETEROGENICITY MAKES THE ANALYSIS OF OUTCOME DIFFICULT TO
  ACHIEVE AND THE THERAPEUTIC RATIONALE DIFFICULT TO CHOOSE

• AT IFOS MEETING IN PARIS (2017) AN ATTEMPT OF CONSENSUS HAS BEEN
  DRAWN: INSISTING ON THE HETEROGENICITY OF CAUSES RENDING
  DIFFICULT THE MANAGEMENT
FIRST IMPORTANT QUESTION: WHICH PART OF THE AUDITORY PATHWAY IS ALTERED?

• Huge heterogenicity of causes due to the different deleterious mechanisms

• **COCHLEA**: Stria vascularis, organ of Corti (OHCs or IHCs), membranes and gap junctions, homeostasis of fluids (hydrops)

• **SYNAPTIC RIBBON**

• **ACOUSTIC FIBERS**

• **CENTRAL PATHWAYS**
THE COCHLEA
WHICH EXPLORATIONS? First: AUDIOLOGIC TESTING

PTA but also speech discrimination
An approx. same level of hearing loss can be associated with a quite different discrimination

For example here: lack of tuning (OHCs)?
Or acoustic distortion due to acoustic fibers dysfunction
Acoustic facial reflex

• If there is no facial paralysis, and SNHL: excellent test of the acoustic nerve.
  • Absence of AFR suggests alteration of acoustic nerve
  • Presence of AFR is likely due to alteration of cochlea

• Even though it is not very specific, it is a noninvasive test very simple to achieve
Auditory Brainstem Responses (ABRs)

• Test the whole peripheric auditory function
• Here, in moderate SNHL, likely point to alteration of acoustic nerve
Otoacoustic emissions - OAEs

• Generated by OHCs

• Presence of OAEs in case of SNHL suggests:
  • Either a simulator
  • Or a retrocochlear cause without ischemia
  • Fine analysis of phase spectrum: hydrops
WHAT ABOUT VESTIBULAR FUNCTION?

• SAME BLOOD SUPPLY:
• DELAY VERTIGO: sudden deafness followed by BPPV preceding brainstem infarction
• Sensitive to same virus (VZV, Ramsay Hunt syndrome, Sicard syndrome)
• Same peripheric nerve pathway: cochlear vestibular nerve: alteration of one nerve can altered function of the other.
Shared blood vessels
same nerve pathway

[Anatomy of the vestibulo-acoustico-facial neurovascular pedicle. Importance of therapeutic management of vestibular schwannomas].

Mom T, Gabrillargues J, Gilain L, Chazal J, Kemeny JL, Vanneuville G.

CARDIOVASCULAR EXPLORATION

• Kim JY et al, 2018: JAMA oto: [OR = 2.02; CI 95%; 1.16-3.51] to have stroke compared to controls, after SNHL in long follow-up

• FORAMEN OVALE: heart echography
• CARDIAC ARYTHMIA: electrocardiogram
• THROMBOSIS (VERTEBROBASILAR SYSTEM): echography or angiography of supra aortic arteries
• AUTO-IMMUNE ANTIBODIES (ANTI PHOSPHO LIPID): serum level
IMAGING: very important
Bilateral vestibular schwannoma revealed by LEFT sudden SNHL (deafness)
LEFT SUDDEN DEAFNESS: INFECTIOUS LABYRINTHITIS
MRI Axial Flair T1 WITH GADOLINIUM: HIGH SIGNAL OF LANYIRNTHINE STRUCTURES
LEFT SUDDEN DEAFNESS : INFECTIOUS LABYRINTHITIS
MRI 3D T2: LOSS OF LABYRINTHINE FLUID SIGNAL
MANAGEMENT of sudden SNHL

• FIRST: confirm sudden SNHL and try and spot the altered site
  • audiologic explorations
  • Vestibular explorations
  • Cardiologic investigations
  • Dedicated imaging (MRI, sequences T1 flair)
  • Exhaustive inflammatory blood work
  • IMAGING: CEREBRAL and CPA MRI AND

• SECOND: Importance of early treatment: functional exploration must not delay treatment onset
<table>
<thead>
<tr>
<th>SUDDEN SNHL</th>
<th>FUNCTIONAL EXPLORATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTA AND SPEECH DISCRIMINATION</td>
<td>ALWAYS</td>
</tr>
<tr>
<td>REFLEXE ACOUSTICO FACIAL REFLEX</td>
<td>ADVISED</td>
</tr>
<tr>
<td>ABRs</td>
<td>ALWAYS</td>
</tr>
<tr>
<td>OEAs / (ECOG)</td>
<td>ALWAYS</td>
</tr>
<tr>
<td>MRI</td>
<td>ALWAYS</td>
</tr>
<tr>
<td>CARDIOVASCULAR EXPLORATION</td>
<td>ALWAYS</td>
</tr>
<tr>
<td>SYSTEMIC BLOOD WORK</td>
<td>ALWAYS</td>
</tr>
<tr>
<td>SEARCH FOR INFECTION VIRAL OR BACT</td>
<td>IF CLINICAL SUSPICION</td>
</tr>
</tbody>
</table>
ETIOLOGIES

• Possible causes are numerous:
  • Vascular accident:
    • Inflammatory process
    • Auto-immun disease
    • Tumor
  • Genetics: revelation of cochlear fragility
TREATMENT

• CORTICOIDS: reference even though there’s no strong evidence proving their efficacy

• Clinical Practice Guideline of the AAO-HNS
  • Vasoactive drugs, thrombolytics, antioxydants ou antiviral drugs have no evidence of effectiveness

Rationale for corticoids in sudden SNHL

• Most of etiologies can respond to corticoids
• Oral administration is simple (but side effects possible)
• Clinical series seems to show that corticoids are effective
  • Evidence limited by heterogenicity of population (etiologies)
  • Dose-effect might have an impact on outcome
  • Intratympanic treatment is rather recent but seems to be effective

• Other treatments? transtympanic genic thérapy?
PRACTICAL GUIDELINES FOR USE OF CORTICOIDs

• SYSTEMIC ADMINISTRATION: &MG/KG/D 7-10 DAYS (NOT IN DIABETES PATIENTS)

• OR INTRATYMPANIC: 1-5 CONSECUTIVE ITT

• OR BOTH
Local Anesthesia, oxybuprocaïne +/- Bonain Needle for Lumbar puncture long enough, to bend it

Myringotomy: large, radial, postero-inferior
-Air of cavum tympani will be chase out of the ear through the large myringotomy during ITT
-TM closed in 5-7 d

Patient in decline position, No swallowing for 10-30 mins. 5 ITT (1/d) consecutive
Intratympanic treatment (ITT)

- corticoids
  - Dexaméthasone
  - Méthylprednisolone: PLUS DL

- ITT of corticoids:
  - in case of failure of oral corticoids (salvage treatment)
  - In case of contraindication to systemic steroids
  - In case of severe to profound deafness
**ITT or systemic corticoids first**

*Rauch et al. JAMA 2011*: prospective, multicentric, randomized study; ≥18 yo; M/F 1.5/1. < 14 jours

<table>
<thead>
<tr>
<th>Groupe</th>
<th>Oral</th>
<th>ITT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>Prednisone 60mg/d for 10d then 5d regression</td>
<td>4 ITT méthylprednisolone 40mg/ml in 2 weeks</td>
</tr>
<tr>
<td>n</td>
<td>121</td>
<td>129</td>
</tr>
<tr>
<td>PTA threshold</td>
<td>86.7 dB</td>
<td>86.4 dB</td>
</tr>
<tr>
<td>% discrimination</td>
<td>14.0%</td>
<td>15.9%</td>
</tr>
<tr>
<td>Recovery ≤ 30 dB</td>
<td>20.7%</td>
<td>24.8%</td>
</tr>
<tr>
<td>recovery 30-90 dB</td>
<td>66.9%</td>
<td>62.0%</td>
</tr>
<tr>
<td>NO recovery (&lt; 10 dB)</td>
<td>15.7%</td>
<td>23.3%</td>
</tr>
<tr>
<td>Average recovery</td>
<td>30.7 dB</td>
<td>28.7 dB</td>
</tr>
<tr>
<td>Side Effects</td>
<td>Mood alteration, sleep disorders, appetite, ↑Na+, oral dryness, ↑ body weight</td>
<td>Otalgia, pain during ITT, vertigo, infection, tympanic membrane perforation (3.9%)</td>
</tr>
<tr>
<td>Cost</td>
<td>&lt; $ 10</td>
<td>$ 688 (+4 consultations, transportation, inconfort)</td>
</tr>
</tbody>
</table>
What about combined treatment?

- **Battaglia et al. Otol Neurotol 2014**
  - prospective, multicentric (n=139), SNHL (class C or D) < 42d
  - Treatment
    - 2004-2007 (n=59): oral corticoids (60mg/d x 7d then ↓ during 7d)
    - 2008-2012 (n=80): combined Treatment (oral idem + ITT DXM 10mg/ml 3 ITT /week)

<table>
<thead>
<tr>
<th>Group</th>
<th>Oral corticoids ≤ 7d (mean 3.6 d)</th>
<th>combined corticoids ≤ 7d (mean 3.6 d)</th>
<th>Oral corticoids &gt; 7d (mean 16.6 d)</th>
<th>combined corticoids &gt; 7j (moy 16.6 d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTA gain</td>
<td>17,6 dB</td>
<td>39,8 dB</td>
<td>4,4 dB</td>
<td>20,0 dB</td>
</tr>
<tr>
<td>discrimination gain</td>
<td>29,3 %</td>
<td><strong>58,4 %</strong></td>
<td>6,3 %</td>
<td><strong>28,7 %</strong></td>
</tr>
<tr>
<td>post treatment class</td>
<td>C</td>
<td>B</td>
<td>D</td>
<td>D</td>
</tr>
</tbody>
</table>

⇒ **combined corticoids** more effective than coral corticoids
⇒ Effectiveness depends on delay of treatment
What about combined treatment?


<table>
<thead>
<tr>
<th>Groupe</th>
<th>Oral corticoids (n=144)</th>
<th>Combined treatment (n=60)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete recovery</td>
<td>34%</td>
<td><strong>55%</strong></td>
</tr>
<tr>
<td></td>
<td><img src="P_0.004.png" alt="P = 0.004" /></td>
<td></td>
</tr>
</tbody>
</table>

- Best recovery if SNHL is severe
What about combined treatment?


- N=102, treatment < d 14

<table>
<thead>
<tr>
<th>Groupe</th>
<th>IV then oral corticoids (n=35)</th>
<th>ITT (n=34)</th>
<th>Combined treatment (n=33)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain en tonale</td>
<td>29 dB</td>
<td>27 dB</td>
<td>29.8 dB</td>
</tr>
</tbody>
</table>

- No significant effect (iv administration? Heterogenicity of etiology?)
What about ITT of corticoids in salvage cases?

- **Moon et al. Otol Neurotol 2011**
  - prospective, multicentric, randomized in 3 groups after oral corticoids failure (60 mg prednisolone): 151/415 = 36%
    - Control Group: oral corticoids
    - Group oral « corticoids »: same 2nd protocol of oral corticoids
    - Group DXM ITT: 5 injections of 5mg/ml - un ITT every 2d s at 2 weeks of initial treatment

- Results at 2 months:

<table>
<thead>
<tr>
<th>Groupe</th>
<th>improvement</th>
<th>Amount of recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>15,4 %</td>
<td>5,5 dB</td>
</tr>
<tr>
<td>Oral corticoids</td>
<td>16,9 %</td>
<td>5,7 dB</td>
</tr>
<tr>
<td>ITT</td>
<td>48,5 % $^{\hspace{1em}}_{P &lt; 0,05}$</td>
<td>14,3 dB</td>
</tr>
</tbody>
</table>

⇒ ITT is more effective in salvage treatment
4ème question : Quel est l’intérêt des ITT en rattrapage?

  • Prospective case-control
    • Oral corticoids (n=99) and salvahge ITT (DXM 4mg/j x 7d) (n=28)
    • Gain in PTA : 75% if ITT vs 35.4% oral corticoids
      • 24 +/- 20 dB vs 4.7 +/- 16 dB (p<0.05)

  • Observational study of 109 cases
  • Csystemic corticoids (7d)+ ITT if failure
    • PTA 7 d : 53 dB in control group vs 66 dB in ITT group (P<.01).
    • At 6 months, improvement of 10.8dB in ITTs vs 1.1dB in controls

⇒ ITT est effective in salvage cases if early applied
CONCLUSION

- In sudden SNHL
  - FIRST: confirm diagnosis and evaluate labyrinthine function alteration
    - AUDITORY TESTING
    - VESTIBULAR TESTING

- Effective Search for etiology:
  - IMAGING: +++
  - BLOOD WORK
  - CARDIOVASCULAR CHECKING: MANDATORY if BALANCE IMPAIRMENT

- TREAT As Soon As Possible:
  - ORAL CORTICOCIDS IF POSSIBLE (NO CONTRAINDICATION AT 1 MG/D/KG FOR 7 DAYS WITH SLOW REGRESSION
  - IF FAILURE: ITT WITH DXM (40MG/ML) 5 DAYS
  - IF SEVERE TO PROFOUND SNHL: COMBINED TREATMENT
STRATEGY IN CASE OF LIMITED RESOURCES: QUESTIONS TO AUDIENCE

• FUNCTIONAL EXPLORATION: WHICH TYPE?

• CARDIOVASCULAR EXPLORATION: WHICH TYPE?

• IMAGING? WHICH TYPE?

• BLOOD WORK? WHICH TYPE?

• TREATMENT: ORAL OR ITT CORTICOIDS?