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Auditory attention and tinnitus: the objective determination of tinnitus decompensation

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Background:

In previous studies we showed that decompensated tinnitus patients differ significantly from compensated tinnitus subjects in the amplitude as well as the synchronisation stability of late auditory evoked potentials. According to the neurophysiological tinnitus model of Jastreboff and Hazell one major difference between decompensated and compensated tinnitus patients is that decompensated tinnitus patients shift their (subconscious) attention to the tinnitus signal as a result of dysfunctional emotional associations with the tinnitus signal. Therefore we were interested to look at the possibility that this difference in synchronization stability is due to an attentional bias in direction of the tinnitus. If neural synchronization stability could be changed by changing the attentional focus in healthy persons there would be evidence that the difference in neural synchronization stability between compensated and decompensated tinnitus patients is due to an attentional focus to the tinnitus signal.

Methods:

10 volunteers entered the study. Late auditory evoked responses were obtained. We delivered 3 pure tones of 40ms each in random order to the right ear. Meanwhile the left ear was presented with music that served as a distractor. Subjects were required to pay attention to a target tone within the pure tones applied for the first 10 minutes. After that the subjects were told to ignore the stimulus. During that procedure single sweeps of late auditory responses were recorded and the synchronization stability was calculated.

Results:

Similar to the difference in synchronization stability between compensated and decompensated tinnitus patients synchronization stability changed significantly (Wilcoxon Test) when the attentional focus was drawn away from the target stimulus. This change occurred in the time interval between 100 and 200 ms.

Conclusion:

Our results give evidence that the difference in synchronization stability in late auditory evoked potentials (N1, P2) between compensated and decompensated tinnitus patients is due to the attentional focus to the tinnitus signal. As this attentional bias can therefore be shown objectively and in real time, it might be the basis of a therapeutic neurofeedback system.

Literatur:

DJ Strauss, W Delb, R D'Amelio, P Falkai: Neural synchronization stability in tinnitus decompensation. Proceedings of the 2nd Int. IEEE EMBS conference Arlington, USA, pp. 186-189.

