

SUMMARY

Title: „Balance Multifrequency Examination“

The dissertation is written in the form of annotated publications.

Relevance of the topic

Currently, knowledge of the physiology and pathophysiology of the balance system is advancing due to the implementation of new diagnostic methods and the improvement of existing ones. Together with the improvement and increase in the number of diagnostic tests, greater demands are placed on physicians to process a higher volume of data, and at the same time the differential diagnostic schemes of central and peripheral, acute, chronic and paroxysmal balance disorders are expanding.

Objectives of the dissertation

- 1 Design and validation of a newly developed vestibulogram - an innovative visualization of different vestibuloocular reflex (VOR) tests.
- 2 To examine the potential of the head-shaking test to reflect the compensation for vestibular function loss.
- 3 To create normative data for an innovative binocular variant of the video head impulse test and establish the normative values for disconjugate eye movements.
- 4 Mathematical testing of the suitability of Jongkees' formula for calculating vestibuloocular reflex asymmetry.

Annotated publications

The results of four original publications by the author were selected and annotated. These are closely related and mutually develop the main theme.

- 1 **EVEST:** The author developed an EVEST graph to analyse the vestibular test results and calculate estimated multifrequency vestibular function asymmetry (VFA) in healthy individuals and individuals with different diagnoses. The VFA with a cutoff value of 6.5% was more sensitive (91%) and specific (98%) for identifying any vestibular deficit, compared to individual tests. The study demonstrated that EVEST is a valuable graphical tool for rapid multifrequency comparison and diagnosis of different types of peripheral vestibular deficits.
- 2 **Head-shaking nystagmus:** the second study has the potential to fill a gap in our understanding of what HSN actually reflects in patients with peripheral vestibular loss. HSN values tended to decrease to those of the control group once vestibular compensation was sufficient for the patient's daily life. The persistence of HSN in

patients with inadequate compensation and poor clinical recovery confirmed the potential of HSN to reflect and discriminate between adequate and inadequate dynamic compensation.

3 In the third paper, normative data for innovative binocular video head impulse test (bvHIT) were established.

4 and fourth paper demonstrated by theoretical and mathematical proofs the nonlinearity, non-intuitiveness and inappropriate use of the current calculation of vestibular function asymmetry, which has been widely used for the last six decades.