Abstract

Theoretical part of the thesis summarizes state of art in the field of interaction of sound stimuli with the vestibular system and balance control. Further it summarizes the effect of cochlear implantation on the peripheral vestibular structures and on the stance stability. Cochlear implantation is effective way of hearing rehabilitation. Nevertheless surgery in the region of the inner ear results in reduction of function of the peripheral vestibular structures on the implanted side. The functional deficit of the peripheral vestibular system induced by the surgery is well tolerated by patients and quickly spontaneously subside. Sound available to the patients after implantation is one of the important modalities needed for balance control. In patients with balance deficit was found higher reliance on hearing when maintaining stable stance. Some sounds can reduce postural sway. Namely listening to the broadband noise (such as white and pink) results in reduction of postural sway. The balance control also relies on the ability to localize sound source. Information about position of sound source can be utilized as point of reference for driving balance reactions.

Experimental part of the thesis quantifies changes in stance stability in patients with cochlear implants using stabilometry. The stabilometry was carried out 1 day before implantation, 10 to 14 days after implantation and 90 and more days after implantation. Second part of the experiment records changes of postural sway in patients with cochlear implants and in healthy adults in 5 different sound conditions: stance on foam with closed eyes (the reference condition), subduing sound (cochlear implant turned off or wearing headphones and ear plugs), listening to record in foreign language and listening to record in native tongue with attention focused on the sound.

14 participants in total participated in the study including 7 patients with cochlear implants and 7 healthy adults. Patients with cochlear implants had on the 1st day after surgery significantly higher mean sway velocity. Patients had higher mean postural sway velocity in all subsequent measurements but mean differences never reached significance again. Mean differences of postural sway in various sound conditions almost never reached significance. Tendency to disturb postural stability was observed when listening to white noise both in patients with cochlear implants and in healthy adults. Remarkable interindividual differences were observed in effect of sound conditions on patients with cochlear implants.