**Head-mounted Vibrotactile Prosthesis for Rehabilitation of Chronic Imbalance**

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Maintenance of balance requires optimal use of vestibular, visual, and proprioceptive cues; proper central integration; and appropriate motor responses. In cases of bilateral vestibular failure (BVF), the brain is missing its internal reference frame for verticality and must rely mainly on visual and proprioceptive cues to maintain upright posture in a gravitational field. If additional orientationally correct cues are available (i.e., cane or walking stick), the brain uses these cues to improve stance and mobility. Over the last ten years, we have studied the utility of head-mounted vibrotactile stimulation as an additional sensory cue in patients with severe BVF, and the results are encouraging (1,2,3). An ongoing trial with our BalCap vibrotactile prosthesis now includes patients with chronic postural instability from a variety of etiologies. This presentation summarizes our work to date and the vision for future applications.

1. Goebel JA, Sinks BA, Pyle M, Brey R, Eggers S, Zapala D: Efficacy of the BrainPort® Balance Device in Patients with Severe Bilateral Vestibular Loss: A Multicenter Trial. Assoc Res Otolaryngol Abstr. No. 707, 2008.

2. Goebel JA, Sinks BC, Parker BE Jr, Richardson NT, Olowin AB, Cholewiak RW. Effectiveness of Head-Mounted Vibrotactile Stimulation in Subjects with Bilateral Vestibular Loss: A Phase 1 Clinical Trial. Otol Neurotol. 2009 Feb; 30 (2):210-6. PMID: 19106768

3. Richardson NT, Clark BR, Parker BE, Sinks BC, Goebel JA. Assistive and rehabilitative effects of head-mounted vibrotactile prosthesis (BALCAP) for chronic postural instability. Feb 23, 2014, 37th Annual Midwinter Meeting, Association for Research in Otolaryngology Poster Presentation.