Commentary on "3D Model for BPPV Diagnosis and Treatment"

Letter to the Editor

Melikşah Çakır, Fatih Özdoğan, Halil Erdem Özel

University of Health Sciences Türkiye, Kocaeli City Hospital, Clinic of the Ear Nose Throat and Head & Neck Surgery, Kocaeli, Türkiye

Dear Editor,

We have read with great interest the article published by Güneri et al. (1) in the August 2022 issue of your journal. Benign paroxysmal positional vertigo (BPPV) is one of the most common causes of peripheral vertigo (2). However, understanding the pathophysiology of BPPV and visualizing therapeutic maneuvers remain challenging. Consequently, various illustrations, animations, and mobile applications have been developed to elucidate the pathophysiology of BPPV (3). This study, which represents BPPV using a three-dimensional model, is particularly valuable and unique in demonstrating the anatomy of the semicircular canals and the movement of otoliths during therapeutic maneuvers.

The authors utilized an existing 3D model design to reconstruct the vestibular structure and printed it using a 3D printer. The semicircular canals were placed in appropriate regions of the vestibule using transparent tubing. However, in the provided 3D model, the points where the semicircular canals connect to the vestibule were designed as sealed (https://www.printables.com/model/2800-fluid-filled-vestibular-apparatus-for-vertigo-educ#preview.file.5ZpP4).

Within the tube representing the lateral semicircular canal, sand particles were added to simulate otoliths. Although these particles could move within the canal, they could not exit the non-ampullary end into the utricle. Instead, they accumulated at the terminal part of the canal. In this scenario, for example, during a therapeutic barbecue roll maneuver for a right lateral canal canalithiasis model, when the patient is rotated 90° to the left from the roll position, the sand particles would halt at the non-ampullary end. With two additional 90° leftward rotations, the otoliths would fail to transition to the utricle due to the sealed utricular connection. As a result, they would fall back into the canal under the influence of gravity, preventing an accurate simulation of the maneuver.

The authors noted the absence of a reconstructed cupula and the inability to demonstrate the ocular movements induced by head motion as limitations of

ORCID IDs of the authors:
M.Ç. 0000-0002-9220-6190
F.Ö. 0000-0003-2945-8608
H.E.Ö. 0000-0002-7235-3433

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Corresponding Author:
Melikşah Çakır, MD;
drmeliksahcakir@gmail.com

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their study. We believe that modifying the existing 3D design using software (e.g., Fusion 360, Autodesk) to create openings at the junctions where the semicircular canals connect to the utricle would allow otoliths to transition into the utricle, enabling a more accurate simulation of the maneuvers. Furthermore, by adding such openings to the non-ampullary ends of all three semicircular canals, the model could, for the first time, demonstrate canal switch during maneuvers on a 3D platform. This enhancement would contribute significantly to understanding the pathophysiology of BPPV and visualizing therapeutic maneuvers.

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Footnotes

Authorship Contributions

Surgical and Medical Practices: M.Ç., Concept: M.Ç., F.Ö., Design: M.Ç., F.Ö., H.E.Ö., Data Collection or Processing: M.Ç., Analysis or Interpretation: M.Ç., H.E.Ö., Literature Search: M.Ç., F.Ö., H.E.Ö., Writing: M.Ç.

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Author's Reply

To the Editor,

Thank you for your interest in our article and for your valuable contributions. As we mentioned in the manuscript, this prototype model was planned only for demonstrating and teaching horizontal canal dynamics. Our work on the model is ongoing and we are working on various additions, including the ones you have suggested, so that all physiopathologic processes can be depicted.

Enis Alpin Güneri, MD

Department of Otorhinolaryngology, Dokuz Eylül University Faculty of Medicine, İzmir, Turkey

ORCID ID of the author:

E.A.G. 0000-0003-2592-0463