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ABSTRACT BOOK

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STUDY OF THE EFFECT OF CRANIAL HOLES DUE TO EMISSARY VEINS AND INHOMOGENEITIES IN THE THICKNESS OF THE SKULL WHEN FOCUSING A TRANSCRANIAL ULTRASOUND BEAM

María Cristina Dejoz-Díez[1], Sergio Jiménez-Gambín[1], Andrei Marin[1], Noé Jiménez, Francisco Camarena[1]
[1] Instituto de Instrumentación para Imagen Molecular, Consejo Superior de Investigaciones Científicas, Universitat Politècnica de València, Valencia, Spain
e-mail: madedie3@etsii.upv.es; serjigam@upv.es; ancrism2@alumni.uv.es; nojigon@upv.es; fracafe@fis.upv.es

OBJECTIVES

Skull bones present inhomogeneities due to variations in the thickness of the skull and, in addition, the appearance of emissary veins cause the existence of some of the skull holes. In transcranial focused ultrasound applications acoustic beams encounter in their path these tissues causing strong beam aberrations. The aim of this study is to numerically evaluate the impact of these inhomogeneities in the quality of an ultrasonic transcranial beam.

METHODS

Ultrasound fields produced by a 500 kHz single-element focused transducer were simulated using *k*-space methods. The acoustic properties of the skull were obtained from two CT-scan sets. In all simulations ultrasound beams were set to propagate through the parietal hole.

RESULTS

The robustness of single-element 500 kHz focused ultrasound has been proven with two skull CT-scan sets, one with a significant hole and the other homogeneous. The results show that the main focus retains good quality and only small increases in acoustic intensity are detected in the hole area due to inner resonances. The local increase of the energy density can lead to skull overheating in therapeutically applications. In addition, variations of the skull thickness produce the appearance of secondary foci, as well as to varying both the gain and the width of the main focus.

CONCLUSIONS

In the treatment planning it is recommended to avoid the areas of the skull where there exist strong irregularities in the thickness within the coverture of the acoustic beam, since the quality of the focus of single element focused transducers can be compromised.

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