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Meeting Abstract

Can voice prostheses remain in situ? An inquiry to ensure the safety of modern voice prostheses in MRI

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Text

Introduction: Currently, there are about 20,000 people living without a larynx in Germany. The voice restoration is an essential part of the rehabilitation of these patients without larynx. At the present day, voice prostheses constitute the gold standard of vocal rehabilitation after total laryngectomy in addition to the oesophageal voice and operative procedures (e.g. laryngoplastic). Due to these voice prostheses, 85–90% of the affected patients attain a substitute voice that is suitable for daily use [1], [2], [3], [4]. Due to the further development of these prostheses new materials (silicones to be high in silver oxide, steel tubes, titanium rings and magnets) are used more frequently [5], [6], [7], [3], [4]. Particularly oncological after-treatment of laryngeal operated patients, having voice prostheses, consistently raises the question whether special voice prostheses are MRI-proof and, for instance, can remain in the original position, or not. Therefore, the aim of the following paper is to examine all models of voice prostheses on the current German market in regard to their safety in MRI.

Material/method: Voice prostheses of the following types have been exposed in a Siemens Avanto MRI with a maximum of 1.5T, whereby the emerging forces were determined: Provox® 1, Provox® 2, Provox Vega®, Provox® ActiValve (light, strong, extra strong) Atos Medical; Blom Singer® Classic 20fr, Blom-Singer® Advantage (first generation, second generation) Blom-Singer® Dual Valve, Inhealth; Tracoe Voicemaster®, Tracoe medical; ESKA® Herrmann (flexion 60°, 75°, 90°), Adeva® Highflow, ESKA Medical; Groningen® 4 Ultra Low Resistance and Heimomed Phonax®, Heimomed Heinze. At the beginning of the study a rough calculation of the occurring forces and the places of the maximal force were asserted with the help of a dynamometer ultra light®. Subsequently it was carried out the quantitation of the voice prostheses affected by the maximal magnetic gravitational pull and translation according to a standardised procedure, referred to as thread test.

It is supposed that the force that leads to the deflection of the object is equivalent to the magnetical force that affects the object. Additionally, the rotation force has been evaluated using a five point scale [8], [9], [10], [11], [12]. With this scale the rotation force that affects the voice prosthesis can be determined with an established procedure (angular degree 0 = no alteration of the alignment of the object, angular degree 4 = immediate and powerful adaptation to the magnetic field).

Result: As expected, the prostheses containing silicon and synthetic materials didn't show any conspicuousness in the MRI. Prostheses containing prefabricated titan parts are most widely MRI-proof, whereas voice prostheses including metal parts and magnets, Provox® ActiValve (light, strong, extra strong), its weights are all 0.66 gram, cause forces up to 0.003334 N and a torsional moment up to 0.0005 Nm. The measurement with the five point scale showed a rotation force of angular degree 0/4.

Conclusion: Pure synthetic voice prostheses are MRI-proof. Merely the three tested Provox Activalve prostheses (light, strong, extra strong) showed forces that are equivalent to 0.5g. In all probability, this can not lead to a dislocation of the prosthesis. The examination showed that the used metal parts can cause picture imageries in the MRI what needs to be examined in additionally examinations.

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