

Surgical Head Holder Combined with Receiving Coil for Intraoperative MRI

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OBJECTIVE: In recent years, intraoperative MRI (iMRI) has become an important diagnostic modality for neurosurgery. We developed a head coil which has dual functions of head holder and receiving coil that can be used under the magnetic field.

METHODS: The head coil (head-holder coil: HHC) consisted of three components: a head holder, connectors, and a covering coil. In laboratory experiments, signal-to-noise ratio (SNR), image uniformity, and geometric accuracy of the HHC were measured to assess the receiving coil performance. In clinical studies, the head-holder function and iMR images using the HHC was evaluated in 27 patients.

RESULTS: In laboratory experiments, the SNR of the HHC (55.1 \pm 4.4) was significantly better than that of the previously used body coil (38.8 \pm 8.0). With respect to uniformity in a circle area (diameter, 10 cm) that approximately corresponded to a real surgical field in size, there was no significant difference between the HHC (9.8 \pm 0.5) and the previous coil (9.1 \pm 1.5). The mean geometric errors of the X, Y, and Z axes were 0.36 mm, 0.22 mm, and 0.08 mm, respectively. In clinical studies planned head position and surgical approach were accomplished in all cases (n = 27, 100%), and the MR image quality obtained using the HHC was good enough on both T1- and T2- weighted images in 26 cases (96%).

CONCLUSION: The HHC is a practical device that strikes a balance between the functions of head fixation and receiving coil for iMRI in neurosurgery.