

QUALITY ASSURANCE FOR MR STEREOTACTIC IMAGING FOR THREE SIEMENS SCANNERS

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Quality assurance of stereotactic imaging, especially with MRI (magnetic resonance imaging), is a complex issue. It can be divided in the basic verification and commissioning of a particular new scanner or a new scanning MRI protocol that is being implemented into a clinical practice and the routine quality assurance performed for each single radiosurgical case. The aim of this study was geometric distortion assessment in MRI with a special PTGR (Physikalisch-Technische Gesellschaft für Radiologie – GmbH, Tübingen, Germany) target phantom. PTGR phantom consists of 21 three-dimensional cross-hairs filled with contrast medium. Cross hairs are positioned at known Leksell coordinates with a precision of better than 0.1 mm and covering the whole stereotactic space. The phantom can be fixed in the Leksell stereotactic frame and thus stereotactic imaging procedures can be reproduced following exactly the same steps as for a real patient, including also the stereotactic image definition in the Leksell GammaPlan. Since the geometric position (stereotactic coordinates) of each cross-hair is known based on the construction of the phantom, it can be compared with the actual measured Leksell coordinates based on the stereotactic MRI. Deviations between expected and actual coordinates provide information about the level of distortion. The measured distortions proved satisfactory accuracy precision for stereotactic localization at 1.5 T Siemens Magnetom Avanto scanner, Siemens Magnetom Symphony scanner and 3T Siemens Magnetom Skyra scanner (Na Homolce Hospital, Prague). The mean distortion for these MR scanners for standard imaging protocol (T1 weighted 3D images) were 0.8 mm, 1.1 mm and 1.1 mm and maximum distortions were 1.3 mm, 1.9 mm and 2.2 mm, respectively. There was detected dependence of the distortions on the slice orientation and the type of imaging protocol. Image distortions are also property of each particular scanner, the worst distortion were observed for 3T Siemens Magnetom Skyra scanner.