ever, patient-induced relevant phenomena cannot be predicted and may not be constant in time (e.g., susceptibility effects related to the presence of gadolinium-based contrast agents). Therefore, patient-specific distortion characterization and/or correction has drawn considerable attention. Relevant studies rely on either the field mapping technique or the read gradient polarity reversal method. Both methodologies not only account for susceptibility and chemical shift distortions but also for Bo related distortion. It is worth noting that the total distortion magnitude measured is mostly affected by the location dependent relative signs of distortion components stemming from different sources, such as Bo inhomogeneity and susceptibility effects. Spatial distortions also result in signal intensity distortions, since the signal intensity of a homogeneous voxel is either compressed or extended in a voxel of different size, shape and position.

Conclusions. Overall, it is essential to characterize, reduce and correct spatial distortions, so as not to adversely affect MRI quantitative results or introduce inaccuracies in MRI-based treatment planning applications.

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[OA042] Correlation of magnetic resonance spectroscopy and histological findings in brain tumors

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Purpose. The method of Magnetic Resonance Spectroscopy (MRS) imprints with a fast and a non-destructive manner series of brain metabolites as well as their concentration within brain parenchyma. Furthermore, it illustrates the infiltrative character of brain tumors. These MRS indicators correspond to biochemical products of the carcinogenesis procedure, such as cell proliferation, cell metabolism, cells’ destruction, necrosis, hemorrhagic and cystic elements. The combination of the macroscopic translated information of MRS along with the microscopic findings of Pathologoanatomy can differentiate in a reliable manner between the various types of cancer and assess therapies.

Methods. MRS technique has the potential to diagnose brain tumors in vivo, in a non-invasive manner, without using ionizing radiation, with good spatial and temporal resolution. A number of patients with brain glioma were imaged with Magnetic Resonance Imaging (MRI). Magnetic Resonance Spectroscopy followed, as well as Perfusion measurements and post injection MRI. All examinations were performed in a 1.5 Tesla Signa HDxt General Electric system. The MRI protocol involved T2 Flair, T2, gradient-echo T2*, T1, Diffusion, Diffusion Tensor Imaging (DTI), Tractography, Perfusion and post injected contrast medium MRI. MRS protocol involved both single voxel as well as 3-D Chemical Shift Imaging (CSI).

Results. This study illustrates the correlation between MRI and MRS macroscopic findings with the microscopic pathologoanatomical ones: Diffusion with cellularity, DTI with neuronal axons’ destruction. Perfusion with neovascularization, MRS with brain metabolism, cell proliferation, necrosis, hemorrhage, anaerobic glycolysis, etc. MRS can also demonstrate infiltration of tumor cells within brain parenchyma even in cases where MRI fails to do so, due to the fact that the local cell biochemical background is at an initial stage.

Conclusions. MRS is a non-invasive technique that provides useful and conclusive information regarding differential diagnosis of brain tumors.

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[OA043] A new signal-to-noise ratio (SNR) measurement method based on low-pass filtering for magnetic resonance imaging (MRI) quality control (QC) purposes

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Purposes. Signal-to-noise ratio (SNR) is a prominent metric to assess scanners performances. SNR measurement in MRI is challenging because of the difficulty to quantify noise level from images. A gold-standard consist in pixel-by-pixel variance calculation on several images (>100) scanned in identical conditions. This method is accurate but cannot be practically implemented because of time constraints. Another gold-standard consists in scanning images without radiofrequency excitation hence collecting noise-only. This latter is also unpractical because it requires a specific and generally not-granted access to the hardware. Consequently, there is a need for designing alternative methods for accurate and precise noise quantification. This work aims to introduce a new noise level quantification method for SNR measurement.

Methods. Our method (Noise_{filt}) quantifies noise level by combining these operations: (1) subtraction of two images subsequently scanned in identical conditions, (2) Low-pass filtering to extract and suppress low-frequency remaining information, (3) \(\text{Noise}_{\text{filt}} = \text{standard deviation of pixels. Using a dataset of 30 exams of a head phantom scanned on a 3T MR unit with an 8-channel phased-array brain coil, we compared our method with three others from the literature: noise level quantified using one-image background region-of-interest (ROI) (Noise_{bgd}), several background ROIs (Noise_{bgd})), and from the subtraction of two images (Noise_{diff}) [6]. By means of Bland–Altman analysis, we assessed the agreement between all these methods and the noise-only standard method (Noise_{norm}). We also assessed their correlation with Noise_{norm} (Pearson’s correlation coefficient r, p < 0.05).

Results. Bland–Altman analysis showed that Noise_{filt} agrees more with the standard than the three other methods. Correlation of our Noise_{filt} method with the gold-standard (\(r_{\text{filt}} = 0.80, p < 0.05\)) was higher than the three others’ (\(r_{\text{bgd}} = 0.37, r_{\text{bgd}} = 0.61, r_{\text{diff}} = -0.04\)).

Conclusion. We demonstrated that our method produces accurate measurement, is simple to implement, and is usable for instance for quality control (QC) purposes. This new metric is being tested with additional scans in QC monitoring of different MR scanners.