

The Importance of Shimming in Magnetic Resonance Spectroscopy

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Abstract

Background: Proton magnetic resonance spectroscopy (MRS) is a well-known device for analyzing the biological fluids metabolically. Obtaining accurate and reliable information via MRS needs a homogeneous magnetic field in order to provide well-defined peaks and uniform water suppression. There are lots of reasons which can disturb the magnetic field homogeneity which can be corrected by a process known as shimming. This study is intended to recall the importance of shimming and also the significant role of quality control (QC) in achieving an accurate quantification.

Methods: An acrylic cylindrical quality control phantom was designed as an analog of brain MRS test phantoms in order to control the accuracy of the obtained signal of a 1.5 T Siemens MRI system which belonged to one of Shiraz hospitals. The signal of NAA, Cho, Cr, the combination of these metabolites and also the distilled water, which was used in this study, was evaluated using separate phantoms. A QC test was performed using Siemens QC phantom and a standard test phantom.

Results: The spectrum of our home-made phantom had a significant difference with the expected spectrum. The results of checking the spectrum of metabolites separately also confirmed that there was a systemic problem that affects all the signals originated from all metabolites and even the pure distilled water. The MRS system could not pass QC tests, and peak broadening was common in all spectra. The complex spectrum of standard test phantom was not produced successfully by the MRS system.

Conclusions: By a simple check of the water peak characteristics, lots of information can be obtained, one of which is the status of shimming that has a considerable effect on the accuracy of the spectrum. Thus, performing an automatic or manual shimming is not a criterion of the spectrum accuracy, and performing a periodic quality control using a test phantom by a specialist is necessary. Briefly, the quality control of MRS and all the other clinical device must be taken seriously. Sometimes QC can be the boundary of a right or a wrong decision for the patient.

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