

MR spectroscopy of pituitary macroadenomas for preoperative assessment of proliferation and hemorrhage

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Purpose: The aim of this study was to correlate proton MR spectroscopy (¹H-MRS), histopathologic and operative findings of proliferation and hemorrhage in pituitary macroadenomas.

Material and Methods: Quantitative ¹H-MRS was performed at 1.5T in 32 patients with pituitary macroadenomas. A point resolved spectroscopy (PRESS) sequence (TR/TE=2000/135 ms) with 128 averages and CHES water-suppression was used. Voxel dimensions were adapted to ensure that the volume of interest (VOI) is fully located in the lesion and to obtain an optimal homogeneity of the magnetic field. Water unsuppressed spectra (16 averages) were acquired from the same VOI for eddy-current-correction, absolute quantification of metabolite signals, and determination of full-width-at-half-maximum of the unsuppressed water peak (FWHM_{water}). Metabolite concentrations for choline-containing compounds ([Cho]) were computed using LCModel and unsuppressed water as internal reference and were correlated with MIB-1 proliferative cell index (PCI) from tissue specimen.

Results: In 13 patients suffered from macroadenomas without hemorrhage a strong positive linear correlation for [Cho] and MIB-1 PCI (R=0.824, P<0.001) were found. [Cho] ranged between 1.8–5.8 mM and the FWHM_{water} between 4.4–11.7 Hz. Eleven patients had a hemorrhagic adenoma and showed not assignable [Cho] and FWHM_{water}=13.4–30.3 Hz. In eight patients the size of the lesion was too small (<20 mm in two directions) for acquisition of MRS data.

Conclusions: Quantitative ¹H-MRS provided important information on proliferative potential and hemorrhage of pituitary macroadenomas useful for the pre-operative planning of pituitary macroadenomas. Differences in FWHM_{water} could be explained due to iron-ions of hemosiderin, which leads to worsen homogeneity of the magnetic field.

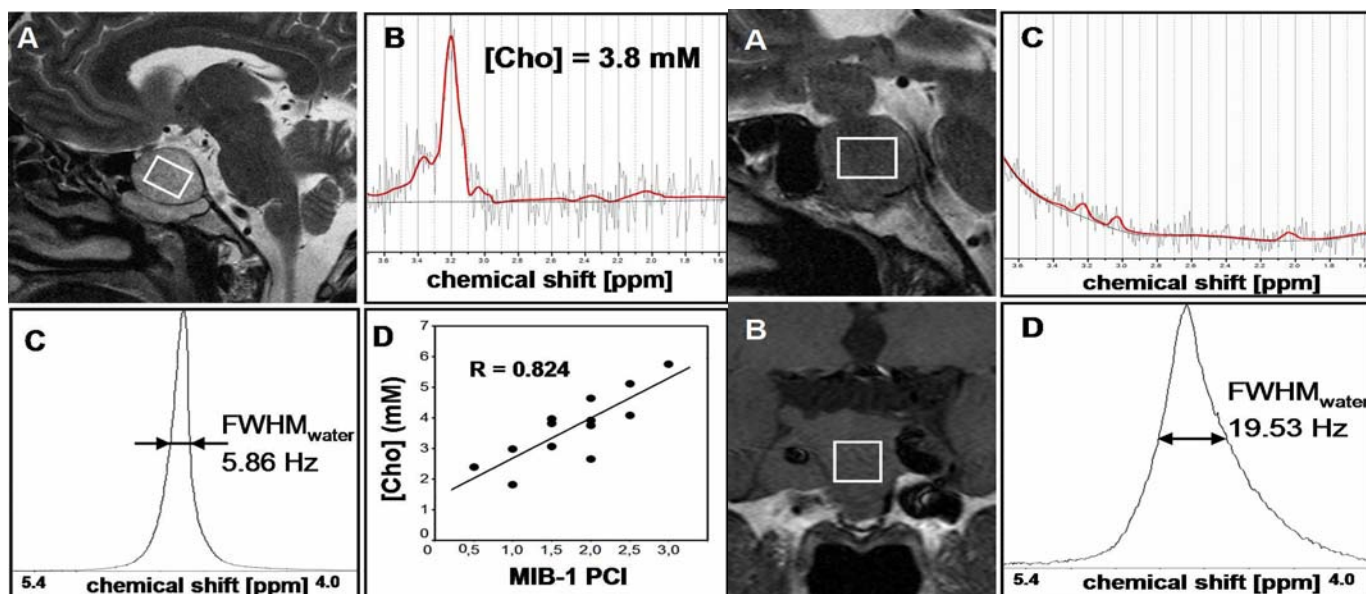


Figure 1: ¹H-MRS of a patient suffered from a non-hemorrhagic pituitary macroadenoma. A) T2w MRI with voxel position. B) Quantified spectra with Cho-concentration. C) Unsuppressed water spectrum with FWHM. D) Correlation of Cho-concentration with MIB-1 proliferation index.

Figure 2: MRS of a patient suffered from a hemorrhagic pituitary macroadenoma. A) T2w MRI and B) T1w MRI with voxel position. C) Spectra fitted with LCModel. D) Unsuppressed water spectrum with FWHM.