MRS scan instruction manual

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A. MRS protocol content:

1) Single Voxel on the lesion with TE 144(Fig 1);

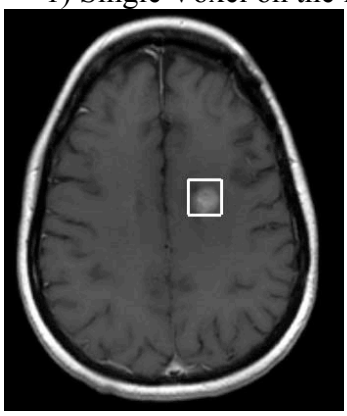

Figure 1

2) Single Voxel on the lesion with TE 35 (Fig. 1)

3) Single Voxel on the contralateral, normal tissue with TE 144(Fig 2);

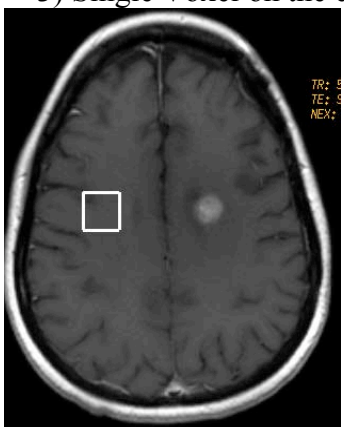

Figure 2

4) 2D-CSI with TE 144 covering the same regions in both hemispheres (Fig 3).

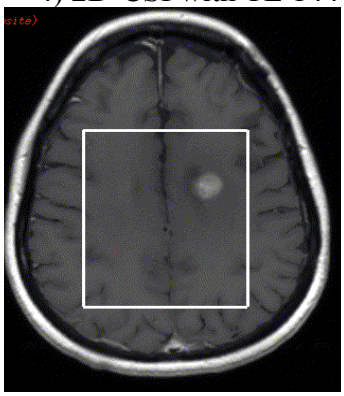

Figure 3

B. How to perform MRS scan:

1) Perform a fast “absolute” axial scan (without tilt) “AX LOC” or 3D SPGR as reference image;

2) Where is optimal localization for SV on the lesion?

a. Usually ROI of SV should be localized on the enhanced bulk or the nodule of the lesion. Other areas of interest may be selected by the radiologist;

b. Browse reference images from lower level to higher level; evaluate lesion thickness; select the image which is in the center of the lesion;

c. Adjust the VOI thickness to the optimal value; the default setting of SV is 20*20*20(which means the thickness is 20 mm). If the interested lesion is not as thick as 20 mm, please reduced it to the corresponding value or to 10 or 15mm.

d. Control the positioning of the box by checking the upper and lower extent of the box. The box will disappear from the image when the image is outside the VOI.

e. Avoid placing the ROI too close to the scalp or skull base;

f. Avoid placing the ROI on the hemorrhage area, which is high signal on T1 weighted(without contrast) image(Fig 4 and Fig 5). The hemorrhage will cause local magnetic field inhomogeneous and ruin the MRS result as no meaningful signal(Fig 6).

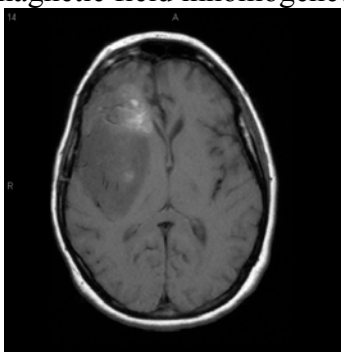

Figure 4

Figure 5

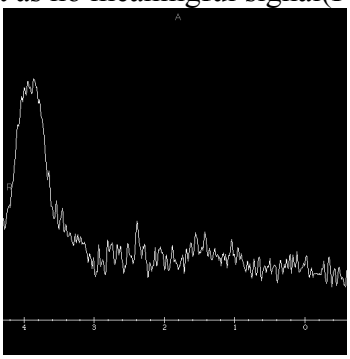

Figure 6

g. For lesions close to cranial bone, use coronal images as reference. It is recommended to combine this with saturation bands;

h. After the auto prescan of each MRS scan, please try to keep the **LnWdth**≤8 (at least 10-15) and **Supplvl**≥98%(at least 93-95%), Fig 7;

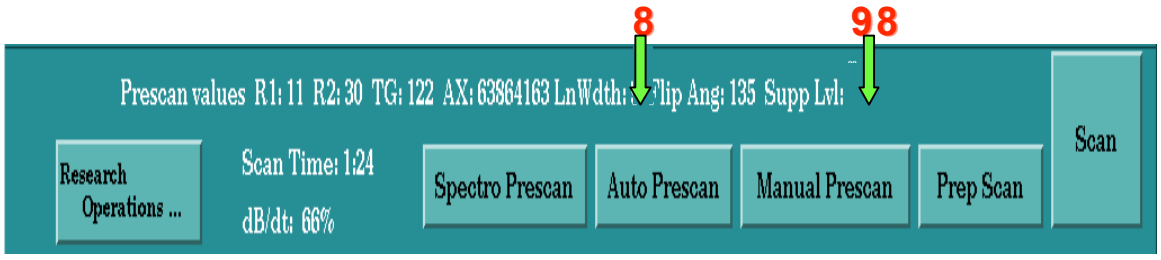

Figure 7

C. Some advanced MRS skills:

1) Sometimes, if the lesion is too close to the scalp or skull base; auto-prescan may fail.

Under those circumstances, try the auto-prescan again. If it still fails, then you can select “Manual Prescan ” to continue.

2) For clinical fellows or researchers, if you are paged to help with the localization of an MRS volume, please do not only review T1 contrast images; but also have a look at the PWI images. Firstly, PWI is useful for locating “active” tumor as increased perfusion(arrow on Fig 8); MRS on the “active” tumor will give better information for clinical diagnosis. Secondly, as PWI is based on EPI sequence, which is sensitive for any inhomogeneous artifacts including hemorrhage(arrow on Fig 9), post-operation changes; manifested as low signal. Combining with PWI before MRS localization will help us avoid putting ROIs on such contaminated area and improve MRS scan quality(On Fig 10, comparing with ROI 1 and 3on the hemorrhage area; ROI of 2 and 4 on the “active” tumor suggested by PWI could get better MRS curves, on Fig 11).

Figure 8 to 11 are from same patient as Figure 4 to 6.

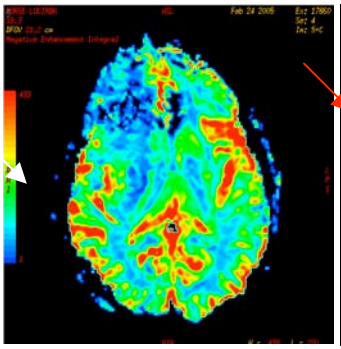

Figure 8

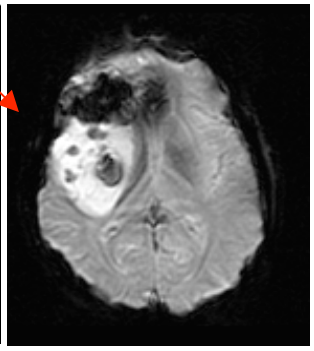

Figure 9

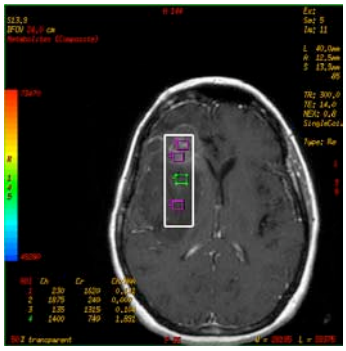

Figure 10

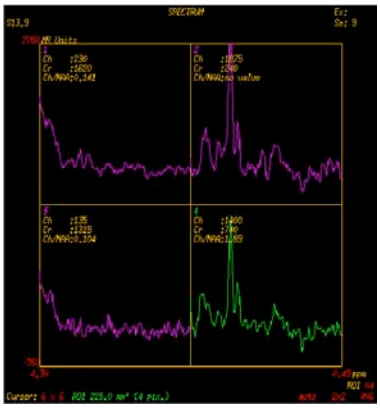

Figure 11

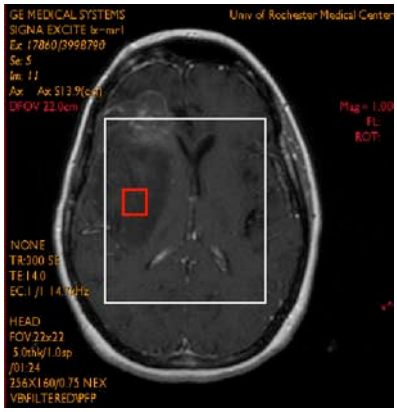

Figure 12

Please note, for this patient, the multi-voxel MRS localized ROI should include both sides, the multi-voxel MRS localization in Fig 10 is wrong.

Correct single voxle MRS localization for this patient could be as the red frame in Fig 12; and correct multi-voxle MRS localization sample is white box in the Fig 12.