

Effects of electroconvulsive therapy on metabolites in the brain - a prospective case-control study

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Introduction

- Electroconvulsive therapy, ECT, is by many clinicians regarded as the most effective acute treatment of major depression¹
- We lack a good understanding of what ECT does to the brain and how it alleviates depression
- The study is part of a larger, multidisciplinary, ongoing project investigating mechanisms of action of ECT
- ECT's effects on metabolites in the human brain will be characterized by use of Proton Magnetic Resonance Spectroscopy (H-MRS)

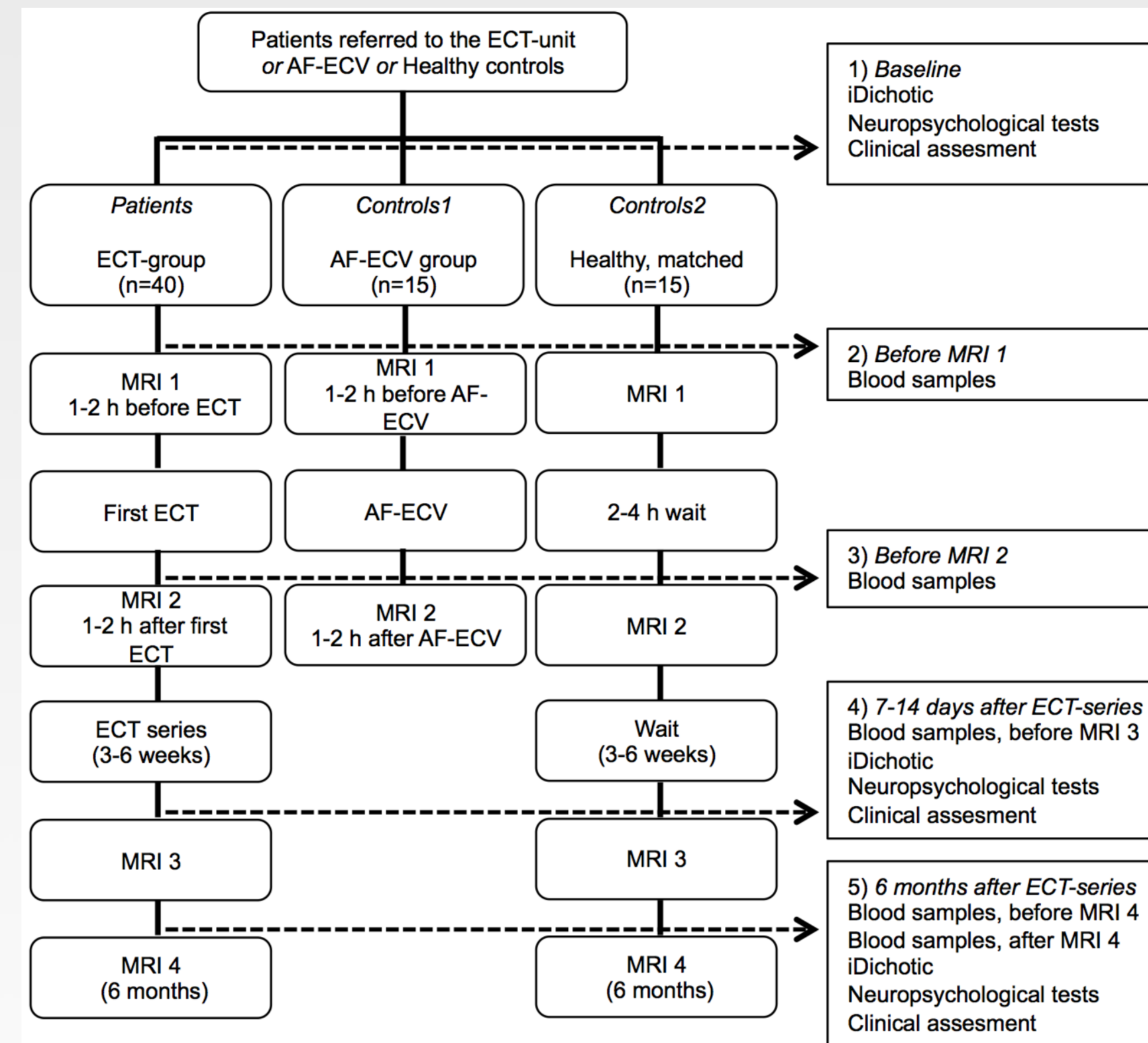
Study Design

- An outline of the study design is shown in figure 1
- So far 15 patients suffering from major depression (five men; age 25-78) and 6 healthy controls (group 2) have been included in the study
- Healthy controls are matched on factors age and sex
- Control group 1 will start in October 2015

Methods

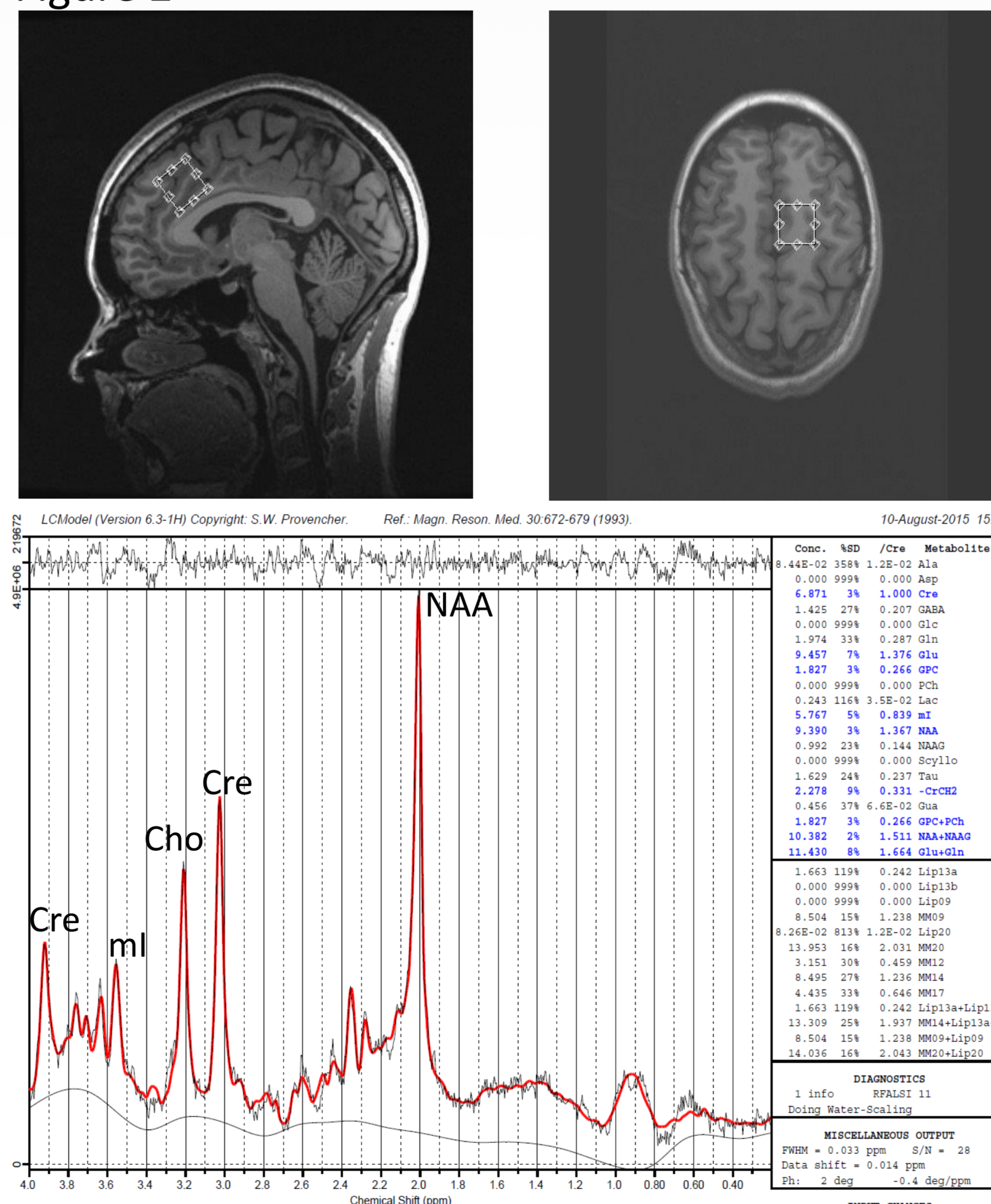
- All patients were treated with right upper unilateral brief pulse (0.5 ms) ECT
- Imaging performed by: 3T GE Signa HDxT MR, 8 channel head coil or 3T GE Discovery 750 MR, 32 channel head coil
- For H-MRS single-voxel point resolved spectroscopy, SV PRESS is used
- The SV PRESS voxel measures 2x2x2 cm³ and placement alternates between the right and left anterior cingulate cortex (ACC) for every new patient
- LCMModel Software² is used for data-analysis

Figure 1



Flow chart of the multidisciplinary project that the study is part of. The illustration is adapted from³.

Figure 2



Upper panel: placement of the voxel in the left anterior cingulate cortex. Lower panel: a typical H-MRS spectrum, peaks of relevant metabolites are named.

Acquisition parameters: TE/TR/NS=35/1500/128 TA=3:48

Preliminary results

- All patients except one improved. Mean MADRS-score before treatment: 33,5 ± 10,5 and 16,3 ± 16,7 after treatment
- There were decreases in the concentrations of Glutamate, Glycerolphosphorylcholine (GPC) and Myo-inositol (ml), none of which were significant
- There was a significant decrease (≈10%, p=0,02) in the concentration of N-acetylaspartate (NAA) between the first MR session (before treatment) and third MR session (after treatment)

Discussion & Conclusion

- Results are preliminary and the number of patients limited
- So far, the control group is too small for comparison
- However, NAA was reduced after treatment
- Previous studies show conflicting results^{4,5}
- NAA is the second most concentrated substance in the brain and thought to be predominantly present in neuronal cell bodies and neurites
- Reduction in the level of NAA has been consistently shown in studies of diseases that involve loss of neurons and axons⁶
- Although the exact function of NAA is unknown, the reduction of NAA seen after ECT may suggest neuronal loss or decreased neuronal integrity

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