

## Cerebral Sodium ( $^{23}\text{Na}$ ) Magnetic Resonance Imaging in Patients with Migraine vs. Healthy Controls

Tuesday 10:50-11:00 AM | SSG11-03 | Room: N226

### PURPOSE

Evaluation of  $^{23}\text{Na}$  concentrations in patients with clinically manifest migraine vs. healthy controls.

### METHOD AND MATERIALS

In this prospective, IRB-approved study we recruited 12 patients (all female; mean age  $34 \pm 11$  years) who have been clinically evaluated for migraine and who have filled out a questionnaire regarding onset of disease, length, intensity (scale 1-10) and frequency of attacks and accompanying aura, as well as 12 healthy controls (all female; mean age  $34 \pm 11$  years). Both groups underwent a cerebral  $^{23}\text{Na}$ -magnetic resonance imaging examination at 3.0T (TimTrio, Siemens Healthcare Sector). For each scan a non-contrast enhanced T1w MP-RAGE sequence for anatomical referencing and a 3D-density-adapted, radial gradient echo (GRE-) sequence for  $^{23}\text{Na}$ -imaging were acquired using a double-tuned ( $^1\text{H}/^{23}\text{Na}$ ), dedicated head-coil.  $^{23}\text{Na}$ -sequences were reconstructed according to the MP-RAGE, allowing direct cross-referencing of regions-of-interest (ROI). Circular ROIs were placed in predetermined anatomic regions: anterior and posterior cerebrospinal fluid (CSF), grey and white matter (GM/WM), brain stem and cerebellum. External  $^{23}\text{Na}$  reference phantoms were used to calculate the  $^{23}\text{Na}$  tissue concentrations.  $^{23}\text{Na}$  concentrations of migraine patients and healthy controls were compared and statistically analyzed by Wilcoxon rank sum test.

### RESULTS

Overall  $^{23}\text{Na}$  concentrations (in millimoles per liter) in the anterior CSF region of patients with manifest migraine were significantly higher with  $79 \pm 7$  vs.  $69 \pm 4$  in healthy controls ( $p=0.0001$ ) (see figure 1). Similar findings were found for the posterior CSF region with  $^{23}\text{Na}$  concentrations of  $85 \pm 6$  in migraine patients vs.  $63 \pm 8$  in healthy controls ( $p=0.0013$ ). No statistical difference was found for  $^{23}\text{Na}$  concentrations in the grey and white matter, brain stem and cerebellum.

### CONCLUSION

Cerebral  $^{23}\text{Na}$  concentrations in CSF of migraine patients are significantly higher than in healthy controls.

### CLINICAL RELEVANCE/APPLICATION

Cerebral  $^{23}\text{Na}$  MRI may be a potential imaging tool for the diagnosis of migraine.