

Visceral Pain associates with cingulate glutamate level in chronic pancreatitis patients

Janusiya Anajan Muthulingam^{1,2}, Tine Maria Hansen^{1,2} Søren Schou Olesen^{2,3},
Asbjørn Mohr Drewes^{2,3} and Jens Brøndum Frøkjær^{1,2}

1 Mech-Sense, Department of Radiology, Aalborg University Hospital, Aalborg, Denmark

2 Department of Clinical Medicine, Aalborg University, Aalborg, Denmark

3 Centre for Pancreatic Diseases, Department of Gastroenterology & Hepatology, Aalborg University Hospital, Aalborg, Denmark

● Introduction

- Chronic pain disorders can lead to structural, functional and metabolic changes of the central nervous system.
- Chronic pancreatitis is characterized by long-standing inflammation of the pancreas with chronic abdominal/visceral pain as the most severe symptom.
- Previous studies have shown structural and functional alterations of the central nervous system in patients with chronic pancreatitis and chronic abdominal pain.

● Aims

- To use magnetic resonance spectroscopy to investigate brain metabolites
- in patients with chronic pancreatitis.
- To investigate associations to various risk factors/clinical characteristics and patient outcome.

● Methods

- Magnetic resonance spectroscopy (3T GE scanner) measurements were performed in the anterior cingulate cortex (ACC), insula, prefrontal cortex and the parietal region (see Figure 1).
- N-acetylaspartate/creatine (NAA/cre), glutamate/creatine (glu/cre), myo-inositol/creatine (mi/cre) and glycerolphosphocholine (GPC/cre) were analyzed in LCModel.
- Subgroup analyses based on disease characteristics were performed and associations to abdominal pain symptom scores and quality of life were explored.

● Results

| | Chronic pancreatitis (n=31) | Healthy controls (n=23) | P-value |
|------------------|-----------------------------|-------------------------|-----------------|
| Age (years) | 58.5±9.2 | 54.6±7.8 | <i>p</i> =0.111 |
| ACC glu/cre | 1.24±0.17 | 1.13±0.21 | <i>p</i> =0.045 |
| Parietal NAA/cre | 1.45±0.18 | 1.54±0.12 | <i>p</i> =0.027 |

- Lower parietal NAA/cre were found in patients with alcoholic etiology as compared to patients without alcoholic etiology and healthy (ANCOVA with age as covariate, *p*<0.006).
- Pain scores in the patient group with highest ACC glu/cre was 4.1±2.7 and pain scores in the group with lowest glu/cre was 1.9±2.3, *p*=0.039 (Mann-Whitney U test).

● Conclusions

- Patients with chronic pancreatitis had altered cerebral metabolite levels.
- The group of patients with highest glutamate levels in ACC had higher pain symptoms. This may support the role of central brain mechanisms in painful chronic pancreatitis.
- Decreased parietal NAA/cre levels are likely related to the general impact of alcohol on the brain and not chronic pancreatitis per se.
- A multi-modal approach combining structural, functional and metabolic brain assessment may be useful to further explore disease mechanisms in chronic pancreatitis.

Contact information: j.muthulingam@rn.dk, Janusiya A. Muthulingam, Department of Radiology, Aalborg University Hospital, Denmark. Acknowledgement: This study was supported by the Obel Family Foundation. Conflicts of interest: None.

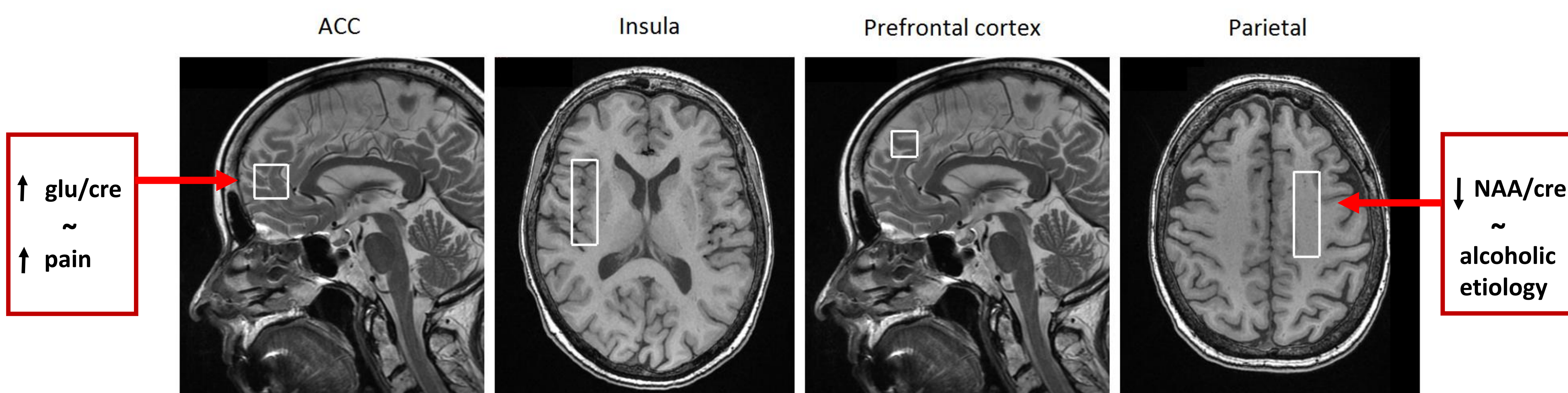


Figure 1: Positions of voxels of interests: ACC (20 x 20 x 20 mm), insula (15 x 20 x 50 mm), prefrontal cortex (15 x 15 x 20 mm) and the parietal region (15 x 15 x 50 mm).