Neuroimaging in alcoholism: results of a MRS-follow-up study

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## MRS-studies in alcoholism

<table>
<thead>
<tr>
<th>Author and Year</th>
<th>Modality</th>
<th>N Patients</th>
<th>N Controls</th>
<th>Follow up</th>
<th>Main results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martin et al. (1995)</td>
<td>H-MRS</td>
<td>10 alcoholics</td>
<td></td>
<td>3-4 weeks of abstinence</td>
<td>NAA↑, Ch↑</td>
</tr>
<tr>
<td>Jagannathan et al. (1996)</td>
<td>H-MRS</td>
<td>10 alcoholics</td>
<td>27 healthy, age-matched</td>
<td></td>
<td>NAA/Ch ↓, NAA/Cr ↓</td>
</tr>
<tr>
<td>Seitz et al. (1999)</td>
<td>H-MRS</td>
<td>11 alcoholics</td>
<td>10 healthy, age-matched</td>
<td>-</td>
<td>NAA/Cr ↓, Ch/Cr ↓ MI/Cr ↔</td>
</tr>
<tr>
<td>Bendszus et al. (2001)</td>
<td>H-MRS</td>
<td>17 alcoholics</td>
<td>12 healthy, age-matched</td>
<td>day 1-3 and 36-39 of abstinence</td>
<td>day 1-3: NAA/Cr ↓ frontal Lobe, Cerebel. Ch/Cr ↓ Cerebellum day 36-39: NAA/Cr ↑, Ch/Cr↑</td>
</tr>
<tr>
<td>O’Neill et al. (2001)</td>
<td>H-MRS</td>
<td>12 alcoholics (recovering)</td>
<td>8 actively heavily drink.</td>
<td></td>
<td>NAA, Ch, Cr ↔</td>
</tr>
<tr>
<td>Schweinsburg et al. (2001)</td>
<td>H-MRS</td>
<td>37 alcoholics</td>
<td>15 healthy</td>
<td></td>
<td>NAA ↓ (frontal WM) NAA ↔ (parietal WM)</td>
</tr>
<tr>
<td>Parks et al. (2002)</td>
<td>H-MRS</td>
<td>31 alcoholics</td>
<td>12 healthy</td>
<td>day 3-5 and week 12</td>
<td>day 3-5: NAA ↓, Ch ↓ (Cerebellum) week 12: NAA ↑ (Cerebellum)</td>
</tr>
</tbody>
</table>
CT - Volumetry

Ventricular system

Sulcal widening
MR-Volumes

Pfefferbaum et al. 1992
Results: spectroscopy alcohol dependence (TE 135ms)
H-Spectroscopy cerebellum (TE 135ms)

Probands (n=10)

Alcoholics (n=11)

Rel. Signal intensity

NAA/Cr

Cho/Cr

*significant (p<0.05)

Seitz et al. 1999
yellow = last ROI
red = ROI
green = next ROI

gray matter
white matter
CSF
Cerebellum

Evaluated sub-regions

Cerebellar Cortex  n = 8 ± 2
Cerebellar Vermis  n = 5 ± 1
Dentate Nucleus  n = 6 ± 2
evaluated sub-regions

gray matter
n = 5 ± 2
gm > 50%

cingulate
n = 3 ± 2
gm > 50%

white matter
n = 10 ± 3
wm > 60%

Frontal Lobe
## Socio-demographic data of complete sample

<table>
<thead>
<tr>
<th>variable</th>
<th>alcohol dependent patients N=55</th>
<th>control group N=36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>46.69 ± 8.07</td>
<td>44.39 ± 9.91</td>
</tr>
<tr>
<td>Gender: m/f</td>
<td>32 / 23</td>
<td>23 / 13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>N=34/16</th>
<th>N=27</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>Alcohol Dependent Patients (N=55)</td>
<td>Control Group (N=36)</td>
</tr>
<tr>
<td>----------</td>
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<td>---------------------</td>
</tr>
<tr>
<td>Duration of dependence</td>
<td>13,18± 8,7</td>
<td>- -</td>
</tr>
<tr>
<td>LDH (Life Time Drinking History)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total alcohol consumption in g **</td>
<td>897312,3± 985465,62</td>
<td>49675,53± 67552,15</td>
</tr>
<tr>
<td>Total alcohol consumption in g / weight **</td>
<td>11735,27± 10774,25</td>
<td>748,90± 1003,8</td>
</tr>
<tr>
<td>GGT **</td>
<td>176,54± 431,73</td>
<td>14,73± 11,26</td>
</tr>
<tr>
<td>Number of abstinent days before T1</td>
<td>14,62± 6,95 (3-37)</td>
<td></td>
</tr>
<tr>
<td>TLFB (last 90 days before T1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount of drinks (g) **</td>
<td>10722,15± 8186,69</td>
<td>318,7± 306</td>
</tr>
<tr>
<td>Amount of drinks /weight *</td>
<td>146,1± 112,58</td>
<td>4,59± 4,8</td>
</tr>
<tr>
<td>Drinks per day (12 g)**</td>
<td>12,2± 9,38</td>
<td>0,38± 0,4</td>
</tr>
<tr>
<td>Number of inpatient detoxifications</td>
<td>3,2± 1,09</td>
<td>- -</td>
</tr>
<tr>
<td>Patients with seizures</td>
<td>N= 13 23,6%</td>
<td></td>
</tr>
</tbody>
</table>

**p<0,001 signifikant
*p<0,05 signifikant
Results

Longitudinal MSSI: choline changes in frontal WM

male patient
36 years
Results

first MSSI: frontal WM differences between patients and controls

\[ p < 0.05 \]

\[ p = 0.001 \]
Results

Longitudinal MSSIs: choline changes in frontal WM

- Controls
- Abstinent patients
- Relapsing patients
Results

T2 : longitudinal intra-individual choline increase in abstinent patients

14 of 30 patients examined after three months had remained abstinent. In a paired t-test the choline signal increased significantly only in the abstinent patients in:

- frontal lobe WM
- cingulate region
- cerebellar cortex
- cerebellar vermis
- dentate nucleus
Number of drinks within the last 90 days per kg body weight

Ch left frontal WM

Ch right frontal WM

controls

patients
Co-workers

Central Institute of Mental Health Mannheim:
Michael Smolka, Bernhard Croissant,
Alexander Diehl, Hans Herre, Helga Welzel, Sabine Klein,
Gaby Ende, Mira Bühler, Herta Flor

Charité Berlin:
Andreas Heinz
12th World Congress on Biomedical Alcohol Research

ISBRA

29/09 – 2/10/2004
Heidelberg/Mannheim
Age effects in alcoholism

Pfefferbaum et al. 1992
Number of drinks within the last 90 days per kg body weight

Ch cerebellar vermis

Ch anterior cingulate