Emotion Regulation And Depression Correlate With Structural Differences In Patients Six Months After Lumbar Disc Surgery

Omar Chehadi1, Adina Rusu1, Enrico Schulz2, Otto Köster3, Monika Hasenbring1

1 Department of Medical Psychology and Medical Sociology, Faculty of Medicine, Ruhr University Bochum, Bochum, Germany
2 Pain Imaging Neuroscience Group, Nuffield Department of Clinical Neurosciences & FMRIB Centre, John Radcliffe Hospital, University of Oxford, Oxford, OX3 9DU, UK
3 Dept. of Radiology, St. Josef Hospital, University Hospital of Bochum, Germany

BACKGROUND

There is ample evidence that structural differences in grey matter have been found in patients suffering from chronic back pain when compared with healthy controls. The gray matter volume (GMV) of these patients was reduced in several regions that are related to the experience of pain1. According to the latest studies regional decreases in GMV correlate with back pain intensity and, moreover, with depression. Thought suppression (TTS), as part of emotion regulation, plays a significant role in the development of depression2, presumably even in patients with chronic low back pain (CLBP). fMRI studies revealed specific cortical networks that are modulated by attentional control of pain in general and, more specifically, by thought suppression. However, the relation between structural brain alterations in these regions and thought suppression is unclear until today.

HYPOTHESES

- Brain regions, which are specific to the cognitive control of emotions and pain (DLPFC, VLPFC and ACC) will be affected the most.
- The changes in these prefrontal regions will correlate with psychometric data like (depression and thought suppression).

MATERIALS AND METHODS

- 30 patients six months after lumbar disc surgery (13 Recovered x 17 Non-recovered).
- In this study we distinguish those recovered from those unrecovered based on pain score (cut-off 3), subject how pain score ≥ 4 in a non-recovery group and subject with pain score ≤ 3 in a recovery group.
- We performed two age- and sex-matched groups, each group contained of 12 participants.
- Statistics & Data Analysis was performed via the SPSS package (Wellcome Department of Imaging Neuroscience, London, UK; available online at http://www.fil.ion.ucl.ac.uk/spm). The structural data were processed using the voxel-based morphometry 8 toolbox (VBM8) which was executed on a Matlab 7.9 platform (Mathworks, Sherborn, MA, USA). A cluster extent threshold of p < 0.001 (uncorrected) with an extend of 10 voxels was applied.
- The following questionnaires were used: - Pain intensity: numerical rating scale (NRS). - Physical function: Funktionsfragebogen Hannover-Rücken (FFbH-R). - Thought Suppression Scale (TSS) of The Avoidance-Endurance Questionnaire (AEO).

MRT RESULTS

PHYSICAL FUNCTION

- R PoG, R Pu, R cg, R ITG, R PHG
- R STG, L LgG, L Cun

THOUGHT SUPPRESSION

- L PCun, R PCun, L PCC, R MFG, L Ins

CORRELATION WITH THOUGHT SUPPRESSION

- L STG, L LgG, L Cun

PSYCHOMETRIC RESULTS

Table 1: Psychometric assessment of Nonrecovery and Recovery Group

<table>
<thead>
<tr>
<th>Total</th>
<th>Recovery</th>
<th>Nonrecovery</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>45.27(5.00)</td>
<td>43.06(5.00)</td>
<td>45.06(5.11)</td>
</tr>
<tr>
<td>Gender</td>
<td>W=15</td>
<td>W=6</td>
<td>M=15</td>
</tr>
<tr>
<td>BDI</td>
<td>5.67(3.48)</td>
<td>3.75(3.13)</td>
<td>7.42(4.01)</td>
</tr>
<tr>
<td>Thought Suppression (TSS)</td>
<td>2.47(1.80)</td>
<td>1.94(1.32)</td>
<td>3.33(3.61)</td>
</tr>
<tr>
<td>Physical function (FFbH-R)</td>
<td>77.22(23.20)</td>
<td>89.23(33.49)</td>
<td>65.62(24.43)</td>
</tr>
</tbody>
</table>

DISCUSSION & CONCLUSION

Our results reveal alterations in GMV between patient groups in areas that associated with pain processing and emotion regulation.

The data suggest that prolonged low back pain input leads to a structural alteration, which in turn may have contributed to the chronicity of LBP, even after lumbar disc surgery.

Our findings support the process model of emotions regulation, in that the effects of suppression have varying temporal trajectories that impact that strategy’s effect on emotion experience, behaviour, and neural systems.

The results of this study are consistent with previous research on cognitive control and may provide potential insights into neural mechanisms of depression and emotion regulation in low back pain, with a special emphasis on thought suppression.

Corresponding Author:
Omar Chehadi, M. sc
Department of Medical Psychology
Universitätsstrasse 150, Bochum, Germany
Email: omar.chehadi@rub.de

References