Background: Studies indicate brain grey matter volumetric changes are associated with chronic pain. In people with painful hand osteoarthritis (OA), grey matter volume reductions have been identified in the anterior cingulate cortex (ACC); a key pain-processing region.1

Objectives: We hypothesised that people with hand OA would have alterations in resting-state functional connectivity networks involving the ACC and other pain-processing brain regions relative to non-OA controls. Furthermore, we hypothesised that treatment with centrally-acting analgesics (pregabalin or duloxetine) would result in connectivity changes in these brain regions.

Methods: Resting-state functional MRI (fMRI) of the brain was performed on hand OA participants (n=28) before and after 12 weeks of treatment with duloxetine, pregabalin or placebo, and compared to non-OA participants (n=11) from the same age range (40–75 years). Scans of 7 hand OA participants and 1 control were excluded due to excessive movement artefact. Seed-based correlation analyses were performed using the CONN toolbox2 to evaluate differences in functional connectivity of networks involving the ACC, insular cortices and thalami between patients and controls, and between pre- and post-treatment states.

Results: Relative to non-OA controls, hand OA patients had increased functional connectivity at baseline between the ACC and the cunei, occipital poles, lateral occipital cortices and precuneus (p=0.00054, FDR-corrected for multiple comparisons; MNI coordinates x=-4, y=-86, z=+40; 513 voxels) (figure 1). No differences in baseline functional connectivity were found in the insular cortices or thalami. After treatment, altered functional connectivity was identified between the left thalamus and the ACC and paracingulate gyr (pFDR=0.038; MNI coordinates x=-4, y=-36, z=-24; 138 voxels). Pairwise comparisons between treatment cohorts suggested that this represented a reduction in connectivity with pregabalin relative to duloxetine, without reaching statistical significance (pFDR=0.062). No significant treatment-associated connectivity changes were evident between duloxetine and placebo, or pregabalin and placebo.

Conclusions: We have shown that people with painful hand OA have altered functional connectivity networks involving the ACC. In conjunction with previous findings of volumetric changes in this pain-processing brain region, this strongly supports the role of maladaptive neuroplasticity and central sensitisation in hand OA pain. Larger studies are required to better confirm if treatment with centrally-acting analgesics leads to connectivity changes in these brain regions.

REFERENCES:

Acknowledgements: We acknowledge support from the Rosetree’s Trust and the NIHR Clinical Research Network.

Disclosure of Interest: None declared