Longitudinal MRI reveals decreased cortical thinning in Rolandic epilepsy in seizure remission: a pilot study

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Introduction

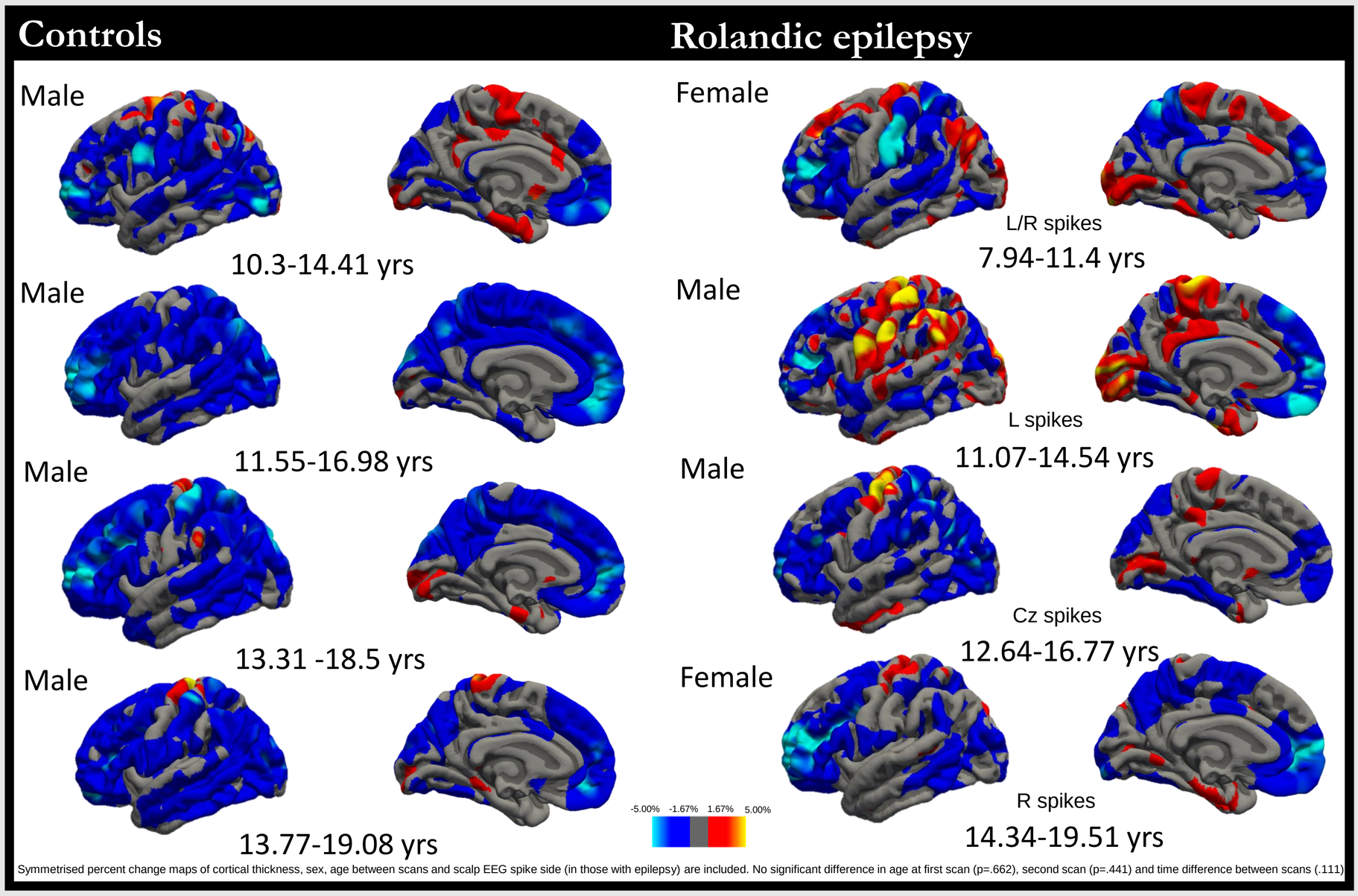
- Neuro-developmental problems are prevalent in Rolandic Epilepsy (RE). These include dyslexia[1], speech and language problems[2], attention deficit hyperactivity[3] and developmental coordination disorders[4].
- A recent study[5] showed sparse regions of reduced cortical thinning and some thickening in a group of children with RE (38% in seizure remission) whereas thinning predominated in healthy controls.
- It is possible that the trajectory of cortical development in RE is aberrant. Due to the association with language and reading deficits, we hypothesised that in remitting RE there would be a similar delay in cortical thinning in the left hemisphere.

Objectives

1. **Create maps of change over time in cortical thickness in the left hemisphere and compare the spatial distribution of changes.**
2. **Calculate mean symmetrised percent change (SPC) in the left hemisphere in each group between the time points. SPC=rate of change in thickness/average cortical thickness.**
3. **Identify which cortical regions have reduced thinning less than 1 SD below the control mean in participants with RE.**

Methods

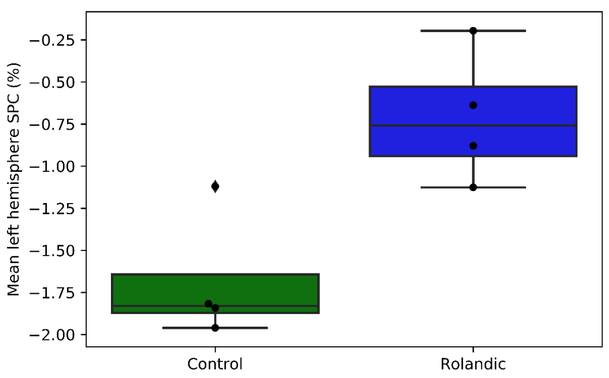
- Longitudinal 3T, T1, magnetic resonance (MR) images from four individuals with RE (3 right handed and 1 left) between active epilepsy and seizure remission (inter-scan interval 3.8±2.3 years) and four healthy controls (right handers).
- MR: TE=2.848, TR=6.988, Inversion time=650, FA=8, slice thickness=1.2, matrix=256x256**.**
- Longitudinal Freesurfer[6,7] analysis calculated symmetrised percent change (SPC) (15 mm FWHM kernel).
- Average SPC for Desikan-Killiany[8] brain regions.
- Calculate a growth threshold from control data: Average left hemisphere SPC - 1SD.
- All regions were statistically analysed using MANCOVA; covariates, age at first scan and sex.



Symmetrised percent change maps of cortical thickness, sex, age between scans and scalp EEG spike side (in those with epilepsy) are included. No significant difference in age at first scan (p=.662), second scan (p=.441) and time difference between scans (.111)

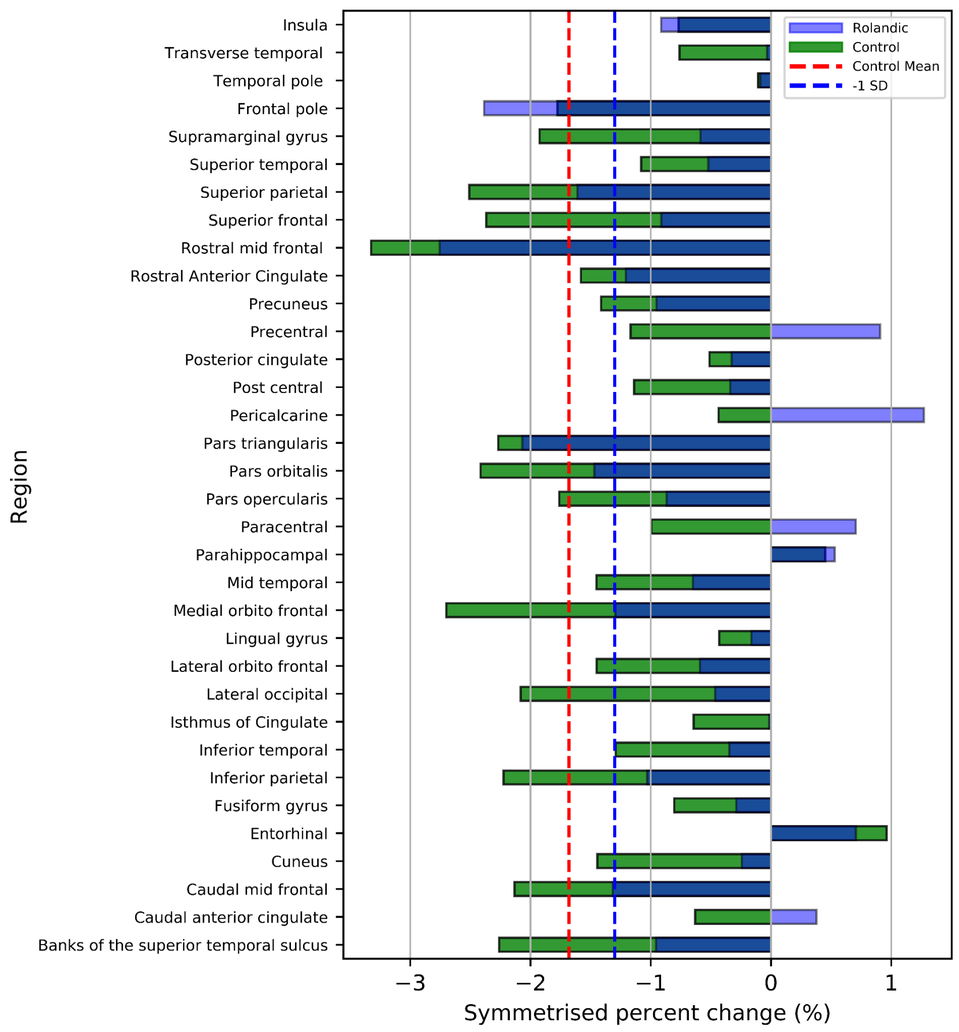
Results

Hemisphere



Between groups two tailed T-test: Significant t=-3.545 p=.012.

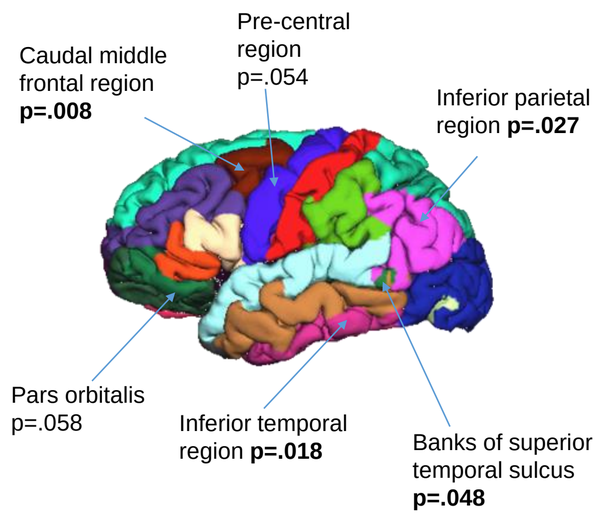
Regions



Bars are opaque, overlapped bars between groups appear darker. Control mean and -1SD (dotted lines), average for the left hemisphere

Statistics

- RE group: **58.8%** of regions did not reach the threshold.
- MANCOVA was not significant. Pillai's trace **p= .163** F=20.644
- **Post-hoc analysis**: **Four** regions were significant and two approached significance.



Conclusion

- This study has shown evidence of **decreased cortical thinning** in children with RE in seizure remission.
- The distribution of changes in cortical thickness are similar to controls. However, the rate of thinning appears to be slower in RE, in particular over the **left caudal mid frontal, inferior temporal** and **parietal** regions.
- We are currently analysing more scans to see if these results are reproducible.

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