

Rationale

- EEG source localisation of interictal epileptic spikes is a valuable non-invasive tool for presurgical epilepsy evaluation,
- This solution is time consuming and needs expertise,
- Automated analysis has been validated on long-term low-density recordings.

Aim

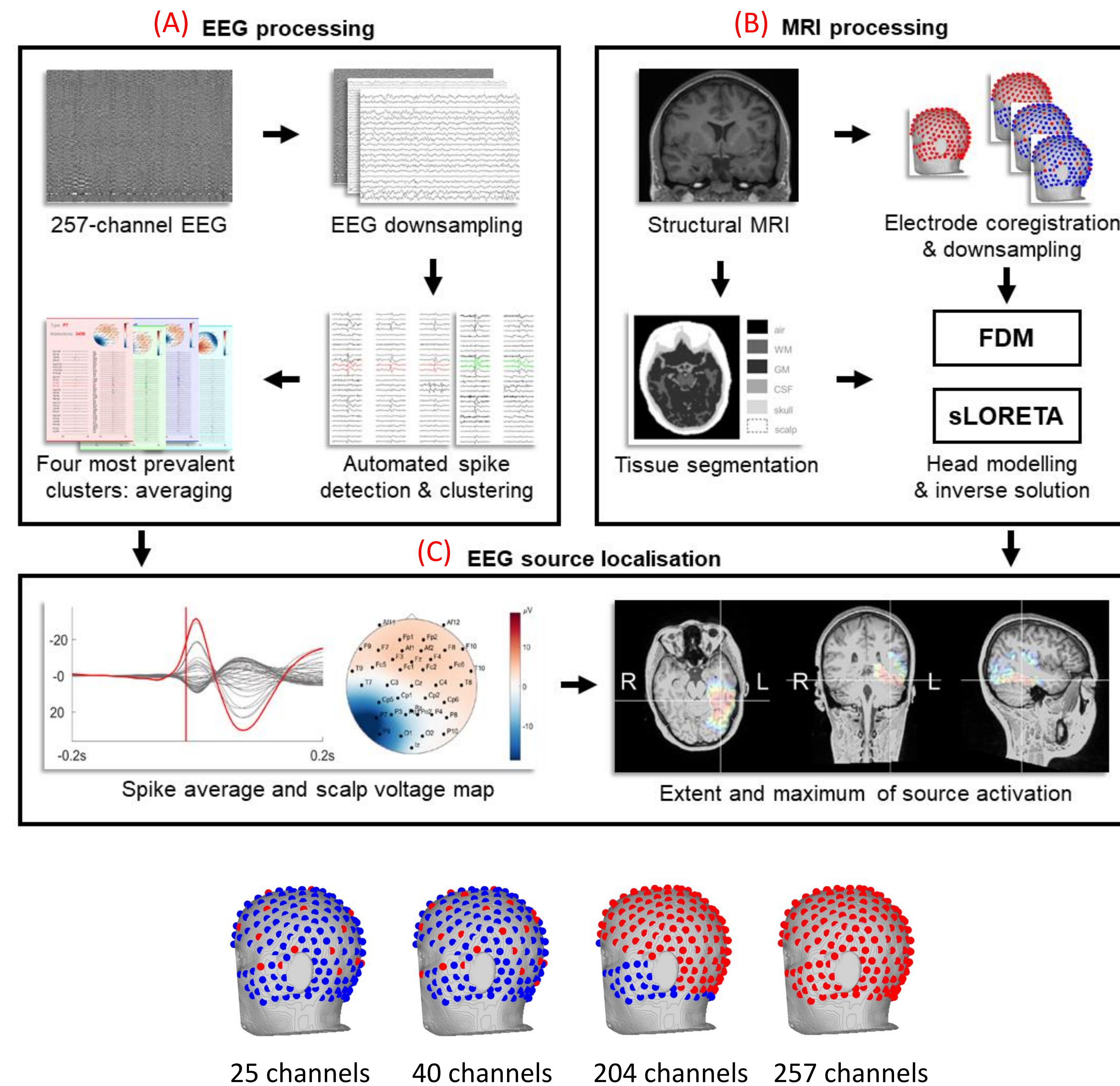
We aimed at evaluating feasibility and accuracy of automated interictal EEG Source Imaging (ESI) based on presurgical high-density (HD) EEG and comparing different electrode setups.

Methods

(A) The full 257-channel EEG was downsampled to 25, 40, and 204 channels for comparison. For each EEG setup, spikes were automatically detected and clustered based on their topography. The 4 clusters with the highest numbers of single events were further evaluated.

(B) The 257-channel EEG setup was co-registered to the structural 3D MRI and downsampled. The head was automatically segmented into 6 tissue layers (white matter, grey matter, cerebrospinal fluid, skull, scalp, and air) to generate an individual finite difference head model (FDM). The standardized low-resolution electromagnetic tomography (sLORETA) served as inverse solution.

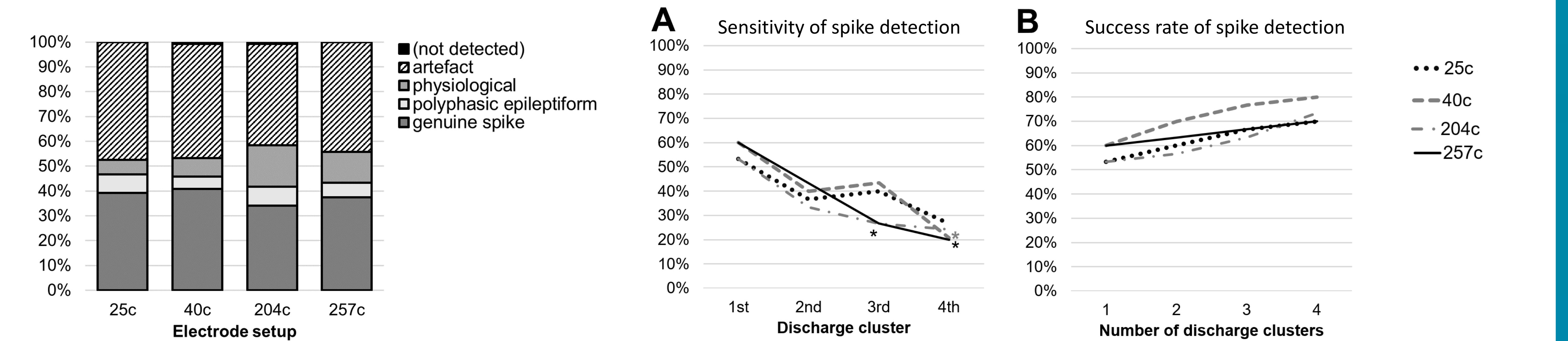
(C) For each spike cluster, at the average's onset, half-rise, and peak, both the extent and the maximum (crosshairs) of the source activation were visualised in the 3 orthogonal planes of the MRI. The source maximum of half-rising was later compared to the postsurgical MRI.



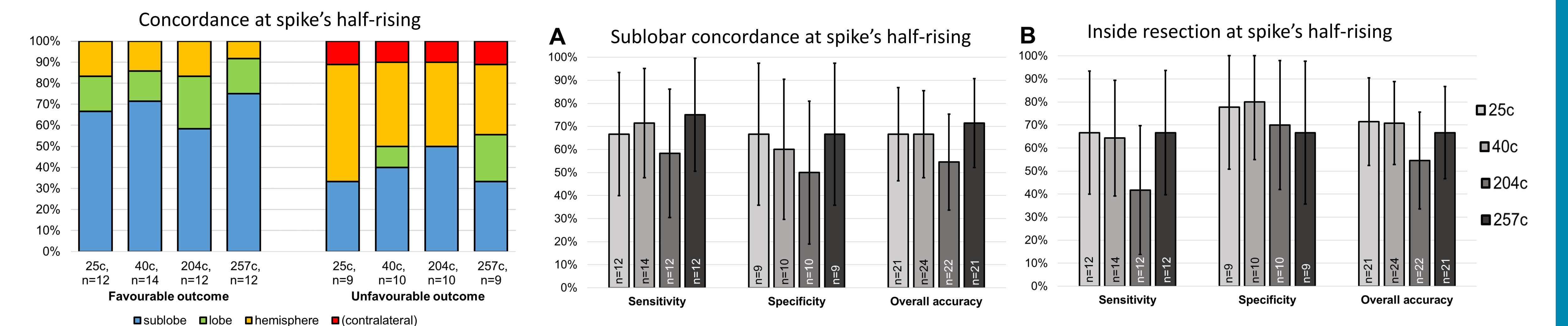
Results

From 30 consecutive cases of this study, 21 patients had at least one spike cluster.

- N1 = 12 with favourable postsurgical outcome, ILAE 1+2;
- N2 = 9 with unfavourable outcome, ILAE 3-5.



- A)** proportion of genuine spikes in the first, second, third, and fourth most prevalent discharge cluster,
B) success rate of automated spike detection to detect at least one genuine spike cluster depending on the number of the most prevalent discharge clusters included.



- A)** parameters based on sublobar concordance between source maximum and resected brain area at the most prevalent spike average's half-rise.
B) parameters based on the source maximum located inside the resected brain area at the most prevalent spike average's half-rise. Error bars indicate 95%-confidence intervals.

Conclusion

- Automated interictal source localisation from high-density EEG is feasible in the majority of patients, with EEG-expert review to discard false-positive patterns.
- Validated by site of resection and postsurgical seizure outcome, results of automated source localisation are fairly accurate but not significantly different from low-density EEG.