2-years PostDoc proposal

Understanding the Impact of Neonatal Arterial Ischemic Stroke on Brain Development

Lab

LARIS, Angers France

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Funding : FRM (Fédération pour la recherche médicale)

Contact

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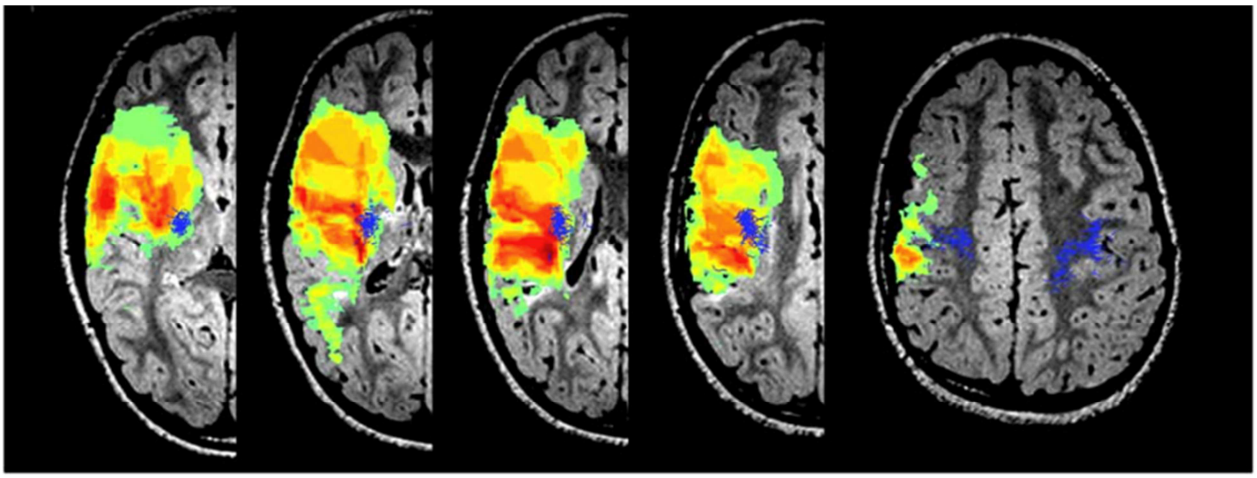
Scientific Context

With a prevalence of 1/2,000 to 1/4,000 live births, perinatal ischemic stroke is the most frequent form of childhood stroke and constitutes the leading cause of unilateral cerebral palsy in term-born children. Perinatal ischemic stroke is an umbrella term including several conditions that differ in pathophysiology, timing and thus in outcomes. Neonatal arterial ischemic stroke (NAIS) refers to a perinatal ischemic stroke syndrome with neonatal signs (mainly iterative focal seizures in the first days of life) related to an arterial infarct as revealed by brain imaging.

Every case of NAIS is unique to the individual. Considering for instance NAIS leading to unilateral cerebral palsy, one person may have total paralysis and require constant care, while another with partial paralysis might have slight movement tremors but require little assistance. This is due in part to the type of injury and the timing of the injury to the developing brain. The prediction of long-term motor outcome (and the associated treatment or therapy) requires new personalized approaches, i.e. patient-specific techniques to understand the causes of the observed disabilities.

Figure 1 – Overlay of CST tracts and voxel-based lesion-symptom mapping on FLAIR data.



Objectives

The objective is to perform a morphometry study focusing on changes such as cortical thickness, cortical folding, white matter fiber shape, after NAIS using the AVCnn cohort, and the available CMIND dataset (Cincinatti, MR imaging of NeuroDevelopment, https://research.cchmc.org/c-mind) as a control population. We plan to characterize the impact of NAIS on brain development in patients included in the AVCnn cohort using morphological features and connectivity-based measurements. We will compute structural connectivity to the ischemic lesion by reconstruction of white-matter tracts connecting stroke regions with remote cortical surfaces using fiber tracking methods. The structural T1-weighted images will be processed using the Freesurfer software package to segment brain structures and to compute the cortical thickness. Brain folding will be characterize using in-house software. Results will be to bridge the gap between NAIS and physical growth modeling.

Required skills

- Image processing and analysis, medical image computing
- Applied Maths
- Programming (Matlab, Python and C++)

How to apply

Candidates are invited to email (to Mickaël Dinomais, Julien Lefèvre and François Rousseau) a motivation letter and CV detailing in full your academic background, including all modules taken and grades assigned.