

Post-doctoral position 2016

LONGIDEP study - Study of morphological and perfusional predictive imaging biomarkers of treatment resistant depression

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<http://www.irisa.fr/visages>

Duration: 1 year with possible renewal; Salary: around 2100 € net/month according to experience

Context

Depression is a debilitating illness which course is frequently recurrent. This disease affects more than 350 million people around world (World Health Organization, 2012) with a lifetime prevalence in the range of 10% to 15%. It is identified to be a leading cause of burden with high disability in every day life. The risk of recurrence in specialized medical care after 15 years is estimated around 85%. Two major factors are involved in the risk of recurrence: the number of previous episode and the persistence of inter-critical residual symptoms. The latter hits one third of people suffering from Mood Depressive Disorders (MDD). The most identified are anxiety, intensity of sadness, psychiatric comorbidities such as panic disorder.

During the last decade, the field of neuroscience has investigated the function and the morphology of the brain of patients suffering from depression and specifically TRD. Some brain networks (fronto-striato-limbic) have been identified as key structures that could be involved in therapeutic resistance. LONGIDEP is a routine care cohort of patients suffering from mood depressive disorder (MDD) who underwent clinical, neuropsychological and imaging. The aims of this study are 1/ to identify clinical and imaging markers (morphological and arterial spin labeling-resting state perfusion) which are predictive of pejorative outcome in MDD and 2/ to identify pathophysiological processes involved in MDD at different resistance stages in order to better characterize them.

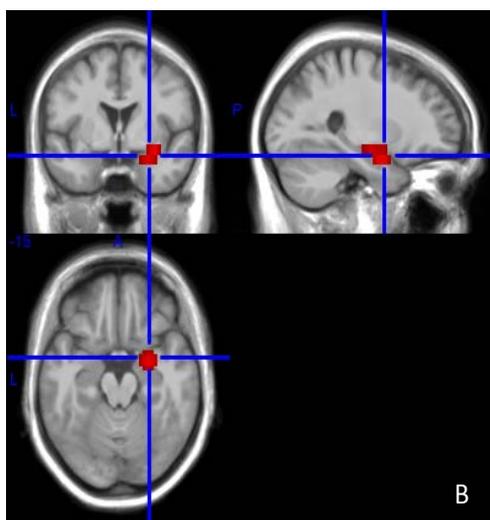


Figure 1 : ASL right amygdala hyper-perfusion in a population of TRD patients compared to healthy controls. (Batail et al., 2014.)

Post-doctoral position objectives

The objective of this post-doc position will be to develop and use available image processing methods in order to identify imaging biomarkers that can correlate indices coming from the imaging data in correlation with clinical scores. The post-doc will work on the LONGIDEP clinical protocol that measures both structural state of the brain using a combination of MRI sequences such as Arterial Spin Labelling and high Resolution diffusion MRI (for multi-compartment diffusion imaging). This will allow the integration of

1. Image processing: morphological data (voxel based morphometry, anatomical connectivity such as DTI), arterial spin labeling (pulsed and pseudo-continuous), individual patterns. This part will be driven by the daily close collaboration of clinicians and post-doctoral researcher.
2. Longitudinal analysis: Development of a functional ASL- based connectivity processing method working on LONGIDEP's data.

From a methodological perspective, this work will deal with

- registration between modalities, time points and patients
- segmentation of the brain compartments
- quantification of brain perfusion and image artefacts correction
- statistical comparisons between imaging and clinical scores

The post-doc will work in close collaboration with PhD students, already working on the project and in charge of recruiting the control subjects and patients. At least two articles are expected from this research program.

Location : This post-doctoral project is a collaboration between researcher in information sciences and medical imaging (research Unit Visages U746), and the psychiatrists / neuropsychologists (EA 4712 Behavior and basal ganglia, and the psychiatric hospital of Rennes). It will be located in both sites two research teams: and imaging engineers (INSERM/INRIA research team VisAGeS U746). The job contains two sides:

1. Imaging processing: morphological data (voxel based morphometry, anatomical connectivity such as DTI), arterial spin labeling (pulsed and pseudo-continuous), individual patterns. This part will be driven by the daily close collaboration of clinicians and post-doctoral researcher.
2. Development of a functional ASL- based connectivity processing method working on LONGIDEP's data.

Location: This post-doctoral position will take place at Inria/IRISA, UMR CNRS 6074, in the VisAGeS U746 research team. The work will be conducted in close link with the MRI experimental platform at Neurinfo (<http://www.neurinfo.org>) and the neurologists and radiologists involved in the project.

Requirements: This work will require strong knowledge in the fields of information sciences (statistics, optimization), and image processing (image segmentation, registration...). A PhD thesis in one of those fields will thus be required. A good knowledge of computer science tools will also be required, especially in object oriented programming (C++), Matlab or python.

References

1. O. Commowick, N. Wiest-Daesslé, S. Prima. Automated diffeomorphic registration of anatomical structures with rigid parts: application to dynamic cervical MRI. MICCAI 2012.
2. R. Hedouin, O. Commowick, M. Taquet, E. Bannier, B. Scherrer, S. Warfield, C. Barillot. Symmetric Block-Matching Registration for the Distortion Correction of Echo-Planar Images. IEEE International Symposium on Biomedical Imaging (ISBI) 2015
3. Maumet C, Maurel P, Ferré JC, Carsin B, Barillot C. (2013). Patient-specific detection of perfusion abnormalities combining within-subject and between-subject variances in Arterial Spin Labeling. *Neuroimage*: 81, 121-30.
4. Batail et al., Poster presentation “Study of morphometric and perfusion abnormalities in chronic and treatment resistant depression”, American Psychiatric Association Congress, New York. 05/2014.
5. Batail et al., Anxiety and centro-medial amygdala perfusion in treatment resistant depression, an Arterial Spin Labeling study, 2016 (in prep).