

## FUNCTIONAL CONNECTIVITY OF PATIENTS WITH BRACHIAL PLEXUS INJURY: A RESTING-STATE FMRI STUDY

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## **Brachial Plexus**



## **Brachial Plexus Injury**

- 10% to 20% of peripheral nervous system injuries involving the brachial plexus (MUMENTHALER, 1969; NARAKAS, 1985).
- Patients Profile: age less than 30 years old, male, involved in auto / motorcycle accidents (DUBUISSON et al., 2002; FLORES, 2006; MELLO JR. et al., 2012).
- Type of lesion: complete or incomplete



Therapeutic approach: Reconstruction of the brachial plexus and physiotherapy

# Plasticity in human primary sensorimotor cortex after amputation





Cohen et al., 1991; PascualLeone et al., 1996; Flor et al., 1995; Ojemann & Silbergeld, 1995

#### CEREBRAL PLASTICITY IN CROSSED C7 GRAFTS OF THE BRACHIAL PLEXUS: AN fMRI STUDY

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Cortical Reorganization Following Neurotization: A Diffusion Tensor Imaging and Functional Magnetic Resonance Imaging Study

Anilkumar Masalavada Sokki, Dhananjaya Ishwar Bhat; Bhagavatula Indira Devi

Functional magnetic resonance imaging and control over the biceps muscle after intercostal–musculocutaneous nerve transfer

MARTIJN J. A. MALESSY, M.D., PH.D., DICK BAKKER, M.D., AD J. DEKKER, PH.D., J. GERT VAN DIJK, M.D., PH.D., AND RALPH T. W. M. THOMEER, M.D., PH.D.

**Brain Reorganization** in Patients with Brachial Plexus Injury: A Longitudinal Functional MRI Study

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#### **Task paradigm**

Change of interhemispheric functional connectivity between the primary motor cortex after brachial plexus injury



**Resting-state** 

Liu et al., 2013

## **STUDY 1**

Functional connectivity changes in the M1 organization were investigated in a group of patients with brachial plexus root avulsion submitted to intercostal-musculocutaneous nerve transfer with fMRI.

### PARTNERSHIPS



Leiden University Medical Center: Martijn Malessy Serge Rombouts





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#### **PARTICIPANTS**

- Nine right-handed patients with a brachial plexus avulsion submitted to ICN-MC transfer.
- Eleven right-handed control subjects, matched in age and sex with the patient's group participated in this study.



#### **EXPERIMENTAL PROCEDURE**



- Data acquisition was performed in Netherlands.
- 3T scanner
- Participants were instructed to keep their eyes closed, and not to think of anything in particular during resting-state scanning by 5 minutes.

#### **MEASURES**

• We designed an analysis in order to investigate local interactions between voxels, to understand how interactions decay as a function of the distance, and to compare the correlation behavior between the groups.



• Euclidean distance between voxels.

- For each distance between voxels, we computed the 95% confidence interval on the population value of the Spearman correlation.
- After, for each distance was compared the correlations between the two groups, using a Mann-Whitney test.

#### RESULTS



Fraiman et al, 2015 (paper in preparation).

## **STUDY 2:**

Characterization of the functional connectivity by EEG

- Investigate the functional connectivity in other brain regions
- Investigate if there is a correlation between the degree of functional connectivity and upper limb functionality

#### **Participants**

- BPI patients are being recruited in the Instituto de Neurologia Deolindo Couto
- The control subjects are being matched for sex and age with BPI group.

#### **Experimental designe**



128-channel system by Electrical Geodesics, Inc.





Resting-state • 3 min

# THANKS

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