Automatic detection of the lesion in children with pharmacoresistent epilepsy secondary to focal cortical dysplasia

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Introduction: Focal cortical dysplasia (FCD) is the most common cause of pharmacoresistant epilepsy in childhood. FCD has a good prognosis of seizure control after surgery if the complete lesion is resected[1]. However, FCD have a range from easily visually detected lesions to lesions with subtle abnormalities in magnetic resonance imaging (MRI)[2]. This study aims to evaluate post-processing protocol of MRI for the improvement of the detection of abnormalities suggestive of FCD.

Materials and Methods: Twelve 12 children with clinical diagnoses of pharmacoresistant epilepsy secondary to FCD followed in Clinical Hospital of Unicamp were selected. The images were acquired in a 3T MRI with volumetric T1-weighted sequences. Using voxel based morphometry (VBM) technique, we applied an algorithm based in the gray and white matter maps and compared each patient with a control group of 100 healthy subjects. Pre-process of T1-weighted images included gray and white matter segmentation, normalization, modulation and smoothing. The algorithm based on increased gray matter volumes and decreased white matter volumes was applied for each patient looking for areas with abnormalities suggestive of FCD. The clinical data was based in the pre-surgical investigation.

Results: From the 12 patients, 5 had a lesion visually detected in de MRI image (MRI-pos) and 7 had the MRI image considered normal (MRI-neg). In the MRI-pos group, 3/5 (60%) cases presented VBM abnormalities concordant with the MRI visual analysis. All concordant cases in the MRI-pos group had extra-temporal lesions and the 2 discordant results were lesions in the temporal lobe. In the MRI-neg group, 3/7 (43%) cases presented VBM abnormalities concordant with the presumed epileptogenic zone defined in the pre-surgical evaluation. Among the concordant cases of the MRI-neg group, 2 were extra-temporal and 1 temporal lobe case.

Discussion: This is a preliminary analysis with an adult control group. Subsequently these analyses will be repeated with a pediatric control group, so we hope to improve the results. Also, we have a worse result in temporal cases due to the worse resolution in MRI image in this area.

Conclusion: This preliminary analysis showed that this automatized post-processing protocol may be a useful toll to detect FCD areas, especially in extra-temporal lobe epilepsies. However, a larger number of cases need to be evaluated to confirm the effectiveness of this method.

References: [1] Coan, AC & Guerreiro, MM., Journal of International Chid Neurology Association 16(115): 7 pages, 2017; [2] Cendes, F., Continuum (Minneap Minn) 19(3): 623-642, 2013.