VOXEL-BASED MORPHOMETRY OF BRAIN CHANGES IN OROMANDIBULAR DYSTONIA
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Introduction
Oromandibular dystonia (OMD) is a focal dystonia whereby repetitive or sustained spasms of the masticatory, facial, or lingual muscles result in involuntary, and possibly painful jaw opening, closing, deflecting, retruding, or a combination of the above. While there have been numerous publications since it’s firstly reported in 1910, OMD is often misdiagnosed and subsequently patients are managed incorrectly1. Based on the elusive etiology for most OMD cases, Botulinum toxin injection is currently the mainstay of treatment, as for most focal dystonias. Voxel-based morphometry (VBM) is an automated and unbiased image analysis technique that allows the comparison of regional patterns of whole brain volume on T1-weighted magnetic resonance imaging (MRI) scans between two groups of subjects; typically between a group of subjects with a disorder and an age-matched control group2. Some previous studies have explored the brain changes of several focal dystonias, while relative report focusing on OMD was very rare. This study aimed to explore the brain changes of OMD with the latest method of VBM in order to help clinicians understand the mechanism of such kind of dystonia.

Methods
Twenty patients with primary OMD (6 men and 14 women; age: 53±10.17 years; disease duration: 46.68±40.32 months) were included from outpatient, and all secondary factors such as trauma, tumor, inflammation, medication and any other neurological disease were excluded. All patients had no other neurological sign but dystonia. Nineteen healthy controls (6 men and 13 women; age: 52.05±9.31 years) were also recruited. Informed contents were obtained from all subjects. All subjects were right-handed.

This study was performed at a 3.0 T MR scanner with an 8-channel phase array head coil. Axial T1-weighted 3-dimensional fast spoiled gradient echo sequence (TR=6.9ms, TE=3.3ms, flip angle=15º, matrix=256x256, FOV=24x18cm, slice thickness=1.6mm, slice gap=0.8mm) was applied to acquire structural images of whole brain. Besides, conventional pulse sequences that composed the standard head examination, including T1WI, T2WI, FLAIR and DWI, were also performed to help exclude subject with brain abnormality. All images were reviewed to evaluate the quality.

With SPM8, VBM was performed to show GM and WM changes in OMD with the DARTEL method. After standard procedure of new segment, creating template, normalize to MNI and smooth with 8mm full width at half maximum (FWHM), two-sample t tests were performed between patients and controls on gray matter and white matter respectively. \( P \) values were set as 0.01 (uncorrected), and cluster threshold was set as 100 voxels.

Results
One female patient was excluded because of motion artefact, and no difference was found in age and gender between the two groups. The remaining OMD patients showed significant GM and WM increase in right cerebellum and temporal pole (Figure 1). Besides, GM increase could also be seen in right postcentral gyrus and precuneus (Figure 2). On the other hand, significant GM decrease was demonstrated in right putamen, right middle temporal gyrus and left middle frontal gyrus and bilaterally in the precentral gyrus (Figure 3).

Discussion and Conclusions
In general, the involved regions of cerebellum, putamen, precuneus and primary somatosensory cortex in this study, were also revealed in previous studies on other focal dystonias3-5. The decrease in primary motor cortex were never reported before, but previous fMRI study had showed decreased activity in this region6. Prefrontal and temporal changes were also reported for the first time, which might be relative to the nonmotor manifestations of the patients7, and further study was needed to resolve it. The advantages of Voxel-based analysis were demonstrated to help understand the mechanism of OMD.

References