VOXEL-BASED MORPHOMETRY OF BRAIN CHANGES IN OROMANDIBULAR DYSTONIA

Bo Hou[1], Yuan Tian[2], Hui You[1], Xin-hua Wan[2], and Feng Feng[1]

[1]*Department of Radiology, Peking Union Medical College Hospital, Beijing, China,* [2]*Department of Neurology, Peking Union Medical College Hospital, Beijing, China*

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 incorrectly[1]. 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 group[2]. 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=256×256, FOV=24×18cm, 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.

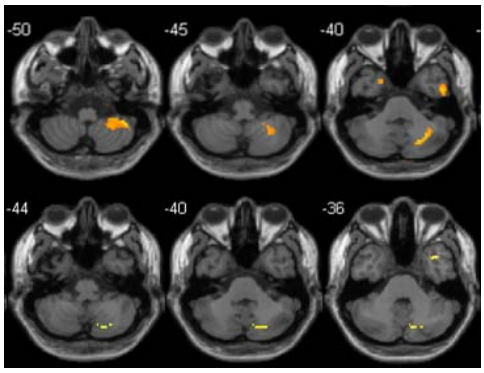

Figure 1.GM(top) and WM(bottom) increase in

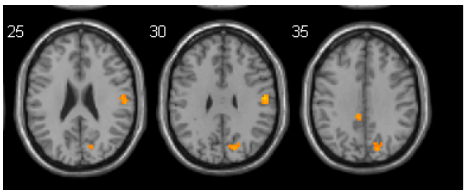

Figure 2.
GM increase in hemispheres in OMD

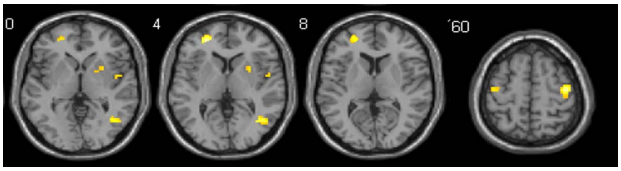

Figure 3.
GM decrease in hemispheres in OMD

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 dystonias[3-5]. The decrease in primary motor cortex were never reported before, but previous fMRI study had showed decreased activity in this region[6]. Prefrontal and temporal changes were also reported for the first time, which might be relative to the nonmotor manifestations of the patients[7], and further study was needed to resolve it. The advantages of Voxel-based analysis were demonstrated to help understand the mechanism of OMD.

References

1. Balasubramaniam R, Rasmussen J, Carlson LW, Van Sickels JE, Okeson JP. Oromandibular dystonia revisited: a review and a unique case. Journal of oral and maxillofacial surgery: official journal of the American Association of Oral and Maxillofacial Surgeons. 2008. 66(2): 379-86.
2. Zoons E, Booij J, Nederveen AJ, Dijk JM, Tijssen MA. Structural, functional and molecular imaging of the brain in primary focal dystonia--a review. Neuroimage. 2011. 56(3): 1011-20.
3. Obermann M, Yaldizli O, De Greiff A, et al. Morphometric changes of sensorimotor structures in focal dystonia. Mov Disord. 2007. 22(8): 1117-23.
4. Filip P, Lungu OV, Bares M. Dystonia and the cerebellum: a new field of interest in movement disorders. Clinical neurophysiology : official journal of the International Federation of Clinical Neurophysiology. 2013. 124(7): 1269-76.
5. Horovitz SG, Ford A, Najee-Ullah MA, Ostuni JL, Hallett M. Anatomical correlates of blepharospasm. Transl Neurodegener. 2012. 1(1): 12.
6. Dresel C, Haslinger B, Castrop F, Wohlschlaeger AM, Ceballos-Baumann AO. Silent event-related fMRI reveals deficient motor and enhanced somatosensory activation in orofacial dystonia. Brain. 2006. 129(Pt 1): 36-46.
7. Kuyper DJ, Parra V, Aerts S, Okun MS, Kluger BM. Nonmotor manifestations of dystonia: a systematic review. Mov Disord. 2011. 26(7): 1206-17.