AGE-RELATED CHANGES OF NORMAL SUBTHALAMIC NUCLEUS: EVALUATION WITH HIGH RESOLUTION MR IMAGING AT 3.0 T

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Introduction

The subthalamic nucleus (STN) is the target region of electrode implantation plus continuous high frequency stimulation by means of a pacemaker for advanced Parkinson's disease. Recent advances of MR imaging allowed direct visualization of STN (1, 2), whereas age-related changes of the STN has not been fully evaluated. The purpose of this study was to assess the alterations in signal intensity and spatial position of the STN with aging on MR images at 3.0-T.

Methods

A total of 24 neurologically normal cases (12 women, 12 men; age range, 32-86 years; mean age 56.0 years) were prospectively included in this study. Coronal FSE T2-WI (TR/TE/NEX 4000/84.1/3, ETL 14) and fast STIR (TR/TE/NEX 5000/20.9/2, ETL 10, TI 120msec) images perpendicular to the AC-PC line with a 2.5-mm thickness with no gap, a FOV of 20cm, and a matrix of 512x320 were acquired at a 3.0-T MRI system (Excite HD, GE). The definition of the STN on MR imaging was determined by referring to the Schaltenbrand and Wahren atlas. For evaluation of alterations in signal intensity of the STN with aging, we calculated contrast-to-noise ratio (CNR) between right and left STN and adjacent white matter: $[(SI_{STN} - SI_{white\ matter})/SD_{background}]$ on FSE T2-weighted image. For evaluation of alterations in position of the STN with aging, we measured the distance from the midline to the medial and lateral border of right and left STN, the length of the long axis of the STN, and height of the STN on fast STIR image. The statistical correlation between signal intensity and spatial position of the STN and subjects' age was determined by using Pearson's correlation coefficient test.

Results: No statistically significant correlation between CNR and subjects' age was observed on FSE T2-weighted image. There were a statistically significant differences between age and the distance from the midline to both lateral border of the STN (*left; r=0.4956, p<0.05, right, r=0.4526, p<0.05*) on fast STIR image (Fig.1): the distance from the midline to the lateral border of the STN increased with advancing age in both sides. In addition, distance from the midline to the medial border of left side STN also increased (*r=0.5717, p<0.01*).

Fig.1-1 Relationship between the distances from midline to the lateral border of right side STN

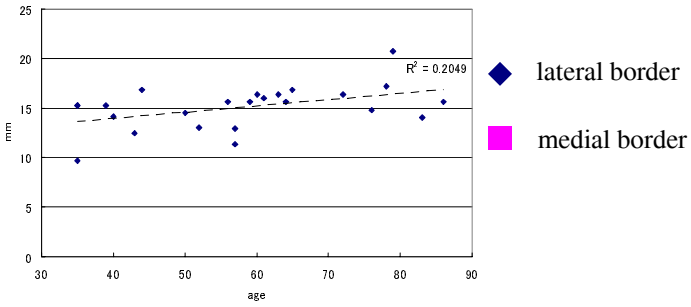
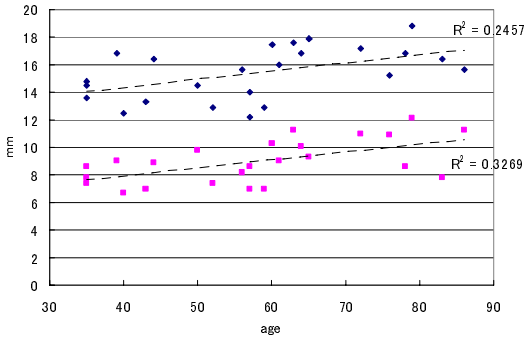


Fig.1-2 Relationship between the distances from midline to the lateral and medial border of left side STN



Conclusion: The position of the STN changes with advancing age, while the signal intensity does not change. The age-related positional change should be considered in target determination for deep brain stimulation procedures.

Reference

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