216

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REDUCED CEREBELLAR VERMIS ACTIVATION IN RESPONSE TO MICTURITION IN MULTIPLE SYSTEM ATROPHY; 99MTC-LABELED ECD SPECT STUDY

Aims of Study

Multiple system atrophy (MSA) is a disease characterized by widespread autonomic failure, of which urinary dysfunction is the most common. In normal subjects, functional brain imaging showed specific brain activation including the brainstem, cerebellum and frontal cortex during micturition. We examined which brain area might account for the urinary dysfunction in MSA in vivo as compared with normal subjects.

Methods

MSA group comprised 8 patients, 2 men and 6 women, mean age of 61 years. All patients had urinary symptoms, and 6 had detrusor hyperreflexia and 3 had post-void residuals more than 100 ml. Control group comprised 5 normal subjects, 3 men and 2 women, mean age of 62 years, with mild urinary symptom in one. In both groups, [^{99m}Tc]-ECD SPECT scans were obtained in 3 phases; resting, urinary filling and voiding. Using NEUROSTAT software, statistical difference between normalized mean tracer counts of both groups in each phase was calculated and visualized as 3-dimentional, stereotactic surface projections (3D-SSP).

Results

In the resting state, there was a reduction of tracer counts in the brainstem and cerebellum, and to a lesser extent, in the frontal cortex in the MSA group, although it was not statistically significant. During urinary filling, there was a further decrease of tracer counts in bilateral upper cerebellar vermis particularly on the right side in the MSA group ($p<0.05$). During voiding, the decrease of tracer binding in the upper vermis was more marked particularly on the right side in the MSA group ($p<0.05$). Changes of tracer counts in the insular cortex and the basal ganglia were not observed.

Conclusions

It is speculated that the decrease in the cerebellar vermis activity is associated with the urinary dysfunction in MSA.

References

Aswal BS, Berkley KJ, Hussain I, Brennan A, Craggs M, Sakakibara R, Frackowiak RSJ, Fowler CJ. Brain responses to changes in bladder volume and urge to void in healthy men. Brain 2001: 124; 369-377.

Beck RO, Betts CD, Fowler CJ. Genito-urinary dysfunction in Multiple System Atrophy: clinical features and treatment in 62 cases. J Urol 1994;151:1336-1341.

Blok B, Willemsen T, Holstege G. A PET study of brain control of micturition in humans. Brain 1997; 129: 111-121.

Bradley WE, Teague CT. Cerebellar influence on the micturition reflex. Exp Neurol 1969; 23: 399-411.

Fukuyama H, Matsuzaki S, Ouchi Y, Yamauchi Y, Kimura J, Shibasaki H. Neural control of micturition in man examined with single photon emission computed tomography using 99mTc-HMPAO. NeuroReport 1996; 7: 3009-3012.

Minoshima S, Giordani BJ, Berent S, Frey KA, Khul DE. Metabolic reduction in the posterior cingulated cortex in very early Alzheimer's disease. Ann Neurol 1997; 42: 85-94.

Nishizawa O, Ebina K, Sugaya K, Noto H, Satoh K, Kohama T. Effect of cerebellectomy on reflex micturition in the decerebrate dog as determined by urodynamic evaluation. Urol Int 1989; 44: 152-156.

Nour S, Svarer C, Kristensen JK, Paulson OB, Law I. Cerebral activation during micturition in normal men. Brain 2000; 123: 781-789.

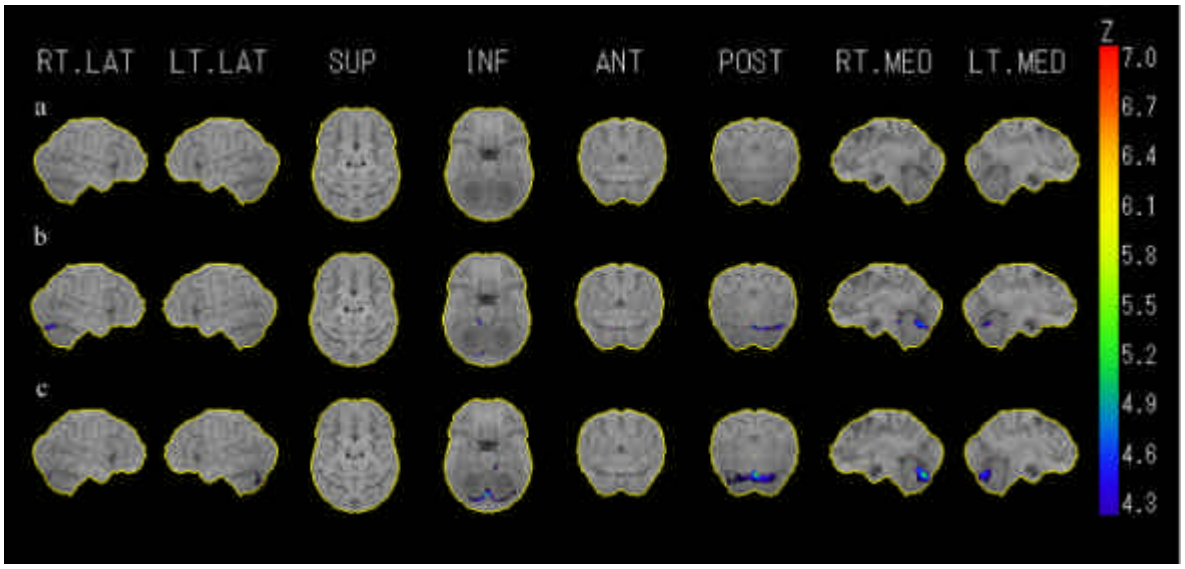

Figure 1

3D-SSP statistical mapping of the difference between tracer counts of MSA and control groups. a. resting state, b. urinary filling, c. voiding.

Coloured area indicate the decrease in tracer counts in the MSA group during urinary filling (middle, b) and during voiding (bottom, c) ($p<0.05$).