

FESOTERODINE MODULATES THE BRAIN FUNCTION IN OAB PATIENTS: A REAL-TIME MEASURE OF OXYHEMOGLOBIN CONCENTRATION CHANGES DURING URODYNAMICS

Hypothesis / aims of study

Anticholinergics ameliorate overactive bladder (OAB) mostly at the bladder, e.g., anticholinergics suppress bladder efferent cholinergic fibers as well as urothelial/suburothelial acetylcholine transmission, and suppress increased bladder afferent activity¹. Recently, it is reported that anticholinergic may modulate brain function in OAB patients². This is because in OAB patients, the prefrontal cortex is deactivated where the frontal micturition center normally suppresses the micturition³. To further clarify this, we performed a real-time NIRS (near-infrared spectroscopy)-urodynamic study in OAB patients before and after administration of an anticholinergic agent fesoterodine.

Study design, materials and methods

We recruited 43 OAB patients in our outpatient clinic. Most of them were referred patients. They were 28 male, 15 female patients; mean age 73 years, range 53-85 years. Before and after administration of 3 months, 4 mg/day fesoterodine, all patients underwent a NIRS-urodynamics according to the International Continence Society standards. Cerebral changes in the oxy-hemoglobin concentration (oxy-Hb) and deoxy-hemoglobin concentration (deoxy-Hb) were sampled by optical topograph systems for NIRS (OMM-3000, Shimazu Inc, Kyoto, Japan, 58 channels being measured simultaneously). Concentration changes in oxy-Hb and deoxy-Hb were calculated based on a modified Beer-Lambert approach². According to the Talairach's brain atlas, the probe array covers the areas 4, 6, 8, 10, 44, 46 and the more anterior parts of the frontal cortex.

Results

Fesoterodine ameliorated night-time frequency, urgency ($p < 0.05$), QOL measure and total score ($p < 0.01$) (by the OAB-symptom score [OABSS]) and increased bladder capacity volume (258 ml to 319 ml, $p < 0.05$) significantly. The number of patients with detrusor overactivity (DO) did not lessen significantly (25 to 24). A real-time NIRS -urodynamic study showed that fesoterodine significantly changed brain activity, e.g., lessened activation in the paramedian paracentral lobule (Brodmann's area 6,8) and right prefrontal area; and increased activation in the left prefrontal area (Brodmann's area 44,46 and the more anterior parts).

Interpretation of results

In the present study, fesoterodine increased bladder capacity volume significantly without marked disappearance of detrusor overactivity. This presumably reflects fesoterodine's suppression of the bladder afferent signals. Along with this, fesoterodine modulates the brain function in OAB patients, e.g., increased activation in the left prefrontal area while decreased activation in the right prefrontal area. Previous studies suggest right-side dominance in regulating micturition; therefore our finding still needs further clarification. Fesoterodine also lessened activation in the paramedian paracentral lobule, presumably reflecting less need to contract the sphincter muscles against DO.

Concluding message

A real-time NIRS -urodynamic study showed that fesoterodine modulates the brain function in OAB patients by changing activation in the prefrontal bladder area and lessening activation in the paracentral sphincter area.

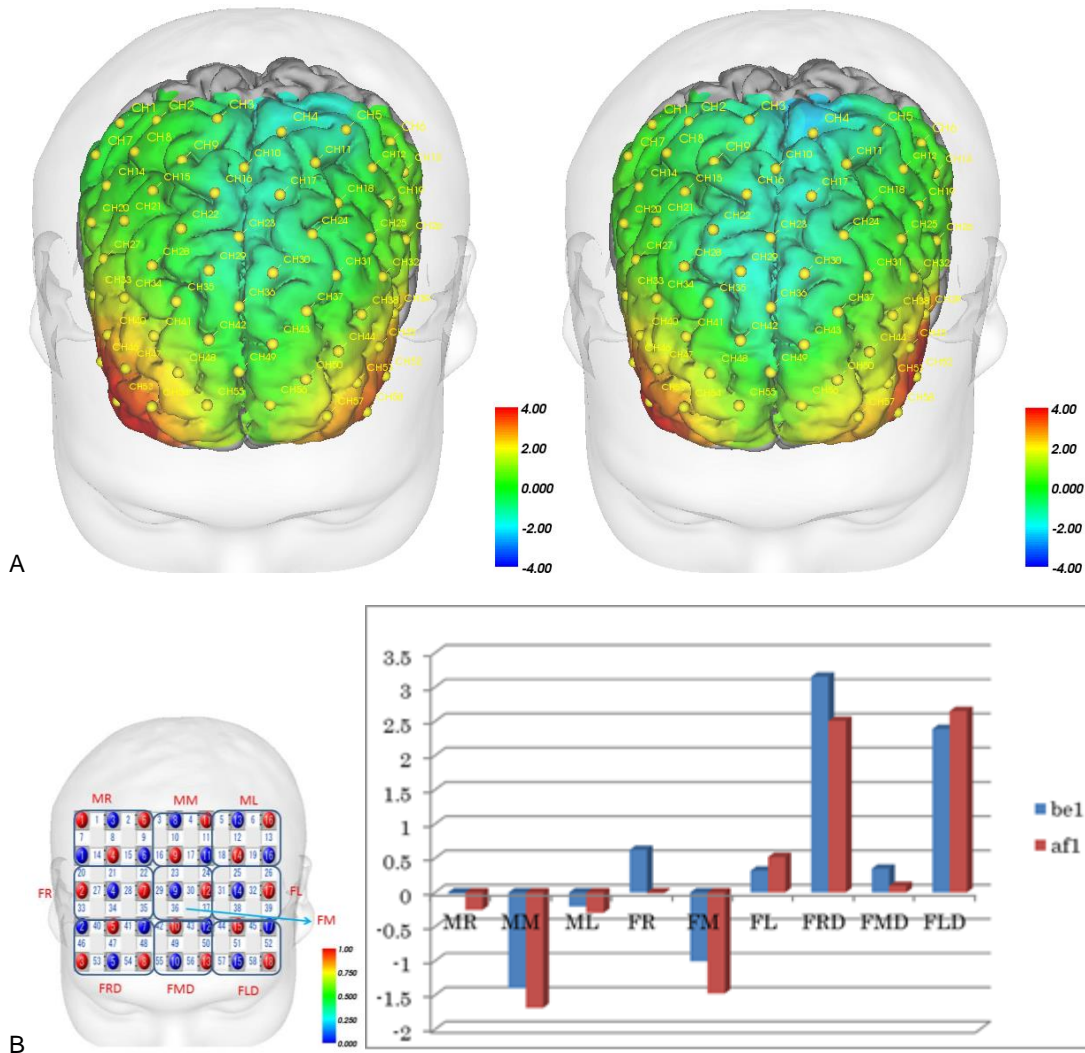


Figure 1 NIRS summation data of 43 patients.

A. Difference of brain activation between start to the first sensation: (left) pre, (right) post-fesoterodine. Vertical bar indicates t-value (larger value means more statistical significance).

B. We divided the brain area into nine, e.g., mid right, mid mid, mid left (including paracental lobule); front right, front mid, front left (including prefrontal area); front right down, front mid down, front left down (including frontal pole). Fesoterodine significantly changed brain activity, e.g., lessened activation in the paramedian paracental lobule (Brodmann's area 6,8) and right prefrontal area; and increased activation in the left prefrontal area (Brodmann's area 44,46 and the more anterior parts). Vertical bar indicates t-value.

References

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Disclosures

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