

## EFFECTS OF SUBTHALAMIC NUCLEUS STIMULATION ON THE MICTURITION-REFLEX IN CATS

### Aims of Study

High frequency stimulation (HFS) of the subthalamic nucleus (STN) has been performed to reverse motor dysfunction in severe parkinsonian patients. Recent studies suggested that neural circuitry in the basal ganglia might regulate micturition function as well.

### Methods

In 15 adult male cats under ketamine anaesthesia, in which spontaneous isovolumetric micturition reflex had been generated, we performed electrical stimulation and extracellular single unit recording in the STN.

### Results

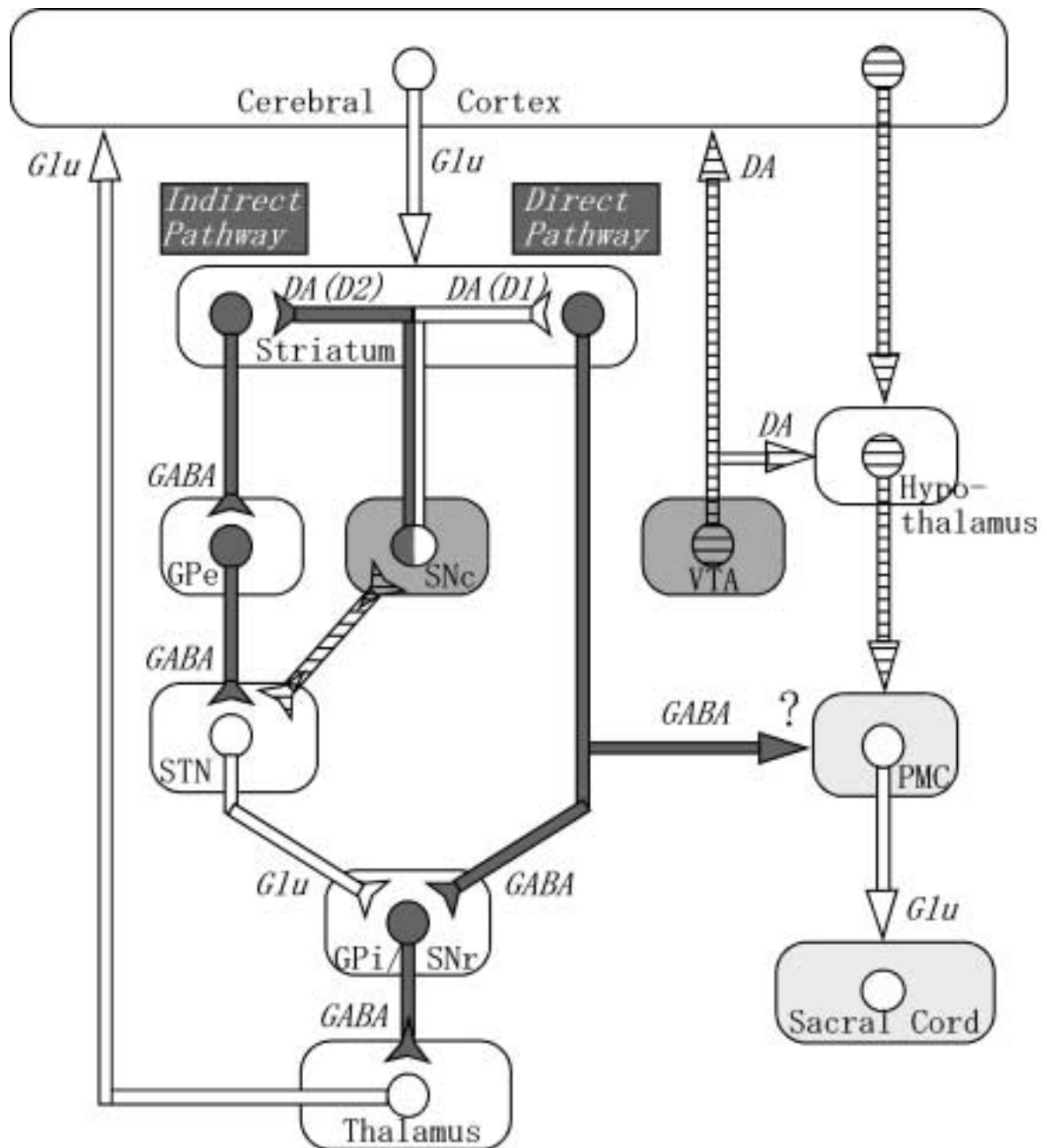
Electrical stimulation applied in the STN elicited inhibition of the micturition reflex. None of the responses was facilitatory. Effective amplitude of the electrical stimulation for evoking inhibitory responses was less than 50  $\mu$ A, which gradually increased and exceeded 250  $\mu$ A as the location of the stimulation exceeded an area of the STN. Effective frequency of the electrical stimulation with given stimulus intensity was 50 Hz and higher. Total 10 neurons were recorded in the STN that were related to urinary storage/micturition cycles. All neurons were tonically active throughout storage/micturition cycles with storage phase predominance, with almost constant firing activities during the storage phase.

### Conclusions

Our results showed that HFS-STN inhibited the micturition reflex and there were micturition-related neuronal firings in the STN in cats, suggesting the STN may be involved in neural control of micturition. The results also provide an implication that clinical HFS-STN may alter urinary function in parkinsonian patients.

### References

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**Figure 1** Possible basal ganglia circuitry relevant to micturition.

Whereas inhibiting the *indirect* pathway, high frequency STN stimulation activates the SNc that leads to D1-dopaminergic stimulation on the striatum in the *direct* pathway. Thus, increased striatal GABAergic output not only inhibits the SNr, but also may lead to an inhibition of the micturition reflex. SNc: substantia nigra pars compacta, SNr: substantia nigra pars reticulata, GPe: globus pallidus externus, GPi: globus pallidus internus, STN: subthalamic nucleus, VTA: ventral tegmental area, PMC: pontine micturition center, Black line: inhibitory neurons, White line: excitatory neurons, Hatched line: neurons of undetermined property, Italic letters: putative neurotransmitters, *Glu*: glutamate, *GABA*: -aminobutyric acid, *DA*: dopamine