

The tip of medical instrument is situated at

Case 339

2. Subthalamic nucleus

[Progress]

She got drip infusion for dehydration. She discharged our hospital after improving general fatigue.

[Discussion]

Of various functions on brain, mobility and sensation are pivotal. For smooth mobility, brain has two main routes: pyramidal tract and extra-pyramidal tract, while for sensation, a tract between thalamus and cortex exists. Pyramidal tract for voluntary motility is a tract through brain cortex, deep white matter, internal capsule, cerebrum peduncle, and connect to cerebellum, finally to spinal cord. Extrapyramidal tract includes a tract from brain cortex to corpus striatum which compose of caudate nucleus and putamen, and connect to cerebellum, finally to spinal cord. Comparing with pyramidal tract, it has been unclear how extrapyramidal tract works. In recent years, the accumulation of knowledge on extrapyramidal function progress, finding a key to clarify the mechanism.

Extrapyramidal functions to adjust motility by activation and repression by two tracts; one, activation tract includes cortex to subthalamic nucleus and then, medial globus pallidus, this tract functions as ignition of driving motility: another, repression tract includes cortex to corpus striatum, followed by corpus striatum to medial globus pallidus (1, 2). After ignition and repression, motility activation works smoothly. Further, motion activation is thereafter preserved by another route of cortex to corpus striatum and then, corpus striatum to subthalamic nucleus via lateral globus pallidus, and finally to medial globus pallidus (1). All signals from ignition, repression and continuous stimulation accumulate to medial globus pallidus. Namely, three mechanisms work for smooth motility, ignition, repression, and acceleration. These signals accumulate to medial globus pallidus. Medial globus pallidus might finally accommodate involuntary movement smoothly (1). It connects to brain stem and thalamus.

Dopamine, nerve transmitter, which is produced by substantia nigra works in route of repression motility, namely corpus striatum to medial globus pallidus (1). It indicates dopamine plays a role to repress motility after ignition. Interestingly, only ignition does not work movement elevation. Repression after ignition causes movement elevation, in other words, motility work smoothly.

Parkinson disease is known to cause rest tremor, awkward movement, bradykinesia, postural instability, rigidity and finally leading to akinesia. In a medically refractory case, stimulation of subthalamic nucleus or medial globus pallidus via electrode is conducted (2 - 4).

Extrapyramidal mechanism mimic to make a car driving. Engine ignition is corresponded to subthalamic nucleus. Recent car does not move until pressing brakes. Pressing brake is corresponded to activation of a tract between striatum corpus to medial globus pallidus via dopamine transmitter. Pressing accelerator is corresponded to corpus striatum to lateral globus pallidus and then, to subthalamic nucleus. All the signals accumulate to medial globus pallidus.

To liken car moving with braking and accelerating is easy to understand how extrapyramidal tract works and how Parkinson disease onset and develop by deficient dopamine production.

[Summary]

We presented a seventy-four-year-old female with electrode inserted to subthalamic nucleus for Parkinson disease. She had been bothered by rest tremor for years. It is borne in mind that extrapyramidal function mechanism likens to car driving as recent car does not move until pressing brakes.; car ignition is corresponded to a tract of cortex-subthalamic nucleus-medial globus pallidus; pressing brake is corresponded to a tract of corpus striatum-medial globus pallidus by transmitter of dopamine: pressing accelerator is corresponded to a tract of corpus striatum-lateral globus pallidus-subthalamic nucleus-medial globus pallidus. Parkinson disease onset by deficient of dopamine which is chemo transmitter between corpus striatum to medial globus pallidus, namely likening to loss of brake action leading to be unable to move smoothly.

[References]

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