

Among many stereotaxic instruments available at present, Bennett's stereotaxic apparatus has several outstanding advantages as follows. (1) The patient with the Bennett's stereotaxic frame can be placed either in sitting or in supine position for ventriculography. (2) Therefore, with the patient in sitting position, the ventriculography with 6 cc of myodil injected through the frontal burr hole can clearly visualize the foramen of Monro and the anterior and posterior commissures which are essential for determination of the target point. (3) The conventional positive pressure air ventriculography can also be performed with the patient in supine position if desired. (4) With the aid of special telescopes attached both to the X-ray tube and the frame, the X-ray can be beamed at an exact point of the patient's head with an exact angle from the distance of 3 meters. (5) With the one inch apart double plates each scaled horizontally and vertically every 2 mm which are attached to the frame, one can eliminate the factor of magnification upon reading the ventriculogram. (6) By implanting a specifically designed electrode guide consisting of a spheroid with multiple holes for electrode every 3 mm apart which is fixed to the skull between two plates, the stereotaxic frame and ventriculography are unnecessary for the second and subsequent operations.

Based on these advantages, all of our stereotaxic thalamotomies are carried out in two stages. The stage I is carried out under general anesthesia in which the ventriculography is performed with the frame attached to the patient to determine the target point and the electrode guide is implanted unilaterally or bilaterally. The stage II is carried out under local anesthesia in which an electrode is inserted through one of the multiple holes of the spheroid  $\phi$  for physiological studies to determine the best target followed by thermocoagulation. The electrode guide is kept implanted for several months so that the lesion can be enlarged repeatedly if necessary.

Upon the ventriculography with the patient in supine position, the generally used positive pressure air ventriculography is avoided because of its possible complications. The head is slowly rotated so that the con-

tralateral occipital horn will come to the highest position while the ventricular fluid is replaced with the air through a frontal burr hole. The head is then returned to the normal position when the X-ray film is taken. This technique of normal pressure air ventriculography will completely visualize the third ventricle and the aqueduct. This procedure of air injection is carried out before putting the frame on the patient's head.

#### 4. Some Basic Considerations in Role of the Locus Coeruleus for Manifestation of Pain Problems

##### —Evoked Response Studies—

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The trigeminal nerve (alveolar nerve) was stimulated electrically and evoked responses were recorded from the ipsilateral trigeminal sensory nucleus, contralateral CM, and LM. CM recording by ipsilateral LM stimulation, LM recording by the ipsilateral CM stimulation, and antidromic recording by stimulating trigeminal sensory nucleus were also performed. And changes in evoked response recorded from these various regions were observed before and after conditioning of the locus coeruleus (LC).

Conditioning stimuli of the locus coeruleus were given a train of four square wave (0.2 msec, 5 volt, 250 Hz/sec), and then 30 msec after this train, single test stimulus was given. Parameter of conditioning stimulations were fixed throughout the experiments.

Evoked negative responses with about 8 msec peak latency, recorded from the trigeminal sensory nucleus by stimulating the alveolar nerve, were suppressed after conditioning of the bilateral LC. Ipsilateral stimulation of LC suppressed more heavily than the contralateral LC did. The antidromic responses were facilitated by both ipsilateral and contralateral LC conditioning. Ipsilateral LC stimulation facilitated more than that of the contralateral one. LM response evoked by stimulating contralateral alveolar nerve was facilitated after conditionings. Contrariwise,

responses recorded from CM with 10–20 msec peak latency evoked by the contralateral peripheral trigeminal nerve stimulation were suppressed by ipsilateral and contralateral LC conditioning. Similarly, CM response by stimulation of the contralateral sciatic nerve, CM response by ipsilateral CM stimulation and LM responses by the ipsilateral CM stimulation were suppressed after conditioning. Among these suppression of the evoked response, superior suppression by the ipsilateral LC were found in the case of sciatic nerve to CM and CM to LM, on the contrary contralateral superiority was in the case of the peripheral trigeminal nerve to the contralateral CM. And in the case of LM to CM almost same degree of the suppression was noted whichever LC was stimulated.

### 5. The Appearance of Rhythmic Slow Wave in the Subthalamic Nucleus and Ventral Tegmental Area Related with Monoamine Contents

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The rhythmic slow wave is recorded at the subthalamic nucleus and ventral tegmental area (Tasai) of cats under Nembutal anesthesia. The positive phase of slow wave is just coincidence with extended post synaptic inhibitory period recorded at the same area by subthalamic or ventral tegmental stimulation as reported in previous papers.

In this experiment, the relationship the appearance of rhythmic slow wave and monoamine contents by using Flemming method at the both area. The results are as follows:

- 1) Under the local anesthesia, the rhythmic slow wave at the both area do not recorded and reciprocal post synaptic inhibitory period is not extended. Both subthalamic nucleus and tegmental area contains 0.5–0.8  $\mu\text{g}/\text{gr}$ . of 5HT and 2.3–3.4  $\mu\text{g}/\text{gr}$ . of Norepinephrine.
- 2) 5HT increases to 9–12 times as much as

much as normal level in the both area under the nembutal anesthesia, whenever the rhythmic slow wave records and postsynaptic inhibitory period extends more than 80 msec. in both area. But norepinephrine increases only to 2 times comparing with normal level. 3) Following intravenous infusion of 5HTP (10 mg/kg), the rhythmic slow wave and extended postsynaptic inhibitory period are recorded. And 5HT in the both area increases to 2–5 times of normal level. But NE is rather decrease to 1.8 and 1.6 in the ventral tegmental area and subthalamic nucleus respectably.

According to these results, it is concluded that the rhythmic slow wave is induced by increase of 5TH in the ventral tegmental area and subthalamic nucleus. And reciprocal post synaptic inhibitory period between both of them also expanded to 80–120 msec.

The activity of extrapyramidal system might be controlled by monoamine metabolism at the local area in brain tissue.

### 6. Effect of Amantadine on Serotonin Metabolism in Rat Brain

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Several pharmacological and biochemical studies have indicated the interaction of amantadine (Symmetrel), which has proven clinically effective for Parkinsonism, via the central catecholaminergic mechanism.

In this study, effect of amantadine on serotonin metabolism was investigated in the rat brain. Male Wister rats weighing 100–200 g were given amantadine i.p. or together as a mixture with the diet.

5-HT content (Bogdanski et al.), 5-HIAA content (Giacolone and Valzelli), aromatic amino acid decarboxylase (AADC) activity (Lovenberg et al.) MAO activity (Wurtman and Axelrod) were estimated in the brain and other tissues. Significant changes were not found on the entire brain serotonin level or the AADC activity with amantadine treat-