Fig. 3. Monohemisphere-dogs and stimulation of lenticular nuclei

- a) Monohemische dog seizurs (+)
- b) " without thalamus seizure (+)
- c) " " cortex seizure (+)
- d) " " " and thalamus seizure (-)

shown in Fig. 3, a seizure could be produced when there existed a nucleus lenticularis with a homolateral cortex or with the thalamus, not produced when existed a nucleus lenticularis alone. This means that a continuance of a seizure after the cessation of the stimulation needs some oscillations of impulses between the subcortical structures. This oscillation is presumed to be the origin of the loss of consciousness in attacks of human epileptics.

Reference: Hayashi, T. (1959) Neurophysiology and neurochemistry of convulsion. Tokyo Dainihon-tosho, xii pp. 306.

DISCUSSION TO DR. WALKER'S SPEECH

Dennosuke JINNAI, M.D.

Okayama University Medical School

I feel greatly honored to mention that I have been interested in research of epileptic convulsion and it is a particular pleasure to be able to discuss the subjects of Dr. Walker, since it is his provocative and fruitful lines of research that have long inspired most of our own investigative efforts in the field. I should first like to compliment the excellent work he just mentioned, based on well organized instrumentation and precise analysis of accumulated data with modernized IBM.

While discussing the pathways of epileptic discharge, he pointed out an

important concept of its operational mechanism, in addition to the one of the structural lines of communication. I should like to agree with such a comment or interpretation. The propagation of excitement is considered in two meanings; the one is a simple transmission of impulses from one structure to others, and the other is to build up a self-sustained discharge at other structures. I believe that such a concept has played a very important role to physiological approach to the central nervous system.

Now I would like to get an opportunity to show the work which was done in our laboratory. Cats were utilized and given metrazol intravenously. As you see in Fig. 1, spike discharge occurs first at bilateral cerebral cortices unexceptionally in all cases. Then it spreads to lenticular nuclei and ventrolateral nuclei of the thalamus 3 to 4 seconds later. So does it to substantia nigra 4 to 7 seconds further later (Fig. 2). It is interesting to note that muscle twitch as the beginning of clinical convulsive seizure starts before the subcortical structures start firing (Fig. 1). As Fig. 3 and 4 illustrate, propagation of epileptic discharge seems to perform the mode of the Fig. 3 but not of Fig. 4. It is noticed that the propagation of discharge is not simple transmission of efferent impulses like Fig. 4 but a somewhat more complexed functional mechanism. In another

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

experiment, a mechanically controlled cutter was designed to make a lesion during epileptic seizure (Fig. 5). If ablation was done at a level before spike discharges spread to the lower structure, both the spike discharges and clinical convulsion were abolished (Fig. 6), but not after the completion of the spreading (Fig. 7). It is to be concluded in these experiments that such a self-sustained discharge moves stepwise down to the lower structures during the course of epileptic seizure (Fig. 3).

Fig. 6. Transsection experiment between diencephalon and mesencephalon

Fig. 7. Transsection experiment between diencephalon and mesencephalon

Fig. 8.

Fig. 9.

In addition, Dr. Walker's interpretation of epileptic conduction pathways from the motor cortex as well as the concept of cortical and subcortical extensions seems to correspond with our experimental data.

Now, I would like to emphasize that efferent tracts of extrapyramidal system appears to play an important role in epileptic seizures. According to the experimental data in our laboratory the pyramidal tract seems to participate as a mechanism for triggering but not for sustaining clinical convulsion.

One of the evidences is the fact that total pedunculotomy during epileptic

seizure could not interrupt the convulsion, even if it was done before substantia nigra starts firing.

The second is the fact that the ablation of the unilateral motor cortex could not abolish the generalized epileptic convulsion in the extremities of the both sides and a convulsive march was observed on the same side of the lesion but not on the opposite side (Fig. 8). And a partial ablation of cortex could not abolish the convulsion of the corresponding limb, although it is out of the order of the convulsive march to be postponed (Fig. 9). The third evidence is presented in the previously illustrated scheme of epileptic conduction. The muscle twitch as the beginning of the clinical convulsion would occur before subcortical structures manifest self-sustained discharge. This may be interpreted to be through the pyramidal tract. But motor cortex ablation could not abolish the convulsion if it is done after the completion of the spread. It seems reasonable to think that this fact shows that impulses pass through a tract other than the pyramidal. So I would like to put more significance on the extrapyramidal tracts for the mechanism of epileptic convulsion.

Thank you.

DISCUSSION TO DR. WALKER'S SPEECH

Experiences of Reticulotomy in Epilepsy

Keiji SANO, M. D.

*Dept. of Neurosurgery & Institute of Brain Research
University of Tokyo*

In the last 15 years, functions of the brain stem reticular system have been greatly elucidated by Magoun and his collaborators. The system is now widely known to modulate various kinds of neuronal activities through its ascending and descending projections. Not only the neocortex, but the limbic system comes under its influence. This report concerns the effects of lesions in the rostral brain stem reticular formation upon the pathological functional states of the brain, namely, epileptic seizures and behavior disorders.

As for the participation of the reticular system in epileptic seizures, there are three possibilities. (1) The reticular system may act as a focus of the seizure. There have been no definite proof of this in our series. (2) The reticular system may be actively involved in conduction of seizure discharge. As Dr. Walker impressively showed in his experiments, this is also unlikely in our experience. Here is an example. In this case (Fig. 1), spiking is seen in the left rolandic