temperature and high temperature.

Measurement of the ultrasonic attenuation of the brain, water content, cerebrospinal fluid pressure and rectal temperature, etc. in each of the above groups, the following conclusions were drawn:

1. The ultrasonic attenuation increased after the brain had died, or during the process of the disappearance of responses. From the fact that no abrupt change occurred during actual blood stoppage, it seems that changes in the brain tissue were a more important factor than blood flow itself.

2. There was no definite parallel relation between the ultrasonic attenuation of the brain and brain water content; however, in general, it was noticed that the attenuation tended of the brain to decrease when brain water content increased.

3. When the amount of cerebral blood flow decreased, the ultrasonic attenuation increased.

4. Increase of cerebrospinal fluid pressure resulted in a biphasic response with the ultrasonic attenuation of the brain; in the first phase, at the time when brain blow was expected to decrease, the attenuation increased and, in the second phase when edematous changes were brought about, the attenuation decreased.

5. With intracranial congestion rising cerebral venous pressure, the ultrasonic attenuation of the brain decreased.

6. When the temperature rose, the ultrasonic attenuation of the brain decreased, and when it dropped, the latter increased.

---

113. Application of Cerebral Ultrasonic Attenuation Measurement on Posttraumatic Follow Up of the Patients with Head Injury

Ikuo Yamaoka, Hiroshi Hata, Hisao Maruta, Genichi Suzuki, Shigeki Kawasaki, Renzo Hirayama and Yutaka Inaba

2nd Dept. of Surgery, Tokyo Medical and Dental University

We have reported that the ultrasonic attenuation (USA) of the brain changes in accordance with the cerebral blood flow volume. In this study, we used automatic and continuous measurement technique using a gating system and ultrasonic transducer of our wide beam sarchlight pattern in good
stability.

Using an X-ray table, we observed the USA of the head of patients continuously while the patients move from spine to 65 degree tilted position and back to spine position. In normal person, the USA of the head increases in accordance with the postural change from lying to standing position, in other words, cerebral blood flow volume decreases. We named this as Type A. Average increase of 15 cases was 3 db (0.5–6.5 db). In patients with postural hypotension the increase of USA of head become large with the rise of the head indicating the cerebral blood flow volume. In patients with head injury, we noticed that there are patients, who show decrease of USA of the head with the rising of the head in cases of 50%, we named this Type B.

Relation of the USA change and severity of and duration after the head trauma were as follows:

The patients of Type I by Araki’s classification (no symptom) showed Type A in 70% even in the acute phase and showed abnormal Type B in 30%. After several days, almost cases of Type B recovered to Type A.

The patients of Type II by Araki’s (commotio cerebri) showed Type B in 55% when measured within 2 months after the trauma and showed Type A thereafter.

In the cases Type III by Araki’s (contusio cerebri) showed Type B in 85% cases and 5–6 months more after the trauma remained in Type B.

So it is the truth that the severer the grade of the head injury, the more cases showed Type B.

In the cases with cerebral syndrom, Type B become Type A in accordance with disappearance of the clinical symptoms after the therapy of suspension.

In 15 cases out of 30 cases of head injuries showed side difference in the change of ultrasonic attenuation of the head at postural change. Out of these 15 cases, 5 cases had side difference in electroencephalogram, too. Other 10 cases showed side difference of neurological symptom. And many cases of cerebral arteriosclerosis showed Type B.

From the above, we concluded that there is some cerebral circulation insufficiency in patients after head injury and this disorder has to do with the severity of and the duration of the trauma.

— 251 —