a sound lens or a reflector, as the peak intensity reaches up to over 2000 w/sqcm., and the induced lesion can be varied by the ultrasonic frequency used on its shape and size, i.e., single ultrasonic shot results a lesion of about 0.2 ml., by 1460 KC., whereas about 0.4 ml. by 970 KC. of frequency, and plural shots can produce a lesion of certain volume larger than a single shot. The focal length may be chosen by the depth of tissues to be destroyed from the surface, and 9-10 cm. of length is now in use.

The stereotaxic device and the focused ultrasonic generator of high power was made and is working on for the selective localized destruction of globus pallidus, the white matter of the prefrontal lobe and other basal ganglia in an attempt similar to that of stereotaxic operations now in use.

One of four patients whose globus pallidus were ultrasonically operated on about a year ago is presented in clinical details, showing that the stereotaxic procedure by the high intensity focused ultrasound was exactly performed with the disappearance of the rigidity of extremities and improvements of epileptic attacks and so far.

Ultrasonic thalamectomy and hypophysectomy may be done effectively with very little risk, as studies of the author indicate functions of motor fibers within the internal capsule to reveal a little more resistant than those of motor ganglion cells to the focused ultrasonic irradiation, and that precise examinations of hypophyseal functions showed deeply disturbed hypophyseal control to adrenal cortical functions by the ACTH-test and well defined destructions located in the hypophysis with hypertrophic adrenal glands.

Ultrasonic surgery in the neurosurgical field will be a promising method as the stereotaxic procedure.

B6 Experimental Studies on the Stereotaxic Destruction of Basal Ganglia using Colloidal Radioactive Isotopes.

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It is now well established method to treat Parkinsonian syndrome or allied involuntary movements by stereotaxic destruction of various nuclei in the brain stem. As the destructive agents, alcohol, celloidin-alcohol, corrosive sublimate, oil-wax, electric coagulation, collective ultrasonic wave, etc. have been used. Recently Mullau pointed out that the implantation of radioactive isotope was more effective than alcohol injection.

In recent years our research group has developed studies on the treatment of cancer by local use of radioactive isotopes combined with colloidal ion exchange resin. It is the purpose of this study to examine if the radioactive isotopes com-

bined with colloidal ion exchange resin can also be used for the destructive agent in stereotaxic brain surgery.

Method of preparing colloidal isotopes:

Adding water, anion exchange resin AMBERLITE IRA-400 ($R\equiv Na^+Cl^-$) is ground in Ball-Mill and the colloidal fluid is obtained. The ion exchange between resin and isotope can be formulated as follows:

2.5 mC of each ^{32}P or ^{131}I are combined with 100 mg of Amberlite IRA-400 almost completely.

Experimental Method and Results:

The colloidal resin, 100 mg in weight and 3~1,000 μC in radioactivity, was injected into the globus pallidus of cats, with the aid of stereotaxic apparatus of Hess type. Following the injection general condition of the animal and the decrement of radio-activity in the brain were investigated. Histological examination of the brain at the various period after the injection was also performed.

The local radio-activity reduced to half in 24 hours in cases of ^{131}I and in 3 days in cases of ^{32}P , the reduction thereafter being in coincidence with natural decrement rate.

Animals never fell into coma. Sometimes motor paresis and disturbances in gait were seen, but recovered in several days.

Slight increase in body temperature was usually seen for about ten days after the injection.

The leucocyte count, after showing slight increase for few days, dropped to about 50%, and one month was necessary to regain the normal value.

If the radio-activity exceeded 1 mC, the mortality became considerably higher.

Macroscopic and histologic investigation revealed that the resin was injected in a mass into the target. Surrounding the injected resin, accumulation of compound molecular corpuscles and the narrow zone of disintegration of nervous tissue was observed.

From results obtained until now, it is our impression that the colloidal ion exchange resin combined with isotopes can be used as the destructive agent in stereotaxic brain surgery.

More detailed research must be continued in the future.

B7. Involuntary Disorders from an Aspect of Control System.

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Servomechanism of movement is considered to have spacio-temporary factors.