mm of water. In the dogs, of which intracranial subarachnoid space is obstructed with kaolin suspension introduced into the cisterna magna some three to four weeks prior to the experiments, intraventricular absorption of fluid begins at the pressure (CSFP-SSVP) of 0 mm of water. In both normal and hydrocephalic dogs the absorption rate increase when CSFP-SSVP is elevated by alteration of outlet tubing height. The slopes of regression lines for absorption in both normal and hydrocephalic animals are not significantly different each other. On the contrary, in dogs with the aqueduct of Sylvius is acutely plugged and made hydrocephalic, the slope is less steep. In another words, there is more resistance for the fluid to be absorbed. And more higher pressure is being required to see any absorption in the ventricular system.

In several patients with obstructive mass lesions in the posterior third ventricle, continuous ventricular drainage was made for a relatively long period of time for some reason to another. From these observations it is noticed that the outflow drainage volume is linearly dependent on the drainage pressure. In one case the maximal 300/ml/day drainage volume was obtained at the pressure of some 50 mm of water above the nasion and the outflow volume decreased linearly as the outflow tubing was raised. As the authors previously postulated that the formation rate was independent of pressure and maintained in fairly constant level, the outflow volume is actually the figure subtracting absorption volume from formation during a certain period of time.

From this point of view, one is able to calculate the intraventricular absorption rate at various pressure in each subject when the formation rate in that compartment can be estimated.

It is an well known evidence that CSF contains the almost the same amount of Na⁺ and rather higher concentration of Cl⁻ per liter in comparison with plasma, therefore, from unnecessary low pressure continuous drainage of CSF, ignoring the fact that CSF can be absorbed in the ventricular system depending upon the pressure, one can easily induce severe electrolyte unbalance and this is especially true in infant bases.

D-4. Studies of CSF Dynamics Using RISA

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We have previously reported the result of CSF pressure measurements after two different type of PEG. First, various amounts of air were introduced intrathecally without any removal of CSF throughout of procedure (“pressure injection PEG”). Examining CSF pressure before, during, and after the procedure, the authors found lowering of pressure occurred soon after this procedure and lasted for one to three
days in almost all cases, whether the original pressure had been high or normal.

Second, "overflow PEG" was done, where CSF was allowed to flow out freely from a cut manometer tube to maintain the initial pressure when the air was injected into the lumbar sac. This group of patients showed no appreciable pressure changes after one to three days. In order to ascertain its mechanism, isotopic studies were carried out in order to investigate the changes of CSF dynamics after the "pressure injection".

The patients first received $^{131}$I-RISA (150 $\mu$Ci) diluted in only 1 cc of saline so as to obviate any change in the CSF dynamics ("no pressure injection"). At the second study, about 10 days later, the above patients received two lumbar punctures. at first 20 cc of saline was injected into the lumbar sac from one needle at the rate of 3 cc per minute and CSF pressure was continuously observed through an another needle connected to a manometer tube. As soon as the pressure returned to its original level, 1 cc of RISA ($^{131}$I-RISA 150 $\mu$Ci + $^{131}$I-RISA 50 $\mu$Ci) was slowly instilled into the lumbar subarachnoid space.

Then, the movements of protein was observed by serial scanning. The results may be said that, in general, the cephalad flow of CSF exists irrespective of volumes of injected saline, but the speed of its flow becomes much faster in the cases where 20 cc of saline is first injected, that is, after the "pressure injection". Following the intrathecal injections of RISA, blood and urine specimens were collected. The activity in each specimen was measured by counting 1 cc of the specimen in a special vial in the well-scintillation counter.

In blood stream, after the "pressure injection", activity of RISA increased much faster. Into urine, after "no pressure injection" of RISA, radio iodine appeared sooner and reached higher level. First daily urine contained more radio iodine than whole 24 hrs- blood. Then, $^{131}$I-RISA (50 $\mu$Ci) was injected intravenously at the same time of intrathecal injection of $^{131}$I-RISA (50 $\mu$Ci). After 3 —4 hrs of two injections, the rate of urinary excretion of $^{131}$I, and increased over this. It seems that the "active transport" of RISA from subarachnoid space to urine (or blood) is taken, as the "passive transport" by CSF pressure is done.

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D-5. Studies of Cerebrospinal Fluid (CSF) Dynamics with Intrathecally Administered Yb-169-DTPA

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Recently, RI-cisternography has become a widely used method for the morphological assessment of CSF dynamics by means of radioactive materials introduced into the subarachnoid space. This technique provides useful information regarding the intracranial subarachnoid CSF pathways and flow. A wide variety of radioactive