permeability to protein in the cerebral cortex except for the vicinity of the region of balloon compression and basal ganglia.

The correlation between the impairment of vasomotor tone and the alteration of brain water content was studied in those two groups of brain swelling, and acute brain swelling was discussed pathologically and etiologically.

The conclusions are the following:

(1) Mean 0.94~1.74% increase of brain water content is considered to be a sufficient volume to elevate ICP markedly. It is suggested that brain water content, therefore, plays an important role in the etiology of acute brain swelling.

(2) It is thought that the increase of brain water content is influenced by the alteration of vasomotor tone and the change of cerebral perfusion pressure by the decompressive craniectomy.

(3) It should be recognized that the decompressive craniectomy leads to increase the brain water content earlier and more widespread in acute brain swelling.

S-I-13. U-Form External Decompression: Bilateral Fronto-Temporo-Parietal External Decompression

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Introduction

Extremely increased intracranial pressure resulted from acute subdural hematoma or intracerebral hematoma frequently causes severe damage of brainstem such as irregularity of respiration, loss of pupillary light reaction, decerebrate posture or complete paralysis of extremities.

However an adequate and sufficient effect of external decompression sometimes fail to be expected, even though the unilateral or bilateral external decompression has been performed following the evacuation of the hematoma.

For the purpose to resolve this problem, we have performed a new surgical technique of U-Form External Decompression, that is, bilateral fronto-temporo-parietal external decompression, to these cases which have severe brainstem damage resulted from extreme increased intracranial pressure.

Following points are discussed; 1) Clinical cases, 2) Application of U-Form External Decompression, 3) Technique of U-Form External Decompression.

1) Clinical cases (Table 1)

All cases except the case 5 were not survived. Postmortem examination revealed that the causes of death were the primary brainstem damage (case 3, 4), postoperative hematoma (case 1) and heart failure (case 1, 6).

The results of this operative procedure was poor, however the effect of decompres-

sion was evident because the normalization of respiratory pattern, the appearance of deep tendon reflexes and the improvement of decerebrate posture were noticed immediately or gradually after this decompressive procedure.

U-Form External Decompression
bilateral fronto-temporo-parietal decompression

		Diagnosis	Respiration	Occular Signs		Posture
				L-Reaction	*Pupil*	
1	T.S. 69. ♀	bilateral acute subdur. hemat.	shallow & rapid	(−)	rt>lt	Decerebrate
2	K.S. 21. ♂	bilateral acute subdur. hemat.	shallow & rapid	(−)	dilatated	Decerebrate
3	T.M. 20. ♂	bilateral acute subdur. hemat.	irregular	(−)	dilatated	complete paralysis
4	M.U. 37. ♂	rt. int. cereb. hemat. lt. acute subdur. hemat.	shallow & rapid	(−)	dilatated	Decerebrate
5	H.E. 10M. ♂	rt. acute subdur. hemat.	arrested	(−)	dilatated	complete paralysis
6	T.Y. 56. ♂	rt. hemorrhagic infarcton *(non-filling)*	deep & slow	(−)	dilatated	Decerebrate

Table 1: Clinical cases of U-Form External Decompression

2) Application of U-Form External Decompression
   i) To the cases showing the signs of severe brainstem damage such as irregularity of respiratory pattern, bilateral loss of pupillary light reaction, decerebrate posture and complete paralysis.
   ii) To the cases showing the non-filling phenomenon by the cerebral angiography caused by the extremely increased intracranial pressure.
   iii) The application of U-Form External Decompression may not determine to be limited, if the preoperative determination is impossible whether the signs of brainstem damage comes from the primary or secondary, or which is reversible or not.
3) Technique of U-Form External Decompression
   i) *Skin incision* is usually a coronal incision, however T-form incision is occasionally taken, which is a combination of coronal and sagittal incision.
   Bilateral temporal muscles are stripped off from the temporal bone with scalp on the purpose to minimize the bleeding from these muscles. And at the time of suturing, all layers of temporal muscle are sutured together to protect the rebleeding and liquorrhoea before scalp suturing.
   ii) *The area of removal of the skull* is determined by the consideration how to achieve the sufficient effect of decompression, how to protect the hemorrhage

from the sagittal sinus and bridging veins of the cortex and how to support the bilateral cerebral hemispheres effectively.

Frontal removal of the skull is done from the anterior margin of both orbit up to the coronal suture to avoid hemorrhage from the sagittal sinus.

Lateral and posterior removal of the skull is done bilaterally, from the lower portion of temporal bone, up to the 2 or 3 cms width from the sagittal sinus laterally to protect the damage of bridging veins of the cortex, and up to the lamboidal suture posteriorly to make an effective support of bilateral cerebral hemispheres. (Fig. 1, 2)

iii) *The opening of dura* is made through the midline of the skull opening with a few lateral incisions.

Gelfilm is placed over the both cerebral cortex under the dura whose angles of incisions are connected loosely with each other to help the dural repairment at the time of dural plasty.

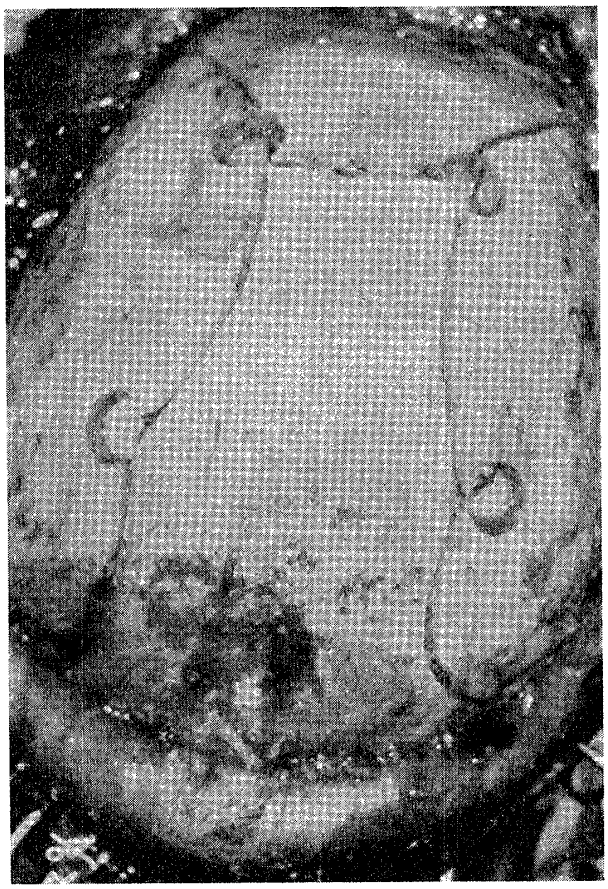

Fig. 1 Case 6: Note the position of burr holes and skull opening of U-Form External Decompression.
Preoperatively, right carotid angiography showed non-filling phenomenon.

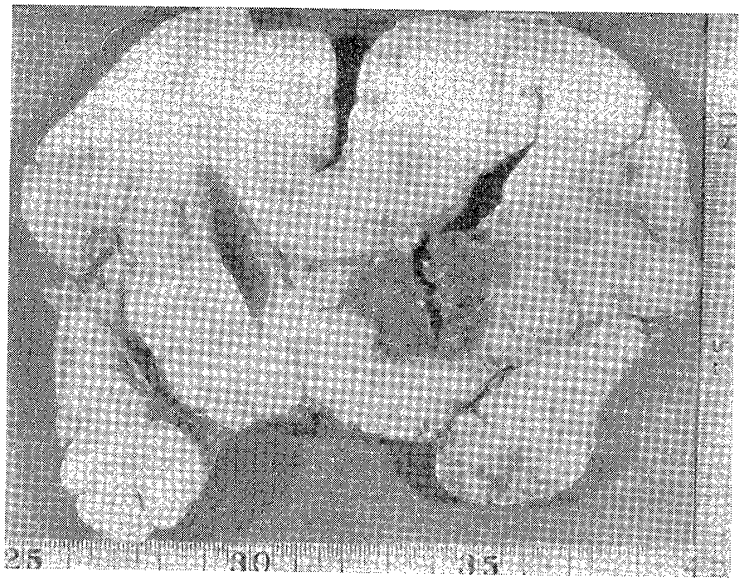

Fig. 2 Case 6: Rt. hemorrhagic infarction.
Postmortem coronal section of the brain, which showed non-filling phenomenon preoperatively.
Note no compression necrosis and hemorrhage along the margin of U-Form External Decompression of the skull.

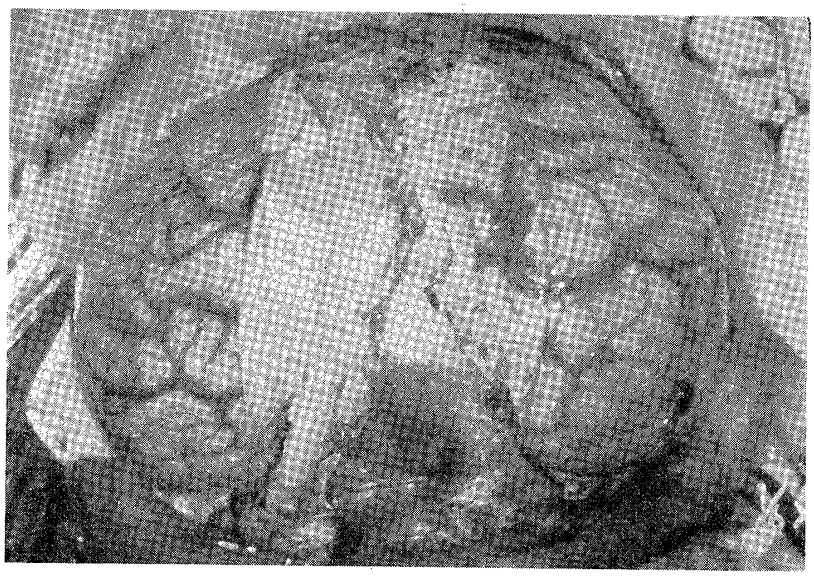

Fig. 3 Case 5: U-Form External Decompression is performed to the ten months boy suffering from the right acute subdural hematoma.
Note the opening of the dura and swelling of the brain.

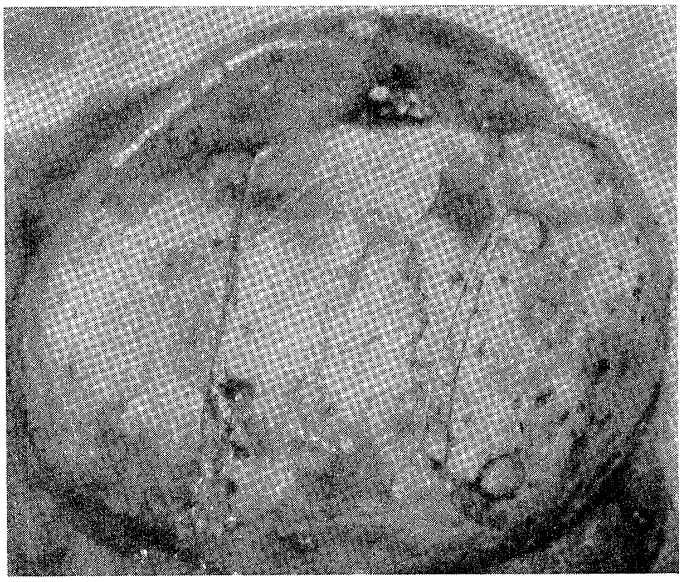

Fig. 4 Case 5: Cranioplasty and duralplasty are done two weeks later. Note the opening of the skull.

iv) *Dural plasty and cranioplasty* are planned waiting for the disappearance of the cerebral swelling and the improvement of physical condition of the patient.

Dural plasty is made by the fascia lata of the patient (fascia lata of parents in a case of a child).

Cranioplasty is made by the patient's own skull that has been put into the sterilized bag with antibiotics and preserved in the freezing cabin of the refrigerator. (Fig. 4)

S-I-14. Indication of Decompressive Craniectomy in Cases of Acute Head Injury

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Among the problems in the treatment of acute head injury, intracranial hypertention due to cerebral swelling in one of the most difficult problems to handle with. This report is based on an analysis of 30 cases whose intracranial pressure was elevated to the level high enough to cause tentorial herniation due to cerebral swelling. From the cause, clinical signs, and from the autopsy findings in the fatal cases, these cases were fell into 3 groups.