

## Case Report

Il Choi, M.D.

Kyeong-Seok Lee, M.D.

Jai-Joon Shim, M.D.

Weon-Rim Choi, M.D.

Department of Neurosurgery  
Soonchunhyang University  
Chonan Hospital, Cheonan  
Korea

## Deciding not to Operate in Head Injuries and Legal Considerations

It is not the best way to treat a hopeless patient with life-sustaining medical devices until the heart beats stop. Advanced medical technology may prolong the life for a significant period without recovery from the disease. However, it would give an unbearable economic burden to the family and the society. In 2006, we decided not to operate 9 patients with traumatic intracranial hematomas. We examined those patients with special references to possible legal and ethical problems. It is reasonable to withhold a treatment after documentation that the family never wants any life sustaining treatment when the treatment does not guarantee the meaningful life.

**KEY WORDS :** Withholding treatment · Decision making · Resuscitation orders · Legislation and jurisprudence · Medical futility · Craniocerebral trauma.

### INTRODUCTION

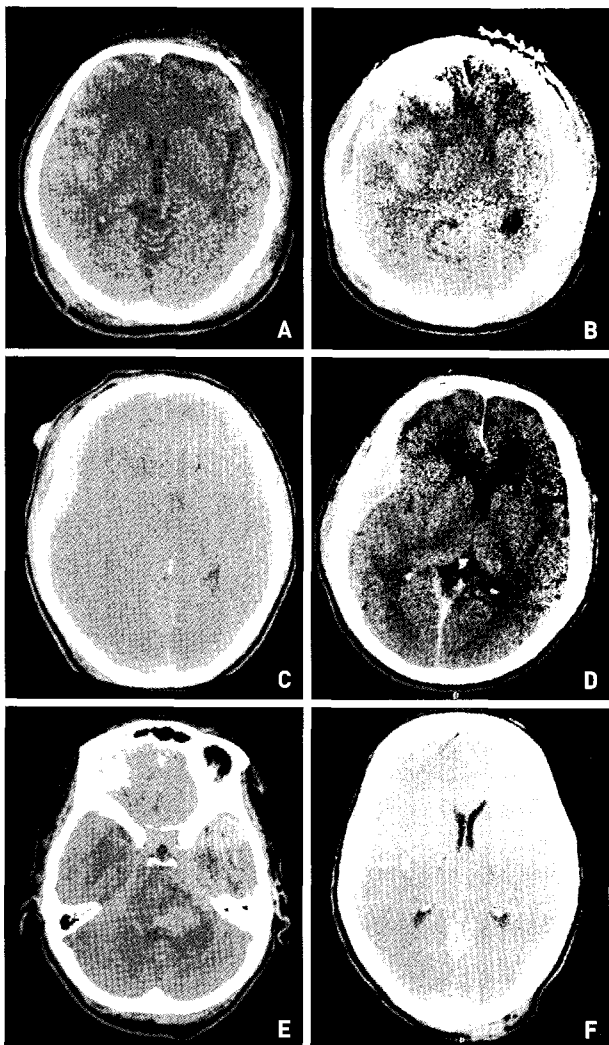
It is not the best way to treat a hopeless patient with life-sustaining medical devices until the heart beats stop. Advanced medical technology may prolong the life for a significant period without recovery from the disease<sup>2)</sup>. However, it would give an unbearable economic burden not only to the family but also to the community. On the contrary, inappropriate decision may lose the last chance of recovery or a life. In 2004, the Korean Supreme Court gave a decision that a woman who made her husband to discharge from the hospital against medical advices was guilty as a murder. The Court also gave a decision that the doctors who permitted the discharge were guilty as a murder-aid. Aggressive treatment may raise the economical burden, while discharge or withdrawal of the treatment may become illegal or unethical. Between these two extremes, surgical decision making is never easy for the critical patients with poor chance of survival. Especially in head injuries, there are usually not enough time to consider legal or ethical aspects together with accurate prediction of the prognosis. Every neurosurgeon can be involved in such situations. It is necessary to reflect on the legal and ethical considerations together with socioeconomic situations in the critical patients with poor chances of survival. In 2006, we decided not to operate 9 patients with traumatic intracranial hematomas. We examined those patients with special references to possible legal and ethical problems. It is reasonable to withhold a treatment after documentation that the family never wants any life sustaining treatment when the treatment does not guarantee. The purpose of this report is to review on decisions whether not to operate for the patients with surgical lesions and to find out a reasonable way to end the futile life-sustaining treatment.

### CASE REPORT

#### Case 1

This 50-year-old man visited the Emergency Department due to lacerations on the scalp and lips after an assault. On arrival, he was drunk. His pupils were normal and Glasgow Coma Score (GCS) was 12 (E; 3, V; 4, M; 5). Blood pressure (BP) was 90/60 mmHg, pulse rate (PR) was 125/min, respiration rate (RR) was 20/min, and body temperature (BT) was 36.7°C. He had a history of liver cirrhosis with ascites. Minimal (less than 100 cc) hemothorax was suspicious in the right side of the chest. The initial computed tomographic (CT) scan of the brain revealed subarachnoid hemorrhage and small cerebral contusion on

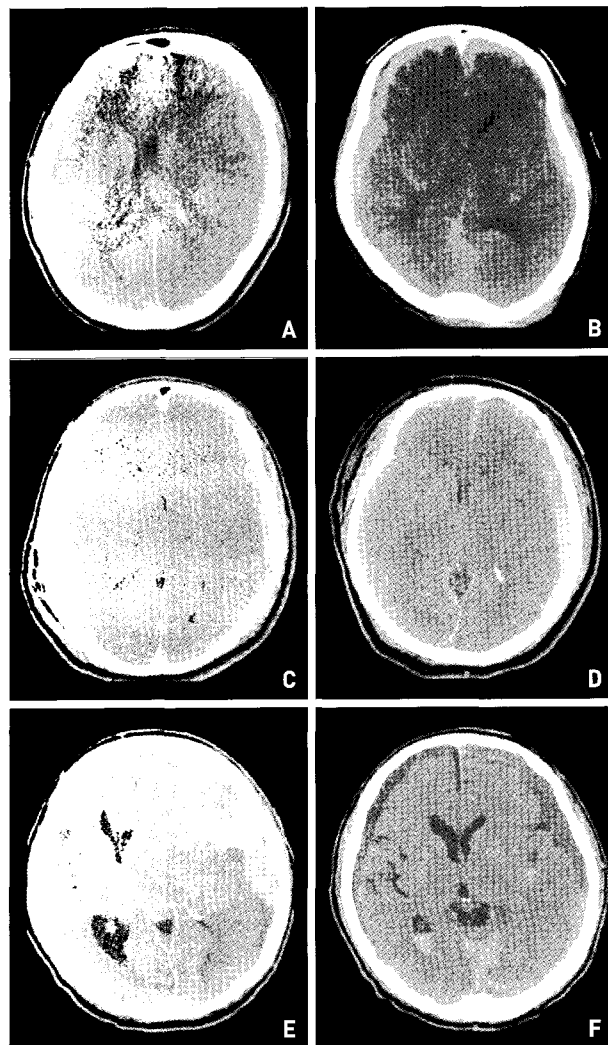
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- Address for reprints :  
Kyeong-Seok Lee, M.D.  
Department of Neurosurgery  
Soonchunhyang University Cheonan  
Hospital, 23-20 Bongmyeong-dong  
Cheonan 330-721, Korea  
Tel : +82-41-570-3652  
Fax : +82-41-572-9297  
E-mail : ksleens@hotmail.com



**Fig. 1.** The initial computed tomography (CT) scan of Case 1 (A) shows no significant mass lesion. The follow-up CT scan (B) reveals an acute subdural hematoma and contusion with marked midline-shift. The CT scan of Case 2 (C) also shows an acute subdural hematoma with marked midline-shift. The CT scan of Case 3 (D) shows an acute subdural hematoma. The CT scan of Case 4 (E) revealing a brain-stem hemorrhage. The cerebral cuts of Case 4 (F) show bilateral acute subdural hematomas.

the right frontal lobe. There was no significant mass effect or midline-shift (Fig. 1A).

About 5 hours later, he became comatose. His GCS was deteriorated into 4 (E; 1, V; T, M; 2). The right pupil became dilated. The follow-up CT scan revealed a huge acute subdural hematoma (ASDH) with marked midline-shift (Fig. 1B). There was a coagulopathy (hemoglobin 6.5 g/dl, hematocrit 19.8%, platelet 42,000/cc). He was homeless. We contacted a member of his family by a telephone. However, we could not explain on the emergency operation, because his family hung up on the phone. We decided not to operate. The patient died on the third hospital day (HD) after admission.



**Fig. 2.** The computed tomography (CT) scan of Case 5 (A) shows an acute subdural hematoma (ASDH) on the left frontoparietal region with severe midline-shift. The CT scan of Case 6 (B) reveals bilateral ASDH on the both frontoparietal regions. The CT scan of Case 7 (C) shows a thin ASDH in the left frontoparietal region. The CT scan of Case 8 (D) revealing an ASDH on the left frontoparietal region with scalp swelling on the right temporal region. The CT scan of Case 9 (E) reveals an ASDH on the left frontoparietal region with marked midline-shift. The follow-up CT scan of Case 9 on the 7th HD (F) revealing a spontaneous resolution of the ASDH with contralateral subdural hygroma and near complete restoration of the midline-shift.

### Case 2

This 25-year-old male patient underwent an in-car accident. His GCS was 3 on arrival with dilated pupils. He was in apnea state. BP was 140/70 mmHg, PR was 67/min, and BT was 36.9C. The CT scan revealed an ASDH on the right frontoparietal region with marked midline-shift (Fig. 1C). We explained very grave prognosis of survival to the family, and decided not to operate. His family wanted to donate the organs. On the second HD, he was transferred to the hospital where the organ transplantation was performed.

**Case 3**

This 71-year-old male was discovered on the street in comatose mental state. He was drunken and his GCS was 4 (E; 1, V; T, M; 2). Pupils were normal. BP was 140/90 mmHg, PR was 81/min, RR was 14/min, and BT was 36.7C. The CT scan showed an ASDH with marked midline-shift (Fig. 1D). We explained poor prognosis to his family and decided not to operate. The patient was expired on the third HD after admission.

**Case 4**

This 71-year-old woman was brought to Emergency Department due to comatose mentality. On arrival, her GCS was 4 (E; 1, V; T, M; 2). Pupils were dilated without light reflex. BP was 140/80 mmHg, PR was 130/min, RR was 16/min, and BT was 36.4C. The CT scan showed brainstem hemorrhage (Fig. 1E) and ASDH on both frontoparietal regions (Fig. 1F). There was a linear occipital fracture and scalp swelling on the occiput. The ASDH on the right side was larger than the left side one. She was living alone. We explained poor prognosis to her family and decided not to operate. A cardiopulmonary resuscitation (CPR) was tried once, even though we decided not to operate. The patient was expired within 5 hours after admission.

**Case 5**

This 31-year-old man was brought to ER after in-car accident. His GCS was 4 (E; 1, V; T, M; 2). Pupils were dilated. BP was 160/100 mmHg, PR was 58/min, RR was 16/min, and BT was 36.7C. The CT scan revealed an ASDH on the left frontoparietal region with severe midline-shift (Fig. 2A). Basal cisterns were obliterated. We explained poor prognosis to his family and decided not to operate. The patient was expired on the day of admission.

**Case 6**

This 74-year-old female patient was transferred to our Emergency Department after a fall from a cultivator. Her GCS was 4 (E; 1, V; T, M; 2). Pupils were dilated. BP was 200/120 mmHg, PR was 96/min, and BT was 36.4C. Her breath was ceased on arrival. The CT scan showed bilateral ASDH on the both frontoparietal regions (Fig. 2B). There were a linear occipital bone fracture and scalp swelling. ASDH on the right side was larger than the left one, causing left shifting. We explained poor prognosis to her family and decided not to operate. The patient was expired on the day of admission.

**Case 7**

This 20-year-old male patient became comatose after a

fall. His GCS was 3. Pupils were dilated. BP was 130/70 mmHg, PR was 70/min, and BT was 36.8C. He became apneustic within an hour after arrival. The CT scan showed a thin ASDH in the left frontoparietal region. Skull fractures were noticed in both temporal and occipital bones (Fig. 2C). The brain was edematous and the basal cisterns were obliterated. We decided not to operate after explanation of the grave prognosis. We asked on the organ donation. His parents refused it for a religious (Jehovah's Witness) reason. On the 8th HD, CPR was tried once without success.

**Case 8**

This 52-year-old man became comatose after a fainting. He suffered from a diabetes for 5-6 years. His GCS was 3. Pupils were dilated. BP was too low to check. PR was 124/min. Respiration was ceased on arrival. BT was below 35.0C. Laboratory data showed signs of sepsis; WBC 6500/ $\mu$ l, RBC 750/ $\mu$ l, platelets 14/ $\mu$ l (normal 130-400/ $\mu$ l). The CT scan revealed an ASDH on the left frontoparietal region with scalp swelling on the right temporal region (Fig. 2D). The cerebral ventricles were compressed due to cerebral swelling. Although the platelets were raised to 25/ $\mu$ l, he was expired on the day of admission.

**Case 9**

This 84-year-old man became comatose after a fainting. He suffered from a chronic renal failure from longstanding diabetes and hypertension. He had received hemodialysis regularly for recent 2 years. His GCS was 3. Pupils were dilated. BP was 220/110 mmHg. PR was 84/min. RR was 22/min. BT was 36.8C. The CT scan revealed an ASDH on the left frontoparietal region with marked midline-shift (Fig. 2E). We explained high risk of surgery and very low possibility of survival to his family. His family also refused surgical treatment for his age and longstanding systemic diseases. However, surprisingly enough, his GCS got better up to 10 (E; 4, V; T, M; 5) on the 4th HD. Pupils became reactive. Although his family still did not want surgical treatment, they wanted to continue hemodialysis. The follow-up CT scan on the 7th HD revealed a spontaneous resolution of the ASDH with contralateral subdural hygroma and near complete restoration of the midline-shift (Fig. 2F). After the third hemodialysis on 8th HD, his GCS deteriorated with fever and hypotension. He died on the 9th HD without CPR.

**DISCUSSION**

All illustrated cases were 3 or 4 in GCS with abnormal pupils. In 2006, Demetriades et al.<sup>5)</sup> developed a predictive

**Table 1.** Summary of the cases of "not to operate" after head injury

Case	Age	Sex	GCS	Pupil	Shift	Lesion	Span	P (%)	Condition
1	50	M	4	+/-	20 mm	ASDH	3 days	89.1	Liver Cirrhosis with coagulopathy
2	25	M	3	-/-	9 mm	ASDH	3 days	94.5	Organ Donation
3	71	M	4	+/-	7 mm	ASDH	3 days	97.1	Expired without CPR
4	71	F	4	-/-	4 mm	ASDH	1 day	97.1	CPR once
5	31	M	4	-/-	7 mm	ASDH	1 day	89.1	Expired without CPR
6	74	F	4	-/-	7 mm	ASDH	1 day	97.1	Expired without CPR
7	20	M	3	-/-	1 mm	ASDH	8 days	94.5	CPR once
8	52	M	3	-/-	3 mm	ASDH	1 day	94.5	Diabetes with sepsis
9	84	M	3	-/-	10 mm	ASDH	8 days	94.5	Chronic renal failure (hemodialysis)

GCS : Glasgow Coma Score, +/- : anisocoria, -/- : mydriasis, Shift : midline shift, ASDH : acute subdural hematoma, Span : Life span after the injury, P : probability of death ( $p=1/[1+\exp(-Z+C)]$ ),  $Z = -0.741 \times (\text{GCS score}) + 1.036 \times (\text{head AIS group}) + 2.375 \times (\text{penetrating injury}) + 1.415 \times (\text{age} > 55)$ , CPR : cardiopulmonary resuscitation

model of probability of death on the basis of GCS on admission, head abbreviated injury score, age, and mechanism of injury. The probability of death among these 9 cases was 89.1% in 2, 94.5% in 4, and 97.1% in 3 according to this model (Table 1).

We decided not to operate when the family or relatives of the victims agreed, as in all cases except Case 1. Do-Not-Resuscitate (DNR) order was decided after an agreement between medical staffs and family members in 56%<sup>10)</sup>. Only in 7% it was made by the doctors alone<sup>10)</sup>. When there was an agreement between doctors and family, the possibility of legal or ethical conflict will be low. However, the more clear evidences of fatality may be necessary, when we cannot get an agreement from the family. In Case 1, the victim had coagulopathy with advanced liver cirrhosis that might have increased the surgical mortality by itself.

Decision not to treat a patient is usually made on the basis of the natural history of the disease and the risks and benefits of the proposed treatment<sup>2)</sup>. Levy et al.<sup>19)</sup> reported that patients with admission GCS scores of 3, 4, or 5 were not likely to benefit from surgical intervention in penetrating craniocerebral injury. Even in blunt head injury, favorable outcome was possible only in 17%, when their admission GCS were 3, 4, or 5<sup>16)</sup>. In 1989, so called "Leeds Scale" was proposed to select patients whose death could be predicted with certainty at an early stage and who should therefore not receive prolonged intensive care<sup>8)</sup>. Feldman et al.<sup>7)</sup>, however, found the Leeds prediction model was not infallible and should be applied cautiously when making decisions about the early termination of care in severely head injured patients. Within the population of very severely head injured patients (GCS 3-5), the simple combination of age and admission GCS score appeared to predict accurately non-functional outcome in almost one third of patients<sup>24)</sup>. The accurate prediction of outcome after head injury remains elusive.

Aggressive treatment for the most severe injuries requires

astronomical costs. It is both survivors and their families who suffer most, rather than those who die<sup>18)</sup>. There were numerous studies suggesting that neurosurgical operations should not be performed on those patients who present with a GCS score of 3 with fixed and dilated pupils<sup>4,9,13,18,20,26)</sup>. Especially for the unconscious suicide victims, surgery may be the wrong course of action<sup>11, 17)</sup>.

On the other hand, Demetriades et al.<sup>6)</sup> reported that aggressive resuscitation should be done for these patients, since they could be an important source of organ donation. In Korea, the family should pay for the astronomical cost of aggressive treatment. In this situation, it is hard to agree with the aggressive treatment for the organ donation. In Case 2, the victim could donate his organs. However, in Case 7, his family refused to donate organs by reason of his religion. Jehovah's Witnesses are often assumed to be opposed to organ donation because of their belief against blood transfusion<sup>12)</sup>. According to the Watch Tower Society, Jehovah's Witnesses believe donation is a matter of individual decision. However, this merely means that all blood must be removed from the organs and tissues before being transplanted<sup>22)</sup>. In Case 7, although a decision not to operate on the hematoma had been made, we could not withdraw the ventilator for more than a week. Withholding a surgery not likely to be effective is easier than withdrawing the ventilator sustaining the life already. It is reasonable to withdraw a therapy, when there was a central nervous system disease, physician prediction of less than 10% probability of survival, and physician perception of patient preferences to limit life support<sup>25)</sup>.

In Case 9, after a decision not to operate, the hematoma resolved spontaneously. Although we gave up the risky surgery, the surgical mass itself disappeared spontaneously. This case is exceptional even though there are some case reports<sup>1,14,21,23,27)</sup> of spontaneous resolution of the ASDH. Bleeding augmented by iatrogenic coagulopathy for hemodialysis might produce large amount of subdural

hematoma. The coagulopathy inhibited clot formation, which resulted rapid spontaneous resolution of the hematoma. Surgery on the ASDH might be rather harmful than the spontaneous resolution. Withholding the risky surgery was much better than the risky surgery. No one can think that a surgery can save an 84-year-old man with GCS 3 and dilated pupils, who was maintained with hemodialysis three times a week. When his GCS improved up to 10, there was no surgical mass lesion. In this situation, we think that the withdrawal of a surgical decompression was reasonable.

We did inappropriate CPR in Case 4 and 7, even though we decided not to treat aggressively. It resulted from lack of documentation of the DNR. Most (70%) of the Korean doctors experienced DNR, although education for the DNR was given in only 19% of them<sup>10</sup>. It is not uncommon to do CPR in patients ordered DNR. It may happen in one third of the patients. The reasons were lack of communication in the medical team, reversal by the family or relatives, to delay the time, or possible medicolegal conflicts<sup>10</sup>. The main reason of lack of communication within the medical team was lack of documentation of the DNR order. Some doctors worried about that the documentation might become an unfavorable evidence for the best treatment. Documentation of DNR can be found in on the medical chart 12-59% of the cases in Korea<sup>3,15</sup>. The decision of the Korean Supreme Court in 2004 (Supreme Court 2002Do995) may reflect a legal intervention on the medical field and social attitudes promoting personal autonomy and agreement instead of authority of the doctors. A document against medical futility might be a reasonable way to stop the futile life-sustaining treatment without medicolegal conflicts.

Before deciding not to operate, doctors should provide the information on all possible outcomes of the victim, as much as possible, not only the chance of survival, but also the sequelae and quality of life after surgery.

## CONCLUSION

Deciding not to operate in head injuries is never easy for the patients with poor chance of survival. There are usually not enough time to consider legal or ethical aspects together with the accurate prognosis. The operation might be the last chance of survival. However, the family should have information on the sequelae and quality of life after surgery.

It is reasonable to withhold a treatment after documentation that the family never wants any life sustaining treatment, when the treatment does not work. A document against medical futility is preferred to documentation of the DNR order.

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