Acta Neurochir (Wien) (1988) 91: 21–24

Acta Neurochirurgica

Emergency Treatment of Cerebral Aneurysms with Large Haematomas

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Summary

Of 469 patients with subarachnoid haemorrhage (SAH) from ruptured intracranial aneurysms, 31 had large intracerebral haematomas and were treated as emergency cases at the University Central Hospital, Kuopio, Finland during 1979–1985. The haematomas were evacuated and the aneurysms clipped immediately after diagnosis with CT and angiography. The mean diameter of the haematomas was 48 mm. Of the 31 patients 15 died. Mortality was lower for patients with aneurysms of the middle cerebral artery and for those with a better clinical grade (Gr. IV) at the time of the operation (41%); all patients with dilated pupils in grade V died. Five patients returned to work, and 10 are living a useful and independent life at home. Because early CT is increasingly used as the first diagnostic tool in vascular catastrophies, the pressure for early emergency treatment of aneurysmal intracerebral haematoma is increasing. The almost 100% mortality with conservative treatment should be compared to the 41% mortality with selection of the surgical candidates.

Keywords: Subarachnoid haemorrhage; ruptured intracranial aneurysm; intracerebral haematoma; operative treatment; emergency operation.

Clinically significant intracerebral haematoma (ICH) is seen in 4–17% of patients with SAH from aneurysms[3, 9, 14, 15]. ICH can be diagnosed easily and accurately by computerized tomography, but opinions about the clinical management of such cases differ. In 1979 Pia reported that in his series there was only one case out of 25 in whom the treatment in the acute stage was life saving[14]. As a rule, however, expanding haematoma and signs of brain stem involvement are considered an indication for emergency evacuation of ICH with or without clipping of the aneurysm. Lougheed and Marshall suggested only evacuating the clot and not attempting to treat the aneurysm unless it was easily accessible and the state of the brain satisfactory[11]. Wheelock *et al.* recommended evacuating a significant ICH as soon as possible and clipping the ruptured aneurysm at the same time[20]. For patients treated by evacuating the ICH and clipping at the same operation, the mortality rate has been 28–50%[1, 5, 9, 16, 20] as opposed to 69–100% for those who had evacuation of ICH without clipping[4, 13, 16, 20]. It is difficult, however, to evaluate the benefits of emergency surgery when there are very few series of ruptured aneurysms with large ICH.

In this report are presented the results of emergency surgical management of 31 patients with large ICH arising from supratentorial aneurysms.

Patients and Methods

A group of 469 consecutive patiens with aneurysmal SAH were operated on at Kuopio University Central Hospital during 1979–1985; 31 of these patients were operated on immediately after the diagnostic studies because of intracerebral haematomas. Most were operated upon within 6 hours of the bleeding and all within 24 hours. The mean age of the 31 patients was 44 years (range 20–65). Preoperative grade was classified as IV–V according to the scale of Hunt and Hess. All these patients underwent computed tomography (CT) and had carotid angiograms at least on the side of the bleeding. The location of the ICH was classified as frontal, temporal or interhemispheric. Aneurysms larger than 2.5 cm were defined as giant aneurysms. In this group there were five giant aneurysms arising from the middle cerebral artery.

The aim of acute operation was complete removal of intracranial haematoma and clipping of the aneurysm as part of the same procedure. Intravenous mannitol and controlled hypotension for reduction of brain volume were used in all patients. Craniotomy was modified according to the site of ICH. The haematoma was removed by suction. All aneurysms were clipped using a microsurgical technique. Postoperative intraventricular pressure was recorded in 12 patients through an intraventricular catheter. CT was performed on days 1 and 7–10 after the operation and repeated later if needed. A postoperative angiogram was performed on 14 patients.

All the patients were treated with an anticonvulsant for at least one year after their aneurysm rupture. The patients were examined in the outpatient clinic at three months and one year after surgery.

Results

The mean diameter of the haematomas was 48 mm, range 35 mm to 73 mm. The location of aneurysm and

Table 1. *Location of the Aneurysm and Outcome of the Patients*

	Number of patients	Working	At home	Needs care	Dead
Middle cerebral artery	22	5	7	1	9 (41%)
Internal carotid artery	4		1		3 (75%)
Anterior communicating artery	2				2 (100%)
Pericallosal artery	3		2		1 (33%)
	31	5	10	1	15

Table 2. *Preoperative Grade and Outcome*

Outcome	Number of patients	
	Grade IV	Grade V
Working	5	
At home	8	2
Needs care		1
Dead	9	6
	22	9

Table 3. *Outcome of 12 patients with intra- and postoperative ICP-recording*

ICP-group	Patients	Working	At home	Dead
Below 15 mmHg	2	1		1
15–40 mmHg	6	2	4	
Above 40 mmHg	4			4
Total	12	3	4	5

outcome of the patients are seen in Table 1. Fifteen patients of 31 died; six of those were Grade V at the time of the operation (Table 2). None of the patients with extension rigidity and dilated pupils survived. The cause of death was progressive neurological deterioration in 11 patients, pneumonia in two patients and delayed neurological deterioration in two patients. Except for these two deaths due to vascular spasm, no delayed ischaemic complications developed in this group. Angiographic vascular spasm was seen, however, in 10 of the 14 patients who had postoperative angiograms.

Since 1984, prophylactic postoperative anticoagulation with warfarin has been practised in all aneurysm patients. Intracranial pressure and the outcome for 12 patients is seen in Table 3. Six patients had shunts for hydrocephalus. Five (31%) of the patients who survived developed epilepsy and are treated with anticonvulsants.

Five patients returned to work and 10 are able to care for themselves and lead normal lives at home. All five patients who are able to work had temporal lobe haematomas and recovered completely. Of the eight patients with frontal or interhemispheric haematomas, five died and two have marked intellectual impairment (Table 4). one patient with left frontal haematoma returned to work 2.5 years after surgery. The outcome was not influenced by age.

Discussion

Although in this study the total number of patients with large haematomas was small, it is representative of a certain population with ICH that was secondary to ruptured intracranial aneurysm who reached the hospital and made up 6% of the total number of patients. All these patients were in poor condition at the

Table 4. *Location of the ICH and Outcome*

	Number of patients	Working	At home	Needs care	Dead
Temporal	23	4	9		10 (43%)
Frontal	6	1		1	4 (66%)
Interhemispheric	2		1		1 (50%)
Total	31	5	10	1	15

time of surgery, which explains the high mortality. Progressive neurological deterioration, due to the initial brain injury caused by the bleeding, was the main cause of death. Only two deaths were related to vasospasm; the other patients did not develope delayed ischaemic neurological symptoms, although postoperative vasospasm was seen in 71% of the 14 angiograms. It has been suggested that because the bleeding has been primarily into the brain parenchyma rather than into the subarachnoid space, vasospasm would not be a significant problem[1, 6]. ICH without extension of blood into the subarachnoid space is, however, very rare. In the autopsy series of Housepian and Pool[7], ICH was solitary in two percents of the cases. Most of our patients had dense collections of blood in the subarachnoid space. In accordance with other authors[1, 2], we found that the patients with decerebration, anisocoria or dilated pupils with severe shift of the midline structure on CT always died. Elevated intraventricular pressure is associated with a significant increase in mortality and morbidity[18, 19]. High ICP after evacuation of haematoma is a sign of diffuse cerebral oedema due to SAH but may also be a sign of intraoperative complications.

There may also be fatal extracranial complications. Two of our patients died from bronchopneumonia. Most of our patients had postoperative anticoagulation with warfarin[17], and there was no mortality caused by embolism. Surgical difficulties did not pose a major problem. In these large aneurysms the haematoma was often partly evacuated before dissection of the neck getting the initially tight brain less tense. There are, however, controversies among experienced neurosurgeons which part of operation should be done first[10]. In one patient with a giant aneurysm, however, occlusion of the major branch of right middle cerebral artery occurred as a technical complication. This patient is hemiparetic but can walk and take care of himself.

The patients who survived generally recovered well from their hemiparesis. Speech disturbances, loss of visual field, and cognitive symptoms, which occurred especially in patients with central or frontal haematomas, were the usual causes of incapacity.

This study supports earlier findings that late epilepsy is a significant problem in Grade III–IV patients[8]. Patients with ICH of the middle cerebral artery aneurysms should be treated with anticonvulsants for at least two years after rupture of the aneurysm.

There was a haematoma, mostly small and silent, in 20% of our SAH-patients; only these 31 (6%) were candidates for an acute craniotomy. The volume of the haematoma may be one important factor; many patients with ICH have no critical intracranial pressure (ICP) and acute operation is not needed. The combination of high ICP and neurological deficit is the sole indication for treatment.

Some aneurysms immediately cause fatal ICH, owing to involvement of the third ventricle, hypothalamus and basal ganglia. The quality of survival in haematomas from anterior cerebral aneurysms is poor[14].

In conclusion, emergency evacuation of ICH with clipping of the aneurysm should be adopted for all patients with neurological Grade IV. Surgical treatment in patients with Grade V with decerebration is not promising but should be tried. Because surgical treatment in patients with haematoma and both pupils dilated was always too late, surgery is not recommended for such patients.

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