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Vascular

Glasgow Coma Scale and hematoma volume as criteria for treatment of putaminal and thalamic intracerebral hemorrhage

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Abstract

Background: The decision to administer conservative or surgical treatment for putaminal and thalamic ICH is still a controversial issue. This study was undertaken to examine the decision-making criteria for these 2 treatments.

Methods: In a retrospective study, case records of 400 patients with spontaneous putaminal and thalamic hemorrhage who underwent conservative treatment (n = 201) and surgical treatment (n = 199) over the past 5 years were examined. Conservative treatment included hypertonic solution treatment and hypertension control. Surgical treatments included endoscopic surgery, craniotomy, and stereotactic aspiration. Preoperative GCS score and ICH volume were the major evaluating factors, and comparison of the 30-day mortality rate and 6-month BI score was used for outcome evaluation.

Results: In patients with a GCS score of 13 to 15, there was no difference in mortality between conservative and surgical treatments. At a GCS score of 9 to 12 and ICH volume of less than 30 mL, the mortality rate with surgical treatment (10.5%) was lower than that with conservative treatment (20.0%, $P < .05$). At a GCS score of 3 to 8 and ICH volume of at least 30 mL, surgical treatment was for life saving. Mortality rates were lower for conservative treatment than for surgical treatment when the GCS score was 3 to 12 and ICH volume less than 30 mL. Endoscopic surgery had a better functional outcome compared with craniotomy and stereotactic aspiration when the GCS score was at least 9 ($P < .001$ and $P < .02$, respectively). Those in conservative treatment received a better BI score than those in surgical treatment did when the ICH volume was less than 40 mL ($P < .001$).

Conclusions: Intracerebral hemorrhage volume is probably more important than GCS score in determining treatment. Our nonrandomized data could be interpreted to show that conservative treatment is suggested at GCS score of at least 13 or when ICH volume is less than 30 mL, regardless of GCS score. Surgical treatment could be recommended at GCS score of less than 12 with ICH volume of at least 30 mL for life saving. Endoscopic surgery may improve the functional outcomes because it is less invasive and effectively removes the ICH at GCS score of at least 9.

Keywords: Conservative; Glasgow Coma Scale (GCS); Intracerebral hemorrhage (ICH) volume; Putaminal; Surgical; Thalamic

1. Introduction

Surgical treatment for hemorrhagic stroke is still controversial [2,15,18,19,21,24,26]. Hankey and Hon [10] and Prasad et al [30] reported that there was insufficient evidence regarding the risks and benefits of surgery for primary ICH in a systematic overview of meta-analyses. Recently, Mendelow et al [22] reported that there were no significant benefits in early surgery vs initial conservative treatment for spontaneous supratentorial intracerebral

Abbreviations: BI, Barthel index; CT, computed tomography; EVD, external ventricular drainage; GCS, Glasgow Coma Scale; GOS, Glasgow Outcome Scale; ICH, intracerebral hemorrhage; IICP, increased intracranial pressure; IVH, intraventricular hemorrhage; MISTIE, Minimally Invasive Surgery plus rtPA for Intracerebral Hemorrhage Evacuation; STICH, Surgical Trial in Intracerebral Hemorrhage.

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hematomas in the international STICH study. However, in their study, about 26% of the patients needed a treatment shift from conservative treatment to surgical treatment after an initial period of observation. Rebleeding and clinical neurologic deterioration were the major determinants for the treatment shift. Other clinical studies showed that early surgical treatment would be an effective treatment for hemorrhagic stroke in certain situations [15-17], but the surgical criteria and surgical intervention time need to be more precise and strictly observed under the criteria of the neurologic condition (GCS) and the ICH volume changes. Also, the appropriate selection of subgroups of patients for surgery and the improvement of operative techniques may improve the results of the surgical treatment. In the STICH study, most patients (75%) with surgical treatment underwent craniotomy, which may be invasive for deep hematomas such as basal ganglia or thalamus, although it is less invasive for subcortical ICH. Endoscopic surgery is one of the methods expected to be most effective for the treatment of deep hematomas [1,5,12,25,26,28,31]. The endoscopic surgery in the STICH study accounts for only 7% of the patients. Our previous study reported that endoscopic surgery was vastly superior to craniotomy in the area of functional outcomes [5]. We anticipate that greater use of endoscopic surgery for putaminal and thalamic ICH may open new vistas of surgical possibilities.

2. Methods

2.1. Patient collection

For 5 years, we observed patients admitted to our hospital with an ICH in the putamen and thalamus (the main ICH in the thalamus other than in ventricles) at least 72 hours before the onset of a stroke. The patients' ages ranged from 30 to 80 years. Any patients with traumatic ICH, hemorrhagic infarction, aneurysmal rupture, tumor bleeding, coagulopathy, heart failure, liver cirrhosis, and uremia were excluded. Our acute stroke team members (neurologists and neurosurgeons) subjectively provided different information regarding surgical intervention and conservative treatment to families during admission. Owing to ethical considerations in this very emergent condition, we did not completely randomize our patients for study. Informed consent was obtained from each patient's family for surgical or conservative treatment after the family indicated full understanding of the options provided. The choices of operation depended on the neurosurgeons' preference. Drs Cho and Chen preferred endoscopic surgery for surgically indicated patients. Drs WN Lee and HC Lee preferred craniotomy, and Dr Lin preferred stereotactic aspiration.

2.2. Conservative treatments

For a conservative treatment approach, we used medication for blood pressure control. The mean arterial pressure was maintained in a range of 90 to 120 mm Hg with antihypertension medication (labetalol, amolodipine, etc). We also used a hypertonic agent (glycerol, mannitol) when the CT scan indicated mass effect when or clinical symptoms showed signs of IICP signs.

2.3. Surgical methods

2.3.1. Endoscopic surgery

Under general anesthesia, our surgical team made a linear skin incision (2 cm in length) on each patient's forehead for basal ganglia ICH with or without IVH. The entry point corresponded with the CT scan slice. The surgeons then inserted a plastic or stainless steel working channel (developed by our surgical team), 8 mm in diameter and 15 to 20 cm in length, into the hematoma center. Our team then used a 4-mm endoscope with an irrigation system (Karl-Storz, Tuttlingen, Germany) for the hematoma removal through the working channel [5,6]. For a thalamic ICH, we went through the anterior or posterior horn of the lateral ventricle to remove the hematoma, depending on the position of the ICH in the anterior or posterior thalamus [12].

2.3.2. Craniotomy

Under microscope, we removed the putaminal and thalamic ICH through the middle temporal gyrus. An EVD tube was set into the lateral ventricle for drainage, if it was associated with IVH.

2.3.3. Stereotactic aspiration

A burr hole was created at Kocher point under the Leksell frame (Stockholm, Sweden). We aspirated the hematoma with an Archimedes aspirator (Stockholm, Sweden) after determining the localization point using Leksell Surgiplan software (Stockholm, Sweden). Usually, 2-3 aspiration points were used for decompression.

2.4. Data collection

The 30-day mortality and 6-month BI scores (0-100) [7,20,32,33] were collected for evaluation. For comparison,

Table 1
Demographic characteristics of patients

	Conservative treatment (n = 201)	Surgical treatment (n = 199)
Mean age (y)	62.3 ± 13.8	59.6 ± 13.0
Sex (M/F)	123/88	136/63
Mean GCS score	11.3 ± 4.92	10.8 ± 4.10
15-13 (n)	116	78
12-9 (n)	25	55
8-5 (n)	16	37
4-3 (n)	44	29
P/T	158/43	146/53
R/L	90/110	81/118
IVH	55	71
ICH volume		
<30 mL (n)	116	87
≧30 mL (n)	85	102

P/T indicates putaminal/thalamic; R/L, right/left side.