

นิพนธ์ต้นฉบับ

Original article

Clinical Outcome of Patients Treated Surgically for Moderate Spontaneous Hemorrhagic Stroke (GCS 9–12) Fast Track

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Abstract

This study examined the clinical outcomes of surgical treatment in patients with spontaneous intracerebral hematoma (SICH) with Glasgow coma scale (GCS) between 9 and 12 through fast tract system of our hospital. Data were retrospectively collected from 86 SICH patients who underwent surgery at Sawanpracharak Hospital between January 2019 and February 2024. These patients were categorized into two groups: the fast-track group (SICH fast track) and a control group of 86 patients who received routine surgical treatment (non-fast track). The study investigated various factors, including risk factors (such as heart disease, previous stroke, hypertension, diabetes mellitus, hyperlipidemia, thrombocytopenia, smoking, alcohol consumption, and chronic kidney disease), vital signs, Glasgow Coma Scale (GCS), hematoma volume, midline shift (MS), intraventricular bleeding (IVH), brain edema, hydrocephalus, meningitis, renal failure, brain infarction, re-bleeding, pneumonia, sepsis, convulsions, pressure sores, time from emergency room to operating room (ER to OR), operating time, intraoperative blood loss, ventriculostomy, ventriculoperitoneal (VP) shunt, re-craniotomy, tracheostomy, Glasgow Outcome Scale (GOS), and length of stay (LOS). Statistically significant associations ($p < 0.05$) were found between fast-track system and routine surgical treatment (non-fast-track) with the following factors: mean age, history of hypertension, mean hematoma volume, time from ER to OR, operative time, pneumonia, and GOS.

Keywords: spontaneous intracerebral hematoma, Glasgow Coma Scale, hematoma volume, Glasgow Outcome Scale

Introduction

Stroke remains a major cause of mortality and disability worldwide. Spontaneous intracerebral hematoma (SICH) accounts for approximately 10–20% of all strokes^(1,2), with an incidence of 13–35

per 100,000 population. It has the highest morbidity and mortality of all types of stroke and is more common in men. Around 35–50% of patients with SICH die within the first month after bleeding^(3,4). Data from the Asian Stroke Advisory Panel (ASAP)

reveal an incidence of ICH ranging from 17–33% of all strokes, which is twice as high as in Western countries⁽⁵⁾. In Thailand, SICH accounts for 30% of all strokes⁽⁶⁾.

Several prognostic models have been proposed and validated to assist clinicians in predicting mortality and functional outcomes in SICH patients. The most common risk factors include hypertension and advancing age. Other risk factors include smoking, alcohol consumption, previous stroke, coronary artery disease, diabetes mellitus, hyperlipidemia, and a family history of stroke. Well-known predictors of early death following SICH include low Glasgow Coma Scale (GCS) on admission, hematoma volume, the degree of intraventricular hemorrhage, presence of midline shift, and the degree of hydrocephalus.

Surgical intervention is believed to be beneficial in stopping bleeding, preventing re-bleeding, removing the mass effect, and preventing secondary brain damage, including herniation. The optimal timing for surgical evacuation of SICH has varied widely, with reports ranging from 4 to 96 hours^(7–9). Some studies have found that surgery performed within 8 hours of onset is associated with better outcomes^(8,10).

The aim of this study was to evaluate the mortality rate and the impact of various prognostic factors on the outcomes of patients with SICH who underwent surgical treatment either as part of a fast-track protocol or routine treatment. Understanding these prognostic factors at the time of admission can help predict patient outcomes.

Material and Method

This was a retrospective analysis of 86 patients with SICH (GCS 9–12) who were admitted to the

Department of Surgery at Sawanpracharak Hospital, Nakhonsawan Province, between January 2019 and February 2024 and treated through fast-track system. A comparison group of 86 patients with SICH who had undergone routine surgical treatment was also studied. The research proposal was reviewed and approved by the Sawanpracharak Hospital Ethics Committee. Upon admission, all patients suspected of having a stroke underwent a brain CT scan, which was evaluated by both a neurosurgeon and a radiologist.

The inclusion criteria for SICH in this study were supratentorial hematomas (including those in the basal ganglia, thalamus, and subcortical regions). Patients with ICH caused by bleeding tumors, vascular malformations, aneurysms, brainstem hemorrhage, infarctions, bleeding diatheses (e.g., thrombocytopenia, anticoagulation therapy), or hemorrhagic infarction were excluded from the study.

The time from the emergency room (ER) to the operating room (OR) was approximately 90 minutes for all patients.

Data collected included personal information (age, sex), major risk factors (e.g., heart disease, previous stroke, hypertension, diabetes mellitus, and hyperlipidemia), minor risk factors (e.g., obesity, smoking, alcohol consumption, thrombocytopenia, and chronic kidney disease), vital signs, Glasgow Coma Scale (GCS) scores, hematoma volume, midline shift (MS), intraventricular bleeding (IVH), hydrocephalus, convulsions, brain edema, meningitis, renal failure, brain infarction, re-bleeding, pneumonia, sepsis, pressure sores, time from ER to OR, operating time, intraoperative blood loss, ventriculostomy, VP shunt, re-craniotomy, tracheostomy, Glasgow Outcome Scale (GOS) scores, and length of stay (LOS).

The outcome of the patients was classified according to the Glasgow Outcome Scale (GOS) as follows: (1) GOS 4 and 5 were categorized as good outcomes (good outcomes), (2) GOS 2 and 3 were categorized as poor outcomes (poor outcomes), and (3) GOS 1 indicated death. All SICH patients were surgically treated, and those with post-operative hydrocephalus or re-bleeding were treated appropriately.

STATA SE18 software was used for statistical analysis. The characteristics of the subjects were described in terms of frequency, percentage, and mean± standard deviation. Student's t-test was used for comparing continuous quantitative variables, while Chi-square and Fisher's Exact tests were used for categorical data. A p-value of <0.05 was considered statistically significant.

Results

A total of 86 consecutive patients with surgically treated spontaneous intracerebral hemorrhage (SICH) were admitted to the Department of Surgery and Medicine at Sawanpracharak Hospital, Nakhonsawan Province, between January 2019 and February 2024, under the treatment in the fast-track group. An additional 86 consecutive patients who underwent routine surgical treatment for SICH during the same period were included as the non-fast-track group.

The patients' ages in both groups ranged from 30 to 88 years, with 99 patients being male (57.6%). The mean age was 58.45±13.69 years. Hypertension was the most common medical condition, followed by hyperlipidemia, diabetes mellitus, smoking, and alcohol consumption (Table 1). The mean age and the presence of hypertension showed statistically significant differences between the two groups (p<0.05

Table 1 Demographic features, clinical characteristics, and disease factors of spontaneous hemorrhagic stroke (SICH) (GCS 9–12) fast-track and non-fast-track (routine surgical treatment) groups

Demographic features	Non-fast-track (n = 86)		Fast-track (n = 86)		p-value
	number	%	number	%	
Sex					
Male	47	54.7	52	60.5	0.440
Female	39	45.3	34	39.5	
Mean Age (Years)	61.02±13.69		55.88±13.29		0.013
Age Range	30 – 85		31 – 88		
Hypertension	66	76.7	78	90.7	0.013
Hyperlipidemia	17	19.8	18	20.9	0.850
Diabetes Mellitus	14	16.3	15	17.4	0.839
Old CVA	8	9.3	2	2.3	0.099
Atrial Fibrillation (AF)	3	3.5	3	3.5	1.000
Chronic Kidney Disease	2	2.3	4	4.7	0.682
Smoking	25	29.1	29	33.7	0.511
Alcoholic Consumption	22	25.6	34	39.5	0.073

for both).

significant association between the two groups

Statistically significant associations were also (Table 3).

observed between the two groups for the following

factors: mean hematoma volume, time from emergency

room (ER) to operating room (OR), operative time,

and pneumonia (Table 2), Additionally, the Glasgow

Outcome Scale (GOS) showed a statistically

Discussion

Spontaneous intracerebral hemorrhage (SICH) is

a devastating disease with high mortality and grave

neurological outcomes worldwide, had a high reported

Table 2 Demographic features, clinical characteristics, disease factors, and treatment factors of spontaneous hemorrhagic stroke (SICH) (GCS 9–12) fast-track and non-fast-track (routine surgical treatment) groups (n = 172)

Demographic & treatment factors	Non-fast-track (n = 86)		Fast-track (n = 86)		p-value
	number	%	number	%	
Mean SBP (mmHg)	183.36±30.76		184.36±26.25		0.819
Mean DBP (mmHg)	104.03±23.20		102.92±21.03		0.741
Mean HR (bpm)	85.17±14.17		84.09±14.80		0.625
Mean Hematoma Volume (mL)	59.20±22.49		69.03±26.73		0.010
Midline Shift (mm)	7.58±3.01		7.73±3.18		0.750
Intraventricular Hemorrhage (IVH)	53	61.6	49	57.0	0.641
Hydrocephalus	26	30.2	23	26.7	0.735
Meningitis	1	1.1	3	3.5	0.621
Brain Infarct	2	2.3	2	2.3	1.00
Time from ER to OR (minutes)	726.64±575.76		97.30±64.57		< 0.001
Operative Time (minutes)	64.88±21.88		77.44±28.01		0.001
Intraoperative Blood Loss (mL)	239.53±174.91		270.93±223.14		0.306
Thrombocytopenia	3	3.5	2	2.3	0.990
VP Shunt	4	4.7	0.0	0.0	
Ventriculostomy	5	5.8	3	3.5	0.720
Re-craniotomy	6	7.0	6	7.0	1.00
Tracheostomy	32	37.2	26	30.2	0.333
Re-bleeding	16	18.6	17	19.8	0.846
Brain Edema	35	40.7	30	34.9	0.432
Pneumonia	46	53.5	31	36.0	0.021
Convulsions	7	8.1	7	8.1	1.00
Renal Failure	4	4.7	4	4.7	1.00
Sepsis	16	18.6	11	12.8	0.295
Pressure Sore	12	14.0	5	5.8	0.074

Table 3 Glasgow coma scale (GCS), Glasgow outcome scale (GOS), and length of stay (LOS) for spontaneous hemorrhagic stroke (SICH) (GCS 9–12) fast-track and non-fast-track (routine surgical treatment) groups (n = 172)

Outcome Measures	Non-fast-track (n = 86)		Fast-track (n = 86)		p-value
	number	%	number	%	
Glasgow coma scale (GCS)	10.01±0.96		10.16±1.21		0.368
Glasgow outcome scale (GOS)					
Good	42	48.8	62	72.1	0.005
Poor	19	22.1	13	15.1	
Dead	25	19.1	11	12.8	
Length of Stay (LOS) (days)	13.71±8.05		16.38±17.18		0.193

mortality rate of 35 to 52%, out of which one-half of deaths occurred within the first two days^(11,12), which is similar to the figures reported by the previous two Malaysian studies^(13,14).

There have been numerous attempts to identify outcome predictors for ICH. Several prognostic models had been proposed and validated to help clinicians in predicting mortality and functional outcome^(4,15).

The advancing age and hypertension were the most important risk factor for SICH⁽¹⁶⁾. Hyperglycemia on admission had been reported as the indicator of a poor prognosis in patients with SICH⁽¹⁷⁾. The hyperglycemia was probably not directly harmful to the brain but reflects stress relating to stroke severity. The study of Gill JS, et al.⁽¹⁸⁾ found that low levels of alcohol consumption might have same protective effect upon the cerebral vasculature, whereas heavy consumption predisposes to both hemorrhagic and non-hemorrhagic stroke. Many studies also showed heavy consumption of alcohol as one of the risk factors for hemorrhagic stroke^(19,20). The admission GCS was a well-known predictor of outcome in ICH^(21,22). The GCS score was

a standard neurological assessment tool that because of its reproducibility and reliability⁽²³⁾, it had been associated with ICH outcome in other prediction models⁽²⁴⁾.

Clinical predictors of outcome should be easy to use if they were to gain wide acceptance. CT scanners had the capability to outline and measure areas of hemorrhage. Helping the physician to make quick and critical decisions about a patient with ICH. The ideal method was the one that gave a reasonable estimation of actual hemorrhage volume as quickly as possible because of volume of the hematoma is a powerful predictor of outcome in ICH^(21,25). The simple ellipsoid method could easily estimate hemorrhage volume within one to two minutes. With regard to radiological variables based on CT imaging, a significant association between midline shift and functional outcome and survival time were observed⁽²⁶⁾. Intraventricular bleeding seems to be a very powerful predictor of outcome⁽²⁷⁾. A large prospective observation study from the Stroke Data Bank demonstrated that frequency of neurologic deterioration was greatest on the first hospital day and most of the

patients had a large hematoma volume on initial CT scan⁽²⁸⁾. The incidence of hydrocephalus was higher in patients with deep hemorrhage and over half of the patients with hydrocephalus died compared with 2% of those without hydrocephalus. Hydrocephalus was associated with a considerably higher mortality, demonstrated the impact of hydrocephalus on outcome from ICH. Seizures were well known to occur at the onset of ICH. After ICH, progressive brain edema was a well-documented phenomenon and occurs in 25–61% of patients⁽²⁹⁾, brain edema was most often manifested as midline shift.

Most common complications of surgical ICH patients were ventilator-acquired pneumonia and rebleeding. According to Saribekian AS et al there were 29% deaths from pneumonia and 19.5% deaths from rebleeding⁽³⁰⁾.

Spontaneous ICH has places a significant burden of health and social services. Patients diagnosed with ICH often suffer from the space-occupying effects of the hematoma. In addition, the hematoma components cause a series of secondary pathological lesions in the perihematoma region that may heavily influence the outcome of the clinical prognosis. The main goal of surgery is hematoma evacuation with consequent relief of mass effect that mass removal might reduce nervous tissue damage, possibly by relieving local ischemia or removal of noxious chemicals of blood degradation products on the brain., reduction of intracranial pressure and prevention of herniation. Surgical intervention is thought to be beneficial in stopping bleeding, preventing rebleeding and removing the mass effect to prevent secondary brain damage. The meta-analysis of the published outcome from these studies shows a significant benefit from surgery both

for the outcome of mortality and for the combined outcome of death or disability^(9,10).

The optimum timing for surgical evacuation of spontaneous ICH have reported a wide variability ranging from 4 h to 96 h^(11,12), some studies found that surgery performed within 8 h of the ictus was associated with better outcome^(11,13).

Conclusions

Spontaneous ICH is one of the most lethal stroke type with high morbidity and mortality.

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**ผลการรักษาของผู้ป่วยเลือดคั่งในสมองที่เกิดขึ้นเอง (Spontaneous Intracerebral Hematoma Patients)
ที่ได้รับการผ่าตัดรักษาในช่องทางด้นพิเศษที่โรงพยาบาลสวรรค์ประชารักษ์**

ณรงค์พงศ์ โล้วพฤกมณี พ.บ.

แผนกศัลยกรรม โรงพยาบาลสวรรค์ประชารักษ์ จังหวัดนครสวรรค์

วารสารวิชาการสาธารณสุข 2568;34(4):765-73.

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บทคัดย่อ: การศึกษานี้มีวัตถุประสงค์เพื่อศึกษากลุ่มผู้ป่วยผู้ป่วยเลือดคั่งในสมองที่เกิดขึ้นเอง (spontaneous intracerebral hematoma: SICH) เปรียบเทียบระหว่างช่องทางด้นพิเศษและการรักษาอื่นก่อนหน้าการพัฒนาช่องทางด้นพิเศษที่ได้รับการผ่าตัดถึงผลการรักษาและปัจจัยที่มีผลต่อการรักษา เป็นการศึกษาย้อนหลังของผู้ป่วย SICH จำนวน 86 รายที่ได้รับการผ่าตัด ณ โรงพยาบาลสวรรค์ประชารักษ์ ระหว่างมกราคม 2562 ถึง 1 กุมภาพันธ์ 2567 (ช่องทางด้นพิเศษ) เปรียบเทียบการรักษาก่อนหน้าการพัฒนาช่องทางด้นพิเศษจำนวน 86 ราย ผู้ป่วยทั้งหมดได้รับการวินิจฉัยว่าเป็นโรค spontaneous intracerebral hematoma (SICH) และได้รับการผ่าตัดรักษา ข้อมูลเก็บวิเคราะห์ได้แก่ โรคหัวใจ ประวัติโรคหลอดเลือดสมอง ความดันโลหิตสูง เบาหวาน ไขมันในเลือดสูง โรคเกล็ดเลือดต่ำผิดปกติ สูบบุหรี่ ต้มสุรา โรคไตเรื้อรัง สัญญาณชีพ ระดับความรู้สึกตัว (Glasgow Coma Scale - GCS) ปริมาตรของก้อนเลือด ระยะการเคลื่อนที่ของสมองผ่านแนวกลาง เลือดคั่งในช่องนำสมอง ภาวะสมองบวม น้ำ ภาวะช่องนำสมองโต ภาวะติดเชื้อในโพรงสมอง ภาวะไตวาย ภาวะสมองขาดเลือด การเกิดเลือดออกซ้ำ ภาวะปอดติดเชื้อ ภาวะติดเชื้อในกระแสโลหิต ภาวะลมชัก ผลกดทับ ระยะเวลาจากห้องฉุกเฉินถึงห้องผ่าตัด ระยะเวลาการผ่าตัด การเสียเลือดระหว่างผ่าตัด ผ่าตัด ventriculostomy ผ่าตัด VP shunt ผ่าตัดซ้ำ เจาะคอ ผลการรักษา (Glasgow Outcome Scale - GOS) และระยะเวลาในการนอนโรงพยาบาล จากการศึกษาพบว่า ปริมาตรของก้อนเลือดกลุ่มช่อง-ทางด้นความแตกต่างอย่างมีนัยสำคัญทางสถิติ ($p<0.05$) คือ มีปริมาตรมากกว่า ระยะเวลาจากห้องฉุกเฉินถึงห้องผ่าตัดสั้นกว่า ภาวะปอดติดเชื้อน้อยกว่า และผลการรักษา (GOS) ดีกว่า

คำสำคัญ: เลือดคั่งในสมองที่เกิดขึ้นเอง; ค่า Glasgow Coma Scale, ปริมาตรของก้อนเลือด, ค่า Glasgow Outcome Scale