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Research Article

Treatment Outcomes of Elderly Patients with Acute Subdural Hematoma

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Abstract

Introduction: Determining the factors associated with treatment outcomes of patients with acute subdural hematoma is critical in clinical practice. This study evaluated factors related to poor outcomes in elderly patients with acute subdural hematoma following head trauma.

Methods: This cross-sectional study was conducted on 107 elderly patients with acute subdural hematoma treated at the Department of Neuro-Spine Surgery at Thai Binh General Hospital from July 2021 to August 2022. Multivariate analysis was performed to identify factors associated with poor treatment outcomes.

Results: Thirty-two out of 107 patients (21.5%) had poor outcomes after treatment. No statistically significant differences were found between age, gender, cause of injury, chronic diseases, Glasgow scale score upon admission, hematoma size, midline deviation, and combined injuries on computed tomography. Only impaired consciousness (GCS) was independently associated with poor outcomes in elderly patients with acute traumatic subdural hematomas.

Conclusion: The independent factor associated with poor outcomes in elderly patients with traumatic subdural hematoma is the poor level of consciousness upon admission.

Keywords: Acute Subdural Hematoma, Elderly, Intracranial Hematoma, Traumatic Brain Injury.

Introduction

Traumatic brain injury is one of the most complex and severe injuries, with a high mortality rate and significant consequences [1, 2]. Among patients with traumatic brain injury in general, acute subdural hematoma is among the most potentially life-threatening events, particularly among elderly patients with traumatic brain injury [3]. A subdural hematoma is a hematoma that forms between the dura mater and the cerebral cortex, forming within 72 hours of injury. Acute subdural hematoma develops rapidly in the first hours after injury, often with contusion of the brain.

Due to the anatomical and physiological features of the skull in the elderly, for example, the skull bones are thin, fragile, easy to bleed, and the dura is firmly attached to the skull, the phenomenon of brain atrophy in old age causes the subdural space to expand and easy rupture of the glomerulus, traumatic brain injury in the elderly often leads to acute subdural hematoma. Many cases of acute subdural hematoma are large, but compression symptoms often appear late, significantly affecting patient management. A previous review showed that the mortality rate among patients requiring surgical treatment was 39.8% [4]. The management of acute subdural hematoma (ASDH) in the elderly population is a subject of debate in the academic community. Multiple risk factors have been identified in the current body of research, including age, postoperative seizures, preoperative Glasgow Coma Scale (GCS) scores, and usage of anticoagulant medications [5-8]. The existing literature exhibits divergent findings concerning notable risk factors, which can be attributed to the adoption of distinct protocols across different institutions, particularly on surgical eligibility criteria.

Acute subdural hematoma in the elderly is a common neurosurgery emergency in Vietnam. The incidence of acute subdural hematoma due to trauma in the elderly was about 10%-20% depending on the report. The problem of treatment and care to limit mortality and sequelae in the elderly is difficult given the matter that people of higher age are more likely to have higher risk factors and poor prognosis in treatment. However, evidence in Vietnam regarding this issue is scarce when only a few case reports have been published [9]. Defining SDH situations and identifying contextualized factors associated with treatment outcomes is crucial for developing appropriate treatment plans for SDH patients in Vietnam hospitals. This study aimed to examine the factors associated with treatment failure among older patients with acute subdural hematoma.

Methods

Study settings

A cross-sectional study of 107 elderly patients with acute subdural hematoma at Thai Binh Provincial General Hospital was performed from July 2021 to July 2022. All patients aged 60 years and older with a diagnosis of acute subdural hematoma (confirmed by computed tomography scan) were admitted to the Department of Neuro-Spine Surgery. Other eligibility criteria included patients having accident time within 72 hours with acute subdural hematoma alone or in combination with epidural hematoma, intracerebral hematoma, cerebral contusion, and subarachnoid haemorrhage. Patients were excluded if 1) patients' medical records were not complete and clear; 2) acute subdural hematoma was not due to traumatic brain injury, and 3) patients and their families did not agree to participate in the study. The formula for estimating proportion with specified absolute precision was used to calculate the sample size, with $p=0.77$ (proportion of patients having good treatment outcomes in the previous study [10]), $d=0.08$ and $\alpha=0.05$. The essential sample size was 107 patients. A convenient sampling method was applied to recruit patients. The study was approved by the ethics committee of the Thai Binh University of Medicine and Pharmacy (Code: 503 QD/YTB).

Treatment approach

After hospital admission, patients underwent a clinical and paraclinical assessment to develop a treatment plan. Three treatment methods were employed in addressing this condition: Surgery, Intensive Care, or Internal Medical Treatment. Patients were assigned to intensive care or internal medicine treatment and monitoring if the conditions were not severe. The surgical approach of detaching the dura mater to control subdural bleeding, as outlined by the American Association of Neurological Surgeons guidelines [11], was implemented for patients who are indicated for surgery.

Data measurements

Data from all selected elderly patients with traumatic brain injury acute subdural hematoma were collected following information: age, gender, cause of hospitalization, consciousness on admission, focal neurological signs, pupillary signs, chronic diseases if present, combined injuries such as fractures, abdominal and chest trauma, soft tissue injuries. Acute subdural hematoma characteristics included: hematoma location, subdural hematoma thickness, and midline displacement (<5mm; 5-10mm; >10mm on computed tomographic film). Other information included: methods of medical treatment (Surgery, Intensive care or Internal medical treatment), active resuscitation, surgery, and the patient's progress. Patient's management outcomes upon discharge according to the Glasgow Outcome Scale (GCS) [12].

Evaluation of early treatment results upon discharge: Based on the patient's condition upon discharge, the research team classified treatment results into two groups: group with improvement and group of treatment failure (including transfer to another hospital; more severe; death).

Statistical analysis

SPSS 20.0 software was used for data analysis. A descriptive analysis was performed. Univariate logistic regression analysis was conducted to examine factors associated with treatment outcomes. Independent variables with a p-value of less than 0.05 were included in the multivariate logistic regression model. The dependent variable was treatment outcomes (0=Improvement; 1=Transfer/Severe/death). Independent variables included in the analysis included: age, gender, cause of trauma, underlying medical condition, GCS score on admission, worsening of consciousness during the treatment, signs of pupil dilation, signs of focal neurological paralysis, the thickness of the hematoma, midline displacement, and the number of brain lesions on computed tomography. A P-value of less than 0.05 was used to detect statistical significance.

Results

Table 1 shows the demographic and clinical characteristics of patients. Most of the patients were male (58.9%), aged 60-69 years old (47.7%) and male (58.9%). The majority of patients were traumatized due to traffic accidents (52.3%). Regarding clinical characteristics, 39.3% of patients had high blood pressure. There were 81.3% of patients conscious and had 13-15 GCS scores at hospital admission. Most of the patients had no dilated pupils sign (93.5%) and no hemiplegia (83.2%). For local signs, 36.4% had swollen head areas and 22.5% had skin-tearing wounds. The majority of patients had internal medical treatment.

Table 2 depicts the characteristics of patients on computed tomographic images. On CT scans of the brain, it was found that acute subdural hematoma was the most common in the temporal region (53.3%), followed by the forehead area, accounting for 35.5%. The thickness of the subdural hematoma in the elderly was often 5-10mm, accounting for 44.9% and <5mm accounting for 43.0%. The proportion of patients with signs of midline displacement on CT scan of the brain accounted for 20.6%; the highest degree of midline deviation 5-10 mm accounted for 13.1%; < 5mm accounted for 4.7 %; >10 mm accounted for 2.8%. The proportion of patients with acute subdural hematoma alone accounted for 22.4%. The most associated traumatic brain injury was subarachnoid haemorrhage at 63.6% and cerebral contusion accounted for 30.7%.

Table 3 shows that of the total 107 patients with acute subdural hematoma, patients with improvement accounted for the highest proportion with 78.5%. There were 10.3% of patients having poorer outcomes or even death.

Table 4 illustrates the results of multivariate logistic regression in identifying factors associated with treatment outcomes. After adjustment, only alertness level was found to be associated with poorer treatment outcomes (adjusted R2 = 0,09). Drowsy patients were more likely to have poorer outcomes compared to those who were conscious (OR=23.062, 95%CI=1.500-354.59).

Table 1: Demographic and clinical characteristics of patients.

Characteristics		Frequency (n)	Percentage (%)
Age group	60-69 years old	51	47.7
	70-79 years old	30	28.0
	> 80 years old	26	24.3
Gender	Male	63	58.9
	Female	44	41.1
Cause of injury	Traffic accidents	56	52.3
	Life accident	43	40.2
	Labor accident	3	2.8
	Other accident	5	4.7
Chronic diseases	High blood pressure	42	39.3
	Diabetes	19	17.8
	Kidney disease	1	0.9
	Liver failure	3	2.8
	Epileptic	3	2.8
	Heart-related diseases	7	6.5
	Lung disease	5	4.7
	Stroke	6	5.6
	Other diseases	5	4.7
Level of Alertness	Conscious	87	81.3
	Drowsy	15	14.0
	Loss of consciousness after the accident	5	4.7
GCS score at hospital admission	13 - 15	91	85.0
	9 - 12	11	10.3
	3 - 8	5	4.7
Dilated Pupils sign	No stretch	100	93.5
	Stretch one side	3	2.8
	Stretch both sides	4	3.7
Hemiplegia	No	89	83.2
	Yes	18	16.8
Local sign	Ear bleeding	9	8.4
	Bleeding around the eye socket	10	9.3
	Skin tearing wound	24	22.4
	Swollen head area	39	36.4
Combined trauma	Abdominal trauma	1	0.9
	Chest trauma	11	10.3
	Spinal cord injury	5	4.7
	Fracture of a limb	14	13.1
	Software wound	1	0.9
	Maxillofacial trauma	14	13.1
	Eye Injury	7	6.5
Treatment method	Surgery	7	6.5
	Intensive care	7	6.5

Table 2: Characteristics of computed tomographic images.

Characteristics		Frequency (n)	Percentage (%)
Location	Forehead	38	35.5
	Temporal	57	53.3
	Top	9	8.4
	Occipital	9	8.4
	Hemisphere spread	29	27.1
Thickness of hematoma	< 5 mm	46	43.0
	5 - 10 mm	48	44.9
	11 – 15 mm	10	9.3
	> 15 mm	3	2.8
Midline displacement	No displacement	85	79.4
	< 5 mm	5	4.7
	5 - 10 mm	14	13.1
	> 10 mm	3	2.8
Combined traumatic brain injury	Simple subdural hematoma	24	22.4
	Epidural hematoma	4	3.7
	Subarachnoid hemorrhage	68	63.6
	Brain damage	33	30.8
	Blood pooling in the brain	12	11.2
	Broken skull	40	37.4

Table 3: Treatment outcomes.

Treatment outcomes	Frequency (n)	Percentage (%)
Improvement, discharge	84	78.5
Transfer to another hospital	12	11.2
Severe, death	11	10.3
Total	**107**	**100**

Table 4: Factors associated with treatment outcome

Characteristics	Treatment outcomes (0=Improvement; 1=Transfer/Severe/death)							
	Univariable logistic regression analyses				Multivariable logistic regression analyses			
	OR	95%CI		p	aOR	95%CI		p
		Lower	Upper			Lower	Upper	
Age	1.039	0.994	1.087	0.093	-	-	-	-
Gender								
Male	-	-	-	-	-	-	-	-
Female	0.711	0.272	1.859	0.487	-	-	-	-
Cause of injury								
Traffic accidents	-	-	-	-	-	-	-	-
Life accident	1.111	0.428	2.881	0.828	-	-	-	-
Other accident	0.524	0.059	4.682	0.563	-	-	-	-
Chronic diseases								
None	-	-	-	-	-	-	-	-
One disease	1.134	0.346	3.712	0.836	-	-	-	-
Two diseases or more	4.881	1.529	15.578	0.007	-	-	-	-
GCS score at hospital admission (per score)	0.504	0.357	0.712	<0.001	1.008	0.465	2.187	0.983
Alertness level								
Conscious	-	-	-	-	-	-	-	-
Drowsy	27.156	6.999	105.370	<0.001	23.062	1.500	354.594	0.024
Loss of consciousness after the accident	39.500	3.925	397.469	0.002	62.680	0.073	53642.599	0.230
Hemiplegia								
Yes	-	-	-	-	-	-	-	-
No	14.182	4.421	45.497	<0.001	3.662	0.620	21.615	0.152
Thickness of hematoma (per mm)	1.145	1.034	1.268	0.009	0.979	0.811	1.180	0.822
Midline Displacement								
No displacement	-	-	-	-	-	-	-	-
Displacement	8.073	2.821	23.101	<0.001	0.417	0.033	5.299	0.500
Number of combined traumatic brain injury								
Simple DMC hematoma	-	-	-	-	-	-	-	-
One combined injury	1.333	0.320	5.552	0.693	0.872	0.124	6.144	0.891
Two combined injuries	4.000	0.984	16.258	0.053	2.855	0.406	20.081	0.292

Discussion

This study partly contributes evidence on factors that were associated with treatment outcomes in elderly patients with acute traumatic subdural hematoma. We classified patients into two groups: improvements and treatment failure on discharge. The results of our study found that there were no statistically significant differences in age, sex, and cause of accidents among patients with severe complications. It is possible that our patient group mostly had mild initial signs of consciousness (GCS 13-15), accounting for 85%. Our results are consistent with the study of Seung Hoon Lee et al. which showed that age (p = 0.75), sex (p = 0.36) and cause of injury was not significantly different between those with and without subdural hematoma [13]. However, according to another study, age over 65 was a factor that is statistically associated with poor outcomes [14]. Other previous studies had also shown that among patients with severe traumatic brain injury and age 70 years, the majority of them suffered from deaths or severe sequelae [15, 16]; however, in multivariate analysis, advanced age was not an independent predictor of outcome [17-19]. The authors suggest that there might be a relationship between poor outcomes and advanced age, but it did not seem to be possible to accurately predict death based on advanced age with certainty.

The results of our study showed that the combined pathological characteristics were related to the treatment outcomes. In univariate analysis, patients with two or more chronic diseases had a higher likelihood of having severe progression, the difference between statistically significant differences with $p = 0.009$. Patients had lower average consciousness score (GCS) at admission ($p = 0.00$), hemiplegia ($p = 0.00$), or level of alertness ($p=0.00$). However, in multivariate analysis, only alertness level was an independent factor associated with poor outcomes. It could be explained by the clinical and cognitive characteristics of 107 patients. Most of the patients (85%) when admitted to the hospital had mild symptoms and mainly received internal medical treatment; thus, the rate of successful treatment was high (78.5%). According to a study by Kenechukwu K (2021), the GCS score on admission was a predictor of the outcome of subdural hematoma treatment. A mortality rate of 44.1% had been reported, with most deaths occurring in patients with severe traumatic brain injury [20].

Our study showed that on computed tomography scans of the brain, patients with severe outcomes had a higher hematoma thickness ($p = 0.048$), displaced midline ($p = 0.00$), and combined traumatic brain injury ($p=0.04$). However, in multivariate analysis, these factors were not independent predictors of treatment outcomes. Our study results were different from a study by Seung Hoon Lee et al., which showed that on the CT scan of the brain, in the poor treatment group, the midline was displaced more ($p < 0.001$) and the hematoma was thicker ($p = 0.001$) [21]. The results of the study by Paul Bajsarowicz et al (2015) showed that during the 4 years, a total of 869 patients with acute subdural hematoma due to trauma were studied, and 646 patients (74.3%) were initially treated conservatively. Good results were achieved in 76.7% of patients. In the end, only 6.5% required surgery due to increased intracranial pressure or progression of a subdural hematoma. Factors associated with poor outcomes included thicker subdural hematoma ($p < 0.001$); larger midline shift ($p < 0.001$); hematoma location ($p=0.001$); alcohol abuse ($p=0.0260$); and fall history ($p= 0.018$). There were no significant differences in age, sex, Glasgow coma scale, injury severity score, abnormal coagulation, use of blood thinners, and presence of cerebral atrophy or physical illness. white (10). According to Cameron Rawanduzy et al (2020), poor consciousness score and midline shift on computed tomography were poor prognostic factors [22].

This study had limitations in the small sample sizes within one hospital. Moreover, we used a cross-sectional design with a convenient sampling method for recruiting patients. Further longitudinal studies with larger sample sizes should be conducted to evaluate the causal relationships between treatment outcomes and other potential predictors. Several variables or potential confounders such as body mass index were not included in this study. Other studies with more advanced regression models such as Poisson regression/Structural Equation Modeling should be performed to evaluate the factors associated with the treatment outcomes.

Conclusion

Acute subdural hematoma is a critical condition among patients with traumatic brain injuries. The independent factor associated with poor outcomes in elderly patients with traumatic subdural hematoma is poor alertness level during treatment.

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Conflict of Interest Disclosures

There is no conflict of interest.

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Authors' Contributions

Conceptual design: VMH, DVA, NTD.
Data collection: DNN, NMC, NMD
Data analysis: VMH, DVA, PDT
Manuscript preparation and revision: All authors

Ethical considerations

The study was approved by the ethics committee of the Thai Binh University of Medicine and Pharmacy (Code: 503 QD/YTB).

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