

# Clinical Features of Interhemispheric Subdural Hematomas

Jae-Min Ahn, Kyeong-Seok Lee, Jae-Hyun Shim, Jae-Sang Oh, Jai-Joon Shim, and Seok-Mann Yoon

Department of Neurosurgery, Soonchunhyang University Cheonan Hospital, Cheonan, Korea

**Objective:** Interhemispheric subdural hematoma (IHSDH) is uncommon, because of their unusual location. However, it is a distinct lesion with its unique characteristics. We investigated clinical features and outcomes of consecutive 42 patients with IHSDH, retrospectively.

**Methods:** From 2006 to 2015, we treated 105 patients with IHSDH. All patients were diagnosed by computed tomography (CT) or magnetic resonance imaging. We selected 42 patients with thick (3 mm or more) IHSDH. We retrospectively reviewed the clinical and radiological findings, management and outcomes.

**Results:** The male to female ratio was 2:1. Two thirds of the patients were over 60 years old. Slip or fall was the most common cause of trauma. The level of consciousness on admission was Glasgow Coma Scale (GCS) 13 to 15 in 25 patients. The most common symptom was headache. All IHSDH was hyperdense in CT at the time of diagnosis. IHSDH frequently accompanied convexity subdural hematoma. The outcome was favorable in 27 patients, however, six patients were expired. Twenty-two patients were managed conservatively. Surgery was performed in ten patients to remove the concurrent lesion. The outcome was poor in spontaneous one, patients with low GCS, and patients with conservative treatment.

**Conclusion:** IHSDH is rare especially the isolated one. The outcome was dependent to the severity of injury. Surgery may be helpful to remove the concurrent mass lesion, however, conservative treatment is generally preferred.

(Korean J Neurotrauma 2017;13(2):103-107)

**KEY WORDS:** Craniocerebral trauma · Glasgow outcome scale · Hematoma, subdural · Symptom assessment.

## Introduction

Interhemispheric subdural hematoma (IHSDH) is an uncommon type of subdural hematoma (SDH) because of their unusual location.<sup>10,12)</sup> It accounts for approximately 6% of all traumatic SDH, or 0.8% of all hospitalized patients after head trauma.<sup>13,14)</sup> Till 1995, less than 70 cases were reported in the literature.<sup>2)</sup> Although the IHSDH is

uncommon, it is a distinct lesion with its unique characteristics. We have treated consecutive 42 patients with IHSDH, and retrospectively investigated their clinical features and outcomes.

## Materials and Methods

From January 2006 to December 2015, we treated 105 patients with IHSDH. All patients were diagnosed by computed tomography (CT) or magnetic resonance imaging. We excluded 63 patients since thickness of the hematoma were less than 3 mm or difficult to differentiate from interhemispheric (IH) subarachnoid hemorrhages. Thickness was measured at the thickest part of the hematoma. This study focused on 42 patients with thick (3 mm or more) IHSDH. We retrospectively reviewed the clinical and radiological findings, associated medical history, management and outcomes. The level of consciousness and outcome were assessed by the Glasgow Coma Scale (GCS) score at admission and the Glasgow Outcome Scale (GOS) score at

**Received:** May 31, 2017 / **Revised:** August 2, 2017

**Accepted:** September 8, 2017

**Address for correspondence:** Kyeong-Seok Lee  
Department of Neurosurgery, Soonchunhyang University Cheonan Hospital, 31 Suncheonhyang 6-gil, Dongnam-gu, Cheonan 31151, Korea

Tel: +82-41-570-3652, Fax: +82-41-572-9297

E-mail: ksleens@sch.ac.kr

This research was supported by the Soonchunhyang University Research Fund.

© This is an Open Access article distributed under the terms of Creative Attributions Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted noncommercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

final follow-up. We defined heavy alcoholics as who drank more than one bottle every day. Average follow-up period was 910 days (range, 12–2,555 days) except six expired cases. We classified GOS scores into favorable (good recovery and moderate disability) or poor outcomes (severe disability, vegetative state, or death) for statistical analysis. Statistical analyses were performed by the multivariate logistic regression analysis. A  $p < 0.05$  was considered statistically significant.

## Results

Table 1 showed a baseline characteristics of patients. Two thirds of the patients were over 60 years old. The ratio of male to female was 2:1. Slip or fall was the most common cause of trauma. In eight patients, IHSDH was developed without trauma. Coagulopathy was found in five of them. In two patients, spontaneous cerebral hemorrhage leaking into the hemispheric fissure result IHSDH (Figure 1). Acute IHSDH occurred on the convexity chronic SDH in one patient (Figure 2). The level of consciousness on admission

was GCS 13 to 15 in 25 patients. The most common symptom was headache. So-called falx syndrome was noticed in only two patients.

All IHSDH was hyperdense on CT at the time of diagnosis. IHSDH was located anterior part of the falx in 17 patients, posterior part in 12 patients, and whole falx in 11 patients (Table 2). IHSDH frequently accompanied other lesions. Convexity SDH was the most frequently concurrent lesion. Isolated IHSDH was found in only 4 patients. Overall six patients were expired. The outcome was favorable in 27 patients (Table 3). Twenty-two patients were managed conservatively. Decompressive craniectomy (5 cases) and craniotomy (1 case) were performed to remove the concurrent lesion, usually convexity SDH. In four patients, delayed burr hole was sufficient to remove the liquefied convexity subacute or chronic SDH. The patients with favorable outcome were more frequently observed in good initial neurologic status (GCS > 13), traumatic cause and surgical treatment, but according to multivariate logistic regression analysis, there were no factors that influence to poor outcome in patients with IHSDH.

**TABLE 1.** Baseline characteristics of patients with interhemispheric subdural hematoma

Items	Good	Poor	Total	p-value
Sex				0.384
Male	20 (74.1%)	8 (53.3%)	28	
Female	7 (25.9%)	7 (46.7%)	14	
Age (years)				0.733
≤60	10 (37.0%)	4 (26.7%)	14	
>60	17 (63.0%)	11 (73.3%)	28	
Cause				0.074
Trauma	24 (88.9%)	10 (66.7%)	34	
Spontaneous	3 (11.1%)	5 (33.3%)	8	
GCS				0.005
≤8	4 (14.8%)	6 (40.0%)	10	
9–12	5 (18.5%)	2 (13.3%)	7	
13–15	18 (66.7%)	7 (46.7%)	25	
Thickness				0.172
3–5	8 (29.6%)	4 (26.7%)	12	
5–7	10 (37.0%)	2 (13.3%)	12	
7–9	9 (33.3%)	9 (60.0%)	18	
Medical history				
HTN	14 (51.9%)	7 (46.7%)	21	0.929
DM	8 (29.6%)	3 (20.0%)	11	0.282
Antiplatelet drug	4 (14.8%)	3 (20.0%)	7	0.480
Alcoholics	6 (22.2%)	5 (33.3%)	11	0.358
Treatment				0.026
Conservative treatment	22 (81.5%)	10 (66.7%)	32	
Surgery	5 (18.5%)	5 (33.3%)	10	

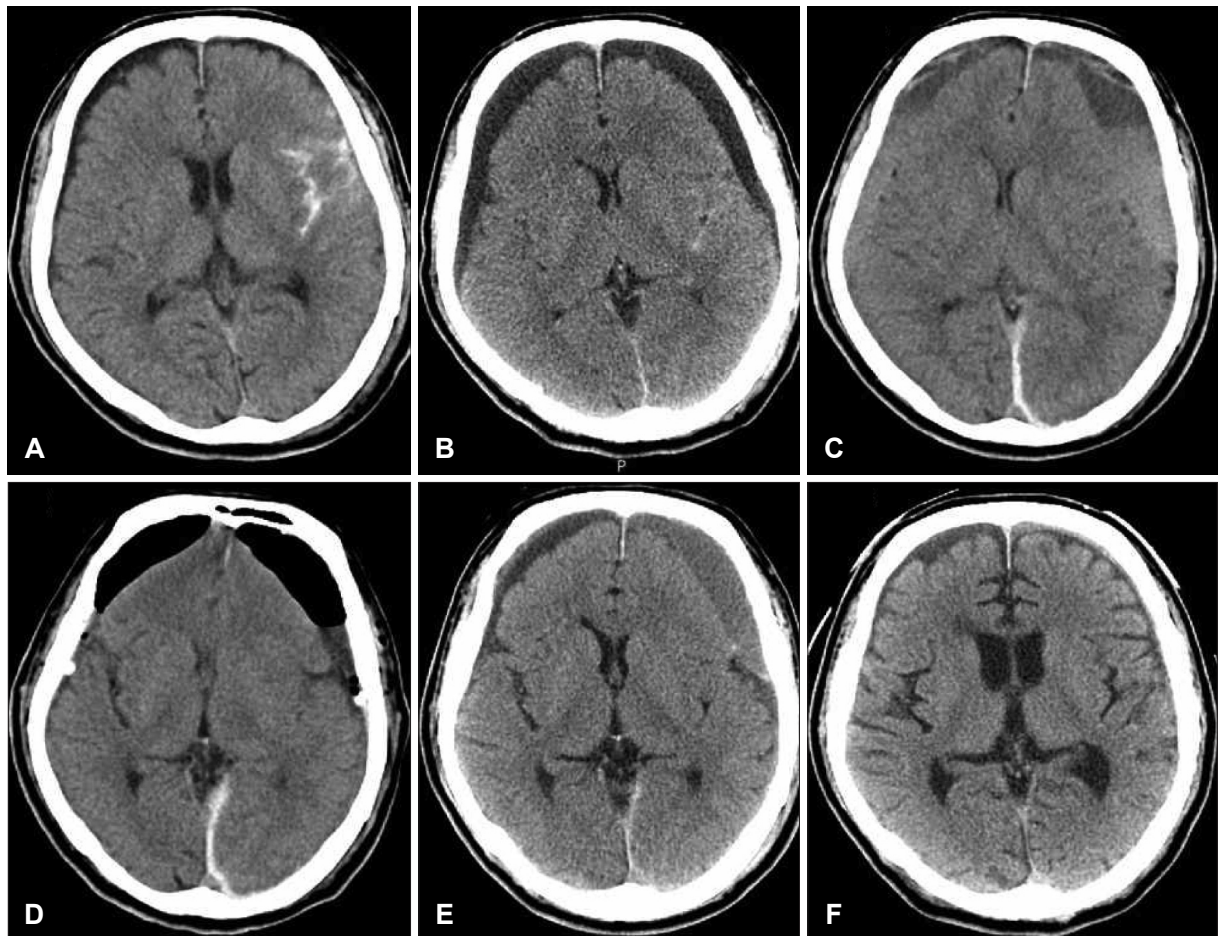
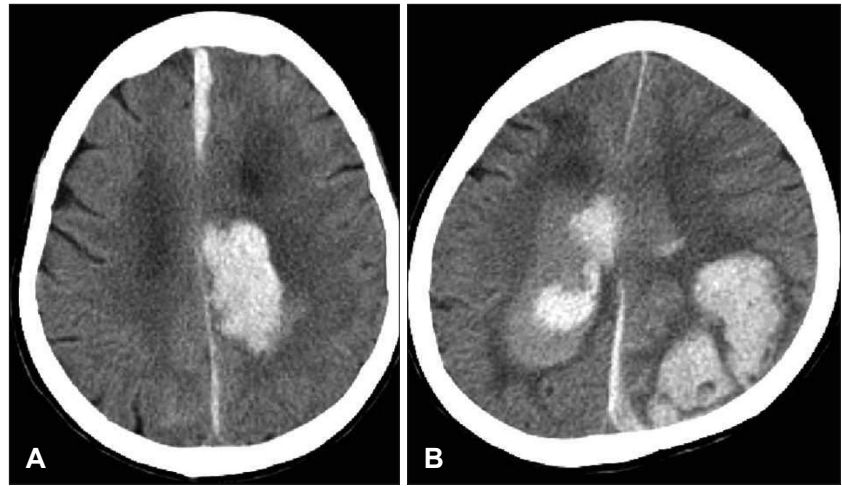
GCS: Glasgow Coma Scale, HTN: hypertension, DM: diabetes mellitus

## Discussion

During 10 year period, we could find 42 patients with

thick IHSDH. Prior to 1974, there were only 10 cases reported in the literature. With the advent of CT scans, the number of reported cases has increased.<sup>2,6)</sup> However, it is

**FIGURE 1.** Computed tomography scans of interhemispheric subdural hematoma result from leaking of the spontaneous cerebral hemorrhage in (A) 74 years old female and (B) 85 years old female patient with hypertension.



**FIGURE 2.** (A) Computed tomography scans of acute interhemispheric subdural hematoma (IHSDH) on bilateral chronic subdural hematomas (SDHs) in a 77 years old male patient. He suffered from spontaneous subarachnoid hemorrhage on October 12, 2013. (B) By bilateral subdural hygromas on October 15, 2013, (C) IHSDH was developed over bilateral chronic SDHs on November 18, 2013. (D) IHSDH was remained after bilateral burr holes on November 18, 2013. (E) IHSDH was spontaneously resolved on December 6, 2013. (F) Bilateral convexity SDHs were also resolved without an additional operation on November 21, 2014.

**TABLE 2.** Radiologic features of interhemispheric subdural hematomas

Items	Male	Female	Total
Comb. L			
Isolated	2	2	4
With SDH	12	3	15
With ICH	5	8	13
With Other*	9	1	10
Thickness (mm)			
3–5	8	4	12
5–7	6	6	12
>7	14	4	18
Site			
Anterior	12	5	17
Posterior	7	7	12
Whole	9	2	11

\*Include subarachnoid hemorrhage, ventricular hemorrhage, and pneumocephalus. Comb. L: combined lesion, SDH: subdural hematoma, ICH: intracerebral hemorrhage

**TABLE 3.** Factors that influence to poor outcome in patients with interhemispheric subdural hematoma according to multivariate logistic regression analysis

	OR (95% CI)	p-value
Sex (Male)	3.669 (0.736–18.287)	0.113
Age (>60)	1.346 (0.125–14.478)	0.806
HTN	0.520 (0.108–2.496)	0.414
DM	0.674 (0.093–4.882)	0.697
Alcoholics	3.000 (0.639–14.079)	0.164
Antiplatelet drug	1.016 (0.109–9.460)	0.989
Spontaneous cause	4.000 (0.799–20.017)	0.092
Low initial GCS (<13)	2.465 (0.587–10.359)	0.218
Conservative treatment	0.516 (0.089–2.975)	0.459

HTN: hypertension, DM: diabetes mellitus, GCS: Glasgow Coma Scale, OR: odds ratio, CI: confidence interval

still rare, especially the isolated one. About 150 cases with ISH were reported in the literature up till 2005.<sup>1)</sup>

IHSDH occurred more common in the aged, over 60 years old. The ratio of male to female was 2:1. Slip or fall was the most common cause of trauma. The most common cause of this lesion is trauma, especially over the occipital region, accounting for 80% to 90% of cases.<sup>10,11,14)</sup> As the pathogenic mechanism of posttraumatic IHSDH, tearing of the parasagittal bridging veins were proposed by some authors,<sup>2,5,7)</sup> however, the origin of this hematoma actually identified by surgery was veins in the IH fissure, branches of pericallosal artery or brain laceration in the IH fissure.<sup>16)</sup>

In eight cases of spontaneous IHSDH, we could find out coagulopathy in five. Aneurysms, coagulopathies were considered as risk factors of IHSDH.<sup>2,11)</sup> In addition, hypertensive cerebral hemorrhage or convexity chronic SDH may

cause spontaneous IHSDH. The GCS on admission was 13 to 15 in more than a half of the cases. The most common symptom was headache. Falx syndrome may be present in 6% to 30% of patients with IHSDH,<sup>6,14)</sup> however, it may depend on the size of hematoma or combined intracranial lesions.<sup>14)</sup>

All IHSDH was acute at the time of diagnosis. Chronic IHSDH is extremely rare being 0.4% of chronic SDH.<sup>9)</sup> Till 2010, only 13 cases were reported in the literature.<sup>8)</sup> They usually result from acute IHSDH.<sup>4)</sup> IHSDH may be more common in the posterior part of the falx due to the gravity, however, thick (3 mm or more) IHSDH was more common in the anterior part in this study. It may be related to the frequency of concurrent lesions. IHSDH frequently accompanied convexity SDHs, which might extend to the anterior part of the falx. Convexity SDH was the most common concurrent lesion in a series of traumatic IHSDH.<sup>14)</sup>

Overall mortality rate was 14%. The outcome was favorable in 64%. There were two different prospects on the outcome of IHSDH. IHSDH is associated with high mortality rate around 25%, like a traumatic acute SDH.<sup>2,6,7,14)</sup> Contrary to this view, it may be considered as a benign variant of acute SDH.<sup>15)</sup> This view may be related to the fact that the IHSDH does not directly correlate with the increase of intracranial pressure (ICP),<sup>17)</sup> and most IHSDH could be treated conservatively.<sup>14)</sup> The outcome was poor in spontaneous one, patients with low GCS, and patients with conservative treatment in this study. Spontaneous IHSDH was usually associated with coagulopathy. According to multivariate logistic regression analysis, there were no factors that influence to poor outcome in patients with IHSDH. Although surgery was performed to remove the combined lesions in 24%, the IHSDH itself was not the target for surgical removal in this study. Although some recommended surgical treatment,<sup>3)</sup> the mortality rate of conservative management was lower than that of surgery (10.5% and 31.7%, respectively).<sup>2)</sup> In 50 cases of IHSDH and tentorial SDH, the hematoma was resolved within two weeks in 80%.<sup>18)</sup> However, surgery may be helpful if: 1) progression of the clinical symptoms and signs especially exacerbation of lower extremity weakness, occurs; 2) paralysis of both lower extremities is present; 3) there is persistent increased ICP (>30 mmHg); and 4) the hematoma volume is >40 mL and/or the hematoma thickness is >15 mm (16). Otherwise, conservative treatment is generally preferred. Although the outcome was poor in patients with conservative treatment in this study, it did not mean surgical treatment was better than conservative one, since we managed conservatively all cases of IHSDH.



## Conclusion

IHSDH is rare especially the isolated one. The most common cause is trauma. Coagulopathy may cause spontaneous IHSDH. Surgery may be helpful to remove the concurrent mass lesion, however, conservative treatment is generally preferred. The exact risk factors for poor outcome of IHSDH are still unknown, more studies are needed.

■ The authors have no financial conflicts of interest.

## REFERENCES

- 1) Alemdar M, Selekler HM, Efendi H. A non-traumatic interhemispheric subdural haematoma: presented with headache as the sole complaint. *J Headache Pain* 6:48-50, 2005
- 2) Bartels RH, Verhagen WI, Prick MJ, Dalman JE. Interhemispheric subdural hematoma in adults: case reports and a review of the literature. *Neurosurgery* 36:1210-1214, 1995
- 3) Glista GG, Reichman OH, Brumlik J, Fine M. Interhemispheric subdural hematoma. *Surg Neurol* 10:119-122, 1978
- 4) Lee KJ, Koh EJ, Choi HY. Interhemispheric chronic subdural hematoma showing falx syndrome: Case report. *J Korean Neurosurg Soc* 32:268-271, 2002
- 5) Lee M, Kim MS, Yoon SW. Interhemispheric subdural hematoma presenting with falx syndrome after trauma. *J Korean Neurotraumatol Soc* 6:158-161, 2010
- 6) Psaltis A, Lath R, McDonald M. Acute interhemispheric subdural haematoma. *J Clin Neurosci* 11:546-548, 2004
- 7) Rapana A, Lamaida E, Pizza V, Lepore P, Caputi F, Graziussi G. Inter-hemispheric scissure, a rare location for a traumatic subdural hematoma, case report and review of the literature. *Clin Neurol Neurosurg* 99:124-129, 1997
- 8) Requejo PR, Vaitzman RP, Paiva MS, Machado AL, Barroso MV, Salame JM, et al. Interhemispheric chronic subdural haematoma: case report and brief review of the literature. *Brain Inj* 24:1039-1043, 2010
- 9) Sambasivan M. An overview of chronic subdural hematoma: experience with 2300 cases. *Surg Neurol* 47:418-422, 1997
- 10) Shankar A, Joseph M, Chandy MJ. Interhemispheric subdural hematoma: an uncommon sequel of trauma. *Neurol India* 51:63-64, 2003
- 11) Shea YF, Li LF, Leung GKK, Chu LW. An uncommon complication of a fall in the elderly: Interhemispheric subdural hematoma. *J Clin Gerontol Geriatr* 4:93-95, 2013
- 12) Sogut O, Yigit M, Turkdogan KA, Yigit E, Gulen B, Sonmez E, et al. Interhemispheric acute subdural hematoma: A distinct entity of subdural hematoma. *J Clin Med Res* 8:178-179, 2016
- 13) Takeda N, Kurihara E, Matsuoka H, Kose S, Tamaki N, Matsuoto S. Three cases of acute interhemispheric subdural hematoma. *No Shinkei Geka* 16:87-92, 1988
- 14) Takeuchi S, Takasato Y, Masaoka H, Hayakawa T, Yatsushige H, Sugawara T. Traumatic interhemispheric subdural haematoma: Study of 35 cases. *J Clin Neurosci* 17:1527-1529, 2010
- 15) Wajima D, Yokota H, Ida Y, Nakase H. Spinal subdural hematoma associated with traumatic intracranial interhemispheric subdural hematoma. *Neurol Med Chir (Tokyo)* 52:636-639, 2012
- 16) Wang Y, Wang C, Cai S, Dong J, Yang L, Chen L, et al. Surgical management of traumatic interhemispheric subdural hematoma. *Turk Neurosurg* 24:228-233, 2014
- 17) Wu C, Liu Y, Yang C. Unusual cause of interhemispheric subdural hematoma: A case report. *Neurosurg Q* 25:436-438, 2015
- 18) Yoo JS, Hu C, Hong SK, Kim HJ, Han YP. Clinical analysis of interhemispheric subdural hemorrhage and tentorial hemorrhage. *J Korean Neurosurg Soc* 20:13-19, 1991