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Chronic Subdural Hematoma in Young Adult: An Age Comparison Study

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Objective: Incidence of chronic subdural hematoma (CSDH) is gradually increasing in young adults for several reasons. In this study, we aimed to identify features of CSDH noted in young adults that distinguish the disease from CSDH diagnosed in the elderly.

Methods: One hundred eighty-two patients with CSDH who underwent a total of 218 surgical procedures between January 2003 and February 2010 were retrospectively reviewed with regard to clinical presentation, radiographic results and prognosis including recurrence. To compare younger patients with the elderly, patients were divided into three groups on the basis of age (Group A: ≤40, Group B: 41−64, Group C: ≥65 years).

Results: Group A showed a male predominance (p=0.0001), lower rate of recurrence (p=0.0012), shorter symptom duration (p=0.035), and fewer leading signs such as hemispheric symptoms (p=0.005) compared to Groups B and C. Radiologic findings such as maximal hematoma thickness (p<0.0001) and degree of midline shift (p=0.028) were less severe in Group A than Groups B and C. Alcoholism was the most prevalent illness in all three groups. When exempting infants with hematologic malignancy, non-recurrence, previous trauma history, headache as leading symptom, and no mortality were all common in younger adults (all p<0.05).

Conclusion: Young adults with CSDH show less severe clinical and radiologic features as well as fewer recurrences than noted in the elderly population. Even if a clinician's index of suspicion of CSDH in young adults complaining of headache is not high, meticulous radiologic surveillance could find CSDH, leading to satisfactory results including less frequent recurrence.

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KEY WORDS: Chronic subdural hematoma · Young adult · Recurrence.

Introduction

Chronic subdural hematoma (CSDH), a common neurosurgical illness with a self-limited course, is a disease of the elderly. Incidence of CSDH has been increasing in younger patients as a result of several clinical trends that increase bleeding risk including increased use of anticoagulant therapy and, hemodialysis, and longer survival with systemic hematologic disease.[5)] Despite the benign nature of CSDH, re-accumulation of hematoma is still a matter of concern, and disease progression can be fatal without timely surgical intervention. Nevertheless, early diagnosis and proper treatment result in complete recovery in most cases.

CSDH is more likely to be missed in young adults because lower incidence in this patient population decreases clinical suspicion. Clinicians infrequently recommend imaging studies in patients younger than 40. Clinical presentation and radiologic findings of CSDH differ among patients in different age group. Until recently, most CSDH research has focused on treatment, frequency of recurrence and pathophysiology.

Several studies reported the difference of clinical presentation and result of CSDH according to age.[3,7,12)] In our study, we divided the patients to three groups for precise comparison and work up of tendency between different age (Group A: ≤40, Group B: 41−64, Group C: ≥65 years).

In this study, we aimed to identify characteristics of CSDH more prevalent in young adults compared to older adults.

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This effort might shed light on the diagnosis of CSDH and broaden differential diagnosis in young adults to include CSDH where appropriate.

Materials and Methods

Between January 2003 and February 2010, 187 patients with CSDH received surgical treatment at our institute. Of these, a total of 218 surgical procedures were performed including recurrent cases during the study period, and five patients were lost to follow-up. In all, 182 patients enrolled in the study. After gaining approval from the institutional review board at our hospital, medical records and radiographic findings were reviewed retrospectively. Demographic factors, symptom onset, head trauma history, and underlying disease data were retrieved. All patients underwent preoperative computed tomography (CT) with or without contrast enhancement. Maximum thickness of subdural hematoma and midline shifting length was measured. CSDH was classified into the following subtypes: 1) hypodense, 2) iso- or hyperdense, and 3) mixed density.

Mostly, surgical procedures were performed under general anesthesia, but elderly patients with poor medical baseline often underwent surgery with local anesthesia and light sedation. The diameter of the drainage catheter was 10.5 millimeters (mm), and the distal catheter tip was placed at the thickest part of the hematoma. The closed drainage system was left in place about 24−48 hours until successful drainage is confirmed by follow-up CT scan.

We divided the patients into three groups according to age at initial presentation in order to compare clinical symptoms and characters of CSDH. Patients less than 40 years old were assigned to Group A, those between 41 to 64 were assigned to Group B, and patients over 65 were placed in Group C. Comparisons were made among three groups with regard to sex, recurrence rate, onset duration, prior head trauma history, maximal thickness (cm) of hematoma on axial scan, midline shift (mm) on axial scan, subtype of CSDH based on density of hematoma on radiographic imaging, leading symptoms, premorbid disease and mortality.

Qualitative variables were compared using the Fisher's exact test to compare between the younger age (Group A) and older age groups (Groups B and C), as well as to compare among the three groups. The Kruskal-Wallis test was used to evaluate the variance among the three groups. Analysis was performed using commercially available statistical software, SPSS 13.0 (SPSS Inc., Chicago, IL, USA). Statistical significance was set at $p<0.05$.

Results

Overall results

Overall, there was a male predominance (148 patients, 81.3%). Thirty-four patients (17%) underwent one or more surgeries due to recurrence. Mean elapsed time from symptom onset to operation was 28.8±8.3 days, and previous trauma history was noted in 165 patients (91.7%). Mean maximal thickness of hematoma on axial scan and midline shift on axial scan were 3.3±1.8 cm and 11.4±4.8 mm, respectively. The most frequent leading symptom was headache (67.6%), and the most common premorbid condition was alcoholism (39.6%). Overall mortality rate was 2.1% (4 patients), including one patient with leukemia (Group A), one with aspiration pneumonia (Group B), one with a cerebral infarct, and one with acute subdural hematoma (Group C).

On initial presentation, all 182 patients underwent one-burr hole drainage. Of these, 31 patients (17%) suffered recurrence requiring re-operation. For recurrent cases, 24 patients received repeat one-burr hole drainage, five patients had two-burr hole drainage and one underwent open craniotomy. In two patients with second recurrences, one patient underwent two-burr hole drainage, and one underwent open craniotomy.

Comparison among the three groups

Female gender was far less frequent in all three groups, and a statistically significant difference was noted among the groups ($p=0.0001$ for Group A vs. Groups B and C; $p=0.0038$ for Group A vs. Group B vs. Group C). Recurrence rate was statistically higher ($p=0.0012$) in the middle and older groups (Group B 16.7%, Group C 18.8%) than in the younger group (Group A 6.7%). Symptom onset to operation time was shorter in the younger age group than in the middle and older groups ($p=0.035$ for Group A vs. Groups B and C). Elderly patients, as previously discussed, were more likely to present many hours after symptom onset. Mean maximal thickness of hematoma on axial scan was statistically thinner in younger patients ($p<0.0001$ for Group A vs. Groups B and C; $p=0.0025$ for Group A vs. Group B vs. Group C). Mean midline shift length on axial scan was significantly longer in the older age group than the middle and young age group ($p=0.028$ for Group A vs. Groups B and C; $p=0.042$ for Group A vs. Group B vs. Group C). Density of subdural hematoma is divided to three types and the results could not identify the difference between the groups (low dense/iso- or high dense/mixed dense; 60−86−36).

The most common leading symptom was headache in all three groups, but hemispheric symptoms such as hemipare-

sis, hemiparesthesia, dysphasia and mental status change tended to be more frequent in older age (p=0.005 for Group A vs. Groups B and C). The most common premorbid disease was alcoholism in all three groups (Table 1). Many patients had numerous premorbid disease especially in older age group and the statistical evaluation between the condition was not possible between the group.

Comparison among the three groups after excluding hematologic malignancy in children

Four patients with hematologic malignancy were detected in young age (Group A), and all of them were less than 10 years of age. These four patients were excluded to achieve a more precise comparison between younger and older adults. These excluded patients showed the following characteristics: exclusive male predominance, prior head trauma history, no recurrence, no hemispheric symptoms (Table 2).

Discussion

CSDH is principally a disease of the elderly in whom physiologic brain atrophy, frequent head trauma and several coagulopathic diseases are present.[8,9] Current trends including liberal use of anti-platelets and anticoagulants, as well as longer life span due to well-controlled medical diseases such as liver cirrhosis, hematologic malignancy and alcoholism yield higher prevalence of CSDH, especially in young patients.

Brain atrophy

This study highlights several clinical and radiologic differences between younger and older patients with CSDH. In this study, older patients had more conspicuous radiologic findings than younger patients. Maximal thickness of hematoma and midline shifting were more severe and led to more frequent hemispheric symptoms such as hemiparesis and mental status change. All these results may be attributed to pre-existing atrophied brain in the elderly patients.

Brain weight decreases as age progresses, and space between the brain parenchyma and the skull increases from 6% to 11% of the total intracranial space.[14] Brain atrophy causes enlargement of subarachnoid space, stretching of the bridging veins, tearing of the arachnoid membrane and leaking of bloody cerebrospinal fluid, especially after trauma.[6] Subsequently, late detection can lead to more severe neurologic deficits in older age. Elderly patients with dementia and slow progressive neuronal disease seldom visit hospitals early in the course of the disease because of indefinite symptom progression.[12] Therefore, symptom-onset to operation time may be prolonged in older ages. This study revealed a tendency toward increasing symptom-onset to operation time as age progress (p=0.035).

Several studies revealed that excessive alcohol consumption leads to brain atrophy.[1,10] A history of alcoholism has been identified in up to half of CSDH cases.[4] In our study, alcoholism was the leading premorbid condition in all three groups. Older patients (Group C) suffered with alcoholism more frequently (48.5%) than younger patients (Group A: 33.3%), but this result did not reach statistical significance (p>0.05). Frequent head trauma, presence of brain atrophy and associated medical conditions such as liver cirrhosis and coagulopathy could increase both associated morbidity and recurrence of CSDH.

Recurrence

In the current study, recurrence rate was significantly higher in the older group than in the younger group (Group A: 6.7% vs. Groups B and C: 16.7−18.8%). A larger subdural space and decreased brain elasticity lead to higher recurrence rate and requirements for re-operation including in older patients. In Group A, only one patient showed recurrence. Notably, this patient had been diagnosed with hematologic malignancy. We concluded that younger adults do not suffer frequent recurrence because of rapid brain expansion which can sufficiently obliterate the space between the brain parenchyma and skull bone after appropriate surgical drainage.[11]

Characteristics of younger patients with chronic subdural hematoma

Younger CSDH patients had more promotive factors such as arachnoid cyst, implantation of cerebrospinal fluid shunt, secondary cerebral atrophy and coagulopathy than older patients.[15] The present study showed that 13 patients (86.7%) in Group A had premorbid disease or low intracranial pressure that resulted from ventriculo-peritoneal shunt, bleeding tendency, and cerebral atrophy. All these conditions explain lower intracranial volume and pressure, with resultant space for potential accumulation of blood.

Recent research confirms that younger CSDH patients demonstrate greater prevalence of alcoholism and bleeding tendency than those older than 75 years.[2,7] According to Fogelholm et al.[3] older CSDH patients tend to show more hemiparesis and mental deterioration, whereas younger patients are more likely to complain of headache and demonstrate papilledema on physical examination. Elderly patients can endure a larger volume of hematoma collecting in the subdural space before experiencing clinical manifestation. Spallone et al.[13] described that etiologic trauma was consequently not

TABLE 1. Comparison of clinical presentations and radiologic findings in patients with chronic subdural hematoma according to age

Age	≤40 (A)	41−64 (B)	≥65 (C)	Total	*p*-value (A vs. B+C)*	*p*-value (A vs. B vs. C)**
Total patients	15	66	101	182		
Female sex (%)	1 (6.7%)	15 (22.7%)	18 (17.8%)	34 (18.7%)	0.0001	0.0038
Recurrence (%)	1 (6.7%)	11 (16.7%)	19 (18.8%)	31 (17%)	0.0012	0.0012
Symptom onset (day)	20.5±4.6	28.2±7.7	30.4±6.8	28.8±8.3	0.035	0.055
Trauma history (%)	13 (87%)	62 (94%)	90 (89.1%)	165 (91.7%)	0.863	0.652
Maximal thickness (cm)	1.4±0.3 (0.9−3.3)	3.2±1.1 (1.8−4.8)	3.6±0.5 (2.0−5.4)	3.3±1.8 (0.9−5.4)	<0.0001	0.0025
Midline shift (mm)	8.3±2.9 (5.3−14.2)	10.5±4.1 (7.2−17.5)	12.4±3.5 (6.8−18.5)	11.4±4.8 (5.3−18.5)	0.028	0.042
Density (CT) low/high (iso)/mixed	4−8−3	22−29−15	34−49−18	60−86−36	0.350	0.284
Leading symptom (n)	Headache (12)	Headache (38)	Headache (73)	123 (67.6%)	0.265	0.371
	Hemispheric Sx. (1)	Hemispheric Sx. (8)	Hemispheric Sx. (19)	28 (15.4%)	0.005	0.017
	Vomiting (2)	Nausea/Vomiting (15)	Seizure (2)			
Premorbid disease (n)	Alcoholism (5)	Alcoholism (18)	Alcoholism (49)	72 (39.6%)	0.628	0.836
	Liver Dz. (4)	Liver Dz. (13)	Liver Dz. (16)	33 (18.1%)		
	Hematologic Dz. (3)	Hematologic Dz. (4)	Hematologic Dz. (4)			
	Medication (1)	Medication (8)	Medication (12)			
	VP shunt (2)	VP shunt (2)	VP shunt (3)			
Death	Leukemia (1)	Aspiration pneumonia (1)	Cerebral infarct (1) Acute SDH (1)	4 (2.1%)	0.920	0.583

*Fisher's exact test, **Kruskal-Wallis test, statistically significant if $p<0.05$. CT: computed tomography, VP shunt: ventricoperitoneal shunt, Sx: symptom, Dz: disease, SDH: subdural hematoma

TABLE 2. Comparison of clinical features of chronic subdural hematoma patients, excluding four patients younger than 10 and with hematologic malignancy

Age	≤40 (A)	41−64 (B)	≥65 (C)	Total	*p*-value (A vs. B+C)*	*p*-value (A vs. B vs. C)**
Total patients	11	66	101	178		
Female sex (%)	0 (0%)	15 (22.7%)	18 (17.8%)	33 (18.5%)	0	0
Recurrence (%)	0 (0%)	11 (16.7%)	19 (18.8%)	30 (16.9%)	0	0
Symptom onset (day)	18.9±3.3	28.2±7.7	30.4±6.8	28.5±4.1	0.002	0.041
Trauma history (%)	11 (100%)	62 (94%)	90 (89.1%)	163 (91.6%)	0	0
Maximal thickness (cm)	1.5±0.8 (1.1−3.3)	3.2±1.1 (1.8−4.8)	3.6±0.5 (2.0−5.4)	3.3±5.8	0.0001	0.0001
Midline shift (mm)	8.1±0.9 (6.2−14.2)	10.5±4.1 (7.2−17.5)	12.4±3.5 (6.8−18.5)	11.4±2.5	0.001	0.015
Density (CT) low/high (iso)/mixed	4−6−1	22−29−15	34−49−18	60−84−34	0.481	0.347
Leading symptom (n)	Headache (11)	Headache (38)	Headache (73)	122 (68.5%)	0.257	0.382
	Hemispheric Sx. (0)	Hemispheric Sx. (8)	Hemispheric Sx. (19)	27 (15.2%)	0	0
		Nausea/Vomiting (15)	Seizure (2)			
Premorbid disease (n)	Alcoholism (5)	Alcoholism (18)	Alcoholism (49)	72 (40.4%)	0.571	0.803
	Liver disease (2)	Liver disease (13)	Liver disease (16)	31 (17.4%)	0.351	0.829
	Drug (1)	Hematologic Dz. (4)	Hematologic Dz. (4)			
	VP shunt (1)	Drug (8)	Drug (12)			
		VP shunt (2)	VP shunt (3)			
Death	(0)	Aspiration pneumonia (1)	Cerebral infarct (1) Acute SDH (1)	3 (1.7%)	0	0

*Fisher's exact test, **Kruskal-Wallis test, statistically significant if $p<0.05$. CT: computed tomography, VP shunt: ventricoperitoneal shunt, Sx: symptom, Dz: disease, SDH: subdural hematoma

as severe in elderly patients. Notably, insignificant prior trauma and declining capacity for memory retrieval seem to result in indefinite involvement of head injury in the elderly.

Conclusion

In our study, younger CSDH patients had shorter symptom duration before seeking clinical attention and lower recurrence rates than older patients. Preoperative radiologic findings such as maximal thickness of CSDH and subsequent midline shift on axial CT were also less severe in younger adults. Because symptoms were usually mild in adults younger than 40 years, drawing a clinical diagnosis of CSDH is only possible when clinicians keep a broad differential, which includes CSDH. Once identified and treated appropriately, the outcome in younger adults is reassuring with practically no recurrence, no mortality.

■ The authors have no financial conflicts of interest.

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