

Trauma Mechanisms and Surgical Outcomes in the Elderly Patient with Chronic Subdural Hematoma



Jimmy Sundblom, MD, PhD¹, Elisabeth Sandberg, MD^{1,2}, Elisabeth Ronne-Engström MD, PhD¹

¹Department of Medical Sciences, Section of Neurosurgery, Uppsala University Hospital, Uppsala;

²Department of Radiology, Karolinska University Hospital, Stockholm, Sweden

<https://doi.org/10.5770/cgj.25.519>

ABSTRACT

Background

Chronic subdural hematoma is the preeminent neurosurgical condition in the older population. This retrospective single-centre study focuses on outcome after surgery of chronic subdural hematoma in patients over 70 years.

Methods

Patients treated at a single neurosurgical referral centre between 2010 and 2014 were screened. Included patients were assessed for comorbid conditions, lifestyle factors, and outcomes including recurrence, mortality, and postoperative complications.

Results

A total of 511 patients (70–97 yrs) were identified. 50.7% of patients were treated with anticoagulants and/or antiplatelet therapy. A known probable cause for the hematoma was found in 68.1% of patient's histories. Mortality rate was 3.1% and recurrence was seen in 49 patients (9.6%). Postoperative complications were more common in patients with excessive use of alcohol (p value = .02). Neurological function was improved in 78.1% of patients after the initial surgery. A strategy of delayed contralateral surgery in bilateral hematomas showed low rates of recurrence.

Conclusion

Fall injuries are the most common underlying trauma mechanism in the elderly with chronic subdural hematoma. Recurrence is not more common in the elderly patient group compared to the general population. Excessive alcohol use is a risk factor for post-operative complications.

Key words: chronic subdural hematoma, fall injuries, surgery, mortality, recurrence

INTRODUCTION

Chronic subdural hematoma (CSDH) is a collection of blood and degraded blood products located between the dura and arachnoid.^(1,2) CSDH occurs more often in the elderly.^(3,4) The yearly incidence of CSDH ranges from 8.2–14/100,000 in the general population^(2,5,6) and is expected to be increasing as a consequence of an aging population.⁽⁴⁾ The cause of CSDH has been explained by head trauma which leads to tearing of the bridging veins.⁽⁷⁾ Subsequent inflammation and neovascularization of hematoma capsule, creating small vessels susceptible further tearing, are also important factors for the development of CSDH.⁽¹⁾

Surgical evacuation of CSDH is one of the most common procedures in neurosurgical practice. Several different types of surgical techniques have been described and are currently used, including twist-drill craniotomy, burr-hole craniostomy with closed drainage system, and craniotomy.^(2,8-10) Non-surgical treatment regimes have been suggested, with medical options such as corticosteroids, atorvastatin, tranexamic acid, and ACE-inhibitors being subjected to trials^(1,11-13) with no clinically relevant effect proven.

Symptoms of CSDH are heterogenous, with the most common ones being paresis, headache, and cognitive deterioration.⁽²⁾ In the elderly, the dominating symptom of CSDH is cognitive impairment.^(14,15) This might lead to delay in diagnosing CSDH, since it may resemble other diseases, such as dementia.

In older patients, functional outcome is poorer after surgical treatment of CSDH compared to younger individuals.⁽¹⁶⁾ One study found that 30% of patients older than 80 years and 40% older than 90 years were not able to be discharged home.⁽¹⁷⁾

Since the majority of patients with CSDH are older, often with multiple chronic illnesses, it is of importance to learn more about this particular group of patients, especially since they are more prone to longer rehabilitation and more complications after surgery.^(5,18) The purpose of this single-centre

study is to look at an older population (70 yrs or older) that has undergone surgery for CSDH, and investigate factors possibly affecting surgical outcome and recurrence such as comorbidity, lifestyle, medication, and surgical/post-operative care.

METHODS

Patient Population

Patients over 70 years of age treated pre- or post-operatively between 2010 and 2014 at the Neurosurgical Intermediary ward (NIMA), which is the standard postoperative care unit at the Neurosurgical Department at Uppsala University Hospital, were screened and those with a diagnosis of CSDH were extracted. Information was obtained from the patient's medical records. CSDH was diagnosed with computed tomography (CT) in all but a few cases that had undergone magnetic resonance imaging for other suspected conditions.

The study was approved by the regional ethics review board in Uppsala, Sweden.

Demographic Information/Data Collection

Data regarding patients' medical history and radiological imaging were extracted from medical records and radiology system. Patient characteristics included were age, sex, time of death, diabetes mellitus, cardiovascular disease, epilepsy, fracture tendency, dementia, stroke, excessive use of alcohol according to the medical records, smoking, social factors, medications including use of anticoagulants, post-operative complications within 30 days, surgical technique, or trauma before CSDH. Markwalder Grading Scale score, a CSDH symptom grading scale ranging from 0 (no symptoms) to 4 (comatose), was used for grading of neurological function (Table 1).⁽¹⁹⁾ To roughly estimate incidence, the number of inhabitants in the catchment area was obtained from Statistics Sweden official website.⁽²⁰⁾

Surgical Treatment for Chronic Subdural Hematoma

The patients underwent evacuation of the hematoma according to the standard at the department with burr-hole surgery and irrigation of the subdural space with saline fluid following a subgaleal active closed drainage for 24 hours. In some cases,

drainage was passive due, for instance, to risk of parenchyma herniation into burr hole in thin hematomas. No initial surgeries were converted to open craniotomy. Post-operative CT was not routinely performed after surgery unless there were bilateral hematomas on the initial scan. Antiplatelet therapy and/or anticoagulants was discontinued at least 48 hours before surgery in cases without impaired consciousness and/or severe hemiparesis. Warfarin was usually reversed with prothrombin complex concentrates and vitamin K.

For bilateral hematomas, the strategy used at the Department was evacuation of the side with the largest hematoma and/or largest mass effect as ascertained by midline shift, followed by a CT within 48 hours (unless neurological deterioration was seen) and subsequent surgery on the contralateral side, if deemed necessary. Concurrent surgery on both sides was reserved for cases where the brain visibly expanded during surgery, suggesting mass effect from the contralateral side.

Recurrence and Complications

Recurrence was defined as occurring in patients undergoing same-side surgery within six months of original operation. Thirty-day mortality was assessed in the medical records. Complications were defined as an adverse health event possibly related to the procedure diagnosed within 30 days.

Statistical Analysis

Data are presented as means \pm standard deviation. Univariate analysis was performed with χ^2 test and Student's *t*-test, for continuous variables. Differences with *p* value $<$.05 were considered statistically significant.

RESULTS

Patient Characteristics

Seven regions (including Uppsala county) with a population of 1,966,426 to 2,013,046 (2010–2014) were at the time included in the catchment area for the Neurosurgical Department at Uppsala University Hospital (Figure 1). Approximately 270,123 to 299,130 persons aged 70 years or older were inhabitants in the seven regions.⁽²⁰⁾

We identified 511 patients, 70 years or older, who had undergone surgery for CSDH. Seven hundred and five surgeries were performed on the subjects during the studied period including 511 initial surgeries, 91 surgeries for contralateral hematoma in those with bilateral hematoma, 67 reoperations due to recurrence, and 36 surgeries as a result of post-operative complications. The yearly incidence of CSDH requiring surgical evacuation was 36.2 per 100,000 persons in this population.

The median age was 79 years and mean age was 79.7 years \pm 5.9 SD (range 70–97 yrs). There were 389 (76.1%) males and 122 (23.9%) females. Two hundred and seventy-three patients (53.4%) had unilateral hematoma and 238 (46.6%) had bilateral hematomas; 99.2% had a subgaleal drain post-operatively. Burr-hole procedure was made in 671 surgeries (95.3%) (including all initial procedures), and craniotomy in 33 surgeries (Table 2, Figure 2).

TABLE 1.
Markwalder grading scale

0: Neurologically intact.

1: Alert and oriented; mild symptoms such as headache; absent or mild neurological deficits, such as reflex asymmetry.

2: Drowsy or disoriented with variable neurological deficits, such as hemiparesis.

3: Stuporous but responding appropriately to noxious stimuli; severe focal signs such as hemiplegia.

4: Comatose with absent motor responses to painful stimuli; decerebrate or decorticate posturing).

Comorbidity and Medications

Two hundred and twenty-two patients (43.4%) had a history of cardiovascular disease and 94 (18.4%) had diabetes mellitus; 72 patients (14.1%) had a history of stroke or intracerebral hemorrhage; and 61 patients (11.9%) had a diagnosis of dementia. In 133 patients no known comorbidity was found (Table 2). The most common medication used was beta-receptor blockers (57.3%). Another common hypertensive treatment in the studied group was ACE inhibitors in 127 patients (24.9%). Two hundred and fifty-nine patients (50.7%) were medicated with anticoagulants and/or antiplatelet therapy; 134 patients (26.2%) used antiplatelet treatment (acetylsalicylic acid/clopidogrel/ticagrelor) as single or dual therapy, while warfarin was the most commonly used anticoagulant (20.6%). In addition, 83 patients (16.2%) were treated with either oral diabetes medications or insulin, 19 patients (3.7%) were on steroid therapy, and 14 (2.%) used epilepsy medications (Table 3).

Social Factors

More than half of the patients (57.3%) were living with a partner or other person at the time of the surgery; 43 (8.4%) lived in a nursing home, and 175 (34.3%) lived alone. Twenty-one patients (4.1%) had an excessive use of alcohol,



FIGURE 1. Map of Sweden, showing catchment area for the Neurosurgical Department at Uppsala University Hospital highlighted in blue. The population in the region during the study was 2 million inhabitants, with 270,123 (2010) persons in the age group of interest.

and 405 patients (79.3 %) were non-smokers, but in 15.1 % of all patients it was unknown whether they were smoking or not (Table 2).

Trauma

In 348 patients (68.1%) there was a known trauma in the patient's history prior to the CSDH. In more than half of the patients (61.3%) there was a low-energy trauma, while 14 patients (2.7%) had a history of high-energy trauma. In 26.6%, the trauma occurred 21 days to two months before CSDH was verified on CT. In almost one-fifth of the patients the time interval was 72 hours to 21 days from trauma to CSDH. However, in the majority of cases it was unclear exactly when the trauma had occurred, but the patient or a relative/caregiver

TABLE 2.
Patients characteristics.

Total no. of patients	511
Total no. of surgeries	705
Initial surgery	511
Surgeries of the contralateral hematoma (bilateral hematomas)	91
Reoperations due to recurrence	67
Surgeries due to postoperative complications	36
Gender	
Male n (%)	389 (76.1)
Female n (%)	122 (23.9)
Mean age years (range)	79.7 ± 5.9 SD (70-97)
Median age years	79
Median age years males	80
Median age years females	79
Recurrence rate n (%)	49 (9.6)
Hematoma laterality	
Left n (%)	155 (30.3)
Right n (%)	118 (23.1)
Bilateral n (%)	238 (46.6)
30-day mortality after first surgery %	3,1
History of trauma n (%)	348 (68.1)
Surgical technique	
Burr-hole n (%)	671 (95.3)
Craniotomy n (%)	33 (4.7)
Subgaleal drainage	
Yes n (%)	698 (99.2)
No n (%)	6 (0.8)
Postoperative complications	60 (11.7)
Living situation	
Cohabitation	295 (57.3)
Alone	175 (34.3)
Nursing home	43 (8.4)

N number of patients, SD = standard deviation

SUNDBLOM: CSDH IN ELDERLY PATIENTS

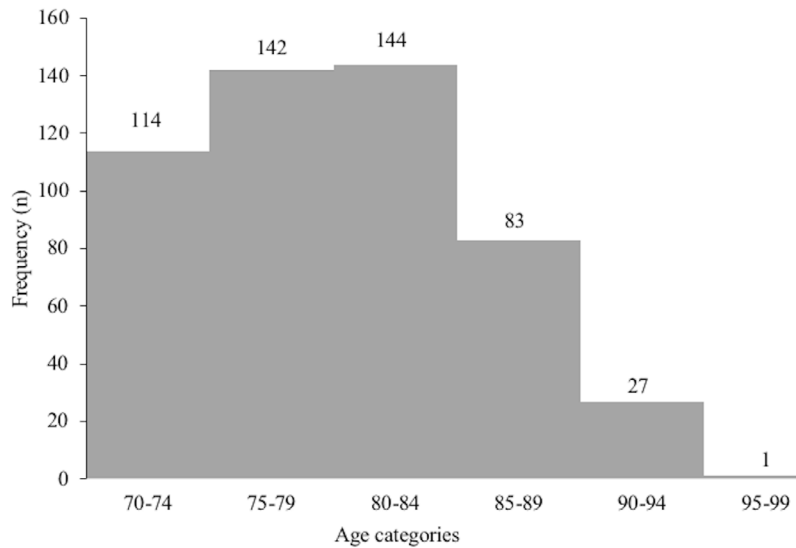


FIGURE 2. Age distribution. Expected distribution noted, with the majority of patients in the age group 80–84, suggesting an increasing frequency of CSDH with advanced age, and tapering off in the oldest age groups where general mortality has taken its toll.

TABLE 3. Comorbidity and medications

	N (%)
<i>Comorbidity</i>	
Cardiovascular disease	222 (43.4)
Diabetes	94 (18.4)
Stroke/ICH	72 (14.1)
Dementia	61 (11.9)
Smoking	29 (5.7)
Excessive alcohol use	21 (4.1)
Fracture tendency	17 (3.3)
Epilepsy	9 (1.8)
No known comorbidity	133 (26.0)
<i>Medications</i>	
Beta-blockade	293 (57.3)
Anticoagulants and/or antiplatelet therapy (total)	259 (50.7)
Anticoagulants	
Warfarin	105 (20.6)
Heparin	11 (2.2)
NOAC	3 (0.6)
Antiplatelet therapy	
Single therapy	128 (25.1)
Dual therapy	6 (1.2)
Combination of warfarin and antiplatelet therapy	6 (1.2)
ACE inhibitors	127 (24.9)
Diabetes medications	83 (16.2)
Steroids	19 (3.7)
Epilepsy medications	14 (2.7)

N = number of patients; ICH = intracerebral hemorrhage.

could attest to some, usually negligible, head trauma in the preceding weeks.

Outcome and Recurrence

Thirty-day mortality after initial surgery was 3.1% (Table 2). Total recurrence rate was 9.6%, with 27 patients (9.9%) with unilateral hematoma and 22 patients (9.2%) with bilateral hematomas (Table 4). In the univariate analysis, there was no significant difference in recurrence between those with bilateral and unilateral hematoma (Table 5). Preoperative anticoagulants (*p* value = .71) and antiplatelet therapy (*p* value = .51) were not significant factors for recurrence, nor were cardiovascular disease, diabetes mellitus, dementia, and excessive use of alcohol (Table 5). Markwalder score was improved in 399 (78.1%) patients at discharge after the first surgery. The score had not changed in 99 (19.4%) and deteriorated in 13 (2.5%) patients (Table 4). At admission, 32.3% scored 0–1, and when

TABLE 4. Recurrence rates and neurological function (MGS) at discharge compared to admission before initial surgery

	N (%)
<i>Recurrence</i>	
Total	49 (9.6)
Unilateral	27 (9.9)
Bilateral	22 (9.2)
<i>MGS</i>	
Improved	399 (78.1)
Unchanged	99 (19.4)
Deteriorated	13 (2.5)

N = number of patients; MGS = Markwalder Score.

TABLE 5.
Univariate analysis of factors affecting recurrence and postoperative complications

	Recurrence n (%)	No Recurrence n (%)	p value
Mean age	79.4	79.8	0.63
Male	42 (85.7)	347 (75.1)	0.10
Preoperative anticoagulants	11 (22.5)	114 (24.7)	0.73
Preoperative antiplatelet therapy	12 (24.5)	122 (26.4)	0.51
ACE inhibitors	12 (24.5)	115 (24.9)	0.95
Bilateral/unilateral	22 (9.2)/27 (9.9)	216 (90.8)/246 (90.1)	0.80
Diabetes mellitus	9 (18.4)	85 (18.4)	1.00
Cardiovascular disease	25 (51.0)	197 (42.6)	0.26
Dementia	7 (14.6)	54 (11.7)	0.60
Alcohol abuse	4 (8.2)	17 (3.9)	0.15
Cohabitation/living alone	25 (52.1)/23 (47.9)	310 (67.1)/152 (32.9)	0.09
	Post-operative Complication n (%)	No Post-operative Complication n (%)	p value
Diabetes mellitus	9 (15.3)	85 (18.8)	0.48
Cardiovascular disease	31 (52.5)	191 (42.3)	0.11
Dementia	5 (8.8)	56 (12.7)	0.38
Alcohol abuse	6 (10.4)	15 (3.5)	0.02 ^a
Anticoagulant treatment	12 (20.3)	113 (25.0)	0.39
Antiplatelet treatment	21 (35.6)	119 (26.3)	0.16
ACE inhibitors	16 (27.1)	111 (24.6)	0.51

^aSignificance

N = number of patients.

discharged 86.3% of patients scored 0–1. Most patients improved from MGS 2 to 0–1 after the initial surgery (Figure 3).

Post-operative Complications

Sixty patients (11.7%) suffered a post-operative complication with a total of 65 post-operative complications (Table 2). The most common complication was post-operative hematoma at the site of the surgery (2.6%). Twelve patients (1.7%) suffered from seizures post-operatively. Infection or empyema was seen in 9 patients (1.3%) within 30 days post-operatively in all cases. Other rare complications were brain herniation/ischemia at surgical site (0.9%), hematoma on the contralateral side (0.6%), stroke (0.4%), pneumonia (0.4%), subarachnoid hemorrhage (0.4%), surgical site leakage or wound dehiscence (0.3%). Excessive use of alcohol was significantly more common in patients with post-operative complications (10.4%) compared to those without (3.5%) (p value = .02). Other comorbidities (diabetes, cardiovascular disease and dementia) or use of anticoagulants or antiplatelet therapy were not factors of significance in complication rate (Table 5).

DISCUSSION

Patient Characteristics

In this article we included patients over the age of 70, since our main interest was the outcome for the elderly population

after treatment of CSDH. The most common age range was 80–84 years which indicates that CSDH is a disease especially affecting people in the oldest age categories (Figure 2). In our material the mean age was 79.7 years with an incidence of 36.2 per 100,000 persons. We found a 30-day mortality rate of 3.1%. Other studies concerning outcome after CSDH surgery in older patients present a mean age of 84 years (range 80–94 yrs),⁽¹⁵⁾ 76 years (range 65–94 yrs),⁽²¹⁾ and 79 years (range 65–84 yrs).⁽⁶⁾ Previously reported incidence in people over the age of 80 with CSDH has been up to 129.5 per 100,000 persons.⁽²²⁾ In our study, the incidence is underestimated since some patients undergo surgery for CSDH at regional hospitals in the catchment area and, therefore, are not included here. Also, our population is a selected group of patients who were deemed in need of (and eligible for) surgery.

There was a predominance of males compared to females (76.1% vs. 23.9%, respectively). This is consistent with other articles.^(15–17,23) Data suggest that traumatic brain injury is more common in males than females, and that male gender is a risk factor for TBI.⁽²⁴⁾ One explanation for this discrepancy is that males are more exposed to injury and high-risk behaviours, such as alcohol abuse, than females.⁽²⁵⁾

Recurrence

We found a total recurrence rate of 9.6% (9.9% with unilateral hematoma and 9.2% with bilateral hematoma), and there was

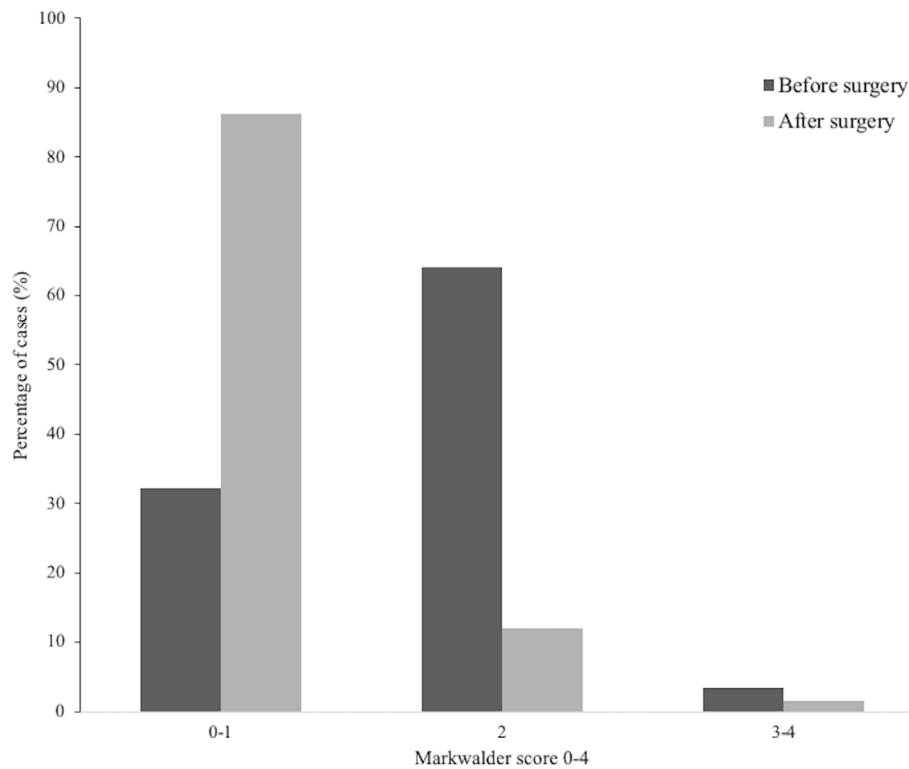


FIGURE 3. Markwalder score before and after surgery. The data show clear improvement after surgery, with most patients relieved of severe symptoms such as impaired consciousness and/or hemiparesis.

no significant difference in recurrence between bilateral and unilateral hematomas (Table 4, Table 5). The overall recurrence rate in CSDH ranges from 10 to 17%.^(8,16,17,26) Risk factors for recurrence according to the literature include old age, anticoagulants, brain atrophy, bilateral hematoma, heterogeneous density of the hematoma, diabetes, hypertension, larger hematoma volume, midline shift, alcohol abuse, liver dysfunction, post-operative pneumocephalus, and non-use of active drainage.^(23,27-29) Studies have shown a retreatment rate in bilateral CSDH of 21.6%,^(30,31) while in unilateral CSDH the recurrence rate in need of re-operation was 14%.⁽³²⁾ Different strategies concerning bilateral hematomas are used at different centres, whether to perform initial surgery on both sides or, as in our centre, delayed second surgery. Our data suggest that the delayed surgery strategy may reduce recurrence rates in this age group. However, this strategy, of course, means that the patient undergoes two separate surgeries.

Antiplatelet therapy and warfarin were frequently used in our studied population. It has been suggested that also antiplatelet therapy has an impact on recurrence; however, the results have been ambiguous.⁽¹⁷⁾ One study showed that clopidogrel was a predictor for recurrence.⁽²⁷⁾ Another study showed that delaying surgery three days after cessation of antiplatelet therapy decreased the risk of recurrence significantly.⁽²³⁾ Pre-operative anticoagulants or antiplatelet therapy had not a significant impact on recurrence in this study, strengthening the case for early discontinuation and delayed surgical

intervention as strategy of choice in non-emergent cases.

Social factors are important to take into consideration in this particular group of patients. In our material, 34% lived alone. This could possibly lead to a delay in seeking medical care and longer wait for surgery. Prolonged time from diagnosis to surgery is associated with increased mortality and morbidity, especially in the elderly.^(14,33) When comparing living alone or with a partner/nursing home, there was not a significant difference in recurrence rate (Table 5).

Trauma

Same-level trauma (falling) is the most common trauma mechanism behind inpatient care in the elderly across the world.⁽³⁴⁾ Occurrence may be preventable by use of walking aids and better road care.⁽³⁵⁾ The incidence seems to be increasing, in all probability due to the increase of elderly in the population, with head injuries becoming more common with increasing age.⁽³⁶⁾ Even a minor trauma can cause CSDH,⁽²⁾ making our observations somewhat expected and in line with the only comparable material in the literature.⁽³⁷⁾ In our study material, same level trauma (falls) was identified in more than half of the patients and it was usually a low-energy trauma. Other mechanisms of trauma before CSDH were bicycle accidents, motor vehicle accidents, and other mechanical head trauma. Evidence show that trauma might not always be the cause of CSDH, since trauma is absent in many cases. Instead it is a complex combination of inflammation, angiogenesis,

and fibrinolysis which promotes development of CSDH.⁽¹⁾ In our material, almost one third had no known trauma in the patient's history. Explanations could be that the patients have no memory of any trauma due to cognitive deterioration caused by the hematoma, or that the trauma was negligible and not worth mentioning to the physician. In some cases, the physician might not have asked the direct question about trauma preceding the CSDH or the patient would not tell the physician for some reason. High rates of elder abuse have been uncovered in recent studies and the risk is increased for those living with a partner. This is an important aspect which sadly often is missed when meeting elderly patients in health care.⁽³⁸⁾ In our material there was only one known case of injury caused by another person and it happened during a burglary, not a domestic abuse.

The time period from trauma to CSDH ranged from 72 hours to two months. Other studies found that the mean time interval from trauma to CSDH was 49.1⁽¹⁴⁾ to 51.9 days.⁽³⁹⁾

Post-operative Complications

Excessive alcohol use, according to the medical records, was the only factor significantly increasing the rate of post-operative complications in our study. Alcohol abuse is a known risk factor for post-operative complications such as infections, post-operative bleeding due to prolonged bleeding time caused by liver dysfunction, and cardiopulmonary complications.⁽⁴⁰⁾ A reason why patients with alcohol abuse suffer more complications is that they have prolonged bleeding time post-operatively.⁽⁴¹⁾ This would explain why alcohol abuse was a significant factor for post-operative complications in this study since our results showed that hematoma was the most common complication. After intracranial surgery, post-operative hematoma is more frequently seen in patients with excessive use of alcohol.⁽⁴²⁾ Since only four patients with anticoagulants or antiplatelet therapy underwent acute surgery regardless of bleeding time pre-operatively, this would not affect the result significantly on the post-operative hematomas (Table 4).

A study by Zetterling and Ronne-Engstrom, performed in the same Department (Uppsala University Hospital), showed that 0.8% of patients had a post-operative hematoma after intracranial surgery (not only surgery for CSDH). The mean age was 64 years compared to our study with a mean age of almost 80 years.⁽⁴³⁾ Since patients in the older age categories have multiple diseases and use anticoagulants or antiplatelet treatments more frequently, they are more prone to post-operative hematoma.⁽¹⁸⁾ When comparing with Zetterling and Ronne-Engstrom, the time interval studied is shorter than ours which also can explain the discrepancy in the results.⁽⁴³⁾ Another study focusing on complications after burr hole craniotomy for CSDH showed that 3.5% suffered acute intracranial hematoma post-operatively and 2.0% developed seizures.⁽⁴⁴⁾ Other articles show a slightly higher rate of seizures, and data suggest that seizure is the most common post-operative complication.^(15,45,46) In our material, surgical site infection or empyema was seen in 1.3% which corresponds well with previously reported rates.⁽⁴⁵⁾ Risk factors for post-operative

infections are repeated surgeries, surgeries longer than four hours, and/or use of dural substitute.⁽⁴⁷⁾ Another study from our institution showed a rate of surgical site infection of 4.3% after three months and 4.9% after 12 months post-operatively of all procedures included. The difference in rates compared to our results could be explained by the fact that we only look at surgeries for CSDH which is shorter in time compared to other neurosurgical procedures such as tumour resection. When only looking at SDH, the infection rate was 2.1%.⁽⁴⁷⁾

Outcome

Mortality rate (all causes) 30 days after the first surgery was 3.1%. Overall, mortality rate in other studies in the elderly after CSDH surgery varies from 2.75% (ages 65–94 yrs)⁽²¹⁾ to 6.8% (ages 80–94 yrs).⁽¹⁵⁾ Another article showed a mortality rate of 17% four weeks post-operatively in a population over 65 years of age.⁽⁶⁾ In our study, functional outcome was assessed by using the Markwalder score and it showed an improvement in neurological function in 78.1% of cases after the initial surgery. When comparing the scores at admission with post-surgical scores, the majority of patients improved from MGS 2 to 1–0 (Figure 3). In conservative treatment of CSDH, which often includes small and asymptomatic CSDH, some hematomas resolute spontaneously. In some studies, using corticosteroids was comparable regarding mortality and outcome with surgical treatment. Other studies have shown that tranexamic acid, mannitol, platelet activating factor receptor antagonist, and statins may promote resolution of the hematoma. However, conservative treatment is only suitable for patients with few symptoms and at high risk of surgery due to multiple illnesses.

Limitations

This is a retrospective single-centre study, with the inherent limitations of such materials. Some patients with unilateral CSDH without other complicating factors, such as anticoagulant/antiplatelet medications, undergo surgery at regional hospitals and are therefore not included in this study. The definition of excessive use of alcohol is based on medical records; there might be a risk that some patients with overconsumption of alcohol are missing, but it is not likely that those included in this study are false positive. The recruitment of patients was exclusively from an intermediate care ward, thus missing severely affected patients who may have received care only in the intensive care unit. Cognitive status before and after surgery were not investigated in detail; thus possible cognitive complications could not be investigated in detail. The incidence includes only patients who have undergone surgery for CSDH, and this type of material precludes us from drawing conclusions about the general incidence of CSDH, including cases treated conservatively.

CONCLUSION

CSDH is a common treatable cause of ill health and disability in the elderly. The dominant underlying trauma mechanism is

same-level falls, but other mechanisms, including high-energy trauma, is a factor. Surgery is an effective treatment and neurological function is improved post-operatively. Recurrence is not more commonly seen in elderly patients. Delaying surgery of contralateral hematoma in bilateral cases may reduce recurrence rates. Excessive use of alcohol increases the risk of developing post-operative complications.

ACKNOWLEDGEMENTS

Not applicable.

CONFLICT OF INTEREST DISCLOSURES

We have read and understood the Canadian Geriatrics Journal's policy on conflicts of interest disclosure and declare that the authors report no conflicts of interest.

FUNDING

The study was financially supported by Centre for Clinical Research, Sörmland, Sweden, ALF-funds from Region Uppsala, the Åland cultural foundation and "Konung Gustav V:s och Drottning Victorias Frimurarestiftelse".

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Correspondence to: Jimmy Sundblom, MD, PhD, Department of Neuroscience, Section of Neurosurgery, Uppsala University Hospital, Sjukhusvägen, 751 85 Uppsala, Sweden
E-mail: jimmy.sundblom@neuro.uu.se