Restoration of Functional Integrity After Evacuation of Chronic Subdural Hematoma—An Age-Adjusted Analysis of 697 Patients

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OBJECTIVE: **Although chronic subdural hematoma (CSH) can be treated by surgery, little is known about age-dependent symptoms and age-adjusted rates of restoring functional integrity. To evaluate the clinical symptoms and the course of CSH in patients of different age groups (AGs), we reviewed patients with CSH treated at our department over the past 22 years.**

METHODS: **This retrospective analysis included 697 patients with CSH (461 men, 236 women; mean age 70.1 years). Subgroup analysis was done according to AG 1) <65 years, 2) 66—75 years, 3) 76—85 years, 4) 86—95 years, and 5) >95 years.**

RESULTS: **Most patients had been treated with burr-hole trephination and implantation of a subdural drain (96.5%; $n = 673$). No significant difference concerning surgical morbidity and mortality was found between the AGs, but patients >75 years more frequently required reoperation ($P = 0.001$). Preoperatively, the most common symptoms were headache in AGs 1 and 2 (56.3% and 48.5%) and mnestic deficits in AGs 3—5 (54.9%, 51.9%, and 50.0%). After surgery, the clinical symptoms of CSH had significantly abated in all age groups. The most common clinical residuals were motor deficits in AG 1 (10.4%), mnestic deficits in AG 2 (10.7%), AG 4 (24.1%), and AG 5 (50.0%), and organic brain syndrome in AG 3 (15.0%).**

CONCLUSION: **CSH predominantly caused unspecific symptoms such as headache and cognitive decline. CSH surgery immediately relieved symptoms in patients of all AGs. However, improvement rates significantly depended on patient age. This should be taken into consideration when advising on surgical treatment of CSH.**

INTRODUCTION

Chronic subdural hematoma (CSH) is a common problem in neurosurgical practice. A recently published study has predicted an incidence of 17.6 CSH per 100,000 people in the United States by 2030; thus CSH is likely to become the most commonly conducted cranial neurosurgical procedure.[1] Viewed as a disease mainly affecting the elderly, CSH causes increasing concern in aging societies.[2] CSH often results in unspecific symptoms such as altered behavior and mnestic deficits.[2,3] For this reason, elderly patients in particular are at risk of being misdiagnosed with beginning dementia, although the reason for their altered mental state could be easily detected by a neurosurgic examination.[3,4]

In past decades, most studies on CSH focused on the different treatment options and therefore on comparing different neurosurgical procedures with regard to decreasing hematoma thickness, complications, and recurrence rates.[5] Symptom relief after CSH treatment, particularly in the elderly, was often not part of the study. Clinical symptoms before surgery are often recorded according to the Markwalder grading system,[6] which describes the general neurologic state of a patient independent of detailed neurologic symptoms. So far, only a few authors have focused on the general or detailed clinical improvement of CSH patients after surgery.[3,4,7,8]

We conducted a retrospective age-adjusted analysis of 697 patients to show the differences in CSH symptoms between the different age groups at hospital admission and at discharge after surgical intervention.

Key words
- Age-adjusted analysis
- Chronic subdural hematoma
- Detailed symptom description
- Symptom relief

Abbreviations and Acronyms
AG: Age group
CSH: Chronic subdural hematoma
pts: patients

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Table 1. Patient Characteristics (n = 697)

Characteristics		%
Ratio men/women	461/236	66.1/33.9
Age (years)		
Mean	70.1	
Range	1–97	
Age groups		
AG 1 (<65 years)	208	29.8
AG 2 (66–75 years)	208	29.8
AG 3 (76–85 years)	196	28.1
AG 4 (86–95 years)	83	11.9
AG 5 (>96 years)	2	0.3
CSH localization		
Frontotemporoparietal	466	66.9
Frontoparietal	98	14.1
Parietal	46	6.6
Frontal	45	6.5
Frontotemporal	19	2.7
Parietooccipital	7	1.0
Temporoparietal	5	0.7
Temporal	4	0.6
n.a.	7	1.0
Thickness (cm)		
Left side	2.1	
Right side	2.0	
Anticoagulation treatment		
Yes (%)	226	32.4
No (%)	471	67.6
Trauma		
Yes (%)	317	45.5
No (%)	202	29.0
Unknown (%)	178	25.6
Hospital stay (days)		
Mean	10.8	
Range	1–57	

Table 2. Surgical Procedures

Characteristic	Number	%
Initial surgical procedure	697	100
Burr-hole and drainage	673	96.5
Craniotomy	22	3.2
Craniectomy	2	0.3
Reoperation rate	155	22.2
Second surgical procedure		
Burr hole and drainage	112	72.3
Craniotomy	38	24.5
Craniectomy	5	3.2
Re-reoperation rate (of all patients)	33	4.7
Third surgical procedure		
Burr hole and drainage	4	12.1
Craniotomy	26	78.8
Craniectomy	2	6.1
Wound revision	1	3.0

Patients and Methods

We retrospectively reviewed our database of all patients with chronic subdural hematoma (CSH) who had been operated on in our neurosurgical department between 1992 and 2013. Three hundred sixty five patients had been reported previously.[3] Exclusion criteria were acute or subacute subdural hematoma, hygroma, and presence of a shunt catheter.

Patient charts were analyzed for demographical data (age and gender); localization; side and thickness of CSH; type and number of surgical procedures (burr-hole trephination and implantation of a subdural drain, craniotomy, craniectomy); history of previous trauma; anticoagulation therapy; procedure-related complications; in-hospital mortality; and days of hospitalization. Clinical presentation at admission and before discharge were documented, including the symptoms headache, speech disorders, motor deficits, altered behavior (aggressive or inadequate behavior), mnestic deficits (cognitive decline and confusion), and seizures. The patient population was dichotomized in age groups (AG): 1) <65 years, 2) 66–75 years, 3) 76–85 years, 4) 86–95 years, and 5) >96 years. Subgroup analysis was carried out according to these 5 age groups.

Statistical analysis was done with sigma stat 3.5 software. Analysis of variance (ANOVA) was carried out with the Kruskal-Wallis One-Way ANOVA on Ranks. Subgroups were compared with the Mann-Whitney Rank Sum Test. The confidence interval was defined as 95%, and the significance level was set to $P < 0.05$.

The study was approved by the Ethics Committee of the University Regensburg (14-101-0072).

Results

Altogether, 697 patients (461 men, 236 women) with a mean age of 70.1 years (range 1–97 years) were identified. AG 1 and AG 2 included 208 patients each, AG 3196 patients, AG 483 patients, and AG 5 only 2 patients. Statistical workup of the age-adjusted subgroups was carried out for AG 1 to AG 4. Because of the low number of patients in AG 5, this age group was not included in the statistical analysis.

The detailed patient baseline data on hematoma location, hematoma thickness, and surgical procedures are shown in Tables 1 and 2.

A large proportion of patients had developed CSH with hemispheric extent (frontotemporoparietal localization in 466 patients,