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Outcomes in octogenarians with subdural hematomas

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ABSTRACT

Objective: In the majority of literature concerning age in TBI, specifically in subdural hematomas (SDH), the mean age of patients considered elderly is 55–65. Limited data in SDH patients > 75 years suggest an increased mortality rate. The impact of medical decision making on these data is not well-documented.
Patients/Methods: We use the Nationwide Inpatient Sample (NIS) database to compare outcomes between SDH patients 60–79 and ≥80. As administrative databases have some shortcomings, i.e. in-hospital data only, acute and chronic SDHs listed together, we examined institutional data to evaluate the impact of these factors on medical decision making which may falsely elevate mortality rates.
Results: In-hospital mortality was increased in NIS patients > 80 treated both surgically and non-surgically ($P < 0.05$). Our institutional data confirmed higher in-hospital mortality rates in patients > 80 with SDHs as a group. However, the SDH patients > 80 who underwent surgery at our institution had much lower mortality rates. We found that patients ≥ 80 made up 87% of all patients with "surgical lesions" that were not operated on. Type of subdural, admission GCS, and baseline cognitive status appeared to have a significant impact on surgical decision making.
Conclusion: This study examines mortality rates in patients > 80 with SDHs who are managed surgically and non-surgically using a large administrative database and institutional data. It provides preliminary insight into medical decision making which make affect mortality rates of the very elderly.

1. Introduction

Traumatic brain injuries (TBI) and their after-effects account for approximately $25 billion in healthcare costs annually in the United States, with an estimated 50–99% of moderate to severe head injuries resulting in long term sequelae [1]. Most clinicians are well aware of the peak in TBI that occur in young adult males, but are less familiar with the additional TBI peak occurring in the elderly, even though TBI is seen more frequently in older female patients than younger ones. In the majority of literature concerning age in TBI, specifically in subdural hematomas (SDH), the mean age of patients considered elderly is 55 to 65.

There are three series we are aware of that examine mortality rates in patients > 75; one examines traumatic acute intracerebral hematoma (ICH) and two look at outcome following chronic subdural hematoma (cSDH). Patients > 75 year with an acute ICH have a significantly higher mortality rate [2]. Mortality rates in two studies on cSDH in very elderly patients appear higher [3,4]. In the most recent series of patients with chronic SDHs (cSDH) whose mean age was 80.6 years, it was clear that patients with SDHs were significantly more likely to die within 2 years than those without cSDHs, regardless of surgical intervention or anticoagulant use [3]. Likewise, Jones and Kafetz found that 31% of patients presenting with cSDH died within 6 months [4]. Both allude to the fact that cSDH may be a marker of chronic disease and impaired health status, rather than a cause of death.

In order to better evaluate this hypothesis, we examine the impact of age and comorbidities on outcomes in patients > 80 with SDH as compared to a cohort of patients 60–79. We use the Nationwide Inpatient Sample (NIS) database to examine this data on a large scale. As administrative databases have some shortcomings, i.e. in-hospital data only, acute and chronic SDHs listed together, baseline status unknown, we examined institutional data to evaluate the impact of these factors on medical decision making which may falsely elevate mortality rates.

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Table 1
Mortality rates in patients with SDH both who were managed medically and surgically.

	NIS surgical		NIS non-surgical		Institutional surgical		Institutional non-surgical	
	Overall No. (%)	Mortality (%)	Overall No. (%)	Mortality (%)	Overall No. (%)	Mortality (%)	Overall No. (%)	Mortality (%)
Total No. Patients	2596		49570		29		31	
age								
60–79	1669 (64.3)	145 (8.6)	27249 (55.0)	3770 (13.7)	21 (72.5)	2 (9.5)	10 (32.3)	3 (33)
≥80	927 (35.7)	112 (12.1)*	22321 (45.0)	3612 (16.2)**	8 (27.5)	0 (0)**	21 (67.7)	10 (48)**

* $P < 0.01$.
** $P < 0.001$.

2. Clinical material and methods

2.1. NIS database

2.1.1. Data source

Data for the years 1998–2007 inclusive was gathered from the Nationwide Inpatient Sample (NIS), the largest all-payer inpatient database in the United States. This database is a representative sample of 20% of US hospitals and is maintained by the Agency for Healthcare Research and Quality. It contains data on over 8 million hospital stays from over 1000 hospitals [5]. This approximates a 20% stratified sample of US community hospitals. Unweighted data from this 20% sample was used throughout this study.

2.1.2. Inclusion criteria

To identify the appropriate patient population, we used diagnosis and procedure codes from the International Classifications of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) [6]. Patients from 1998 to 2007 with a diagnosis of SDH (ICD-9-CM 432.1, 852.2) both who underwent and did not undergo evacuation (ICD-9-CM 01.24) were included in the analysis. Patient gender, race, and co-morbidities were analyzed.

2.1.3. Outcome variables

The primary outcome was in-hospital mortality. Mortality was defined as death from any cause prior to discharge from the hospital. The secondary outcome was the presence of in-hospital post-operative complications.

2.1.4. Statistical analysis

All data are presented in unweighted raw values and were analyzed using SAS version 9.2 (SAS Institute, Inc, Cary, NC). Univariate analysis was performed using χ^2 tests, with $P < 0.05$ as statistically significant. Multivariate logistic regression was created with outcome measures as dependent variables. Independent variables included patient age (grouped 60–79 and ≥80 years) and various comorbidities (including congestive heart failure, liver disease, renal failure, diabetes mellitus, and obesity). In order to adjust for comorbidities, we used the NIS Comorbidity Software, Version 3.0, to identify the conditions from the Elixhauser index that are relevant to surgical patients [5,7]. Adjusted odds ratios (ORs) were calculated in order to determine the effects of the identified covariates on outcome measures.

2.1.5. Single institution experience

Eighty-four patients over 60 years old were admitted to a single institution with a primary diagnosis of SDH over a 24 month period from 2008–2010. Of these patients, 60 patients had SDHs without a confounding intracranial diagnosis. Patients with significant intracerebral hemorrhage, subarachnoid hemorrhage, intraventricular hemorrhage, and ventriculoperitoneal shunts were excluded. Forty-four of these isolated SDHs had surgical lesions, which were defined as SDHs ≥1 cm with mass effect and midline shift. We compared outcomes across patients treated surgically and conservatively across age groups.

Patient gender, race, comorbidities, use of anticoagulation, and type of SDH (acute v. chronic) were analyzed. The primary outcome was in-hospital all-cause death. We examined one year survival rates through the social security database. We obtained IRB approval for this study.

2.1.6. Statistical analysis

All data was analyzed using Student's *t*-tests/Chi Square were performed with $P < 0.05$ as statistically significant. Patients were analyzed based on age, gender, anticoagulant use, type of subdural, Glasgow coma score and baseline cognitive status.

3. Results

3.1. NIS database

Between 1998 and 2007, 52,166 people over 60 years old in the NIS database were discharged with a primary diagnosis of SDH and had valid mortality information. Patients between 80 and 95 made up 42.7% (22,321) of this group. Of those, 3612 died during their hospital stay (16.1% of patients) which was the highest rate of mortality of all age groups.

Of the patients who underwent SDH evacuation ($n = 2596$), 927 patients (35.7%) were ≥80. Patient gender, race, and hospital teaching status did not affect mortality rates. A significant difference in mortality rate did exist between different age groups (Table 1). Mortality was significantly increased across all groups by congestive heart failure ($P < 0.0001$), liver disease ($P < 0.01$), and renal failure ($P < 0.0001$). Octogenarians with ≥3 comorbidities had an in-hospital mortality rate of 36.6% as compared to 11.8% in the same age group without any comorbidities.

3.2. Multivariate analysis

Using multivariate logistic regression, we assessed the impact of age v. comorbidities on in-hospital mortality and complications on SDH surgical patients in NIS (Table 2). Age appeared to increase the risk of in-hospital mortality, but not complications, while comorbidities increased both rates.

Table 2
Multivariate analysis of NIS data showing effect of patient age and comorbidities on mortality and complications after subdural hematoma evacuation.

Variable	Mortality Odds ratio (95% C.I.)	Complications Odds ratio (95% C.I.)
Age		
60–69 vs ≥ 80	0.606 (0.421–0.873)	0.959 (0.754–1.219)
70–79 vs ≥ 80	0.755 (0.566–1.007)	0.940 (0.766–1.153)
Comorbidities		
1 vs 0	0.859 (0.485–1.523)	1.858 (1.245–2.771)
2 vs 0	1.832 (1.095–3.065)	3.249 (2.212–4.770)
≥3 vs 0	2.550 (1.564–4.159)	4.460 (3.076–6.466)