

Short-Term Outcome of Treatment of Elderly Patients with Epidural Hematomas

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Abstract

Introduction: There is substantial literature data dedicated to intracranial epidural hematomas affecting young and middle-aged individuals, but studies focusing on their characteristics in elderly patients are scarce, assuming that old age is a poor prognostic factor.

Aim: The aim of the current study was to review the typical features of the etiology, clinical presentation, disease course, and outcome in a series of cases with epidural hematomas in elderly patients.

Materials and methods: The etiology, clinical presentation, neuroimaging findings, treatment, and outcome in elderly patients operated for traumatic epidural hematomas were investigated in the Clinic of Neurosurgery at St George University Hospital, Plovdiv between January 2015 and December 2020.

The study included patients with isolated traumatic epidural hematoma, as well as those with epidural hematoma in combination with other traumatic intracranial lesions (cerebral contusion, subarachnoid hemorrhage, subdural and intracerebral hematoma). Postoperative epidural hematomas were not included in the study.

The neurological status of patients at admission was assessed using the Glasgow Coma Scale. The Glasgow Outcome Scale was used to monitor their condition during the first month after discharge.

Results: 121 patients with epidural hematomas underwent surgery during the study period in the Clinic of Neurosurgery at St George University Hospital, Plovdiv. Of these patients, 13 (10.7%) were people aged over 65 years (8 women and 5 men, mean age - 69 years). The most common cause of injury was a fall. Twelve patients (92.3%) had associated craniocerebral lesions and only one had an isolated epidural hematoma. Upon admission, 6 patients (46.2%) were neurologically intact. Ten patients were treated surgically, two – conservatively. Good outcome (GOS=4–5) was achieved in 8 patients (61.5%), poor outcome – in one patient, and four patients (30.8%) died.

Conclusions: Good outcome in elderly patients with epidural hematoma can be achieved in two-thirds of the cases, despite the negative influence of the age as a prognostic factor.

Keywords

elderly, epidural hematoma, outcome, surgery, traumatic brain injury

INTRODUCTION

Epidural hematomas (EH) account for 1% to 9% of all traumatic brain injuries (TBIs), but are significantly less common in the elderly due to significant adhesion of the dura mater to the inner surface of the skull.^[1] The outcome of treatment of patients with EH depends on many factors with different prognostic values, with age being one of the significant variables.^[2] According to the World Health Organization, people ≥ 60 years of age are considered to be elderly. According to the United Nations Department of Economic and Social Affairs, their percentage of the world population in 2020 is 9.3% and is expected to reach 16% by the year 2050.^[3-4]

AIM

The aim of the present study was to investigate the etiology, clinical presentation, disease course and outcome in a series of 13 elderly patients with EH, as this group represents the fastest growing segment of the population, which presumably will increase the incidence of this pathology in the future.^[5]

MATERIALS AND METHODS

The etiology, clinical presentation, neuroimaging findings, treatment and outcome in elderly patients operated for traumatic epidural hematomas were investigated in the Clinic of Neurosurgery at St George University Hospital in Plovdiv between January 2015 and December 2020.

The study included patients with isolated traumatic EH, as well as those with EH in combination with other traumatic intracranial lesions (cerebral contusion, subarachnoid hemorrhage, subdural and intracerebral hematoma). Postoperative EH were not included in the study.

The neurological status of the patients at admission was assessed using the Glasgow Coma Scale (GCS). The Glasgow Outcome Scale (GOS) was used to monitor their condition during the first month after discharge.

RESULTS

During the study period, 121 patients with EH were treated in the clinic, 13 (10.7%) of whom were ≥ 65 years. The female-to-male ratio was 8:5 (1.6:1). The age of the patients was in the range of 65 to 87 years, with an average of 69 years (mean age, 73.153 ± 7.777 , 95% CI 68.454, 77.854) ($p=0.0242$). The average age of the men was identical to the overall average age, while that of the women was slightly higher (70.5 years), (mean, 71.25 ± 6.112 , 95% CI 66.139, 76.361) (65-82) ($p>0.10$).

Ten patients (76.9%) were injured at home, 5 of whom fell down the stairs and 5 fell from their own height. Two

(15.4%) were injured in traffic accidents and one (7.7%) was hit by a falling tree. Six patients (46.2%) were transferred from other hospitals. The time to admission to the clinic after the injury is presented in **Table 1**.

Table 1. Time to hospital admission

Time to admission after the injury	n (%)
Up to 3 hours	1 (7.7)
3 to 6 hours	6 (46.2)
6 to 8 hours	1 (7.7)
8 to 12 hours	3 (23)
At 25 hours	1 (7.7)
At 60 hours	1 (7.7)

Almost all patients were physically independent before the trauma. The presence of concomitant diseases is presented in **Table 2**.

Table 2. Presence of concomitant diseases

Concomitant diseases	n (%)
Without concomitant diseases	3 (23)
Arterial hypertension	6 (46.2)
Bronchopneumonia	1 (7.7)
Diabetes mellitus, pulmonary emphysema and arterial hypertension	1 (7.7)
Chronic cholecystitis and gastritis	1 (7.7)
Cardiovascular, pulmonary, renal, and liver failure	1 (7.7)

The level of consciousness of patients at admission assessed by the GCS ranged from 5 points in one patient, 8-9 points in 7 patients, and 13-15 points in 5 patients. During the admission to the clinic, 6 patients (46.2%) were without neurological deficits, but 4 of them (30.8%) had symptoms of increased intracranial pressure of varying severity. In the remaining 7 patients (53.8%), there were focal neurological symptoms (hemiparesis/hemiplegia, sensomotor aphasia, peripheral paresis of the facial nerve) (**Table 3**).

The computed tomography scans showed that the majority of EH were localized mainly in the parietal region – pure parietal (n=3); temporoparietal (n=3), frontotemporoparietal (n=1), and parietooccipital (n=1). Two hematomas were located in the temporal and frontal areas and one in the occipital area. Associated brain lesions were found in 12 patients (92.3%). In 10 patients (76.9%), there was a skull fracture, in 10 (76.9%) – traumatic subarachnoid hemorrhage, in one (7.7%) – subdural hematoma, and in 5 (38.5%) – intracerebral hematoma (**Figs 1, 2**). Midline shift was present in 6 patients (46.2%).

In 10 patients (76.9%) the EH were evacuated surgically – in 8 (61.5%) by craniotomy and in 2 patients

Table 3. Clinical data at admission, discharge, and 30 days after discharge and the neuroimaging findings of the patients

No.	Sex/Age	Neurological status at admission	Hematoma localization	Midline displacement	Associated lesions	GCS and GOS at discharge and follow-up at day 30
1	F/66	GCS=8 Elevated ICP, W/oND	Temporal	No	SF, CC, CE, SAH, IH, PC	GCS=15 GOS=5 W/oND
2	F/69	GCS=13 Elevated ICP, W/oND, Disoriented	Temporoparietal	No	CC, CE, SAH	GCS=15 GOS=5 W/oND
3	F/65	GCS=14 Elevated ICP, W/oND	Temporal	No	SF, CC, CE, SAH	GCS=15 GOS=5 W/oND
4	F/82	GCS=8 Hemiparesis	Temporal	Yes	SF, CC, CE, SH, IH	GCS=14 GOS=4 Latent hemiparesis
5	F/78	GCS=8 Hemiplegia	Frontotemporoparietal	Yes	SF, CC, CE, SAH	GCS=15 GOS=3 Hemiparesis
6	M/87	GCS=8 CMA Hemiparesis	Frontotemporoparietal	Yes	CE	GOS=1
7	M/69	GCS=15 W/oND	Parietooccipital	No	CC, CE, SAH	GOS=1 HAI
8	M/69	GCS=15 PPF	Temporoparietal	No	SF, PC, CC, CE	GCS=15 GOS=4 PPF
9	M/69	GCS=8 SMA, Hemiplegia	Parietal	Yes	SF, CC, CE, SAH	GOS=1
10	F/72	GCS=5 Hemiplegia	Parietal	Yes	SF, CC, CE, SAH, IH	GCS=15 GOS=4 Slight hemiparesis
11	M/87	GCS=8 Hemiparesis	Parietooccipital	Yes	SF, PC, CC, CE, SAH, IH	GOS=1
12	F/72	GCS=15 Elevated ICP, W/oND	Parietal	No	SF, CC, CE, SAH	GCS=15 GOS=5 W/oND
13	F/66	GCS=9 Elevated ICP, W/oND	Frontal	No	SF, CC, CE, SAH, IH	GCS=15 GOS=5 W/oND

F: female; M: male; PC: pneumocephalus; ICP: intracranial pressure; W/oND: without neurological deficit; CC: cerebral contusion; CE: cerebral edema; SF: skull fracture; SAH: subarachnoid hemorrhage; SH: subdural hematoma; IH: intracerebral hematoma; SMA: sensorimotor aphasia; PPF: peripheral paresis of the facial nerve; HAI: hospital-acquired infection; GCS: Glasgow Coma Scale score; GOS: Glasgow Outcome Scale score

(15.4%) by single burr-hole trephination. Two patients were treated conservatively due to the small volume of the hematoma.

The outcome of treatment is presented in **Table 3**. At discharge, 9 patients (69.2%) had a GCS score of 15. At the follow-up exam 30 days after discharge, 5 patients (38.4%) were neurologically intact (GOS=5), 3 (23%) were moderately impaired (GOS=4), and one was dependent on foreign assistance (GOS=3). Four patients died (30.7%). Patient No. 6 died 24 hours after admission without undergoing surgery due to multiple organ failure. Patient No. 7 was admitted with EH and bronchopneumonia and died

at 13 days due to a hospital-acquired infection and subsequent multiple organ failure. Patient No. 9 had a concomitant chronic gastritis and cholecystitis. He underwent emergency surgery during which the EH was evacuated (**Fig. 2**). Nevertheless, his neurological status deteriorated and the patient died 5 days postoperatively. The last deceased patient suffered from diabetes mellitus and pulmonary emphysema. He underwent emergency surgery, but his postoperative condition did not improve, despite a total removal of the hematoma, and he died 5 days postoperatively.

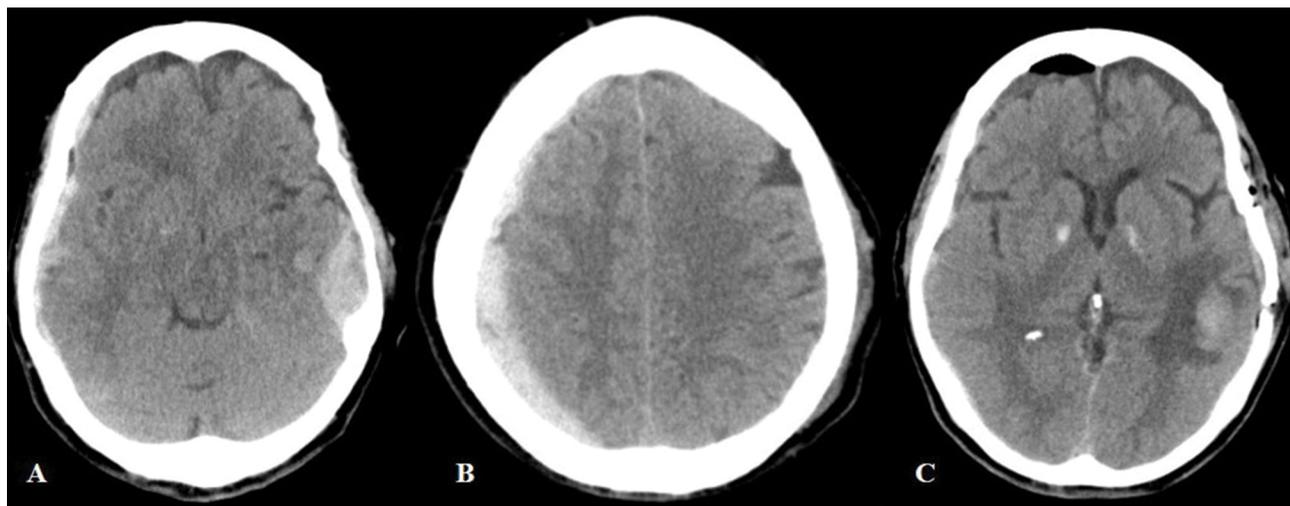


Figure 1. CT of an 82-year-old woman who fell down the stairs. **A)** Presence of an epidural hematoma in the left temporal region and a subdural hematoma in the right temporoparietal region; **B)** The location and size of the subdural hematoma were visualized; **C)** Post-operative CT shows the evacuation of the hematomas and the present brain contusion in the left temporal region.

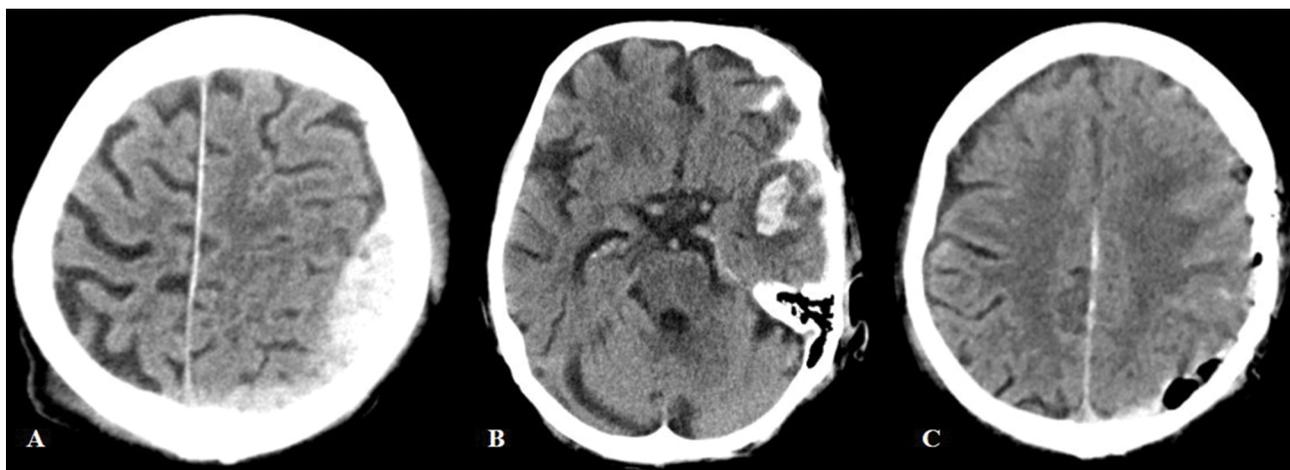


Figure 2. CT of a 69-year-old patient who fell from his own height at home. **A)** Presence of an epidural hematoma in the left parietal region and edema of the left cerebral hemisphere; **B)** Presence of a hemorrhagic contusion focus in the left temporal region and traumatic subarachnoid hemorrhage; **C)** Postoperative CT shows the evacuation of the hematoma.

DISCUSSION

The incidence of EH in elderly patients is low and ranges from 0.9% to 2.8%.^[1,6-8] The frequency of 10.8% in elderly patients that we found is significantly higher, which to some extent can be attributed to the increased proportion of this segment of the general population.

In younger people with EH, the male sex predominates, with the male-to-female ratio in the Ismail and Lasseini publication being 9:1, and in that of Ndoumbe et al. reaching 14.3:1.^[9,10] In elderly patients with EH, Hamlat et al. found a slight predominance of females (1.3:1), which is similar to the one we found (1.6:1).^[11]

While in young people, EH usually result from traffic accidents, in elderly patients they are usually caused by falls which is confirmed by our study.^[1,10]

Despite the presence of significant intracranial lesions at admission, the neurological status of elderly patients with EH may be intact or slightly abnormal. Nevertheless, acute deterioration is sometimes possible even after adequate evacuation of the hematoma, which is confirmed by our study.^[11] In our series, 5 (38.5%) had a GCS score of 13-15 points, 6 patients (46.2%) were without neurological deficit. Patient No. 7 was fully alert, without neurological symptoms, and with a small EH, but postoperatively gradually deteriorated and died.

The high incidence of EH-associated traumatic intracranial lesions in elderly patients confirms the statement that the resulting vertical deceleration during fall from height can cause significant brain injuries.^[11] It is difficult to determine the exact cause for neurological deterioration in patients with different intracranial traumatic lesions.^[111] In our

study, only one patient (No. 6) had an isolated EH, but with severe somatic concomitant diseases that led to his death.

Despite the fact that skull fractures are frequently associated with EH, their absence cannot rule out the presence of EH in all age groups. In three of our patients (Nos. 2, 6, and 7), no skull fractures were found.

There are many authors who accept certain neurological findings as prognostic factors in patients with EH.^[1,12] Most of them consider midline shift and compressed perimesencephalic cisterns (mainly cisterna ambiens) as important prognostic factors.^[12,13] Midline shift should be considered as a warning sign in elderly patients with EH. Similarly to Hamlat et al., we found that midline displacement was present in 85.7% of the patients with GCS \leq 8 points, while in those with GCS score of 13–15, this was usually absent.^[1]

According to Wintermark et al., the presence of severe cerebral edema and increased intracranial pressure impairs cerebral perfusion and is associated with poor treatment outcomes.^[14] Due to the frequent presence of brain atrophy, the elderly tolerate increased intracranial pressure better. Therefore, timely evacuation of the hematoma promotes favorable recovery (GOS=4-5), which was achieved in 8 of our patients (61.5%).^[15]

In young people, EH are most often located in the temporal region, while in elderly patients they usually affect the parietal region.^[1] This is due to the fact that with increased age the dura mater is less adherent to the inner lamina of the parietal bone, compared to the other regions of the cranial vault, which predisposes to its separation during direct impact. The parietal area was affected in 9 of our patients (69.2%).

Similarly to others, our indications for surgical treatment in patients with EH were the presence of midline shift, severe neurological deficits, low GCS scores, and rapid neurological deterioration.^[1,10]

We treated conservatively patients who had low-volume hematomas, lack of midline displacement, and absence of focal neurological deficit.

The outcome of treatment has improved significantly with the improvement of diagnostic methods and neuro-intensive care. On the other hand, the favorable outcome decreases with age at the background of increased number of elderly people with TBI.^[16-18] In addition to age, the outcome depends on the severity of TBI, the period from the trauma to treatment, and the presence of associated intracranial lesions and concomitant diseases.

According to Soon et al., the mortality rate due to EH varies from 1.2% to 30%.^[19] Out of 888 elderly patients with a severe TBI, Shimoda et al. found 41 (4.6%) with EH, 20 of whom were treated surgically and 21 conservatively.^[20] In the first group, the mortality rate was 75%, and in the second – 81%, and only 15% of the cases had a favorable outcome (GOS = 4-5). In contrast to these results, Hamlat et al. in a series of 14 patients aged \geq 70 years found only a 7.4% mortality rate and favorable outcome (GOS=4-5) in 64.3%, but the majority of their patients had a mild to moderate TBI.^[1]

The analysis of our results showed that good outcome (GOS=4-5 points) was achieved in 8 patients (61.5%). The mortality rate in our series was 30.8%, as 3/4 of the deceased patients had severe TBI upon admission and all were with significant associated lesions and/or serious comorbidities.

There are reports of better outcomes in elderly women with TBI, which was explained by higher levels of estrogen and progesterone that provides improved brain perfusion.^[21,22] At the same time, there are clinical and experimental studies that oppose these findings.^[23] Without being able to draw a definite conclusion, we must emphasize that in our series there was no female death, although the average age of women in our series was higher than that of the men while the severity of TBI was approximately the same.

CONCLUSION

Epidural hematomas in elderly patients are rare, generally resulting from falls. Surgery is indicated for cases with low GCS score, rapid neurological deterioration and presence of midline shift. Conservative treatment should be preserved for patients with low-volume, well-tolerated hematomas with close neurological and CT monitoring. Despite the importance of age as a prognostic factor, good outcome can be achieved in the majority of elderly patients with EH.

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Competing Interests

The authors have declared that no competing interests exist.

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Краткосрочный результат лечения пациентов пожилого возраста с эпидуральными гематомами

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Резюме

Введение: Имеются обширные литературные данные, посвященные внутричерепным эпидуральным гематомам, поражающим лиц молодого и среднего возраста, но исследования, посвященные их характеристикам у пожилых пациентов, немногочисленны, предполагая, что пожилой возраст является плохим прогностическим фактором.

Цель: Цель настоящего исследования состояла в том, чтобы рассмотреть характерные особенности этиологии, клинической картины, течения заболевания и исхода в серии случаев эпидуральных гематом у пожилых пациентов.

Материалы и методы: Этиология, клиническая картина, результаты нейровизуализации, лечение и исходы у пожилых пациентов, оперированных по поводу травматических эпидуральных гематом, были исследованы в Клинике нейрохирургии Университетской больницы Святого Георгия в Пловдиве в период с января 2015 г. по декабрь 2020 г.

В исследование включались пациенты с изолированной травматической эпидуральной гематомой, а также пациенты с эпидуральной гематомой в сочетании с другими травматическими внутричерепными поражениями (ушиб головного мозга, субарахноидальное кровоизлияние, субдуральная и внутримозговая гематома). Послеоперационные эпидуральные гематомы в исследование не включались.

Неврологический статус больных при поступлении оценивали по шкале комы Глазго. Шкала исходов Глазго использовалась для наблюдения за их состоянием в течение первого месяца после выписки.

Результаты: 121 пациент с эпидуральными гематомами был прооперирован за период исследования в Клинике нейрохирургии Университетской больницы Святого Георгия, Пловдив. Из них 13 (10.7%) были лица старше 65 лет (8 женщин и 5 мужчин, средний возраст 69 лет). Наиболее частой причиной травмы было падение. У 12 пациентов (9.9%) были сочетанные черепно-мозговые поражения и только у одного — изолированная эпидуральная гематома. При поступлении 6 больных (4.9%) неврологически интактны. Десять больных пролечены хирургическим путём, двое – консервативно. Хороший результат (GOS = 4–5) достигнут у 8 больных (6.6%), неблагоприятный – у 1 больного, умерли 4 пациента (3.3%).

Заключение: Хороший исход у пожилых пациентов с эпидуральной гематомой достигается в 2/3 случаев, несмотря на негативное влияние возраста как прогностического фактора.

Ключевые слова

пожилой возраст, эпидуральная гематома, исход, оперативное вмешательство, черепно-мозговая травма