



Analyses of clinical prognostic factors in operated traumatic acute subdural hematomas

Ameliyat edilen travmatik akut subdural kanamalı hastalarda klinik prognostik faktörlerin analizi

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BACKGROUND

Traumatic acute subdural hematoma is the most lethal of all head injuries.

METHODS

In this study, 113 patients with the diagnosis of posttraumatic acute subdural hematoma, who were operated between 1998 and 2006, were reviewed retrospectively. Statistical analysis was performed to detect any effects of the variables of age, Glasgow Coma Scale (GCS) score on admission, time interval between the trauma and operation, and abnormality in the pupil reaction on the disease mortality and morbidity.

RESULTS

Results obtained in the study are discussed and compared with the related current literature. The overall mortality in 113 patients was 56.6%.

CONCLUSION

According to the results, the most important determinants of the prognosis are GCS score of the patient on admission, abnormality in pupil reaction, timing of the operation, and the patient's age.

Key Words: Acute subdural hematoma; prognosis; prognostic factors; trauma.

AMAÇ

Travmaya bağılı akut subdural kanamalar kafa travma tanılarında en ölümcül olanıdır.

GEREÇ VE YÖNTEM

Bu çalışmada 1998 ile 2006 yılları arasında travma sonrası akut subdural kanama tanısı ile ameliyat edilen 113 hasta geriye yönelik olarak incelendi. Başvuru sırasındaki Glasgow Koma Skalası (GKS) Skoru, hasta yaşı, travma ile ameliyat arasında geçen süre ve pupilla reaksiyonundaki anormalliklerin mortalite ve morbidite üzerindeki etkilerini saptamak amacıyla istatistiksel analiz yapıldı.

BULGULAR

Elde edilen sonuçlar güncel literatürle karşılaştırılarak tartışıldı. Yüz on üç hastadaki toplam mortalite %56,6 olarak bulundu.

SONUÇ

Başvuru sırasındaki GKS skoru, hasta yaşı, travma ile ameliyat arasında geçen süre ve pupilla reaksiyonundaki anormalliklerin prognozun belirlenmesinde önemli olduğu sonucuna varılmıştır.

Anahtar Sözcükler: Akut subdural kanama; prognoz; prognozistik faktörler; travma.

Posttraumatic acute subdural hematoma (PASH) remains one of the most difficult tasks faced by neurosurgeons because of the high mortality and morbidity of the disease (55-79%).^[1] Considering that the rate of mortality was 76-90% between 1930 and 1940, the

decline in this rate to 50%, while representing significant progress, cannot be accepted as a satisfactory level. For this reason, considerable research has been devoted to studying the prognostic factors in patients with PASH, but differing results have been reported.

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Cooper and Seeling reported that the underlying brain injury is a more important determinant than the PASH itself.^[2,3] This study included 113 cases who were operated due to PASH.

The aim of this study was to assess the effects of variables such as age, Glasgow Coma Scale (GCS) score on admission, time interval between the trauma and operation, and abnormality in the pupil reaction on the mortality and morbidity and to discuss the results in the context of the current literature.

MATERIALS AND METHODS

This retrospective study comprised 113 patients who were operated due to PASH between 1998 and 2006 in our clinic. The criteria for inclusion were patients accepted to the hospital with head injury who underwent surgery following a diagnosis of PASH with the assistance of computerized cranial tomography (CCT) (Fig. 1).

Patients with firearm injury and those with life-threatening major organ injuries were excluded. Of the patients included, 90 were males (79.6%), with a mean average age of 32. Fifty-two (45.9%) were admitted to the hospital with a history of traffic accident, 48 with falling injury (42.5%), and 13 with an assault injury (11.8%).

The patients were divided into three groups according to their calculated GCS scores on admission. The patients with GCS scores between 3-8 were classified in Group I, 9-12 in Group II and above 13 in Group III. Diagnoses were made in all patients with the assistance of CCT. The hematoma was completely evacuated with craniotomy in all cases. The patients were followed up for one year, and the results were quantified according to the Glasgow Outcome Scale (GOS) as: 1, dead; 2, vegetative state; 3, severe neurological impairment; 4, moderate impairment; 5, no impairment). At the end of one year, patients demonstrating increases in GCS scores and in GOS scores to the level of 4 (moderate disability=disabled but independent=travel by public transportation, able to work in sheltered setting=exceeds mere ability to perform "activities of daily living") were accepted as having undergone a functional recovery (FR).^[4]

The effects of age, GCS scores on admission, abnormal pupil reaction, and timing of the operation on mortality and morbidity were evaluated. SPSS for Windows version 13.0 was used for statistical analysis. In the data analysis, in addition to definitive statistical methods (standard deviation, median), the chi-square test and correlation test for two variables were used for comparison of the qualitative data. The results were evaluated at a 95% interval, and values of $p < 0.05$ were accepted as indicating statistical significance.



Fig. 1. Cranial CT of a frontotemporoparietal acute subdural hematoma.

RESULTS

Of the 113 patients who were operated and included in the study, 63 died. A FR was reported in 30 patients (26.5%). A further 20 patients (18%) developed considerable defects and progressed into vegetative state.

While traffic accidents led to the trauma in patients below the age of 60, above this age the main cause was impact injury.

Mortality and FR rates according to age were 34.7% and 43.4% ($p=0.438$), respectively, in the age group 0-17, 57.5% and 24.2% ($p < 0.0001$), respectively, in the age group 18-60 and 75% and 16.6% ($p=0.0001$), respectively, in the age group above 60 (Table 1).

The rates of mortality and FR according to GCS scores upon admission were 70.2% and 7.0% ($p < 0.0001$) in Group I, 54.3% and 28.5% ($p < 0.022$) in Group II and 23.8% and 76.2% in Group III ($p < 0.016$), respectively (Table 2).

Regarding mortality and FR rates according to the time interval between the trauma and operation, there was a 36.7% mortality and 56.7% FR ($p < 0.003$) in patients operated within the first 4 hours compared to

Table 1. Mortality and functional recovery rates according to age group

Age	0-17	18-60	>60	Total
Number of patients	23	66	24	113
Death	8	38	18	64
Functional recovery	10	16	4	30
Mortality (%)	34.7	57.5	75	56.6
Functional recovery (%)	43.4	24.2	16.6	26.5

Table 2. Mortality and functional recovery rates according to GCS scores on admission

	Number of patients	Death	FR	Mortality (%)	FR (%)
Group I (GCS 3-8)	57	40	4	70.2	7
Group II (GCS 9-12)	35	19	10	54.3	28.5
Group III (GCS 13-15)	21	5	16	23.8	76.2
Total	113	64	30	56.6	26.5

FR: Functional recovery; GCS: Glasgow Coma Scale.

59.3% mortality and 15.7% FR ($p<0.0001$) in those operated after the 4th hour following trauma (Table 3).

Mortality and FR rates according to the abnormality in pupil reaction were statistically significant ($p<0.001$). In patients whose pupil reactions were evaluated as normal, mortality was 42.8% and FR was 42.8% ($p<0.006$). In those evaluated with an abnormality in pupil reaction, these values were 74.0% and 6.0% ($p<0.0001$), respectively (Table 4).

DISCUSSION

Wilberger and colleagues^[4] reported that the time interval between the operation and trauma and control of intracranial pressure were the most important factors among the variables (age, sex, neurological examination on admission, etc.) that can affect mortality in PASH.

Seelig and colleagues^[3] reported a considerable decline in the rates of mortality and morbidity of the patients operated in the first four hours after the trauma compared to those operated upon later (mortality rate of 30% and FR rate of 65%). The authors pointed out that in conditions in which the time interval was more than four hours, the mortality rate rose to 85% and the

FR rate remained at 7%. This report suggests that the timing of the surgery for evacuation of the hematoma is the unique and most critical controllable variable.

Stone and colleagues^[5] reported no significant difference between the results of the operations carried out in the first four hours following the trauma and those performed beyond this time. Haselberger and colleagues^[6] noted that when the time interval between admission and operation is longer than two hours, the mortality rate rose from 47% to 80%. Howard and colleagues^[7] indicated that it is possible to achieve mortality rates of 18% and FR rates of 66%. This study found a 36.7% mortality rate and 56.7% FR for the patient group operated upon in the first four hours after trauma, and rates of 63.8% and 15.7%, respectively, in those operated beyond the fourth hour following trauma. When the FR and mortality rates were analyzed statistically, a significant difference was found between the two groups ($p=0.0001$). In other words, our study demonstrates that in patients with PASH, the prognosis is affected by the timing of the operation. Those operated on soon after trauma have decreased mortality and there is also a considerable rise recorded in FR.

Table 3. Mortality and functional recovery (FR) rates according to time interval between trauma and operation

Time interval between trauma and operation	Number of patients	Death	FR	Mortality (%)	FR (%)
0-4 hours	30	11	17	36.7	56.7
>4	83	53	13	63.8	15.7
Total	113	64	30	56.6	26.5

FR: Functional recovery.

Table 4. Mortality and functional recovery rates according to pupil reaction

Pupil reaction	Number of patients	Death	FR	Mortality (%)	FR (%)
Normal	63	27	27	42.8	42.8
Abnormal	50	37	3	74	6

FR: Functional recovery.

There is a strong correlation between the GCS score on admission and prognosis of PASH.^[8,9] Phuenpathom and colleagues^[10] reported that the GCS score is one of the most critical factors. In this study, the mortality and FR rates of patients according to GCS scores on admission were 70.2% and 7.0%, respectively, in Group I, 54.3% and 28.5% in Group II and 23.8% and 76.2% in Group III. Differences between these results were statistically significant ($p < 0.001$). In patients with higher GCS scores on admission, the mortality was low and FR rates were high.

Anisocoria and lack of pupil reaction are indicators of a transtentorial herniation and are associated with a higher mortality. Nevertheless, traumatic mydriasis and oculomotor nerve damage should be distinguished from this condition. In our study, the mortality rate was 42% and the FR rate was 42.8% in patients with normal pupil reactions, while these rates were estimated as 74% and 6.0%, respectively, in those who had abnormal pupil reaction on admission. Differences in mortality and FR rates between the two groups were statistically significant ($p < 0.0001$). These results are similar to other research findings in the literature.^[8,10] It is clear that abnormal pupil reaction is a strong determinant of the prognosis in PASH and negatively affects the results.

Posttraumatic acute subdural hematomas (PASHs) are more frequently reported in males than females in the literature.^[2,11] In this study, 90 of the patients were male (79.6%) and the total mortality rate was found to be 56.3%, which is similar to the rates in the literature.^[2,8,11]

In this study, mortality and FR rates were 34.7% and 43.4% in the age group 0-17, 57.5% and 24.2% in the age group 18-60, and 75% and 16.6% in the age group >60. There was a statistically significant difference between mortality and morbidity rates of patients above the age of 18 and those younger than 18. Wilberger and colleagues^[4] reported a statistically significant difference between mortality and morbidity rates of patients below 34 years and those older than 65 years. Nevertheless, in some of the studies that have reported that the age of the patient affects mortality, there was no significant difference in terms of statistics.^[6]

In the acute subdural hematoma guideline published in 2006 by Bullock and colleagues,^[12] it is stated that patients with hematomas thicker than 10 mm or who have midline shift greater than 5 mm should be operated without considering the GCS. Craniotomy is

strongly suggested as soon as possible if a decline of 2 points occurs in the GCS score, if the intracranial pressure is greater than 20 mmHg, or if an abnormal pupil reaction is detected, despite a thickness of hematoma greater than 10 mm and midline shift less than 5 mm. Our clinical experience is similar to this report. Patients who have a detected mass effect have to be operated upon urgently.

In conclusion, in patients with PASH, the GCS scores, abnormal pupil reaction on admission, age, and timing of the operation are all prognostic determinants. A rise in intracranial pressure should be kept under control, CCT has to be taken as soon as possible, and patients should be operated upon urgently if there is an indication for surgery.

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