

Clinical Observations and Prognostic Evaluation of Spontaneous Cerebellar Hemorrhages: A Report of 29 Cases

Spontan Kanamalarda Klinik Gözlem ve Prognostik Değerlendirme: 29 Olgu Sunumu

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ABSTRACT Objective: The prognostic factors in spontaneous cerebellar hemorrhages are advanced age, arterial blood pressure at the time of admission, level of consciousness, size of the hematoma, intraventricular bleeding, presence of hydrocephalus, pressure on the fourth ventricle, and blood in the basal cisterns. This study evaluated the etiological factors, neurological symptoms and findings at the time of admission, the clinical course, and the neuroradiological features in 29 cerebellar hemorrhage cases and the relationship between these parameters. **Material and Methods:** Twenty-nine cases with acute cerebellar hemorrhage who were admitted to the Department of Neurology at the Ankara Numune Training and Research Hospital from January 2000 to August 2003 were evaluated retrospectively. **Results:** Cerebellar hemorrhages were common in patients older than 70 years (48.3%). Hypertension (89.7%) was the most common etiological factor. The main presenting symptoms were nausea and vomiting (72.4%). The prognosis was worse in female patients, and in cases with hypertension, a hematoma larger than 30 x 30 mm, pressure on the fourth ventricle and right hemispheric localization. There was no statistically significant relationship between clinical deterioration and neuroradiological findings ($p > 0.05$). The mortality rate was 37.9%. **Conclusion:** In our series, the major prognostic factors were the level of consciousness at the time of admission, hypertension, size of the hematoma, and hemispheric localization.

Key Words: Prognosis; tomography; cerebellar hemorrhage, traumatic; Glasgow coma scale

ÖZET Amaç: Spontan serebellar kanamalarda prognostik faktörler yaş, başvuru anındaki arteriyel kan basıncı, bilinç düzeyi, hematoma boyutu, intraventriküler kanama, hidrosefali, 4.ventriküle baskı ve bazal sisternada kanamanın bulunmasıdır. Bu çalışmada, 29 serebellar kanama olgusunda etiyolojik nedenler, başvuru anındaki bulgular, klinik seyir, nöroradyolojik özellikler ve bu parametreler arasındaki ilişki incelendi. **Gereç ve Yöntemler:** Ocak 2000 ile Ağustos 2003 tarihleri arasında Ankara Numune Eğitim ve Araştırma Hastanesine akut serebellar kanama ile başvuran 29 olgu retrospektif olarak incelendi. **Bulgular:** Serebellar kanamalar sıklıkla 70 yaşın üzerindeki (%48.3) olgularda izlendi. Hipertansiyon (%89.7) en sık etiyolojik neden idi. Başvuruya en sık neden olan belirti bulantı ve kusma idi (%72.4). Kadın olan, hipertansiyonu bulunan, kanama boyutu 30x30 mm'den büyük, 4.ventriküle baskı saptanan ve sağ hemisfer lokalizasyonu bulunan olgularda prognozun kötü olduğu saptandı. Klinik kötüleşme ile nöroradyolojik bulgular arasında istatistiksel bir ilişki bulunmadı ($p > 0.05$). Ölüm sıklığı %37.9 idi. **Sonuç:** Serimizdeki temel prognostik faktörler, başvuru anındaki bilinç düzeyi, hipertansiyon, hematoma boyutu ve hemisferik lokalizasyon olarak belirlendi.

Anahtar Kelimeler: Prognoz; tomografi; serebellar kanama; Glasgow koma skalası

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Non-traumatic cerebellar hemorrhages are called spontaneous cerebellar hemorrhages and constitute 10% of all intracranial hemorrhages.^{1,2} Hypertension (HT) is the most common cause, but other

etiological factors include advanced age, aneurysm, arterio-venous malformation, vasculitis, diabetes mellitus (DM), hepatic disease, bleeding diathesis (hemophilia, leukemia, thrombocytopenia), oral anticoagulants, smoking, alcohol, and amphetamine and cocaine usage.^{1,3,4} Previous studies have implicated advanced age, arterial blood pressure at the time of admission, level of consciousness, and neurological condition as major prognostic factors.^{3,4} The radiological findings previously correlated with a poor outcome include hemorrhage of more than 3 cm in diameter, midline location, intraventricular hemorrhage, presence of hydrocephalus, and obliterated fourth ventricular and basal cisterns.^{2,4-7} Regardless of the treatment regimen, these hemorrhages have mortality rates between 20 and 75%.^{8,9}

Magnetic resonance imaging (MRI) is not markedly superior to cranial computerized tomography (CT) in the early diagnosis of hemorrhages. A non-contrast cranial CT easily demonstrates blood invasion of the brainstem, the presence of hypertensive hydrocephalus, blood in the ventricular system, and the size of the hematoma. Furthermore, CT is quicker and easier to perform than MRI.^{4,10}

This study evaluated the etiological factors, symptoms, and findings at the time of admission and discharge, the clinical course, and the neuro-radiological features of cerebellar hemorrhage and examined the relationships between these parameters and prognostic factors.

MATERIAL AND METHODS

Twenty-nine cases with acute cerebellar hemorrhage who were admitted to the Department of Neurology at the Ankara Numune Training and Research Hospital, Ankara, Turkey from January 2000 to August 2003 were evaluated retrospectively. In all cases, a standard neurological examination was conducted at the time of admission. Complete blood count and blood chemistry studies were performed and an electrocardiogram, posteroanterior chest X-ray, and cranial CT were obtained. Serum hematological laboratory tests and vasculitis markers were all within normal limits. The patients did not use oral anticoagulants or any

other drugs such as alcohol, amphetamine or cocaine. Aneurysm, arterio-venous malformation, vasculitis and cerebral venous thrombosis were excluded with cranial MRI angiography and venography.

The patients were evaluated using the Glasgow coma scale (GCS; <8 and ≥8) and Rankin scale (0-5) at the times of admission and discharge. The patients were also evaluated for the presence of etiological factors such as HT, DM, heart disease, bleeding diathesis, hyperlipidemia, smoking, alcohol consumption, and anticoagulant use. Cranial CT was used to determine the location of the bleeding (cerebellar hemispheres, vermis or both) and size of the lesion, as well as the presence of intraventricular bleeding, hydrocephalus and blood in the fourth ventricle, and the patency of the basal cisterns. The family members in the majority of patients did not give informed consent for surgical evacuation and in the rest surgeons insisted on medical therapy. All patients were treated conservatively.

STATISTICAL ANALYSIS

All data were entered into a database for later analysis (SPSS version 11.0 for Windows; SPSS; Chicago, IL, USA). Chi-square analysis was used to examine differences in the frequencies of categorical variables. Multivariate logistic regression analysis was performed on appropriate variables. Statistical significance was established at $p < 0.05$.

RESULTS

Sixteen (55.2%) female and 13 (44.8%) male patients between the ages of 43-89 years (mean \pm SD, 68.17 ± 10.9) were included in the study. The mean age of the female patients was 66.69 ± 9.58 years and that of the male patients was 70.0 ± 12.5 years. Fourteen patients were older than 70 years of age (48.3%), ten were between 60 and 70 years (34.5%), four were between 50 and 60 years (13.8%), and one was 43 years old (3.4%). The ages of the patients were summarized in Figure 1.

The clinical features of the 29 patients with cerebellar hemorrhage were listed in Table 1. On etiological evaluation, HT was present in 89.7% of the

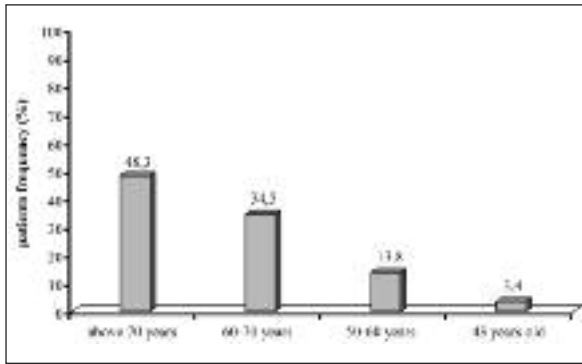


FIGURE 1: The ages of the patients.

TABLE 1: Clinical features in 29 cases.

Clinical Parameter	Patients (%)
Gender ratio, male:female	55.2%:44.8%
Mean age, years	68.17 ± 10.9
Etiological factors	
Hypertension	89.7%
Diabetes Mellitus	24.1%
Hyperlipidemia	17.2%
Heart disease	10.3%
Alcohol consumption	6.9%
Smoking	3.4%
Symptoms at admission	
Nausea and vomiting	72.4%
Vertigo	41.3%
Altered level of consciousness	31.0%
Loss of consciousness	27.5%
Imbalance	20.7%
Headache	17.2%

patients, DM in 24.1%, hyperlipidemia in 17.2%, heart disease in 10.3%, alcohol consumption in 6.9%, and smoking in 3.4%. None of the patients were receiving anticoagulant treatment, and none had bleeding diathesis.

The main symptoms of the patients at the time of admission were nausea and vomiting (72.4%). Other symptoms, in decreasing order of frequency, included vertigo, altered level of consciousness, loss of consciousness, imbalance, and headache.

The coma and stroke scale scores on admission and at discharge were presented in Table 2. At the time of admission, 72.4% of the patients had a GCS score ≥ 8 and the remaining patients scored < 8 . At the time of discharge, 62.0% of the patients scored ≥ 8 on the GCS and 38.0% scored < 8 .

Figure 2 shows the relationships between the risk factors and the GCS score on admission. There was a significant relationship between the GCS score on admission and gender ($p = 0.044$). Among those with a GCS score < 8 , 75% were male and 25% were female, whereas for cases with a score ≥ 8 , 66.7% were female and 33.3% were male. No statistically significant relationship was found between the GCS score at baseline and age, HT, DM, hyperlipidemia, smoking, heart disease, alcohol use or the presence of multiple diseases ($p > 0.05$). However, there was a significant relationship between the GCS score at discharge and HT ($p = 0.019$). Of the patients with HT, 69.2% had a GCS score ≥ 8 at discharge. Moreover, 72.7% of patients with a GCS score < 8 had HT, whereas all patients with a GCS score ≥ 8 were hypertensive. No statistically significant correlation was found between the GCS score at discharge and any other risk factor.

No significant relationship was found between the Rankin score on admission and any risk factor ($p > 0.05$). There was a statistical correlation between the Rankin score at discharge and alcohol use ($p = 0.004$); 33.3% of patients with a Rankin score of 3-5 at discharge consumed alcohol, and those with a score of 0-2 did not.

TABLE 2: Frequency of coma and stroke scale scores at admission and discharge.

	Patients (%)
GCS ≥ 8 at admission	72.4%
GCS score < 8 at admission	27.6%
GCS score ≥ 8 at discharge	62.0%
GCS score < 8 at discharge	38.0%
Rankin score 0-2 at admission	31.0%
Rankin score 3-5 at admission	69.0%
Rankin score 0-2 at discharge	79.2%
Rankin score 3-5 at discharge	20.8%

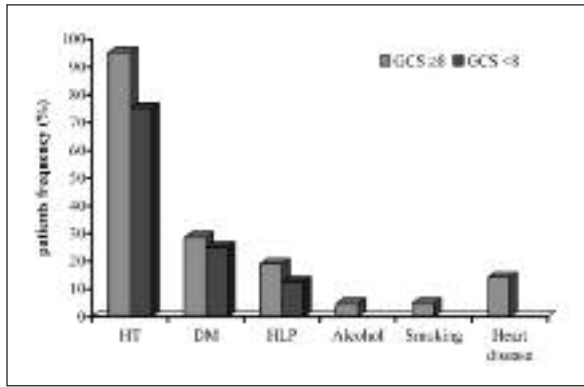


FIGURE 2: Relationship between risk factors and the GCS score at admission. HT: Hypertension; DM: Diabetes mellitus; HLP: Hyperlipidemia.

TABLE 3: Relationship between hemorrhage localization and the GCS score at admission.

Localization	GCS ≥ 8	GCS < 8
Right hemisphere	47.6%	37.5%
Left hemisphere	38.1%	37.5%
Bilateral	9.5%	25%
Vermis	4.8%	--

The relationship between hemorrhage localization and the GCS score on admission or at discharge was presented in Table 3. On cranial CT, the hemorrhage was localized at the right cerebellar hemisphere in 44.8% of the patients, at the left cerebellar hemisphere in 37.9%, bilaterally in 13.8%, and primarily at the vermis in 3.4%. In this study, the localization of the hematoma did not influence the GCS or Rankin score at baseline or discharge ($p > 0.05$). Nevertheless, all patients with a vermis hemorrhage had a GCS score ≥ 8 at baseline and discharge, although the most common hemorrhage localization in patients with a GCS score ≥ 8 was the right hemisphere.

Pressure on the fourth ventricle was present in 86.2% of the patients, blood in the basal cisterns in 65.5%, intraventricular bleeding in 48.3% and hydrocephalus in 24.1%. Table 4 shows the relationship between the neuroradiological findings and the GCS score on admission. No significant relationship was present between the GCS score at baseline or discharge and any neuroradiological finding

($p > 0.05$ for each). Although the relationship was not significant, patients with a GCS score < 8 at baseline or discharge tended to exhibit hydrocephalus more frequently than patients with a GCS score ≥ 8 on admission (62.5 vs. 9.55, respectively) or at discharge (45.5 vs. 11.1%, respectively). While there was a significant correlation between the presence of hydrocephalus and the Rankin score on admission ($p = 0.042$), there was no relationship between the presence of hydrocephalus and the Rankin score at discharge ($p > 0.05$). All patients with hydrocephalus had a Rankin score of 3-5 at baseline and no patient with a Rankin score ≤ 2 on admission exhibited hydrocephalus.

The hematoma was larger than 30×30 mm in 58.6% of the patients. Hematoma size was not related to the GCS score on admission ($p > 0.05$) but was related to the GCS score at discharge ($p = 0.032$). There was no relationship between hematoma size and the Rankin score on admission or discharge ($p > 0.05$). The results of the statistical analysis of factors influencing outcome were presented in Table 5.

Eleven (37.9%) patients died during the study. In the cases with a fatal outcome, the symptoms and findings at baseline were nausea, vomiting, vertigo, and progressive loss of consciousness, with

TABLE 4: Relationship between neuroradiological findings and the GCS score at admission.

Finding	GCS ≥ 8 (n = 21)	GCS < 8 (n = 8)
Intraventricular bleeding	42.8%	62.5%
Hydrocephalus	0.95%	62.5%
Blood in the basal cisterns	66.6%	62.5%
Pressure on the fourth ventricle	85.7%	87.5%

TABLE 5: Results of the statistical analysis of the factors influencing outcome.

GCS score at admission and gender	$p = 0.044$
GCS score at discharge and hypertension	$p = 0.019$
GCS score at discharge and hematoma size	$p = 0.032$
Rankin score at discharge and alcohol use	$p = 0.004$
Rankin score at admission and hydrocephalus	$p = 0.042$

nausea and vomiting being the most common (72.7%). With regard to the presence of the risk factors in those who died, 72.7% had HT, 18% had DM, 9% had heart disease and 9% smoked. None of the remaining risk factors were present. Of the patients who died, 54.5% had a GCS score <8 and 45.5% had a GCS score ≥8. On admission, the hemorrhage was on the right side in 54.5% and on the left side in 45.5%. The hematoma in the fatal cases had a mean size of 49 × 32 mm and was larger than 30 × 30 mm in all but two cases. Pressure on the fourth ventricle was the most common neuroradiological finding (81.8%) and hydrocephalus was the least common (45.4%).

DISCUSSION

Cerebellar hemorrhages are easily diagnosed owing to the advent of computerized tomography.¹¹ In our series, cerebellar hemorrhage was most commonly observed in patients aged 70 years or more and nausea and vomiting were the major complaints. Most of our patients were in the 6th to 8th decades of life, which concurs with previous studies.^{4,12,13} Nevertheless, the tendency for cerebellar hemorrhage to occur in the elderly does not itself lead to a poor prognosis, as we found no significant difference in the clinical course of the disease between the four age groups in our study.

Gonzalez-Garcia reported that the most common symptom at the time of admission was headache, with a frequency of 90%, whereas nausea and vomiting were the most common presenting symptoms in our series.¹⁴ In accordance with previous studies, HT was the most common etiological factor.^{3,15} In our study, the risk factors for hemorrhage were, in decreasing order, HT, DM, hyperlipidemia, heart disease, alcohol consumption, and smoking. Patients with HT on admission usually had the worst outcome at follow-up. The clinical picture at the time of admission was less favorable in women and the use of alcohol led to more severe

neurological deficits during the course of the disease.

Pressure on the fourth ventricle, blood in the basal cisterns and intraventricular hemorrhage were the most common radiological findings; hydrocephalus was less frequent. These results agree with those of DaPian et al, whereas hydrocephalus had a more important role as a prognostic factor in other studies.^{12,16} In contrast, Alvarez-Betancourt et al reported that neurological status and degree of fourth ventricle compression were the most important factors affecting patient management.¹⁵ Pressure of fourth ventricle was observed more often in the cases with a fatal outcome.

In our study, the mortality rate was higher in patients with a larger hematoma or a lower GCS score. The mortality was higher with right hemisphere involvement, but the frequency of right hemisphere involvement was greater on admission. No mortality occurred in patients with pressure on the vermis, due to bilateral hemispheric involvement. We found that the localization of the hematoma did not influence the admission or discharge GCS score, although the patients with hematomas in the vermis had a worse outcome than patients with hemispheric lesions did. Some studies reported that patients with hematomas in the vermis did not have a worse outcome, whereas others found that vermian localization was a mortality predictor for patients at risk of neurological deterioration.^{15,16} This is because vermian hematomas are closer to the brainstem and the cerebrospinal fluid pathways.⁴

According to earlier studies, the level of consciousness, the presence of HT and the size of the hematoma were significant prognostic factors, but hemispheric localization had no effect.^{2,4,5} We believe that the prognostic factors in cerebellar hemorrhages are the level of consciousness at the time of admission, the size of the hematoma, and the hemispheric localization. Additional studies with more patients are needed to resolve this issue.

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