

CORRELATION BETWEEN EARLY AND LATE EPILEPTIC FITS DURING AND AFTER STROKE AND HEART DISEASES

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SUMMARY – Stroke is the leading cause of mortality and the main cause of disability in adults in Europe. According to the American Heart Association, “the profile of apoplectic personality is determined by systolic blood pressure greater than 160 mm Hg, diastolic blood pressure higher than 95 mm Hg, family history of cardiovascular diseases, hypercholesterolemia, smoking, alcohol abuse and diabetes mellitus”. The aim of this retrospective study was to assess the correlation between early and late epileptic seizures during and after stroke, and some heart diseases associated with hypertension. Ten-year records (January 1, 1989 till December 31, 1998) of the University Department of Neurology, Sarajevo University Clinical Center, were examined. There were 7001 stroke patients (53.6% with cerebral thrombosis, 17.35% with embolic etiology, 21.96% with intracerebral hemorrhage, and 1.17% with subarachnoid hemorrhage), with a 3.38% incidence of symptomatic epileptic seizures. The following cardiac diseases were considered relevant for the study purpose: absolute arrhythmia, subdecompensated heart state, well treated cardiac decompensation, angina pectoris, postmyocardial infarction state, and extrasystoles. Results revealed a statistically significant difference in the correlation with cardiac diseases between patients with early and late epileptic seizures. The patients with early epileptic fits had severe heart problems compared to those with late seizures. The former suffered from angina pectoris, heart decompensation and chronic subdecompensated state, yielding a ratio of 1.1 to 0.6. There was no statistically significant difference between the groups according to absolute arrhythmia. Study results suggested the patients with cerebrovascular disease and early epileptic fits to have a significantly higher rate of heart problems compared to stroke patients with late epileptic fits, in whom the morphological changes of the brain appeared neurophysiologically to act as an epileptogenic focus.

Key words: *Cerebral infarction – complications; Brain – physiopathology; Seizures – etiology; Epilepsy – etiology; Retrospective studies*

Introduction

Stroke is a crisis of cerebrovascular circulation and central nervous system functions, at the same time or consequentially also a crisis of other systems, primarily cardiovascular and respiratory systems. Clinically, stroke is focal neurologic dysfunction of the central nervous system with

an acute onset, which is the consequence of a pathologic disorder of vascular origin. According to the American Heart Association (AHA) statement from 1996, the risk factors for stroke are divided into changeable and unchangeable ones.

Changeable risk factors for stroke are:

- hypertension (blood pressure > 165 mmHg / > 95 mmHg)
- heart diseases: atrial fibrillation, infectious endocarditis, mitral stenosis, repeated wide heart infarction
- smoking

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- transient ischemic attack
- asymptomatic carotid stenosis
- diabetes mellitus
- hyperthrombocystinemia
- left heart hypertrophy

Unchangeable risk factors are:

- age
- sex
- hereditary factors for cerebrovascular disease
- relationship
- climate

Risk factors for intracerebral and subarachnoid hemorrhage are also divided into changeable and unchangeable ones.

Unchangeable risk factors are:

- age
- sex
- relationship
- ethnicity

Changeable risk factors are:

- hypertension
- smoking
- alcohol consumption
- anticoagulants
- amyloid angiopathy
- hypercholesterolemia
- use of contraceptives

According to the Framingham Study, the consequences of stroke are various. They can be classified into the category of clinical consequences (different motor disturbances, lack of orientation, communication disturbances, unilateral or bilateral motor disturbances, problems with vision and sensitivity, fecal and urinary incontinence), and of the quality of life and degree of disability, i.e. capability to urinate independently, to take food, to dress, to take a bath, to make bed, to be capable or incapable to walk independently, to be partially dependent, completely dependent, or mentally dependent^{1,2}.

Early epileptic seizures are seizures that occur in the acute phase of stroke, which lasts from day 1 to day 14 of the disease onset. This group of seizures does not include so-called 'occasional seizures', i.e. seizures that the stroke begins with but do not recur either in the acute phase or later. Late seizures are those that occur from day 15 of the disease onset and up to 5 years of stroke. Epileptic manifestations may occur consequentially to various stroke types and subtypes.

Etiologically, epilepsy has specific characteristics in the elderly. Aside from brain tumor, a damage to cerebral vascularization is frequently reported as an etiologic factor³⁻⁵. Vascular damage is classified according to particular artery lesions or as diffuse atherosclerotic changes. According to differently designed stroke studies, the reported rate of epilepsy ranges from 2% to 17%^{4,6-13}. Epileptic manifestations may occur as early or as late manifestations. The pathophysiologic basis of early seizures are molecular changes that in ischemia occur as primary, and in hemorrhage as secondary changes¹⁴. The basis of late seizures are morphological changes of the brain after stroke, and their epileptic activity¹⁵.

Material and Methods

The aim of the study was to assess the correlation between early and late epileptic seizures during and after stroke, and some somatic disorders that are significant risk factors for the occurrence of stroke. In the study, we used documentation of the University Department of Neurology, Sarajevo University Clinical Center. We examined ten-year records, from January 1, 1989 till December 31, 1998, with special reference to the following stroke risk factors: atherosclerosis, hypertension, treated heart decompensation, absolute arrhythmia, chronic subdecompensated heart state, postmyocardial infarction state, rhythm disturbances, and extrasystoles.

Results

Survey of the files on 7001 patients treated at University Department of Neurology, Sarajevo University Clinical Center, during the ten-year period revealed 3753 cases of cerebral thrombosis, 1208 of cerebral embolism, 1538 of intracerebral hemorrhage, and 502 cases of subarachnoid hemorrhage. The incidence of symptomatic epileptic seizures in the total sample ranged from 0.75% to 6.67%.

Fig. 1. Rate of particular cerebrovascular diseases

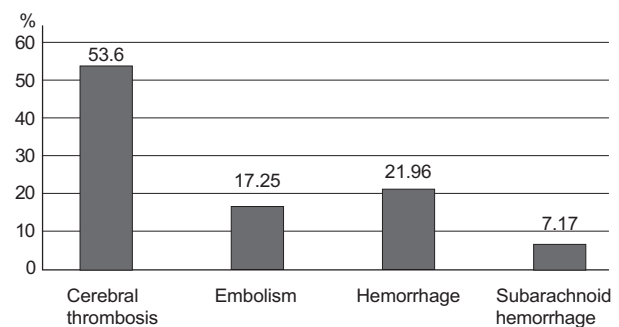


Table 1. Results of patient file survey January 1, 1989 – December 31, 1998

	Cerebral thrombosis	Cerebral embolism	Intercerebral hemorrhage	Subarachnoid hemorrhage
Total patient number	3753	1208	1538	502
Total number of epileptics	75	36	30	7
Late seizures	47	23	23	4
Early seizures	28	13	7	3
% of epileptics in total patient number	1.998	2.980	1.951	1.394

Atherosclerosis was present in 72%, hypertension in 66.7%, angina pectoris in 7.8%, absolute arrhythmia in 35.1%, subdecompensated heart state in 19.8%, treated heart decompensation in 12%, postmyocardial infarction state in 5.4%, and extrasystoles in 3% of patients. Results of the patient file survey are presented in Table 1, and Figures 1-2.

The number of patients with hypertension was significantly greater than the number of patients without it ($\chi^2=15.667$; $n=1$; $p<0.001$). There was no significant difference according to the presence of hypertension between the patients with early and those with late epileptic seizures ($\chi^2=0.139$). There was no significant difference according to the duration of hypertension either (excluding the hypertension duration of >30 years, recorded in a low proportion of patients) ($\chi^2=0.563$; $n=2$). A statistically highly significant difference was observed in the rate of somatic disorders ($\chi^2=91.341$; $n=8$; $p<0.01$).

Differences between early and late seizures

Angina pectoris comorbidity was significantly higher in the group of patients with early seizures than in those with late seizures ($\chi^2=6.242$; $n=1$; $p<0.05$). There was no significant difference between the early and late seizure groups of patients according to the rate of absolute arrhythmia ($\chi^2=0.119$; $n=1$). Treated heart decompensation was significantly more frequent in the group of patients with early seizures than in those with late seizures ($\chi^2=9.117$; $n=1$; $p<0.01$). Chronic subdecompensated heart state was significantly more common in the group of patients with early seizures than in those with late seizures ($\chi^2=13.765$; $n=1$; $p<0.01$). The rate of somatic disorders was higher in the group of patients with early seizures than in those with late seizures. The mean number of somatic disorders *per* patient in the groups with early and late seizures was 1.1 and 0.6, respectively, yielding an almost double rate in the former (Fig. 2).

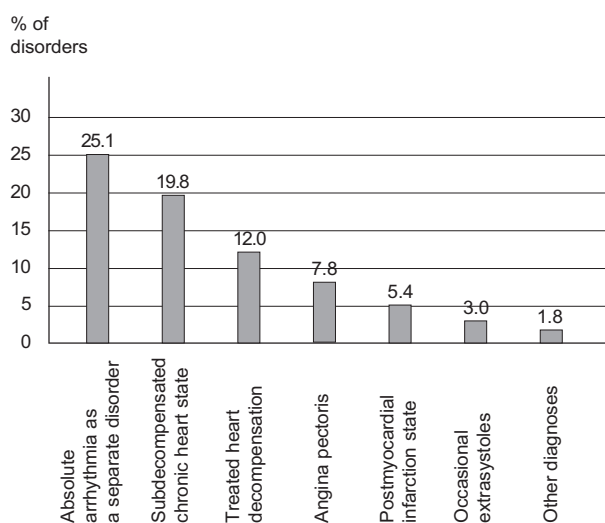
Discussion

According to AHA 1996, the profile of apoplectic personality includes arteriosclerosis, hypertension (>160/95 mm Hg), and a history of cardiovascular diseases such as coronary heart disease, congestive heart disease, left heart hypertrophy, mitral stenosis, and various rhythm disorders¹⁶.

In our sample, there were 72% of patients with atherosclerosis and 67.7% of patients with hypertension, which fits the profile of apoplectic personality defined by AHA 1996, and is consistent with the results reported by Buri *et al.*⁷, Arboix *et al.*¹³ and Giroud *et al.*¹⁷ on the role of these disorders in the occurrence of stroke. However, we found no significant impact on the occurrence of epileptic manifestations during and after stroke, or on the type of epileptic manifestations, their frequency or seizure outcome.

Absolute arrhythmia based on atrial fibrillation is the most powerful and most common precursor of stroke^{18,19}.

Fig. 2. Rate of associated cardiac diseases



It has been found to double with every decade of life after age 55¹. In our material, atrial fibrillation was present in 25.1% of patients, and was more common in the group of patients with early seizures than in those with late seizures. Our results are consistent with those reported in the literature on atrial fibrillation as an independent risk factor for cardioembolic stroke^{1,6,12,13,17,20,21}. Our results on other heart diseases, i.e. subcompensated chronic heart state (19.8%), treated heart decompensation (12%), angina pectoris (7.8%) and postmyocardial infarction state (5.4%) were consistent with those reported from the Framingham study on the occurrence of stroke^{18,19,22}. In our sample, somatic disorders were present at a significantly higher rate in the group of patients with early seizures (1.1 *per* patient) than in those with late seizures (0.6 *per* patient), which is in accordance with the data reported by AHA¹⁸, Reed¹⁹ and SHEP Cooperative Research Group²².

Conclusions

- During the period from January 1, 1989 till December 31, 1998, 167 patients with early and late seizures etiologically caused by cerebrovascular insults were treated as inpatients or outpatients at University Department of Neurology, Sarajevo University Clinical Center, in Sarajevo. During the same period of time, 7001 patients were hospitalized for stroke. The incidence of epileptic seizures was 3.38%.
- Hypertension as a stroke risk factor has a significant role in the occurrence of stroke, however, no effect on the occurrence of early and late epileptic manifestations was recorded.
- Atherosclerosis was found to be an important risk factor for stroke, whereas the statistical significance of its role in the occurrence of early and late epileptic manifestations was somewhat lower.
- Heart diseases with hypertension, i.e. postmyocardial infarction state, angina pectoris, chronic subdecompensated heart state, treated heart decompensation, rhythm disorders of the type of absolute arrhythmia or extrasystoles, were confirmed as significant risk factors for the occurrence of stroke, and were more common in the group of patients with early seizures but had no major effect on the occurrence of late epileptic seizures.
- It is concluded that the group of patients with early seizures had a higher rate of somatic disorders than those with late seizures.

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Sažetak

KORELACIJA IZMEĐU RANIH I KASNIH EPILEPTIČNIH NAPADAJA TIJEKOM I NAKON MOŽDANOG UDARA I SRČANIH BOLESTI

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Moždani udar je vodeći uzrok smrtnosti i glavni uzrok invalidnosti u odraslih osoba u Europi. Prema Američkom udruženju za srce, "profil apoplektične osobe određen je sistoličkim krvnim tlakom višim od 160 mm Hg, dijastoličkim krvnim tlakom višim od 95 mm Hg, obiteljskom poviješću kardiovaskularnih bolesti, hiperkolesterolemijom, pušenjem, zlouporabom alkohola i šećernom bolešću". Cilj ove retrospektivne studije bio je procijeniti korelaciju između ranih i kasnih epileptičnih konvulzija tijekom i nakon moždanog udara uz neke srčane bolesti povezane s hipertenzijom. Studija je obuhvatila bolesnike liječene na Klinici za neurologiju, Klinički bolnički centar u Sarajevu, kroz razdoblje od deset godina (od 1. siječnja 1989. do 31. prosinca 1998.). Ukupno je bio 7001 bolesnik s moždanim udarom (53,6% s moždanom trombozom, 17,35% s moždanim udarom embolijske etiologije, 21,96% s moždanim krvarenjem i 1,17% sa subarahnoidnim krvarenjem). Incidencija simptomatičnih epileptičnih konvulzija bila je 3,38%. U radu su obrađene slijedeće srčane bolesti: apsolutna aritmija, subdekompenzirano srčano stanje, liječena srčana dekompenzacija, angina pectoris, stanje nakon infarkta miokarda i ekstrasistole. Rezultati su pokazali statistički značajnu razliku između bolesnika s ranim i onih s kasnim epileptičnim napadajima u odnosu na srčane bolesti. Tako su bolesnici s ranim epileptičnim napadajima imali ozbiljnije srčane probleme u usporedbi s onima s kasnim napadajima. U prvoj je skupini zabilježena angina pectoris, srčana dekompenzacija i kronično stanje subdekompenzacije, uza statistički omjer od 1,1 prema 0,6. Nije bilo statistički značajne razlike između dviju skupina glede apsolutne aritmije. Zaključano je da su bolesnici s cerebrovaskularnom bolešću i ranim epileptičnim konvulzijama imali značajno više srčanih problema negoli oni s moždanim udarom i kasnim epileptičnim napadajima, u kojih su morfološke promjene na mozgu u neurofiziološkom smislu predstavljale epileptogeno žarište.

Ključne riječi: Moždani infarkt – komplikacije; Mozak – fiziopatologija; Konvulzije – etiologija; Epilepsija – etiologija; Retrospektivne studije