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Review article

Malignant middle cerebral artery (MCA) infarction in people over 85 years old – Diagnosis, management and risk factors

Żanna Pastuszak [a,*], Zbigniew Czernicki [b], Waldemar Koszewski [b], Adam Stępień [c], Anna Piusińska-Macoch [c]

[a] Department of Neurosurgery, Mossakowski Medical Research Centre, Polish Academy of Sciences, Pawińskiego 5, 02-106 Warsaw, Poland
[b] Department of Neurosurgery, Warsaw University of Medicine, Cegłowska 80, 01-809 Warsaw, Poland
[c] Military Institute of Medicine, Department of Neurology, Szaserów 128, 04-141 Warsaw, Poland

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ABSTRACT

Introduction: Malignant ischemic stroke of the middle cerebral artery (MCA) territory causes neurological deterioration due to the effects of space occupying cerebral edema. The prognosis is poor, and death usually occurs as a result of brainstem compression. There is no information on ischemic stroke, especially the malignant ones, in patients over 85 years old.

Aim: The aim of this retrospective study was to evaluate the disease course, risk factors, survival rate and treatment of MCA malignant infarction in people over 85 years old.

Method: The medical history of 66 patients with malignant MCA stroke was analyzed. The frequency of the occurrence of the risk factors like hypertension, hyperlipidemia, atrial fibrillation, heart failure, diabetes was evaluated. Disability was measured with the use of the National Institutes of Health Stroke Scale (NIHSS). Safety and effectiveness of the anticoagulants used in the group of patients with atrial fibrillation were analyzed. Chi-quadrat test and Mann–Whitney *U* test were used for statistical analysis of data. We also described 85 year-old patient with malignant brain stroke who was treated neurosurgically with a positive effect.

Results: Atrial fibrillation was diagnosed in 65% of patients of the investigated group. There were no statistically significant changes in the survival rate between the group of patients treated with the use of mannitol and patients without this treatment.

Conclusion: The key risk factor in this group is the atrial fibrillation. The elderly patients require an intensive monitoring of the health condition by reference to brain stroke risk factors, especially atrial fibrillation.

* *Corresponding author.*
E-mail addresses: ekozniewska@imdik.pan.pl, zpastuszak@imdik.pan.pl (Ż. Pastuszak), zbigniew.czernicki@wp.pl (Z. Czernicki), koszewski@gmail.com (W. Koszewski), astepien@wim.mil.pl (A. Stępień), anka.renata@vp.pl (A. Piusińska-Macoch).
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The malignant infarction can occur in case of the middle cerebral artery (MCA) stroke. It is a neurological deterioration caused by the severe cerebral edema. The malignant stroke manifests itself in hemiparesis, gaze deviation, headache, vomiting and disturbances of consciousness. That malignant edema usually develops one to several days after the stroke [1]. Treatment is often ineffective, the prognosis is still poor, the survival rate is low and among patients who survived there are many people with severe disabilities. There is a lack of publications related to the ischemic strokes – especially the malignant ones – in people over 85 years old. The incidence of the ischemic stroke increases with age. The risk of the brain stroke is twice higher in case of people over 80 years old than in case of people aged 60–79 [2]. Within the next 20 years, the incidence of stroke is expected to increase by about 100% [3,4]. The malignant edema develops in case of 10–15% of patients with MCA ischemic stroke. The mortality rate in this group is about 80% [1,5,6]. The prevalence of the malignant ischemic edema in the group of people over 85 years old is not accurately determined. Moreover, there is no information on the risk factors of ischemic stroke in people over 85 years old. The European population is getting older and this problem becomes more relevant [2,7,8]. Edema caused by the malignant infarction leads to intracranial pressure increase, reduction of the cerebro-spinal fluid circulation and blood flow in brain vessels, finally leading to compression of the brain stem and death [9]. If the normal cerebral blood flow is reduced and falls below a certain level, the reversible functional failure occurs leading to the morphological damage of neurons [10]. Appropriate treatment of the ischemic stroke, if applied fast, can give a chance to save a brain tissue called penumbra. Due to the lower blood flow, in this area of brain, the neurons' functions are disabled but the apoptosis does not occur [11,12]. The risk factors of the ischemic brain stroke in people over 85 years old remain elusive and they are even less known in case of malignant strokes.

The aim of this retrospective study was to evaluate the disease course, risk factors, survival rate and treatment of MCA malignant infarction in people over 85 years old. The presented study also concerned the case of 85 year-old patient with malignant ischemic stroke treated neurosurgically with a positive effect. Better knowledge of the malignant ischemic stroke in patients in this age group can contribute to the improvement of prophylaxis and treatment strategy.

1. Method

The medical history of 66 patients (M 13, W 53) with malignant MCA stroke (infraction of >50% MCA territory) was analyzed. The patients were at the age from 85 to 102 years old (the average age: 89 years old, SD 4 years). The agreement of Bioethical Committee in Military Institute of Medicine was obtained for this study. Thrombolytic therapy, osmotic treatment or only anti-platelet agents were used in investigated group. One patient was treated neurosurgically. The frequency of risk factors like hypertension, hyperlipidemia, atrial fibrillation, heart failure, diabetes was evaluated in all patients. Severity of the disease and disability were measured with the use of The National Institutes of Health Stroke Scale (NIHSS). Computer tomography (CT) of brain, ultrasonography of carotid arteries and laboratory tests were also evaluated. Safety and effectiveness of anticoagulants used in the group of patients with atrial fibrillation were analyzed. The survival rate and the most frequent complications following hospitalization were evaluated. The neurological status measured with the use of NIHSS scale and survival rate were evaluated both in the group of people treated with mannitol and in the group of people without this treatment. Chi-quadrat and Mann–Whitney *U* tests were used to perform the statistical analysis of data.

2. Results

In the investigated group, 6% of patients after stroke were diagnosed with the spontaneous hemorrhagic transformation. In case of 7 patients, the thrombolytic treatment was applied. In case of 53% of patients, the malignant edema occurred on the first day of hospitalization. In case of 23 patients, the ultrasonography examination was performed. Clinically significant carotid artery stenosis was observed in case of one patient. In case of 60% of patients the mannitol was administered and 40% of patients did not obtain that treatment. NIHSS score on admission to the hospital, in the group of patients that survived 30 days, was 17.80 (SD 2.85) points and in the group of patients that died in the first month was 18.03 (SD 3.64) points. There was no statistical correlation between NIHSS on admission and survival rate (Table 1).

In the investigated group, 26% of patients had abnormal level of HDL, the same number of patients had abnormal level of total cholesterol and the LDL level of 18% of patients was too high. The abnormal level of triglyceride was observed in case of 8% of patients (Table 2).

The most frequent risk factor diagnosed before the occurrence of the brain stroke was the hypertension (present in case of 58% of patients). Heart failure was observed in case of 44% of patients and atrial fibrillation in case of 41% of patients. Diabetes was present in case of 24% of patients in the investigated group, while 14% of patients had suffered from the ischemic stroke in the past. The ischemic heart disease was diagnosed in case of 9% of people. The transient ischemic

Table 1 – Correlation between NIHSS score on admission to the hospital and survival rate.

	Death in 30 days	N	M	SD	Min	Max
NIHSS on admission	No	30	17.80	2.85	8	24
	Yes	36	18.03	3.64	9	25
NIHSS on discharge	No	30	17.17	3.25	8	24
	Yes	36	18.97	3.42	10	25

where n denotes number of patients, data are shown as mean value (M)+/- SD.

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