The Relationship between Ischemic Stroke And Atrial Fibrillation

Anca Gogu, Mirela Lupu, Any Docu Axelerad

Objective: Cardioembolic stroke accounts for approximately a quarter of all ischemic strokes, with nonvalvular atrial fibrillation as the predominant type. The proportion of strokes caused by atrial fibrillation increased by age, because this arrhythmia is more prevalent around the age 70-79. Material and methods: We received 375 patients hospitalized on emergency between January 2013 - November 2014. Demographic (sex, age), clinical, imagistic (cerebral-CT, cerebral-MRI, extracranial ultrasound, minimum two ECG, one of the moment of admission and the other later, Ecoardiography, Chest X-ray), paraclinic data, as well as risk factors, treatment, evolution and neurologic recovery were all considered. Results: We studied 375 patients, 244 females and 131 males (65% vs 35%). The mean age was 78.2 years (range 41-98). According to the age groups, the biggest frequency of ischemic stroke associated with atrial fibrillation is between 70-79 years (151 cases; 40.26%), followed by the age group of 80-89 years (118 cases; 31.46%), 60-69 years (68 cases; 18.13%), 50-59 years (29 cases; 7.73%), 90-99 years (8 cases; 2.13%), 40-49 years (1 case; 0.26%). We have 287 patients (76.53%) with ischemic stroke and nonvalvular atrial fibrillation and 324 patients (86.40%) with permanent atrial fibrillation. The partition of the cases according to the ischemic stroke localization shows that the most cases are in the partial territory of MCA (168 cases), followed by full territory of MCA (65 cases) as well as the other vascular territories. The risk of hemorrhage transformation is high in cardiac embolism compared to the other stroke subtypes (38 cases; 10.13%). In 311 cases (83%) it has been a favorable recovery but 64 cases (17%) died. Conclusions: Ischemic stroke associated with atrial fibrillation is a major cause of long-term, physical, emotional and social disability in the elderly, the biggest frequency is between 70-79 years (40.26%). Ischemic stroke with atrial fibrillation is more common in females (65%) and in the territory of MCA (62.13%). The development of noninvasive diagnostic technique like cerebral-MRI, echocardiography as well as new therapeutic strategies for acute cardioembolic stroke demonstrates that the lethal cases decreasing at 17%. Cardioembolic strokes are associated with substantial morbidity and mortality.

* Dr. Anca Gogu, MD, PhD. Tel: +40-745-351-400.
E-mail address: agogu@yahoo.com
1. Introduction

Cardioembolic stroke accounts for approximately a quarter of all ischemic strokes, with nonvalvular atrial fibrillation as the predominant type (Bornstein, 2009).

The proportion of strokes associated with atrial fibrillation increased with age, because this arrhythmia becomes more prevalent with age in the general population (Marini, et al, 2005).

The most common substrate for cerebral embolism in older patients is atrial fibrillation, accounting for one half to two third of emboli of cardiac origin (Bradley, et al, 2008). Other cardiac conditions with high risk of cerebral embolism include sustained atrial flutter, sick sinus syndrome, left atrial thrombus, left atrial myxoma, mitral stenosis, prosthetic valve, infective endocarditis, recent anterior myocardial infarct and dilated cardiomyopathy.

Cardioembolic strokes have a sudden onset of symptoms, maximal from the beginning and are associated with high morbidity and mortality.

Any vascular territory may be affected. In the anterior circulation cardioembolism is a major cause of full middle cerebral artery (MCA) infarcts due to proximal MCA occlusion (Bornstein, 2009). In this situation, cerebral infarcts are often large, with decreased level of consciousness and high severity. Partial MCA infarcts due to more distal occlusion are more frequent in the posterior territory. These ischemic strokes are more often associated with Wernicke’s aphasia, homonymous hemianopsia, apraxia without severe hemiparesis (Bradley, 2008). Cardioembolism is a common cause for cerebellar infarcts in the PICA (postero-inferior cerebellar artery) and SCA (superior cerebellar artery).

Involvement of multiple cerebral vascular territories is suggestive for cardiac source of embolism.

The risk of early hemorrhagic transformation is about twice as high in cardiac embolism compared to other stroke subtypes (Paciaroni, et al, 2008).

The objective of this study is to investigate the cardioembolic strokes caused by atrial fibrillation, the most common cardiac arrhythmia requiring hospitalization in Romania.

2. Material and methods

2.1. Patients

We received 375 patients hospitalized on emergency between January 2013 – November 2014. Demographic (sex, age), clinical, imagistic (cerebral - CT, cerebral – MRI, extracranial ultrasound, minimum two ECGs, echocardiography, Chest-X-Ray), paraclinic data, as well as risk factors, treatment, evolution and neurologic recovery were all considered.

2.2. Investigations

- **Electrocardiogram (ECG)**
  
  We analyzed the first ECG made at the moment of admission and another one later during hospitalization. All patients had atrial fibrillation at admission and is clear that this arrhythmia caused the ischemic stroke; cardioembolic event is not secondary to cerebral infarction in this situation.

- **Native Computer Tomography (CT)**
  
  At the moment of admission has the possibility to show the location of lesions, size or unspecific images like diffuse cerebral edema.

- **Cerebral – MRI**
Cerebral – MRI was performed in all patients with cardioembolic stroke using Signa Horizont Lx 10T MRI, during hospitalization.

- **Echocardiography**
  Echocardiography was made with an Acuson Sequoia C512 echocardiograph. At the echocardiographic examination we assessed the dimension of the heart cavities, valvular disfunction, ejection fraction (EF) and left ventricular function.

- **Carotid ultrasound**
  For carotid vascular ultrasound was used an Aloka SSD 4000 equipment. Bilateral common carotid arteries, bifurcation, internal and external carotid arteries, intima-media thickness (IMT) were examinated.

- **Other tests**
  - Chest – X – Ray
  - Paraclinic explorations like WBC, total cholesterol, LDL cholesterol, HDL cholesterol
  - Blood pressure

3. **Results**

We studied 375 patients, 244 females and 131 males (65 % vs 35 % ) (Fig.1)

![Fig.1. Distribution of cases according to sex](image)

The mean age was 78,2 years (range: 41 - 98). According to the age groups, the biggest frequency of ischemic stroke associated with atrial fibrillation (AF) is between 70 – 79 years (151 cases; 40,26 %), followed by the age group of 80 – 89 years (118 cases; 31,46 %), 60 – 69 years (68 cases; 18,13 %), 50 – 59 years (29 cases; 7,73 %), 90-98 years (8 cases; 2,13 %), 40 – 49 years (1 case; 0,26 %). (Fig.2)
Cardioembolic stroke accounts for 25 – 35 % of all ischemic strokes, with nonvalvular atrial fibrillation as the predominant type (287 cases; 76.53 %). We have 324 patients (86.40 %) with ischemic stroke and permanent atrial fibrillation and 51 patients (13.60 %) with ischemic stroke and paroxistic atrial fibrillation. Paroxistic atrial fibrillation carries a similar risk for embolism as the average risk for permanent atrial fibrillation. (Fig.3)

Fig.2. Partition of the cases according to the age

Fig.3. Distribution of cases with ischemic stroke and nonvalvular AF / valvular AF and cases with permanent AF / paroxistic AF
Any vascular territory may be affected. The partition of the cases according to the ischemic stroke localization shows that the most cases are in the partial territory of MCA (158 cases), followed by full territory of MCA (65 cases) as well as the other vascular territories: ACA (16 cases), PICA and SCA (30 cases), multiple lesions in multiple vascular territories (62 cases), acute single small deep infarction (30 cases) and basilar artery territory (4 cases).

The risk of hemorrhagic transformation is higher in cardiac embolism compared to other stroke subtypes (38 cases; 10,13 %). Females have a lower percentage of early hemorrhagic transformation of the cerebral stroke than males (6,96 % vs 16,03 %).

Stroke patients with atrial fibrillation have also a higher risk of death during the acute phase of the stroke. Strokes due to cardioembolism are more severe than average. In our study 311 cases (83 %) had a favorable recovery and 64 patients (17 %) died. A dramatic increase in the rate of death in these patients is the early hemorrhagic transformation. In our study group, 11 patients of the 64 who died had an early hemorrhagic transformation. (Fig.6)
The results of the echocardiographic examination reveals at 285 patients mild to moderate abnormalities: mitral / aortic regurgitation, left ventricle hypertrophy, reduced ejection fraction of the left ventricle, tricuspid regurgitation, cardiac emboli. Only 27 patients had severe cardiovascular disorders: mechanical prosthetic heart valves for reumathic heart disease (10 cases), dilated cardiomyopathy (7 cases), patent foramen ovale (2 cases), acute myocardial infarction (8 cases).

We made carotid ultrasound at 312 patients during the hospitalization. Bilateral common carotid arteries, bifurcation, internal and external carotid arteries, intima-media thickness (IMT) were all examined. Studies on the role of carotid IMT prognostic for coronary artery disease showed a strong and significant association (Akosah at al, 2007). An increase with one standard deviation of the IMT is associated with a relative risk of 1,36 for myocardial infarction or stroke (Parv, 2011).

4. Discussions

Cardioembolic stroke accounts for approximately 25% of all ischemic strokes and is a very important emergency in neurology.

The most common substrate for cerebral embolism in older patients is atrial fibrillation.

The proportion of strokes associated with atrial fibrillation increased with age.

Cardioembolic strokes are associated with high morbidity and mortality because there are often large or are involved multiple cerebral vascular territories; also the risk of early hemorrhagic transformation is high.

5. Conclusions

Ischemic stroke associated with atrial fibrillation is a major cause of long-term, physical, emotional and social disability in the elderly.

Ischemic stroke associated with atrial fibrillation is more frequent in females (244 cases, 65 %) versus males (131 cases, 35 %).

Patients with ischemic stroke associated with atrial fibrillation are older than the average stoke patients. This arrhythmia is more prevalent with age. In our study, the age decade “70-79” is well represented (151 cases; 40,26 %), followed by the age group “80-89” (118 cases; 31,46 %).
Cardioembolic stroke accounts for a quarter of all ischemic strokes, with nonvalvular atrial fibrillation as the predominant type (287 cases; 76.53%).

Permanent atrial fibrillation is more frequent than paroxistic atrial fibrillation (324 patients; 86.4% versus 51 patients; 13.6%).

Any vascular territory may be affected. The partition of the cases according to the ischemic stroke localization shows that the most cases are in the partial territory of MCA (168 cases), followed by full territory of MCA (65 cases). Cardioembolism is common in the posterior circulation (34 cases) or in multiple vascular territories (62 cases).

The risk of hemorrhagic transformation is higher in cardiac embolism compared to other subtypes (38 cases; 10.13%). Females have a lower percentage of early hemorrhagic transformation of strokes than males (6.96% vs 16.03%).

The development of noninvasive diagnostic techniques like cerebral – MRI, echocardiography as well as new therapeutic strategies for acute cardioembolic stroke demonstrates that the lethal cases decreased at 17% (64 cases). In our study 311 cases (83%) had a favorable recovery.

References


Parv F., Avram R., Tudoran M., Balint M., Balas M., Avram I. (2011). Journal of Experimental Medical and Surgical Research; Nr. 4: 153-159