

ARTERIAL HYPERTENSION AND STROKES

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Keywords: arterial hypertension (AHT), stroke, complications

Abstract: Arterial hypertension (AHT) gravity depends on the complications given to other target organs: brain, heart and kidneys. The neurological complications are multiple: hypertensive encephalopathy, stroke and vascular dementia. Strokes are the most common complications responsible for high mortality (30-45% within 6 months) despite the progress made in the recent years in the field of neuro-imaging (computed tomography, magnetic resonance imaging) and in acute phase treatments (thrombolysis).(1)

Cuvinte cheie: hipertensiune arterială (HTA), accident vascular cerebral (AVC), complicații

Rezumat: Gravitatea HTA ține de complicațiile pe care le dă asupra organelor țintă: creier, inimă și rinichi. Complicațiile neurologice sunt multiple: encefalopatii hipertensive, accidente vasculare cerebrale și demențe vasculare. Accidentele vasculare cerebrale sunt complicațiile cele mai frecvente responsabile de o mortalitate mare (30-45% în decurs de 6 luni) în ciuda progreselor realizate în ultimii ani în domeniul neuro-imageriei (tomografia computerizată, imagieria prin rezonanță magnetică nucleară) și a tratamentelor de fază acută (tromboliza).(1)

INTRODUCTION

The link between hypertension and stroke incidence

Hypertension is the main modifiable risk factor of the entire cerebrovascular pathology. 50-70% of strokes occur in the hypertensive patients. The epidemiological studies show that the risk of stroke increases at the same time with the blood pressure figures.

In the Framingham study, the relative risk for developing a stroke is of 3,1 in males and of 2,9 in females, in the patients with blood pressure figures above 160/95 mmHg. The risk increases to 1.5 in the subjects whose blood pressure is limited compared with the normotensive subjects.(2) Systolic hypertension, more common in the elderly, significantly increases the risk of stroke. In a British study, the risk of stroke increases 4 times for the systolic blood pressure values between 160-180 mmHg and 6 times higher for the blood pressure values above 180 mmHg.(3)

Role of the AHT control on stroke incidence

The causal role of hypertension was confirmed by prospective studies and clinical trials concluding that AHT in moderate or severe forms, reduces the incidence of stroke.(4) The role of blood pressure figures control on the incidence of stroke was demonstrated according to the results of Rochester between the 50's and 70's.(7) Recent studies confirm the interest of borderline hypertension treatment, which reduces the incidence of stroke by 30%.(6) A meta-analysis conducted on 9 prospective studies, which included 420,000 subjects followed

for 10 years, shows that stroke risk increases by 46% for each increase of 7.5 mmHg in the diastolic pressure.(8)

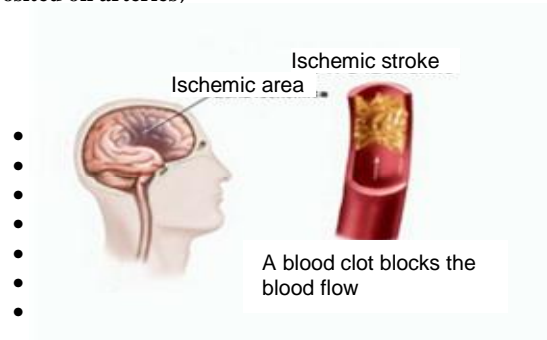
Pathological aspects

Hypertension plays a major part in stroke predisposition, in aggravating atherosclerosis from aorta arch and the arteries serving the encephalon and a lipolytic degeneration of small terminal perforating cerebral arteries.

Hypertension can also causes heart diseases, thus complicating the stroke. Indeed, hypertension occurs as a cause of heart disease (coronary insufficiency, heart failure, dilated left cavities and in particular, the left auricle that is significantly associated with atrial fibrillation called idiopathic).

The atherosclerotic lesions of the major vessels whose development/aggravation is accelerated by AHT favours the development of stenosis of the internal carotid and the stenosis of the ostium of the vertebral arteries and megadolichoartery.

Progressive disorganization of arterioles wall involves the formation of micro-aneurysms characterized by focal dilatations of arteries containing thrombi.(6,9)

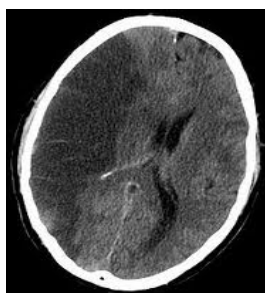
Strokes types related to AHT**Ischemic stroke****Figure no. 1. Causes of cerebral infraction (atheroma plaque deposited on arteries)**

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- atheromatous thrombo-embolism and occlusive thrombosis of small terminal arteries are the main causes of cerebral infarction;
- hypotension associated to a severe stenosis and to a cerebral artery is rarely responsible for an ischemic stroke;
- the ischemic stroke may be incomplete or non-lacunar;
- lacunar strokes are given by small cavities developed after the resorption of a small-sized infarction, a consequence of the occlusion of one perforating artery. In this situation, the imaging by tomodensitometry or MRI emphasises a sub-cortical infarction smaller than 15 mm.

Figure no. 2. Cerebral CT of cerebral infarction



Immediate prognosis is good with rapid functional recovery, long-term prognosis is with an increased risk of dementia.

- the non-lacunar stroke corresponds to the territorial cerebral infarction given by the atherosclerosis of the large cervical vessels or hypertensive heart disease, they generally affect the cortical structures. (6,9)

Hemorrhagic stroke

In cerebral hemorrhage due to hypertension, deep black nuclei and the internal capsule are generally damaged, compared with the lobar hemorrhages that are the appanage of the ruptured vascular malformations.

Figure no. 3. CT scan of hemorrhagic stroke in the basal nuclei

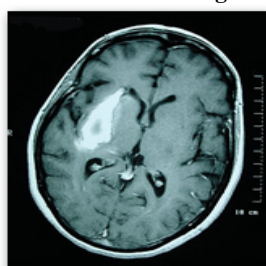
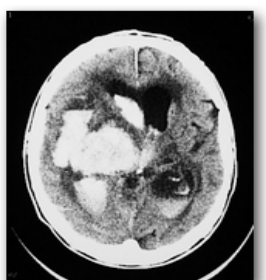


Figure no. 4. CT scan of hemorrhagic stroke with ventricular inundation due to hypertension



Cerebral hemorrhage in case of hypertension is the result of vascular arterioles rupture products bearing micro-aneurysms. Brain CT shows a hemorrhage in the internal or intermediary capsule, without cortical effraction.

Figure no. 5. Cerebral angiography

a. Basilar artery trunk aneurysm

b. 3D reconstruction

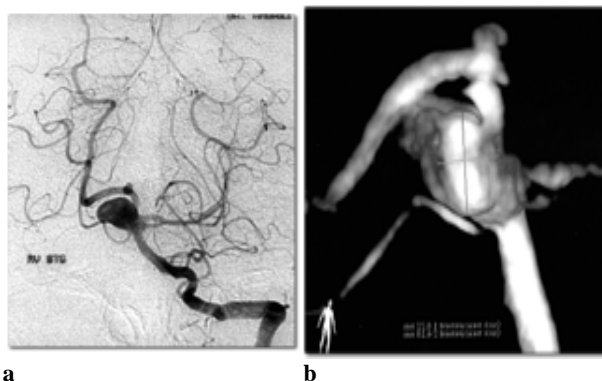
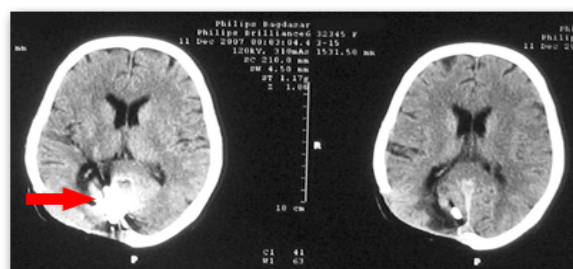


Figure no. 6. Right occipital arteriovenous malformation, IV degree Martin-Spetzler



Prognosis remains severe, a secondary exacerbation may occur either due to edema or due to a secondary rupture between ventricles.(10)

Prevention

Hypotensive therapy remains the most effective way to prevent stroke due to AHT. The epidemiological studies show that reducing the blood pressure by a few millimeters will reduce the risk of stroke in the hypertensive patients by 40%.(3,1)

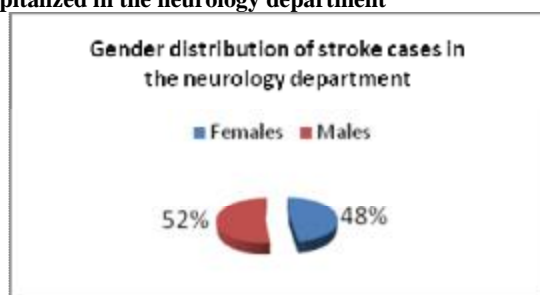
The Framingham study show that 25-45% of the patients with stroke, will develop another one within a period of 5 years. Therefore, it is indispensable to maintain a good control of the blood pressure values in order to preserve the secondary prevention of the stroke, In a randomized study (PAST), conducted in China, that included 2841 patients before stroke, the treatment with diuretics (although the patients were or not hypertensive) triggers a decrease of the arterial hypertension by 5 mmHg, reducing the more or less fatal strokes by 31%.(7)

In practice

Persistent AHT (public health issue) and stroke remain an important cause of hospital morbidity. In the neurology department of the Emergency County Clinical Hospital of Sibiu, that registered 2545 files of patients hospitalized for stroke on a period of 5 years (13.10.2009-29.05.2012), it has been noticed that AHT is the main risk factor.

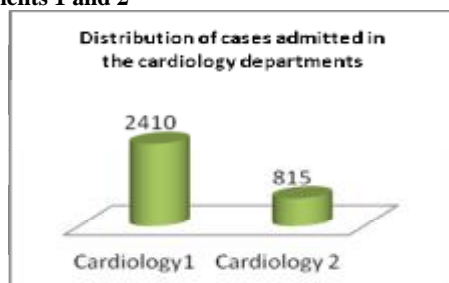
AHT antecedents are present in 64% of the patients and 53% of the patients had hypertension upon hospitalization.

Figure no. 7. Distribution by gender of the stroke cases hospitalized in the neurology department



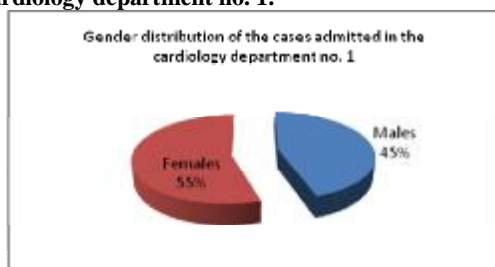
From figure no. 7, it results that out of the 2545 cases hospitalized in the neurology department in the last 5 years with the diagnosis of stroke, 52% were males. The number of cases of AHT hospitalized in the cardiology departments (1 and 2) during the same period was 3225.

Figure no. 8. Distribution of AHT cases in the cardiology departments 1 and 2



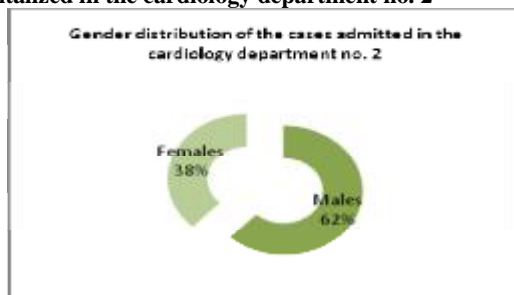
Of those 3225 cases of AHT – 2410 cases were hospitalized in the cardiology department 1 and 815 cases were admitted in the cardiology department no. 2.

Figure no. 9. Distribution by gender of cases hospitalized in the cardiology department no. 1.



Of those 2410 cases hospitalized with ATH in the cardiology department no. 1, 55% were represented by females.

Figure no. 10. Distribution by gender of the cases hospitalized in the cardiology department no. 2



Of those 815 cases with hypertension, hospitalized in the cardiology department no. 2, 62% were represented by males. In a hemorrhagic or ischemic stroke, a bout of hypertension is found almost constantly; it is the result of all the reflex phenomena, whether the patient had hypertension and was normotensive before the stroke. An increase of the arterial

hypertension upon hospitalization is very important in the chronic hypertensive and in case of cerebral bleeding. Arterial pressure drops suddenly during the days following the stroke and every third patient remains hypertensive on the 10th day.(1) The conduct regarding the bout of hypertension has been long time discussed. Nowadays, it is recommended to observe this bout of hypertension during the hours and the days following the stroke; a hypertensive treatment is not to be used unless in the case of patients with cardiac or renal associated complications or in case of high blood pressure values (more than 130 mmHg).(11) Antihypertensives are not recommended (due to their vasodilatation action), especially Nifedipine of 10 mg. p.o.) is not recommended to be prescribed for hypertension as it has a negative effect and worsens the stroke.(10)

Conclusions

AHT gravity is related to the damage to other target organs; in case of stroke, morbidity and mortality rates remain increased in the absence of the therapeutic means and despite the progress made in the last years. It is essential to focus on the early diagnosis and to effectively treat AHT, with the general practitioner playing a major part.

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