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Hypertension as the Major Cause of Stroke

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Abstract

The aim of this manuscript was to point out the relevance of the clinical aspects of stroke based on several clinical studies. We carried out a retrospective data collection study in 433 patients with cerebrovascular disease,which represent 7% of all patients admitted to our Service of Internal Medicine between 1979-1985. In this particular study the most frequent risk factor found was hypertension, 64.7%_which represents the total median value (in men and women) of Transient Ischemic Attack (TIA), full stroke, and stroke in evolution. In another recent cross-sectional investigation carried out in 243 patients admitted with ischemic stroke, the most common modifiable risk factors were hypertension (72.1%), followed by diabetes (51.7%), and dyslipidemia(28.5%). Patients older than 60 years with isolated systolic hypertension constitutes a special group of population susceptible to disorders of the central nervous system. In our experience,a more effective antihypertensive treatment is needed to prevent this serious clinical situation in these patients.

Keywords: Hypertension; Stroke; Age; Risk factors; Cardiovascular disease; Cerebrovascular events; Ageing; Isolated Systolic Hypertension; Ischemic stroke; Intracerebral hemorrhage; Transient Ischemic Attack; Vascular neurologic dysfunction; Embolism; Thrombosis; Bleeding; Atherosclerosis; Diabetes mellitus; Dyslipidemia; Tobacco; Alcohol abuse; Obesity; Cardiac dysrhythmia; Semiology of stroke; Vascular dementia; Cerebral disease; Non modifiable risk factors; Arterial circle or Willis hexagon

Introduction

Levels of Blood Pressure (BP) higher than normal (≤130/80 mmHg) is the most important public health problem in developed countries. It is important to realize that it is commonly asymptomatic, easy to detect, but difficult to control, and often leads to acute lethal complications, such as stroke. It is a devastating disease and is responsible for a transient or permanent neurologic dysfunction secondary to ischemic or hemorrhagic mechanisms of the Central Nervous System (CNS) [1]. Terminology and classification of stroke had already established according to the etiology [2]. There are several terms to define the presentation of this pathology in the clinical practice; the most adequate term should be cerebrovascular disease, mainly due to circulatory system problems (embolism, thrombosis, or hemorrhage) responsible for producing lesions occasionally irreversible. Arterial circle, polygon or Willis hexagon, supplies blood to the encephalon. It was described by the English clinician Thomas Willis (1622-1673).This author was also the first to describe myasthenia gravis and puerperal fever.

At present, epidemiological analyses are able to quantify the risk factors responsible for cardiovascular diseases [3], age [4], hypertension, and history of previous heart disease [5-7]. Nevertheless, the principal etiology of stroke is atherosclerosis: a combination of circumstances affecting the arterial wall responsible for the inadequate supply of blood to the CNS. According to the general clinical opinion, the risk factors are classified into three categories: a) modifiable risk factors, (hypertension (72.1%), diabetes, dyslipidemia, arrhythmia, tobacco, alcohol abuse (>5 drinks daily) (8.1%), obesity (8.1%), and uncommon cause (25.6%); b) non modifiable risk factors (age, gender, ethnic groups, history of cardiovascular disease), and c) unknown circumstances.

Our Experience

Isolated Systolic Hypertension (ISH) is defined as Systolic Blood Pressure (SBP) ≥160 mmHg and Diastolic Blood Pressure (DBP) ≤90 mmHg. This situation affects 5% of the population older than 60 years, 13% of patients older than 70 years, and 24% of patients ≥80 years [8]. Some observational studies have demonstrated that the incidence of stroke and myocardial infarction in elderly people was strongly related to the levels of SBP; conversely, DBP levels do not represent an important predictor of risk [9]. However, the treatment of patients with both systolic and diastolic BP elevation reduces the incidence of cerebrovascular disease and all cardiovascular events combined. The hypothesis that antihypertensive drugs should also be prescribed to elderly population with ISH has been proven in at least three big clinical trials: SHEP (Systolic Hypertension in the Elderly Program), SYST-EUR Study (Systolic Hypertension in Europe), and HYVET (Hypertension in the Very Elderly Trial).

The SHEP trial showed a significant benefit for non-fatal stroke, but fatal strokes were not significantly reduced. The incidence of fatal strokes was rather low in the SHEP's control group (14 of 159 strokes without including transient ischemic attacks, 9%). Whether the low incidence of fatal strokes in the

SHEP trial is the results of the healthy patient effect or is due to the classification of a number of very mild cerebrovascular accidents as stroke remains still unknown [8]. Furthermore, the fate of some stroke survivors was not yet been reported. It may be important to know how many stroke survivors have fully recuperated, how many remained incapacitated, and how many will eventually die from other causes during later follow-up [9].

This information is based on our large clinical experience in patients admitted to our Service of Internal Medicine and those referred from the Hypertension and Lipid Unit, as well as on several own studies [10-17]. In one of our researches [10] we analyzed retrospectively, 433 cases of stroke that represent 7% of all patients admitted to our Service of Internal Medicine between 1979 and 1985. The following were the conclusion of this investigation: most of the patients (men and women) were between 65 and 75 years old; the most frequent risk factors were hypertension 74.3%, 75.7%, and 54.2%, in men for TIA, full stroke, and stroke in evolution, respectively, and values of 70%, 62.2%, and 51.8% in women for TIA, full stroke, and stroke in evolution respectively; the median values for cardiac dysrhythmia were 35 % and 35.2% in men and women, respectively, and the median values for diabetes mellitus were 36.9% and 21.8% in men and women respectively [10] (Detailed values are shown in table 1). The prevalence of cerebral risk factors in our patients is shown in table 2). These previous discouraging results from our population were however, the motivation to create our Hypertension Unit in order to ameliorate this devastating clinical situation, not only in our region but also probably in everywhere. After that point and so far, we have treated thousands of patients with cardiovascular risk (hypertensive, diabetic, dyslipidemic patients and others) with the important and ambitious goal to improve this deteriorated situation. After that time, our group has also participated in more than 150 international clinical trials to improve the prognosis of this disease; even if the situation is now getting much better than three decades ago, there are still many problems to be resolved.

The recent study [11] was an observational cross-sectional investigation about the incidence of patients with ischemic cardiovascular disease carried out between June 2005 and June 2006. The study enrolled 243 patients in a referral population of 250,000 individuals from the province of Almeria (Spain). 172 individuals were diagnosed with acute ischemic stroke. All these patients with stroke were admitted to the Emergency and Critical Care Unit (1% of the population) because of ischemic cerebrovascular disease (neurological deficit lasting more than 24 hours of ischemic origin) with an incidence of 69 per 100,000 individuals per year. The semiology developed in the patients shown in table 3. The prevalence of stroke according to age shown in table 4. Although age is a risk factor for stroke events affecting mostly people older than 65 years, our experience reveals that this pathology is found in younger immigrants coming from the African continent (countries belonging to the Sub-Saharan region). The study was carried out according to the recommendations of the 59th General Assembly, Seul, 2008, and by the Convention for the Protection of Human Rights and Dignity of the Human Being.

Table 1: Previous risk factors in stroke patients.

Disorder	TIA(%)		Full Stroke(%)		Stroke In Evolution(%)	
	M	W	M	W	M	W
HT (64.7%)*	74.3	70	75.7	62.2	54.2	51.8
Diabetes	40.5	13.3	30.8	17.8	39.5	34.5
Cardiac Dysrhythmia	40.5	36.6	35.5	34.0	29.2	35.2
Heart Failure	21.6	30.0	31.8	17.8	29.2	24.1

M= Men; W= women; TIA= Transient Ischemic Attack; HT (64.7%)*= Total median value for hypertension

Table 2: Prevalence of patients with cerebrovascular risk factors in our Service of Internal Medicine.

Modifiable risk factors	Prevalence (%)
Hypertension	72.1
Diabetes	51.7
Dyslipidemia	28.5
Arrhythmia	22.1
Tobacco use	20.3
Alcohol consumption (>5 drinks daily)	8.1
Obesity	5.8
Other uncommon or unknown risk factors	25.6

Table 3: Semiology of patients before stroke development.

Symptoms	TIA(%)		Full Stroke(%)		Stroke In Evolution(%)	
	M	W	M	W	M	W
Headache	32.4	23.3	28.9	25.5	29.2	27.8
Intelectual disturbances	13.5	18.3	4.7	5.5	20.9	3.7
Insomnia	12.1	6.7	4.7	7.8	4.2	9.2
Dizziness	16.4	15.0	14.0	11.1	18.7	18.6

TIA: Transient Ischemic Attack; M = men; W = women

Table 4: Prevalence of stroke (hemorrhagic or ischemic) according to age.

Age	Prevalence (%)	Hemorrhagic stroke (%)	Ischemic stroke (%)
18-50	2.7%	100%	0%
51-65	38.4%	50%	50%
66-99	58.9%	18%	82%

Patients aged between 18 and 50 years presented hemorrhagic stroke in 100% of the cases. However, these patients represent only 2.7% of the total strokes for all ages. These results can not be compared to other studies, given the special characteristics of this region of Almería, Spain, where there are many young African immigrants with uncontrolled, severe hypertension, who presented with hemorrhagic stroke.

We found an increasing prevalence of ischemic stroke with age: the prevalence of hemorrhagic and ischemic stroke was similar in patients between 51-65 years (50% vs 50%); however, the prevalence of ischemic stroke was found to be much higher in older patients (between 66-99 years) (Table 4).

The inclusion criteria for our patients were:

- No age limit;
- People going to the Emergency room on one's own initiative, or referred from Primary Care Unit or the Emergency medical services (DECU, 061);
- Reason for consultation- deficient neurological symptoms or signs, lasting more than 24 hours, and later admission to the Service of Internal Medicine or Intensive Care Unit;
- Physical examination and initial complementary tests suggesting acute stroke;
- For diagnostic process CAT scan should be performed for Cranioencephalic trauma.

The exclusion criteria includes three particular points:

- Patients diagnosed with transient ischemic stroke;
- Patients diagnosed with hemorrhagic stroke (they were referred to the Referral Hospital of Torrecardenas, in Almería)
- Cases of hemorrhagic stroke rejected for neurosurgery treatment.

The statistical analysis was performed using SPSS Version 10.1; Student's t-test was employed for continuous variables and Chi-Square for discrete variables. Comparisons are made in two ways such as one-way analysis of variance was used for quantitative variables; when significant, paired comparisons were carried out according to the Bonferroni method. Contingency tables are performed for qualitative variables; Chi-square test and Fisher's test were used for contingency tables. P value of <0.05 was considered significant in all tests.

A number of medical interventions as well as lifestyle modifications and the control for modifiable risk factors are available to reduce the incidence and prevalence of cardiovascular disease. It is especially important for the early diagnosis of acute episodes of the disease by the therapeutic procedures in the interim of 3-6 hours after the onset of stroke symptoms during the penumbra period, in order to reduce functional sequela and the high socioeconomic impact of stroke. It is important for the physicians to know the clinical, epidemiological and therapeutic characteristics of cerebral ictus not only in older population but also in young people, particularly, in our case, the increasing number of African immigrants in the South of Spain.

Hemorrhagic stroke is the most common type of non traumatic intracranial bleeding events provoked by different causes such as hypertension, amyloid angioplasty, aneurysm breakage, systemic bleeding disorders, cocaine, or amphetamines consumption. In our patients, intracerebral hemorrhage was more frequent in the young population, while obviously, ischemic stroke was present mostly in older population, subsequent to atherosclerotic blood vessels. In younger people cocaine, abuse and aneurysm are the cause responsible for the disease.

In the third part of this paper, we report our experience on hypertension associated with increased risk of both vascular dementia and Alzheimer disease [12,13]. Because of the increasing longevity of the population worldwide, prevention of dementia has turned into a major public health problem. Randomized double blind placebo-controlled Systolic Hypertension in Europe (Syst-Eur) trial, our Hypertension Unit, and other 18 European countries have participated in the study. We found that compared with placebo, treatment with antihypertensive drugs –enalapril, nitrendipine, hydrochlorothiazide or all- reduced the incidence of dementia by 50% from 7.7 to 3.8 cases per 1000 patient-years (21 vs. 11 cases). These findings are the results of 106 selected centers in Europe, with 3228 patients enrolled in the study; nevertheless, nine patients had dementia at baseline, whereas in 59 patients cognitive impairment could not be excluded. It is crucial to find a protective mechanism to supply blood flow to vital organs. In older population with isolated systolic hypertension and patients older than 80 years, the incidence of cardiovascular disease, peripheral arterial disease, sudden death, and others problems should not be ignored [15-17].

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