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Scientific Research

Effect of Atrial Fibrillation on Acute Ischemic Stroke Severity

Taha Kamel Alloush[1], Mahmoud Haroun Ibrahim[1], Nahed Salah El Dein Ahmed Ibrahim[1], Ghada Samir El-Shahed[1], Lobna Mohamed Nabil El-Sayed[1], Mohamed Hamdy Ibrahim[1*], Hosam Ahmed Azmy[2]

[1]Faculty of Medicine, Ain Shams University, Cairo, Egypt
[2]Ministry of Health, Cairo, Egypt
Email: [*]mohamedhamdy_neuro2007@yahoo.com

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Abstract

Objectives: To assess the impact of atrial fibrillation on stroke severity and short-term (1 month) mortality. Materials and Methods: Totally 200 patients admitted to Ain Shams University Specialized Hospital were recruited and diagnosed clinically to have acute ischemic stroke within 3 days. Patients with hemorrhagic infarctions were excluded. History taking about previous heart disease was taken, full general and neurological examinations were done. Full metabolic profile, full cardiac investigations, carotid duplex, MRI brain stroke protocol with initial clinical evaluation and after 1 month re-evaluation using (NIHSS) scale. Results: All patients underwent transthoracic echocardiography which revealed absence of "A" wave corresponding to atrial fibrillation in 33 patients (16.5%). Those Patients with atrial fibrillation had a median NIHSS score of 11.00 with IQR of 6.00 - 18.50 at admission and 6.00 with IQR of 2.00 - 14.50 after one month. Patients with atrial fibrillation showed significantly higher NIHSS at admission than patients in sinus rhythm, P < 0.05. Magnetic resonance imaging findings showed that MRA showed significant intracranial vessel stenosis in 117 (79.1%) patients. 51 (34.4%) patients had lacunar infarction, 65 (43.9%) patients had partial anterior circulation infarction, 25 (16.2%) patients had posterior circulation infarction and 7 (4.7%) patients had total anterior circulation infarction. 111 (75%) patients showed leucoaraiosis. Conclusion: Atrial fibrillation was found not to have significantly statistical effect on stroke severity and short term mortality.

Keywords

Atrial Fibrillation (AF)

[*]Corresponding author.

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1. Introduction

Stroke continues to be a major health problem that ranks in the top three causes of death in most countries coming after ischemic heart disease and cancer. It is responsible for a large burden of the population of neurological disorders [1]. Stroke has multiple impacts on the patient's life since 15% to 30% of survivors are disabled with evidence of depression in 50%, high risk of dementia, and increased incidence of fracture [2]. Ischaemic stroke accounts for 75% - 85% of stroke incidence worldwide, causing substantial morbidity and mortality [3]. Atrial fibrillation (AF) is a common cardiac arrhythmia, occurring in 5% - 10% of patients over 65 years of age, it also occurs, particularly in a paroxysmal form, in younger patients [4]. AF is one of the most common cardiac causes of stroke. Hypertension and heart failure are most often associated with non-rheumatic atrial fibrillation. Hyperthyroidism may provoke atrial fibrillation, sometimes as virtually the only feature of the disease [5]. In some patients no cause can be found, and this group is labelled as "lone" atrial fibrillation [6].

2. Aim of the Work

To assess the impact of AF on stroke severity and short-term (1 month mortality). Subjects and Methods: A total of 200 patients admitted to Ain Shams university specialized hospital, stroke unit were recruited to this study between July 2009 and March 2011, diagnosed clinically to have acute ischemic stroke within 3 days.

Inclusion Criteria

Patients were diagnosed clinically to have ischemic stroke if they had "rapidly developing clinical symptoms and/or signs of focal, and at times global, disturbances of cerebral function, lasting more than 24 hours or leading to death with no apparent cause other than that of vascular origin" [7], CT or Gradient echo MRI does not show areas of hemorrhage.

Exclusion Criteria: Patients with hemorrhagic infarction.

Methods: Patients who fulfilled the above criteria were subjected to the following:

Clinical evaluation: This was done within the first 3 days of admission by history taking general and neurological examination and stroke severity assessment using the national institute of health stroke scale (NIHSS). The level of stroke severity as measured by the NIH stroke scale scoring system:

0 = no stroke

1 - 4 = minor stroke

5 - 15 = moderate stroke

15 - 20 = moderate/severe stroke

21 - 42 = severe stroke

Then stroke was subdividing according to modified Oxfordshire classification into total anterior, partial anterior, lacunar and posterior circulation stroke [6] (**Table 1**).

This stroke subtyping was then correlated with diffusion-weighted MRI and if there is any conflict between clinical and radiological findings, diffusion-weighted imaging were taken as decisive. History was also taken for: Hypertension, Diabetes mellitus. History of ischemic heart disease (history of myocardial infarction, angina pectoris or the patient's reporting of a positive diagnostic test (stress ECG, coronary angiography) or drug treatment (**Table 2**, **Figure 1**).

The patients and their families and party were informed orally about objectives, risk factor and benefit of the study. And verbal approvals, consent were obtained and taken. Ethical committee of Ain Shams University Specialized Hospital, Cairo, Egypt had approved the clinical study.

II-Routine investigations: These included complete blood picture, Erythrocyte sedimentation rate, coagulation profile, random blood sugar, liver and kidney function tests, lipid profile, uric acid level, plain chest x-ray and electrocardiography (ECG).

III-Transthoracic Echocardiography: Where the following data were detected: Ejection fraction (EF), patients were considered to have heart failure or systolic dysfunction if ejection fraction is ≤40% [8].

IV-Carotid duplex: This was done using a 7.5 MHz transducer on a Philips ultrasound machine, peak systolic and mean flow velocity were measured for the common carotid, internal carotid and external carotid arteries on both sides. Vertebral arteries were assessed when visualized. Significant carotid stenosis was defined as narrowing of the lumen of ≥70% [9].

V-MRI-Brain (stroke protocol; axial T1, T2, FLAIR, T2*, DWI and MRA).This was done using 1.5 tesla using a head coil, the examination lasted for 20 minutes according to Ain Shams protocol of stroke imaging

Table 1. Types of stroke according to Modified Oxfordshire classification.

	N (148)		%
Types	Lacunar	51	34.4
	PACI	65	43.9
	POCI	25	16.2
	TACI	7	4.7
	N (200)		%
Outcome	Alive	174	87
	Dead	26	13

PACI: partial anterior circulation syndrome, POCI: posterior circulation infarction, TACI: total anterior circulation infarction.

Table 2. Risk factors studied among study group.

		N	%
HTN (200)	−ve	58	29
	+ve	142	71.7
DM (200)	−ve	94	47
	+ve	106	53
Evidence of myocardial ischemia (200)	−ve	126	63.0
	+ve	74	37.0
AF (200)	−ve	167	83.5
	+ve	33	16.5
Cigarette smoking (200)	−ve	134	67
	+ve	66	33

AF: atrial fibrillation, DM: diabetes mellitus, ECG: electrocardiogram, HTN: hypertension

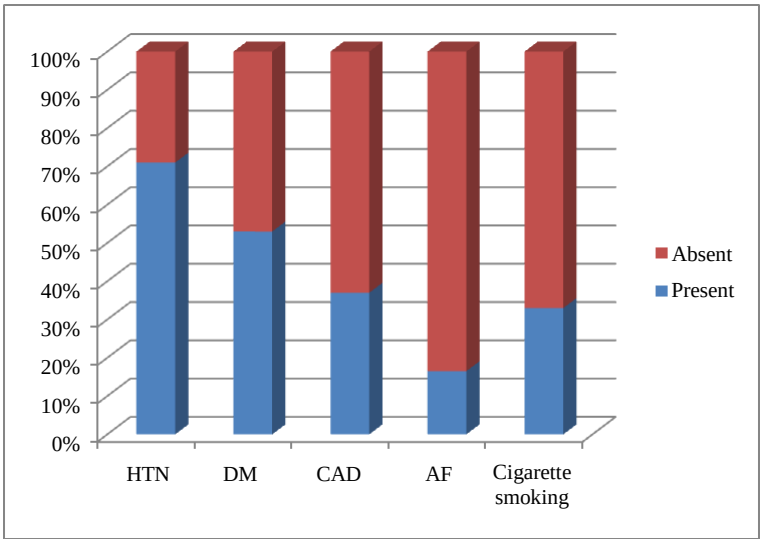

Figure 1. Risk factors among the study group.

sequencing which includes axial T1, T2, Flair, DWI, Gradient echo ($T2^*$) and MRA (Three dimensional time of flight), Where the following data were obtained: Size of the infarct and its arterial territory where infarcts of ≤1.5 cm where considered lacunar infarct, infarcts corresponding to the distribution of internal carotid or main stem middle cerebral artery territory were considered total anterior circulation infarct and infarcts in the distri-

bution of vertebrobasilar territory were considered posterior circulation infarct and after comparison with clinical classification, anatomical or modified Oxfordshire classification was made (**Figure 2**, **Figure 3**).

Presence or absence of intra-cranial stenosis according to (WASID method), by comparing the diameter of the stenosed area and the diameter (D) of the proximal vessel just proximal to the stenosed vessel and applying the following equation:

Percent stenosis = [1 − (Dstenosis/Dnormal)] × 100% where percentage ≥ 25% were taken as positive value [9] [11].

Presence or absence of leucoaraiosis. Patients were followed up by NIHSS after 1 month.

Statistical Analysis:

The data were coded, entered and processed on computer using SPSS (version 15). The level $P < 0.05$ was considered the cut-off value for significance.

Chi-Square test X^2 was used to test the association variables for categorical data.

Fisher exact test was performed in table containing value less than 5.

Student's t-test was used to assess the statistical significance of the difference between Two population means in a study involving independent samples. The Wilcoxon signed-rank test to assess the statistical significance of the difference between two populations in a study involving matched or paired samples.

3. Results

3.1. Descriptive Data

A total of 200 patients admitted to Ain Shams university specialized hospital, stroke unit were recruited to this study between July 2009 and March 2011, diagnosed clinically to have acute ischemic stroke within 3 days.

3.2. Demographic Data

This study included 200 patients, with an age range between 23 - 90 years with a mean and a standard deviation of 61.87 ± 12.65 of those 118 (59%) patients were males and 82 (41%) were females (**Table 3** and **Figure 4**).

All patients had transthoracic echocardiography which revealed absence of "A" wave corresponding to atrial fibrillation in 33 patients (16.5%), diastolic dysfunction in 88% of patients in sinus rhythm, segmental wall motion abnormality in 61 patients (30.5%), Left ventricular hypertrophy in 106 patients (53%), systolic dysfunction represented by ejection fraction of ≤40% in 22 patients (11%), and dilated left atrium represented by atrial diameter of ≥40 mm in 113 patients (56.5%) (**Table 4** and **Figure 5**).

Patients with atrial fibrillation had a median NIHSS score of 11.00 with IQR of 6.00 - 18.50 at admission and 6.00 with IQR of 2.00 - 14.50 after one month (**Table 5**). Where patients with AF showed significantly higher NIHSS at admission than patients in sinus rhythm, $P < 0.05$.

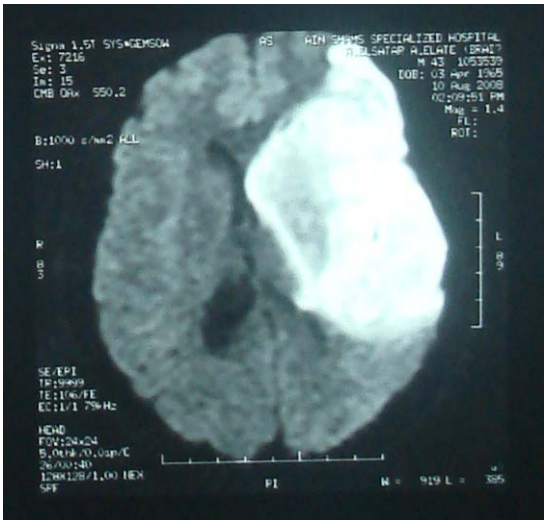

Figure 2. Diffusion-weighted MRI showing total anterior circulation infarction in a patient with atrial fibrillation.

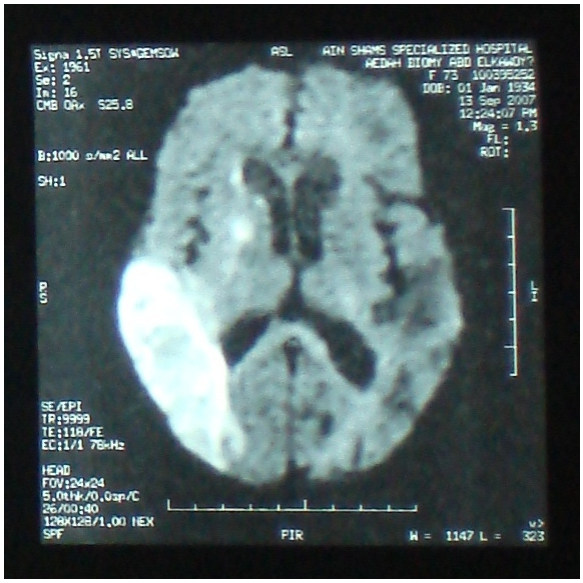

Figure 3. Diffusion-weighted MRI showing partial anterior circulation infarction of the area supplied by posterior branch of MCA in a patient with atrial fibrillation.

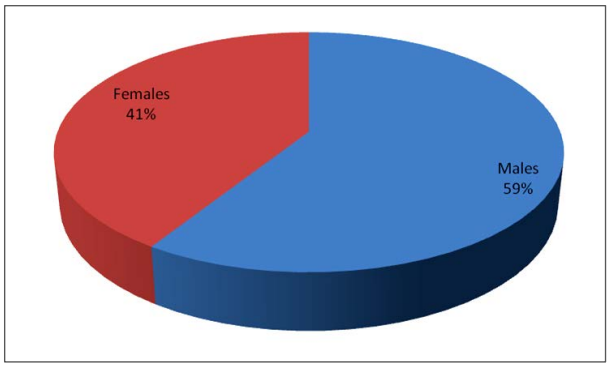

Figure 4. Sex distribution among the study group.

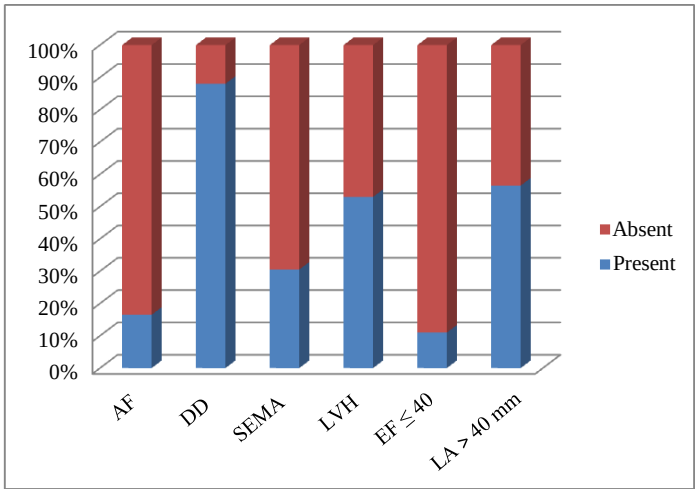

Figure 5. Distribution of echocardiographic variables among the study group.

Table 3. Age and sex distribution among the study group.

	Range	*Mean*	*±SD*	
Age	23 - 90	61.87	±12.65	
Sex (200)		Males	118	59%
		Female	82	41%

Table 4. Echocardiographic variables in the recruited group.

		N	*%*
AF (200)	−ve	167	83.5
	+ve	33	16.5
DD in non-AF patients (167)	Absent	20	12.0
	Present	147	88.0
SWMA (200)	Absent	139	69.5
	Present	61	30.5
LVH (200)	Absent	94	47.0
	Present	106	53.0
EF (200)	>40%	178	89.0
	≤40%	22	11.0
LA diameter (200)	≤40 mm	87	43.5
	>40 mm	113	56.5

AF: atrial fibrillation, DD: diastolic dysfunction, SWMA: segmental wall motion abnormality, LVH: left ventricular hypertrophy, EF: ejection fraction, LA: left atrium.

Table 5. NIHSS at admission and follow-up in patients with and without AF.

	AF				*Z*	*P*	*Sig.*
	−VE (167)		*+VE* (33)				
	Median	*IQR*	*Median*	*IQR*			
NIH at admission	8.00	4.00 - 13.00	11.00	6.00 - 18.50	2.06	0.03	**S**
NIH at follow-up	4.00	2.00 - 7.00	6.00	2.00 - 14.50	1.32	0.19	NS

Mann-Whitney Test. AF: atrial fibrillation IQR: interquartile range, NIHSS: national institute of health stroke scale.

4. Discussion

Stroke is a major health problem and associated with increased long-term mortality, residual physical, cognitive, and behavioral impairments, recurrence, and increased risk of other types of vascular event, such as myocardial infarction [10]. Eighty-eight percent of strokes have ischemic etiology; 8% to 12% of these ischemic strokes result in death within 30 days. Despite gradual declines in overall stroke death rates in many parts of the world, stroke remains a leading cause of death and disability. Worldwide, stroke is also a leading cause of death, with stroke mortality being particularly high in Eastern Europe and Asia [11]. Stroke is also the leading cause of disability in adults. Of the hundreds of thousands of stroke survivors each year, approximately 30% require assistance with activities of daily living, 20% require assistance with ambulation, and 16% require institutional care and thus human and financial costs of stroke are immense [9].

Atrial fibrillation (AF) is a common arrhythmia occurring in around 10% - 15% of those >65 years of age and in up to 25% of those >75 years of age in population based studies [12].

AF was present in 16.5% of our study patients as diagnosed by electrocardiography (ECG) and echocardiography. Their median NIHSS score at admission was 11 which is significantly higher than that of non-AF patients which was 8 and their NIHSS score at discharge was also higher than the NIHSS score for non-AF patients. Similar findings were reported showed that AF patients were twice as common to have fatal ischemic

stroke and functional disability and both short term and long-term mortality were noted to be higher with larger infarct size on imaging studies.

Similar findings were also noted in other studies like that of Sandercock *et al.* (1992) [13] and Hart *et al.* (2001) [14].

5. Conclusion

Atrial fibrillation was found not to have significantly statistical effect on stroke severity and short term mortality.

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