

## BRIEF REPORTS

# Cardiac Monitoring in Stroke Units: Importance of Diagnosing Atrial Fibrillation in Acute Ischemic Stroke

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In patients with stroke, atrial fibrillation is an independent risk factor and indicates a poor prognosis. Cardiac monitoring is carried out for longer periods in stroke units. The aim of this study was to determine the frequency at which atrial fibrillation is detected in stroke units and the percentage of patients with acute ischemic stroke or transient ischemic attack who receive anticoagulant therapy.

The study included 465 patients, who were monitored in a stroke unit for an average of 54.55 (35.74) h. Atrial fibrillation was detected in 33 (48.5% had paroxysmal atrial fibrillation and 51.5% had persistent atrial fibrillation). The most common risk factor was hypertension. Anticoagulation therapy was started in 57.5%.

In conclusion, use of cardiac monitoring in a stroke unit was useful for detecting atrial fibrillation in patients with acute stroke and resulted in treatment modification in more than half the affected patients.

**Key words:** Atrial fibrillation. Stroke unit. Anticoagulant therapy.

## Monitorización cardiaca en la unidad de ictus: importancia del diagnóstico de fibrilación auricular en el ictus isquémico agudo

La fibrilación auricular (FA) es un factor de riesgo independiente y predictor de mal pronóstico en el ictus. La unidad de ictus (UI) prolonga la monitorización cardiaca. El objetivo del estudio fue determinar la frecuencia de FA detectada en la UI y el porcentaje de pacientes con ictus isquémico o accidente isquémico transitorio a quienes se dio tratamiento anticoagulante.

Se incluyó a 465 pacientes monitorizados en la UI durante una media de 54,55 ± 35,74 h. Se detectó FA en 33 (el 48,5%, FA paroxística, y el 51,5%, FA persistente). El factor de riesgo más frecuente fue la hipertensión arterial. Se inició tratamiento anticoagulante en el 57,5%.

Concluimos que la monitorización en la UI es útil para la detección de FA en el ictus agudo y modifica el tratamiento en más de la mitad de los pacientes afectados.

**Palabras clave:** Fibrilación auricular. Unidad de ictus. Tratamiento anticoagulante.

## INTRODUCTION

Patients with transient ischemic attack (TIA) or established stroke are those most at risk of recurrence (10.5% at 90 days), and this is greatest in the first week.<sup>1</sup>

Cardiogenic embolism causes 20% of strokes, and atrial fibrillation (AF) 50%. The most common form, nonvalvular, occurs in 6% of patients aged 65 and arrhythmia is the principal cause in older patients. Both AF and paroxysmal AF (PAF) clearly indicate risk of a first or recurrent stroke and are associated

with poor prognosis. Recurrent events may account for 12%-30% per year.<sup>2</sup>

Given that anticoagulation therapy reduces risk of recurrence, detecting AF after stroke is fundamental to optimizing treatment but underdiagnosis of AF continues. Over 30% of patients are unaware of their diagnosis and 25% of those with stroke had no previous diagnosis. Moreover, in 30% the pattern is intermittent.

Due to the low sensitivity of standard electrocardiography, 24-hour ECG recording (Holter) is frequently used.<sup>3</sup> Holter facilitates detection of previously unknown AF in approximately 2% of patients with stroke. If recording is extended from 24 to 72 hours, frequency of PAF increases from 1.2% to 6.1%, indicating that longer recording times improve chances of detection.<sup>4</sup>

Several studies show care of patients with acute cerebrovascular disease in the stroke unit (SU) reduces morbidity and mortality, and need for

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admission.<sup>5</sup> Admission of patients with stroke to SU would prolong cardiac monitoring and facilitate detection of previously unknown persistent AF (pAF) or PAF.

## METHODS

We conducted a prospective, descriptive study from June 2005 to July 2007 with 722 patients hospitalized with ischemic stroke or TIA, out of 1274 stroke patients admitted to the Hospital del Mar, Barcelona, Spain. Neurologic emergencies are admitted from 2 districts (Sant Martí and Ciutat Vella), with a population of 344 959 (in 2006). Patients with a known history of AF, previous anticoagulant therapy or hemorrhagic stroke were excluded.

We collected demographic and clinical data (prejudicial habits, cardiovascular risk factors, antecedents of stroke, and cardiac arrhythmias), severity of stroke, and prognosis. We conducted neurovascular studies (transcranial Doppler, carotid duplex, cranial computerized tomography [CT], 12-lead ECG and cranial magnetic resonance [MR] in patients with initial cranial CT without lesions). Selected patients underwent echocardiography.

The SU neurology room has 4 beds. Inclusion criteria (acute phase stroke, slight or moderate neurologic deficit or TIA, with no age limit) were the Spanish Society of Neurology study group on cerebrovascular disease, 2004 guidelines for treatment and prevention of stroke.

Monitoring was performed with Dash 2000 (GE Medical Systems) equipment. The acoustic alarm activated on detecting an irregular rhythm or 100 bpm heart rate. After activation, nursing staff perform a standard ECG and call the neurologist to evaluate the patient's condition.

Neurologic deficit severity is determined with the National Institute of Health Stroke Scale (NIHSS). A score of <5 is considered a minor deficit. The modified Rankin scale (mRS) was used to quantify incapacity, with 0-2 considered independent.

Stroke subtype was classified according to the internationally-accepted Trial of Org 10172 in Acute Stroke Treatment (TOAST).

Current CC/AHA/ESC clinical guidelines consider AF is recognized in the ECG by absence of P waves, the isoelectric line being replaced by irregular, high frequency oscillations (f waves) and wholly irregular ventricular response. Paroxysmal AF is defined as self-limited episodes (<30 s) ending spontaneously within 7 days (generally in the first 24 hours). Episodes of >7 days are termed persistent AF and require therapeutic intervention (drugs or electric cardioversion). Permanent AF is usually defined as AF of >1 year, for which cardioversion

has failed or not been attempted.<sup>6</sup> We compared patient characteristics according to whether they presented paroxysmal or persistent AF.

Statistical analysis was with SPSS 13.0. Data are given as mean (SD) or medians for quantitative variables, and n (%) for qualitative variables. Quantitative variables were compared with Student *t* test and qualitative variables with  $\chi^2$ . A *P* value less than .05 was considered significant.

## RESULTS

We enrolled 461 patients with ischemic stroke and 4 with TIA (64% of the total) who remained in the SU for 54.55 (35.74) hours. We detected AF in 33 (7%); PAF in 16 (3.4%) and persistent AF in 17 (3.65%). Monitoring continued for 45.6 (23.86) hours. Characteristics of the 2 groups are in Table. We found no significant differences in demographic data or vascular risk factors between groups. At admission, these 33 patients were diagnosed with stroke of undefined cause, which was later modified to cardioembolic stroke. In the PAF group, 9 (56.25%) began anticoagulant therapy and 5 (31.25%) antiplatelet therapy, due to the high risk of hemorrhagic transformation in the acute phase due to the size of the cerebral lesion; the other 2 patients died without receiving antithrombotic treatment. In the persistent AF group, 10 (59%) patients began anticoagulant therapy and 5 (29.4%) began antiplatelet therapy, for the previously-mentioned indications. In the other 2, treatment was not indicated due to social disadvantage and death. The most frequently prescribed antiarrhythmic drug was Amiodarone prior to cardioversion or to maintain sinus rhythm.

## DISCUSSION

Atrial fibrillation is the most frequent cardiac arrhythmia and its prevalence is increasing with the aging population and improvements in ischemic heart disease and heart failure management. Descriptions of the epidemiology of AF have been based on hospital or population-wide records that underestimate the percentage of patients affected. A similar difference is found in associated risk factors—the most prevalent being hypertension (HT), in population-wide studies, and ischemic heart disease and heart failure in hospital-based studies.<sup>7</sup> In our study HT is the most prevalent risk factor.

Studies referring to AF detection in patients admitted for stroke present contradictory results because they ignore the systematic use of 24-hour Holter and echocardiograms. Recently, several articles have tried to determine cardiologic study indications. Schaer et al<sup>8</sup> analyzed patients with

**Characteristics of Groups With PAF Versus pAF**

	PAF (n=16)	pAF (n=17)
Age, mean (SD), y	79.8 (7.3)	78.5 (7.1)
Women, n (%)	9 (56.3)	12 (70.6)
HT, n (%)	14 (87.5)	17 (100)
Dyslipidemia, n (%)	6 (37.5)	5 (29.4)
Diabetes mellitus, n (%)	8 (50)	4 (23.5)
mRS at discharge, median	2	3
NIHSS at admission, median [interquartile range]	9.5 [4.25-16.5]	5 [2-13]
TOAST at discharge	Cardioembolic	Cardioembolic
Transthoracic echocardiography performed, n (%)	6 (37.5)	8 (47)
Left atrium size, mean (SD), mm	39.7 (4)	43 (8.2)
Anticoagulant therapy at discharge, n (%)	9 (56.3)	10 (59)
Antiplatelet therapy at discharge, n (%)	5 (31.3)	5 (29.4)
Antiarrhythmic treatment at discharge, n (%)		
No	5 (31.3)	4 (23.5)
Beta-blockers	1 (6.3)	1 (6)
Calcium channel blockers	1 (6.3)	2 (11.8)
Digoxin	2 (12.5)	6 (35.3)
Amiodarone	7 (43.8)	4 (23.5)

pAF indicates persistent atrial fibrillation; mRS, modified Rankin scale; NIHSS, National Institute of Health Stroke Scale; PAF, paroxysmal atrial fibrillation; SD, standard deviation.

Non-statistically significant differences ( $P>.05$ ).

stroke or TIA and 24-hour Holter studies and found it was not cost-effective due to the low incidence detected (2.1%). Jabaudon et al<sup>9</sup> showed that the ambulatory record over 7 days increased the percentage of arrhythmias detected (5.7%). Recent articles dealing with benefits of the SU, mention AF detection data recorded. In SU monitoring, Silva et al<sup>10</sup> detected AF in 12.5% of admissions versus 5.3% of patients in conventional stroke units, without distinguishing between chronic AF and PAF. In a similar study, Sulter et al<sup>5</sup> found no differences.

Among our patients, 7% presented with AF in the SU. We could not compare this group with conventional stroke unit admissions.

Anticoagulation therapy reduces recurrence and mortality when used to treat cardioembolic stroke. In our study, 57.6% of patients presenting with AF began anticoagulant therapy. In 33.3% it was decided to start antiplatelet therapy due to the risk of hemorrhagic transformation of extensive cerebral lesions and severe incapacity. The greater efficacy of anticoagulation over antiplatelet therapy in secondary prevention was proven in the European Atrial Fibrillation Trial.<sup>11</sup> No evidence exists to suggest that combining anticoagulant therapy and antiplatelet therapy reduces risk. Results on when to start anticoagulation therapy are inconclusive. The latest AHA/ASA clinical guidelines recommend starting 2 weeks after a minor stroke or TIA. In our study, patients with TIA or minor stroke started immediately; the rest began after 7-10 days, once neuroimaging had ruled out hemorrhagic transformation.

Amiodarone was the antiarrhythmic drug most often chosen, in order to maintain sinus rhythm. At the time of writing, studies comparing strategies to control rhythm or heart rate show no significant differences between these for mortality, increased bleeding, or thromboembolic episodes.<sup>6</sup> The AFFIRM study associated risk of ischemic stroke with absence of anticoagulation therapy or dosage levels too low to meet therapeutic needs. So, independently of the use of heart rate control strategies, anticoagulation therapy is fundamental in managing patients with AF and risk of stroke.<sup>12</sup>

In conclusion, our study indicates that continuous cardiac monitoring in the SU, during at least 48 hours following admission, should be part of standard management practice for detecting AF since it helps determine stroke etiology and optimizes later treatment.

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**REFERENCES**

1. Rothwell PM, Warlow CP. Timing of TIAs preceding stroke: time window for prevention is very short. *Neurology*. 2005;64:817-20.
2. Sacco RL, Adams R, Albers G, Alberts MJ, Benavente O, Furie K, et al. Guidelines for prevention of stroke in patients

- with ischemic stroke or transient ischemic attack. *Stroke*. 2006;37:577-617.
3. Rem JA, Hachinski VC, Boughner DR. Value of cardiac monitoring and echocardiography in TIA and stroke patients. *Stroke*. 1985;16:950-6.
  4. Roche F, Gaspoz JM, da Costa A, Isaaz K, Duverney D, Pichot V, et al. Frequent and prolonged asymptomatic episodes of paroxysmal atrial fibrillation revealed by automatic long-term event recorders in patients with a negative 24-hour Holter. *Pacing Clin Electrophysiol*. 2002;25:1587-93.
  5. Sulter G, Elting JW, Langedijk M, Maurits N, de Keyser J. Admitting acute ischemic stroke patients to a stroke care monitoring unit versus conventional stroke unit: A randomized pilot study. *Stroke*. 2003;34:101-4.
  6. Fuster V, Rydén LE, Cannom DS, Crijns HJ, Curtis AB, Ellenbogen KA, et al. ACC/AHA/ESC 2006 guidelines for the management of patients with atrial fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines and the European Society of Cardiology Committee for practice guidelines. *J Am Coll Cardiol*. 2006;48:854-906.
  7. Lip G, Tse HF. Management of atrial fibrillation. *Lancet*. 2007;370:604-18.
  8. Schaer BA, Zelweger MJ, Cron TA, Kaiser CA, Osswald S. Value of routine Holter monitoring for the detection of paroxysmal atrial fibrillation in patients with cerebral ischemic events. *Stroke*. 2004;35:e68-e70.
  9. Jabaudon D, Sztajzel J, Sievert K, Landis T, Sztajzel R. Usefulness of ambulatory 7-day ECG monitoring for the detection of atrial fibrillation and flutter after acute stroke and transient ischemic attack. *Stroke*. 2004;35:1647-51.
  10. Silva Y, Puigdemont M, Castellanos M, Serena J, Suñer RM, García M, et al. Semi-intensive monitoring in acute stroke and long-term outcome. *Cerebrovasc Dis*. 2005;19:23-30.
  11. European Atrial Fibrillation Trial Study Group. Secondary prevention in non-rheumatic atrial fibrillation after transient ischemic attack or minor stroke. *Lancet*. 1993;342:1255-62.
  12. Sherman DG, Kim SG, Boop BS, Corley SD, Dimarco JP, Hart RG, et al; National Heart, Lung, and Blood Institute AFFIRM Investigators. Occurrence and characteristics of stroke events in the Atrial Fibrillation Follow-up Investigation of Sinus Rhythm Management (AFFIRM) study. *Arch Intern Med*. 2005;165:1185-91.