Echocardiographic Findings in a Contemporary Afro-Caribbean Population Referred for Evaluation of Unexplained Syncope

TC Martin[1,2], BK Bains[2], PA Aslam[2]

ABSTRACT

Echocardiographic findings were reviewed for 106 patients (mean age 41.3 ± 23.0 years, range 3 to 90 years, 61% female) referred for evaluation of unexplained syncope. Abnormal echocardiographic findings were seen in 36/106 (34%) patients, of which 12/106 (11%) may have an abnormality that contributed to symptoms. Abnormal echocardiographic findings (64 vs 6%, p < 0.01) and those possibly causing syncope (22 vs *0%,* p *< 0.05) were significantly more likely in the oldest tercile of patients compared with the youngest. No patient less than 35 years old had a possibly diagnostic abnormality.*

Hallazgos Ecocardiográficos en una Población Afrocaribeña Contemporánea Referida para Evaluación del Síncope Inexplicado

TC Martin[1,2], BK Bains[2], PA Aslam[2]

RESUMEN

Se revisaron los hallazgos ecocardiográficos de 106 pacientes, edad promedio 41.3 ± 23.0 años, rango 3 a 90 años, 61% hembras, referidos para evaluación del síncope inexplicado. Se observaron hallazgos ecocardiográficos anormales en 36/106 (34%) pacientes, de los cuales 12/106 (11%), podían tener una anormalidad que contribuyera a los síntomas. Los hallazgos ecocardiográficos anormales (64 versus *6%,* p *< 0.01) y aquellos que posiblemente causan síncope (22* versus *0%,* p *< 0.05) fueron significativamente más probables en el tercil de pacientes de mayor edad en comparación con los más jóvenes. Ningún paciente menor de 35 años de edad tuvo alguna anormalidad diagnóstica. .*

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INTRODUCTION

Syncope accounts for 6% of general medical admissions in the United States of America (USA) costing up to $16 000 US per patient (1). It is a problem that affects both children (2, 3) and adults (4, 5). The causes of syncope and near syncope can range from trivial to life-threatening (2–5). The initial history and physical examination, together with the electrocardiogram, are diagnostic in over 50% of patients or can allow for further directed evaluation (4, 6–8).

The differential diagnosis of syncope includes neurocardiogenic cause, primary cardiac causes and primary neurologic causes, among other conditions (2–5). The finding of cardiac causes carries a graver prognosis with a 33% incidence of sudden death at five years compared with 5% with non-cardiac cause and 9% with unknown cause in adults (9). Although patients often have echocardiograms done for syncope, the findings are rarely diagnostic in the setting of a negative history, physical examination or electrocardiogram (10–12).

In Antigua and Barbuda, specialist expertise in assessing the cause of syncope is not always available. Patients with unexplained syncope and near syncope are often referred for echocardiogram to rule out a cardiac contribution. This study is an attempt to assess the findings and value of echocardiography in a contemporary Afro-Caribbean population experiencing syncope or near syncope in Antigua and Barbuda.

From: The Antigua Heart Centre, Belmont Clinic[1], and the American University of Antigua College of Medicine[2], St John's, Antigua and Barbuda

Correspondence: Dr TC Martin, Eastern Maine Medical Centre, 489 State Street, Greystone Bldg, PO Box 404, Bangor, Maine, USA. E-mail: tcmartin@emh.org.

SUBJECTS AND METHODS

A retrospective review of all echocardiograms performed on patients referred for the evaluation of unexplained syncope or near syncope between May 1998 and April 2007 was performed. Patients with known cardiac arrhythmia, myocardial infarction or cardiac failure, cerebrovascular accident or seizures and drug or alcohol exposure were excluded. Antigua and Barbuda has a population of 70 000, 90% Afro-Caribbean, 8% mixed ethnicity at last census, per capita income of about $6 000 US during the study period with 70% from tourism. Data available for review included age, gender and echocardiographic findings.

Echocardiograms were performed on a Toshiba Sonolayer V SSA-100A machine (Toshiba Corp, Tokyo, Japan 1988), an ATL Ultramark 9 ADI 3000 machine (Advanced Technologies Laboratories, Bootell, Washington, USA, 1999) or Shimadzu SDU 2200 machine (Shimadzu Corp, Tokyo, Japan 2003) using a 3.25 or 3.5 megaHertz transducer. M-mode echocardiographic measurements using sector focussing included left ventricular end-systolic and end-diastolic diameter, left atrial dimension, aortic diameter, right ventricular size and assessment of valvular abnormality done by accepted standards (13). Intraventricular septum and left ventricular posterior wall thickness were measured using the M-mode standard convention (13). Left ventricular ejection fraction was calculated using long axis guided M-mode derived end-diastolic and end-systolic left ventricular diameters (14).

Normal values for children were within two standard deviations (SD) of normal for age (15). Adult normal values for left ventricular end-diastolic diameter (# 55 mm), right ventricular end diastolic dimension (< 23 mm), left atrial dimension (# 40 mm), aortic diameter (# 40 mm), intraventricular septum and left ventricular wall thickness (< 12 mm) and left ventricular ejection fraction (# 60%) were based on published normal values (16). Abnormal valve anatomy was a qualitative judgement as quantitative Doppler was not available.

The study group was separated into terciles based on age for statistical analysis. Comparisons were made using chi-square analysis on STAT101 software (Ashley-Minitab Inc, Reading, Massachusetts, USA, 1993). Comparisons with p-value > 0.05 are considered not significant.

RESULTS

There were 106 patients who underwent echocardiography for evaluation of unexplained syncope (91/106, 86%) or near syncope (15/106, 14%). The group ranged in age from 3 to 90 years and mean age ± SD was 41.3 ± 23.0 years. Female patients accounted for 65/106, 61%. Any abnormality on echocardiogram was seen in 36/106, 34% of the patients. Patients with syncope had a trend toward having more abnormal findings (33/91, 36%) compared with those with near syncope (3/15, 20%).

Abnormalities seen on echocardiogram which were incidental or non-contributory were seen in 24/106, 23% of patients. These findings included minor to moderate degrees of left ventricular hypertrophy (intraventricular septum or left ventricular posterior wall $ 12 mm) in 23/106 and 1/106 with a haemodynamically insignificant ventricular septal defect. No patient had an abnormal left ventricular ejection fraction. Five patients (5/106, 5%) had dilated left atria (all with left ventricular hypertrophy).

Abnormalities seen on echocardiogram which were possibly of diagnostic significance were seen in 12/106, 11% of patients. These findings included an abnormal aortic or mitral valve in 4/106, an enlarged right ventricle in 4/106 and a thickened intraventricular septum relative to left ventricular posterior wall (ratio > 1.3) in 4/106.

Echocardiographic findings appeared to vary with age. The study group was separated into terciles based on age. The youngest group ranged from 3 to 26 years, mean 16.3 ± 5.1 years, 60% female; the middle group from 26 to 49 years, mean 37.9 ± 6.9 years, 54% female and the oldest group from 53 to 90 years, mean 68.7 ± 9.9 years, 69% female. Comparisons of echocardiographic abnormalities are shown in the Table and illustrated in the Figure.

Table: Echocardiographic findings in patients with unexplained syncope and near syncope by age terciles.

Age (years)	Abnormal findings	Incidental findings	Possibly diagnostic findings
3–26, mean 16	2/35 6%*	2/35 6%**	0/35 0%**
26–49, mean 38	11/35 31%	7/35 20%	4/35 11%
53–90, mean 69	23/36 64%	15/36 42%	8/36 22%

*p-value < 0.01 compared with oldest tercile, ** p-value < 0.05 compared with oldest tercile.

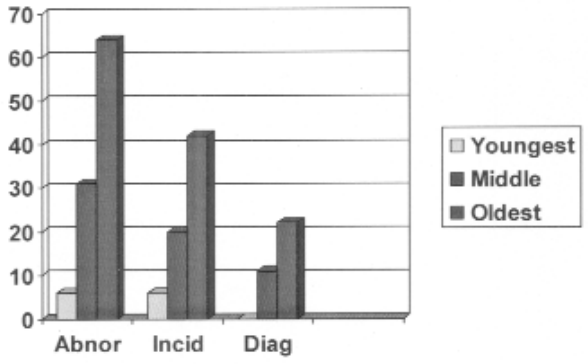

Figure: Abnormal echocardiographic findings in unexplained syncope in youngest (3 to 26 years, mean 16 years), middle (26 to 49 years, mean 38 years) and oldest (53 to 90 years, mean 69 years) terciles. Abn = abnormal, Incid = incidental, Diag = possibly diagnostic.

The youngest tercile had abnormal findings in 2/35 (6%) patients, two being incidental and none was diagnostic. The middle tercile had abnormal findings in 11/35 (31%)

patients, 7/35 (20%) incidental and 4/35 (11%) being possibly diagnostic. The oldest tercile had abnormal findings in 23/36 (64%) patients, with 15/36 (42%) being incidental and 8/36 (22%) being possibly diagnostic. No patient less than 35 years old had an echocardiographic abnormality considered to be possibly diagnostic.

Patients in the youngest tercile were significantly less likely than those in the oldest tercile to have an abnormal echocardiographic finding (2/35, 6% *vs* 23/36, 64%, $p < 0.01$), an incidental abnormality (2/35, 6% *vs* 15/36, 42%, $p < 0.05$) and a possibly diagnostic abnormality (0/35, 0% *vs* 8/36, 22%, $p < 0.05$).

DISCUSSION

The evaluation of unexplained syncope can be complicated and expensive in this era of new technologies (1–5). Attempts have been made to develop guidelines and protocols to streamline clinical decision making (4, 6, 8, 17–22). Such approaches may improve the diagnosis and hopefully decrease the cost of evaluating patients with syncope (1, 18, 20, 22).

A systematic history, physical examination including orthostatic blood pressure changes, carotid massage and a standard 12-lead electrocardiogram are the most important parts of these diagnostic pathways, resulting in a diagnosis in 23 to 69% of patients with syncope (4, 6, 8, 21). Further tests are to be done on the basis of clinical suspicion. These might include angiography, electroencephalography, cardiac catheterization and echocardiography as necessary (8). In one report, patients having structural heart disease, a family history of sudden death, an abnormal echocardiogram, a significant arrhythmia or palpitations underwent 24-hour electrocardiographic Holter monitoring and electrophysiologic testing (19); the others had tilt-table testing for neurocardiogenic syncope (19).

In the smaller territories of the Caribbean region, these studies are not readily available. The need to further define a group at risk which would benefit from overseas evaluation is necessary. Age is a factor that affects the risk of syncope. Patients less than 65 years old had fewer cardiac causes for syncope, 12% *vs* 34%, and were more likely to have a neural cause, 68% *vs* 54%, compared with those over 65 years (23). Tests in paediatric patients with syncope were diagnostic for 4% of tests done and were helpful in 14% of patients (12). In this series of patients with syncope in Antigua and Barbuda, echocardiograms did not provide diagnostic help in any patient less than 35 years old and the yield of diagnostic echocardiographic studies was significantly less in patients less than 27 years old compared with those over 50 years old. In unexplained syncope in young people with no family history of sudden death or cardiomyopathy, no exertional symptoms, normal physical examination and electrocardiography, echocardiography is probably not needed (2, 3).

Cardiac causes for syncope double the risk for all-cause mortality and increase the risk four to six-fold for sudden death compared with other causes of syncope in adults (9). The history in patients with syncope (for example, syncope while supine or with physical effort) help identify a cardiac cause for syncope (23). However, the risk of a cardiac cause for syncope increases with age and may be less apparent by history (24). In this series of patients from Antigua and Barbuda, echocardiographic findings that were possibly diagnostic were seen in 11% of patients between 26 and 49 years old and in 22% of patients between 53 and 90 years old. These patients may represent a group that would benefit from overseas assessment.

Patients with cardiac arrhythmias represent a group at high risk. Although the electrocardiogram may be useful for chronic arrhythmias, long QT syndrome and Brugada syndrome, tests like electrophysiologic testing, upright tilt table testing, Holter monitoring and implantable loop recorder might be needed to make a diagnosis (4, 19, 20, 21, 25, 26). Prolonged cardiac rhythm monitoring may be the best approach to unexplained syncope (27). There is a suggestion that sudden death may be less of a risk for Afro-Caribbean patients than for patients of European ethnicity living in the United Kingdom (28). An abnormal echocardiogram may help identify patients at risk, but extended electrocardiographic monitoring, either ambulatory or in an intensive care unit setting, might identify those with no underlying structural heart disease in regions where electrophysiologic testing or implantable loop recorders are not available.

Although echocardiography may not be useful as a stand alone test for syncope (10–12), it may be useful for identifying a group at higher risk who may benefit from additional testing. The possibly diagnostic findings in this population from Antigua and Barbuda included valvular heart disease, right ventricular enlargement and asymmetric septal hypertrophy. These findings may be related to syncope due to limited cardiac output, recurrent pulmonary emboli or pulmonary hypertension and left ventricular outflow obstruction or arrhythmia.

In summary, the echocardiogram was abnormal in 34% of patients referred for evaluation of syncope in Antigua and Barbuda. Abnormalities which may have contributed to unexplained syncope were seen in 11% of patients, all over 35 years old.

The echocardiogram may be useful in identifying a group of patients who might benefit from additional evaluation, especially older patients.

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