

Association Between Symptoms and Frequency of Arrhythmias on 24-Hour Holter Monitoring

Ghazala Irfan¹, Mansoor Ahmad² and Abdul Rasheed Khan³

ABSTRACT

Objective: To determine association between patient's symptoms and incidence of arrhythmia on 24-hour electrocardiographic Holter monitoring.

Study Design: A cross-sectional descriptive study.

Place and Duration of Study: The Cardiology Department, Liaquat National Hospital, Karachi, from January to June 2007.

Methodology: Patients above 15 years of age, of either gender, referred for Holter monitoring with symptoms of palpitations, dizziness and syncope were evaluated for arrhythmia. The symptoms were documented by the patients in their symptom diaries (historical logs) during Holter monitoring. Patients who had permanent pacemaker implants were excluded. Descriptive statistics were used to calculate the frequencies and percentages of different symptoms, different arrhythmias were noted on Holter monitoring and the age of patients was noted. Chi-square test was applied to calculate p-values with significant at value less than 0.05.

Results: The mean age of patients was 53.71 ± 15.52 years. There were 54% females and 46% males. Eighty two percent had documented arrhythmias on their Holter monitoring reports. The complaints for which patients were referred included dizziness in 24%, palpitations in 61% and syncope in 15%. On analysis of the historical logs of patients only 64% had symptoms during Holter monitoring and 23% had concurrence of their symptoms with an arrhythmia.

Patients who had sinus exit block ($p=0.02$) and sinus arrest ($p=0.002$) had significant association with arrhythmia. Twenty percent patients with dizziness, 50% patients with palpitations and 12% of patients who presented with syncope had documented arrhythmias.

Conclusion: Twenty four hour Holter monitoring is an important investigation for evaluation of patients with palpitation, dizziness and syncope. Arrhythmias were detected frequently in both symptomatic and asymptomatic patients. One must be careful to avoid attributing a symptom to an arrhythmia until a close temporal relationship is demonstrated.

Key words: 24-hour electrocardiographic monitoring. Holter monitoring. Arrhythmias. Sinus exit block. Sinus arrest.

INTRODUCTION

Long term ambulatory electrocardiographic (ECG) monitoring is frequently used to evaluate patients with various cardiovascular complaints, including palpitations, syncope, dizziness and chest discomfort.¹ Prolonged ECG recordings in patients engaged in normal activities is the most useful non-invasive method to document and quantify the frequency and complexity of an arrhythmia and correlate the arrhythmia with patient's symptoms.² A number of patients, who visit general physicians, emergency departments and outpatient clinics; including not only cardiology clinics, but also general medicine and neurology clinics commonly have the symptoms of dizziness, syncope

and palpitations in all population groups.^{3, 4} Patients should be filtered to assess who needs further evaluation and investigation.

If arrhythmias are thought to be the cause of symptoms, the crucial information needed is the recording of an ECG during the precise time that the symptom is occurring. Typical symptoms may occur with simultaneous documentation of a cardiac arrhythmia capable of producing such symptoms; this finding is most useful and may help to direct therapy. Symptoms may occur even though Holter monitoring shows no arrhythmias. This finding shows that symptoms are not due to rhythm disturbance. A patient may remain asymptomatic during cardiac arrhythmias documented on the recording. This finding has equivocal value. The patient may remain asymptomatic during recording and no arrhythmias are documented. This finding is not useful. Most studies beginning in the 1970's reported an increased risk of sudden cardiac death among post-myocardial infarction patients, who had frequent premature ventricular depolarizations or episodes of non-sustained ventricular tachycardia during ambulatory ECG monitoring.⁵

¹ Department of Cardiology, Patel Hospital, Karachi.

² Department of Cardiology, Liaquat National Hospital, Karachi.

³ Department of Cardiology, Abbasi Shaheed Hospital, Karachi.

Correspondence: Dr. Ghazala Irfan, R-139, Block 6, Gulshan-e-Iqbal, Karachi.

E-mail: ghazala_irfan@hotmail.com

Received November 29, 2007; accepted June 26, 2009.

Syncope secondary to cardiac causes carries a one year mortality of 18-33%.⁶ Every patient with cardiac syncope diagnostic hypothesis underwent investigation by 24-hour Holter monitoring. Holter monitoring is sixteen times more likely to be diagnostic for patients with cardiac syncope.⁷

Ambulatory ECG has led to many new insights, including an understanding of the mechanisms of sudden cardiac death, causes of syncope and the concept of painless ischemia.⁸ Gatzoulis *et al.* found that abnormal findings on 24-hour Holter monitoring are well correlated with potential brady cardia and/or tachy-arrhythmia causes of syncope, in electrophysiological study of patients with undiagnosed syncope.⁹ This study was conducted to evaluate the association between patient's symptoms and incidence of arrhythmia on 24-hour electrocardiographic Holter monitoring.

METHODOLOGY

It was a cross sectional descriptive study conducted at the Department of Cardiology, Liaquat National Hospital, Karachi, from January to June 2007. One hundred consecutive patients of either gender above 15 years of age were referred for 24-hour Holter monitoring with symptoms of palpitations, syncope and dizziness. They were included after obtaining an informed consent from them. Those with history of permanent pacemaker implantation were excluded. Patients were advised to maintain a log of symptoms during 24-hour Holter monitoring and to record any episode of palpitations, syncope and dizziness. The Holter monitoring reports were analyzed by technicians, fellows and cardiologists for arrhythmias and all findings were entered in study proforma.

The variables studied were palpitations, dizziness, syncope, ectopic beats, sinus bradycardia, sinus exit block, sinus arrest, atrioventricular block type II and III, atrial fibrillation, supra ventricular tachycardia, and ventricular tachycardia.

Palpitations are defined as an unpleasant awareness of forceful or rapid heart beats.¹⁰ Dizziness and syncope are defined as the sudden transient loss of consciousness with associated loss of postural tone and spontaneous recovery without neurological deficit.¹¹

Ectopic beats were graded according to Lown classification as follows:¹² grade 0 = no ectopic beats; 1, fewer than 30 unifocal ectopic beats/hour; 2, greater than 30 unifocal ectopic beats /hour; 3 = multiform ventricular ectopic beats; 4a = couplets; 4b = salvos; and 5 = early ectopic beats. Only grades 2, 3 and 4 were considered in this study.

The other arrhythmias considered were sinus bradycardia equal to or less than 40 beats per minute, sinus exit block characterized by a pause resulting from absence of the normally expected P-wave (duration of pause being multiple of the basic P- P interval), sinus arrest characterized by pause in sinus rhythm (P-P interval delimiting the pause as not the multiple of basic P-P interval), atrioventricular block type II and III, atrial fibrillation, supra ventricular tachycardia and ventricular tachycardia.¹³

Data was analyzed by SPSS version 10. Descriptive statistics were used to calculate frequencies and percentages of different symptoms like palpitations, dizziness, syncope and different arrhythmias noted on Holter monitoring. Mean \pm standard deviation was calculated for the age of patients. Chi-square test was applied to check the relationship between symptoms and arrhythmias.

RESULTS

The mean age of patients was 53.71 \pm 15.52 years. There were 54% females and 46% males. Eighty two percent of patients had documented arrhythmias on the Holter monitoring reports. As far as presenting complaints for which patients were referred; 24% had dizziness, 61% had palpitations and 15% had syncope. On analysis of the historical logs of patients, only 64% had symptoms during Holter monitoring and only 24% had concurrence of their symptoms with an arrhythmia.

Arrhythmias noted on 24-hour Holter monitoring reports included atrial ectopy in 60%, ventricular ectopy in 54%, ventricular tachycardia in 7% and supraventricular tachycardia (SVT) in 38%, of which 2% had sustained SVT of 2-3 minutes duration. Two percent had paroxysmal atrial fibrillation, 15% had sinus bradycardia, 6% had sinus arrest, 10% had sinus exit block and 5% had varying degrees of AV block. Some patients reported more than one arrhythmia.

Twenty percent of patients with dizziness had documented arrhythmias, 50% of patients with palpitations had documented arrhythmias and 12% of patients who presented with syncope had documented arrhythmias (p=0.07).

Of the twenty three percent patients who had concurrent symptoms with arrhythmia, 10% had sinus exit block, 5% had sinus arrest, 5% had supraventricular tachycardia and 3% had ventricular tachycardia.

As detailed in Table I no presenting complaint predicted the occurrence of any specific arrhythmia. Patients with sinus exit block (p=0.02) and sinus arrest (p=0.002) had significant association with arrhythmia.

Table I: Arrhythmias recorded in association with various presenting complaints.

Presenting complaint	VT	SVT	Atrial ectopy	Ventricular ectopy	AF	Sinus brady	Sinus exit	Sinus arrest	AV block
Dizziness	2%	4%	14%	15%	1%	3%	5%	3%	2%
Palpitation	3%	15%	39%	32%	1%	8%	1%	0	2%
Syncope	2%	19%	7%	7%	0	4%	4%	3%	1%
P value	0.498	0.089	0.46	0.4	0.6	0.3	0.02	0.002	0.5

VT= ventricular tachycardia; SVT= supra ventricular tachycardia; AF= atrial fibrillation; AV= atrioventricular.
(Note: the percentages are taken from 100 Holter monitoring reports in which most of the patients have more than one arrhythmia reported).

DISCUSSION

This study was designed to determine the value of 24-hour electrocardiographic monitoring in diagnosing specific arrhythmias as the cause for various cardiovascular complaints. In 100 symptomatic patients who underwent 24-hour Holter monitoring, 82% had documented arrhythmias. No specific symptom was more likely than any others to predict the occurrence of significant arrhythmia and no arrhythmia was closely associated with any specific symptom.

The observed frequency of arrhythmia was same as any other studies performed. Hinkle *et al.*,¹⁴ who recorded 6 hour electrocardiographic studies in 301 actively employed asymptomatic men with a median age of 55 years. They found an incidence of 62% for ventricular arrhythmias (ventricular premature depolarizations, ventricular tachycardia and ventricular bigeminy) as compared to 61% in the study; the frequency of ventricular tachycardia was 3.2%, as compared to 7%, in the present study.

Ventricular tachycardia was recorded in 7% of the studied patients. It was found that only 3% of the presently studied patients had symptoms concurrent with this arrhythmia. Winkle and colleagues in studying ambulatory patients with ventricular tachycardia, found similar results, with only 17% of patients experiencing symptoms.¹⁵

Zides *et al.* showed that no specific complaint or combination of complaints was more likely to predict a disturbance in rhythm. In their study, the overall incidence of arrhythmias was 53% and of major significant arrhythmias were 39%.¹⁶ This is in corroboration with this study's results.

Sarsin *et al.* conducted a study on 140 consecutive patients with unexplained syncope who underwent 24-hour Holter monitoring.¹⁷ Nine of the 140 patients had serious arrhythmia during Holter monitoring. This was considered diagnostic because of the presence of simultaneous symptoms.

The patient population observed was relatively small. The major limiting factor was the spontaneous frequency of symptom itself, which may not occur during that particular period. If the typical symptom occurs at some time during the study, with or without a concurrent electrocardiographic abnormality, the 24-hour study is still diagnostic and useful. However, this may be complicated by the fact that the same arrhythmia may occur at one time concurrently with symptoms and at other times, asymptotically. Similarly, the presenting complaint may occur at multiple times during the 24-hour Holter monitoring period and in association with varying electrocardiographic findings. In every case, a cause and effect relationship needs to be established.

CONCLUSION

The data confirmed that 24-hour electrocardiographic monitoring is a useful test for detecting arrhythmias in patients with varying histories and presenting complaints. Symptoms may be recorded without an arrhythmia being observed or any arrhythmia may be present without a reported symptom. Furthermore, significant arrhythmias were detected so frequently in both symptomatic and asymptomatic patients that one must be careful to avoid attributing a symptom to an arrhythmia until a close temporal relationship is demonstrated.

REFERENCES

1. Crawford MH, Bunstein SJ, Dedwania PC, DiMarco JP, Ferrik KJ, Garson A Jr, *et al.* ACC/AHA guidelines for ambulatory electrocardiography: executive summary and recommendations. A report of American College of Cardiology/American Heart Association Task Force on practice guidelines(committee to revise the guidelines for ambulatory electrocardiography). *Circulation* 1999; **100**:886-93.
2. Miller JM, Zipes DP. Diagnosis of cardiac arrhythmia. In: Braunwald E, Zipes DP, Libby P, Bonow R, editors. Braunwald's heart disease: a textbook of cardiovascular medicine. 7th ed. Philadelphia: Elsevier Saunders; 2004. p. 697- 712.
3. Neuhauser HK, Radtke A, von Brevern M, Lezius F, Feldmann M, Lempert T. Burden of dizziness and vertigo in community. *Arch Intern Med* 2008; **168**:2118-24. Erratum in: *Arc Intern Med* 2009; **169**:89.
4. Patel MJ, Khan NU, Samdani AJ, Furqan M, Hameed A, Khan MS, *et al.* Syncope: experience at a tertiary care hospital in Karachi, Pakistan. *Int J Emerg Med* 2008; **1**:79-83. Epub 2008 May 6.
5. Huikuri HV, Makikallio TH, Raatikainen MJ, Perkiomaki J, Castellanos A, Myerburg RJ. Prediction of sudden cardiac death: appraisal of the studies and methods assessing the risk of sudden arrhythmic death. *Circulation* 2003; **108**:110-5.
6. Ammirati F, Colivicchi F, Santini M. Diagnosing syncope in clinical practice: implementation of a simplified diagnostic algorithm in a multicentre prospective trial the OESIL 2 study. *Eur Heart J* 2000; **21**:935-40.
7. Farwell DJ, Sulke AN. Does the use of syncope diagnostic protocol improve the investigation and management of syncope? *Heart* 2004; **90**:52-8.
8. Zipes DP, Wellens HJ. What we have learned about cardiac arrhythmias? *Circulation* 2000; **102** (20 Suppl 4):IV52-7.
9. Gatzoulis KA, Karystinos G, Gialernios T, Sotiropoulos H, Synetos A, Dilaveris P, *et al.* Correlation of non-invasive electrocardiography with invasive electrophysiology in syncope of unknown origin: implications from large syncope database. *Ann Noninvasive Electrocardiol* 2009; **14**:119-27.
10. Halaky MA. Approach to the patient with palpitations. In: Braunwald E, Goldman L, editors. Primary cardiology. 2nd ed. Philadelphia: WB Saunders; 2003. p. 36.
11. Ellis K, Patel VB. Syncope. In: Griffin BP, Topol EJ, editors. Manual of cardiovascular medicine. 2nd ed. Philadelphia: Lippincott & Wilkins; 2004. p. 461-71.

12. Lown B, Wolf M. Approaches to sudden death from coronary heart disease. *Circulation* 1971; **44**:130.
13. Olgin JE, Zipes DP. Specific arrhythmias: diagnosis and treatment. In: Braunwald E, Zipes DP, Libby P, Bonow R, editors. Braunwald's heart disease: a textbook of cardiovascular medicine. 7th ed. Philadelphia: Elsevier Saunders; 2004. p. 803-61.
14. Hinkle LE, Carver ST, Stevens M. The frequency of asymptomatic disturbances of cardiac rhythm and conduction in middle-aged men. *Am J Cardiol* 1969; **24**:629-50.
15. Winkle RA, Derington DC, Schroeder JS. Characteristic of ventricular tachycardia in ambulatory patients. *Am J Cardiol* 1977; **39**:487-92.
16. Zeldis SM, Levine BJ, Michelson EL, Morganroth J. Cardiovascular complaints. Correlation with cardiac arrhythmias on 24-hour electrocardiographic monitoring. *Chest* 1980; **78**:456-61.
17. Sarsin F, Carballo D, Slama S, Louis-simonet M. Usefulness of 24-hour Holter monitoring in patients with unexplained syncope and high likelihood of arrhythmias. *Int J Cardiol* 2005; **101**:203-7.

