Original Article

Journal of Cardiovascular Medicine and Surgery
Volume 5 Number 3, July - September 2019
DOI: http://dx.doi.org/10.21088/jcms.2454.7123.5319.2

Clinical Presentation and Outcomes of Cardiac Arrhythmias in the Elderly

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Abstract

Introduction: Aging may result in numerous changes in the cardiovascular system including the conduction system of the heart. The present study was conducted to describe various subtypes, various comorbidities, clinical and investigational profile and outcome of cardiac arrhythmias among geriatric population. *Methodology:* The present observational study was conducted with fifty patients diagnosed with cardiac arrhythmia and admitted in the general medicine ward or intensive care unit (ICU) of our hospital. Based on the medical history, examination and various investigations patients were classified as Atrial fibrillation (AF), Complete Heart Block (CHB) or Ventricular tachycardia (VT). *Results:* History revealed cardiac insufficiency in 38%, renal failure in 30%, acidosis in 24%, hypoxia in 20%, hyperkalemia in 14% and hyperthyroidism in 4% of the patients. Most common comorbidity was hypertension (48%). Breathlessness, palpitations, chest pain, syncope and hemoptysis were the common presenting complaints. 46% were diagnosed with atrial fibrillation (AF), 36% complete heart block (CHB) and rest of the 18% with ventricular tachycardia (VT). We found that patients diagnosed with VT were newly presenting and were significantly associated with cardiac insufficiency, higher admission rates to ICU, and higher mortality. Atrial fibrillation in our study patients was significantly associated with rheumatic heart disease and hypoxia/acidosis. CHB patients were more likely to be associated with diabetes mellitus. *Conclusions:* Appreciating changes in the cardiac conduction system in the elderly will assist the practitioner in quicker diagnosis and better management.

Keywords: Atrial; Arrhythmia; Geriatric; Mortality.

How to cite this article:

Pratik Atul Burad, Sangeeta Pednekar. Clinical Presentation and Outcomes of Cardiac Arrhythmias in the Elderly. J Cardiovasc Med Surg. 2019;5(3):117-122.

Introduction

Aging affects the cardiovascular system in multiple ways. It may include arterial stiffening and thickening, mild left ventricular thickening, and imbalance of early and late diastolic filling.[1] The conduction system of the heart is also affected by aging, resulting in conduction disorders or arrhythmia. These changes include sinus node dysfunction, slowing of atrioventricular node conduction, left axis deviation, bundle branch blocks, and an increased prevalence of both supraventricular and ventricular premature beats and arrhythmias. Cardiac arrhythmias form a major component of the non-communicable disease burden in the Indian population.[2] Annually about 50,000 cardiac arrhythmias or heart failure patients receive interventional device therapies annually in India. However, the utility of these

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Received on 12.08.2019 **Accepted on** 04.09.2019

procedures is often overlooked in elderly due to financial or invasiveness. Also, many clinical trials investigating cardiac arrhythmias exclude geriatric population, due to which there is scarcity of data. Thus the present study was conducted to describe various subtypes, various comorbidities, clinical and investigational profile and outcome of cardiac arrhythmias among geriatric population.

Materials and Methods

Study Design and Sampling

The present observational study was conducted with fifty patients diagnosed with cardiac arrhythmia and admitted in the general medicine ward or intensive care unit (ICU) of our hospital. Patients aged above 60, diagnosed with any type of cardiac arrhythmia, with or without any comorbid illness and admitted in the general ward or ICU were included in the study. Patients were randomly selected from all eligible patients during the study period of 18 months. The study was approved by the Institutional Ethics Committee.

Operation definitions

The following clinical definitions were used in the present study:

1. *Renal failure:* Serum creatinine level of more than 2.0 mg/dl
2. *Hyperkalemia:* Serum potassium level more than 5.5 mEq/L
3. *Acidosis:* Low arterial pH (< 7.40) and a low serum bicarbonate concentration (normal 24 mEq/L, with a range of 22–28 mEq/L)
4. *Hypoxia:* Resting arterial oxygen saturation ≤95%
5. *Cardiac insufficiency:* Ejection fraction less than 50%
6. *New/old case:* Patients diagnosed with cardiac arrhythmia during the current hospitalization were labelled as 'new' case and rest as 'old'
7. *Prolonged hospital stay:* More than three days in hospital

Data Collection and Data Analysis

Eligible patients were approached by study investigator and the purpose of the study was explained to them. After obtaining their informed written consent they were enrolled for the study. Demographic details of the patients were obtained from the hospital records. Clinical information like chief presenting complaints, history regarding comorbidities such as diabetes, hypertension, ischemic heart disease, previous heart surgery, congenital heart disease, thyroid disease, obstructive lung disease, obstructive sleep apnea, renal disease, liver diseases, cerebrovascular disease and neoplastic disease were obtained. Physical examination included obtaining vitals and detailed cardiovascular examination. Laboratory investigations like blood count, sugar and lipid levels, arterial blood gases, liver and renal profiles and electrocardiography were sent as part of the treatment or part of the study. Imaging studies like chest X-ray and 2-D echocardiography was ordered by the treating physician if required. Based on the medical history, examination and various investigations patients were classified as Atrial fibrillation (AF), Complete Heart Block (CHB), or Ventricular tachycardia (VT).

Results

In the present study a total of 50 patients were included. The most common age group was 60 to 69 (68%). Females comprised 52% of the study population and two-thirds of the patients had a mixed diet (Table 1). History of smoking was given by 36% and drinking alcohol by 8%. Most common comorbidity was hypertension (48%). Other reported comorbidities were congestive heart failure (18%), diabetes mellitus (16%), ischemic heart disease (14%), and rheumatic heart disease (12%). Detailed medical history and laboratory work-up revealed cardiac insufficiency in 38%, renal failure in 30%, acidosis in 24%, hypoxia in 20%, hyperkalemia in 14%, and hyperthyroidism in 4% of the patients (Table 1). Breathlessness was reported as the most common chief complaint for presenting to the hospital (88%). Presenting complaints of palpitations was given by 54%, chest pain by 38%, syncope by 34% and of hemoptysis by 6% of the patients (Table 2). In our study sample, 46% were diagnosed with atrial fibrillation (AF), 36% complete heart block (CHB) and rest of the 18% with ventricular tachycardia (VT). Of the included cases, 62% were newly diagnosed, rest being known and diagnosed cases. Pacemaker insertion was required in 34% of the patients. After initial stabilization, 48% were shifted to intensive care unit, 78% had a prolonged hospital stay and 14% died in the hospital.

Table 3 describes how various subtypes of arrhythmias were associated with onset of

arrhythmia, various risk factors and final patient outcomes. It was observed that among newly presenting cases, a significantly higher proportion of CHB (83%) and VT (67%) was diagnosed compared to old cases (p value < 0.01). Comorbidity of Rheumatic heart disease and congestive heart failure was significantly associated with AF (p value <0.05). Similarly, diabetes mellitus was significantly associated with the development of CHB (p value <0.05). Risk factors like renal failure, hyperkalemia and hyperthyroidism were equally distributed among all cases of arrhythmia. However, hypoxia and acidosis was found to be more common among cases of AF as compared to CHB or VT (p value <0.01). Similarly, cardiac insufficiency was observed in 39% cases with AF, 17% cases with CHB, and 78% cases with VT. Thus in our study population, cardiac insufficiency was found to predispose to VT more commonly as compared to AF or CHB (p value <0.01). Pacemaker was implanted in significantly higher proportion of patients with CHB (89%) as compared to those with VT (n=1/9) or AF (n=0/23) (p value <0.001). Furthermore, all 9 cases of VT had to be shifted to ICU, while 83% of CHB and 39% of AF patients required intensive care. In addition, prolonged hospital stay was observed in similar proportions among patients with various arrhythmia subtypes. Last, significantly higher in-hospital mortality was observed among patients with VT as compared to AF (n=3/23) or CHB (n=0/18) (p value <0.01).

Table 1: Baseline characteristics of the patients included in the study

Variables	Number (n)	Percentage (%)
Age distribution (in years)		
60 to 69	34	68%
70 to 79	11	22%
≥ 80	5	10%
Gender distribution		
Females	26	52%
Males	24	48%
Diet		
Vegetarian	17	34%
Mixed	33	66%
Addiction		
Smoking	18	36%
Alcohol	4	8%
Comorbidities		
Ischemic heart disease	7	14%
Rheumatic heart disease	6	12%
Hypertension	24	48%
Diabetes mellitus	8	16%
Congestive heart failure	9	18%
Risk factors		
Renal failure	15	30%
Hyperkalemia	7	14%
Acidosis	12	24%
Hypoxia	10	20%
Hyperthyroidism	2	4%
Cardiac insufficiency	19	38%

Table 2: Clinical characteristics of the patients

Chief complaints	Number (n)	Percentage (%)
Chest pain	19	38%
Palpitations	27	54%
Breathlessness	44	88%
Syncope	17	34%
Hemoptysis	3	6%

Onset of arrhythmia		
New	31	62%
Old (known case)	19	38%
Final diagnosis		
Atrial fibrillation	23	46%
Complete heart block	18	36%
Ventricular tachycardia	9	18%
Patient outcomes		
Pacemaker implantation	17	34%
Shifted to intensive care unit	24	48%
Prolonged hospital stay	39	78%
Death	7	14%

Table 3: Association of Final Diagnosis of Arrhythmia with Risk Factors and Clinical Outcomes

	Atrial fibrillation (n=23)	**Complete heart block (n=18)**	**Ventricular tachycardia (n=9)**	***p* value***
Onset of arrhythmia				
New	8	15	6	<0.01
Old (known case)	15	3	3	
CoMorbidities				
Ischemic heart disease				
Yes	2	3	2	0.56
No	21	15	7	
Rheumatic heart disease				
Yes	6	0	0	<0.05
No	17	18	9	
Hypertension				
Yes	7	12	5	0.06
No	16	6	4	
Diabetes mellitus				
Yes	0	7	1	<0.05
No	23	11	8	
Congestive cardiac failure				
Yes	8	1	0	<0.05
No	15	17	9	
Risk Factors				
Renal failure				
Yes	8	4	3	0.06
No	15	14	6	
Hyperkalemia				
Yes	2	3	2	0.56
No	21	15	7	
Hyperthyroidism				
Yes	2	0	0	NA
No	21	18	9	
Hypoxia/acidosis				
Hypoxia	7	0	3	
Acidosis	9	2	1	<0.01
None	7	16	5	
Cardiac insufficiency				
Yes	9	3	7	<0.01
No	14	15	2	
Patient Outcomes				
Pacemaker implantation				
Yes	0	16	1	<0.001
No	23	2	8	

Shifted to ICU				
Yes	9	15	9	<0.01
No	14	3	0	
Prolonged stay				
Yes	17	15	7	0.7
No	6	3	2	
Death				
Yes	3	0	4	<0.01
No	20	18	5	

*Using chi-square or Fisher's exact test

Discussion

Cardiac arrhythmias constitute a major burden among geriatric population. The present study was conducted to describe the demography, clinical and outcome of Indian patients diagnosed with cardiac arrhythmia. Schnabel *et al.* investigated trends in incidence, prevalence, and risk factors for atrial in over 9000 participants enrolled in the Framingham Heart Study over a period of 50 years.[3] The authors found a fourfold rise in elderly people, among which new onset atrial fibrillation were 46% among women. Numerous factors likely contribute to the increase in AF prevalence with age, including an increased prevalence of comorbid conditions, such as hypertension, diabetes, thyrotoxicosis, and mitral valve disorders.[4] Increased left atrial size, which provides an anatomic substrate for wavelets of micro-reentry, is common among elderly individuals, and is an independent predictor of AF.[5] An age-related increase in left ventricular stiffness, with resulting diastolic dysfunction and increased left atrial pressure, may also serve as an important contributor.

In our study, presenting complaints of breathlessness was given by 88% palpitations by 54%, chest pain by 38%, syncope by 34% and hemoptysis by 6% of the patients. A prospective, cross-sectional single-center study of subjects above the age of 65 with a history of documented atrial fibrillation or arrhythmias (either ventricular or bradycardiac) reported 78% with fatigue on mild exercise, 74% shortness of breath with exercise, 59% resting fatigue, 52% palpitations, 54% resting shortness of breath, and 45% chest pain/pressure.[6] The authors concluded that quality of life was significantly worse in patients with perceptions of severe arrhythmic episodes and in those with symptoms of dizziness and exercise intolerance. Detailed medical history and laboratory work-up of our patient population revealed cardiac insufficiency in 38%, renal failure in 30%, acidosis in 24%, hypoxia in 20%, hyperkalemia in 14% and hyperthyroidism in 4% of the patients. The serum potassium concentration is not elevated in elderly patients at baseline; however, even slight insults to the mechanisms involved in potassium homeostasis can induce an abrupt and life-threatening rise in the serum potassium concentration. Furthermore, elderly individuals are particularly likely to take NSAIDs, both as over-the-counter or prescription medications, because musculoskeletal pain and osteoarthritis are common comorbidities in this population. Risk factors that increase patient vulnerability to NSAID-associated hyperkalemia include volume depletion, congestive heart failure (regardless of degree of compensation), renal insufficiency and concomitant therapy with potassium-sparing diuretics.[7]

We found that patients diagnosed with VT were newly presenting and were significantly associated with cardiac insufficiency, higher admission rates to ICU and higher mortality. Tanaka *et al.*, in a study of 625 patients with idiopathic ventricular arrhythmias, found that the mean age of mitral-free wall ventricular arrhythmia patients (62 ± 14 years) was higher than that of tricuspid annulus-free wall ventricular arrhythmia patients (51 ± 18 years; p = 0.03).[8] The authors also found that the prevalence of ventricular arrhythmia originating from the left ventricular outflow tract increased with age compared to that in the right ventricle. The mechanism underlying this age-related variability is not clearly understood. A study using a heart rate variability analysis demonstrated that sympathetic tone increased with age.[9] It was suggested that the increasing sympathetic tone with age might cause a shift in the origin of ventricular arrhythmia from the right side of the heart to the left side. However, this needs to be investigated in further studies.

Atrial fibrillation in our study patients was significantly associated with rheumatic heart disease and hypoxia/acidosis. Arrhythmias are common in patients with hypoxemia and abnormalities of carbon dioxide tension.[10] Emerging risk factors for the development of AF include a variety of breathing

disorders: among them chronic obstructive disease has been associated with a high frequency to cardiac arrhythmias. Hypoxiemia and hypercapnia may be associated with over-compensatory fluctuations in autonomic tone, intrathoracic pressures and cardiac hemodynamics, with possible atrial stretch and remodeling, each of which could lead to AF[11], particularly when hypercapnia causes a significant decrease in pH values.[12]

There are a few limitations of this study. First, a smaller sample allowed us to complete the study within the stipulated period, although a larger sample would have increased the generalizability of our results. Second, patients discharged from the hospital were not followed up for an extended period to assess the functional outcomes of various arrhythmia subtypes.

Conclusion

The present study describes the clinical characteristics of geriatric population presenting to our hospital and diagnosed with cardiac arrhythmias. Appreciating changes in the cardiac conduction system and development of arrhythmias in the elderly will assist the practitioner in differentiating ECG findings that represent normal aging from those suggesting a disease process requiring further evaluation. Future studies are needed to assess the utility of screening geriatric population for arrhythmias.

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