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Atrial Fibrillation: Current Trends and Management in the West African Sub Region

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Abstract

Atrial fibrillation is the most common sustained arrhythmia and though may be asymptomatic it increases the morbidity and mortality related to cardiovascular diseases. Optimal treatment of atrial fibrillation is one of several strategies needed to reduce the morbidity and mortality related to cardiovascular diseases. The study is aimed to review current epidemiology in the West African sub region and treatment options available with a view to raising awareness about the current recognition and the challenges in the treatment of atrial fibrillation in blacks in the sub region. An in-depth electronic search of the literature on the subject of atrial fibrillation in West Africa and in Africa was done. The internet search was conducted using Pubmed and Google on the topic 'atrial fibrillation' and 'atrial fibrillation in Africa'. The findings were; atrial fibrillation is common in black patients in the West African sub region suffering from symptomatic heart failure, rheumatic heart disease, thyrotoxicosis and hypertension but little is known about treatment offered to these patients and challenges involved. Treatment is aimed at relief of symptoms, prevention of complication and control of ventricular rate by pharmacological means mainly and newer and surgical options are not available to patients in the sub region. In conclusion atrial fibrillation is common in the West African sub region and various treatment options are available.

Keywords

Atrial Fibrillation, Cardiovascular Disease, Rhythm Control, Embolisation, West Africa

1. Introduction

Arial fibrillation (AF) was first described clinically by Roberts Adam in 1827 in association with mitral stenosis and was referred to as "Delerium Cordis". Sir Thomas Lewis was the first to record AF on the modern electrocardiograph in 1909. AF is a disorder of cardiac rhythm characterized by totally irregular atrial activity and represented by fibrillary (f) waves of varying amplitude, duration and morphology causing random oscillation of the baseline on the ECG. The atrial rate is usually between 350-600 beats/min with a ventricular response rate that is irregularly irregular. AF occurs in less than 1% of the general population but prevalence rises to over 10% amongst those aged 80 years or more in Western countries. [1] In the West African sub region the prevalence in rural communities is also less than 1.0% [2] but among hospitalised patients and cardiac patients from cardiac centers or cardiac clinics it varies from 4.6% to 5.5%. [3], [4] There are however no review of AF in the West African sub region. The aim of this study was to review current epidemiology in the West African sub region and treatment options available with a view to raising awareness about the current recognition and the challenges in the treatment of AF in blacks in the sub region.

2. Methods

An in-depth electronic search on the internet was made for literature on the subject of AF using Pubmed and Google search engines in January 2016. Original research articles as well as scientific guidelines on the subject were examined.

The key words for the search were 'atrial fibrillation', 'atrial fibrillation in West Africa' and 'atrial fibrillation in Africans'. Articles published in English language from year 1995 to 2015 on atrial fibrillation were evaluated for this review. The articles which met these eligibility criteria were retrieved in full-text and the findings from reviewing these articles are presented in various subtitles in the results section of this article.

3. Results

AF is a disorder of cardiac rhythm characterised by asynchrony between atrial and ventricular contraction and results in total irregularity in the atrial rate and a variable ventricular response rate. The clinical diagnosis is based on a total irregularity of the peripheral pulse and is confirmed with the 12 lead surface electrocardiograph which shows absolutely irregular R'R' intervals, absent 'P' waves and variable ventricular rate. [5] It is the most common chronic sustained arrhythmia encountered in clinical practice.

3.1. Classification

The patterns of AF when first diagnosed could be described as intermittent (paroxysmal), persistent, long standing persistent or permanent (chronic). [6]

Intermittent or paroxysmal AF is characterised by spontaneous onset and spontaneous conversion or resolution and lasting for a few seconds or to no more than 48 hours, though rarely some may last up to seven days. [5] When it lasts for over 48 hours, the chance of spontaneous resolution is slim and the risk of thrombose formation becomes very high. Persistent AF describes AF which has lasted for more than seven days and requires electrical or pharmacologic intervention to abort it or convert to sinus rhythm. Long lasting persistent describes AF lasting one year or more when it is decided to adopt rhythm conversion strategy. Permanent or chronic AF refers to AF which has failed to convert to sinus rhythm after attempted cardioversion or has persisted for long and cardioversion is inappropriate and AF becomes the rhythm of choice and ventricular rate control becomes the treatment option. Lone AF refers to AF in which investigation do not reveal any underlying cardiac or pulmonary disease in patients who are less than 60 years of age though in a few cases myocardial biopsy may show inflammatory and fibrotic changes. [7]

3.2. Pathophysiology

AF results from structural heart diseases that cause increased fibrous tissue deposition in the myocardium which results in electrical dissociation between the myocyte bundles. When this disruption in electrical synchrony occurs in the atria, it provides the substrate for multiple reentrant waveforms in the atria, resulting in tachycardia which is irregularly irregular (atrial quavering), the hallmark of AF. The waveforms are conducted through the atrioventricular node to the ventricles with a response rate that depends on the refractory state of the atrioventricular (AV) node. [8] In addition, there are tissues located in the pulmonary veins and left atrium which have been found to play active roles in activating and sustaining this atrial reentrant activity. [9] The irregular atrial contraction results in loss of atrial contractile contribution to ventricular filling, thereby reducing left ventricle ejection fraction, atrial stagnation with the potential for thrombose formation which is responsible for the known complications of AF such as congestive cardiac failure, transient ischemic attack, stroke, splenic infarction and limb ischemia.

3.3. Aetiology

AF can arise from a number of cardiovascular and non-cardiovascular diseases. The non-cardiovascular causes of AF include thyrotoxicosis, hypothyroidism, alcohol intoxication, pulmonary thromboembolism, pneumonia, hypothermia, electrocution, acidosis, hypokalemia, hypomagnesaemia, hypocalcaemia and pheochromocytoma. [10] Certain drugs such as the amphetamines, pseudoephedrine in cough syrups and caffeine can also cause AF.

The common cardiovascular causes of AF include hypertension, left ventricular hypertrophy, symtomatic cardiac failure (New York Heart Association classes II-IV), cardiomyopathies, ischemic heart disease, mitral valve disease, myocarditis, congenital heart diseases such as short and long QT syndromes and pericardial diseases such as pericarditis. [11], [12]

3.4. Epidemiology

AF is the most common chronic cardiac arrhythmia in both persons with normal or diseased hearts. [5] It is estimated that AF affects 1.0 to 1.5 % of the population in the United States but with increase in age, prevalence rises so that in those aged 80 years or more, up to 9.0% may have AF. [13] In developed countries AF is more common in whites than in blacks, males are more frequently affected than females in all ages and more than half of all cases are due to cardiovascular diseases such as coronary artery disease, hypertension, diabetes, obesity and smoking. [4], [14]

These findings however appear quite different from African studies which show higher prevalence in females with heart failure as the most common underlying pathology and a lower population prevalence of 4.6%. [4] In Senegal prevalence was also found to be lower than in developed countries at 5.35% and females were more affected than males [15] however in a recent hospital study the prevalence of AF was much higher at 14.7%. [16] AF was found in 0.3% of participants in a rural community study in northern Ghana but in patients diagnosed with heart failure in a teaching hospital the prevalence was 8.9%. [2], [17] In Nigeria as in other West African countries, community based epidemiologic data is not available on its prevalence but in hospital based studies, hypertension was the most common underlying heart disease (46.2%) in patients with AF,

followed by cardiomyopathies and rheumatic heart disease. [18] Similar findings were also noted in Cameroun [19] while in Senegal valvular heart disease was the most common. [15] The most common non cardiac causes of AF in Nigeria were found to be thyrotoxicosis and lone AF while in patients with thyrotoxicosis, 14.0% were found to have AF. [20] Thus significant differences exist between AF in the developed economy compared with the developing West African sub region in terms of aetiology and epidemiology.

3.5. Clinical Presentation and Investigation

The clinical presentation of AF varies widely from being asymptomatic and undetected [21] to weakness, palpitation, irregularly irregular pulse, pulse deficits, absence of the 'a' wave in the JVP and life threatening features such as syncope, uncontrolled angina, cardiogenic shock, acute myocardial infarction, decompensated congestive cardiac failure, stroke, peripheral thrombotic phenomena and sudden death. [22], [23] It is because of this widely variable presentation that all patients with AF should undergo a thorough physical, cardiac and arrhythmia related evaluation.

Investigation in AF should aim at documenting the presence of AF and elucidating the possible cause or causes. A 12 lead surface electrocardiogram which shows characteristic small irregular baseline waves at a rate of 350 to 600 per minute, the absence of distinct P waves, and irregular R'R' intervals are the hallmark of AF. Some other arrhythmias such as atrial tachycardia, multifocal atrial tachycardia, paroxysmal atrial tachycardia with block, atrial flutter with a variable block and frequent atrial complexes can mimic AF on standard 12 lead ECG and care should therefore be taken to exclude these arrhythmias. In addition, 24 to 48 hours continuous electrocardiographic monitoring (Holter monitor) may be needed to identify asymptomatic or irregularly occurring AF but unfortunately this is only available in a few university hospitals in the sub region. Some authorities recommend that any 12 lead ECG resembling AF and lasts for 30 seconds on a standard rhythm strip should be considered as AF. [24]

Other investigations such as chest x ray and echocardiography are useful in identifying cardiac causes of AF. Thyroid function tests, serum electrolytes, urea, creatinine and vanyl mandelic acid levels are useful in the diagnosis of the aetiology in noncardiac causes. Electrophysiological studies may be needed to elucidate the exact pathway of the current and isolation of difficult to identify accessory pathways but this too is not available to clinicians in the sub region. Thus diagnostic challenges exist even in the tertiary institutions of the sub region and there is no information about the existence of any electrophysiology laboratory in West Africa.

3.6. Treatment

Management of AF patients requires knowledge of its pattern of presentation (paroxysmal, persistent or permanent) and decisions about control of the ventricular rate, restoration and maintenance of sinus rhythm and anticoagulation.

There are three key objectives in the management of AF namely: (i) to control the rate, (ii) to correct the rhythm disturbance by reversion to sinus rhythm (iii) to prevent embolization and stabilization of haemodynamic impairment.

The treatment should be aimed at relieving symptoms and to prevent complications related to AF and maintain sinus rhythm or control ventricular rates to less than 80 beats per minute. In controlling the rate, if ventricular function is preserved verapamil or metoprolol may be used. If ventricular function is impaired diltiazem or amiodarone is used. To convert the rhythm, direct current cardioversion or amiodarone is recommended if ventricular function is impaired while flecainide or propafenone is used if the ventricular function is preserved. [25] The option of treatment depends on duration of AF and the need or otherwise of restoration of sinus rhythm.

3.6.1. Treatment of Acute Atrial Fibrillation

This treatment is required in new AF (AF of less than 48 hours) or in patients with hemodynamic instability, worsening heart failure, and disabling symptoms. These situations are more common in patients with acute coronary syndrome. The immediate goal in this acute situation therefore should be the restoration of hemodynamic balance, reduce ventricular rate to 70-80 beats per minute and restoration of sinus rhythm to prevent embolization.

In such unstable patients, pharmacological cardioversion using intravenous beta blockers such as metoprolol or non-dihydropyridine calcium channel blockers like verapamil or diltiazem or digoxin can be used and is successful in 4-84%. [26] In patients with slow ventricular rate or bradycardia, bolus intravenous atropine 0.5 to 2.0g should be administered, or electrical cardioversion should be attempted. In patients who are in heart failure, with low blood pressure and AF, intravenous digoxin would be the appropriate drug to use. [27] If all these measures fail to restore sinus rhythm, a temporary pacemaker may be inserted to stabilise patient and relieve disabling symptoms. Facilities for pacemaker insertion is however limited in the sub region to very few tertiary institutions. In stable patients electrical cardioversion is an alternative treatment and gives a higher success rate in restoration of sinus rhythm than pharmacologic cardioversion but requires the administration of sedation or general anaesthesia. This choice of treatment however poses significant challenge in the resource poor setting of the West African sub region. In haemodynamically stable patients, oral beta adrenergic blockers such as atenolol and metoprolol or oral diltiazem or verapamil are effective and can be used.

3.6.2. Treatment of Chronic Atrial Fibrillation

Chronic AF is much more common than acute AF and is likely to be the predominant type in patients of the sub region in which the major underlying diseases are hypertension, left ventricular hypertrophy, heart failure, rheumatic mitral valve disease and dilated cardiomyopathy. [17]-[20] Treatment should be aimed at prevention of embolization in all patients and to control ventricular rate and to restore sinus rhythm if possible. Treatment may be by pharmacological means and

with failed medical treatment, surgery is required.

The prevention of thromboembolism is important because AF results in substantial morbidity and mortality from ischaemia. For example the risk of stroke and embolism is increased 4 to 5 times in non valvular AF patients. [28], [29] In the West African sub region, assessment and treatment of AF is poorly documented, and in published studies risk assessment tools are not routinely used and treatment or prophylaxis is not along published guidelines. [18], [30]

3.6.3. Pharmacological Treatment

Pharmacologic cardioversion may not be useful if AF has lasted for more than 48 hours, if there is structural heart disease, a large left atrium, in patients with advanced age and if AF recurs repeatedly or if there is sick sinus syndrome. [27] The aim of drug treatment is to convert AF to sinus rhythm and or control the ventricular rate thereby preventing complications and relieving symptoms.

Adenosine, beta blockers, calcium channel blockers or digoxin should not be used in treatment of AF associated with Wolff-Parkinson-White (WPW) syndrome. If duration is less than 48 hours and ventricular function is preserved, amiodarone, procainamide, propafenone or sotalol may be used. Amiodarone is the only recommended drug if ventricular function is impaired. For duration greater than 48 hours, urgent or delayed cardioversion is recommended. [25]

In pregnancy digoxin, metoprolol or verapamil may be used in the treatment of AF. In patients who develop AF during an acute pulmonary illness or exacerbation of chronic pulmonary disease, correction of hypoxemia and acidosis are the primary therapeutic measures. A calcium channel blocker, verapamil or diltiazem is preferred for rate control. [6]

Controversies had raged over the superiority of rate control over rhythm control and several large studies have been undertaken to resolve these but no clear advantage of one over the other has been found. The AFFIRM and RACE studies were land mark studies that evaluated these strategies and analysis of both studies confirm absence of superiority in composite end points which ever strategy was used. [28] Amiodarone is the oldest and most known anti arrhythmic drug, is readily available, cheap and is the drug of choice. Other drugs in this class which can be prescribed include sotalol and flecanide. There are however unmet medical need with these older anti arrhythmic agents because they have not shown much benefit in terms of morbidity and mortality and all of them exhibit significant side effects such as pulmonary fibrosis with amiodarone and torsade de pointes with sotalol. [29] Pharmacological cardioversion has been shown to be successful in only up to 40% of patients [30] and in our sub region where surgical intervention is nonexistent; this would appear to be the more favoured option.

3.7. Surgical Management

Long term drug administration with antiarrhythmic drugs in chronic AF is associated with significant side effects, low efficacy and has given rise to the development of other techniques including surgical ablation technique for the management of AF. These surgical procedures aim to eliminate the triggers and or modify the electrophysiological substrate for AF. The first of these procedures was developed in the nineties and involved the isolation of the pulmonary vein muscle sleeves from the left atrium and ablation of the substrate via a catheter and it gives a success rate of 60-70%. [31], [32] The procedure is safe with complications ranging from 3.8% to 4.5% and mortality is about 0.15%. [33] In patients who have long standing AF or with structural heart disease, recurrence rate post ablation is very high but this has been shown to be improved with the modified Maze procedures. [34] Cardiac tamponade (both early and/or late) has been shown to be the most common fatal complication leading to cardiac arrest during or after AF catheter ablation. Other complications include development of atrio-oesophageal fistulas, cerebral and cardiac ischaemia, extra pericardial bleedings related to subclavian or pulmonary veins perforation and post-operative massive pneumonia refractory to antibiotics. [34] Less common complications are deaths related to conditions such as torsade de pointes, sudden respiratory failure, or acute respiratory distress syndromes in the post-operative period. [35]

3.8. Prevention of Thrombosis in Atrial Fibrillation

The complication associated with untreated AF is thromboembolic phenomenon and can affect the brain, heart, kidneys or peripheral limbs with significant morbidity and mortality. Stroke is the most common of these complications in AF with the rate of ischemic stroke in AF being four to five times the rate in non valvular AF patients. [28] Other less common complications include precipitation of decompensation in stable heart failure, splenic infarction and rarely limb ischemia. [28]

The prevention of thromboembolic phenomenon is the key issue in chronic AF in this sub region as the morbidity associated with stroke is high. [36] Prevention involves use of anticoagulants after appropriate risk assessment using either the $CHADS_2$ or the CHA_2DS_2-VASc scoring system. CHA_2DS_2-VASc score of 1 or more indicate the use of oral anticoagulants. The drug of choice in this sub region should be warfarin because of ready availability and cheap cost at a dose of 2.5 to 10mg at bedtime. When warfarin is used the risk of bleeding needs to be monitored regularly, weekly for the first one month of initiating therapy, then monthly and later three monthly thereafter using International Normalisation Ratio (INR). [37] The bleeding risk could be assessed using the HAS-BLED score. [6] In patients with rheumatic heart disease or prosthetic valves this value is set at 2.5 to 3.5 while in most other conditions such as thyrotoxicosis, heart failure, hypertensive heart failure and dilated cardiomyopathy the target INR is set at 2.0 to 3.0. [37] In elderly patients aged 60 years or more the use of low dose aspirin may be considered instead of anticoagulation.

There are newer oral anticoagulants in the market that have received approval for use to prevent thromboembolism. Those approved for use include dabigatran 150 mg twice daily, rivaroxaban 20 mg daily and apixaban 5 mg twice

daily and their use only occasionally require monitoring like warfarin, have no dietary interactions and less drug interactions. They however have the disadvantage of nonexistence of antidotes for bleeding side effects but trials are ongoing for antidotes. The cost also remains very high and they are therefore unaffordable in resource poor setting West Africa. They are also not recommended for valvular AF, thus a significant proportion of the patients in the sub region with rheumatic valve disease would not benefit from them.

3.9. New Frontiers

Blood pressure monitors with AF detecting devices could be used for opportunistic detection of AF. [38] There are new surgical procedures for the treatment of persistent AF. These include more recent versions of the Maze procedure the 'Maze Cox IV' with or without mitral valve repairs or procedures [39] which would be the ideal for our patients with AF and rheumatic mitral valve disease. Catheter based ablation techniques have also become available. In addition, device based treatment modalities such as cardiac re synchronization therapy are now part of the treatment modalities that has helped to improve left ventricular function, functional capacity in patients with heart failure and permanent AF. [40] All of these innovative treatment techniques are however yet to be introduced as part of the options available to patients and physicians in the West African sub region.

4. Conclusion

AF in chronic form is common in patients in the West African sub region and common underlying causes are hypertensive heart disease, rheumatic heart disease, cardiomyopathies and thyrotoxicosis. Treatment of such chronic AF is long term use of antiarrhythmic agents such as amiodarone and prophylaxis against thromboembolism using mainly warfarin. Newer oral anticoagulants are available but expensive. Surgical ablation services are not available, thus patients in West Africa cannot reap the full benefit of modern treatment modalities for chronic AF. There is urgent need to develop capacity in the use of innovative technology for the treatment of AF. This is particularly so as prevalence is expected to increase as the ageing population increases with improved socio economic conditions in the sub region.

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