

Review article

Stratification, inducing agents, assessment techniques and list of medications and its adverse effects for treating atrial fibrillation

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Abstract

Distinctive atrial fibrillation types poses different morbidity rates, treatment options, prognoses and mortality rates. For example the congenital heart disease or any structural modifications in the mitral valve which leads to valvular atrial fibrillation carries the maximum risk of stroke. The atrial fibrillation caused mainly by a reversible and an underlying condition which can be treated is referred to as secondary atrial fibrillation. Among the two mechanisms-The first is the depolarizing foci (1 or more) are enhanced automaticity for the triggering and atrial fibrillation maintenance. The second is the aberrant circuits which are one or more leading to reentry. Atrial remodeling occurs if the atrial fibrillation is persisted. It can be characterized by the appearance of fibrosis in patches; sino-atrial node contains fatty infiltration, cellular energy usage and depolarization pattern is changed, molecular modifications in the ion channel, collagen is deposited abnormally and excessively and apoptosis occurs. The rhythm control and the rate control are the two main strategies compared for atrial fibrillation treatment. The medication given for atrial fibrillation aims for reduction of stroke risk accompanied with anticoagulants and warfarin. Along with these medications, rate controlling medications are combined for bringing the normal beat rate of heart. If the heart rate or the symptoms are uncontrollable with the initial treatment, the doctors prescribe different medications for controlling the heart rhythm for bringing heart rhythm to normal. Heart failure, irregular heart rate, clot prevention, racing and preventing the stroke are the symptoms to be controlled by designing the atrial fibrillation treatment.

Introduction

Atrial Fibrillation Definitions

Distinctive atrial fibrillation types poses different morbidity rates, treatment options, prognoses and mortality rates. For example the congenital heart disease or any structural modifications in the mitral valve which leads to valvular atrial fibrillation carries the maximum risk of stroke. The atrial fibrillation caused mainly by a reversible and an underlying condition which can be treated is referred to as secondary atrial fibrillation. The patients who had undergone thoracic and cardiac surgery are highly prone to atrial fibrillation [1]. If the condition persists after the treatment, the risk of stroke is highly increased. In individuals below the age of 60 with no identifiable cause are non-cardiac patient can also be affected leading to lone atrial fibrillation. Lone atrial fibrillation patients exhibit good prognosis. Intermittent atrial fibrillation occurs in episode which terminate spontaneously referred to as Paroxysmal atrial fibrillation. In patients with chronic atrial fibrillation the fibrillation is continuous and is non-convertible to normal sinus rhythm. The termination in

persistent atrial fibrillation is by pharmacologic or electrical cardio version [2].

Stratification of Atrial Fibrillation

- Chronic/permanent atrial fibrillation – it is characterized by the continuous atrial fibrillation which does not respond to cardio version and it cannot be again attempted.
- Lone atrial fibrillation- It usually occurs in individuals with age less than 60 years and in which there are no echocardiographic and clinical signs/causes found.
- Nonvalvular atrial fibrillation- the problems related with the prosthetic valves of heart, valve repair and valular disease are not responsible for this kind of fibrillation [3].
- Paroxysmal atrial fibrillation- it is characterized by the occurrence of episodes which can be terminated spontaneously [2].

- Persistent atrial fibrillation- it is the fibrillation which can only be terminated by the cardio version and is caused when the paroxysmal atrial fibrillation has been sustained for more than a week.
- Recurrent atrial fibrillation- characterized by the occurrence of more than two episodes of the atrial fibrillation [4].
- Secondary atrial fibrillation- it is caused mainly due to underlying events such as hyperthyroidism, cardiac surgery, myocardial infarction and pulmonary disease.

Inducing agents/inducers of atrial fibrillation

- Pericarditis
- Cardiothoracic surgery
- Myocarditis
- Long standing hypertension
- Cardiac
- Myocardial infarction
- Heart failure
- Valvular disease
- Cor pulmonale
- Sleep apnea
- Non cardiac
- Drug abuse
- Alcoholism
- Pulmonary embolism
- Hyperthyroidism
- Wolff-Parkinson-White syndrome
- Pneumonia [5]

Pathophysiology

Among the two mechanisms-

- The first is the depolarizing foci (1 or more) are enhanced automaticity for the triggering and atrial fibrillation maintenance [6].
- The second is the aberrant circuits which are one or more leading to reentry. Atrial remodeling occurs if the atrial fibrillation is persisted. It can be characterized by the appearance of fibrosis in patches; sino-atrial node contains fatty infiltration, cellular energy usage and depolarization pattern is changed, molecular modifications in the ion channel, collagen is deposited abnormally and excessively and apoptosis occurs [7].

Irreversible atrial enlargement is the result of chronic remodeling. The restoring of the normal sinus rhythm becomes difficult as long as the heart is present in the atrial fibrillation condition. The condition gets persistent if the paroxysmal atrial fibrillation perpetuates self and reaches a critical point.

Assessment Techniques

Atrial fibrillation is assessed by performing certain tests using instruments. The test and the purpose for its performance is discussed below:

- Chest radiography- it is performed to identify the pulmonary disease if any, for example chronic obstructive pulmonary disease, pneumonia and vascular congestion [8].
- CBP (complete blood picture) - it is performed to identify the comorbid conditions such as infections, anemia etc.
- CMP (complete metabolic profile) - any electrolytic abnormalities can be identified, which are mainly responsible for atrial fibrillation. It is also performed to assess blood glucose level, liver and kidney function
- Echocardiography – it is performed to assess the shape and size of heart, functions and structure of valve, size of heart chamber and its pressure, pericardial effusion presence, diastolic and systolic functions and the abnormalities in wall motion [9].
- Electrocardiography- it is usually performed to diagnose the atrial fibrillation and the arrhythmias of different kinds for example atrial flutter and the atrial tachycardia, ischemia, injury, strain and left ventricular hypertrophy.
- Thyroid stimulating hormone measurement test- it is performed to identify the hyperthyroidism.

Management

The rhythm control and the rate control are the two main strategies compared for atrial fibrillation treatment [10]. According to the data, the patients with the rhythm control exhibit more serious adverse cardiovascular events and side effects including increased hospitalizations from medications and these data was compared with patients of rate control exhibit same thromboembolic events. Hence, patients are recommended for the rate control. In case when the rate control fails, the rhythm control is an option. Anticoagulation therapy is essential part in both strategies to prevent stroke [11].

List of Medications for Therapy

Atrial fibrillation (A-fib) patients are at greater risk of cardiac failure and risk of stroke increase upto five times when compared to individuals who don't possess this condition.

A-fib medications can be classified by specific health problems such as- to prevent clot formation, managing the heart's rhythm and controlling the heart rate.

Clot Prevention

A-fib medications are mainly preferred by patients for the prevention of clot. These Drugs treat already formed clots, or to for thinning the blood to prevent the clots from forming in the blood stream.

Basically two different medications are used for clot prevention. They are-

- I. Antiplatelets, commonly used is aspirin and
- II. Anticoagulants, example warfarin (Coumadin)

FDA (US- Food and Drug Administration) approved other anticoagulants which include:

- apixaban (Eliquis)
- dabigatran (Pradaxa)
- edoxaban
- rivaroxaban (Xarelto) [12]

Controlling heart rate

The quality of life of the person can be increased by slowing and controlling the heart rate with A-fib.

Three different types of drugs are reported by the American Heart Association for controlling the heart rate are-

- I. Digoxin or Digitalis compounds which helps to regulate heart electrical currents.
- II. Beta-blockers; for example- imolo, bisoprolol, metoprolol, carvedilol, propranolol and nadolol.
- III. Calcium channel blockers, commonly used are verapamil and diltiazem [13].

Managing the heart's rhythm

Heart rhythm management is the complex requirement in treating certain cases of A-fib medications. Chemical or drug cardio version is the bringing normal rhythm in heart using medications in atrial fibrillation patients.

American Heart Association studied for two ways by which the chemical or drug cardio version can be attained.

- I. Using Sodium blockers- quinidine (commonly used), rythmol/propafenone, tambocor and flecainide. They act by limiting the electricity conductivity in the heart.
- II. Using Potassium blockers- dofetilide, cordarone, betapace/sotalol, pacerone and amiodarone. They act by interfering disruptive impulses carried electrically which is responsible to make the heart get out of rhythm.

These medications are also referred to anti-arrhythmic drugs and usually doctors need to cautious while prescribing these to the patients due to high risk of adverse effects such as critical problems in normal heart rate and other body functions [14].

Factors affecting the drug prescribed

About 2.7 to 6.1 million individuals are affected by atrial fibrillation in United States. The common age is over 65 who are affected, yet younger individuals are also affected.

Before developing the treatment plan, the doctors consider a number of factors affecting the medication-

- Heart rate
- Age
- Risk of stroke
- Frequency and severity of symptoms
- Pre-existing or inherited heart disease
- Other health problems [15]

CHA2DS2-VASc scoring approach helps the doctors to assess an individual's risk to stroke. This approach also helps to determine medications for atrial fibrillation demand needs.

For calculating stroke risk, points are awarded to this approach based on-

- Female sex
- Diabetes presence
- Age between 65 to 74c years
- Congestive heart failure (CHF) presence
- Presence of blood clots or previous strokes
- High blood pressure
- Vascular disease
- Age more than 74 years

The above given factors may be a risk for occurrence of stroke and helps the doctor for prescribing the aggressive treatment for treating the atrial fibrillation in individuals.

The medication given for atrial fibrillation aims for reduction of stroke risk accompanied with anticoagulants and warfarin. Along with these medications, rate controlling medications are combined for bringing the normal beat rate of heart.

Even if the individual is still affected with atrial fibrillation, the doctors may examine the symptoms for heart rate drugs and anticoagulants resulting in the healthy heart rate. In this condition no further changes in the atrial fibrillation medication are advised [12].

If the heart rate or the symptoms are uncontrollable with the initial treatment, the doctors prescribe different medications for controlling the heart rhythm for bringing heart rhythm to normal.

Heart failure, irregular heart rate, clot prevention, racing and preventing the stroke are the symptoms to be controlled by designing the atrial fibrillation treatment.

Atrial fibrillation is of 3 basic types

Permanent stage- when bringing the heart to normal rhythm is not at all possible.

Persistent stage- when the irregularity in the heart beat is observed more than a week

Paroxysmal stage- it is the early stage and is the common one, where every now and then the episodes occur in the individual [16].

Paroxysmal atrial fibrillation is the long term condition in which the episodes may appear to end away. National Heart, Lung and Blood Institute issued a note according which the electrical system of heart can be changed due to atrial fibrillation multiple episodes making the treatment necessarily ongoing.

The doctors are required to have keen watch on the patient's heart health that had an atrial fibrillation episode. Doctors are required to look after even if the individuals feels there's nothing wrong as many individuals are unaware of the atrial fibrillation symptoms.

Medication is required to individuals who have this condition and the symptoms are to be managed effectively, reducing the stroke risk [8].

Cardio version, catheter ablation, electrical stimulation and surgical maze procedures are recommended along with the medication as the medication itself is not enough for controlling the atrial fibrillation.

Adverse effects and risks

Health maintenance and individuals wellbeing is maintained with the medications prescribed for atrial fibrillation patients. Yet there are adverse effects for these medications. Regular examining with the doctor is recommended for making sure proper working of the drugs [10].

Pregnant, breast-feeding and planning pregnancy women's should tell doctors in general to avoid the interactions of atrial fibrillation.

Anticoagulants

The anticoagulants are the drugs which basically are advised to be taken for stopping the bleeding. In certain conditions these medications may result in excessive bleeding and are required to be cut back [16].

The individual must take care to visit the doctor on regular basis and talk to pharmacist for ensuring the drugs taken, and watch the unusual bleeding signs if any.

Beta-blockers leads to adverse effects such as-

- Impotency
- Insomnia
- Dizziness
- Cold feet and hands
- Other effects
- Increased sensitivity to cold and sunlight weather
- Grape fruit affects the drug activity [12]

Antiarrhythmic drugs

Individuals on antiarrhythmic drugs must be aware to not get affected by arrhythmia in certain cases. The drug

prescribed may lead to adverse effects. Individual must be regular examining for effects on other health conditions such as

- Metallic taste
- Damage to organs such as liver and lungs
- Damage to thyroid gland
- Difficulty in seeing
- dizziness
- Changes in vision
- Weight
- Heart rate
- Swelling of limbs
- Shortness of breath
- Light headedness [13]

Specific side effects

Atrial fibrillation includes specific side effects such as-

- Antiarrhythmic medication such as Amiodarone /Cordarone may induce side effects such as changing of skin to blue complexion and harm the lungs.
- Blood thinning drug such as Aspirin can lead to internal bleeding [16]
- Constipation, fatigue or diarrhea can be a side effect of Dilitiazem
- Anticoagulant such as Warfarin can lead to bleeding. Regular testing of blood is done to make sure the right dose is taken.
- Kale, spinach and other vitamins lead to food-drug interactions with the Warfarin. The risk to bone fracture is also increased in adult patients. Studies revealed that genetics can aid about 25% of the patients in effective responding to medications [17].

Conclusion

Health maintenance and individuals wellbeing is maintained with the medications prescribed for atrial fibrillation patients. Yet there are adverse effects for these medications. Regular examining with the doctor is recommended for making sure proper working of the drugs. Pregnant, breast-feeding and planning pregnancy women's should tell doctors in general to avoid the interactions of atrial fibrillation. The individual must take care to visit the doctor on regular basis and talk to pharmacist for ensuring the drugs taken, and watch the unusual bleeding signs if any. The doctors are required to have keen watch on the patient's heart health that had an atrial fibrillation episode. Doctors are required to look after even if the individuals feels there's nothing wrong as many individuals are unaware of the atrial fibrillation symptoms. Medication is required to individuals who have this condition and the symptoms are to be managed effectively, reducing the stroke risk. Cardio

version, catheter ablation, electrical stimulation and surgical maze procedures are recommended along with the medication as the medication itself is not enough for controlling the atrial fibrillation.

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