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Sinus Arrhythmia: Symptoms, Diagnosis and Management

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Abstract

Arrhythmia is a condition in which the normal heartbeat rhythms are irregular. Where the pulse may be too fast or too slow, until the efficiency of pumping blood from the heart to the different parts of the body decreases, which may lead to a risk of heart attack or stroke, which is life-threatening. The aim of this research was to learn about sinus arrhythmia including symptoms, diagnosis and treatment. Management of patients with sinus arrhythmia has made significant progress including drug therapy, catheter ablation, and device therapy. Catheter ablation in coronary heart patients has paralleled advances in this technique in pediatric and adult patients with skeletally normal hearts. Therefore, it became clear through this research that the causes of arrhythmia differ in each patient. Whether the heartbeat becomes faster or slower depends on the individual's lifestyle, health history and environment. Most patients with arrhythmias do not know that they have this problem. Often, arrhythmias are discovered during a comprehensive medical examination or treatment for other diseases. Arrhythmia is the leading cause of morbidity and mortality in adult patients with congenital heart disease. Arrhythmia can be the result of a primary anatomical defect or it can be the result of the long-term effects of hemodynamic defects and surgical repairs.

Keywords: *Arrhythmia, sinus arrhythmia, symptoms, diagnosis, , managementHeart failure.*

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1. Introduction

Cardiovascular disease has been one of the most important life-threatening diseases in the world and one of the biggest public health problems. The Global Status Report indicated that 17 million people suffer from cardiovascular disease annually. Cardiovascular disease was the fourth cause of death. Although patients with cardiovascular disease can be treated by medical and surgical treatment, the surgical treatment of patients with cardiovascular disease has been increased (Al-Zaru, 2010). The main objective of cardiac surgery is to prevent sudden death, relieve chest pain, and improve quality of life (Yotda, Khuwatsamrit, & Siripitayakunkit, 2021).

Health is a subject of primary concern to the human being, and we find this especially in the sick person, who increases his insight and interest in it compared to the healthy person, and it has become the focus of the interest of many researchers and scientists in the various fields of health. Chronic diseases are among the diseases that accompany the patient throughout his life, and that he has to keep pace with and monitor them daily for many years, which require self-control on the part of the patient to be able to practice second-degree prevention to avoid disease complications (Hernández-Madrid & Doc, 2018).

The heart is a four-chamber muscular system designed to work efficiently, reliably, and continuously for life. The muscular walls of each chamber contract in a regular sequence; it pumps blood as required by the body while expending as little energy as possible during each heartbeat (Stephenson, 2010). The contraction of muscle fibers is controlled by an

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electrical current that flows through the heart in a precise manner along specific pathways at a controlled speed. The electrical current that powers each heartbeat is generated in the pacemaker (called the sinus node or SA node), which is located at the top of the heart's upper right chamber (right atrium). The rate at which the pacemaker discharges electrical current determines the heart rate. This rate is affected by nerve impulses and levels of certain hormones in the bloodstream. The heart rate is regulated automatically by the autonomic nervous system, which is made up of the sympathetic and parasympathetic parts. The sympathetic portion increases the heart rate through a network of nerves called the sympathetic plexus. The parasympathetic division lowers the heart rate through one nerve, the vagus nerve. Adrenaline and norepinephrine increase the heart rate. Thyroid hormone, which is released by the thyroid gland into the bloodstream, also increases the heart rate (Yotda, Khuwatsamrit, & Siripitayakunkit, 2021).

A normal heart rate is usually between 60 and 100 beats per minute in adults at rest. But lower rates may be normal in young people, especially those who are physically fit. A person's heart rate usually varies in response to exercise and stimuli such as pain. The heart rhythm is abnormal only when the heart rate is fast, slow, or irregular or when electrical impulses travel along abnormal pathways (Hernández-Madrid & Doc, 2018).

Electrical current flows from the SA node first through the right atrium and then through the left atrium, causing the muscles in these chambers to contract and pump blood from the atria toward the heart's two lower

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chambers (the ventricles). The electrical current then reaches the AV node; located in the lower part The AV node provides the only electrical connection between the atria and the ventricles, while the atria are isolated from the ventricles by non-conductive tissues elsewhere. The AV node delays the transmission of electrical current so that the atria can fully contract the ventricles can fill as much blood as possible before the electrical signal is transmitted to them to contract (Boonyaphisit, 2012). In this paper, sinus arrhythmia will be studied including symptoms, diagnosis, management and factors related to the occurrence of sinus arrhythmia.

2. Literature review

2.1 Sinus arrhythmia

In general, arrhythmias in CHD patients may be due to abnormal anatomy, congenital malformation, malformation of the sinus nodes or atrioventricular conduction systems, abnormal hemodynamics, primary myocardial disease, hypoxic tissue injury, and residual sequelae or after surgery, genetic influences (Katritsis, 2017).

Abnormal position of the sinus node can be found not only in rare forms of malformed hearts with adjacent left atrial appendages but may also be present in patients with sinus defects of the superior vena cava (SVC) type. In hearts with left atrial symmetry, the sinus node tissue may be completely absent or may be found as remnants in the inferior atrium wall near the atrioventricular junction, while in right symmetry two sinus

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nodes may be present (Brugada, Association, & al., 2013). A dysfunctional sinus node may be found abnormal in the usual position in patients without the right superior vena cava (Katritsis, 2017).

Direct injury to the sinus node may occur via surgical incisions or suturing in the upper right atrium. Atrial switch procedures for patients with transposition of the great arteries, Fontan procedures for patients with mono-V physiology and redirection of partial anomalous pulmonary venous return are the most common surgical interventions that lead to chronic insufficiency. More than 50% of mustard operation survivors, for example, have lost reliable sinus rhythm by adulthood (Walsh, 2007). Sinus node dysfunction is often associated with limited exercise capacity and exacerbation of AV regurgitation, which in turn may contribute to the development of MRAT (Walsh, 2007). The conduction system is particularly susceptible to injury during surgical and catheter procedures in patients with ASDs and CC-TGA. Additionally, a periventricular septal defect is associated with an increased risk of atrioventricular block associated with percutaneous closure at a young age (Brugada, Association, & al., 2013).

Most patients with congenital heart disease have a normal sinus node. Exceptions include left atrial juxtaposition, position inversion, and heterochromia syndromes (Khairy & Balaji, 2009). In the left juxtaposition of the atrial appendages, both appendages are on the left side of the arterial neck (Anjos, 1990). The sinus node is displaced forward and downward, below the apex of the ends. In atrial position reversal, the atria are positioned in a mirror image, with the sinus node on

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the left side. Asymmetric disparity syndromes can generally be categorized as either right (splenic) or left atrial (splenomegaly). Patients with right atrial symmetry often have bilateral sinus nodes. The ruling node may shift from one to the other (Khairy etal., 2007). In left atrial isomerism, the sinus nodes are either absent or hypoplastic and posteriorly dissected. Congenital sinus node dysfunction is common (Momma, 2009).

Normal sinus rhythm (NSR) is the rhythm that arises from the sinus node and describes the characteristic rhythm of a healthy human heart. The rate in NSR is generally uniform but varies depending on the autonomic inputs into the sinus node. When there is an irregularity in the sinus rate, it is called "arrhythmia". A sinus rhythm that is faster than normal is called sinus tachycardia, while a slower rate is called sinus bradycardia (Brugada, Association, & al., 2013).

The SA node, due to its small mass, does not have a visible appearance on the EKG. Therefore, SA node behavior must be inferred from the atrial response. The upper right atrium is depolarized first, followed by simultaneous depolarization of the remainder of the right atrium and some of the left atrium, and finally depolarization of the left atrial appendage. The blood supply and anatomy of the SA node will be discussed here along with the electrocardiographic characteristics of NSR and arrhythmia. Abnormalities of SA node function are considered elsewhere (Yotda, Khuwatsamrit, & Siripitayakunkit, 2021).

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A normal heart rate was considered to be between 60 and 100 beats per minute, although there is some disagreement regarding the normal rate in adults. The range (defined as the 1st and 99th percentiles) is between 43 and 102 bpm in men and between 47 and 103 bpm in women (Khairy & Balaji, 2009). There is also an important age variance in young children. The normal heart rate is 110 to 150 beats per minute in infants, with a gradual slowing down over the first six years of life. A variety of pharmacological factors and physiological conditions can lead to changes in the normal heart rate of the sinuses. These terms are discussed in more detail separately. The normal heart rate increases with exertion and decreases after the activity stops, the rate at which heart rate returns to baseline after exercise can have predictive significance (Mason, 2007).

Congenital heart disease is the most common form of birth defect, with an estimated 1-2% of newborns with moderate or severe types (Hoffman, 2002). Cardiac arrhythmias are prominent among healthcare problems faced and present unique and diverse challenges (Khairy, 2008). The incidence of arrhythmias generally increases with age in a patient with congenital heart disease. Indeed, by adulthood, arrhythmia is the leading cause of morbidity and hospitalization (Engelfriet, 2005), and sudden death of a putative arrhythmia is the most common cause of mortality (Oechslin, 2000) arrhythmias may reflect conduction systems Congenitally malformed or displaced, altered hemodynamics, mechanical stress and/or hypoxia, and/or residual or postoperative effects (Khairy, 2006). The whole series of subtypes of arrhythmia may occur in patients with congenital heart disease, and often several forms coexist.

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Endothelial arrhythmias may include disturbances of the sinus node, AV node, Purkinje system, or intra-atrial proliferation. Junctional arrhythmias are common, especially in young patients after surgery (Rekawek, 2007). Atrial diarrhoea is highly prevalent and can be mediated by accessory pathways, re-entry of duplex AV node, duplex AV nodes, large master circuits, spontaneous rhythms, or non-automatic foci. Atrial fibrillation is increasingly prevalent in the growing and aging population of adults with congenital heart disease. Ventricular arrhythmias are thought to be the leading cause of sudden death in several subtypes of congenital heart disease (Khairy & Balaji, 2009).

2.2 Symptoms of Sinus arrhythmia

Arrhythmia is a condition in which the normal heartbeat rhythms are irregular. Where the pulse may be too fast or too slow, until the efficiency of pumping blood from the heart to the different parts of the body decreases, which may lead to a risk of heart attack or stroke, which is life-threatening. The causes of injury vary for each patient individually, and this depends on the person's style and lifestyle, whether the beats are fast or slow, as well as due to the person's health history and the environment, but there are several general causes for tachycardia, such as the presence of congenital defects, or heart defects, For example, heart diseases that appear with the life of the newborn, and there are diseases that affect heart valves, swelling of the heart, lack of the required blood supply to the heart, and coronary artery disease. In addition to some physical diseases that affect the efficiency of the heart and its ability to function

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well, such as high blood pressure, increased cholesterol in the blood, diabetes, thyroid disorder, and salt imbalance in the body. There are also drugs that affect the heart, especially drugs that include stimulants, as well as caffeinated drinks, and carbonated drinks. In addition, stress and heart factors are among the reasons that lead to sinus arrhythmia. Cardiac arrhythmias are divided into several types (Hernández-Madrid & Doc, 2018):

- Supraventricular tachycardia: an abnormally fast heartbeat.
- Atrial fibrillation: It is a rapid and irregular heartbeat, as it occurs mostly with the elderly and people who drink excessively alcoholic substances, as well as people with heart diseases. This leads to the accumulation of blood clots and blockage of the cerebral arteries.
- Ventricular tachycardia: a disorder in the heart rhythm caused by abnormal electrical signals in the lower chambers of the heart. It may lead to unconsciousness and sudden death unless treated promptly.
- Ventricular fibrillation: A heart rhythm problem that occurs when the heart contracts due to rapid and irregular electrical charges. This can cause unconsciousness and sudden death if not treated promptly.
- Heart block: It is a defect that affects the electrical system of the heart, and this system controls the rate and rhythm of the heart's beats. If the heart is affected by this defect, it causes the heart to beat at an abnormally slow rate due to the inconsistency of the atria and ventricles in work, which may lead to death.

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- Bradycardia: It is a lower heart rate than normal (Khairy & Balaji, 2009).

Arrhythmia, cardiac arrhythmias, or sinus arrhythmias are the differences in the heart rate and the electrical signal transmission systems in the heart muscle. These differences in heart rhythm can manifest themselves as acceleration or slowing of the heart rate, and symptoms can appear as an irregular heartbeat, or as palpitations. Disorders of the system differ among themselves in their importance and danger to the patient's life. Some of them are considered a manifestation of diversity that has no satisfactory value, and some of them pose a threat to the patient's life, or a disease that must be treated. Most cases of arrhythmia are harmless, but some can be serious or even life-threatening. When the heartbeat is too slow, too fast, or irregular, the heart may not be able to pump enough blood to the body and thus leads to ischemia of these organs, which in turn damages the brain, heart, and other vital organs and may lead to periodic shock (Wasmer & Eckardt, 2016).

Sinus arrhythmia is typically asymptomatic, nonetheless if symptoms occur, they may include; chest discomfort, dizziness, palpitations (the heart beating too fast or fluttering), fatigue, pounding heartbeats, syncope, difficulty breathing. Some people with arrhythmias may be aware of them. However, the feeling of the heartbeat (palpitations) varies widely between people. Some people can feel the normal heartbeat, and most people can feel the heartbeat when they lie on their left side (Yotda, Khuwatsamrit, & Siripitayakunkit, 2021).

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The consequences of arrhythmias range from harmless to life-threatening. The severity of the arrhythmia may not be closely related to the severity of the symptoms it causes. Some life-threatening arrhythmias may cause no symptoms, while others may cause severe symptoms. The nature and severity of the underlying heart disorder is often more important than the arrhythmia itself. When the arrhythmia affects blood flow, it can cause weakness, decreased ability to exercise, shortness of breath, light-headedness, dizziness, fainting, or death. Fainting occurs when the heart pumps blood so ineffectively that it cannot maintain an appropriate blood pressure. If this arrhythmia persists, it can be fatal. The arrhythmia may also worsen symptoms of underlying heart disease, including chest pain and shortness of breath. Symptomatic arrhythmias need to be treated promptly (Stephenson, 2010).

2.3 Diagnosis of Sinus arrhythmia

Diagnosis of arrhythmia begins with hearing the medical history, where some patients narrate tachycardia, or palpitations, sometimes patients feel the heart acceleration, then they are asked about its precursors, if any, how it starts suddenly or the pulse accelerates gradually, and in cases of slow heart, the patient tells For drowsiness, or syncope or fainting of the patient. This is followed by palpation of the pulse, where the speed and regularity of the pulse can be assessed or not, and heart contractions and diastoles can be heard using a stethoscope. The most important tool for diagnosing arrhythmias is the electrocardiogram (ECG), since arrhythmias cannot be diagnosed without an ECG (Boonyaphisit, 2012).

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After evaluating your symptoms and performing a physical exam, your cardiologist may perform a variety of diagnostic tests to help confirm the presence of an arrhythmia and indicate its causes. Some of the tests that may be done to confirm the presence of an arrhythmia include (Hernández-Madrid & Doc, 2018):

• Electrocardiogram (ECG or EKG)

The electrocardiogram gives important information about heart rhythm and detects many arrhythmias. It is considered the main tool in diagnosing arrhythmias, especially if it is possible to obtain an electrocardiogram at the moment the patient feels disturbed. There are types of examination, including (Hernández-Madrid & Doc, 2018):

Chart at rest or during the shift

It is a chart that is drawn in the clinic in a state of rest, and it shows the current rhythm of the heart, and it can also detect many arrhythmias that appear during the resting period of the heart, and the chart can be drawn in moments when the patient feels arrhythmia, then the drawing is called an attack chart, given that it was drawn during the show's frenzy.

Voltage check

Examination of stress, that is, the electrocardiogram, during the effort, the effort is reached by using a walking belt or a bicycle, accompanied by recording the electrocardiogram, and observing the effect of increased stress on the heart rhythm (Bouchardy, 2009).

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Long electrode plan

Paroxysmal arrhythmias vary with each other in the frequency of the disturbance, there are disturbances that the patient feels daily, here it is sufficient to record for 24 hours, but in cases where arrhythmias occur varying by weeks or months, it is necessary to analyze the electrocardiogram for periods ranging according to the frequency of attacks from weeks to years. There are several devices developed to diagnose such cases, including (Stephenson, 2010):

• “Holter examination” or electrocardiogram over a period of 24 hours, and is used by planning a three-electrode electrocardiogram to analyze the electrocardiogram of the electrocardiogram over a whole day, and to note the disturbances in the rhythm during that period.

• “Spider ECG”: It is so called because the device is fixed on the patient's chest, and then wires are attached to the patient's chest in a spider-like or spider web. Such devices record the electrocardiogram for periods of up to several weeks.

• “Event Recorder”: This is a hand-sized device that the patient carries with him, and when he feels arrhythmia, he puts the device on his chest to record an electrocardiogram for a period of 30 seconds, for example.

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• Implanted Loop Recorder or Implanted Event Recorder: These devices are the size of a USB flash drive, which are implanted under the skin, and they analyze the ECG, and record any disturbances that the device notices. Some of these devices enable the patient to record the disturbances believed to be occurring in minutes retrospectively, and the measurements are analyzed periodically (Hashemzadeh, 2013).

There is a new method for diagnosing and treating arrhythmias, which is drawing the electrocardiogram through probes that are inserted into the heart chambers through a special catheter similar to a cardiac catheter, but the difference is that it is an intravenous catheter. These probes draw an electrocardiogram of the impulses transmitted through the heart muscle, thus locating the abnormalities that cause arrhythmias in the heart muscle, and working to treat it by modifying these pathways (Hernández-Madrid & Doc, 2018).

• Ambulatory monitors, such as the Holter screen.

• Stress test: A test used to record arrhythmias that begin or get worse with exercise. This test may also be useful in determining whether there is an underlying heart disease or coronary artery disease associated with an arrhythmia.

• Echocardiogram: A type of ultrasound used to provide a view of the heart to determine if there is heart muscle or valve disease that may be causing an arrhythmia. This test can be done while you are resting or active.

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Cardiac catheterization: Using a local anesthetic, a catheter (a small, hollow, flexible tube) is inserted into a blood vessel and directed to the heart with the help of an X-ray machine. A contrast dye is injected through the catheter so that X-ray films of the coronary arteries, heart chambers, and valves can be taken. This test helps your doctor determine whether the arrhythmia is caused by coronary artery disease. This test also provides information about how well the heart muscle and valves are working.

• Electrophysiology study (EPS): A special cardiac catheterization that evaluates your heart's electrical system. A catheter is inserted into your heart to record the electrical activity. EPS is used to find the cause of the abnormal rhythm and to determine the best treatment for the patient. During the test, the arrhythmia can be reproduced and safely terminated.

Tilt table test (also called passive head tilt test or upright head tilt test): records blood pressure and heart rate on a minute-by-minute basis while the table is tilted head-up at various levels. The test results can be used to evaluate heart rhythm, blood pressure, and sometimes other measurements during a change of position (Yotda, Khuwatsamrit, & Siripitayakunkit, 2021).

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2.4 Management of Sinus arrhythmia

Pharmacological management

The mechanisms of arrhythmia in adult congenital heart disease are classically represented by large atrial or ventricular circuits that revolve around the sites of fixed and functional myocardial conduction block, through regions of slow conduction, thus facilitating that the wave front captures the excitatory myocardium. Additional types of tachycardia include focal tachycardia, AVRT, AVNRT, and AF. Pharmacotherapy should be guided by an understanding of the individual heart disease, the atomic electrophysiological substrate and the electrophysiological features of tachycardia (Hernández-Madrid & Doc, 2018).

Acute management

Adenosine is the treatment of choice for the acute management of AV node-dependent mechanisms. Particular consideration should be given to the use of adenosine in patients with reduced EF depending on the elevated heart rate in order to maintain cardiac output. In haemodynamically stable patients, intravenous (class II) beta-blockers or calcium channel antagonists (class IV) may provide rate control before spontaneous switching or alternative administration (Katritsis, 2017).

The potential benefits of intravenous sotalol are still unknown at present. Negative inotropes such as beta-blockers and verapamil can cause cardiovascular collapse when ventricular function is affected. Previous echocardiography and slow infusion rate rather than bolus injection should be warranted. In patients with documented SND, backup velocity

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should be available before drug therapy is attempted. In view of the unexpected side effects of negative inotropic agents in coronary heart disease patients with paroxysmal SVT or AF, electrical cardioversion (AF) or IV. Adenosine (SVT) should be the preferred form of acute treatment. Acute tachycardia is very effective in terminating atrial fibrillation and MRAT and avoiding the side effects of pharmacological agents at all (Hernández-Madrid & Doc, 2018).

Anticoagulation

Cerebral thromboembolic complications are a major cause of morbidity in the CHD population, necessitating individual risk stratification and initiation of anticoagulant therapy. The age- and sex-standardized incidence rates of ischemic stroke are shown from 9 to 12. The risk is doubled for people with coronary heart disease <55 years of age with heart failure, diabetes mellitus, and recent myocardial infarction identified as the strongest prognostic factor. Certain groups such as those with Fontan circulation or those with right-to-left intracardiac shunts (eg Eisenmenger syndrome) may benefit from anticoagulation. Although patients with central cyanosis have a higher risk of thromboembolism due to reduced flow, they also have a higher bleeding risk because coagulation is inadequate. Current practice in most centers is anticoagulation in cyanotic patients when they have atrial fibrillation/flutter, however, with acceptance of the increased risk of life-threatening bleeding. Anticoagulants should always be individualized in discussion with the patient and based on the relative risk of stroke and compatibility with bleeding. In strategies for lower-risk patients similar to

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those used for other variants of structural heart disease, an approach based on the CHA2DS2-VASc risk factor appears appropriate. Stroke prevention with the same indications as in atrial fibrillation is recommended among CHD patients with atrial fibrillation or AT (Hernández-Madrid & Doc, 2018).

Catheter ablation

Besides the fact that antiarrhythmic drugs are often associated with negative inotropic and/or motility effects in CHD, the main reason for performing ablation as a first-line treatment is its superior efficacy over pharmacological therapy. Catheter ablation is increasingly used in patients with CHD to treat all types of tachycardia including AVRT, AVNRT, and VT (Sherwin, Triedman, & Walsh, 2013).

However, while acute resection success rates are high, recurrence is not uncommon, and approximately 50% of CHD patients remain MRAT-free and non-CTI-dependent VT in the long-term. Routes to access the heart, such as the internal jugular, subclavian, femoral collaterals, or access through the liver may be required (Dave, 2010). In patients with physiologically aligned septal structures, such as in VSD and TOF, the Koch triangle serves as a good reference for the location of the integrated AV node, whereas its position is highly variable when abnormal septal alignment is present (Bouchardy, 2009).

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With the further development of catheter and sheath technology and the advent of 3D mapping systems, success rates and safety have improved significantly. Congenitally corrected TGA is frequently associated with systemic tricuspid valve abnormalities, including dysplasia and leaflet displacement and shows a high incidence of additional AV connections (Walsh, 2007). As in patients with Ebstein anomaly, ablation is the preferred option. However, the abnormal location of the atrioventricular conduction tissue with its fragile state warrants utmost care to avoid developing atrioventricular block and to avoid the need for a permanent pacemaker (Roten, 2011).

In patients with atrioventricular septal defects, the connecting atrioventricular node is displaced to an inferior site in the right atrioventricular valve annulus, regardless of the typical margins of Koch's triangle. Unbranched and branched bundles are usually defective, i.e. not covered by valve tissue, which makes them more susceptible to damage catheter ablation in postoperative settings. The experience of AVNRT ablation in postoperative coronary heart patients is limited (Singh, 2011).

Post-operative CHD patients after surgery are at risk of developing rapid heart rhythm disturbances in adulthood. Areas of dense fibrosis resulting from surgical incisions, patch material, and valve annulus are areas of conduction block that create an overlapping anatomical isthmus of the myocardium. Patients with atrial arrhythmias often harbor a multifactorial arrhythmia (Hernández-Madrid & Doc, 2018), which complicates ablation procedures. There is variable heterogeneous thrust propagation and slow conduction. Scars from the surgical auricle, suture lines to the

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walls or intracardiac spots, or even radiofrequency lesions from previous ablation operations may facilitate the development of preferential conduction ducts or isthmuses within the scars or adjacent to anatomical septa. In general, early complete repair and sophisticated surgical strategies are likely to reduce the risks of acquired pillars in modern patients (Escudero, 2013).

Catheter ablation of atrial tachycardia

The success of catheter ablation for ATs in coronary heart patients has steadily increased in designated centers. Focal non-spontaneous AT, defined as induced and terminated localized tachycardia with programmed stimulation, either re-entry or due to stimulated activity, may account for 5–10% of all normal ATs. Large entrances, identification of the critical isthmus that maintains the circuit is crucial for proper resection. The most common CTI-dependent electrocardiogram, in both operated and non-operated coronary patients, is the most common (Hernández-Madrid & Doc, 2018).

Nevertheless, a superficial ECG may not look unambiguously like classic atrial fibrillation depending on the changing anatomy. Atypical morphology does not exclude a dependence on CTI. In individuals repaired from CHD, most non-CTI readmissions tend to revolve around the affected tissue as surgical tachycardia in the lateral and anterior wall of the right atrium. Sudden, subtle changes on the ECG may predict a partial interruption of the duplex circuit (Wasmer & Eckardt, 2016).

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In patients after the mustard/Senning procedure, the MRAT predominantly includes the CTI (Correa, 2015). and the same is true in patients after TOF repair where the area between the atrial fibrillation scar and the inferior vena cava (IVC) may serve as an additional critical substrate. In patients with unstimulated MRAT or unstimulated circuits, a substrate mapping approach including voltage and activation mapping can be performed during a steady sinus rhythm or atrial pacing (Stephenson, 2010).

A high output velocity, in order to trace the path of the phrenic nerve using an electrodynamic mapping system, must be performed in advance to deliver radiofrequency to the posterior-lateral aspect of the right atrium or pelvic periphery regions. Ablation for atrial fibrillation has occasionally been performed in patients with uncomplicated heart, primarily in ASD patients, by pulmonary vein isolation, with some combinations including SVC isolation and additional left atrial applications in continuous AF (Troianos, 2011) guidance recommended Transseptal perforation echocardiography in the case of an anatomical abnormality that confounds radiological orientation, in the case of ASD closure devices or septal grafts (Lakkireddy, 2008). There are reports showing that the results of atrial fibrillation ablation in coronary heart patients do not differ significantly from the population without CHD (Philip, 2012).

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At present, cardiac surgery can be performed on a large scale with satisfactory success. Although surgical treatment increases the survival rate, it also has a risk of complications (Anthony, A Senedlbach, S. , 2007).

Cardiac surgery is the major surgery that has risks of complications and death after surgery especially within the first 24 hours, and blood circulation may be unstable (Smeltzer, 2008). If heart surgery patients have complications, they will delay recovery, spend longer in hospital and higher post-operative mortality (Hareyan, 2013). Postoperative complications in cardiac surgery patients vary depending on the individual's risk factor. These complications are postoperative hemorrhage, cardiac tamponade, arrhythmia, neurological complications, respiratory and pulmonary complications, renal complications and wound infection (Chaiyaroj, 2008).

Arrhythmia is often detected as a complication after heart surgery. In addition, the incidence of arrhythmia was on the second to fourth day after surgery. Atrial fibrillation frequently occurs after heart surgery. Patients with arrhythmias after heart surgery had a higher mortality rate than patients without arrhythmias after heart surgery. This leads to a 50 percent increase in hospital deaths and an additional 10 percent of deaths within another two years. The cause and mechanism of the arrhythmia after heart surgery is not yet clear (Hashemzadeh, 2013). Previous studies indicated that the causative factors for arrhythmias are age (Sutheeraphattharanon, 2008), high blood pressure (Boonyaphisit, 2012), heart failure, thyroid function disorder, valvular heart disease and

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myocardial infarction, obesity, diabetes, COPD and electrolyte imbalance including low blood potassium level, low blood magnesium level (Peretto, 2014).

Sinus Arrhythmia has been a significant complication in cardiac surgery patients that must be monitored and prevented by the nurse and health care professional team or, when it occurs, can be treated promptly. Therefore, in the first 24 hours after surgery, the nurse must play a critical role in monitoring for complications so that this condition can be treated quickly (Jones, 2010).

3. Conclusion

Sinus arrhythmia is an irregular heartbeat — the heart may beat too fast or too slowly. The reason for this condition is changes in the electrical system of the heart or a short circuit in the heart. This leads to the heart's inability to pump blood efficiently, which leads to poor blood circulation in the body. This can increase the risk of heart failure and stroke.

The current research summarizes the knowledge and provides recommendations regarding the diagnosis and treatment of sinus arrhythmia in patients with congenital heart defects. This research mainly addressed this situation as arrhythmia in adults with congenital heart disease, because in many cases, the anatomy and management of sinus arrhythmia in adult patients cannot be directly applied to patients with congenital heart disease. However, there are still significant limitations in understanding and managing the different types of sinus arrhythmia that must be overcome in the future. Although at present the vast majority of

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coronary heart disease can be fixed by surgical or interventional treatment, there is still a lack of understanding of how arrhythmias develop in our congenital heart patients. Additional advances in mapping technology that allow accurate identification of the arrhythmia substrate may improve results. When abnormal electrical impulses occur in the heart, the resulting normal beats are not regulated, and this is what worries many sufferers. This pulse is either light or very fast, and the irregular heartbeat is uncommon and can cause a blood clot, or a heart attack in the person who suffers from it. This irregularity is more dangerous for people who suffer from heart failure or disease, and there are several symptoms that the person with tachycardia suffers from, including: the person with dizziness and vertigo, and difficulty breathing.

The research stated that the electrocardiogram (ECG or EKG) is the main diagnostic procedure for detecting and determining the cause of arrhythmias. This procedure provides a graph of the electrical current produced by each heartbeat. The ECG usually records the heart's rhythm for a very short time. Since the arrhythmia is often intermittent, a portable ECG device (called a Holter monitor or event monitor) may be used to record the heart rhythm continuously or when a person senses an arrhythmia and turns on the device 24 or 48 hours - intermittent arrhythmia during normal daily activities. During the recording period, the patient also writes down symptoms and activities associated with the arrhythmia doctors sometimes implant a recording device under the skin of the left collarbone to check for serious arrhythmias that occur very rarely. The device can be left in place for long periods. This device

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electronically transmits stored data of the abnormal heart rhythm painlessly through Skin.

People with suspected life-threatening arrhythmias are usually hospitalized. The heart rhythm is constantly recorded and shown on a television screen at the bedside or in the nurses' corner. Therefore, any problems can be identified promptly. Other diagnostic procedures include exercise stress testing, exercise blood pressure measurement, echocardiography to detect anatomical abnormalities, and electrophysiologic testing. During an electrophysiological exam, a catheter with tiny electrodes at its tip is inserted through a vein and into the heart. The electrodes are used to stimulate the heart, and the heart's response is monitored so that the type of arrhythmia and the best treatment options can be determined.

Further research is needed to explore how other factors of sinus arrhythmia such as use of inotropic drugs, use of antiarrhythmic drugs, and postoperative blood transfusions should be explored in a future study. This would be a fruitful area for further work in the screening program for high risk of postoperative arrhythmias to improve quality of care and prevent further complications. Cardiology and electrophysiology training programs need to consider dedicating more curriculum time to this topic in an effort to improve future care delivery. The paucity of evidence-based management protocols for arrhythmias in adults with CHD is also a concern, and there is a clear need for larger collaborative studies involving pediatric and adult cardiology centers to generate more objective treatment guidelines.

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