SUMMARY

Normal rhythmic cardiac contraction is initiated by spontaneous depolarization of the sinoatrial node. This depolarization generates an impulse that spreads sequentially through the atrial wall and specialized internodal tracts to the atrioventricular node, and then to the His bundle and its branches to reach the purkinje network and to excite the ventricular muscle.

The normal sinus rhythm is regular; each impulse follows another at regular interval (Ganong, 1981). The expected heart rates under resting conditions in different age groups are :

Age	Heart rate
Up to 1 year	88 - 215
1 - 3 years	100- 188
3 - 5 years	68 - 150
5 - 8 years	75 - 150
8 -10 years	51 - 125

(Keith, et al., 1978).

Tachyarrhythmias are defined as the rates which are more rapid than normal, regular or irregular, arising from the sinus node, the atria, the atrioventricular junction or the ventricles (Moss and Adames, 1968).

When an ectopic focus generates an impulse faster than the sinus discharge rate, it assumes control of the heart and ectopic tachycardia results. From an electrophysiologic standpoint there is evidence for both reentry and automatic ectopic focus mechanisms to account for the pathologic tachycardias (Courtney, 1980).

It is traditional to divide the tachyarrhythmias according to whether the pacemaker (reentrant or automatic ectopic) is above or below the His bundle bifuraction supraventricular and ventricular. Such categorization is useful because of etiologic and therapeutic differences.

Causes of tachyarrhythmias :

- Physiologic; they are rare in otherwise normal hearts.
- Pharmacologic; sympathomimetic agent and digitalis overdosage.
- Pathologic; rheumatic heart disease, myocarditis, congenital heart disease, preexcitation syndromes, cardiac surgery, cardiac catherterization and electrolyte disturbances (Alpert, 1980), (Goldberger, 1982).

Tachyarrhythmias may precipitate or aggravate congestive heart failure in the setting of significant cardiac disease. At excessively rapid heart rates, the cardiac output systemic blood pressure and blood flow to the vital organs may become so reduced that ischaemia of the brain, myocardium, liver, kidney, gastroentestinal tract and musculocutaneous system may develop (Hurst, 1974). Ventricular tachycardias often produce a more significant haemodynamic abnormality than supraventricular ones because they nearly always occur in advanced heart disease and the rapid ventricular rate further compromises cardiac function (Bellet, 1971).

The most common type of tachycardia has its origin in the sinoatrial node and is a physiologic response to exercise, fever or fright, but may be associated with anemia, myocarditis, shock or heart failure. E.C.G. shows normal P wave and normal (AV) conduction. Treatment of this sinus tachycardia consists in management of the underlying condition, if any. Paroxysmal atrial tachycardia is the most common pathologic tachyarrhythmia in childhood (Courtney,1980). PAT is seen in association with congenital heart disease, W.P.W. syndrome, myocarditis and cardiac catherization or surgery.

In older children, PAT is characterized by abrupt onset and cersation of palpitations. In younger infants sings of congestive cardiac failure rapidly supervene . The E.C.G. shows regular rhythm at a rate of 140-240 beats per min, with normal or abnormal QRS complexes (Widened) as a result of aberrant verticular conduction. P waves,

if present, are usually of different configuration than sinus P waves. Digoxin is the drug of choice in the management of PAT (Kempe, et al., 1980). In desperately ill patients or those resistant to drug therapy, electrical cardioversion is the next most common method (orlando and Aronow, 1979). Carotid sinus massage may cause abrupt cersation or has no effect at all.

PAT will AV block is most commonly due to digitails toxicity. Symptoms and signs of an underlying condition are usually apparent. E.C.G. shows successive P waves (150 - 250 beats/min) which separated by isoelectric line. AV conduction may be 2 : 1, 3 : 1 or 4 : 1. QRS complexes are usually normal, but may exhibit widening due to intraventricular aberration (Goldman, 1979). Treatment of non digitalis incuded PAT with block is completed by digitalis. When the arrhythmia is associated with digitalis , the drug should be discontinued and potassium salts or phenytoin may be used.

Etiology, clinical features and treatment of paroxysmal AV junctional tachycardia is the same as in PAT. The E.C.G. shows regular abnormal P waves (inverted in leads II, III and aV_F) which may precede, coincide with or follow QRS complexes. The QRS complexes are usually normal but may be widened due to aberrant intraventricular conduction. The non paroxysmal form of AV junctional tachycardia is usually associated with digitalis toxicity. The heart rate in the paroxysmal form is about 70 - 130/min. The treatment is completed by stopping of the drug and by using potassium salts or phenytoin.

Atrial flutter is not common in children. It is most common in patients with organic heart disease (congenital heart disease, myocarditis, cardiomyopathy) although it may occur with normal hearts (Nelson, 1979). If there is a rapid ventricular response, the clinical picture is that of a PAT. Also signs and symptoms of congestive heart failure frequently appear. There is a rapid, regular atrial rate

(250 - 350/min) with P (flutter) waves having a saw tooth pattern in leads II, III, aV_F. Conduction to the ventricles may be 1 : 1, 2 : 1 or 4 : 1. QRS complexes are usually normal but may be widened due to aberrant intraventricular conduction. Electrical direct current cardioversion has been reported as being successful in treating atrial flutter (Lown, et al., 1962). Digitalis is the second method of choice for treatment of atrial flutter.

Atrial fibrillation (AF) is rare in children (Kempe, et al., 1980). It has been reported that the cardiac conditions commonly associated with AF in children are severe rheumatic heart disease, congenital heart disease, cardiomyopathy and atrial tumours (Radford and Izukawa, 1977) . The rhythm is grossly irregular and is associated with a pulse deficit. AF may complicate or precipitate heart failure. The atrial excitation is irregular and more rapid (300-600/min).

All cases of AF are associated with variable AV block. The ventricular rate varies from 60 to 180/min and is usually irregular. QRS complxes are usually normal, but may be widened due to aberrant intraventricular conduction. Treatment is by digitalization which restores the ventricular rate to normal (Nelson, 1979). Normal sinus rhythm may then be restored with quinidine or by electrical cardioversion (Hutchison, 1980).

Ventricular tachycardia is uncommon in childhood. It usually occurs in presence of severe myocardial disease such as myocarditis, myocardial damage and chronic cardiomyopathy. Acute disturbances such as hypoxia, acidosis and hypokalaemia may induce ventricular tachycardia. Ventricular tachycardia is seldom tolerated for long periods without developing symptoms of an inadequate cardiac output. Heart failure may occur especially if these is a severe heart disease (Alpert, 1980). The ventricles beat regularly or slightly irregularly at 140-180/min. The atrial beat more slowly, regularly and independently of the ventricles. Each QRS

complex has a duration which is prolonged for the age of patient and different from the patient's normal QRS complex. Ldiocaine and cardioversion are methods of choice for rapid treatment (Goldberger, 1982). Ventricular fibrillation results in death unless an effective ventricular beat is restored (Nelson, 1979). The vast majority of children who have this arrhythmia have abnormal hearts (Pedersen, et al., 1979). Ventricular fibrillation is a form of cardiac arrest. On E.C.G., it is a series of low amplitude, rapid irregular depolarizations without identifiable QRS complexes. A thump on the chest sometimes restores sinus rhythm. Usually cardiac massage (preferably external) with artificial ventilation and electrical defibrillation are necessary.

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