

Electro Cardiogram and Its Normal Variations in Healthy Adults

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Abstract

Background: Electro cardiogram is used to assess cardiac, rhythm and conduction and provides information about chamber size also. The Electrical activity is initiated in SA node and then to AV node and then to bundle of HIS and from that through the purkhji system spread to myocardium. Electrocardiogram is the best non-invasive investigation in diagnosing acute myocardial infarction and arrhythmias like atrial fibrillation and ventricular tachycardia. Electrolyte abnormalities like hypokalaemia and hyperkalaemia may also be detected with electrocardiogram. **Aim:** To study the normal variations QRS duration, ST, T changes and other rate and rhythm abnormalities, which can occur in healthy individuals. **Subjects and Methods:** We have examined 280 healthy adults, among those 280, 120 were females and 160 were males. The age group is between 20 and 60 years. ECG'S were taken after Careful history and clinical examination to rule out any heart diseases like coronary heart diseases, rheumatic heart diseases and hypertensive heart diseases. Drug history was also recorded especially regarding B blockers and Calcium channel Blockers. **Results:** Out of 280, females were 120 and males were 160 the age group is between 20 and 60 years. The heart rate is between 56 and 104. Normal sinus rhythm is observed in 146. The increased heart rate is seen in young adults, T_↓ are very common. **Conclusion:** Electro cardiogram is a best investigation in diagnosing acute myocardial infarction and certain arrhythmias. Even though normal variations are common it is very much useful in detecting certain conditions like silent Myocardial infarction which is very common in diabetic patients and old age Individuals.

Keywords: Electro cardiogram, Bradycardia, Tachycardia, P-R interval, T Wave inversion, Incomplete RBBB.

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Introduction

Electrocardiogram is used to assess cardiac, rhythm and conduction and provides information about chamber size also. The normal electro cardiogram is composed of P wave, QRS complex and T wave. The QRS complex is often but not always three separate waves. The Q wave, R wave and S wave.^[1]

The p wave is caused by electrical potentials generated when the atria depolarise before atrial contraction begins. The QRS complex is caused by potentials generated when the ventricles depolarise before contraction that is as the depolarisation waves spreads through the ventricles. Therefore both p wave and components of QRS complex are depolarised waves.^[2]

The Electrocardiographic recording paper is divided into small and large squares. The small squares are 1mm square. The large squares are 5mm square. The squares Forms a grid which facilitates the measurements of time parameters.(horizontal Measurements) and deflexion amplitude(vertical measurement).^[3] There are two types electro cardio graphic leads 1.frontal plane leads 2.horizontal plane leads. Frontal plane leads consist of standard leads I, II, III and leads AVR, AVL, AVF. The horizontal plane leads consists of lead V₁, V₂, V₃, V₄, V₅, V₆.^[4] The intensity of electrical activity decreases as the distance increases from heart. The standard lead I, II, III forms the triangle

which is called Einthoven's triangle. Rhythm strip is used to see the rate and rhythm.

The SA node initiates the activation of the atrium. The maximum duration of normal atrial activation is thus 0.11 sec since SA node is situated in RA, right atrial activation begins first. It is reflected by the proximal or ascending limb of p wave in the frontal plane leads, most commonly standard lead II. Left atrial activation begins 0.03 sec after RA activation and constitutes distal half of descending limb of p wave in Standard lead II. The p wave is thus a combination of right and left atrial activation.^[5] Activation of depolarisation of the ventricles is reflected by the QRS complex. The QRS complex reflects ventricular activation or depolarisation. Activation of ventricles begins in left sub endocardial region of lowers third of interventricular septum.^[6] T wave is normally inscribed in the same direction as the QRS complex. It has asymmetric limbs, proximal limb shallower than distal limb. The ST segment Represent the greatest part of ventricular repolarisation.it leaves the base line almost immediately after its origin from the end of QRS complex.^[6]

Subjects and Methods

We have examined total 280 subjects out of these 280.females were 120 and males Were 160, 2 ECG's were Taken to all these 280 subjects. We have excluded the

subjects with the history of coronary artery disease, valvar heart disease, hypertension, and congenital heart diseases and patients who are on drugs like calcium channel blockers which will have effect on heart rate. We have excluded the patients with COPD, thyroid disease and anaemia also. COPD patients may have p pulmonale, hypothyroidism can cause Bradycardia and hyperthyroidism can cause tachycardia and atrial fibrillation. Blood samples sand for CBP, RBS, serum creatinine, thyroid function test. And after careful history elicitation and clinical examination the ECG's were taken the common age group in male is 40 – 49yrs i., 52 subjects (32.65%). In females the common age group is 30 – 39yrs is 45 subjects (37.52%).

Table 1: Age wise distribution- Males

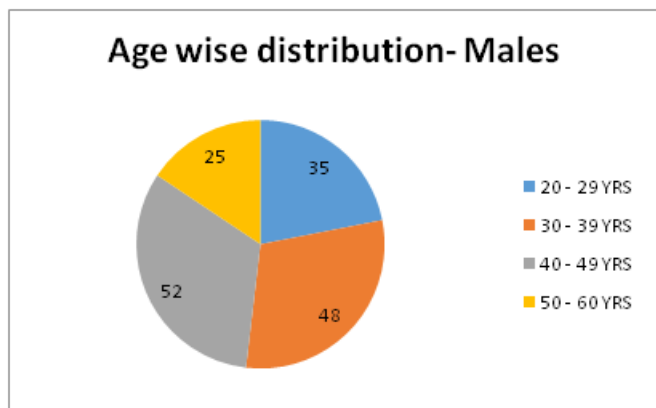
Age Group	No. of Subjects	Percentage
20 - 29 YRS	35	21.57 %
30 - 39 YRS	48	30.50%
40 - 49 YRS	52	32.65 %
50 - 60 YRS	25	15.62%

Table 2: Age wise distribution- Females

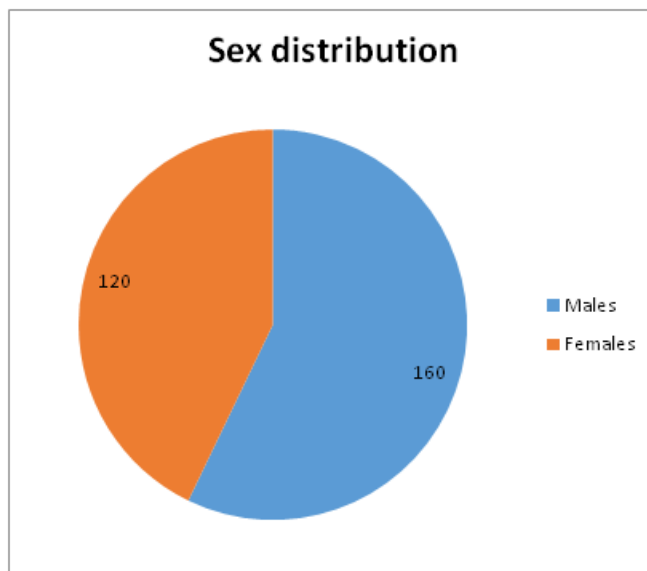
Age Group	No. of Subjects	Percentage
20 - 29 YRS	22	18.23%
30 - 39 YRS	45	37.52%
40 - 49 YRS	35	29.16%
50 - 60 YRS	18	15.62%

20yrs and max. Age limit is 60 yrs. The rate is between 54 and 106 beats /min .The normal heart rate is between 60-100 beats /mins. Brady cardia is called When HR is <60 and tachycardia is called when HR is > 100 beats /mins .Increased heart is observed in young age group .Bradycardia observed in 22 subjects with the age group in 40 years .18 subjects were having tachycardia with age group is 30-40yrs .Males were 12 and female were 6. The maximum P.R internal observed is 0.22 sec. (normal is 0.12 sec, to 0.20 sec.) 12 Subjects were having incomplete right bundle branch block .The electrical position of the heart is determined by complexes in AVL and AVF whether they are positive or negative .The ST segment represents the greater part of ventricular repolarization. It leaves the base line almost immediately after its origin from the end of the QRS complex .The U wave is a small rounded deflection which occurs immediately after the T wave (8.9).

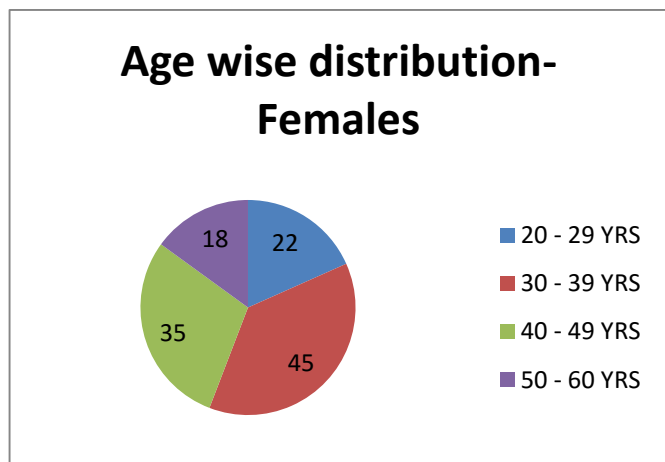
T wave abnormalities are most common .T wave is seen in 4- 2 and sinus arrhythmias is seen in 58 subjects. Premature ventricular contractions were noted in 12 males subjects which were benign.



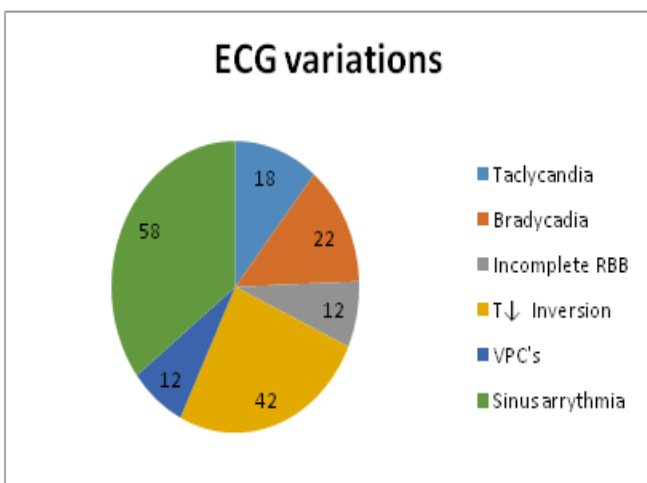
Graph 1: Age Wise Distribution – Males.



Graph 3: Sex Distribution.



Graph 2: Age Wise Distribution – Females.



Graph 4: ECG Variation.

Results

We have examined 260 subjects, the minimum age limit is

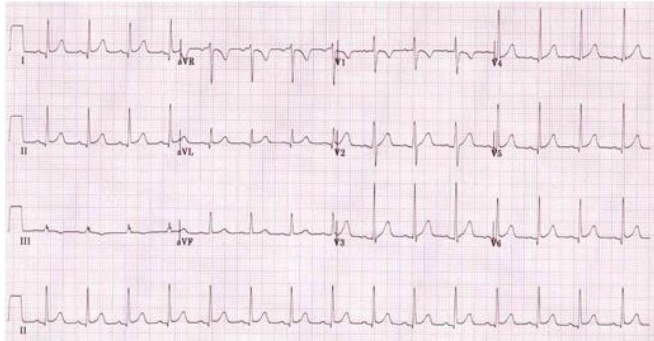


Figure 1: Normal ECG recording from six standard chest leads.

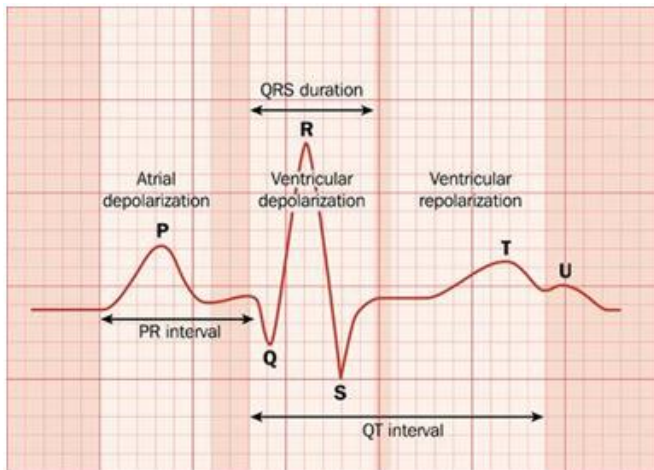


Figure 2: Normal ECG.

Discussion

Electrocardiogram is graphic representation of heart electrical activity of heart which can be recorded from various parts of the body like limbs and chest.^[10] ECG is one of the best noninvasive investigations diagnosing acute myocardial infarction. Rate rhythm and electrical abnormalities can also detected by ECG. ECG is normal individuals shows many normal variations from individuals to individuals which may be normal most of the times. The variations are like VPC'S, incomplete RBBB and T Wave inversions. In congenital heart diseases like atrial septal defect which is asymptomatic most of the times can be detected by ECG and complications like pulmonary arterial hypertension can be prevented and the T waves is most unstable component of electro cardio graphic recording; changes of this deflection may occur with hyperventilation, Heavy meals, anxiety, smoking, drinking ice Water changes, in body position, and decreases in blood pressure. Variations also occurs with race and age the normal T waves is

asymmetrical. The T waves associated with coronary insufficiency has symmetrical limbs.^[11]

Incomplete RBBB is very commonly seen in normal individuals. It is not significant most of the times, but complete RBBB is to be evaluated carefully, and VPC's are also common but they are very occasional and not always recorded by ECG In old age and diabetes silent myocardial infection can be detected by ECG.

Most common abnormality in our study is T wave winersions 18%. The study conducted by karki et al show almost similar results 16.73%.^[12]

Ventricular premature contraction and tachycardia are other common abnormalities found in our study.

Conclusion

ECG is very much useful in detecting acute myocardial infarction and arrhythmias. Even through normal variations are common it is very much useful in detecting certain conditions like ASD where complications like PAH can be presented. And silent myocardial infection can also be detected by electro cardiogram. ECG is cheap and best non invasive investigation in diagnosing acute myocardial infarction.

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