12 lead ecg

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The ECG and the ECG are redirected here. For other purposes, see ECG (disambiguation) and ECG (disambigation). Not to be confused with other types of electrography or echocardiography. Electrocardiography of the heart in normal sinus rhythmICD-10-PCSR94.31ICD-9-CM89.52MeSHD004562MedlinePlus003868 (edited on Wikidat) Electrocardiography is the process of producing an electrocardiogram (ECG or ECG). This is a voltage graph compared to the time of the electrical activity of the heart using electrodes placed on the skin. These electrodes detect small electrical changes that result from the depolarization of the heart muscle and subsequent repolarization during each heart cycle (heartbeat). Changes in the normal structure of the ECG occur in numerous cardiac abnormalities, including heart rhythm disorders (such as atrial fibrillation and ventricular tachycardia), inadequate blood flow of the coronary artery (e.g., myocardial ischemia and myocardial infarction), and electrolyte disorders (such as hypokalemia and hyperkalemia). In a normal 12-lead ECG, ten electrodes are placed on the patient's limbs and on the surface of the chest. The total magnitude of the heart's electrical potential is then measured from twelve different angles (leads) and recorded over a period of time (usually ten seconds). Thus, the total size and direction of the electrical depolarization of the heart are seized at every moment throughout the heart cycle. There are three main components of ECG: Wave P, which is the depolarization of atria; a complex of RRS, which is the depolarization of the ventricles; and the T-wave, which is the repolarization of the ventricles. During each heartbeat, a healthy heart has an orderly progression of depolarization that begins with a pacemaker of cells in the synoathtrial nodes, spreads throughout the atrium, and passes through the atrioventricular node down into a bundle of it and into the fiber Purkinje, spread down and left throughout the ventricles. This streamlined depolarization model results in a characteristic tracking of the ECG. To qualified clinicians ECG transmits a large amount of information about the structure of the heart and the function of its electrical system of work. Among other things, ECG can be used to measure the speed and rhythm of the heartbeat, the size and position of the heart chambers, the presence of any damage to the muscle cells of the heart or the system carried out, the effects of cardiac drugs and the function of implanted pacemakers. Medicine uses a normal 12-leader ECG 12-leading ECG of a 26-year-old male with incomplete RBBB The overall goal of performing an ECG is to obtain information about the electrical function of the heart. The medical use of this information is varied and often must be combined with knowledge of the structure of the heart and signs of physical examination that must be interpreted. Some indications for the ECG to be performed include Chest pain or suspected myocardial infarction (heart attack) such as ST elevated myocardial infarction (STEMI) or non-ST elevated myocardial infarction (NSTEMI) funny twists, or arrhythmias, including new rapid heartbeat or monitoring of known cardiac arrhythmia Drug monitoring (e.g., drug-induced extension of RT, dygoxin toxicity) and overdose management (e.g. tricyclic overdose) Electrolyte abnormalities such as hyperkalemia perioperative monitoring, in which any form of anesthesia is involved (This includes preoperative assessments and intraoperative and postoperative monitoring. Cardiac stress-testing Computer tomography (CTA) and magnetic resonance angiography (MRA) of the heart (ECG is used for gate scanning so that the anatomy of the heart is stable) Clinical Cardiac electrophysiology, in which a catheter is inserted through the femoral vein and can have several electrodes along its entire length to record the direction of electrical activity in the heart. , patients undergoing general anesthesia, and patients who have infrequently occur cardiac arrhythmia, which could hardly be seen on the usual ten seconds of ECG. Continuous monitoring can be carried out with Holter monitors, internal and external defibrillators and pacemakers, as well as/or biothematheria. Screening data do not support the use of ECG among those who have no symptoms or are at low risk of cardiovascular disease as a prevention effort. This is due to the fact that the ECG may falsely indicate a problem, leading to misdiagnosis, recommendations for invasive procedures and overtrend treatment. However, those employed in some critical professions, such as aircraft pilots, may be required to have an ECG as part of their normal medical assessments. Hypertrophic cardiomyopathy screening can also be seen in adolescents as part of a physical sportsmanship due to anxiety over sudden cardiac death. Electrocardiographs Electrocardiograph with a built-in display and keyboard on the wheel trolley Sensor ECG Electrocardiographs are registered by machines consisting of a set of electrodes connected to the central unit. Early ECG machines were built with analog electronics, where the signal led the engine to print the signal on paper. Today, electrocardiographs use analog digital converters to convert the electrical activity of the heart into a digital signal. Many ECG machines are now portable and usually include a screen, keyboard and printer on a small wheeled cart. Recent advances in electrocardiography include the development of even smaller devices for inclusion in fitness trackers Smart watch. These smaller smaller often rely on only two electrodes to deliver one lead I. Recording ECG is a safe and painless procedure. The machines are powered by power, but they are designed with several safety features, including grounded (ground) lead. Other features include: Defibrillation protection: any ECG used in health care can be attached to a person who requires defibrillation and the ECG needs to protect itself from this energy source. The electrostatic discharge is similar to the defibrillation discharge and requires voltage protection of up to 18,000 volts. In addition, a circuit called the right foot driver can be used to reduce interference in the general mode (usually 50 or 60 Hz). The intensity of the ECG measured throughout the body is very small. This low voltage requires low noise insulation and instrument amplifiers. Lead simultaneous recordings: Earlier projects recorded each interest sequentially, but current models record multiple versions at the same time. Most modern ECG machines include automated interpretation algorithms. This analysis calculates features such as PR interval, interval i.e., adjusted TT interval, PR axis, RS axis, rhythm, and more. The results of these automated algorithms are considered preliminary until they are verified and/or modified by expert interpretation. Despite recent advances, misinterpretation of computers remains a significant problem and can lead to clinical mismanagement. The electrodes also result in the correct placement of the limbs' electrodes. The limbs electrodes can be far down on the limbs or close to the hips/shoulders as long as they are positioned symmetrically. The placement of the doord electrodes electrodes are actual conductive pads attached to the surface of the body. Any pair of electrodes can measure the difference in electrical potential between the two respective attachment locations. This pair forms lead. However, leads can also be formed between a physical electrode and a virtual electrode, known as Wilson's Central Terminal, whose potential is defined as the average potential measured by three limb electrodes that are attached to the right arm, left arm and left leg, respectively. Typically, 10 electrodes attached to the body are used to form 12 ECG leads, with each lead measuring a specific electrical potential difference (as listed in the table below). The wires are broken into three types: limbs; Increased limb and pre-recording or breasts. The 12-lead ECG has a total of three limb leads and three enlarged limb leads arranged as the spokes of the wheels in the coronal plane (vertical), and six precorded leads or chest leads that lie on a perpendicular transverse plane (horizontal). In medical conditions, the term brings is sometimes used to refer to the electrodes themselves, although this is technically incorrect. The 10 electrodes in the 12-lead ECG are listed below. Electrode name Electrode Placement RA Right avoiding thick muscles. LA In the same place where the RA was placed, but on the left hand. RL On the right leg, the lower end of the inner aspect of the calf muscle. (Avoid bony notoriety) LL In the same place where the RL was placed, but on the left foot. V1 In the fourth interreburn space (between ribs 4 and 5) just to the right of the sternum (breast bone) V2 in the fourth interreburne space (between the ribs 4 and 5) just to the left of the sternum. V3 Between V2 and V4 leads. V4 In the fifth interreburne space (between the ribs 5 and 6) in the mid-clan line. The V5 is horizontal even with the V4, in the left front armpit. The V6 is horizontal even with the V4 and V5 in the middle of the armpit line. Two types of electrodes commonly used are a flat paper thin sticker and a self-adhesive circular pad. The former are usually used in a single ECG record, while the latter for continuous records as they stick longer. Each electrode consists of the electrical conduction of this electrolyte gel and the silver/silver chloride conductor. The gel usually contains potassium chloride, sometimes silver chloride, to allow the electron to hold from skin to wire and to an electrocardiogram. The common virtual electrode, known as Wilson's Central Terminal (VW), is produced by averaging measurements from the electrodes of RA, LA, and LL to give the average body potential: V W {1}{3} No. 1 3 (R A and L L L) V_ all wires except the limbs leads are supposed to be unipolar (aVR, aVL, aVF, V1, V2, V3, V4, V5, V6). Voltage measurement requires two contacts, and therefore, electrically, unipolar wires are measured from total lead (negative) and unipolar lead (positive). This averaging for general lead and abstract unipolar lead concept makes for a more complex understanding and is complicated by the careless use of lead and electrode. In fact, instead of being a constant reference, VW has a value that fluctuates throughout the heart cycle. It also does not really represent the potential of the heart center because of the parts of the body through which the signals pass. Limb leads the shower leads and the enlarged limb folii (Wilson Central terminal is used as a negative pole for the last in this performance) leads I, II and III called limb showers. The electrodes that form these signals are located on the limbs, one on each arm and one on the left leg. [31] Lead I is the voltage between the (positive) left arm (LA) electrode and right arm (RA) electrode: I = L A − R A {\displaystyle I=LA-RA} Lead II is the voltage between the (positive) left leg (LL) electrode and the right arm (RA) electrode: I I = L L − R A {\displaystyle II=LL-RA} Lead III is the voltage between the (positive) left leg (LL) electrode and the left arm (LA) electrode: I I I = L L − L A {\displaystyle III=LL-LA} Augmented limb leads aVR, aVL and aVF are enlarged limbs. They are derived from the same three electrodes as wires I, II and III, but they use Goldberger's central terminal as a negative pole. Goldberger's central terminal is a combination of inputs from two limb electrodes, with a different combination for each enlarged lead. It is referred directly to the below as a negative pole. Lead enlarged right vector (aVR) has a positive electrode on the right hand. The negative pole is a combination of the electrode of the left hand and the electrode of the left leg: V R and R A No. 1 2 (L A and L L) Frac {1}{2} (LA'LL) frac {3}{2} (RA-V_) Lead increased vector on the left (aVL) has a positive electrode on the left hand. The negative pole is a combination of the electrode of the right hand and the electrode of the left leg: V L and L A No 1 2 (R A and L L) L-Frak {1}{2} (RAZL) frak {3}{2} (LA-V_)) Lead enlarged vector leg (aVF) has a positive electrode on the left leg. The negative pole is a combination of the electrode of the right hand and the electrode of the left hand: V F and L L No. 1 2 (R A and L A) No. 3 2 (L L and V W) displaystyle aVF'LL-frac {1}{2} (RA'LA) frac {3}{2} (LL-V_) II and III, The enlarged limb leads to aVR, aVL, and aVF form the basis of a six-axis reference system that is used to calculate the electrical axis of the heart in the frontal plane. Older versions of the nodes (VR, VL, VF) use Wilson's central terminal as a negative pole, but the amplitude is too small for the thick lines of old ECG machines. Goldberger terminals scale (increases) Wilson's results by 50%, by compromising physical correctness without having the same negative pole for all three. Precordial leads precordial leads lie in a transverse (horizontal) plane, perpendicular to the other six leads. Six pre-recorded electrodes act as positive poles for six relevant preliminary versions: (V1, V2, V3, V4, V5 and V6). Wilson's Central Terminal is used as a negative pole. Recently, unipolar preliminary wires have been used to create bipolar precornal leads that explore the right left axis in a horizontal plane. Specialized wires Additional electrodes can rarely be placed to generate other clues for specific diagnostic purposes. The right-hand precorn wires can be used to better study the pathology of the right ventricle or dextrocardia (and are designated R (e.g. The back wires (V7 to V9) can be used to demonstrate the presence of a posterior myocardial infarction. where the distance to the back left atrium is only about 5-6 mm (remaining constant in people of different ages and Lead esophagus is used for more precise differentiation between certain cardiac arrhythmias, especially atrial flutter, AV noral reantrant tachycardia and orthodromic atrioventricular reanticular tachycardia. It can also assess the risk in people with Wolf-Parkinson-White syndrome, as well as discontinue supraventricular tachycardia caused by re-recording. The intracardia electrogram (ICEG) is essentially an ECG with some added intra-heart wires (i.e. inside the heart). The standard e-wires (external wires) are I, II, III, aVL, V1 and V6. Two to four intracardiac leads are added through cardiac catheterization. The word electrogram (EGM) without additional specification usually means an intracarid electrogram. The lead places in the ECG report standard 12-lead ECG report (electrocardiograph) shows a 2.5-second trace of each of the twelve versions. Traces are most often located in a grid of four columns and three rows. The first column leads the limbs (I, II and III), the second results in an increase in limbs (aVR, aVL, and aVF), and the last two columns are pre-recorded wires (V1 to V6). In addition, the rhythm strip can be included as the fourth or fifth row. The time on the page is continuous, not tracing 12 leads over the same time period. In other words, if the output was tracked by needles on paper, each row would switch, which leads as the paper is pulled under the needle. For example, in the top row, lead I is tracked first, then switched to the lead aVR, then switches to V1, and then switches to V4, so none of these four versions traces is a period of time when they are traced sequentially over time. The Continuity Leads Chart showing adjacent leads in the same color in the standard 12-lead layout Each of the 12 ECGs leads to recordings of electrical heart activity at a different angle, and therefore align with different anatomical areas of the heart. The two clues that look at the neighboring anatomical areas are said to be adjacent. Category leads activity Lower leads II, III and aVF Look at electrical activity in terms of lower surface (diaphragmatic surface of the heart) Side leads I, AVL, V5 and V6 Look at electrical activity in terms of the side wall of the left ventricle Septal leads V1 and V2 Look at electrical activity in terms of septum of the surface of the heart (intervention septum) Anterior leads V3 and V4 Look at electrical activity in terms of the septum of the heart surface (interventricular septum) Anterior leads V3 and V4 Look at the electrical activity in terms of heart septum (interventional septum) Anterior leads V3 and V4 Look at electrical activity in terms of the septum of the heart surface (interventional septum) from the point of view In addition, any two preliminary wires next to each other are considered to be adjacent. For example, although the V4 is the front lead and the V5 is a lateral lead, they are adjacent because they are next to each other. Electrophysiology Main article: Cardiac Electrophysiology Study of the heart conduction system called cardiac electrophysiology (EP). An EP EP carried out by right-handed cardiac catheterization: a wire with an electrode on the tip is inserted into the right heart chambers from the peripheral vein and placed in various positions in close proximity to the conduction system, so that the electrical activity of this system can be recorded. The interpretation of the ECG is fundamentally about understanding the electrical system of the conductive heart. Normal conductivity begins and spreads in a predictable model, and deviation from this model may be a normal variation or pathological. ECG does not equate to mechanical pumping of the heart, for example, pulsed electrical activity produces an ECG that is to pump blood, but the impulses are not felt (and is a medical emergency and CPR must be performed). Ventricular fibrillation produces an ECG, but is too dysfunctional to produce cardiac release life support. Some rhythms are known to have a good cardiac output, and some are known to have a bad cardiac output. Ultimately, an echocardiogram or other anatomical imaging conditions are useful in assessing the mechanical function of the heart. Like all medical tests, what constitutes normal is based on demographic research. The heart rate range of 60 to 100 beats per minute (bpm) is considered normal, as the data show that it is a normal resting pulse. The RS theory is upright in the lead when its axis is aligned with the vector of this lead Schematic representation of the normal ECG Interpretation of the ECG ultimately that recognizes the images. In order to understand the patterns found, it is useful to understand the theory of what the ECG is. The theory is rooted in the electromagnetic and boils down to four following points: the depolarization of the heart to the positive electrode produces a positive deviation of the depolarization of the heart from the positive electrode produces a negative deviation of the positive electrode thus, the general direction of depolarization and repolarization leads to a positive or negative deviation of the trace of each lead. For example, right-to-left depolarization will result in a positive deviation in lead I because two vectors point in the same direction. In contrast, the same depolarization will result in minimal deviation in V1 and V2 because the vectors are perpendicular, and this phenomenon is called isoelectric. Normal rhythm produces four entities - P-wave, complex RS, T-wave and U-wave, each of which has a rather unique pattern. Wave P is the depolarization of the atrium. The COMPLEX is a ventricular depolarization. The T-wave is a ventilation repolarization. Wave U is a repolarization of papillary muscles. Changes in the structure of the heart and its surroundings (including blood composition) of these four entities. Wave U is not usually considered, and its absence is usually ignored. Atrial repolarization is usually hidden in a much more visible complex of credra and usually cannot be seen without additional specialized electrodes. Background ECGs are usually printed on the grid. The horizontal axis represents time, and the vertical axis represents tension. The standard values on this grid are shown in a nearby image: a small box of 1 mm × 1 mm and is 0.1 mV × 0.04 seconds. The large box is 5 mm and × mm and is 0.5 mV × 0.20 seconds. A large box is represented by a heavier weight line than small boxes. Not all aspects of the ECG rely on accurate records or known zoom amplitude or time. For example, determining whether tracing is a sinus rhythm requires only object recognition and mapping, not measurements of amplitude or time (i.e. the grid scale does not matter). For example, the stress requirements of the left ventricular hypertrophy require knowledge of the scale of the grid. Speed and rhythm In a normal heart, the pulse rate at which the sinoatrial node depolarizes because it is the source of cardiac depolarization. Heart rate, like other vital signs such as blood pressure and breathing rate, change with age. In adults, the normal heart rate is between 60 and 100 bpm (normalcardia), while it is higher in children. The heart rate below the norm is called bradycardia. when the atrium and ventricles are out of sync and the heart rate should be indicated as atrium or ventricular (e.g., the ventricular rate in ventricular fibrillation is 300-600 bpm, while the atrial rate may be normal (60-100) or faster (100-150). , the physiological rhythm of the heart is a normal sinus rhythm (NSR). Normal sinus rhythm creates a prototype of P-wave, complex RS and T-wave. As a rule, deviation from the normal sinus rhythm is considered cardiac arrhythmia. Thus, the first question in the interpretation of the ECG is whether or not the sinus rhythm. The criterion for sinus rhythm is that P-waves and RS complexes appear 1-to-1, which means that the P wave causes the RS complex. Once the sinus rhythm is set, or not, the second issue is speed. For sinus rhythm, it is either the speed of P waves or the arse systems as they are 1-to-1. If the speed is too fast, it is sinus tachycardia, and if it is too slow, it is sinus bradycardia. If it is not a sinus rhythm, then the definition of rhythm is necessary before proceeding with further interpretation. Some arrhythmias with characteristic findings: Missing P-waves with irregular irregular PC complexes are a hallmark of atrial fibrillation. The saw tooth pattern Atrial-force complexes are a hallmark of atrial flutter. The sinus wave pattern is a hallmark of the ventricular flutter. </60> </60> P waves with wide complexes RS and rapid pulse of ventricular tachycardia. Determining speed and rhythm is necessary in order to understand further interpretation. The Heart axis has several axes, but the most common to date is the axis of the ARS complex (references to the axis implies the axis of the AXIS). Each axis can be calculated to result in a number representing the degree of deviation from zero, or it can be classified into several types. The axis of the ARS is the general direction of ventricular depolarization of the wave line (or medium electric vector) in the frontal plane. It is often enough to classify an axis as one of three types: normal, left deflected, or the right is rejected. Population data show that the normal axis of RS is between 30 and 105 degrees, with 0 along lead I and positive inferior and negatively superior (best understood graphically as a hexagonal reference system). In addition to 105 there is a deviation of the right axis, and outside 30 - the deviation of the left axis (the third quadrant from 90 to 180 euros is very rare and is an uncertain axis). A short way to determine whether the AXIS is normal if the PC complex is mostly positive in lead I and lead II (or lead I and aVF if 90 is the upper limit of the norm). The normal axis of the LDC is usually down and left, after the anatomical orientation of the heart in the chest. The abnormal axis involves a change in the physical shape and orientation of the heart or a defect in its conductivity system, which leads to depolarization of the ventricles in an abnormal manner. The classification angle notes that the normal 30 to 105 normal deviation of the left axis from 30 to 90 may indicate a hypertrophy of the left ventricle, left anterior fascicular block, or old lower deviation of the right STEMI axis (105) to 180 euros may indicate a hypertrophy of the right ventricle, left posterior fascicular block or old STEM lateral STEM axis from 180 to 90 degrees; considered an electric no man's land The degree of normal axis can be 90 or 105 depending on the source. Amplitudes and Intervals Animation of normal ECG-wave All waves on ECG tracking and intervals between them have a predictable length of time, a range of acceptable amplitude (stress) and typical morphology. Any deviation from normal tracking is potentially pathological and therefore clinical value. For the convenience of measuring amplitudes and ECG intervals, it is printed on graph paper on a standard scale: each 1 mm (one small box on a standard ECG paper) is 40 milliseconds of time on the x-axis and 0.1 millivolts on the axis. Characteristics Description Description Duration P Wave P is a depolarization of the atria. Atrial depolarization extends from the SA node to the AV nod, and from the right atrium to the left atrium. P wave is usually upright in most leads, except for AVR; The P Wave axis (inverted in other wires) may indicate an ectopic atrial pacemaker. If P P has an unusually long term, it can represent an extension of the atrium. Usually the large right atrium gives a high, peak P wave while the large left atrium gives two humpback pifida P waves. The 80 ms PR PR interval is measured from the beginning of the P wave to the start of the ARF complex. This interval reflects the time it takes for an electrical impulse to travel from the sinus node through the AV node. The PR interval is shorter than 120ms suggests that the electrical impulse bypasses the AV node, as in Wolf-Parkinson-White syndrome. The PR interval consistently more than 200 ms diagnoses the first degree of atrioventricular block. The PR segment (part of the tracing after Wave P and in front of the SRS complex) is usually completely flat, but can be suppressed by pericarditis. Complex 120-200 ms RS Complex of the RRS is a rapid depolarization of the right and left ventricles. The ventricles have a higher muscle mass compared to the atrium, so the RS complex usually has a much larger amplitude than P waves. If the RS complex is wide (more than 120 ms), it indicates a violation of the heart conduction system, for example, in LBBB, RBBB or ventricular rhythms, such as ventricular tachycardia. Metabolic problems such as severe hyperkalemia, or tricyclic overdose of antidepressants can also expand the RS complex. Unusually high complex RS can be a hypertrophy of the left ventricle, while a very low-ampoturial complex RS can be pericardial effusion or infiltration myocardial disease. The 80 to 100 ms J-dot J-point is the point at which the RS complex ends and the ST segment begins. The J-point can be upgraded as a normal option. The appearance of a separate Wave J or Osborne in J-point is pathognomonic hypothermia or hypercalcemia. The ST ST segment combines the RS and T wave segment; it is a period when the ventricles are depolarized. It is usually isoelectric, but can be suppressed or elevated with myocardial infarction or ischemia. ST depression can also be caused by LVH or digoxin. St height can also be caused by pericarditis, Bruda syndrome, or may be a normal variant (J-point height). The T-wave T-wave is a repolarization of the ventricles. This is usually vertical in all leads except the AVR and lead V1. Inverted T-waves can be a sign of myocardial ischemia, left ventricular hypertrophy, high intracranial pressure or metabolic disorders. Peak T-waves can be a sign of hyperkalemia or a very early myocardial infarction. The interval of 160 ms Fixed PERIOD CT (CT) RT interval is measured from the beginning of the ARC complex to the end of the Wave T. Acceptable ranges vary depending on the heart rate, so it should be corrected in the CPC by dividing into a square root of the RR interval. The long interval of CTC is a risk factor for the development of ventricular tachiarhythmia and Death. Long ST can occur as a genetic syndrome, or as a side effect of certain medications. Unusually Unusual The citz can be seen with severe hypercalcemia. The U wave is thought to be caused by the repolarization of the intermediate partition. Usually it has a low amplitude, and even more often completely absent. A very prominent U wave can be a sign of hypokalemia, hypercalcemia or hyperthyroidism. Limb wire and electrical conduction through the heart Formation of the waves of the limbs during pulse Animation, shown on the right, illustrates how the path of electrical conduction leads to ECG waves in the limb. Recall that the positive current (created as a result of depolarization of heart cells), going towards a positive electrode and from the negative electrode creates a positive deviation from the ECG. Similarly, a positive current, having moved from a positive electrode to a negative electrode, creates a negative deviation from the ECG. The red arrow represents the general direction of depolarization. The size of the red arrow is proportional to the number of depolarized tissue in this case. The red arrow is simultaneously shown on the axis of each of the three limbs. Both the direction and the size of the red arrow projection on the axis of each limb lead are shown by blue arrows. Then the direction and magnitude of the blue arrows theoretically determine deviations from the ECG. For example, as the blue arrow on the lead axis I move from the negative electrode to the right, to the positive electrode, the ECG line rises, creating an upward wave. When the blue arrow on the lead axis moves to the left, a downward wave is created. The larger the magnitude of the blue arrow, the greater the deviation from the ECG for this particular limb lead. Footage 1-3 shows the depolarization generated and spread through the Sino-American node. The SA node is too small for it to be depolarized on most ECGs. The footage, 4-10, shows the depolarization of the atria to the atrioventricular node. During Frame 7, depolarization passes through the largest amount of fabric in the atria, creating the highest point in the P wave. Like the SA node, the AV is too small to depolarize its fabric to be detected on most ECGs. This creates a flat PR segment. Frame 13 depicts an interesting phenomenon in an overly simplistic form. It depicts depolarization as he begins to travel along the intermediate partition, through his Beam and the Connected Branches. After the Set, his system of ongoing separation is divided into the left branch of the beam and the right branch of the beam. Both branches hold a rally from around 1 m/s. Interestingly, however, the potential action begins to travel down the left branch of the beam for about 5 milliseconds before it starts to travel down the right branch of the beam, as pictured on frame 13. causes the depolaration of the tissue of the intermediate partition to spread from left to right, as depicted by the red arrow in frame 14. In some cases, this results in a negative deviation after the PR interval, creating a q wave, such as a wave seen in Lead I in the animation on the right. Depending on the average electric axis of the heart, this phenomenon can cause a wave in lead II as well. After the depolarization of the intermediate septum, depolarization moves to the top of the heart. This is depicted by 15-17 frames and leads to a positive deviation on all three limb shower wires, which creates an R wave. The footage, 18-21, then depicts the depolarisation as she travels through both ventricles from the top of the heart, following the action potential in Purkinje fibers. This phenomenon creates a negative deviation in all three limb shower wires, forming a wave S on the ECG. Atrial repolarization occurs at the same time as the generation of the ARF complex, but it is not detected by THE ECG, as the mass of the ventricular tissues is much larger than that of the atrium. Ventricular contraction occurs between ventricular depolization and repolarization. During this time there is no movement of the charge, so the ECG does not create a deviation. This leads to a flat st-segment after Wave S. Frames 24-28 in animation depict the repolarization of the ventricles. Epicardia is the first layer of ventricles for repolarization, and then myocardial. Endocardium is the last layer for repolarization. It has been shown that the plateau depolarization phase lasts longer in the endocardium than in the epicardial cells. This leads to repolarization to start at the top of the heart and move up. Since repolarization is the spread of negative current as membrane potentials shrink back down to the potential of resting membrane, the red arrow in the animation points in the opposite direction to repolarization. Thus, this creates a positive deviation in the ECG and creates a wave of T. Ischemia and infarction Main article: Electrocardiography in myocardial infarction ischemia or non-stationary myocardial infarctions (not STEMIs) can manifest as ST depression or inversion of T-waves. It can also affect the high-frequency band of myocardial infarctions of RS height. ST (STEMIs) have different characteristic ECG findings depending on the amount of time elapsed since the first MI event. The earliest signs are hyper-sharp T-waves, peak T-waves due to local hyperkalemia in ischemic myocardium. This then progresses within a few minutes at the altitudes of the ST segment, at least 1 mm. Within a few hours a pathological wave may appear and the T wave is inverted. Within a few days, the st height will be decided. Pathological waves, as a rule, will remain forever. The coronary artery that has been closed can be identified in STEMI depending on the location of the ST height. Teh The anterior downward (LAD) artery provides the front wall of the heart, and therefore causes ST heights in the anterior leads (V1 and V2). LCx delivers the lateral aspect of the heart and therefore causes ST heights in lateral leads (I, aVL and V6). The right coronary artery (RCA) usually supplies the lower aspect of the heart, and therefore causes ST heights in the lower leads (II, III and aVF). The ECG tracking artifacts depend on the patient's movement. Some rhythmic movements (such as tremors or tremors) can create the illusion of cardiac arrhythmia. Artifacts are distorted signals caused by secondary internal or external sources, such as muscle movement or interference from an electrical device. The misrepresentation poses significant challenges for health care providers who use different methods and strategies to safely recognize these false signals. The exact separation of the ECG artifact from the true ecG signal can have a significant impact on patient outcomes and legal obligations. The Unreliable Medical Source? improper placement of lead (e.g., reversing two limbs) was estimated at 0.4% to 4% of all ECG records, and led to misdiagnosis and treatment, including unnecessary use of thrombolytic therapy. Diagnosis numerous diagnoses and conclusions can be made based on electrocardiography, and many of them are discussed above. In general, diagnoses are made on the basis of models. For example, the irregularly irregular RS complex without P waves is a hallmark of atrial fibrillation; however, there may be other findings, such as a block of bundle branches that change the shape of the CRS complexes. ECGs can be interpreted in isolation, but they should be used, like all diagnostic tests, in the patient's context. For example, observations of peak T-waves are not sufficient to diagnose hyperkalemia; such a diagnosis should be verified by measuring the level of potassium in the blood. Conversely, the discovery of hyperkalemia should be followed by ANC for such manifestations as peak T-waves, advanced MS complexes and loss of P waves. Rhythm disorders or arrhythmia: Atrial fibrillation and atrial flutter without rapid ventricular reaction Premature atrial contraction (PAC) and premature ventricular contraction (PVC) Sinus arrhythmia bradycardia and sinus tachycardia sinus pause and synoactrial arrest of the patient's sinus syndrome: flutter with rapid ventricular reaction AV node reantrant tachycardia Atrioventricular reant oriental tachycardia Junctional ectopic tachycardia of the atrial ecchycardia ectopic atrial tachycardia (unicentral) Multipical atrial of tachycardia Paroxysmal atrialless ventricular tachycardia) Wide complex tachycardia ventricular flutter Ventricular fibrillation of ventricular tachycardia (monomorphic ventricular tachycardia) Prejudice Syndrome Lawn-Ganong-Levine syndrome Wolf-Parkinson-White syndrome J-wave (Osborne wave) and third-degree AV node first-degree AV unit second degree AV unit (Mobitz (Wenckebach) I and II) Third Degree AV unit or full AV unit Right Block Incomplete right beam branch unit Full right block bundle (RBBB) Left beam Full left block branch Bundles (LBBB) Incomplete Left Beam Branch Block Left Front Fascicular Block (LAFB) Left Rear Fascicular Block (LPFB) Bifascicular Unit (LAFB plus LPFB) Trifascicular Unit (LAFP plus FPFB plus RBBB) Syndromes Bgagadah Syndrome Short Syndrome Genetic and Narcotic Right and Left Atrium Anomaly Electrolytes Disturbance and Intoxication: Digitalis Calcium Intoxication: Hypocalcemia and Potassium Hypercalcemia: Hypokalemia and Hyperkalemia and Heart Attack : Syndrome Wellens (LAD occlusion) de Winter T wave (LAD occlusion) 55 ST height and ST depression High frequency RS changes myocardial infarction (heart attack) Ne-i wave infarction NSTEMI STEMI Sgarbossa criteria for Ish anemia with LBBB Structural: Acute pericarditis of the right and left ventricular hypertrophy of the right ventricle strain or S1'3T3 (can be seen in pulmonary embolism) History of early commercial ECG device (1911) ECG from 1957 to 1872 Alexander Muirhead reportedly attached wires to a patient's wrist with a fever to get an electronic recording of their heartbeat. In 1882, John Burdon-Sanderson, who works with frogs, was the first to estimate that the interval between the potential variations was not electrically quiet, and coined the term isoelectric interval for this period. In 1887, August Waller invented an ECG machine consisting of the Lippmann capillary electrometer mounted on a projector. The trail from the heartbeat was projected on the photographic plate, which itself was fixed on the train with toys. This allowed the heartbeat to be recorded in real time. In 1895, Willem Einthoven assigned the letters P, R, S and T to theoretical wave forms, which he created using equations that corrected the actual waveform obtained by the capillary electrometer to compensate for the inaccuracy of the instrument. The use of letters cast from the letters A, B, C and D (letters used for the wave shape of the capillary electrometer) contributed to comparison when uncorrected and corrected lines were drawn on the same graph. Einthoven probably chose the initial letter P to follow Descartes' example in geometry. When a more precise wave shape was obtained using a string galvanometer that corresponded to the corrected capillary electrometer wave form, it continued to use P, q, R, S, S, T, and these letters are still in use today. Einthoven also described electrocardiographic features of a number of cardiovascular diseases. In 1897, the string galvanometer was invented by French engineer Clement Ader. In 1901, Einthoven, who works in Leiden, the Netherlands, used a string galvanometer: the first practical ECG. This device was much more sensitive than Waller's used capillary electrometer. In 1924, Einthoven was awarded the Nobel Prize in Medicine for his pioneering work in the development of THE ECG. By 1927, General Electric had developed a portable device that could produce electrocardiograms without the use of a string galvanometer. Instead, the device combined amplifier tubes similar to those used in radios with an internal lamp and moving mirrors that directed the tracking of electrical impulses to the film. In 1937, Taro Takemi invented a new portable electrocardiograph. In 1942, Emanuel Goldberger increased Wilson's unipolar wires by 50% and created an enlarged limb leading to aVR, aVL and aVF. When we add to three Einthoven showers and six pectoral wires, we come to the 12-lead electrocardiogram that is used today. The etymology of the Word comes from greek electro, which means related to electrical activity; Cardia, that is the heart; and a graph, which means writing. See also The Electric Heart Conduction System Electrogastricogram Electrocamerograph Electro-Cardiac Electroretinography Heart Rhythm Monitor Emergency Medicine Anterior Electrocardiology Notes - Version with '-K-', more commonly used in American English than in British English, is in the early 20th century loanword from the German acronym EKG for Elektrokardiogramm (electrocardiogram), which today style AMA and - under its stylistic influence - most American medical publications use ECG instead of ECG. The German term Elektrokardiogramm as well as the English equivalent, electrocardiogram, consists of new Latin/international scientific elements of the terminology elektro- (cognate electro-) and kardi- (cognate 'cardi-'), the latter from the Greek kardia (heart). The '-K' version is more often maintained in circumstances where there may be verbal confusion between ECG and EEG (electroencephalography) due to similar pronunciation. Links : Definition of ECG Lexico. Dictionaries Lexico. 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