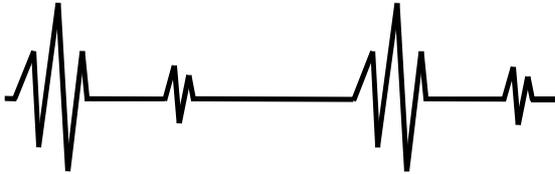


Phonocardiography

Introduction



Chris Astill-Smith D.O., N.D., DIBAK

A Phonocardiogram is a recording of the sounds and murmurs made by the heart with the help of a digital stethoscope, of the sounds made by the heart during a cardiac cycle. The sounds are a result from vibrations created by closure of the heart valves.

There are at least two: the first when the atrio-ventricular valves close at the beginning of systole and the second when the aortic and pulmonary valves close at the end of systole. It allows the detection of sub-audible sounds and murmurs, and makes a permanent record of these events.

80% of all physicians die of heart disease.
80% of cardiac conditions are valvular
10% muscular
6% nervous
4% coronary
More people are affected and die with heart disease than any other illness

Heart and circulatory disease — which also includes disease caused by high blood pressure — is responsible for 231 deaths per 100,000 men across the UK, but 267 per 100,000 in Scotland. Cancer among women results in 159 deaths per 100,000 population across the UK, but 181 per 100,000 in Scotland, according to the Office for National Statistics (ONS) data, which includes 2010.

In Britain
1,000,000 men have suffered heart attacks
500,000 women have suffered heart attacks

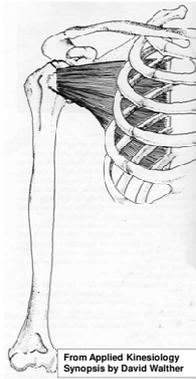
Functional Testing

Only one muscle – the SUBSCAPULARIS is associated in AK with the heart

Subscapularis

Origin – Subscapular fossa

Insertion – Lesser tuberosity of the humerus and fibrous capsule.



Function – Medial rotation of the humerus

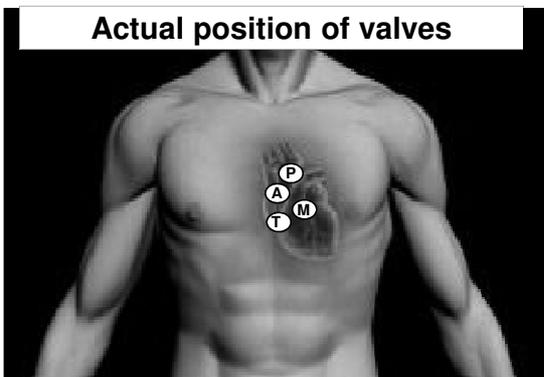
Nerve supply – Upper and lower subscapular nerve C5, 6

Meridian association – Heart

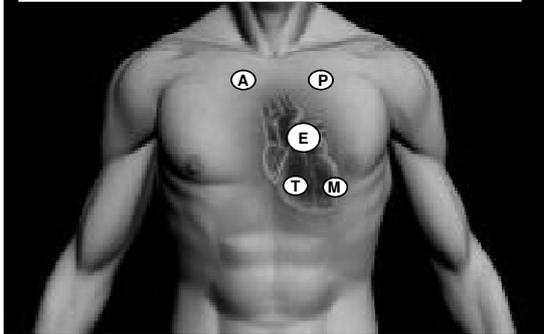
The aortic area, pulmonic area, tricuspid area and mitral area are areas on the surface of the chest where the heart is auscultated. Heart sounds result from reverberation within the blood associated with the sudden block of flow reversal by the valves closing.

Because of this, auscultation to determine function of a valve is usually not performed at the position of the valve, but at the position to where the sound waves reverberate.

Actual position of valves



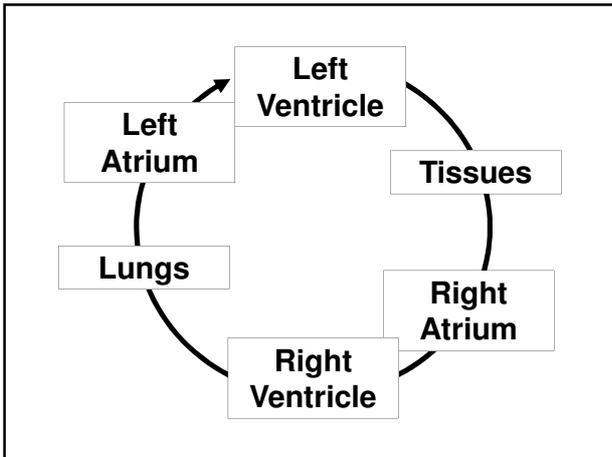
Optimal auscultation areas

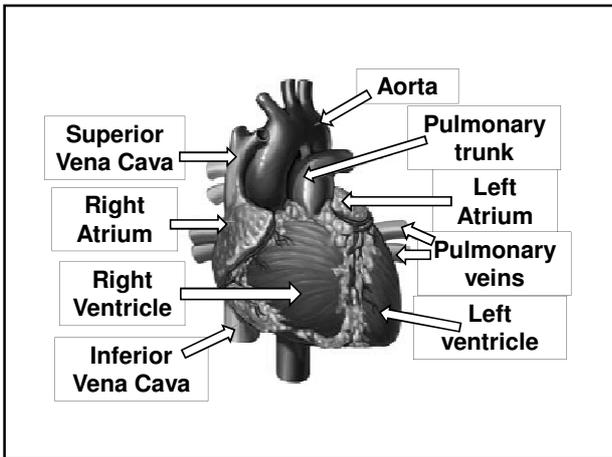


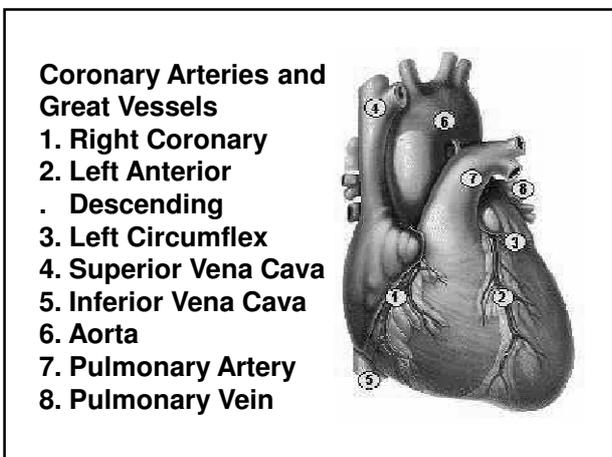
Heart valve auscultation points

Pulmonary valve (to pulmonary trunk)	left second intercostal space	left upper sternal border
Aortic valve (to aorta)	right second intercostal space	right upper sternal border
Erb's point	Left third intercostal space	medial left sternal border
Mitral valve (to left ventricle)	left fifth intercostal space	medial to left midclavicular line
Tricuspid valve (to right ventricle)	left fifth intercostal space	lower left sternal border

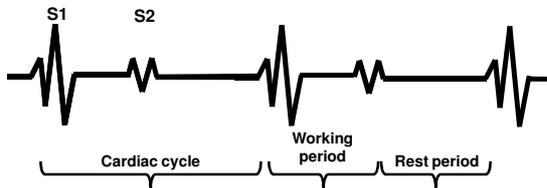
In cardiology, Erb's point refers to the third intercostal space on the left sternal border where S2 is best auscultated. It is essentially the same location as what is referred to with left lower sternal border (LLSB).







Normal Heart Sounds



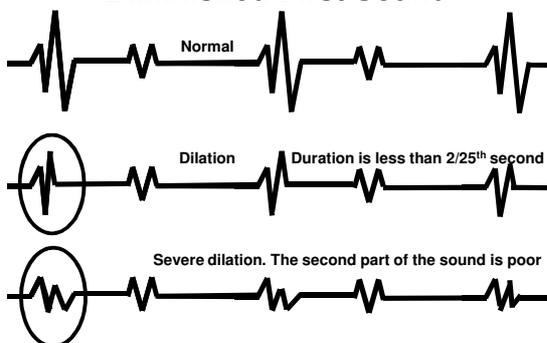
The first sound is 2 to 3 times louder than the second. The period between the second sound and the next first sound is twice as long as the period of time between the first sound and the second. This is normal. Anything different is abnormal.

Both auricular / ventricular valves must close at the same time. That closure is the first heart sound (LUB). Pulmonary and aortic valves are closed by the blood pressure pushing back creating the second sound (DUB).

Rest period is longer as this is the period that the ventricles are opening again and should be twice as long as the closing period.

Muscular Conditions

Diminished First Sound



Muscular conditions
Quality of the first sound indicates the quality of the muscle tone.

The shorter the first sound is and the higher it is in respect to the second sound the better the tone.

With failing heart the sound becomes longer and lower in regards to the second sound.

In hypertrophied muscle the first sound in relationship to the second sound decreases.

Often the second sound is the same size as the first. As the tone decreases the second sound appears 2 or 3 x the size of the first sound.

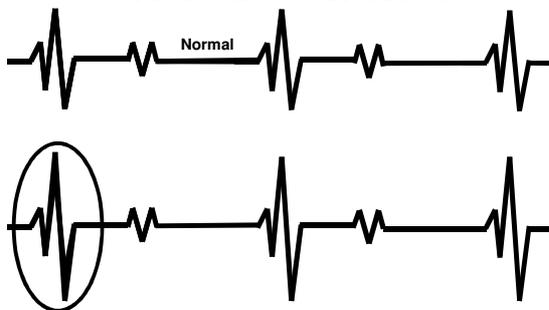
Totally decompensated muscle the first sound is almost gone.

Maybe due to Low Testosterone

Alcohol decreases the first heart sound quickly and up to 24 hours after so no alcohol for 24 hours before serious competitive sports.

Products
Heart extract
WGO (Vitamin E)
Manganese, Magnesium, Potassium
Hawthorne (Crategus)
Black walnut tincture (Juglans nigra)
Smart CoQ10 Complex
Taurine increases the force and effectiveness of heart-muscle contractions

Accentuated First Sound



Accentuated First Sound
Maybe due to Hyperthyroid especially with exophthalmic goiter.

An increase in the first sound at the mitral valve area of moderately increased duration, followed by an accentuated aortic sound indicates left ventricular hypertrophy.

High in the apex area during infections.

Consider

- Allergy to Wheat / Gluten**
- Toxic metals**
- Iodine excess**
- Smart C Complex**

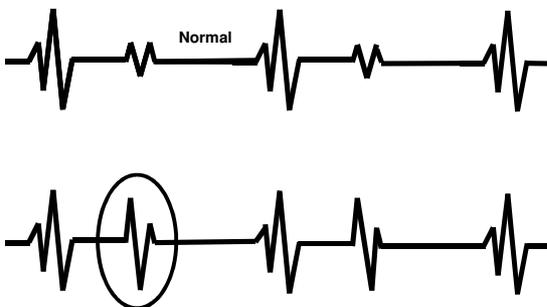
Diminished Second Sound



Diminished Second Sound
Maybe due to Hypoadrenia.
Low blood pressure.
Myocardial degeneration.
Dilatation of left ventricle when
over the aortic area.
Failure of the right ventricle when
over the pulmonary area.

Consider
Adrenal tissue
Smart G Complex
Smart C Complex
EFAs
Calcium lactate

Accentuated Second Sound



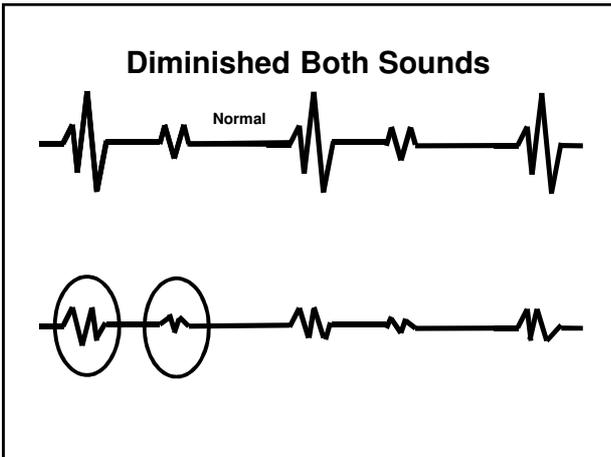
Accentuated Second Sound
Maybe due to lung pathology such as malignancy, tuberculosis etc.
If at the pulmonary area only may indicate pulmonary hypertension due to low adrenalin, bronchial constriction and vasodilation found with hypoadrenia.
If only at the tricuspid area maybe indicative of liver dysfunction.

Accentuated Second Sound
Maybe due to hyper(o)adrenia, excess caffeine

Angiospasm in hypertension, arteriosclerosis, chronic nephritis, ureamia and in apoplexy.
Moderate accentuation in pregnancy.

**Consider Smart C Complex
EFAs
Magnesium**

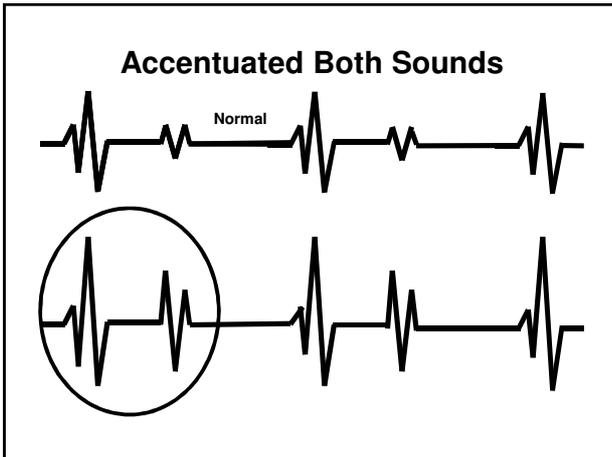
Avoid stimulants



Diminished Both Sounds
Maybe due to Hypotension,
Hypothyroid, Low Testosterone,
Obesity, Robust subject with deep
thorax, Hypertrophic emphysema,
Moderate pericardial effusion,
Myocardial degeneration, Cardiac
dilation, General asthenia.

Consider

- Smart CoQ10 Complex
- Magnesium
- Smart B Complex
- Black walnut
- Hawthorne



Accentuated Both Sounds
Consider excess stimulants like
Coffee
Tea
Colas
Chocolate
Alcohol
Recreational drugs
MSG
Aspartame

Blood pressure
Young person central readings
low and peripheral readings
higher due to more flexibility.

Older person central readings
higher and peripheral readings
higher due to poorer flexibility
thus greater risk of aneurysm.

Hypertension products
Smart G Complex
Magnesium
Potassium
Smart C Complex
Vitamin D3 (Hemp oil based)
Culinary oils
GOG (Ginger, Onion, Garlic)
Cayenne
Hawthorne

Myocardial Infarct

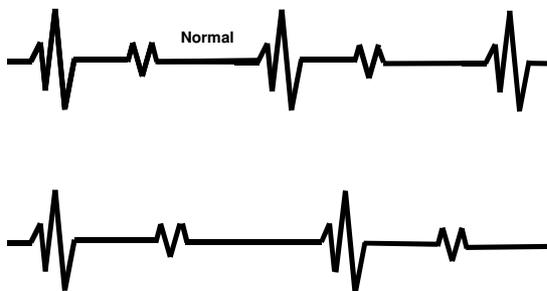
Impending Myocardial Infarct



Coronary circulation
ECGs do not show an impending coronary attack until after the event.
A developing coronary condition will show as a shorter rest period between the second sound and the next first sound. If its half the length it's a severe coronary condition.

Products
Heart extract
Smart G Complex
WGO (Vitamin E)
Multiple vit /min
Smart C Complex
Arginine
Cinnamon
Culinary oils

Bradycardia



HR below 60 to approx 40

Bradycardia
Slow cycle but normal ratios.

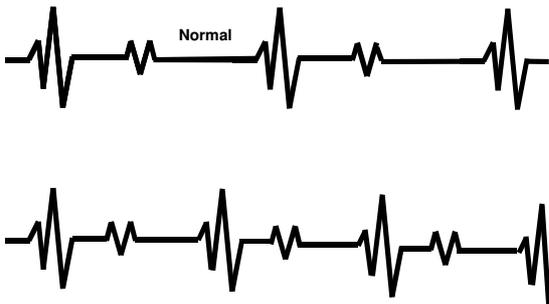
Bradycardia
Maybe an athletic heart.
Maybe Hypothyroid –
Possible toxic metal especially
aluminium, nickel, mercury,
hologens
Allergy
Chemical toxicity from toiletries
and cosmetics
Radiation

Products
Hypothyroid – Tyrosine
Iodine
Selenium
Zinc
Toxic metal – Yarrow
Black walnut
Lemon balm
Chemicals - Yarrow
Radiation - Rutin

Products

Phosphorus or phosphates acid ash minerals. Pasteurised milk, Peanuts, Whole cereals all contain natural phosphates.

Tachycardia



HR over 100 to approx 180

Tachycardia

**A fast cycle but normal ratios.
Maybe due to Hyperthyroid
Consider allergy to Wheat / Gluten
Toxic metals
Iodine excess
Smart C Complex
Potassium or Alkaline Ash minerals
Magnesium**

Consider excess stimulants like

Coffee

Tea

Colas

Chocolate

MSG

Aspartame

Alcohol

Recreational drugs

Allergy

Valvular Lesions

Murmurs

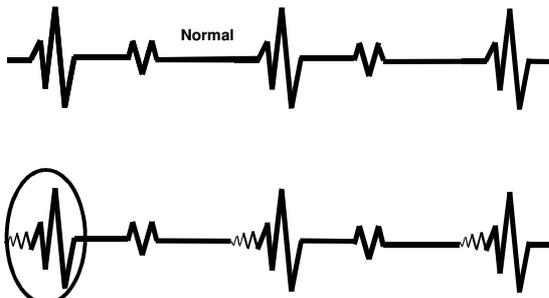
Stenosis is a valve not opening wide enough. Sets up eddy currents on the other side of the stenosed valve which is picked up as a murmur.

If it's the mitral or tricuspid valves the murmur will be just before the first sound. In the case of the pulmonary or aortic valves its just after the first sound.

Etiology - Congenital, Rheumatic fever, Calcification, Cholesterol



Mitral / Tricuspid Stenosis



A presystolic or diastolic murmur or both over mitral or tricuspid areas

Some authorities say that mitral stenosis is the most prevalent valvular disorder of the heart especially in women. It is characterized by a presystolic murmur or presystolic thrill which immediately precedes the first sound. There is also present a diastolic murmur immediately following the second sound.

Mitral / Tricuspid Stenosis
Might be due to Rheumatic fever.

Consider

- Heart tissue**
- Smart G Complex**
- WGO (Vitamin E)**
- Manganese**
- Magnesium**
- EFAs**

Regurgitation is a murmur with blood leaking out back into the atrium from the ventricle during the closing period of the ventricle. Most are due to an enlarged heart or a heart that's out of shape.

Mitral/ Tricuspid Regurgitation



A systolic over the mitral or tricuspid area

Mitral / Tricuspid Regurgitation
Enlarged heart –

Consider

**Smart B Complex (contains
Vitamin B4 - Adenine)
Smart C Complex**

Natural Sources of Vitamin B4 (Adenine):
Nutritional yeast, whole grains, peanuts
and peanut oil, raw unadulterated honey,
bee pollen, royal jelly, propolis, most fresh
vegetables, most fresh fruits.

It is believed that all complex
carbohydrates contain varying amounts of
Vitamin B-4 (Adenine).
Vitamin B-4 (Adenine) is also probably
found in the following herbs:
Cayenne, cloves, ginger, hawthorn, kelp,
sage, spearmint, thyme.

Aortic / Pulmonary Stenosis



A systolic murmur over aortic or pulmonary areas

Aortic stenosis is attended by a systolic murmur of striking intensity and of harsh and unmusical quality with its point of maximum intensity in the aortic area. It is caused mainly by a roughening or dilatation of the proximal portion of the aorta.

**Aortic / Pulmonary Stenosis
Consider**

- Heart tissue**
- Smart G Complex**
- WGO (Vitamin E)**
- Manganese**
- Magnesium**
- EFAs**

Aortic / Pulmonary Regurgitation

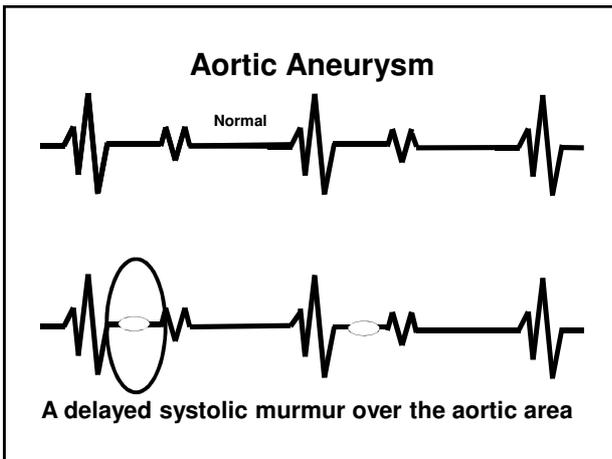


A diastolic murmur over the aortic or pulmonary areas

Aortic regurgitation produces a diastolic murmur with maximum intensity at the aortic area. Maybe caused by a shrinking or thickening of the cusps or an inability to close an abnormally large aortic orifice.

**Aortic / Pulmonary Regurgitation
Enlarged heart
Consider Smart B Complex
Smart C Complex**

Aortic Aneurysm

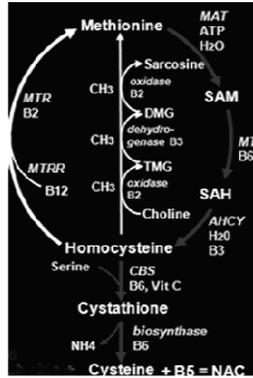


Aortic Aneurysm: A delayed systolic murmur over the aortic area.

Aortic or pulmonary artery aneurysm
Breakdown of the vascular wall creating a bubble like effect.

Challenge with Homocysteine or Methionine loaded Homocysteine for weakening.
Especially directed to RED body types.

Homocysteine is normally metabolised to Cystathione and then to Cysteine requiring Serine (rich in Beetroot), Vitamin B6 and Vitamin C.



Products

- Smart Homocysteine Complex - Beetroot
- Pyridoxal-5-phosphate
- Smart Vitamin C Complex
- Methylcobalamin
- Folic acid + Zinc
- Riboflavin-5-phosphate
- Niacinamide
- Choline

Consider

- Smart C Complex
- Hawthorne
- Black walnut tincture

**Genetic System
(Rhythm)
Disturbances**

**Genetic system disturbances
Rhythm and speed disturbances.
Normal heart is about 72 beats per
minute.**

Presystolic Gallop Rhythm



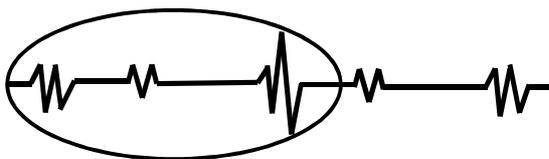
Presystolic sound

Presystolic Gallop Rhythm
Is characterized by a third sound just prior to the first sound simulating a presystolic murmur. Maybe due to undue force of auricular systole or to asynchronous of the right and left ventricles. Also maybe present in hypertension and in prolonged infections.

Presystolic Gallop Rhythm

Consider
Smart B Complex
Smart C Complex
Magnesium

Pulsus Alternans



A weak contraction follows each normal contraction

Pulsus alternans

Arrhythmia is not in length of cycle but in height of sound which varies. It is almost always indicative of left ventricular systolic impairment.

Always challenge for cranial faults.

Pulsus alternans

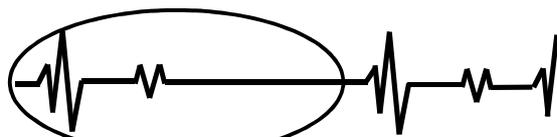
Consider

Smart B Complex

Smart C Complex

Magnesium

Sinus Arrhythmia



Cycles vary in duration

Sinus arrhythmia

First cycle normal, second is long and then short etc. – no evenness to the heart rhythm.

Due to alternations in vagal tone.

Sinus Arrhythmia

Consider

Smart B Complex

Smart C Complex

Magnesium

Extra Systole



A complete extra cycle within the duration of a normal cycle

Extra Systole

Consider

- Smart B Complex**
- Smart C Complex**
- Magnesium**

Right Bundle Branch Block



Reduplication of first sound

Bundle branch block

Both ventricles should be closing together but in bundle branch block they are not simultaneous due to impulse of the bundle of His gets to one ventricle before the other.

Right Bundle Branch Block

Consider

- Smart B Complex**
- Smart C Complex**
- Magnesium**

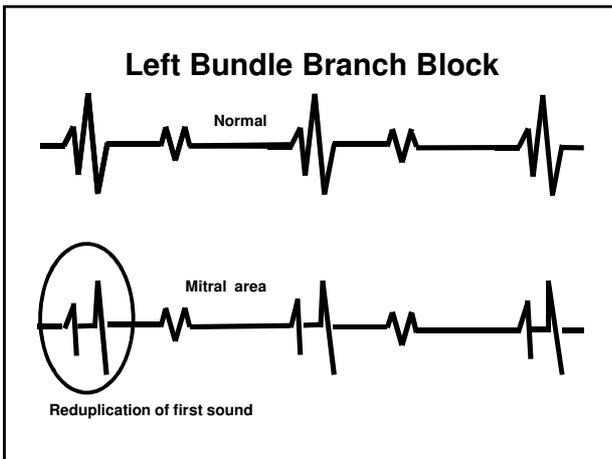
Right Bundle Branch Block



Right Bundle Branch Block

Consider

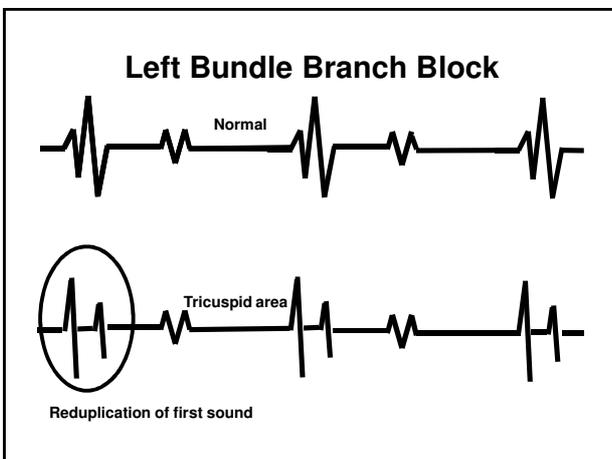
- Smart B Complex**
- Smart C Complex**
- Magnesium**



Left Bundle Branch Block

Consider

- Smart B Complex
- Smart C Complex
- Magnesium



Left Bundle Branch Block

Consider

- Smart B Complex**
- Smart C Complex**
- Magnesium**

Reduplication of the Second Sound



Reduplication of Second Sound

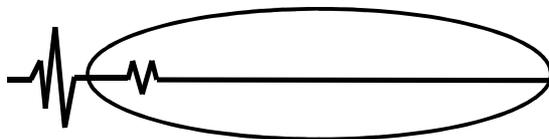
Due to asynchronous closure of the aortic and pulmonary valves occurring as a result of unequal tension in the greater and lesser circulations. Suspect mitral stenosis present.

Reduplication of Second Sound

Consider

- Smart B Complex**
- Smart C Complex**
- Magnesium**

Complete Heart Block



Ventricular rate 30-25 cycles

Heart block

There is an extra long rest period
Product

Complete Heart Block

Consider

- Smart B Complex**
- Smart C Complex**
- Magnesium**

Dropped Beat

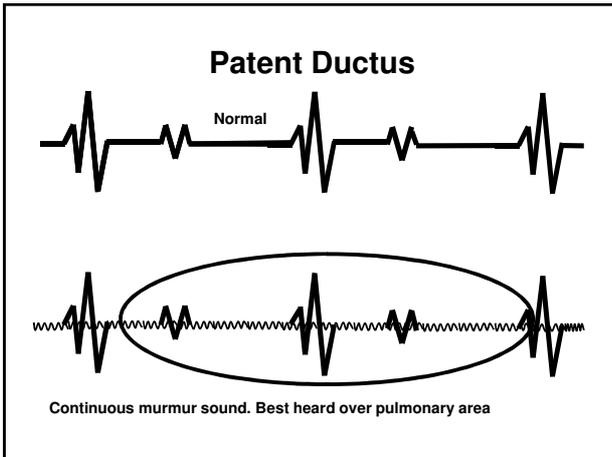


Regular or irregular missing cycle

Dropped Beat

Consider

- Smart B Complex**
- Smart C Complex**
- Magnesium**



Patent Ducus

Consider

- Smart B Complex
- Smart C Complex
- Magnesium

Products

Essential Fatty Acids

Act as a calcium ionizing agent for the use of muscular tissue without which the muscle contractions become reduced so that the heart, the power to complete the contraction cycle is limited and the cycle is not completed, the second sound recorded being weak or totally absent.

Smart B Complex

Includes the B4 factor that prevents nerve paralysis or loss of conduction power. Deficiency leads to split sounds culminating in fibrillation. It prevents heart dilatation or enlargement which distorts the heart valves causing regurgitation.

Smart B Complex (Thiamine, Adenine (Vit B4), Pantothenic acid, B12)
Soluble in alcohol. Heat stable. Associated with the nervous system. Acts as a vasoconstrictor. Increases blood pressure and enhances blood vessel tone. Destroyed by *thiaminase* in clams and salted herring.
Deficiency - Most symptoms due to high lactic acid levels. Burning in soles of feet. Tenderness of the calf muscles, Back pain at night. Poor breath holding less than 20 seconds, low body temperature, frequent yawning, fatigue, lack of appetite, bloating. Symptoms worse with exercise.
Increased psychotic tendency, intolerance to noise, apprehension. Bradycardia, irregular heart beat, atrial fibrillation, heart block. Split S1 and / or S2. Increased body weight.
Lack of vibration sense. Hat on or tight band sensation around the head.
Lack of appetite. Drowsiness after meals. Enhances salivary glands and pancreas to produce their alkaline enzymes thus aiding carbohydrate metabolism. Helps overly acidic patient.
Goes to sleep but wakes up and cannot get back to sleep. Nocturnal frequency.

Smart B Complex
Thiamine 5mg
Magnesium chloride 39mg
Magnesium sulfate 23mg
Pantothenic acid 6mg
Hydroxycobalamin 67mcg
Nutritional yeast 250mg

Smart G Complex
Relaxes muscle tissue especially
the coronary arteries by its
adrenalin action – adrenalin tones
up small arteries but relaxes the
coronary. Contains also the
lipotropic factors to metabolise
cholesterol and triglycerides.
Deficiency causes tight feeling in
chest on exertion.

Smart BComplex (Riboflavin, Niacin, Folic acid, Choline, Inositol, Betaine)
 Insoluble in alcohol, heat labile.
 Nerve relaxing, acts as a vasodilator, aids hypertension.
 Deficiency
 Excessively worried, moody, apprehensive, suspicious, depression.
 Tachycardia, Ventricular ectopic beats, pre angina pectoris, Pre-myocardial
 infarction. S1 and S2 equally spaced.
 Aids in stomach HCl production. Helps overly alkaline patient. Spastic gall
 bladder. Bright red tip of the tongue. Purple or strawberry tongue with Vit B2
 deficiency.
 Rectal and vaginal irritation.
 Frequent crying for no cause.
 Cracking of the lips especially in the corners. Loss of substance in the upper lip.
 Loss of capillary tone. Bloodshot eyes. Spider nervi.
 Regulates oxygen / hydrogen. Role in sugar and aids fat metabolism. Deficiency
 leading to photophobia, burning, itching and blepharospasm. Things go in and
 out of vision.
 Stimulates both acetylcholine synthesis and metabolism. Stimulates
 acetylcholinesterase so deficiency leads to spasms, atherosclerosis including
 coronary vessels, restless legs- jumpy or shaky legs.
 Low levels of tissue choline as lecithinase is R/N dependant. Leads to fat
 deposition.

Smart G Complex
Riboflavin 1.5mg
Nicotinic acid 5mg
Pyridoxal-5-phosphate 1.6mg
Folic acid 400mcg + Zinc chloride
Inositol 50mg
Choline bitartate 50mg
Biotin 1mg
Nutritional yeast 70mg
Soy lecithin 70mg

Smart C Complex
Includes the *tyrosinase* enzyme
essential to all muscle especially
the heart which undergoes atrophy
with replacement fibrosis in
deficiency. Needed when the heart
shows increased contraction time,
indicating an overworked muscle.
Note disappearance of “shortness
of breath” with supplementation.

Smart C Complex
Ascorbic acid 250mg
Organ Reishi mushroom 50mg
Organic Shiitaki mushroom 50mg
Organic Beetroot 50mg
Hesperidin 25mg
Rutin 25mg
α-Lipoic acid 25mg

Smart Homocysteine Complex

Pyridoxal-5-phosphate 5mg
Ascorbic acid 250mg
Organic Beetroot 50mg
Hesperidin 25mg
Rutin 25mg
α-Lipoic acid 25mg
Riboflavin-5-phosphate 2.2mg
Folic acid 400mcg+ Zinc
Methylcobalamin 100mcg
Choline bitartrate 50mg
Niacinamide 20mg

WGO (Smart E Complex)

Deficiency causes a 250% rise on oxygen demand in the muscles.
Deficiency specifically causes necrosis of the heart muscles leading to sudden death.
Tocotrienols have a nitroglycerine effect at vaso-dilating the coronary arteries in angina pectoris.

Smart Co-Enzyme Q10 Complex
Optimal absorption is Co-Q10 mixed in Wonder oil (equal portions of organic Peanut and Sesame seed oil).
5ml of oil delivers 30mg Co-Q10
Best taken last thing at night.
Plus equal portions of Adenosylcobalamin and Methylcobalamin for optimal oxidation
best taken with breakfast.

Smart Potassium Complex
Deficiency characterized by tachycardia, paroxysmal tachycardia in acute form. Normal autonomic control of the heart is lost. Potassium is absorbed from the blood by the stowing away of sugar after a heavy carbohydrate meal bringing on heart labouring. Sugar is stored as phosphagen instead of glycogen.

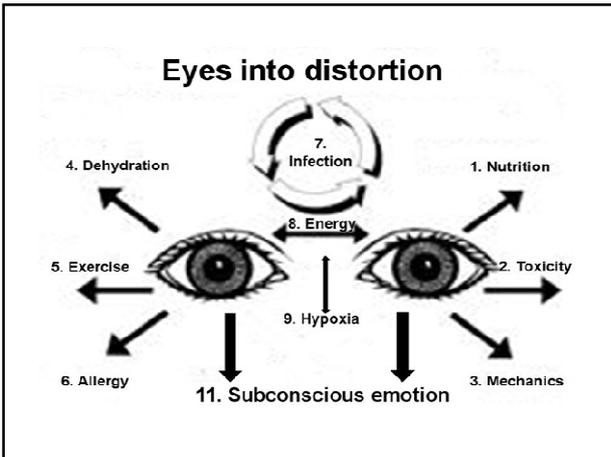
Smart Potassium Complex
Potassium (chloride) 35mg
Potassium (sulfate) 30mg
Citric acid 40mg
Alfalfa organic 260mg

Smart Magnesium Complex
Magnesium (sulphate) 38.4mg
Magnesium (Chloride)24mg
Buckwheat organic 100mg
Citric acid 40mg

Smart Heart Tissue Extract
A new heart muscle extract that acts as a heart muscle tonic. Its action can be immediate on a patient with a weakened or flabby heart. It is indicated when the patient has poor muscle tone, muscular fatigue or hypertrophy. Usually show up as a weakened first sound.

Examining a Patient

Examination
Test left Subscapularis for strength.
Record heart sounds, loop and playback into patients ears.
Retest Subscapularis – will now be weak.
Challenge using eye positions for cause of weakness..



**Examination Mechanics First
Cranial including Cruciate suture
and Sagittal suture jamming.
Upper cervicals
Lower cervicals
Limbic fixation
M/S joint
Thoracics**

The Heart Mind Connection

The heart is a highly complex, self-organized information processing centre with its own functional "brain" that communicates with and influences the cranial brain via the nervous system, hormonal system and other pathways.

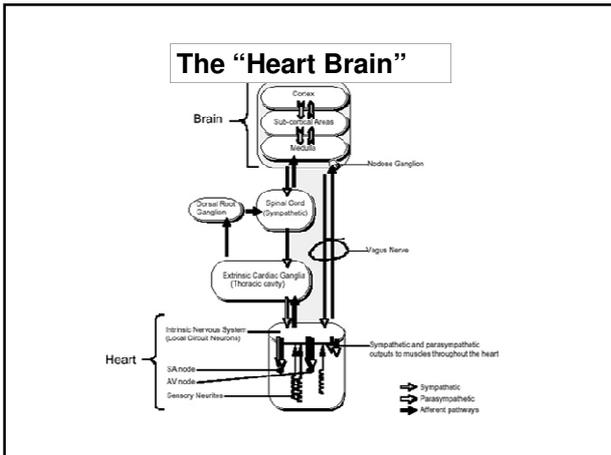
These influences profoundly affect brain function and most of the body's major organs, and ultimately determine the quality of life.

The heart's nervous system contains around 40,000 neurons, called sensory neurites, which detect circulating hormones and neurochemicals and sense heart rate and pressure information.

Hormonal, chemical, rate and pressure information is translated into neurological impulses by the heart's nervous system and sent from the heart to the brain through several afferent pathways. It is also through these nerve pathways that pain signals and other feeling sensations are sent to the brain.

These afferent nerve pathways enter the brain via the medulla, located in the brain stem. The signals have a regulatory role over many of the autonomic nervous system signals that flow out of the brain to the heart, blood vessels and other glands and organs.

They also cascade up into the higher centres of the brain, where they may influence perception, decision making and other cognitive processes.



The neural communication pathways between the heart and the brain.

The heart's intrinsic nervous system consists of ganglia, which contain local circuit neurons of several types, and sensory neurites, which are distributed throughout the heart.

The intrinsic ganglia process and integrate inflowing information from the extrinsic nervous system and from the sensory neurites within the heart.

The extrinsic cardiac ganglia, located in the thoracic cavity, have direct connections to organs such as the lungs and esophagus and are also indirectly connected via the spinal cord to many other organs, including the skin and arteries.

The "afferent" (flowing to the brain) parasympathetic information travels from the heart to the brain through the vagus nerve to the medulla, after passing through the nodose ganglion.

The sympathetic afferent nerves first connect to the extrinsic cardiac ganglia (also a processing centre), then to the dorsal root ganglion and the spinal cord. Once afferent signals reach the medulla, they travel to the subcortical areas (thalamus, amygdala, etc.) and then to the cortical areas.

The Heart as a Hormonal Gland
The heart was reclassified as an endocrine or hormonal gland, when in 1983 a hormone produced and released by the heart called atrial natriuretic factor (ANF) was isolated.

This hormone exerts its effects widely:
on the blood vessels themselves,
on the kidneys and the adrenal glands and
on a large number of regulatory regions in the brain.

It has also been found that the heart contains a cell type known as "intrinsic cardiac adrenergic" (ICA) cells.

These cells are classified as "adrenergic" because they synthesize and release catecholamines (noradrenalin and dopamine), neurotransmitters once thought to be produced only by neurons in the brain and ganglia outside the heart.

More recently still, it was discovered that the heart also secretes oxytocin, commonly referred to as the "love" or "bonding hormone."

Beyond its well-known functions in childbirth and lactation, recent evidence indicates that this hormone is also involved in cognition, tolerance, adaptation, complex sexual and maternal behaviours as well as in the learning of social cues and the establishment of enduring pair bonds.

Remarkably, concentrations of oxytocin in the heart are as high as those found in the brain.

In our internal environment many different organs and systems contribute to the patterns that ultimately determine our emotional experience.

However, research has illuminated that the heart plays a particularly important role.

The heart is the most powerful generator of rhythmic information patterns in the human body. It functions as sophisticated information encoding and processing centre, and possesses a far more developed communication system with the brain than do most of the body's major organs.

With every beat, the heart not only pumps blood, but also transmits complex patterns of neurological, hormonal, pressure and electromagnetic information to the brain and throughout the body.

As a critical nodal point in many of the body's interacting systems, the heart is uniquely positioned as a powerful entry point into the communication network that connects body, mind, emotions and spirit.

Numerous experiments have now demonstrated that the messages the heart sends the brain affect our perceptions, mental processes, feeling states and performance in profound ways.

Research suggests that the heart communicates information relative to emotional state (as reflected by patterns in heart rate variability) to the cardiac centre of the brain stem (medulla), which in turn feeds into the intra-laminar nuclei of the thalamus and the amygdala.

These areas are directly connected to the base of the frontal lobes, which are critical for decision making and the integration of reason and feeling.

The intra-laminar nuclei send signals to the rest of the cortex to help synchronize cortical activity, thus providing a pathway and mechanism to explain how the heart's rhythms can alter brainwave patterns and thereby modify brain function.

In assessing the environment, the amygdala compares incoming emotional signals with stored emotional memories. In this way, the amygdala makes instantaneous decisions about the threat level of incoming sensory information, and due to its extensive connections to the hypothalamus and other autonomic nervous system centres,

is able to "hijack" the neural pathways activating the autonomic nervous system and emotional response before the higher brain centres receive the sensory information.

One of the functions of the amygdala is to organize what patterns become "familiar" to the brain. If the rhythm patterns generated by the heart are disordered and incoherent, especially in early life, the amygdala learns to expect disharmony as the familiar baseline;

and thus we feel "at home" with incoherence, which can affect learning, creativity and emotional balance.

In other words we feel "comfortable" only with internal incoherence, which in this case is really discomfort.

On the basis of what has become familiar to the amygdala, the frontal cortex mediates decisions as to what constitutes appropriate behaviour. Thus, subconscious emotional memories and associated physiological patterns underlie and affect our perceptions, emotional reactions, thought processes and behaviour.
