Clinical Research with the Sphygmograph.

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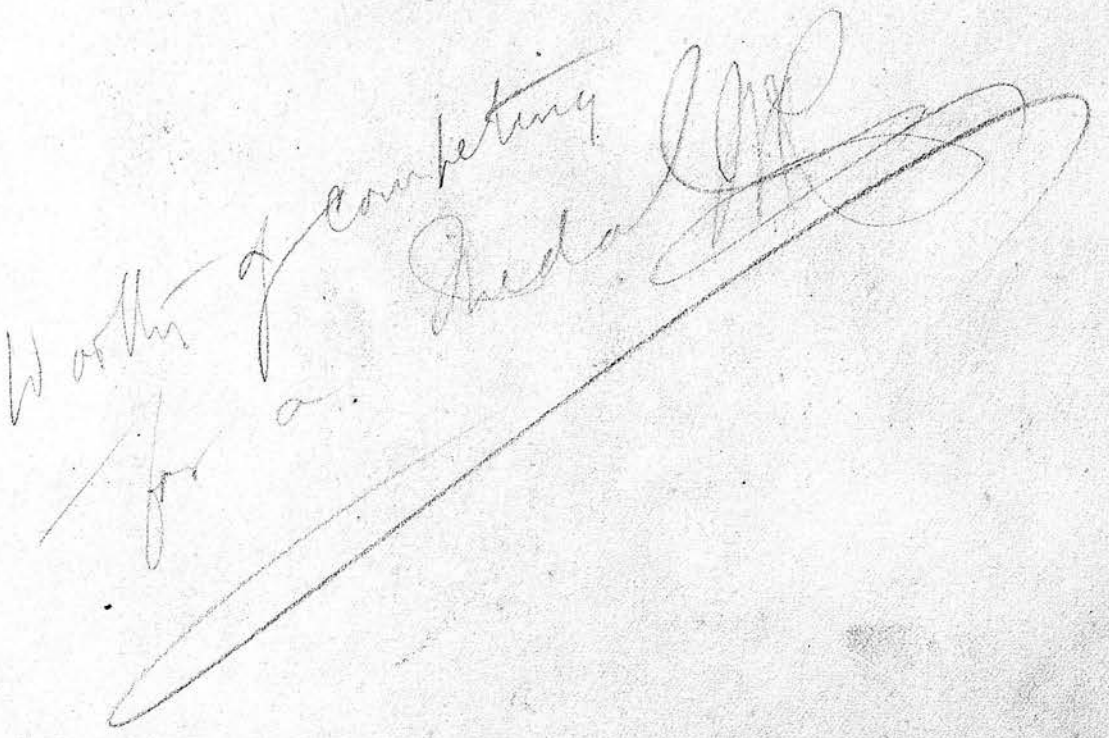
By Albert Wilson MB, CM. 1862



The Object of this Thesis is to demonstrate the practical uses which the physician in his daily routine can make of the Sphygmograph.

In the wards or in the laboratory there are great facilities for research both as regards material & instruments, but when one quits the sacred precints & engages in the routine of General or special practice it is seldom that one can be provided with sufficient apparatus, nor have sufficient time, to perform an exhaustive investigation in any special branch of medicine.

With a small, portable Sphygmograph I have made a number of tracings of different diseases in their different stages - illustrating also the actions of various drugs.

I have also taken tracings of people in health showing the effects of attitude & the actions of drugs on the healthy organism.

These tracings are often difficult to interpret, and it is only by collecting a great number and by falling back

upon the researches of various physiologists, that one is able to understand them.
There is always great room for error in this kind of research, as, time of day, food, fatigue rest, attitude and other circumstances affect the pulse, and therefore I have carefully endeavoured, when taking daily tracings of a particular case, to visit the patient at the same time & choose the same attitude.
It is not necessary to describe the discovery of various forms of sphygmographs, I should only render this thesis unnecessarily wearisome; like all inventions its evolution and perfection were gradual and even now it cannot be considered a perfect instrument.
In pulse tracings it would be of undoubted benefit if one could have a scale showing the amount of pressure in m. m. of mercury which raises the needle at each

stroke. Instead of that however the spring of the sphygmograph which I used (Dudgeon's) can be made to exert pressure from 0 to 5 oz & in each case my object has been to obtain the best possible tracing. Usually this can be done when the spring exerts about 3 oz of pressure on adults, but in some cases where the pulse is weak, one has to use a lower pressure. One can only feel the pulse or take a tracing where the artery lies on bone.

Lauvire was perhaps the first to announce this fact. In his "Recherches sur la cause de la pulsation des artères. Montpelier 1769" he discribes how, feeling the aorta in the abdomen of a cur, he felt the pulse on the anterior surface of the vessel but not on the posterior surface, if he slipped his finger between the vessel & the vertebral column;

Whence he concluded that the pulse was a sudden elevation on the central surface of the aorta. Where an artery lies on soft parts it is well known no pulse can be felt & to estimate the pulse it is necessary to compress it with the finger over a bone depriving it of its cylindrical form. By means of obtaining the fullest tracing in each case one can make an approximate estimate of the strength of the pulse. The use of the sphygmograph is to show any abnormal variation of the curve & the force of the heart beat, and during the treatment of the case is often a guide in the use of drugs. The finger, however sensitive, is unable to detect the changes in the pulse unless they be very marked and in many cases they convey quite an opposite impression of the real state of the pulse. Thus dicrotism occurs frequently

in a pulse tracing when it cannot in the least be detected by the finger, and experience will show that one can often foretell approaching convalescence by this instrument.
To understand the pulse in disease one must first study

The normal pulse in health.

In the ordinary tracing there is a vertical line of ascent followed by a gradual descent with 2 or more waves on it. The pulse tracing is a modification of the heart tracing & therefore it will be easier to understand the former if I first briefly give a sketch of the cardiac tracings.

It is to Marey that we owe most of our knowledge on this subject. Marey found that the Systole of the heart of a frog gave a simple curve like that of an ordinary muscle when it contracts.

Buisson conceived the idea of

reflecting a movement from one point to another, through tubes full of air. Thus two caoutchouc ampullae are connected by a tube filled with air. By compressing one the other distends & would thus raise a lever resting upon it. On this principle a manometer was constructed. Three systems of ampullae are so arranged that one goes into the right auricle, another into the right ventricle and a third in front of the left ventricle to receive its impulse. The terminal ampullae are connected with writing levers, which form tracings showing the intensity, succession and duration of the pressure exerted upon the opposite ampullae.

Marey improved upon this mechanism and constructed a cardiograph which he used on horses and to him we are indebted for tracings which show the exact way in which the heart works.

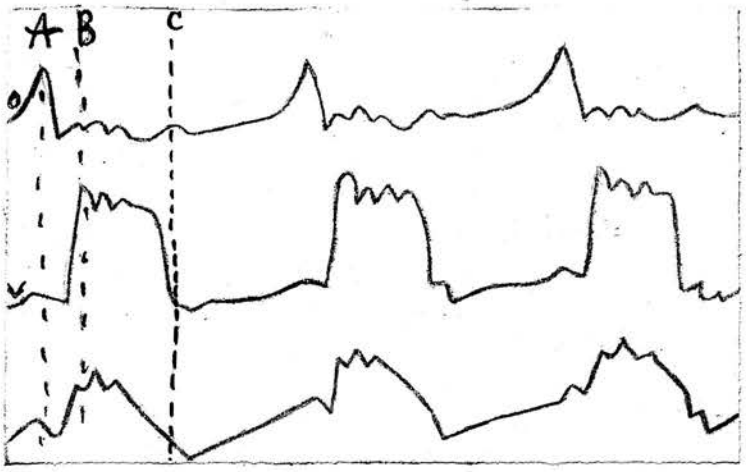


Fig 1.

This diagram, taken from Marey's work on the Circulation (p88) represents the tracing of the right auricle, right ventricle & apex beat of a horse.

The auricular systole (line A.) is felt in the interior of the ventricle, causing a slight rise in the ventricular curve. There is also a small beat of the heart at the same moment.

The ventricular systole causes a marked up-stroke (B) with a longer duration than the auricular, the pressure remaining raised a long time.

The ampulla in front of the heart shows a strong pressure at the ventricular systole which lasts during it & ceases with it at the relaxation of the ventricle (C). The impulse of the heart is thus

Shown to occur at the precise moment of the ventricular systole.

Every muscle proportions its effort according to the resistance it has to overcome. Fig 2 (Loc. cit. p95) Marey & Chauveau demonstrated this in the living frog. They compressed the great venous trunks so as to empty the heart, when they obtained the simple curve of an ordinary muscle; as soon as they allowed the blood to reenter the heart, the curve altered.

The depletion of his ventricle causes a slight ascent with a wave which marks the auricular systole; then a vertical line for its systole and a descent at the end of this period, the plateau marking the duration of the systole.

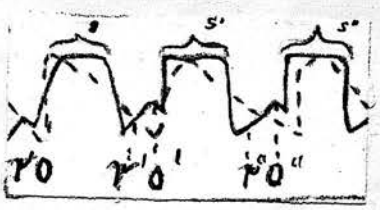


Fig 2.

The frogs heart being slow the tracings are simpler.

The Systole of the heart causes the ascent of the lever Whilst the descent corresponds to the diastole. The auricular Systole is short The ventricular Systole is long. The apex beat ascends & descends abruptly with the ventricular Systole but has a gradual fall between these two points the space between being called the Systolic plateau. During the diastole there is a gradual ascent of the apex curve which shows that the heart is increasing in volume. The filling of each cavity commences immediately after each Systole. This gradual filling is explained by the continuous arrival of blood from the veins.

At the ventricular Systole the auriculo-ventricular valves form a dome with multiple convexities inside the auricles. This has been felt by Marey in the horse. The capacity is diminished

in the auricles & consequently the pressure rises and causes waves in the auricular tracing.
When the ventricle relases a wave occurs in each tracing. At this period the Sigmoid valves are Suddenly lowered and pushed lightly towards the ventricle producing in it a Slight rise of pressure and a wave in the tracing. This wave occurs also in the auricular tracing, because at this moment the cuspid valves are open & the auricles & ventricles are one cavity.

Marey in 1874 took tracings from a case of Ectropion of the heart, & found that it corresponded with those of a horse. The only difference was the Short interval between the auricular & Ventricular Systole. Fig 3
(see Trav. lab. T III p. 311).

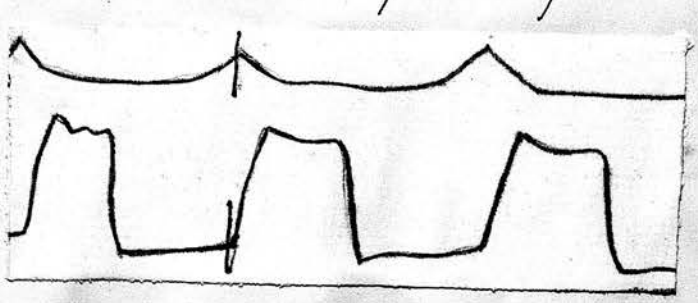


Fig 3.

The blood moves from a point where the pressure is strong to one where it is weak, and the rate of flow is proportionate to the difference in pressure between these two points.

During the Systolic period the pressure is equal in the left Ventricle & the aorta provided the mitrals are competent as they are then one cavity.

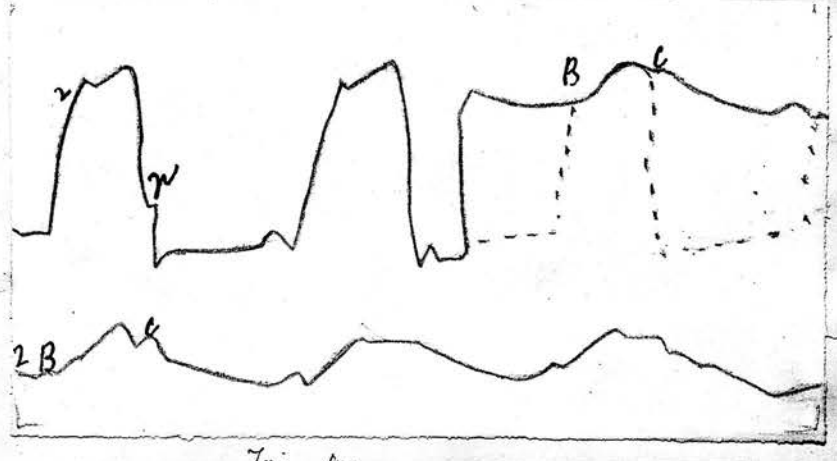


Fig 4.

In the diagram, copied from Marey,* it is seen that where the sigmoid valves close (r) the aortic curve descends slowly (c) because the blood flows gradually into the capillaries. The ventricular descends abruptly (r) as the pressure falls suddenly in the empty and

* (Loc. cit p 117)

relaxed ventricle.
The maximum pressure is less in the aorta than in the ventricle. If the pressure falls in the aorta the blood flows quicker from the ventricle & with greater force. This will be referred to later on when I am describing the pulse in fever.
The great obstacle to the flow of blood is the resistance which the small vessels offer. This resistance varies according to the degree of contraction which depends on their elasticity. The elasticity of the arteries transforms the intermittent into a continuous stream. This can be demonstrated on an elastic tube. In the arterial system it is a gradual transition.
Marey in his "Researches sur la circulation. Sag. Med. de Paris 1858" showed that the elasticity of the arteries diminished the resistance which the blood meets on

entering the main artery. The heart has less difficulty in propelling the blood When the arteries are very extensible.

It will be seen later that in the feverish state Where there is relaxation of the small vessels, there being less resistance to the entrance of blood the upstroke is higher indicating more ventricular force.

The elastic force which comes into play to prevent the over distension of the vessels & keep up the continuous flow of blood into the capillaries during the diastole of the heart is called

The Arterial tension.

Arterial tension is generally considered to have a constant and a variable element. The variable element corresponds to the amplitude of the pulsations.

If the small vessels contract the arterial tension rises, as it has to force the blood into the

capillaries during the diastole of the heart; When the small vessels relax the arterial tension falls.

Marey (in his Trav. lab. T IV. p209) found that if the ventricle meets a growing resistance, it sends waves of small volume, & as the tension rises the fulness of the variations decreases. This decrease of the variable element of tension implies diminished volume of the waves.

The heart preserving its force of impulse Whatever raises the arterial tension diminishes the fulness of its variation and vice versa; Whatever lowers the arterial tension increases the fulness of its variation.

If the Systole diminish in frequency the heart has more time to fill and the blood has more time to pass into the capillaries therefore the arterial tension rises & the fulness of the waves diminishes.

The Pulse

consists of a distension with hardening of an artery. It is caused by a wave of blood which is projected by each Systole of the heart.
The pulse varies according to the Strength of the hearts action, & the amount of blood it sends. It also depends on the elasticity of the arterial walls & the amount of resistance which the blood meets in the capillary circulation.
Now the Sphygmograph does indicate how far these various influences affect the pulse.
Before examining the pulse in disease one must first study it in health. I have therefore selected pulses from people in health of different ages and both Sexes with normal hearts.

Fig 5

The radial is the pulse usually examined. Fig 5. In the normal tracing there is a line of ascent corresponding to that seen in

the heart tracing which is caused by the ventricular Systole. A more or less gradual descent follows marked by at least 2 waves.

The first wave is called the predicrotic and the second the dicrotic wave.

The ascent ought to be vertical & this is due to the suddenness & force of the cardiac pulsation. A weak or slow pulsation causes a more slanting up-stroke. This can be demonstrated on an elastic tube with an enema syringe, as the following tracings show.

Fig 6

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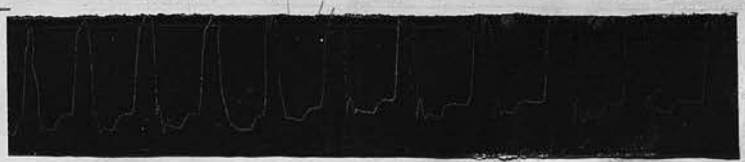

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In these tracings the descent is as sudden as the ascent forming an acute angle at the apex. This is because there is free outlet to the flow of water. These show some resemblance to the pulse wave in the feverish state (See Fig 11 & 12) When the small blood vessels being relaxed there is comparatively free outlet to the wave of blood passing along the artery.

Fig 11

12

There are in the tracings (Figs 6-10) numerous waves. They are undoubtedly waves of oscillation due to the vibrations of the indiarubber tube.

Most physiologists consider the predicrotic wave to be a wave of oscillation due to the vibration of the arterial walls.

(Sebrée Moens (die Puls-curve Leyden 1878) Wolds

this opinion, So do Mosso & others. Marey thinks it is the remains of what he calls the Systolic plateau as it corresponds to an elevation in this plateau before the abrupt descent which indicates the close of the Systolic period. (Loc. cit. p272)

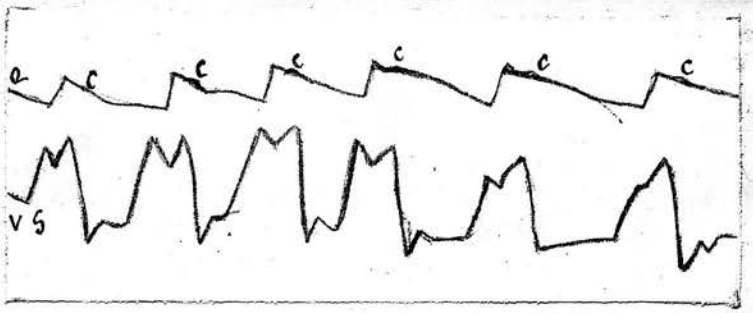

Fig 13

He shows the above diagram in proof of this. The tracing of the pulse and heart being taken simultaneously.

Again in old people with thickened ~~more~~ rigid arteries where the cardiac waves are less altered the predicrotic wave is more marked.

The dicrotic wave is proved by comparing simultaneous cardiographic & Sphygmographic tracings to occur

at the moment of the closure of the Sigmoid Valves. (Loc. cit. Page 252) Fig 14.

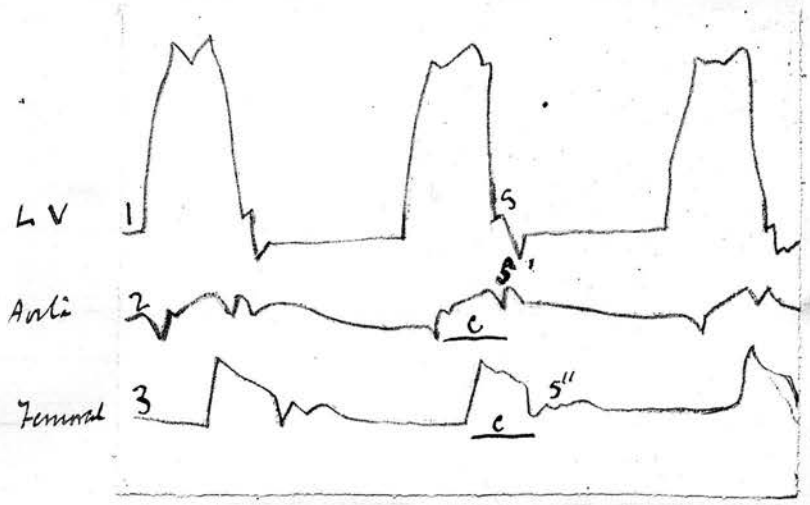

Fig 14

Many theories were held about dicrotism. Buisson said it was caused by the shock of the retrograde aortic waves against the closed Sigmoids (Thèse Inaugurale Paris 1862)
Mary after destroying one Sigmoid valve found that dicrotism immediately disappeared. The dicrotic wave also is absent in aortic incompetence.
Some have considered the dicrotic wave as one of reflection from the periphery. If so it would disappear

No

on compressing the artery below where the sphygmograph is applied. This however does not occur & this opinion has been quite disproved.
Fig 15 illustrates this.

Radial artery after distal compression

Fig 15.

The dicrotic wave then is a centrifugal wave & corresponds to the closure of the sigmoids.

The conditions which favour dicrotism are.

1) Sudden penetration of the blood into the arteries
2) Small volume of the wave
3) Low arterial tension

The latter acts by
a) allowing the ventricle to empty quickly
b) favouring the formation of waves.

With a view to testing if the dicrotic wave occured at the same time as the 2nd sound I auscultated

a patient Whilst I took a tracing of the Radial artery & gave his hand a jerk When I heard the 2nd Sound So as to produce an exaggerated wave in the tracing.

Fig 16

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There being a slight delay in the Radial pulse, I found that if I jerked the hand at the beginning of the 2nd Sound I caused an exaggeration of the Systolic wave. Fig 16 Jerking the hand toward the close of the during the 2nd Sound caused an exaggeration of the dicrotic wave. Fig 17 This is demonstrated the fact that the dicrotic wave is synchronous with the 2nd aortic Sound.

The following tracings are taken from different people in health

Fig 18

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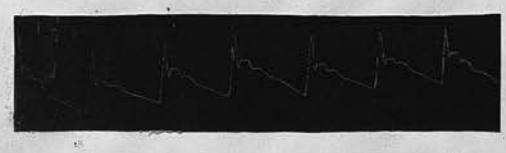

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Fig. 18 From a young lady lying down in the morning.

Fig 19 Is taken from a young lady sitting.

Fig 20 Is from the same lady at night, two hours after dinner.

Fig. 21 Another lady

Fig. 22 A young girl aet 9

Fig. 23 a man of medium height, not very robust. aet about 30.

Fig 24 A strong muscular man.

Fig. 25 & 26 Both from ladies.

Fig 27 From a robust muscular man, about 50, large arteries.

Fig. 28 Is the pulse of a hale old gentleman aet 84.

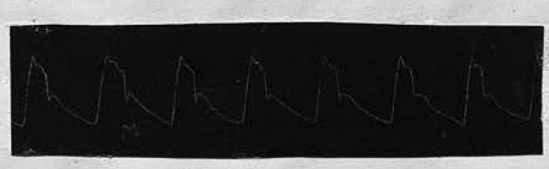

Fig 28

Fig 29

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These are tracings from a person in health with normal heart.
Fig 29 Is taken in the day time sitting.
Fig 30 at 9 p.m. after dinner.
Fig 31 Another day when very tired after a hard day's work and after a light supper.
Fig 32 Another day when very fatigued at midnight.
The 2 latter tracings where there is great bodily & mental weakness show depression of the Systolic force of the ventricle.
Fig 33 at 4 am. after studying all night.

Attitude

has a marked effect on the pulse. Gravity increases the arterial tension in all dependent parts, but diminishes it where the blood flow is opposed to it.

Sprengel (in the Arch. de Müller p 834) states that gravity more than compensates the decrease of pressure which results from the resistance to overcome & on account of which the tension becomes lower as one gets further from the heart.

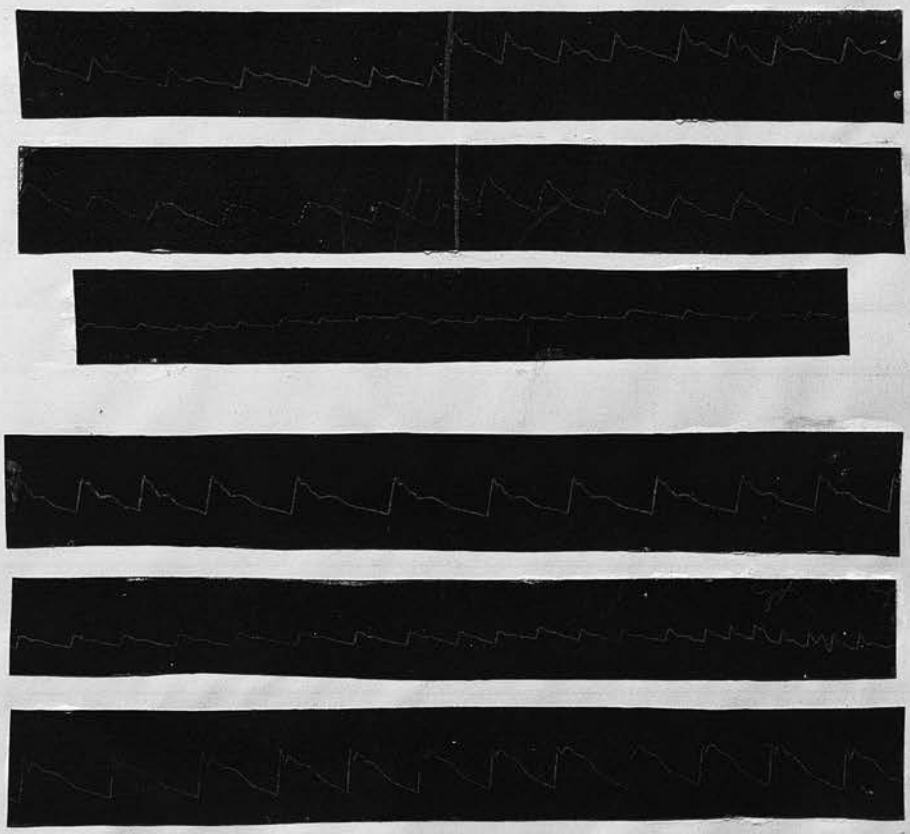
The following 2 series of tracings show how gravity affects the pulse wave in a limb when raised and when hanging down.

One series is taken from W a healthy young man of rather relaxing occupation, coachman, which probably accounts for the rather excessive dicrotism in his pulse tracing.

The other series from M. from a very active robust man.

The W. series are taken standing Fig 34

to with the wrist on a level with the shoulder.
Fig 35 with the arm raised above the head.
Fig. 36 with the arm hanging down by the side.
In series (m) the gentleman was sitting on a sofa.
Fig 37 The arm was straight out on the sofa rest.
Fig 38 The arm hanging down.
Fig. 39 The arm raised above the head.



The ventricular systole is in each case the same during the experiment. The difference in pulse force is due to variation in arterial tension. Elevating the arm the pulse becomes stronger. The wave enters with more force because the artery is less stretched & gravity has lowered the arterial pressure. Lowering the limb the pulse becomes weaker.
Gravity favours the blood by which the arterial tension is increased and the artery is stretched.

When the arm is bent at right angles the pulse is rather feebler than when it is straight out, due, of course to the slight obstruction which the bend causes to the blood stream.
Fig 40 demonstrates this. (Taken from M)
Fig. 41 is the cardiac tracing.

Fig 40

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In modern Surgery it is the custom before applying the tourniquet to drain the limb by elevating it as recommended by Prof. Lister. After the tourniquet is applied the limb is quite blanched. Immediately it is removed the limb becomes rosy & slightly swollen. Prof. Lister says that when the limb is raised the veins empty & the arteries contract & when the limb afterwards becomes congested it is due to a vasometer paralysis.
This vasometer paralysis is probably due to the fact that the nerves have been for a time deprived of their vascular supply.
I practised this operation on the muscular subject M.
I held the arm erect for some time. The pulse did not disappear though the arm became pale, & then I applied the tourniquet.
It seems strange that the tracing of the pulse wave should

be so much fuller when there is so much less blood in the limb. It illustrates prettily how the waves are exaggerated when the vessel is less stretched or relaxed ~~when~~ and the arterial tension lowered. Fig 35 in W's case shows that the line of ascent is sloping & rounded showing feebleness of the blood wave to overcome gravity.

M. relaxed the tourniquet after it had been applied. Some minutes & the whole limb felt numb.

I had the Sphygmograph applied and at a given signal M. relaxed the instrument & I set the tracing paper in motion. Thus I got the 1st wave. It is to be seen in Fig 42.

Fig 42

Fig 43

Fig 44

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Fig 43 Was taken immediately after & a few minutes later Fig 44.

The waves show growing fullness & increasing dicrotism with diminishing predicrotism.

Predicrotism thus diminishes in a relaxed vessel.

Fig 45 Shows the radial of the opposite, or right, side. As the waves got fuller the pulse itself felt larger and bounding.

The blood-vessels large and small in the left limb were at that moment relaxed. This relaxation diminishes the arterial tension and intensifies the vibrations of the blood waves. Whilst it makes their penetration easier.

The result is a higher upstroke and pointed apex with increased dicrotism & diminished predicrotism. The former indicates increase of the variable element of the pulse wave.

Note that the waves get fuller as time goes on. Why is this? Is there an early contraction of the vessels followed by relaxation? Probably not. The early blood waves escape easily into the relaxed capillaries & so the artery is not distended to its fullest until the capillaries are distended & filled.

It has been stated by many physiologists that relaxation of the bloodvessels in one part, causes contraction with higher arterial tension in another.

I therefore took the tracing Fig 45 just after taking Fig 44 It certainly shows less force & less dicrotism than at the commencement of the experiment See Fig 37

The above phenomena were entirely local and due to local causes also, namely, the vasomotor paralysis in the area.

Dilatation of the blood vessels in another part of the body will cause lowered tension in the radial pulse. Thus I made M. inhale amyl and when the full effects were produced, I took a tracing of the right radial artery. There is the pointed apex and increased dicrotism, which shows a state of low arterial tension due here to a distant cause, namely relaxation of the blood vessels of the head. (P 250 Fig 524) The same process will be seen to occur in inflamation of different organs.

Many healthy individuals show an apparently abnormal dicrotism.

This is seen in W's case.

Also in the case of a healthy robust youth of 20. Fig 47

Also in another robust young

mau. Fig 46

Fig 46

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This is due to a general state of slight relaxation of the vessels some slight loss of vascular tone. It is a marked feature is cases of nervous debility.

There is a great difference in the tracings according as a person is standing or lying. The pulse also varies in frequency.

In W's case it was 66 standing 56 whilst lying. Fig 34 shows the pulse in the erect position the annexed figure 48 shows the tracing when patient was lying down with the limbs raised. Pulse is slower and arterial tension is increased. Fig 49 shows the dorsalis pedis when patient was erect, and Fig 50 when lying down. To what is

The difference in pulse frequency & arterial tension due?

Fig 48

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It is held by Marey and others (See La Circulation du Sang p. 341. 442) that gravity in the erect position favours the flow of blood over the greater part of the body & diminishes the tension. Whereas Sitting or lying are unfavourable to the action of gravity on the blood current.

Von Bezold & Mosso maintain views which appear to explain more intelligibly the mode in which attitude affects the pulse.

Von Bezold demonstrated that elevation of pressure in the carotid arteries made the heart beat slower. He attributed

it to pressure on the Vagi. Lowering the pressure in the carotids produced acceleration of the heart.

Francois Franck verified this by submitting the brain to an artificial circulation, independent of the cardiac circulation. (artery) Elevation of pressure in the cerebral produced an arrest or slackening of the heart. (Trav. lab. T III p 273. 1873)

Moxon, in his able Croonian lectures reported B. M J April 1887, discribes most graphically the relation of the Brain to the Circulation. He says, that in the erect position the venous blood escapes more easily from the Cranial cavity. This causes a suction upwards of arterial blood or cerebro-Spinal fluid.

The 4th ventricle contains a mass of choroid plexus which stretches down the Lateral Of set called by Moxon the 'cornu'. The 'cornu' presses on the roots of

the vagus & unites with them.

This is the seat of a mechanism which regulates the heart by the blood pressure in the skull.

The vagus runs a direct & short course from its origin to its exit from the skull, and being tense any pressure from the distended choroid plexus tells on its roots. No other cranial nerve is so exposed to pressure at its origin.

Czermak was able to stop his heart beating by pressing his vagus against a small osseous tumour in the neck.

The more blood in the choroid plexus the more pressure on the vagus, causing a check on the heart's action.

This prevents excessive inflow to the brain like the ball tap of a cistern.

Dr Guy found the average pulse in the erect position to be 81, whilst in the horizontal

posture it is 67.

Muscular effort was counteracted by strapping people on boards.

In the erect position the blood drains away & the choroid plexus is less distended therefore there is less pressure on the vagus. In the horizontal position the blood goes more easily to the brain the choroid plexus gets distended & exerts pressure on the roots of the vagus.

Any cause which produces too great a flow to the brain reduces the pulse.

Thus going into compressed air reduces it, also in general inflammation of the brain & meningitis. In the later stages of meningitis when there is a great flood of blood to the brain the pulse is quick. How is this? It is due to paralysis of the vagi.

Moxon had a case where the pulse rose to 180 in

tubercular meningitis. He gave digitalis & it had no effect in slowing the pulse. It was as though the vagus were paralyzed by atropin.

Rarefied air quickens the pulse. Chauveau found when ascending Mt. Blanc the pulse became dicrotic like the typhoid pulse. This really means that arterial tension diminished.

The Respiratory Movements

are found to have an effect upon the pulse in some cases. Ludwig found at each inspiration the arterial tension falls as the blood is aspirated toward the thorax. During expiration it rises as the blood is pushed toward the periphery. (See Beiträge zur Kenntniss des Einflusses der Respirations Bewegungen auf der Blutlauf

in Aortensystem. Müllers Arch 1847 p. 242).

Vierordt obtained exactly the opposite results. ~~(See Circulation du Sang)~~. (See Die Lehre von arterienpuls).

Marey investigated the subject and found both were right. (See Circulation du Sang chp 28) It depends on whether the circulation be thoracic or abdominal.

The variations in arterial pressure are due to the changes of pressure which the intra thoracic and intra abdominal parts of the aorta undergo. The effects of respiration are opposite in the thorax and abdomen.

Thoracic Respiration — The enlargement of the chest during inspiration tends to cause a vacuum towards which the air rushes. If this occurs easily it fills the chest; should there be any difficulty the chest walls are drawn in & the aspiration is

intense. The blood flows back to the thorax, the aorta is dilated and arterial tension falls in the limbs.

The pulse tracing therefore falls with inspiration. In impeded expiration the muscles come into play & the aorta is compressed driving the blood on therefore the pulse tracing and arterial pressure rise with expiration. This is Ludwig's respiration curve.

Abdominal Respiration

During inspiration the diaphragm descends which enlarges the chest, but diminishes the size of the abdominal cavity & compresses its contents. During expiration the opposite occurs & the abdominal walls are less tense. During ordinary respiration these effects are counteracted by the thoracic variations; but in diseases with distension of the abdomen, while the respiratory passages are free, then

Here the abdominal influences prevail. The compression of the aorta during Inspiration drives the blood on and causes ascent of the pulse curve. On the other hand during Expiration the arterial tension falls and the pulse curve descends. This is the kind described by Vierordt.

The following case illustrates the influence of abdominal respiration in a case of dyspnoea. The patient suffered from ovarian tumour.

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Fig 57

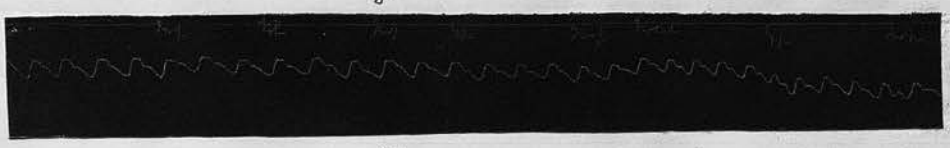

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Fig 52

Fig 57 was taken whilst the patient was being treated with Nux Vomica. The pulse was too weak to count accurately (90 ?), and

The wave in tracing very feeble. It rises during inspiration and falls during expiration.
Fig 52 shows the same rise & fall. The case was being treated with Bromide. The pulse was 120 and weak.

Thoracic Dyspnoea

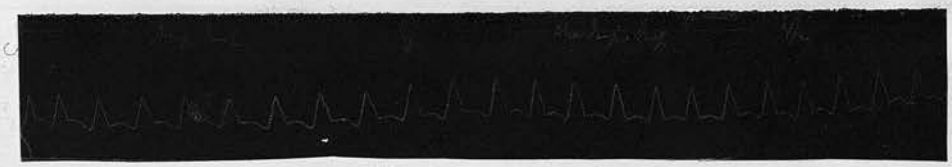


Fig 53

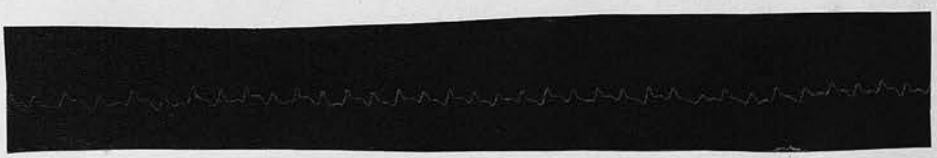


Fig 54

Fig 53 was taken from a robust man with pleuritic congestion of the lungs (See Case L. p. 213) There was great dyspnoea R 48

Fig 54 was taken from a child with catarrhal pneumonia very severe. R 72.

These curves are not well developed so far from the heart. But the line descends slightly with inspiration

A cough is a sudden expiration with the glottes closed. It compresses the thoracic & abdominal viscera. This elevates arterial pressure & suddenly forces the wave of blood to the periphery. Fig 55

Fig 55

illustrates the effect of a cough in a patient suffering from whooping cough. Each cough is followed by a succession of 5 or 6 heart beats ~~followed~~ more rapid than the ordinary ones. The tracing ascends for those number of beats & the pulse wave is smaller.

The effects of the cough on the particular wave with which it is synchronous is to cause an elevation of the line during the early part of the diastolic period followed by a sudden abrupt desent. This abnormal elevation is caused by the wave of blood being projected suddenly from the

compressed aorta through the arteries; as soon as this wave has passed along, the vessel collapses, being empty; until the next cardiac Systole occurs.

The Pulse in Disease

Having studied the pulse in health and the causes which influence it, one is better prepared for the difficult subject of the pulse in disease.

I propose first to discribe lesions of the valves, bringing forward well marked cases.

I also have the advantage of showing one case of fatty heart which terminated fatally.

Then I shall discribe functional diseases of the heart and afterwards pass on to the pulse in inflamatory derangements.

The Pulse
in diseases of the Heart

Mitral Incompetence

M. Triden of Paris (Essai sur les Signes du diagnostic de l'insuffisance mitral. Thèse Paris 1875) was the first to demonstrate the graphic characters of the cardiac tracing in mitral disease. He describes the ventricular wave as having a round apex with diminished fullness of the wave. The pulse tracing partakes of the same character.

If there be great reflux there is marked dicrotism on account of the smallness of the blood wave sent into the arteries.

Case J. G. male. oct 11

P 100 small and compressible. Apex beat visible. A soft blowing systolic murmur replaces the 1st sound at the apex. Aortic 2nd accentuated. The radial tracing

Fig 56 Shows marked dicrotism, no predicrotism apex pointed. All indications of low arterial tension.

Fig 56

57

The cardiac tracing shows pointed & slanting apex which indicated rapid emptying of the ventricle during the systolic period. The rapid emptying is by regurgitation into the auricle. Fig 57

In the normal heart tracings (see Fig 90 p 65 or Fig 41 p 27) the systolic plateau is marked by several waves these are due to the vibration of the tense auriculo-ventricular valves. In mitral incompetence the absence of these oscillations is what one would expect. If, as in some of the waves of the ventricle, on the line of descent there is a small wave it can

Reasonably be inferred that the capacity of the ventricle, having become so much less, the previously incompetent valves have come closer together & become competent; or, if they have not actually become competent they may now form an obstacle to the regurgitating blood.

The patient was treated with X min. tr. digitalis. T. D.

Four days later I examined him. He felt much better. P 84 Fig 58 Small but stronger. The 1st mitral sound is faintly audible and accompanied by a soft blowing murmer.

No aortic 1st audible. 2d aortic still accentuated & reduplicated.

Fig 58

" 59

Radial Tracing. Fig 59 of the heart Shows

Vertical ascent, slanting systolic plateau, descent vertical. Dicrotic wave marked sometimes double.

This shows that the regurgitation is less and the appearance of the last wave of the systolic plateau shows that the valves are acting. This wave produces in the pulse the predicrotic wave. For the sake of a name I shall call this wave in the cardiac tracing "predicrotic" or I should prefer to call it the "terminal systolic wave".

Digitalis strengthens and slows the heart's action. Brunton & Foster found that it increased arterial tension. The former observed thinks that the arterial tension is increased by the contraction of the arterioles.

Boehm found that after dividing the cervical spinal cord, so as to cut off the vasomotor centre, there was no rise in arterial pressure.

In this case the slanting ascent becomes vertical showing more systolic

force. The acute apex becomes more obtuse and not so high showing increased arterial tension. This latter is brought about by the larger volume of blood sent at each systole into the arteries.

When digitalis is administered to excess it causes irregularity and a feeble pulse. It is supposed by Brunton to be feeble because the arterioles are paralyzed & that the blood passes more quickly to the veins.

This patient took digitalis for too long a time or in too large doses.

The following tracings were taken 3 days later. The patient does not feel worse; the pulse is reduced to 68 very small incompressible. The mitral murmer is much less distinct.

Fig 60

61

Figs 60-61 Show the radial pulse. The systolic impulse is strong. Predicrotism is marked which occurs generally in high arterial tension. Dicrotism is absent. The diastolic period is prolonged but irregular. The heart tracing Fig 62 shows great irregularity. The apese is pointed, in some cases the terminal systole wave is absent, in some well marked. There are also some apparently abortive systolic contractions.

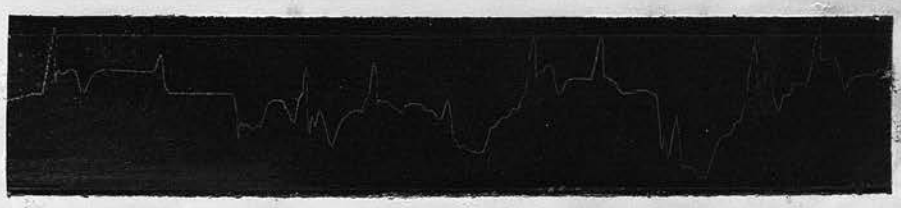


Fig 62

Case N. S. oct 19

This was a case of mitral incompetence & hoemorrhagic diathesis. The patient was very subject to Epistaxes, which began a year ago to come on at intervals of a few days lasting several hours each time. When I first saw her She resembled a corpse. Lips and nails & gums blanched. Pupils widely dilated. I had little hope of her living. She had then been bleeding 6 hours a steady dropping, and there had been daily ~~dropping~~ bleedings for three weeks. The patient was too ill to be examined for 2 or 3 days.

I prescribed 5 m. 2ng Ferri. Tart. & X. m. ac Nitric dil. in Glycerine & water every two hours. This mixture never caused constipation though it was used for many weeks and even months.

Exam of heart. Apex beat visible between 6 & 7 ribs. Thumping impulse no thrill. Right border 1" to right of the sternum. Breadth 5½ inches. Loud, harsh blowing murmur at the

apex replaces the 1st Sound. 2nd inaudible
In the tricuspid area the murmer is heard
less loud. The 2nd is accentuated
in the aortic area. Loud venous
hum at the root of the neck. P 100
Small & weak. Fig 63

A drop of blood under the
microscope shows marked relative
increase of White corpuscles, About 40
in each field. The coloured corpuscles
form rouleaux very badly.

Menstration has been deficient
& irregular for 12 months. absent
for 4 weeks.

The pulse tracing Fig 64 a week later
was taken. It shows feeble Systolic
impulse. This however was probably
due to the fact that the patient
had just dined.

Ten min. of liqr. Arsen. was now combin-
ed with the previous mixture.

There has been no hoemorrhage
since she began the Iron preparation.

A week later Fig 65
was taken. P 112. Patient is now
able to stand but too weak to walk.

A month later the patient had so far recovered as to be able to go out of doors. There is slight color in the lips and nails. The cardiac murmer is much as before. P 100. Very small. Fig 66 shows a much smaller systolic wave with dicrotism absent.

About a fortnight later she had a few slight bleedings from the nose with pain in the iliac region. probably vicarious menstration.

Fig 67 was taken a month after the last nearly 3 months after the first tracing. The anemia was decidedly less, but the state of the heart unchanged. Pulse still keeps about 100 or 108. It now shows an improvement. For the 1st time there is a tendency to predicrotism and the upstroke is more vertical. The apex is still pointed & the dicrotic wave very large.

Auscultating very carefully I heard a faint systolic sound in the aortic area. There would seem

here to be some connection between the simultaneous appearance of a slight predicrotism and a faint systolic sound.

Fig 63

64

65

66

The patient was low & weak. I therefore prescribed X min Tr. Digitalis ter die. After the patient had taken it for 7 days I took Fig 68 It shows a vertical ascent not so high as in those tracings when the low arterial tension was so marked;

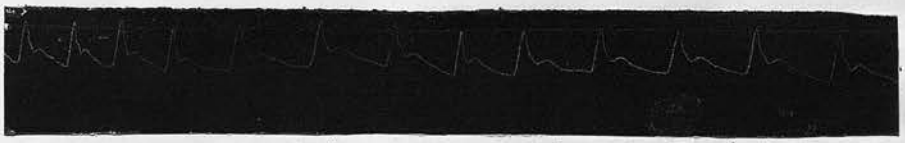
present
predicrotism & the dicrotic wave
smaller. P 84 less compressible.
The mitral murmur is louder
the beat is stronger & there is an
approach to a 1st sound in the
mitral area. Four days later
Fig 69 was taken. Pulse 64 & stronger.
Five days after this the pulse
was reduced to 52 & the patient was
much worse. The pulse is weak,
jerky & irregular. incompressible.
The mitral murmur is not so
loud & follows a faint first sound.
Fig 70 shows a small upstroke.
Systolic & diastolic phases, both
prolonged. dicrotism present.
The digitalis was stopped
and the patient treated with a
mixture of dialysed Iron and
glycerine. one of the former to two
of the latter. This I found a good
way of administering dialysed Iron
as it does not change. One teaspoonful
was taken thrice daily.
In one week she had taken 1 oz
of dialysed Iron with marked benefit.

Fig 67

68

69

70



71

72

73

74

75

her lips & conjunctivae already showing an improvement in color. The pupils are not so dilated they dilate more when she sits up than when she lies down.

Dilatation of the pupils is considered by psychologists to be connected with brain anæmia. This patient has an anæmic brain & always had dilated pupils. Sitting up the blood flows more easily from the brain & the anæmia is more than when she lies down, consequently the pupil dilates more sitting up than lying down. I took care to guard against the influence of light, but even when her eyes met the light sitting up the pupils still dilated.

Fig 11 Shows the effects of the digitalis to have passed off. It had resumed the character due to it on account of the mitral lesion. There is however this improvement that the line of descent does not fall right to the

line of the tracing as before the digitalis. Predicrotism is absent P is 72 fuller & strong.
Fig 72 taken a week later shows much the same character. P84. Tgg The line ascends with deep inspiration the waves becoming less. Showing abdominal respiration to prevail. There is a slight return to predicrotism.

The lips are now quite red nails pink. The patient says she has benefited more from the dialyzed iron than from any other drug.

The cardiac murmur a month later, altered from harsh blowing to a sharper whistling character. Low arterial tension though not less than before. There is slight predicrotic wave. dicrotism is well marked & the apex pointed. Fig 73

Fig 74 shows the apex tracing, which reveals the typical character of mitral incompetence, slanting apex with systolic descent in which is a small terminal systolic

wave, dicrotic wave marked.

A tracing taken at the interspace above the apex beat shows all the character of a normal heart. see Fig 75 This I cannot explain.

Two weeks later the patient menstruated, the first time since 7-8 months. A week later she had an attack of Epistaxis a steady continuous drop. I was sent for 12 hours after it and checked it by plugging the anterior nares She was very weak. P.120 & palpitation so bad, that one could hear the heart knocking against the chest wall 2 feet off. The Fig 76 however shows that the heart's impulse was very feeble. It shows a tracing at the apex. & ~~one at the interspace above~~, Fig 77 was taken at the interspace above the apex beat. The ~~apex~~ line descends with Expiration.

Fig 76

Fig 77

78

79

Fig 78 of the radial & Fig 79 of the apex ~~& interspace above~~ were taken ½ an hour after 20 mm of Tr digitalis. The excitement of plugging may mask the effect of the drug.

Patient was treated with X rn. digit. tri die. which removed the palpitation & reduced the pulse & the patient felt stronger.

Fig 80 was taken the following day

Fig 81 Still 2 days later.

The pulse in each case 100 & small in the latter the predicrotic wave occurs, & the first mitral which had disappeared is faintly audible again. After continuing

The digitalis for five days the pulse fell to 72 & became less compressible. Fig 82 shows the radial tracing the Systolic wave is pointed but the dicrotism is less. Fig 83 shows the apex tracing & that at the interspace above the latter shows normal characters the former those of mitral incompetence. & there is greater irregularity in the force of the different contractions.

Fig 80

Fig 81

Fig 82

Fig 83

The patient resumed the digitalis

Iron and improved rapidly, soon being able to go out of doors.

Fig 84

85

This case shows the typical characters of mitral regurgitation both in the radial & cardiac tracings Figs 84, 85. The dicrotic wave is exaggerated in the pulse but not in the heart tracing due to the low arterial tension. As the case improves predicrotism appears which shows that mitral incompetence benefits by treatment. The incompetence can get less just as it can get more. An incompetent valve is therefore not always equally incompetent but variably so. When the incompetence is less the terminal Systolic wave appears or is more marked; then

The presystolic wave appears whilst under opposite conditions these waves disappear.

Case 2. D. Oct 21.

This is a case of functional mitral incompetence. The patient had had rheumatic fever but without heart complication. He is a heavy Smoker & has gone in for violent exercise. He complains of nervousness & palpitation and his health generally was much impaired. P 100. Full, weak, compressible Apex beat 6-7 interspace, thumpy. A soft blowing Systolic murmur accompanies the first Sound. The 2nd is accentuated.

[redacted] Fig 86

[redacted] 87

[redacted] 88

The radial tracing Fig 86 is dicrotic with a pointed apex. Predicrotism is present. The indication is low arterial tension. Fig 87 is taken whilst excited & shows irregular action with a well marked terminal wave to the Systolic plateau. The dicrotic wave is very marked. Fig 88 was taken when the patient was quieter.

It shows a slanting apex more marked in some ways than others. The patient was treated with X.m. Ir. digit. ter. die. Smoking was discontinued & quiet regular habits were insisted upon.

Four days later I examined the patient. The pulse was so full hard incompressible. The murmur had disappeared but the first sound was impure & dull. The second sound accentuated & reduplicate. The radial tracing Fig 89 is normal so also the cardiac Fig 90. In the latter the terminal Systolic wave is well

marked.

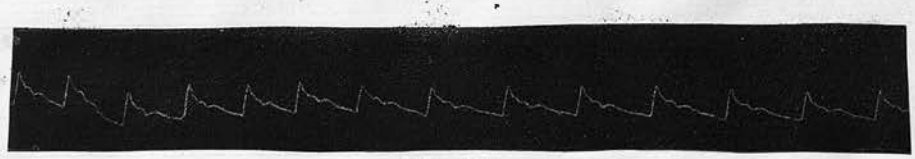


Fig 89.

Fig 90.

The Systolic plateau is broad & concave in the radial tracing the Systolic plateau is also concave between the upstroke and the predicrotic wave which latter corresponds to the terminal Systolic. The Sigmoid wave is marked and double pointed which if it is to be associated with reduplication is a double oscilation of the tense Sigmoids. The auricular wave is also well marked.

The digitalis was continued & four days later the following 4 tracings were taken. The pulse was 84 hard & incompressible. The mitral sound weak but no murmer. Fig 91 is normal, the

line falls with inspiration.

Fig 91

Fig 92

Fig 93

Fig 94

Fig 92 is the heart tracing which is weaker than before.

The patient was now permitted to inhale amyl. to see if lowering the arterial tension would have any effect on the heart tracing. The pulse rose to 100, became full & compressible. Fig 93 shows signs of low arterial tension but the predicrotic wave remains. Fig 94 shows the heart tracing unaffected. On auscultation the

Sounds are as before. There is slight palpitation. In the tracing the dicrotic & auricular waves are more marked & the systolic impulse is greater. The patient said the digitalis acted like magic & also increased his appetite.

His heart was weak and being strengthened set the whole machinery in working order again.

Case. C. S. Mitral incompetence. aet 18
brother to N. S.

Suffers from breathlessness after exertion. Apex 5 to 6 rib. Loud, blowing mitral systolic murmur.

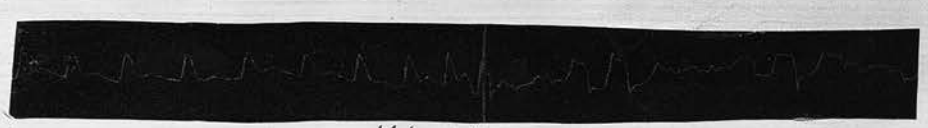


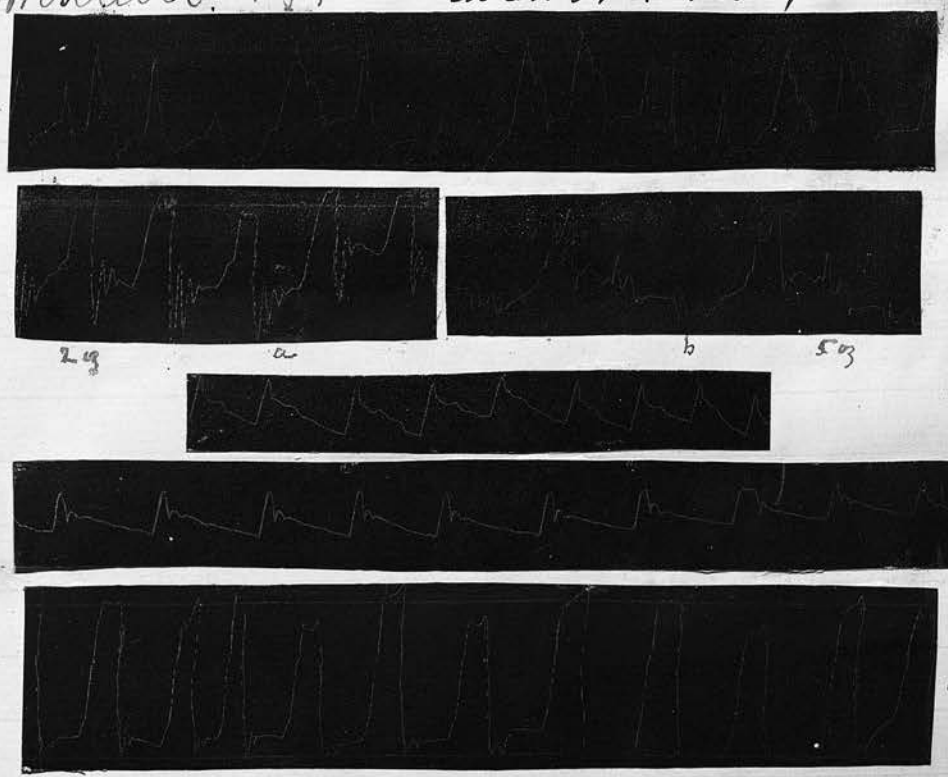
Fig 95

Fig 96

Figs 95 & 96 were taken at the apex & radial when patient was feverish from tonsillitis T 101 P 108. The terminal systolic wave is present.

Figs 97 taken later when patient was well

P 88. Tracing 99 shows low tension. The ventricular wave is pointed & slanting & of irregular impulse. X m. Tr. Dig. t. d. was prescribed. Figs 98 a & b taken at 4th interspace



Figs 100 & 101 show the heart & pulse tracings after four days on digitalis. The predicrotic wave which was absent is now well marked. The dicrotic wave which was in excess is now normal. The systolic impulse is greater & arterial tension increased. The previously slanting apex is flatter. Although there is this marked change in the pulse tracings & the pulse reduced to 60, the physical signs remain unaltered.

I have another case of mitral incompetence to discribe but shall place it under the heading of aortic incompetence with which it was complicated. These cases demonstrate in the pulse tracing low arterial tension by the tall pointed apex, the increased dicrotism & in bad cases absence of predicrotism.

A similar tracing will be shown to occur in the feverish state. Here one must always be aided by the Stethescope. The heart tracings shows in the ventricular wave a pointed apex with a slanting descent during the systole, which leads to the absence more or less complete, of the terminal wave of the systolic plateau. The Sigmoid wave may or may not be marked in the pulse tracing. The dicrotism is due to the low arterial tension in the imperfectly filled vessels.

Aortic Stenosis

The graphic characters of this disease are not always well marked.

If the obstruction be great, the line of ascent is gradual showing that the ventricle empties slowly. But this would not occur where there was a hypertrophied ventricle able to overcome the resistance.

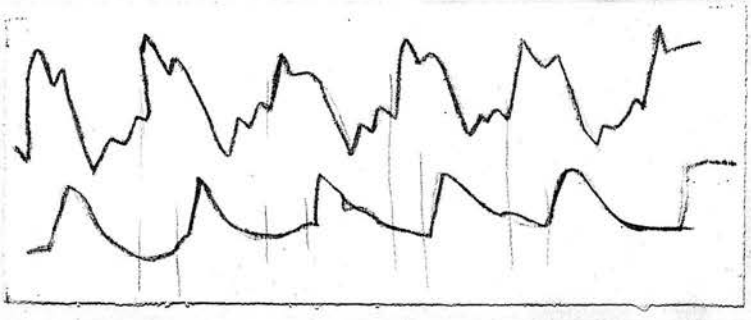
Marey says the absence of dicrotism is a marked feature & is also a proof of slow penetration. But if the Sigmoid valves are competent why should dicrotism be absent? In the tracings I show, dicrotism is less marked when the horizontal posture is assumed whereby the arterial tension is increased; but it does occur in the erect attitude.

By lowering the arterial pressure the slow penetration of blood into the aorta, which as Marey says, diminishes dicro

tism, is obviated.

Reyt, in an article (The Sphygmographic indications of heart decease Cincinatti Lancet & Clinic 19 April 1879) says one of the marked characters in aortic Stenosis is the long duration of the ventricular Systole. He also found a greater delay in the radial pulse & that the auricular Systole produces a marked effect in the cardiac pulsation. and a slighter effect on the radial pulse. The following diagram is copied from his article and illustrates these points. fig 102

Fig 102



Case E. I. Male oct 11

Suffered from heart disease all his life. He is very delicate and poorly developed, he has had rheumatic fever. Exam of heart. Apex beat visible & thumping between the 6th & 7th ribs. Precordia drawn in. No thrill. Ausc. mitral area. Soft blowing systolic murmer. Heard faintly in the axillary line along the rib. 2nd markedly reduplicate. aortic area a loud systolic murmer which is heard in the arteries of the neck. The murmer is loudest about the level of the third or fourth left costal cartilages. The reduplication of the second is also heard - it disappears when the patient lies down. P. 80 small. no visible pulsation. He has constant pain in the left shoulder.

Diagnosis aortic stenosis with mitral regurgitation. The latter probably due to the backward

pressure.

Fig 103

Fig 104.

Fig 103 & 104 show the radial pulsation. The former recumbent, the latter standing. In this, where the arterial tension is lowered, the ventricular wave is more sudden & dicrotism more marked. In some of the waves there is a slight oscillation before the upstroke which is due to the auricular Systole. In the first, where the horizontal posture raises the arterial tension, & thus intensifies the effects of the disease the upstroke is feeble and slanting, the dicrotic wave is just sufficiently perceptible to demonstrate the prolongation of the Systole.

A few months later I took

The following series of tracings the patient being horizontal.

Fig 105

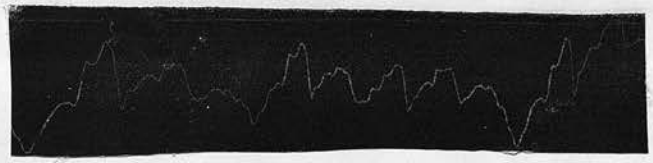


Fig 106

Fig 107

Fig 105 shows the radial pulse which was 84. The line descends with inspiration and ascends with expiration. Fig 106 is a heart tracing taken while the patient was excited. It demonstrates great irregularity. Fig 107 was taken when the patient was quieter and here the marked character is the great exaggeration of the auricular wave. In both the ventricular systole is of long duration but this is better shown in the previous tracing. Where the heart

beat was rapid & excited, & one would expect narrow sharper waves. A few of the waves show a slight slopping where the terminal Systolic wave ought to come. This may be produced by slight regurgitation but in most cases the terminal systolic wave is well marked & even produces predicrotism in the radial tracing. Mitral regurgitation therefore, is not in this case, an important feature even though there is a very distinct murmer in that area

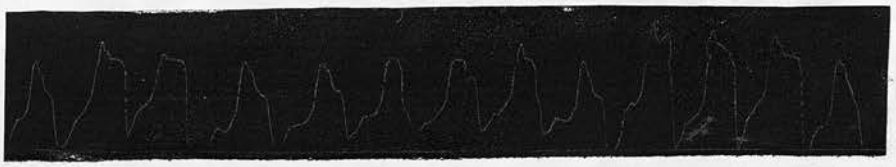
I treated the patient with X m. Sr. Digit F. d. & after four days took the next series of tracings.

Fig 108 shows the radial pulse when horizontal. It was reduced to 72.

The more pointed apex than in fig 103 demonstrates a stronger ventricular impulse almost resembling fig 104 where the ventricle had less resistance to overcome. Predicrotism is absent,

the arterial tension being increased by digitalis. The physical signs are unaltered.

Fig 108



109

110

111

112

Fig 109 taken at the apex when the patient was quiet shows the exaggerated auricular wave and the strong ventricular impulse. The apex is pointed & slanting which indicates an increase of the regurgitation. This is probably

due to the increased arterial tension. Fig 110 & 111 were taken when the patient was excited. Fig 112 represents the pulsation felt at the 4th inter space. Here the auricular wave is also marked.

Aortic Incompetence

Chauveau & Marey perforated the sigmoid valves in a horse taking a tracing with a cardiac sound of the left ventricle both before and after the operation. Fig 113 is copied from Marey's work p 674 showing the result.

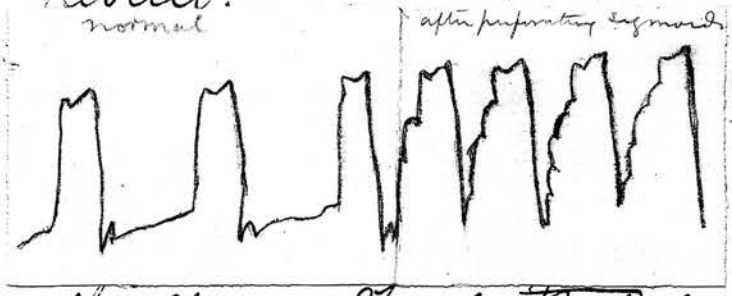


Fig 113

The diagram shows that as soon as diastole commences the blood flows back into the ventricle causing a gradual & jerky ascent until the next ventricular systole. The summit & descent are unaffected. There is no sigmoid

wave. These characters are very marked; the same type occurs in the human subject in this disease.

The waterhammer, or Corrigan's pulse, caused by the sudden filling & emptying of the artery is not due, as generally thought, to hypertrophy of the left ventricle. The same observer found the pulse of the facial artery of a horse, changed its characters at once when the lesion was produced artificially as the diagram from Marey's work page 677 shows.

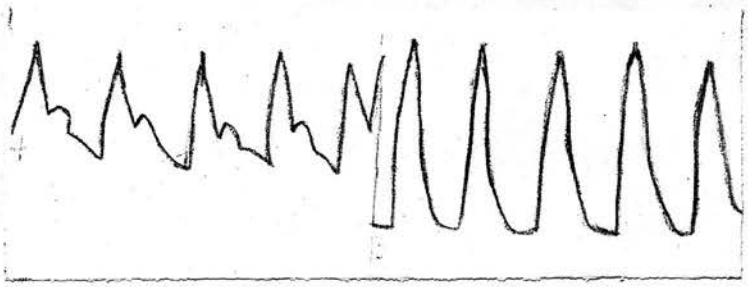


Fig 114

The speciality of the pulse wave is the enormous fulness of the Systolic wave and the sudden ascent. The true cause as Marey

Chauveau considers is the lowering of the arterial pressure to the minimum by the reflux into the ~~ventricle~~ aorta. The greater the incompetence the less the diastolism.

An example is given below of Corrigan's pulse with aortic incompetence but it is complicated with aneurism of the Innominate artery. Case

Case R. P. Male aged 34.

Ecsam of heart. Apex beat 6-7 intr space immediately outside the mammary line. Slight thrill.
Percussion reveals abnormal dullness over & to the right of the manubrium Sterni.
Ausc. mitral 1st clear. Soft diastolic murmer at the apese.
Tricuspid area. 1st Sound muddled loud diastolic murmer.
Aortic area. 1st Sound audible. A blowing murmer accompanies & follows the second Sound. The murmer gets louder as one listens

lower down the Sternum.
Pulm. area 2nd Sound distinct.
Behind the right Sterno Clavicular joint is a large pulsating tumour. The heart Sounds are audible over it & there is a bruit.
P 108 irregular. The pulsation of all the arteries is visible. The right radial pulse is slightly delayed after the left.
Diagnosis. Aneurism of the innominate artery, dilatation of the aorta producing incompetence of the Sigmoid Valves.
Treatment. Patient was treated for flatulence which caused palpitation, and cautioned against over fatigue or exertion.
As soon as the flatulence was cured the pulse fell to 80 & became regular. Examining now in the aortic area a Sharp ringing 2nd is distinctly heard to precede the diastolic murmer which, as before, is heard louder lower down the Sternum. There was also a distinct

Circuit over the aneurism. The delay in the pulse was as before.

This delay is considered by Weber (dissert. inaug) as due to the clots in the sack forming an obstacle to the flow of blood. Marey (in the circulation of the blood p 631) thinks it is due to the elasticity & expansion of the sac, which Broca pointed out was the cause of the weak pulse.

Francois Franck in the journal of anatomy & physiology for 1878, attaches great importance to this delay of the pulse, as of great value in the diagnosis of aneurisms. He found the delay was $\frac{5.04}{100}$ of a second. This delay he considers of more value than the change in fulness of the pulse wave.

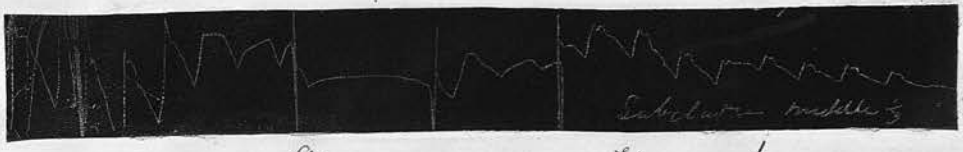
Figs 115 to 118 were taken when the patient was relieved of the palpitation. Fig 1st is the right radial pulse. There is great fullness of the wave due to the very low arterial pressure. The apex is pointed and the descent

is very abrupt especially during the Systolic period. This is due to the Sudden emptying or refluxe which, as it occurs during the Systolic period, must be into the aneurismal Sac it self. This is of great importance. If the Sudden descent came after the dicrotic wave then the refluxe would be into the ventricle from incompetent Sigmoids. This in its self ought to be valuable in the water-hammer pulse as it indicates whether the refluxe is principally into the ventricle or into an aneurism or dilated aorta. The dicrotic wave in this case occurs after this marked and rapid descent which however still continues showing the incompetence of the aortic valves. Figs 116 & 118 are taken over the aneurism it self. The ascent is Sometimes marked with a jerk before it reaches its height; or it is vertical with a flat apex. Those would indicate that the dilatation continues after the first Systolic impulse. The

pulsation was so violent that the paper could not always include it.

Fig 115

Fig 116



a Fig 117 b

Fig 118

Fig 117 b is taken over the middle third of the subclavian. The ascent is in some cases abrupt in others gradual from slow filling of the vessel. The apex is flat which indicates that the vessel is distended for a short time & then, suddenly emptying, the descent is abrupt. Dicrotism is absent.

The patient lived very quietly & his general health was good. He died

not suffer from palpitation unless he had flatulence. Four months later I again examined him when he felt quite well. The physical signs were the same but the murmur did not seem so loud & the aneurism was not so pulsatile. I thought it smaller.

Fig 119

Fig 120

121

122

123

Figs 119, & 120 show the right and left radial arteries. The former was

Slightly delayed Fig 121 taken at the apex does not show signs of aortic incompetence.
Fig 122 taken over middle ⅓ of left subclavian. shows the same features as already described
Fig 123 taken over ~~the~~ first portion of right axillary.
This patient always found Alcohol do him harm. Stimulation was bad for the heart. Caused more forcible contractions, increased the tension in the Sac. For a similar reason digitalis is contraindicated in these diseases.

Mitral Stenosis

The physical signs of this disease are a thrill at the precordia and a presystolic murmur; or sometimes, a hard grating or reduplicate mitral. But as the physical signs are in many cases not well defined there is in consequence much difference of opinion about the lesion.

The effects of the stenosis is to cause a delay & deficiency in the repletion

of the ventricle. The former lengthens the diastole. The latter lessens the volume of the ventricular wave. This does not reduce the arterial pressure, as in cases of mitral incompetence, because the diastole being prolonged the rate of the pulse is decreased. This increases arterial tension.
The auricular systole is effected with difficulty.

The character of the pulse tracing will be considered as cases are described.

S. J. male oct 10. (brother of E. J.
Exam. of heart. Apex beat perceptible & thumping between 5th & 6th ribs. A marked thrill felt. Precordia drawn in. In mitral area 1st sound very harsh, grating & reduplicate "thrumpy." 2nd sound accentuated, reduplicate in aortic & pulmonary areas.
Pg 6 small & compressible.
Fig 124 and 125 represent the radial pulsation at 2 different times.

They show full Systolic wave, but pointed. Predicrotism absent. Dicrotism not marked. Diastolic period in the former prolonged.

Fig 124

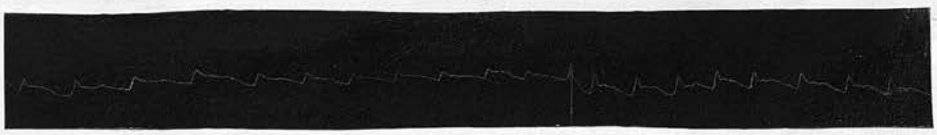


Fig 125

4-5 interspace Fig 126 5-6 interspace

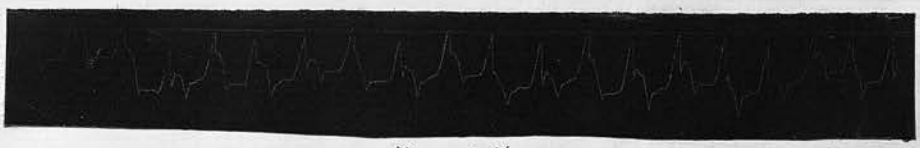


Fig 127

Fig 126 & 127 show the cardiographic character. Resembles wave of incompetence in having pointed apex. Shows blood have to be of small volume & the emptying of the ventricle to be sudden & easy. This is due to ventricle being imperfectly filled.
It is possible that there may be occasional regurgitation as some of the higher

upstrokes have a slanting descent during the systole.

In the former tracing when the patient was calmer there certainly occurs a prolonged diastole. The dicrotic wave is present but the auricular wave is absent. This may be that the slowness & difficulty of the auricular systole produces less effect on the blood column in front

The chief characters in this tracing are

1) weak radial pulse
2) small volume of ventricular wave in both tracings
3) lengthened diastole
4) absence of auricular wave.

Case W. E. oct 35.

The patient has suffered for years from angina, sometimes assuming an alarming character. /
He is constantly subject to a slight pain at the precordia & down the left arm. The attacks yield to amyl & Sometimes the constant pain

disappears for a time also after the inhalations of the drug.
Auscultation reveals only a grating mitral. Some whom he consulted considered his a case of Stenosis.
P 42 small & hard.

Fig 128

" 129

" 130

" 131

Fig 128 taken when patient suffering from his continual ache at heart. Shows small Sudden ventricular Systole, prolonged diastole, neither predicrotism nor dicrotism present.
Patient inhaled amyl till the pain was almost gone & the flushing effects

were produced. Pulse rose to 96, became fuller & softer.
Fig 129 shows small dicrotic wave.
Fig 130 taken a little later, amyl still being inhaled.
Fig 131 shows the pulse when effects of amyl had passed off & pain had slightly returned. Dicrotism has disappeared. The tracing is resuming its early character but the pulse is more rapid than usual.
Four months later the patient came to me about midday. Had had a very bad attack the previous night. the pain & palpitation had continued through most of the time I saw him it was not quite so severe. Pulse 84. Small, hard almost thready

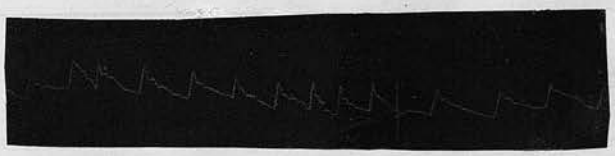


Fig 132

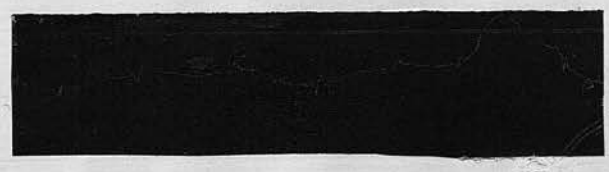


Fig 133

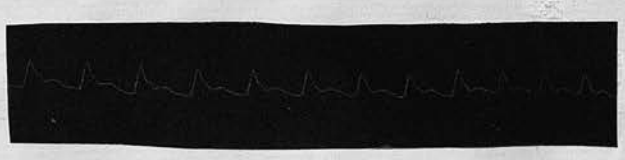


Fig 134

Fig 132 shows the radial pulse. The predicrotic & dicrotic waves occur, diastole is prolonged. (In the early part the paper moved very slowly thro' sphygmograph).

Fig 133 shows apex tracing. It very much resembles the radial tracing Fig 128 and that of S. T. (page 87).

Apex is much smaller & pointed. Diastole marked & prolonged. The auricular wave is marked. (possibly some increased spasmodic contraction).

Patient inhaled amyl till the pain entirely left

Fig 134 shows a completely different pulse wave, fuller ventricular systole & increased dicrotism.

Pulse rose to 120, became fuller and softer. I was unable to get a heart tracing after the inhalation of amyl.

Patient treated with atropine 1/36 gr. t.d. produced great dryness of the mouth & increased the pain & palpitation.

The effects of amyl are too well known to require a description

The tracings show how, by the appearance of dicrotism & increased fullness of the ventricular wave, arterial tension is lowered by its inhalation.

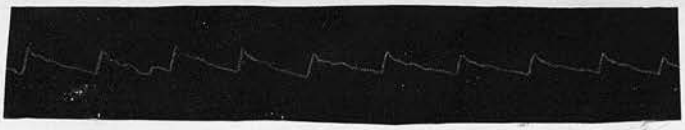
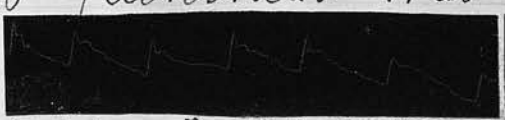


Fig 135

Fig 136

The patient continued the atropin but took only ½ a dose that is 1/120 of a grain; even this made him much worse increasing the cardialgia. It was therefore discontinued.

Lowering the arterial pressure did not in his case relieve the angina pectoris. As the pain & faintness was so much worse



Lyon p64 Fig 137

Fig 137a Sitting P76

Fig 137 b Sitting after amyl P100.

I now tried X m. Tr Digit t.d. which relieved the pain, though it did not disappear, & the faintness Fig 135 & 136 show the radial tracing when the atropine was stopped, the first sitting the 2nd lying. P 100. Fig 137 was taken after ~~ten~~ days on digitalis the patient horizontal It shows strong impulse & normal tension.

Fig 137 the patient sitting. Fig 138 after Amyl which relieved the pain entirely.

Case H. B. Male oct 24. Tall well built.

Suffers from pain at the precordia.

Pulse 60 per min. full, rather soft and compressible.

Apex beat 5-6 rib

Thumping. Slight thrill.

Mitral 1st grating markedly reduplicate. The 1st part being softer. It might be a pre-systolic murmur.

Aortic sounds normal.

Fig 138 of the pulse shows slanting rather pointed apex, feeble impulse for so muscular a man and slight dicrotism. Diastole prolonged.

Fig 139 Shows heart tracing. A decidedly prolonged diastole, also a well marked auricular wave.

Fig 138

Fig 139

Fig 140

Fig 141

Fig 140 is another tracing of the radial. After patient had taken Fr. Belladonna. Pulse was 72 compressible irregular. This tracing resembles previous one but shows more irregularity. Fig 141 is the heart tracing

Case. Mr. C. Oct 48.

Complains of palpitation & pain at the precordia & down the left arm & shoulder. Apex beat visible between 5th & 6th ribs. Right border 2 inches from the middle line

Mitral Sound harsh grating and reduplicate. P. q 2. Small and compressible.
Treatment 10 m. ~~th~~ Digit t. d.
Four days later 1 one hour after a dose Pulse was 84 less compressible Mitral Sound not so grating. Patient felt better.

Fig 142

Fig 143

Fig 144

Fig 145

Figs 142, 143 taken before treatment. Apex in pulse curve is flat, due to senile changes. Heart tracing shows rather prolonged diastole. After digitalis the pulse curve

is fuller & higher, the heart tracing has a slanting apex almost suspicious of regurgitation. Figs 144, 145

Fig 146

Fig 147

Fig 148

Fig 149

Cases

Figs 146, 147 taken from same patient, a boy aged 10, the first erect the second horizontal. A marked thrill at apex with a presystolic murmer P 90. Fig 148 from a girl aged 10 with marked thrill & grating reduplicate mitral.

Fig 149 from a young woman with exophthalmos & mitral stenosis.

Another case I have but will

describe it under the clap irritable heart. Which was also a prominent feature in her case.

Fatty Heart

Case No. 50.

When I saw the patient She was suffering from acute eczema which spread from the legs & arms all over the body & head. She had for a long time been unable to obtain sufficient food. Cadeoil afforded temporary relief but wet boric lint was more effectual. It however yielded to no treatment. The urine thick & albuminous. There was a large deposit made up entirely of fat globules and granular debris. P100. T102 Heart Sounds very weak. A faint musical murmur heard at apex which was absent Sometimes Fig 150 Shows a very feeble Systolic impulse. Ascent low & slanting.

Apex round. Tirotism absent.

Fig 150

Fig 151

The indication is that of a weak exhausted organ. Diagnosis was fatty Kidney & fatty heart. Prognosis very unfavourable. Doubtless the State of the Kidney was the reason why the Skin complain made no progress. I prescribed 10 m. liq. Arsen. t.d.

About a week later I took the Second tracing. fig 151 The patient felt a little better. P. 100 T 101. 4. Mitral 1st louder. The tracing shows a Stronger impulse. Patient was subject to attacks of dyspnoea with a tendency to Syncope. A fortnight later the patient died Suddenly & no autopsy could be obtained.

Pericarditis

Case. C. N. female aet 20.

Patient complained of pain at the heart, palpitation & breathlessness. Pulse 50 weak intermittent. A marked thrill from friction is felt over the heart. Dullness of right border 2" to the right of sternum.

Ausc. Loud, harsh murmur like a coarse saw is heard all over the chest back & front. The maximum intensity is over the 4th left costal cartilage. The murmur does not vary much with change of posture. No valvular sounds are audible.

Fig 152 taken whilst sitting shows a very feeble ventricular impulse, with great irregularity. Dicrotism is absent.

The patient refused to remain in bed. She was ordered Sinapisms & 20 m. Hydrio-Bromic acid t.d. This relieved the palpitation but the physical signs were unaltered.

Fig 153 was taken when patient felt

femt & 2nd daly When recovered.
The former shows weak impulse & the pointed apex denotes low tension. In the latter, upstroke is higher and also shows signs of low tension. She was now obliged to keep in bed.

Fig 152

Fig 153

Fig 154

4th day. 3 days after last tracing. Fig 154 was taken. P. 60 small weak compressible very irregular. Physical signs unaltered but patient is much easier in bed.
12th day P. 64 irregular in time & duration. Murmer is single over 4th rib. Triple or double below this level. This last tracing shows this

irregularity. The systole is stronger with a tendency to a flat apex. Frémitus is slight. The systolic period varies very much in duration. The diastole as a rule is prolonged. The external friction impedes the expansion of the ventricle. The heart in consequence is not so well filled and the blood waves are small & feebly projected on account of the obstacle which the friction presents. I changed the treatment & gave 10. m. Tr Belad. t.d. My object was to lower the arterial pressure & thus relieve the heart. I also hoped to lessen the pain which, though relieved at first by the Hydro Bromic acid, returned. The fact of pain occuring at the heart proves the existence of a sensory nerve.

Ludwig & Cyon discovered a depressor nerve in the rabbit. Stimulation of the ~~peripheral~~ central end ~~nerve~~ gives pain, lowers the arterial pressure & retards the

hearts action.

Sensory depressor fibres are contained in the vagus. Kreidmann has discribed (Arch f. Anat Entwick. of His & Braun) in 1878 a depressor nerve in dog & man. Finkelstein in 1880 described a depressor nerve in man rabbit dog cat & horse. (loc. cit. 405 Vol. 1880)

In this case probably the pain acting on the Sensory & depressing nerve caused the slow pulse. Belladonna at once relieved the pain; When it was discontinued the pain returned but was again relieved by Belladonna.

Atropin paralyses the terminal filaments of the vagus so that stimulation of it has no effect in inhibiting the heart.

I took Fig 155 before the patient began Belladonna P. was 60. The friction murmer at times double & treple & still loudest over the 3d & 4th costal cartilages. The tracing shows feeble impulse, flat apex & diminished dicrotism.

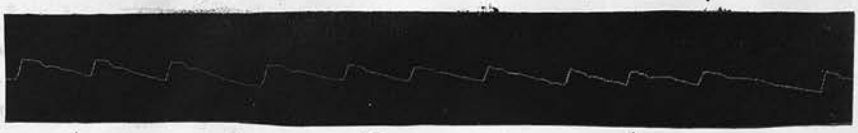


Fig 155

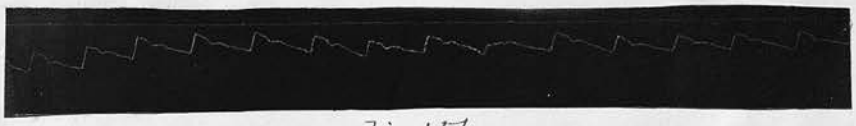


Fig 156

Fig 157

Fig 158

Fig 159

Fig 160

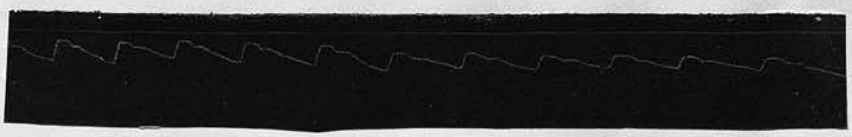


Fig 161

Fig 162

The patient began with X m doses

Twice daily - often took extra doses as it relieved her so much.
Four days later. 37th day. I took Fig 156. There is greater regularity. The wave is small but there is a slight appearance of dicrotism. P 92 compressible. Murmur no longer double or triple but single & I sometimes heard a faint aortic 2nd.
Four days later. Patient not at all well. P 84 intermittant. The murmur is single. Aortic 2nd is faint but more audible when the breath is held.
Fig. 157 shows great irregularity & increased fullness of pulse wave. The duration of the systole is very short the apex is flat.
The dose was increased to 16 m. Though the dry mouth & dilated pupil show that the smaller dose produced physiological effect.
45th day. or 6th week. P 92 small & compressible. The murmur is as harsh & grating as before & is to be felt like a rasp. It is systolic and

the 2nd is audible at apex but not at the base where the murmur is louder. Fig 158 indicates lowered arterial tension. The apex becomes pointed & dicrotism appears.
53d day P 66 intermittent. Fig 159
53rd day. Patient took 5 or 6 doses instead of three. The result was spasm of the Sphincter of the Vesical organ with difficult micturition. P 100 soft compressible.
Typical Signs as last described but the 2nd is much more distinct & is also heard in the aortic area. The amplitude of the ventricular & dicrotic waves is much increased. Fig 160. Belladonna has accelerated the heart & lowered arterial pressure, so the ventrical sends rapidly small waves of blood into the arteries. Dose reduced to 10 m.
59th day. P 78 compressible. Patient anxious to get up.
Fig 161 P 78.
63rd day. P 76 compressible.

Bella stopped two days ago. To begin Ac. Hydro. Brom. Fig 162.
69th day P. 64 weak Patient worse. Murmer Systolic & prolonged to 2nd Sound audible. Fig 163 shows diminished dicrotism & increased tension. No relief to the Symptoms is afforded by Hydro-Bromic acid. The effects of the Belladonna having passed off, the pain returned with inhibition of the heart.

Fig 163

Fig 164

Fig 165

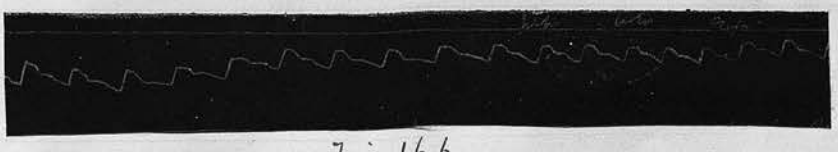


Fig 166

84th day. Patient obliged to resort to

Inj. Bellad. which gave immediate relief. Pulse rose to 84
murmer Systolic Fig 164
98th day. Pulse 96. Systolic friction murmer loud & harsh. but softer than at the early stage. It is loudest & Systolic over the 4th left costal cartilage and prolonged during the diastolic period. It is only heard over the heart not all over the chest as formerly. The thrill is less marked. 2nd Sound audible
The patient has taken 10 m. Tr. Bellad. t. d. Fig 166. This & the previous tracing show very weak Systolic impulse with a rounded apex. The muscle of the heart may be affected & slightly degenerated.
Fig 165 shows the cardiac tracing. The apex beat was feeble. The diastolic line ascends. The tracing of both heart & pulse fall with inspiration
The patient was able to get up and walk about though weak.

Case E.C. oct 26. Female.

This patient occurs again as a bad case of Scarlet fever & nephritis. She had pericarditis with a loud harsh Systolic murmur heard all over the heart but loudest at the 4th left costal cartilage, no thrill. Pulse 76 small. The friction murmur disappeared as soon as the patient took Belladonna, during the time she had Scarlet fever, the murmur returning when the Belladonna was stopped. The pericarditis was of old standing.

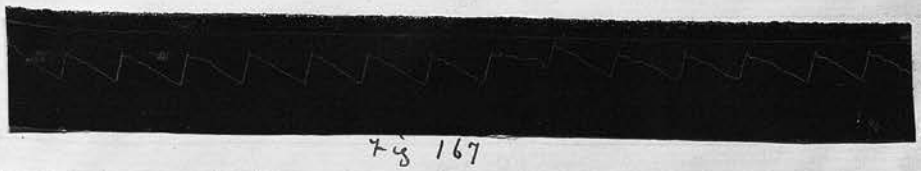


Fig 167

Fig 168

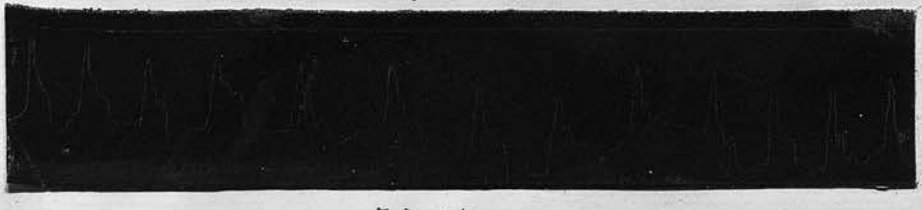


Fig 169

Fig. 167 taken 30 days after the Scarlet fever appeared when Scaling was

almost finished. It resembles slightly some of the tracings in the last case in having a flat apex, a short systolic period a prolonged diastole and absence of dicrotism. Figs 168, 169 taken a month later. Pulse incompressible. Pedicrotic wave is marked leading to a flat apex at times, in other waves the apex is more pointed. The systole is short while the diastole is prolonged. The latter is better seen in the heart tracing where the systolic plateau presents a very slanting character but with three oscillations. This shows that the ventricle empties easily probably due to imperfect repletion

The three oscillations during the systole would indicate competence of the mitral valve.

The sphygmographic characters of pericarditis are irregularity of the duration of the individual waves. The systolic

period is short whereas the diastolic is long due to the external friction. The dicrotic wave is absent predicrotism is present and being feeble leads to a flat apex. The arterial tension rises where the heart beat is slow. In E. C's case the arterial tension was not high the heart beat being rapid Her case demanded no treatment.

Belladonna benifited both cases & is indicated in this disease it lowers the arterial pressure whilst accelerating the heart & thus the work of the ventricle is made easier.

Tricuspid Incompetence

Potain has taken tracings of the jugular pulsation & gets two waves, a small one, due to the auricular systole which precedes the radial pulse, and a large one due to the systole of the right ventricle & which occurs about the same time as the radial pulse Fig 170 is copied from his work.

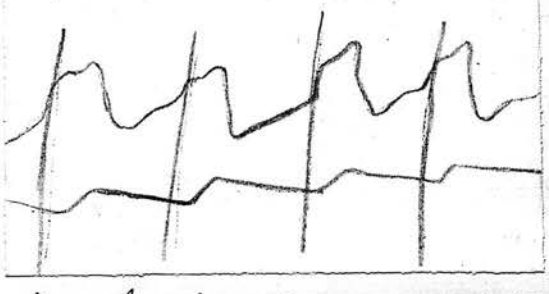


Fig 170

The radial pulse is small in tricuspid disease because, through the refluxe from the right ventricle the blood does not pass with sufficient pressure through the lungs and, consequently, the ventricle does not get properly filled.

In the above diagram the radial pulse is weak and devoid of the regular curves.

I have had one case of tricuspid

incompetence of which I have taken tracings but they seem so devoid of special characters that I almost refrain from showing it.

Case Mrs. S. oct 45.

Complains of pain at the root of the neck more on the left side & at the precordia, breathlessness & palpitation & swelling of the feet & abdomen.

Exam. of heart. apex beat thumping but diffused. Right border extends to about 1½ or 2" to right of sternum.

Epigastric pulsation. Venous pulsation in the neck on the right side.

A soft blowing Systole murmer is heard faintly at the apex but much louder at the tricuspid area. No aortic Systolic Sound. 2nd aortic accentuated. Diagnosed Tricuspid incompetence with dilatation of right ventricle (Mitral incompetence?)

Pulse 100 Small, weak & compressible.

Fig 171 Shows the radial pulsation the 1st part while lying the 2nd while

standing. The ascent is slanting showing weak impulse. The predicrotic wave is well marked, possibly on account of thickening of the arteries. The tracing removes any doubt about the mitral disease for the predicrotism would not be so marked if it existed.

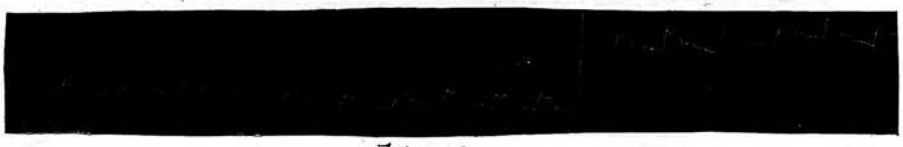


Fig 171

Fig 172

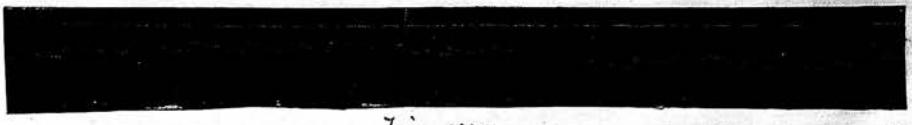


Fig 173

Fig 174

The patient was prescribed ℞ m. Tr. Digit. t. d. Three days later I took Fig 172 the 1st part lying the 2nd sitting. P. still 80 small. The cardialgia unaffected, the murmer more distinct.

In the tracing the impulse is more feeble apex flat diastole longer. Digitalis is considered by experience to be useless in Stimulating the right ventricle & this certainly supports that idea as the pulse wave is not Strengthened or improved.

As the cardialgia persisted the patient was permitted to inhale amyl till the pain quite left. The pulse rose to 120 & there was flushing of the face. The tracing Fig 173 did not undergo any alteration which is I suppose due to the action of the digitalis in keeping the arterial pressure high.

The patient continued with Digitalis for about 10 days

Fig 174 shows the same small pulse but the apex is more pointed.

Two months later the patient returned troubled with palpitation. Cardialgia & breathlessness the physical Signs were as first described.

Fig 175

Fig 176

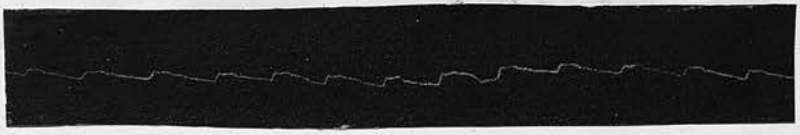
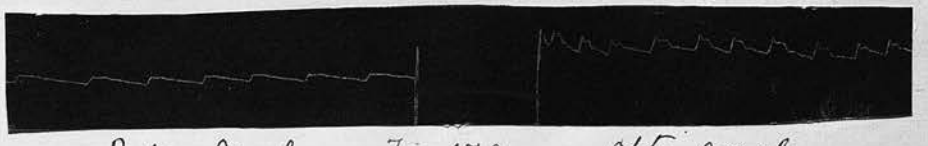


Fig 177

Fig 178



Before Amyl Fig 179 after amyl

Before amyl- Fig 180 after amyl-

Fig 175 shows a fuller pulse than before it resembles that of atheroma It was 84 & full but compressible. The patient lying down. The apex beat has diffused I succeeded however in procuring a tracing. Fig 176 It does not show much that is special.

The patient resumed Digitalis & 5 days later I took Fig 177 which shows the same form as the earlier tracings, although the pulse, which was 80, felt stronger to the finger.
Fig 178 shows apex beat. It is feeble & resembles the pulse curve.
Two days later another tracing was taken. Fig 179 Pulse 84, small & incompressible. Pulse wave very feeble. As the cardialgia was bad the patient was caused to inhale amyl which gave great relief. The pulse rose to 120 & the pulse wave at once became feeble. The probable cause of alteration in this case & not the former time was because the patient had not taken Digitalis during the last 2 or 3 days.
A month later amyl was again administered. Pulse ~~rose~~ from 92 to 100 becoming fuller & softer but again very little effect was produced on the pulse curve.
See Fig 180

Hoemorrhage

Hales in 1774, in his work on Hoemostatics (p 15), describes how that bleeding a horse caused the column of the manometer to fall, indicating a low arterial tension while the amplitude and frequency of the pulse oscillations increase

Lovain found that after uterine hoemorrhage the pulse wave increases in fullness as the result of a low arterial pressure.

Hunter in his work on Inflammation (chap 2) states that in animals killed by sudden hoemorrhage the vessels are contracted. The vessels contract after hoemorrhage, & when this occurs, the fullness of the pulse wave disappears.

Marey found (Thèse d'agregation Paris 1868 p 23) that when an animal undergoes repeated large hoemorrhages, it is the early hoemorrhage which produces the marked fall in arterial pressure. The arterial system seems to accommodate itself to the quantity of blood it has to contain.

Tappeiner on the rabbit; (Arbeit. aus d.

phys. Anst. zu Leipzig B VII S 193) & Solz upon the prog (Virchows Archiv. XXIX 539) & others have established the fact of the adaptation of the vessels to their contents when they are increased, without a notable increase of arterial pressure -

I will now describe 2 cases of severe uterine hemorrhage. The first from medullary carcinoma of the cervix. the latter from retained & partially adherent placenta

Case 1. L. at 50

There had been marked symptoms & repeated attacks for 6 months. When I first saw the case there had been slight hemorrhage for some days & the patient was much exhausted. P 84 small & steady Faint hemic murmurs at the apex & root of the neck. Fig 181 shows a full wave, deicrotism not well marked, which may be due to thickening of the vessels.
Treatment - ℞ m xv Liq Hist & xx m Ext Ergot liq. tid.
Two days later Stroke fig 182. P. 100 small. There had been no more hemorrhage The pulse wave is small & weak. The patient is very exhausted.

Fig 181

Fig 182

The patient was now treated with arsenic & iron pushed. But about a month later an attack occured which lasted 2 days. The hemorrhage being uninfluenced by gallic acid or ergotin.

The pulse was bounding full - 68. T 97.8 under the tongue. The patient was cold & the internal temperature lowered one degree

Hoarse systolic murmur at apex & base

Fig 183

Fig 184

Fig 183 shows great fullness of the pulse wave. The rounded apex shows the feeble impulse & that the resistance increases

during the systole - bisotism increased
Fig 184 of the apex. The ventricular waves are full. The systolic plateau is flat & unmarked by the oscillations which are caused by the tension of the mitral valve. This is because the ventricle being so filled the valves are not stretched

This radial tracing illustrates how deceptive it is to trust to the finger.

A month later there was a sudden attack & I saw the patient within an hour of its commencement. She was pale P108 small & compressible, Apex beat feeble 1st muffled & weak -

Fig 185

Fig 186

Fig 187

Fig 185 of the radial resembles the previous one Fig. 186 is the cardiac. The impulse is [illegible]

The sygmoid wave is well marked.
Two tablespoonfuls of brandy were administered & about 20 minutes later when the effects were felt I took fig 187. P 100 full & strong
The upstroke is strong & vertical & predicrotism more marked. The tracing resembles that of athroma in health.

A week later there was slight but continuous hemorrhage. Patient weak & P 120
I took fig 188
It shows feebleness & low tension

Fig 188

Case J æt-40

This patient had a severe attack of uterine hemorrhage, following on several previous ones. The patient was faint & pallid & cold when I took fig 189 The pulse was 120 small & weak

Fig 189

Temp. 96·8 under the tongue. Two degrees below normal. The tracing shows very feeble impulse.

½ hours later & 2 hours after ½ grs of Ergotin

Both fig 190. The patient had had a small quantity of brandy & hot water bottles applied T99·8 under the tongue P112 small

Fig 190

Fig 191

Fig 192

There is unusual arterial pressure & a return to normal contour

Three days later Both fig 191 which shows low tension. P120 full & compressible T99 General improvement.

Fig 192 is the cardiac tracing

Menorrhagia

The following tracings have been taken from patients while the above condition Existed

Fig 193 from a strong healthy young woman act 19 on the 3rd day. Menstruation for the first

Fig 193

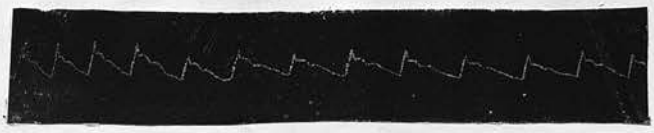


Fig 194

Fig 195

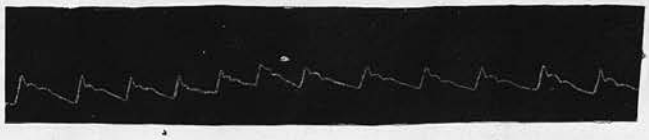


Fig 196

Fig 197

P 70 during + full. Apex pointed impulse weak

Fig 194 from a patient (51 wt 31 weak from Excessive childbearing + menorrhagia. every 3 weeks. This was taken on the 4th day - P80 - Patient horizontal.

Fig 195 on the following day. Misses Excessive P80 small + compressible. Heart-sounds weak

Fig 196 on the 3rd day after Tinct. Et-Digit-alis in 3 doses during the past 24 hours Misses checked P100 small. Heart

arterial tension is increased
Fig 197 was taken 6 days later to show the normal pulse

Anaemia

Case L.S. visit 6 N.S. act 18

Is anemic subject & fainting. There is a soft blowing systolic murmur at the mitral. It is not constant. The aortic valve is audible accompanied by a murmur These murmurs are variable. more distinct when she sits up. They are not heard there every day - They are hoemic
There is a venous hum at the root of the neck - P100 small & jerky

Fig 198

Fig 199

Figs 198, 199 were taken when the murmurs were audible at the mitral & aortic areas The aortic systolic murmur also heard

in the subclavian. The V1 was almost horizontal, the V2 almost standing
They show signs of very low arterial tension.

Four days later when no murmur was audible Electric fig 200
The venous hum was audible a systolic murmur in the subclavian
The characters of the tracing are as before

Fig 200

Fig 201

The patient was treated with ✕ m Liq Arsen & 20 m Liq Ferri Perchlor ter
She improved rapidly.
Ammthe later fig 201 was taken
The mitral sound was weak & not clear; resembled "thrupp", rather grating.
Arterial tension is increased
The tracing is not unlike that of mitral stenosis.
The anemia is cured & she was discharged -

Atheroma

In old people the arteries become less elastic & their walls thickened. In many cases atheroma or calcareous degeneration occurs. The vessels also become more voluminous on account of the constant increased pressure in them. In these cases the artery rolls under the finger & becomes hard & incompressible. In elderly people with atheroma there is always hypertrophy of the left ventricle which has more work to do in overcoming the resistance of the inelastic tubes. The force & suddenness of the pulse often aids in the diagnosis of hypertrophied arteries.

The arteries in health by their elasticity modify the pulse tracings as one gets further from the heart. See Figs 48 + 50 (p 34) But when the arteries are atheromatous they do not modify the oscillations of the blood wave. So that the pulse tracing resembles that of the heart. The pulse tracing

Therefore shows, suddenness & force of impulse & an exaggerated predicrotism.

That is it preserves the form of the terminal systolic wave which gives it a flat apex like that of the ventricular systole. The dicrotic wave is diminished or absent & the descent gradual. As the arterial tension is high, the resistance to the blood-wave is great.

Case H. Male aet 74.

Marked atheroma & hypertrophy of the left ventricle. Apex beat at 6-7 interspace and thumping. The mitral 1st Sound is loud clear & ringing. Pulmonary & aortic sounds also loud.

Fig 202

203

204

Fig 202, 203 shows the character discribed Fig 204 is a very poor apex tracing. It

was difficult to take as it was so diffused.

Case No 4. Oct 90

Well marked atheroma with hypertrophy of the left ventricle & bruit shows visible pulsation. Heart Sounds clear and loud.

Fig 205

Fig 206

Fig 207

Fig 208

Fig 205 Taken when patient was not very well & the mitral was weak. aortic 2nd clear & ringing.
Fig 206. When patient was strong and well. mitral 1st loud & thudding. Pgo hard & incompressible. These are exact

types of cardiography.
Fig 207 was taken when convalescent from an attack of pleurisy. Pg 2
Fig 208 shows the heart tracing at the same time.
There is a marked resemblance between the two. Later on I shall discribe this pulse & heart in the feverish state. See p 229

Fig 209

Fig 210

The above two figures (209, 210 show the pulse & heart tracing of a lady aet 60. P 84 small & compressible. Apex beat visible. Mitral patter weak.

Case Miss C. aged 60

This patient 2 years ago had severe epistaxis for which the posterior nares had to be plugged.
The vessels are thickened & the left

ventricle is hypertrophied. Fig 211 was taken when patient was very weak & unable to stoop without blood rushing to the head & palpitation. P. q6 small, hard & compressible. Heart Sounds normal but weak. Patient treated with X.m Tr. Ferri Perchlor with XX.m. Ac. Hydrobrom. t.d. This always did her good.

Two days later Fig 212 was taken. The pulse was q6 with missed or abortive beats. On auscultating the abortive pulsation was heard thus:

dupp-dupp-dupp — dupp dupp.

This irregularity is well shown on the 2nd q th & 12th beats.

Figs 213, 214, 215, 216, 217, were taken at different intervals during the following month the patient steadily improving. Pulse came down steadily from 90 to 72. The latter pulse waves are typically atheromatous. The early ones show how the atheroma modifies the weak pulse. It becomes feeble in impulse flat apex & absence of dicrotism.

Fig 211

Fig 212

Fig 213

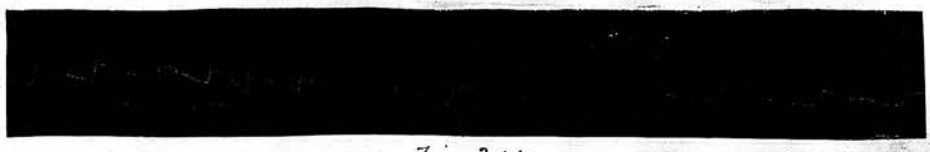


Fig 214

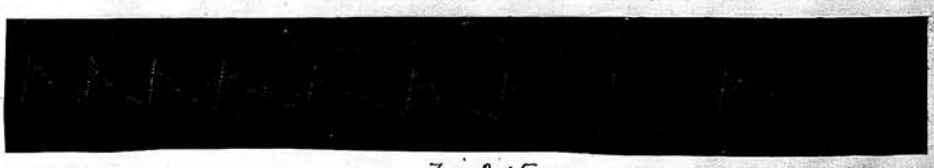


Fig 215

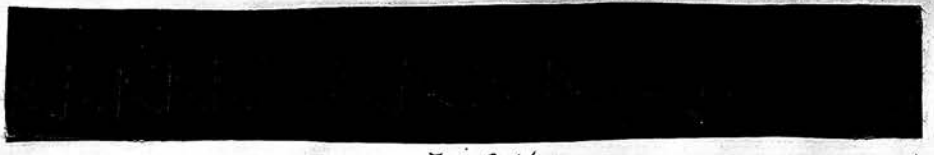


Fig 216

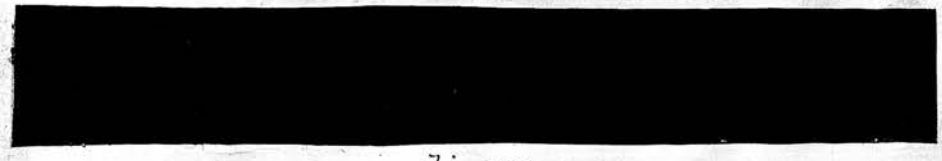


Fig 217

Three weeks after the last tracing patient had slight epistaxis with threatening of its return. There was also 'blood rushing' in the head & ears

and a sense of fullness & oppression in the head with buzzing in the ears. Flushing of the face, tenderness of Scalp. pulse 84 small regular. Heart Sounds normal. Extreme tenderness at the precordia. Fig 218 is a remarkable tracing yet the finger detected nothing.

The pulse tracing being atheromatous fairly represents the heart tracing which here I could not obtain These symptoms indicate the so called congestion of the brain which nature would fain relieve by epistaxis or the physician by a stroke of the lancet.

But in congestion of so important an organ the arterial tension would be lowered, whereas here the arterial pressure is extremely high. So great is the resistance which the ventricle meets that the Systole is considerably prolonged to overcome it. This is shown by the horizontal line which remains raised during the Systole

The dicrotic wave shows the commencement of a very short period of the diastole. It is an established fact that the arterial pressure is reflected to the intra-ventricular pressure. & therefore in this case the pressure in the ventricle is increased.

The arterial pressure was lowered by a strong purge

Fig 218

Fig 219

Fig 220

Figs 219, 220 were taken the two following days. They resemble the normal form. but the third day the dead Symptoms returned; the pulse was 90 & the tracing Fig 221 resembled in a lesser degree that of Fig 218

Fig 221

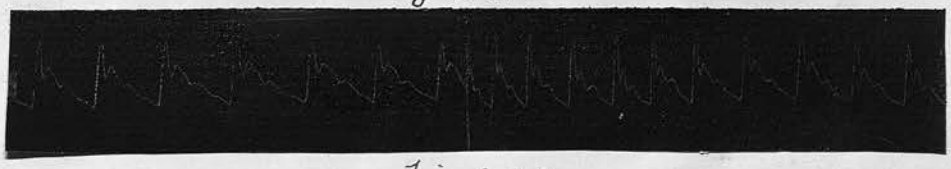


Fig 222

Having studied Moxon's lectures (loc. cit.) I was sceptical of the so called "brain congestion" & this was confirmed by the increase of arterial tension in this case, which, as I have pointed out, ought not to occur as is explained later on when speaking of acute diseases. (P 229)

Moxon (B. M. J. Ap. 16. 87) proves that the brain is paler when the face is congested. That there is no clinical evidence to support the theory of brain congestion in a case like this. That great increase of blood pressure in the brain produces no symptoms whilst giddiness occurs in a pale brain; that apoplexy occurs only

in anemia of the brain as the result of high arterial tension.

The argument is sound. These tracings, which I refer to, support his theory of increased arterial tension. Increased arterial tension is caused by contraction of the arterioles which means anemia.

Acting on this theory I permitted the patient to inhale amyl. When the pulse rose to 100 & became fuller and softer the 1st ½ of Fig 222 was taken. & later the 2nd half. The pulse 108. Head Symptoms quite relieved with a sense of comfort almost excitement.

Comparing the two tracings in Fig 221 the systole is prolonged & difficult the blood pressure is very high; whilst in Fig 222 the systole of the ventricle is sudden, rapid, short; the arterial pressure is low because amyl has relaxed the arterioles of the brain affording an easy outlet for the blood & diminishing the peripheral resistance.

What the physician accomplishes with the lancet, What nature effected by epistaxis, What was procured by an aperient I now obtained by the inhalation of amyl. – the lowering of arterial pressure.

Hemiplegia

Mr. H. Oct 6o.

Two years ago had an attack of left hemiplegia. His arm is contracted, his leg powerless. Heart Sounds normal, left ventricle hypertrophied

Fig 223

Fig 224

Fig 225

Fig 223 represents the right radial artery which is full & hard 72 beats per minute. Fig 224 shows the left radial which

feels Soft & Small, easily compressed. The characters are rather different. The left arm flabby, nutritive processes go on slowly & the vessels share the same deficiency.

A heart tracing could not be obtained. one of the right carotid Fig 225, which closely resembles that of the heart, was however taken. The elevated Systolic plateau shows that arterial tension increases during the Systole of that, on account of it, the ventricle meets a growing resistance during that period. The descent in the more regular waves is sudden & the Sigmoid wave is almost absent.

The left radial tracing resembles the carotid more than the right radial does.

Case Miss C. oct 65.

Had an attack of left hemiplegia 2½ years ago. She can walk with assistance & can use the left arm slightly. There is aortic Stenosis, with regitations.

Pulse 64 - 68. intermits about every 4th beat. On auscultation in aortic area. the Systolic bruit is absent at the intermittents but the 2nd Sound is loud & clear as usual. At the apex there is great tenderness. Fig 226 shows the right radial. Fig 227 the left radial. When patient was calmer. The slightest excitement increasing the pulse & obscuring the intermittance. The patient Suffered from headache which is often attended with Sickness.

Fig 226

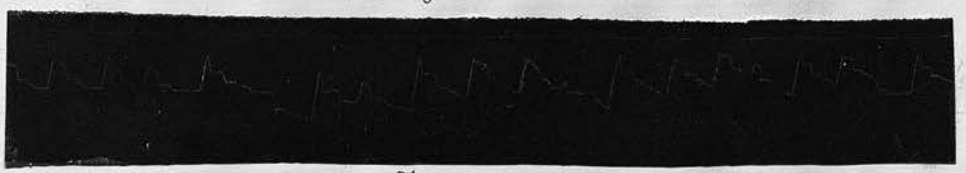


Fig 227

Fig 228

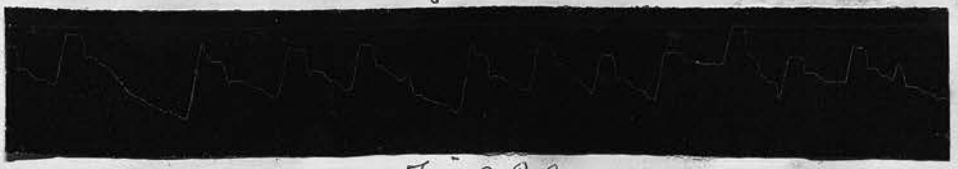


Fig 229

Amyl was tried, it relieved the headache but did not affect the intermittance. Fig 228 was taken with a pulse 76; & Fig 229 when pulse was 84 full & soft. Re auricular wave is well marked in some of the tracings due to the aortic stenosis.

Emphysema.

Show the tracings from two cases. Mr. J. Mrs R. both over 50. and with senile thickening of the vessels.

They were both treated with 20 m. Ac. Hydrobrom. & X m. Liq Ferri Perchlor with benefit. Fig 230 Mr. J. before treatment. Fig 231 after treatment. Heart-sounds very feeble.

Figs 230

231

Mrs R. had loud, clear heart sounds

with hypertrophied heart.

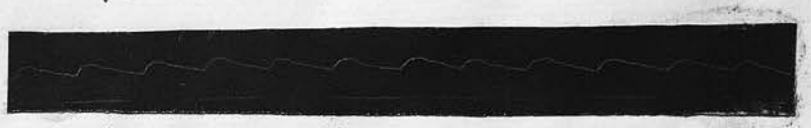


Fig 232

Fig 233

Fig 234

Fig 235

Fig 232 before treatment When patient was weak. Fig 233 after treatment Figs 234, 235 of the heart & pulse When the patient was able to go out 3 months later. The line descends with inspiration the dyspnoea being thoracic.

Asthma.

No 2 - Oct 50.

Heart Sounds weak. Arteries Thickened. Fig 236 before treatment.

Pulse 108 Fig 237 after four days treatment with Bromic Acid & from Pulse 84.

Fig 236

Fig 237

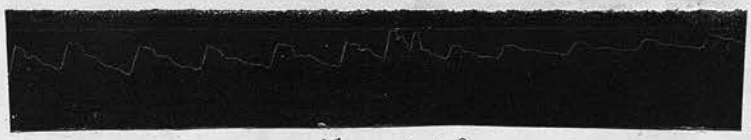


Fig 238

Fig 239

Fig 240

Fig 238 a month later but the asthma worse. Pulse 96 very weak & patient exhausted. ℞ m. Fr. Digit t. d. was given Figs 239, 240 show the radial & cardiac tracings after four days Pulse 90 Patient Stronger. The ulse descends with inspiration.

Functional Palpitation
or Irritable heart of Da Costa

1

The chief symptom is palpitation. The apex beat is thumping. Mitral Sound weak or thudding & loud. Sometimes grating. There is no organic disease. Pulse up to 180 or more. It occurs in nervous subjects as the result of overwork worry of dyspepsia.

Case. Mrs. L. Oct 60.

1st Sound harsh, grating & reduplicate. I diagnosed mitral stenosis. 2nd accentuated. Pulse small & compressible. Her chief trouble was nervous palpitation.

Fig 241

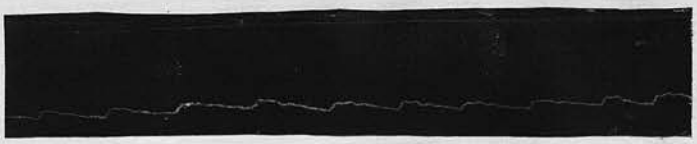


Fig 242

Fig 241 taken during an attack. P. 180. Treatment X m. Sr. Bellad. t. d.

Fig 242 after four days. Pulse impulse in both tracings is very weak. Senile thickening modifies the pulse wave.

One night at 11.30 patient had one of her bad "heart attacks". Palpitation cold perspiration. Extreme nervousness. There was no dyspnoea & no flatus. Pulse 68 small & weak.

Fig 243

Fig 244

Fig 245

Fig 243 taken during the attack. Shows signs of atheroma with feeble impulse. Mitral grating, loud & reduplicate. Patient took 25 m. Tr. Digit. 20 minutes later Fig 244 was taken. & after 15 minutes Fig 245 - Pulse rose to 80 & became stronger the reduplication was less. The tracing shows a much stronger impulse.

The apex becomes pointed instead of flat. The distressing symptoms were relieved. Treatment X m. Tr. Digit. t.d.

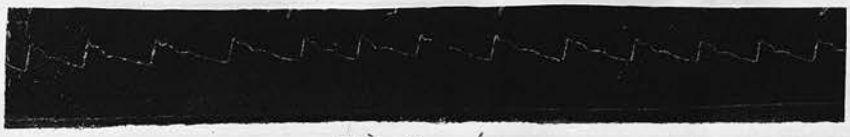


Fig 246

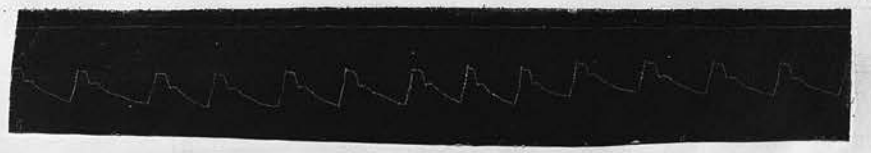


Fig 247

Fig 248

Fig 249

Fig 246 Taken two days later. Pulse 84
Fig 247 on fifth day. Pulse 72. Stronger Heart Sounds louder. Grating of mitral less. On ninth day Fig 248 on tenth day Fig 249 Pulse 68 1st mitral thudding rather grating not reduplicate.
Fig 250 10 days later When the mitral sound was quite normal Pulse 72. Digit Stopped. Patient felt quite well.

Fig 250

Fig 251

Fig 252

Fig 253

Fig 251 the patient was taking Nitric Acid & Taraxacum for biliousness. Figs 252, 253 show the pulse & heart tracings when the patient felt well.

Case W. A. act 50. Suffering from gonorrhoeal Rheumatism. Is subject to palpitation has a pain at the precordia P. 80 full, compressible. Mitral Sound weak & grating. Is heard louder when the breath is held in. 2nd aortic is accentuated. Fig 254 shows a strong pulse modified however by senile thickening.

Fig 254

Fig 255

Fig 256

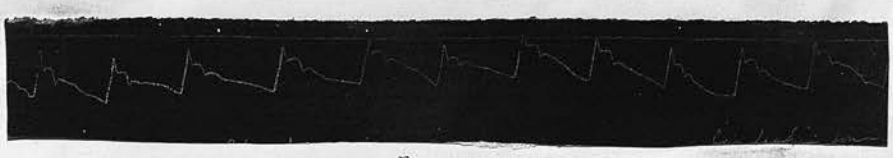


Fig 257

Treatment. X m. Digit t. d. Fig 255 taken four days later Shows more Systolic force. Pulse 64 as the cachalgia was not improved he was permitted to inhale amyl till relief was obtained. Pulse rose to 70. Fig 256 Shows a more pointed apex & an increase of the dicrotism. Digit continued four days longer. Pulse fell to 60 As the patient felt better Digit was Stopped. Fig 257

Case. C. servant. oct 35.

Palpitation. Heart Sounds normal. P. 100

Figs 259, 258 Show radial & heart tracings.

Treatment ✕ m. Tr Digit t.d. Four days later Pulse 84. Palpitation no better the Systolic wave is stronger & the Systolic plateau marked with oscillations. See Figs 260, 261

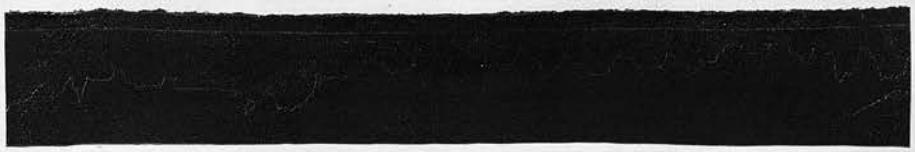


Fig 258

Fig 259

Fig 260

Fig 261

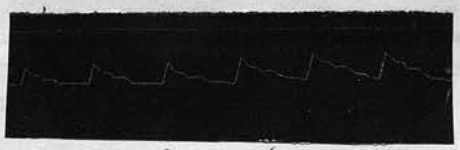


Fig 262

Fifteen grs Pot. Brom t.d. was given with greater benefit Six days later Pulse 84 Fig 262 and still later Figs 263, 264 Pulse and heart when patient felt quite relieved.

Fig 263

Fig 264

Nervous Debility

Is somewhat akin to previous class of diseases. There is no heart lesion but the sounds are very weak & the patients complain of 'weak heart' faintness & breathlessness. This complaint is very common in women after the climacteric period & in both sexes, though more in youths during adolescence. In the former class the tracing indicates weak systolic impulse. Which means cardiac depression. In the latter there is low arterial tension from impaired vascular tone.

Fig 265

Fig 266

Fig 267

Fig 265 is from a woman looking out very hysterical lady aet 56.
Fig 266 A very stout cook aet 60.
Fig 267 A stout lady aet 56.

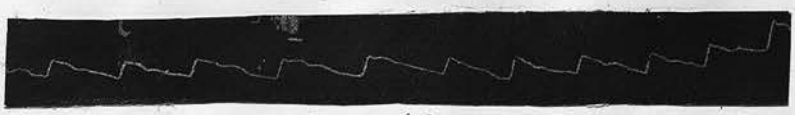


Fig 268

Fig 269

Fig 270

Fig 271

Figs 268, from two ladies, both over 50.
Figs 270 271 from two gentlemen over 40
Suffering from nervous debility.

Fig 272

Fig 273

From a lady aged 30 Fig 272 before & Fig 273
after treatment with Hydro Bromic Acid
Case 2 male set 21.
Nervous. weak. P 104. Heavy Smoker.
Treated with 30 m. Hydrobromic Acid t.d.
Successfully. Pulse falling gradually

to 70. Fig 274 before treatment.

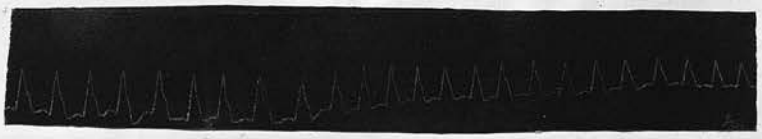


Fig 274

Fig 275

Fig 276

Fig 277

Fig 278

Fig 279

Fig 275 to 9 taken at different periods as patient improved during rest two months. Be last is a heart tracing Fig 279a is from another youth. Fig 279b from a third

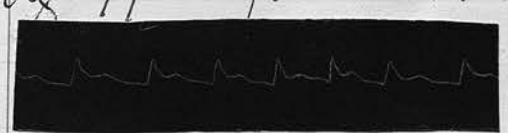


Fig 279a

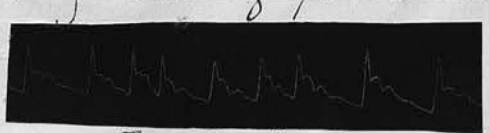


Fig 279b

The Pulse in Acute and Specific inflammatory disease.

In diseases of this class the pulse is affected by the relaxation or contraction of the capillaries. When the capillaries are relaxed more blood flows to that part, the peripheral resistance, which the heart has to overcome, is diminished, consequently, the heart beats with more rapidity & suddenness + force which causes a higher upstroke.

But as the arterial tension is low the line of descent is abrupt. The relaxed condition of the arteries favour the formation of waves & exaggerate the Sigmoid or dicrotic wave.

The heart beating more rapidly is less filled & the waves are consequently of smaller volume.

One of the objects of my thesis is to show the importance of the predicrotic wave as an indicator of the state of the heart and the circulation.

Fig 280

Fig 281

Fig 282

Fig 280 One of the earliest tracings taken by me, from a case of typhoid, 2 relapses, finally thrombosis of left femoral vein with the accompanying White leg which is I believe, rare in the male. Pulse have feeble & dicrotic. Fig 281 from a young man suffering from typhoid & in 2nd week of diarrhoea. Has in addition a mitral murmer. Fig 282 taken 6 weeks later when patient was convalescent. Dicrotism continues. Due probably to a mitral insufficiency.

In the next case of typhoid almost daily tracings were taken. As there are many such cases to describe they are condensed as much as possible, reference

being made almost entire, to what affects the pulse.

Case J. N. Oct 10 Typhoid

General malaise & diarrhoea commenced Dec 25th Typical evacuation. Tongue dry red & raw. Pulse 110 Temp 103 Hard, bounding. Heart sounds normal Rt 24.
Fig 283 Shows typically low arterial tension Dicrotism is very slight. The pointed apex & great amplitude of the systolic wave denotes easy penetration of a small wave of blood. The abrupt & complete descent shows how little peripheral resistance the wave meets. This is due partly to smallness of its volume, also to the relaxed state of the artery & to the easy outlet through the dilated capillaries.
The dicrotic wave is greatly exaggerated due to the sudden entrance of the small blood wave & the low arterial tension.
Treatment 15 grs Iod. Sal. t. d.
Jany 2. Diarrhoea less frequent. Heart sounds weaker. P. 120 weak compressible.

R 24. T 103. See Fig 284 I prescribed ℥ 5 m. ℥. Digis. t.d. Jany 3 T 103 P 100 R 24. Diarrhoea stopped. Patient drowsy & irritable. Has taken 20 m. ℥ Dig. without improvement in heart Sounds or force of the pulse, On the contrary the pulse is more dicrotic. The dicrotic wave ascending the next wave. See Fig 285 The Sod. Sal in 10 gr doses was therefore continued.

Jany 4th T 103. P 100. R 24

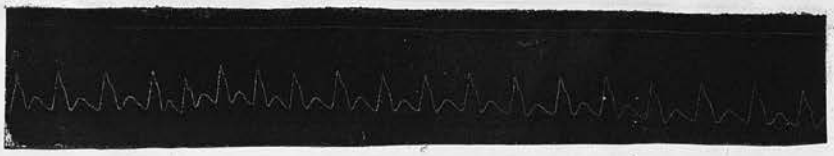
Jany 5th T 102 P 108 weak R 24 Still drowsy delirious, difficult to rouse. Mitral 1st is muffled & weak Fig 286 Shows weak Systolic impulse & low tension. Possibly the Sod. Sal is depressing Have patient Has to combine with it ℥ Rect Spt.

Jany 6 T 102. R 24. P 88 Stronger but intermittent. Heart Sounds Stronger. Patient has had ℥ of Rect Spt. in 24 hrs. & ℥ half an hour before Fig 287 which Shows mitral force & diminished dicrotism.

Jany 7 T 101. P 100 Rect Spt discontinued

Jany 9. T 101. P 92. Patient has had ℥ of Rect. Spt. in 48 hours & no other medicine.

Fig 283



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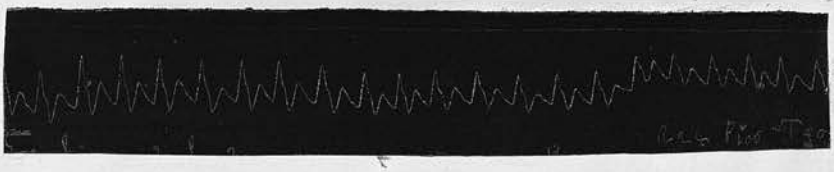

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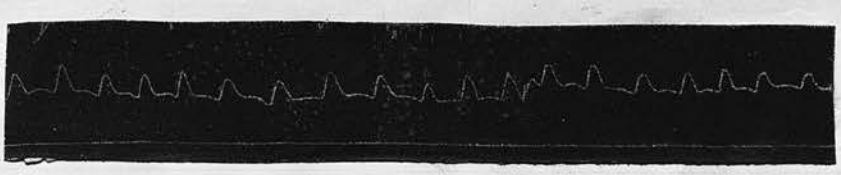

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Fig 288 Shows an improvement

Jany 10. T 100 '5. P 102 full & compressible. Patient has had 3i of Brandy Spt in last 24 hours. Fig 289 shows diminished amplitude of pulse wave & dicrotism less marked, but wave weaker. Brandy has, in this case, been of decided benefit. It removed the drowsiness & muttering delirium & gave quiet sleep. Patient eats better perspires freely. The Temp has fallen from 102 to 101'5 & Pulse has become stronger to the touch whilst the tracing shows an increase of arterial tension. At the same time the heart sounds have become stronger.
No medicine nor Spirit was given for the next 24 hrs as there seemed to be a little depression.
Jany 11 T 98. P 96 stronger less compressible. Evidently here is a time when Alcohol completes its work — for as soon as it ceases, the T falls still lower & the pulse becomes less frequent & the tracing Fig 290 shows increased arterial tension. The descent is not great as before.
Jany 12. In the last 24 hrs Patient has had five 3m. doses of Tr. Dig. Heart Sounds clearer

Tq 8. 8. Pg 6 ers compressible Fig 291 does not show much change. 3 m Liq Ferri Perchlor fort, was therefore prescribed every four hours to see if its astringent would improve the pulse.
Jany 14 Tq 8. P 100. Patient has had 30 m. in the last 24 hours. Fig 292 shows a slight return of predicrotism.

Fig 291

292

293

Jany 16 Tqq 8. P 100 compressible. Patient sat up yesterday against orders & eat some meat. Not so well today & the tracing Fig 293 shows a decided relapse.
To have X m. Tr. Nuc vom. every four hours the general symptoms of the case do not indicate such a pulse.
Jany 18. During last 48 hours patient

has had Zip ℞ Nuc vom. But this is a decided relapse. T 104 P 112 small & compressible. Diarrhoea returned. Heart sounds weak Fig. 294 resembles the pulse at the onset of the fever. As the patient seemed very weak & high temperature I tried the effects of rapid Sponge with quite cold water covering him after with a blanket. Immediately after Fig 295 1st part was taken. Pulse had fallen to 100 irregular & thready & the T was 103 4/5 10 minutes later when the 2nd part of Fig 295 was taken. The tracing shows that the shock of the cold water was very depressing on the heart. In 10 minutes the pulse rose to 120 & the tracing still indicated low arterial pressure. The patient was Sponged about every two hours with tepid water & no medicine given. At 9 p.m. after three Spongings the temperature remained at 103 1/4 P 120 less Compressible. Heart Sounds weak & muffled. Fig 296 shows a decided improvement in the return of the predicrotic wave.

Fig 294

Fig 295

Fig 296

Fig 297

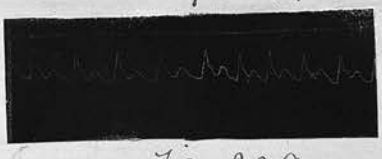


Fig 298

Jany 19th 1 P.M. Patient had three Spongings today. Was very delirious last night. Got great improvement today. Diarrhoea Stopped. T 100'5 R 26. P 108 very Soft & compressible. Heart Sounds Stronger. Fig 297 Still Shows Re-dicrotic wave. Jany 20 noon. Patient has been Sponged twice today with Cold water Temp. 99'5 P. 116 Small. Fig 298 Still improves. Cold Sponging to be stopped tonight.

having succeeded in reducing the temperature & pulse, in lowering the arterial pressure & reproducing the predicrotic wave. and this in three days.
Jany 21. T 98'8. P 108. As the mitral is still weak & muffled I ordered X m. Tr. Digit. t.d. Jany 23d Temp. 99. P 110 Fig 298a shows increasing tension by the decrease of dicrotism & the diminished fullness of the systolic wave. This is more marked in Fig 298b taken two days later when the pulse had fallen to 68 & was less compressible.
Jany 27th Tem. 98'8 P 62. Intermittant & incompressible. Heart Sounds clear & loud. Fig 298c shows a return to the normal type but the upstroke is high & pointed. due to the increased ventricular force, the result of digitalis In the tracing after a strong systole follows a weaker one.
Feby 1st P 60. Irregular Intermittant Incompressible. Heart Sounds loud & thudding. Fig 298d indicates increased arterial tension. Digitalis having been pushed rather to excess was

Fig 298 a

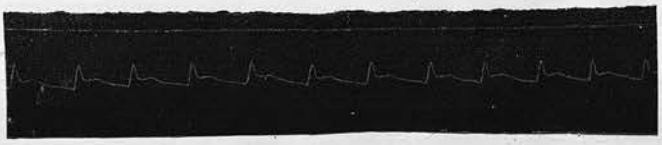


Fig 298 b

Fig 298 c

Fig 298 b

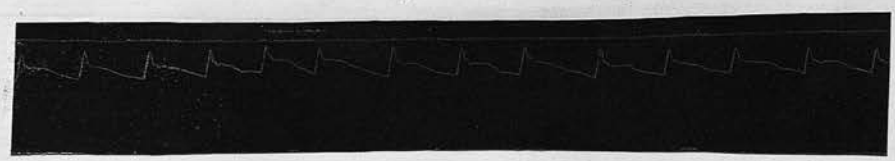


Fig 298. c

Stopped. Feby 4th 1888. Strong incompressible. Fig 2982 is normal.

Remarks Digitalis, during the feverish stage was useless as a cardiac Stimulant to improve the pulse. At this period alcohol was of great benefit both to the pulse & heart, Strengthening the Sounds & developing the predicrotic wave: but when continued too long it caused slight depression of the pulse force. When it was discontinued the Temp fell & the pulse improved. In convalescence Digitalis was very beneficial for the heart & pulse. Cold water Sponging was very effectual in reducing the temperature & improving the pulse & reproducing the predicrotism. It was, in this case a Shock to the heart at first but being in the depth of Winter the water was very cold. It would be advisable to use water warm at first, or, if cold, to administer previously a little alcohol.

Case Miss S. Oct 18 Typhoid.

When I saw patient Diarrhoea had continued for 14 days & was ceasing Gurgling in right Iliac fossa was very marked. T 102. P 130. Heart Sounds weak Mitral muffled. Fig 299 treatment Am. Fig. 2d. Next day T 100. P 108. Fig 300 Shows improvement. The following day T 99'8. P 100. less compressible. Heart Sounds Stronger Fig 301 Shows increased arterial tension & force. Digit Stopped. Next day P 80 T 100. Fig 302 Shows normal characters.

Fig 299

Fig 300

Fig 301

Fig 302

Three days later had an attack of Sickness.

Fig 6. weak Fig 303 shows increased dicrotism.

Fig 303

Fig 304

Fig 305

Fig 306

15 m: Tr. Nuc. Vom. t.i.d. was prescribed & patient recovered rapidly. Fig 304 & the following tracings were taken during succeeding three weeks. Fig 305 taken when patient was rather worse Fig 306 when patient was quite well.

Remarks. In this case digitalis was beneficial when the heart was weak as fever was subsiding.

Diphtheria

Case W. M. aged 6. Boy

Sore throat, Swollen & congested fauces, glands enlarged & tender. T 102. P 140 weak. Fig 307 Shows increased dicrotism.
Treatment 5 m. Tr. Bellad every three hours.
2nd day, after 25 m. Bellad in 18 hours, Throat easier but Swelling increased & diphtheric patches on each tonsil. T 102. P 120 less compressible. Fig 308 Shows increased arterial tension.
Belladonna in inflammation of the throat reduces the frequency & dicrotism of the pulse.
Treatment 5 gr. Sod. Salic every hour & to paint the tonsils every two hours with Glyc of Boracic Acid.
3d day. After one drachm Sod Salic which makes patient sick. General State worse. Patches larger. Prostrate. R 48. T 102. P 132 hard & incompressible. Fig 309 Shows lower tension. Treatment as before except 20 m. Ac. Carbol. added to 3/j Glyc. Borac.

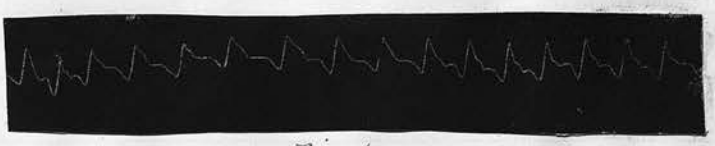


Fig 307

Fig 308

Fig 309

4th Day. 40ℳ Sod Salic in last 24 hours vomiting, delirium, prostration. R 32. T 101 P 108 small, compressible. Heart Sounds loud & clear. Fig 310

5th Day 3ii Sod. Salic & 20 m. Carbol in the paint used in the last 24 hours. Patches less. Resp easier, 48. T 100 P 120 full bounding, heart Sounds strong. Fig 311 Pain in epigastrium. Vomiting of bile & mucus. Dark olive urine, Drowsiness & delirium indicate carbolic poisoning.

7th Day 10 a.m. Had 40 gr. Sod-Salic since yesterday and about 10-12 m ac. Carbol in the paint The Carbolic Acid was stopped & the previous paint continued.

The carbolic poisoning worse. Heart Sounds today are weak & muffled. T 101 P 114. Weak compressible Fig 312 Shows depression Pulse differing from the previous tracing which suggested Stimulation.

Fig 310

Fig 311

Fig 312

Left tonsil is clean The right improving. 10 p.m. More prostration today than previously. So patient has had 3ifs brandy in the last 12 hours administered. Heart Sounds Stronger. P 120 Fig 313 does not yet show improvement but the carbolic poisoning has not yet passed off. 8th Day. 2 p.m. Had 3ifs brandy since last nights visit. P 132 jerky. Fig 314 T 101 8 p.m had 3ifs brandy & 20 m. Gr. Digit

in four doses. Fig. 315 shows great increase of Systolic force with normal predicrotism. Alcohol reproduced the predicrotic wave which had disappeared with the carbolic poisoning. General Symptoms main improved & the Subsultus which commenced yesterday continues. P120. stronger T100'5.

Fig 313.

Fig 314

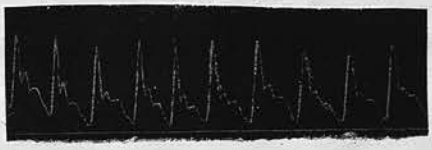


Fig 315

9th Day. No brandy. 30 m. Tr Digit in 3 - doses Rx 24. Quiter. T99'8. P126. Fig 45-4. Patient being unmanageable patches are much worse. The plan was consequently changed. to fʒi Sod Salic & ʒjs Slyce 10. p.m. Has had ʒjfs. R 24 T99. P120. There is a marked diminution of the patches. Fig 316

10th Day. Had ʒjfs brandy. Throat almost

clear. Heart Sounds louder but not clear. Fig 317 shows low tension but there is still great prostration.

Fig 316

Fig 317

11th Day. Throat quite clear. Has had 3ijs brandy & 30 m. Liquor Ferri per chlor. ℥. Pg 6 smaller less compressible T 99 Fig 318 shows increased tension. Probably due to the astringent action of iron on the small vessels. Rubicundism is returned.

12th Day. Throat keeps clear. Patient has had 3i brandy & 25 m. Liquor Fer P.f. P 110 small. Heart Sounds much stronger Fig 319 shows low tension.

13th Day. Had 3i brandy 15 m. Liq. Ferr P.f. Still prostrate P 108. Fig 320 shows lower arterial tension due to epistaxis last night.

14th Day No brandy since last visit. 20 m. Liquor Ferri P.f. Pg 6 small. T 98'8. Fig 321

There is no retrogression for want of the brandy in fact in next 24 hours Pulse fell to 84.

Fig 318

Fig 319

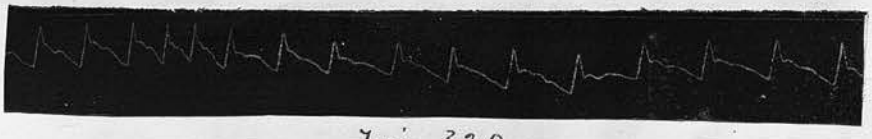


Fig 320

Fig 321

Fig 322

16th Day. P 84. Heart Sounds Stronger. Fig 322 Shows increased tension. Throat Sore has been occasional Epistasis. Treatment 5 m. Liquor Ferri Perchlor. ℥.

Patient improved but was affected with Slight paralysis of the lower extremities being unable to Stand or walk for a few days.

He was treated with Nux Vom. & galvanism which latter was most beneficial. At first the strongest current produced no effect. Later on each application was followed by a marked improvement in walking.

A fortnight later when patient was convalescent I took the following three tracings. Fig 323 of the radial Fig 324 of the femoral, paresis of the limbs remaining. Fig 325 at the apex the heart still irregular it shows strong systoles followed by weak ones. The radial tracing also shows irregularity which was perceptible to the finger.

Fig 323

Fig 324

Fig 325

Remarks. When tonsillitis was the only symptom Belladonna diminished the pre existing dicrotism & frequency of the pulse, whilst

relieving the pain. This is the opposite of the effect of Belladonna in health as may be seen by an experiment on myself
See page 238

Salicylate of Soda produced in this, as in some cases, vomiting & depression which is continued by the tracing See Figs 309, 310
When carbolic acid was locally applied the first effect on the pulse was stimulation resembling that of alcohol as may be seen by comparing Figs 312, 315
its secondary effect was great depression. See Figs 313 where in addition, the predicrotic wave disappears.

Brandy increases the pulse force & reproduces the pulse wave. The local application of Salicylate of Soda was much more effectual in cleaning the throat than boracic acid or even carbolic Acid which latter is too irritating.

Perchloride of Iron in large & frequent doses is very beneficial as a tonic & through its astringency on the small vessels, in raising blood pressure.

It is to be noted that predicrotism bears no relation to the severity of this disease.

Case E. H. aet six. girl.

Mild diphtheria. yielded at once to Sod. Sal. locally & internally administered The tempreture never rose above 101. Nor the pulse above 120.

Nourishment has taken every two hours day & night.

Fig 326

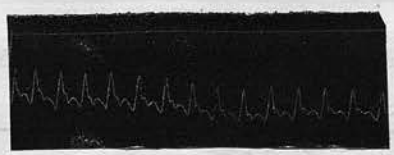


Fig 327

Fig 328.

Fig 329

Fig 330

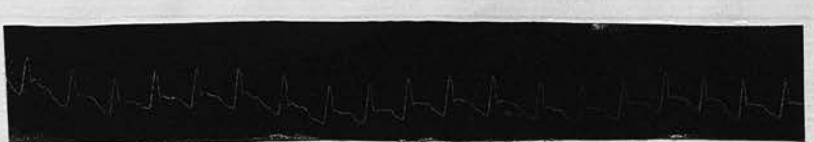


Fig 331

Figs 326 327 & Figs 328. 329 taken on the morning & evening of the 1st & 2d days. Fig 329 taken after 10 m. Tr. Bellad. Figs 330, 331 taken the following morning & evening. The former after 20. Tr. Bellad. The latter after 25. m. in 5. m. doses. Pulse did not rise above 100 Whilst taking Belladonna

Fig 332

Fig 333

Figs 332, 333 taken the two following days when the throat was clean & the patient much better. The throat painting in this case had been hourly in the day time, every two hours at night.

Case R. S. girl oct 6.

Mild diphtheria yielded ~~soon~~ to hourly painting with Glyc. Iod. Sal. in five days. These five tracings were taken on the first five days.

Fig 334

Fig 335

Fig 336.

Fig 337

Fig 338

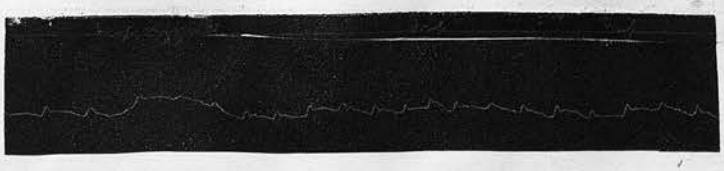
Fig 334 T 103. P 120. Small compressible.
Fig 335 T 101. P 96. after 12 Re minim doses of Fr Aconite. Fig 336 T 99'8 P 96. Stronger after Re same amount of aconite. Tracing shows increased arterial tension. Para Small doses of Aconite reduces Re temperature & rapidity of Re pulse without depression.

No medicine given in next 24 hours. & vomiting less frequent. Re

patches which were almost gone, increased.
T 104. P 120. Fig 337 shows dicrotism.
Zifs Sod. Sal was given in 10 gr doses
& painting hourly.
Next day T 99. P 108. Fig 338

Case C. P. vet 4. boy.

Bad case of diphtheria. 1st day T 100.
P 130. Yellow patch on right tonsil &
small spot on left. Parotid gland
much swollen & tender on right side.
Fig 339 shows small wave not altered
from normal form.
Treatment. hourly painting with Glyc.
Sod. Sal (3i to 3ss) & small dose of
Liq Ammon Acet.
2nd day morning T 102'2.
Evening T 101 P 108 full bounding hard.
Fig 340 shows fuller systolic wave &
dicrotism. B & R tonsils badly affected
He is to take X grs Sod. Salic every 3 hours.
3d Day T 99. P 122 soft & compressible
Patient has had 40 grs Sod. Sal. which has
reduced the Temp 2° The pulse is
however more frequent & weaker & the tracing
Fig 341 shows rather diminished force.



Figs 339

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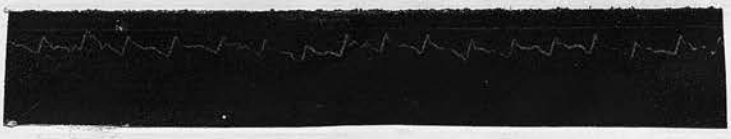


342

4th Day Had 40 gr Sod. Salyc. Tgg '8 - P 116 Stronger. Heart Sounds normal but weak. Rt right tonsil is clean, Rt left almost clean. Fig 342 Shows increased Systolic pree. Rt Sod Salyc Stopped in form of draught but continued per Rt painting. Rt Salyc of Soda has had little if any depressing effect on Rt pulse.

5th Day noon. T 103. P 140. bounding & full but very compressible. Fig 343 Shows lowered arterial tension. Heart Sounds weak. R. 30. nasal & difficult. Rt patches

have returned on both sides. Painting was practiced every 2 or 3 hours instead of hourly as ordered. The Sal. Sod being stopped may have favoured the return of the fever.

6 p.m. T 105. P 135 full bounding. R 36 Heart Sounds muffled. Fig 344 of the radial pulse shows dicrotism ascending the following wave. But predicrotism is present & very marked. Apex beat feeble. Fig 345 is a tracing of it. It is not very definite but corresponds to the form of the pulse wave in having a pointed apex. In some the terminal systolic wave is marked while the sigmoid wave is occasionally on the succeeding up-stroke.

Painting hourly. X grs Sod. Sal every two hours.

6th Day 11 a.m. Had 80 grs Sod. Sal.

T 99 5 P 108 Stronger & less compressible

Left bases worse.

Fig 346 shows no depression in the ventricular force. This supports the idea that Sal. of Soda does not depress the pulse.

The cardiograph Fig 347 resembles the

Radial Tracing. It does not show the terminal Systolic wave well, as the respiration interfered with the taking of the tracing; but the Sigmoid wave is exaggerated.

Fig 343

344

345

346

347

7th Day Patient had 3i of Sod. Sal & panting. P120 Small & lep compressible. T99. R28 nasal mucus being in excess. Fig 348 resembles normal form & indicates increased arterial tension.

8th day P130. Tg q'2 Throat almost clean
General improvement. Had 40 grs
Sod. Sal Fig 349

Fig 348

Fig 349

Fig 350

Fig 351

9th Day. Patient has had no Sod Salyc internally for 24 hours. Rt right tonsil is clean. Painting however continued.
T q q'2. P108. Fig 350
Rt 3 following tracings were taken on the 11th 12th & 14th days. & the last one a fortnight later. The patient

was then quite convalescent, running about & on the following day was to begin a voyage across the Atlantic.

Fig 352

Fig 353

Fig 354

Fig 355

Remarks. It is of importance to note that the predicrotic wave is generally present even where there are signs of low arterial tension. It also occurs during the administration of large doses of Salicylate of Soda.

Scarlatina

case C.C. Female oct 28.

Complicated with nephritis.
1st Day. Incessant uncontrollable vomiting.
2d Day. Scarlatinal Sore Throat & White patches on tonsils. T 105. P 120 Pericardial Systolic friction Sound. Fig. 356 shows weak impulse & low tension Patient much exhausted. Treatment 1 m. Tr. Aconit hourly. q. p. m. Aspir 5ss doses. Throat worse headache. Stupor delirium, Sighing respiration. Dull red eruption on Chest & neck. Tongue Strawberry like. Skin dry T 104. P 108. Fig 357 Treatment. Boracic Acid Gargle & painting with Glyc. Ac. Boracic. 30 grs Sod. Salicyl ad ounce & 30 at 4 a. m.
3d Day. q. a. m. T 103. R 28. P 126. hard full. Restless night. Eruption fading. Fig 358 resembles that of last night. I therefore injected 15 m. of a 2% Sol. of Pilocarpin in the arm. In a ½ hour when the pulse become

Soft & full 120. & Whilst freely perspiring I took took Fig 359. Pulse rate was unaltered. Vomiting now occured & copious Salivation.

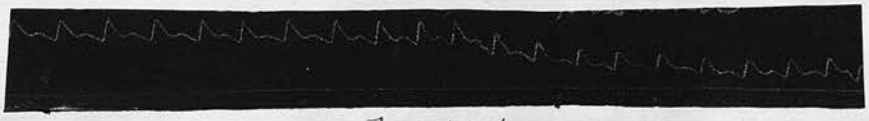


Fig 356

Fig 357

Fig 358

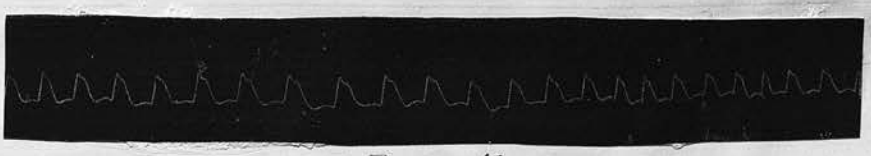


Fig 359

Fig 360

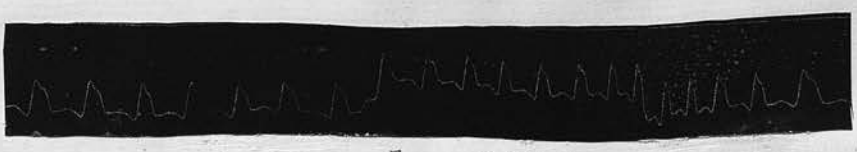


Fig 361

Prescribed 25 grs Sod. Sal every two hours. At 2. p.m. great depression. The rash had come out but was dull. The face livid

Micturition Suppressed, Therefore a wet lumbar pack was employed.

P 120 bares felt. Fig 360 Shows great depression.

8. p. m. after 24 Sod. Sal Since 10 a.m. T 103. R 24. P 140 fuller but compressible Fig 361 There is general depression, Sighing respiration muttering delirium & Subsultus. No urine for 14 hours.

4th day. Half a pint of urine passed thro' the night. It contains albumen & a large deposit consisting of the epithelial tube casts well marked. The liquid is teeming with Small glittering micrococi Which also have found their way into the epithelial Scales. I am not aware that these organisms have been seen before.

10. a m. T 101. R 21. P 124 Patient has had 30 m. of Bellad Since 10 p. m. It was given to relieve the throat & mouth Which was fiery red & dry being denuded of epithelium Fig 362 Shows very weak impulse & marked dicrotism. The Systolic friction murmer has entirely disappeared Since last

Inj Vr. Eruption faint. 4. p. m. after 25 m. Tr. Belladonna in 5. m. doses P 138. T 101 4. Fig 363 Still Shows depression Throat improving. White patches disappearing. Great prostration. Body warm Hands feet & legs Cold. No sleep ½ pint urine at 2 p. m.

Fig 362

Fig 363

Fig 364

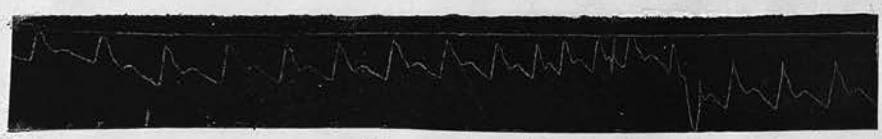


Fig 365

Fig 366

Fig 367

10 p. m. Pack 30 m. Tr. Bellad. in 5 m. doses.

Being so weak patient had 4 ½ table spoon doses of brandy after each of which she fell into a quiet sleep. It also stopped the retching which up to this time had continued occasionally. The rash has also come out more scarlet. R 20. T101'2 P108 & stronger. Fig 364 shows a slight improvement in pulse.

9. a. m. 5th Day Has had 3½ brandy no Belladonna. Patient much better has slept & the delirium is less. T100'5 R. 26. P 92. Pulse Regular Stronger. Fig 365 shows decreasing dicrotism Heart Sounds stronger. No friction 2nd accentuated. At 8. a. m. passed ½ pint urine which is still albuminous. Eruption is fading. Tongue & fauces still filthy red. Brandy stopped. 5 m. Tr. Bellad as before.

The brandy has lowered the temperature reduced the frequency & increased the force of the pulse. The dicrotic wave disappearing. The delirium & prostration has been relieved.

3. p. m. After 30 m. Tr. Bellad R 24. T100'5

P 90. & Stronger Fig 366 10-30 p.m. after 35 m. Fr. Belladd T 100. P 90 full & Strong. Fig 367 Shows a return of the predicrotic wave. Urine about a pint & a ½ per diem

Pain being marked General improvement Fr Belladonna. Was stopped Fr fiery redness & dryness of the mouth Was not relieved by Belladonna. but it is note worthy that Fr large doses did not dilate Fr pupil & Was well borne, nor did it accelerate Fr pulse.

6th Day 10. a.m R 20. T 100. P 84 less compressible Fig 368 Heart Sounds Stronger Pericardial friction returned. Sleeping Small doses of Liquor Ammon. Acet 8 p.m T 100'5. P 84. Fig 369 Tonsils almost clean.

7th Day 3 p.m T 100'6 R 20. P 88 Stronger. Fig 370 Symptoms of Throat gone. Tongue moist. 2 pints Urine today which is an increase

8th Day 4 p.m. T 100. P 80. Fig 371 is almost normal. As no urine since early morning I prescribed ℥i of Acet Jaborandi fort. At 6 p.m & at 8 p.m.

The first dose caused vomiting & slight delirium. The 2nd. dose aggrivated these Symptoms. Man called Short afterwards patient was perspiring freely. P88 Soft. full. T99'8. Fig 372 Shows very little alteration

Fig 368

Fig 369

Fig 370

Fig 371

Fig 372

Fig 373

Fig 374

9th Day 6 p.m. T99'8. P88. Soft, Small,

incompressible. Head 3rd decott Labor-
and 4. today. Urine deficient.
Perspiration diffuse. Fig 373. Shows
a lowering of tension but well
marked predicrotism.

10th Day 8 p.m. T99. P 66 Soft,
full. Has had 3iv ~~3iv~~ since last
visit. Perspiration free. Urine increased
to 3 1/2 pints. Contains no albumen
nor deposit. Menstruation just
ceased. Scaling commenced on chest
& arms. Fig 374 differs from any other
tracing in showing the connection of
the descent.
Arterial tension is high. The heart-
beating slowly is more perfectly filled
& sends a wave of larger volume
into the arteries at each systole.
The blood wave meeting a resistance
penetrates more slowly this causes
the slow descent in the tracing.
11th Day. T99. P70. no medicine been
given.
12 Day T99. P 84. Pericardial friction
well marked over the 4th left costal
cartilage (see hericarditis p108) Fig 375

Fig 375

Fig 376

14th Day Pyo. Fig 376. Carbolic baths were employed. Scaling went on from 4 to 6 weeks very freely. It was altogether out of proportion to the amount of the eruption.

Remarks. Aconite at the commencement of this case was without effect. Pilocarpin produced great depression after a few hours, while at the commencement it did not alter the pulse tracing. Altho' the pulse felt larger & softer. No effect on the rash.

Salicylate of Soda did not depress the pulse nor did it affect the temperature.

Belladonna given on the 2nd day of the eruption when the disease was at its height & complicated with nephritis did reduce the temperature

2 degrees in 12 hours. The pulse also fell. There was extreme tolerance of Belladonna without any physiological effect. About 3iii was given in 48 hours during 12 of which none was administered. It did not diminish the dryness of the mouth & tongue. It may have increased it for the tongue became moist a day & a half after the Belladonna was stopped. The Belladonna did not increase the pulse rate.

Brandy was very useful as a time of great exhaustion in procuring sleep checking vomiting, developing the rash making the pulse slower & stronger. Micturition also decreased slightly.

Jaborandi like its alkaloid produced diaphoresis but was very depressing causing vomiting & delirium. The urine also decreased. After continued use perspiration diminished whilst urine increased. The pulse became slow & the arterial tension rose.

Case. H. E. male. Oct 10. Lived in same house as E. C. but left the day E. C. was taken ill.

1st Day 2 p. m. Two days ago complained of headache. Yesterday of Sore Throat. Last night at 11 p. m. Scarlet rash developed. To-day the rash is very full all over the body. Throat inflamed & Spotted. Mild patch on tonsils. Urine clear no albumen. T103. R 20. P144. Full bounding but compressible. Fig 377 Shows low tension but no predicrotic wave is present.

Treatment to paint the throat with Glyc. Ac. Borac. 30 grs Sod. Sal at once & 10 at 4 & 6 p. m.

7 p. m. T102. P128 Shows slight depression & absence of predicrotism. Fig 378

2nd Day. noon After 70 grs Sod. Sal in 10 gr. doses. Patient been restless & delirious all night. Strawberry tongue well marked. Very deaf probably due to the Sod. Sal. T100. R24 P128 weak & compressible Fig 379 Heart Sounds muffled & weak. Subsultus. Tracing

Shows that the depression due to the drug is passing off.
10 p.m. Was had 30 grs Sod. Sal. T100 P116. R 30. Heavy. Heart Sounds clearer. Fig 380 indicates higher tension & shows the predicrotic wave. Sod. Salis stopped.

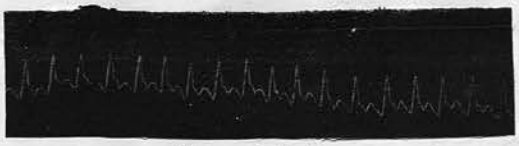


Fig 377

Fig 378

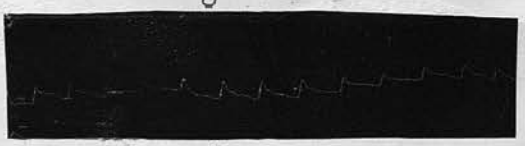


Fig 379

Fig 380

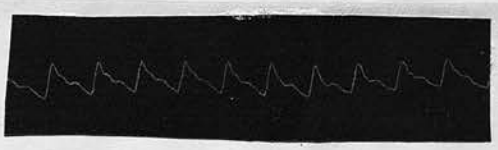
3d Day noon. 2iij. Ammon. Acet in 3ss doses given. The delirium & sleeplessness continue. T100. R 20. P108. Fig 381 shows depression and absence of predicrotism. Due probably to exhaustion.

10 p.m. No improvement, Though 22½ grs Pot. Brom were given at 3, 5, 7, 9 p.m. & cold wet cloths applied to the head. T 100. P 120. Fig 382 Show low tension but predicrotism.

Fig 381

382

383



384

The patient has had no sleep since commencement of decease & was now very exhausted. One tablespoonful of brandy was ordered at once. ½ tablespoonful at midnight to be repeated at 2 a.m.

4th day. 11 a.m. The brandy last night procured a restless sleep at once. After the last dose patient slept for 8 hours. The delirium is quite gone.

Tongue moist & clean. Tgg 5. P100 Small & less compressible. Fig 383 Shows exaggerated predicrotism & upstroke The pulse is stronger, the tension is higher.
8 p.m. Tgg 8 P108 weak Slight delirium Fig 384 not so good. Pat patient has had no Stimulant. A warm Carbolic bath has ordered & if necessary, half a table-spoonful brandy.

Fig 385

Fig 386

Fig 387

5th Day noon. Had to have brandy. & Slept for 12 hours. Rash gone. Scaling. Tgg 8 P96. Fig 385 10 p.m P84. Tgg 5 Fig 386. Fig 387 was taken 3 weeks later.
Remarks. Note marked benefit from brandy at the period of exhaustion.

Temperature in fever.

Marey condemns the ordinary method of taking the temperature in the axilla. That it does not truly represent the central temperature. He insists on the importance of taking the central temperature under the tongue & the peripheral in the hand (la circulation du Sang. chap 36).

Lorrain (le Cholera observé à l'hôpital ~~Paris~~ St Antoine. Paris 1868 et de la Temperature humaine. Oeuvre posthume publiée par P. Brouardel 1874). has shown by curves on charts the central & peripheral temperatures in Cholera. In the hot stage the curves approach. That is the T.C. falls while the T.P. rises. Ordinary observers have been guided by the peripheral temperature only; Whence the nomenclature of cold & hot stages. In the cold stage the reverse occurs. In ague the curves (T.C. & T.P.) follow parallel oscillations.

From these facts Marey enunciates the following principles. (Loc. cit. chap. 31)

a) variations of the two temperatures in the same

Trans
of indicate a change in the production
of heat.
Variations inversely indicate vasomotor
disturbances.

In the cases of Scarlet fever, measles
& acute inflamations which I have in-
vestigated the temperatures have both been
increased. The central as a rule a degree
or two higher than the peripheral showing
increased heat production. But in
one case the peripheral temperature
was ½ a degree higher than the central
due to a strong purge. See page 218.

Case. E. M. female 14. Scarlatina
2nd Day of Eruption. P 120. bounding
T. C. 102'2 T. P. 100'8. Fig 388 shows
absence of predicrotic wave & low tension
a patch on one tonsil. no albuminuria.
Treatment. Painting throat with Glyc. Ac.
Borac & 15 grs Sod. Sal every four hours.
3d Day after 75 grs Sod. Sal. Rash well
out tongue strawberry. Urine diminished
Contains albumen. No deposit. T. C. 102'2
T P 98'8. P 140 weak. Heart Sounds
weak. Fig 389 shows slight depression.

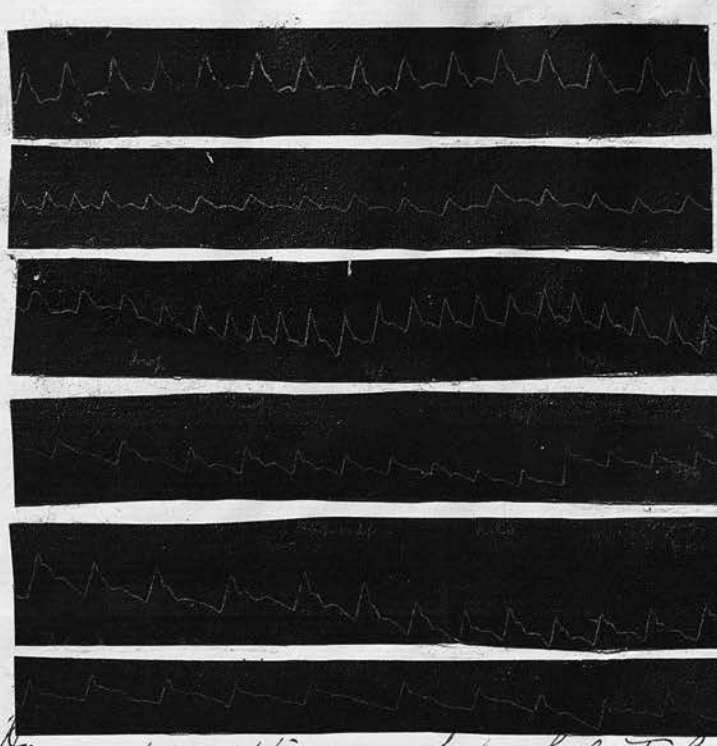


Fig 388

389

390

390a

390b

390c

4th Day after 75 grs Sod. Sal. T. C. 101. T. P q 6'6. P 120 less compressible. Fig 390 shows increased force & descends with inspiration.

5th Day after 60 grs Sod. Sal. T. C. qq. T. P q 5o½ R 28. P 120. Fig 390a approaches the normal type. Patient scaling.

6th Day. Had 60 grs Sod. Sal. T. C. qq T. P. qq. P 108. Heart sounds clear 2nd reduplicate. Fig 390b shows first appearance of predicrotic wave.

7th Day Had one drachm Sod. Sal. T. C. 100 T. P q 8½. R 24. P 108. Fig 390c was taken two following day, patient being convalescent. In the former T. C. qq. T. P 96 P 96. In the latter T. C q 8½ T. P 95. P 84 R 16.

Remarks. The predicrotic wave was absent & did not appear till the eruption faded. This was a moderately severe case. In E. C.'s case this wave did not properly appear till 8th or 9th day. In the case of H. E. this wave was present on the morning of the first day even though arterial tension was low. It then disappeared till the following night. On the morning of the third day it was absent. On the morning of the 4th day it was well marked after the administration of brandy. It again disappeared till the eruption faded.

Measles

Case. Miss P. Oct 11.

2nd day of Eruption. P130 full bounding T101.5. Fig 391

3rd day. P.108 T100. Fig 392

4th day. P120 T100. Fig 393 tracing descends with inspiration showing thoracic influences. Pulse was very obstinate

Bronchitis & hard dry cough.

Fig 391

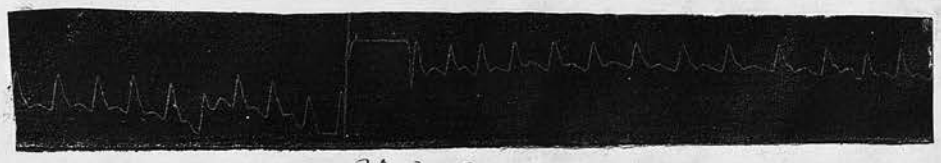


Fig 392

Fig 393

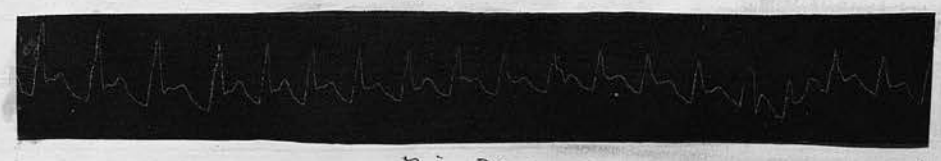


Fig 394

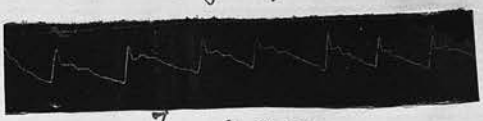


Fig 395

In the last 24 hours patient has had 3½ fr. Sols. Semp. which did not relieve the cough but depresses the pulse.

5th day. Eruption gone. Tgg. P 108 bounding Fig 394 shows low tension but no depression even though 3½ of fr Sols had been taken in the last 24 hours Fig 395 taken 9 days later. Patient up but cough troublesome.

Case

4 P. oct 7 Sister to last Case.

Fig 396 taken on 2nd of the Coryza.

P. 112 hard.

Fig 397 the following day. Hard dry cough. P 120. Temp Slight Constitutional disturbance. The following day the eruption developed P 130. T.C. 103. T. Phot. Fig. 398

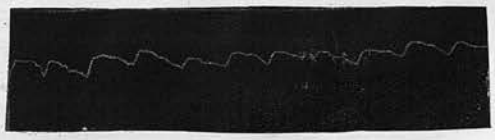
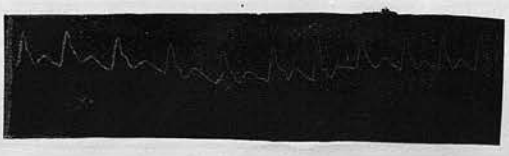


Fig 396



" 397

" 398

" 399

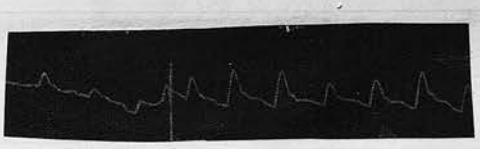
This patient was treated with 10 grs Sod. Sal. every three hours. Whilst her brother who had it milder & as described Resp. was treated with Liq. Am. Act. in 3ii doses. The bronchitis was obstinate in these three cases. This patient lost her

cough almost at once after taking the Sod Sal. The tracing did not show any signs of depression altho drowsiness & delirium followed its use. I would therefore abstain from its use in measles in children.

2nd day of eruption after 3ii Sod. Sal P 126. T.C. 101°5. T.P 101°2. Fig 399

Fig 400

" 401



" 402

3rd Day after 3i Sol Sod. P 130. T.C. 99°5. T.P 99. R 40. Fig 400

4th day. after 90 grs Sod. Sal it was now stopped. P. 108. T.C. 99. T.P 98 R 40 Eruption fading Fig 401 shows return of predictions.

5th. Day Eruption gone. Pulse 100. T.C. 99°5 T.P 99. R 30. Patient got bronchitus. Fig 402 shows a relapse.

Case. P. P. Cotter to last aged 4.

Fig 403 was taken on 2nd day Coryza.
Fig 404 on the following day Pg 6. Both show diminished tension. There is no eruption. Next day the eruption appeared. R 30 P 120. full & hard. T.C. 103 T.P. 101 4/4. Bronchitis & incessant cough. Bronchial respiration no moist sounds. Fig 405 shows predicrotic wave. Which does not appear in H. P. (See Fig 398) although their two temperatures are the same. P.P. has it milder.
2nd Day P. 132. T.C. 102. T P 100. R 28. Fig 406

Fig 403

404

405

406

3d Day. P 104 irregular T.C. 102. T.P. 102. Fig 407

is better than her Sisters today. See Fig 407
Brough temperature is 3 degrees higher.

[redacted]

Fig 407

[redacted]

" 408

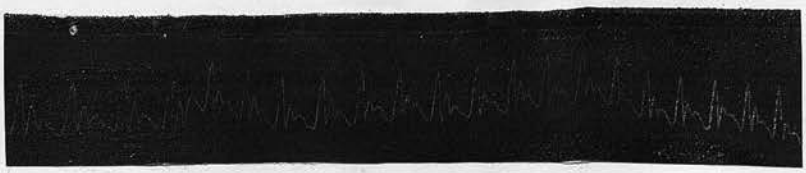
4th Day. Prog. T.C. 98 2/5. T.P. 98 1/2 Eruption quite gone. Fig 408 is normal. This case was treated throughout with Liq. Ammon. Acet & Tr. Scillae. & did much better than the last case.

Case J. Boy. Aet 14.

1st Day of eruption T.C. 102 T.P. 99. P. 130 hard & bounding. Cough Bronchial respiration no moist Sounds. Figs. 409, 410, Show the heart & pulse tracings.

The case was mild. The radial tracing shows by the pointed apex & dicrotic wave easy entrance of the blood wave. Just here is a marked predicrotism wh. corresponds to a marked terminal Systolic wave in the cardiac tracing.

The Sigmoid wave is not in excess in the heart tracing showing that dicrotism is due to the relaxation of the vessels.



Figs 409

410

411

412

2nd Day T.C. qq. T. Pg 6. P120. Small incompressible. Eruption disappearing Fig 411, 412 show radial & heart tracings which approach the normal. Heart sounds weaker than yesterday, mitral muffled which may account for the absence of predicrotism & the rounded Systolic plateau.

Case N. J. Oct 4 Sister of last.

Had a much worse attack.
2nd Day. Eruption full out P144.
T. C. 104. T P 103. R 64. Fig 413 Shows the radial tracing. Arterial tension low, but the predicrotic wave is present. It corresponds to an exaggerated terminal Systolic wave in the heart tracing. Fig 414
The hurried respiration interfers with the heart tracing. In the radial a cough causes an elevation of the tracing.
3d Day. after 5 X gr doses Sod. Sal which relieved the cough. P132. jerky T. C. 102 T. P. 101½ R 48. Fig 415

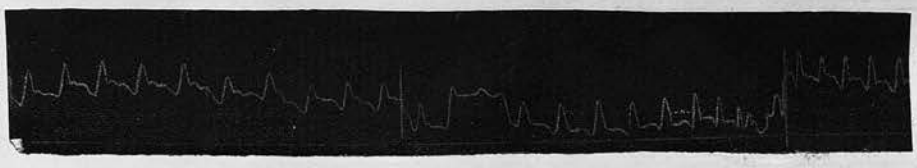
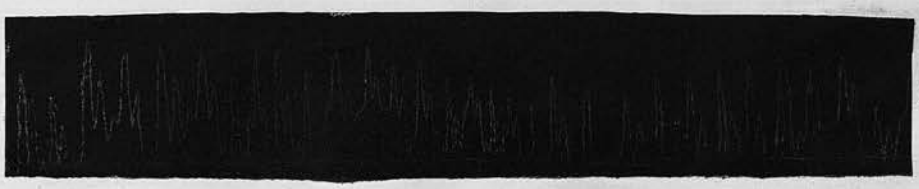


Fig 413


414

415

4th Day after 70 gr Sod. Sal P112. R 52.
T. C. 100. T. P 99½ Temperature, pulse

and respiration are reduced by the drug Fig 416

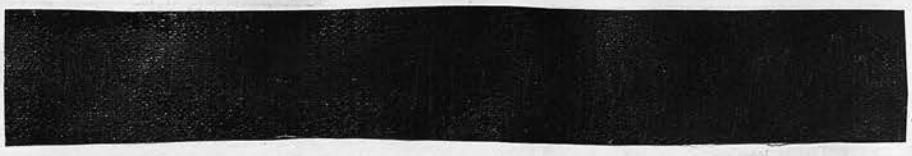


Fig 416

417.

5th Day Catarrhal Pneumonia having set in & the patient being very exhausted She had 6 teaspoonful doses of brandy. Measles has quite gone. P128. R 52. T.C. 101 T P 101. Fig 417 Predicrotism has continued till now.

7th Day. Broncho-pneumonia worse. Patient unconscious. P 144. R 88. T. C. 102 Fig 418 Shows feebleness & absence of predicrotism. In the heart tracing the curves as respiratory rising with expiration the face being livid & Suffocation imminent as death seemed approaching the patient had cold water dashed upon her followed by cold wet pack. This roused the patient & caused deeper respiration 3 or 4 minutes after Fig 419 was taken. It does not show depression

Fig 420 was taken 5 mints later at the apex R. had fallen to 72 & the Temp ½ a degree.

Fig 418

Fig 419

Fig 420

Fig 421

2 Hours later I took Fig 421 of the pulse & apex. The radial is very weak & tension low. The exhaustion being great brandy was ordered in teaspoonful doses every hour. As the result of the cold baths the air enters more freely into the lungs. 10 m. Sr. Still. & ℥iii Liq. Am. Act.

8th Day ℥iiß Brandy in 18 hrs. T102 R. 42. P136. Respirations deeper. Child semi conscious. Fig 422 Slight

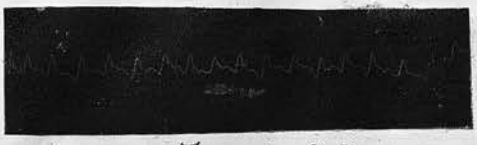


Fig 422

Fig 423

Fig 424

Fig 425

9th Day.
After 3r brandy in 24 hrs, last dose six hours ago. P144. R 80 but easier. T.C. 101'8 Lungs improving. Moist sounds less. Bronchial resp. louder, clearer. Fig 423 shows increased force. Fig 424 cardiac tracing affected by the respiration. Brandy stopped as it did not do good.
10th Day. Patient conscious. Pneumonia improving. R 60. T 100. P 120. Fig 425 shows increased arterial tension. As soon as brandy was stopped patient improved.
11th Day. R 60. P 120. T. 99'5. Fig 426.

Fig 426

Fig 427

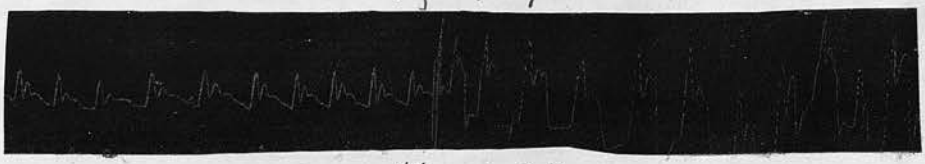


Fig 428

13th Day. Great improvement in physical signs R 40. P 120. Tgg. Fig 427 approaches the normal. Medicine given about every 3 hours. The improvement with these simple drugs has been rapid.
Fig 428 shows the normal tracings taken a week later when patient was convalescent.

Case Miss H. oct 6. measles.

2d Day of eruption. R 36. T.C. 104. TP 103. P 120. Figs 429, 430 represents radial & heart tracing. The predicrotic wave is absent in the former because the terminal wave is slight, the apex being slanting in the latter.
3d Day. P. 132. R 20. T.C. 101.5 T P 101. Fig 431
4th Day. P 100. R 20. T.C. 99. T P 96.

Fig 429

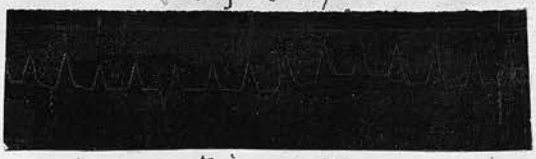


Fig 430

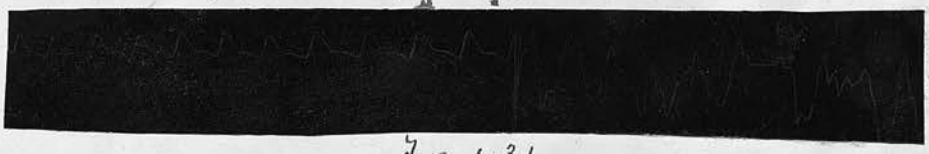


Fig 431

Fig 432

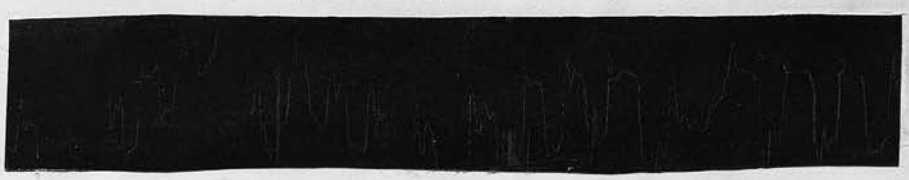


Fig 433

Eruption gone. Fig 432 Shows normal contour, but a series of coughs upset the respiration by elevating the line. Re heart tracing 433 Shows increased Systolic force.

Case W. H. Boy oct 8.

2nd Day T. P. 102. T.C. 102. R 28. P 120.
Fig 434 Heart tracing falls into inspiration
3d Day. Eruption faded entirely. Dry cough troublesome. Fig 435

Fig 434

Fig 435

T.C 99. ½ T.P 95. P 96. R 16.
Case 8 oct 8. Boy.

Measles eruption out one day only. TC 103. TP 107 R 16. P 132. Fig 436 Shows low tension. Systolic apex pointed & slanting in heart tracing. Patient had however a mitral impurity. Fig 437 following day

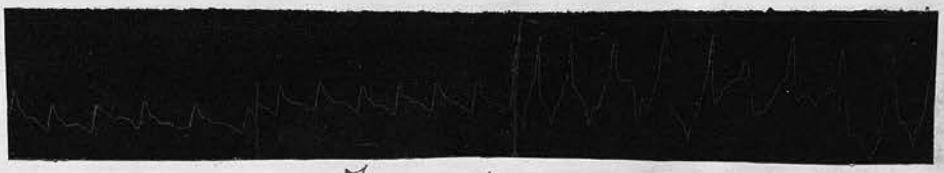


Fig 436

Fig 437

when eruption quite faded, P 88 T 98½. Mitral impurity persists.
Predicrotic & terminal systolic waves marked. Patient been in bed 2 days. Heart working easily.
Remarks. Predicrotism absent in severer cases. except in case of N.J. treated with Sod. Sal. but here it disappeared when pneumonia began, to reappear at convalescence.

Inflamatory
nonspecific diseases.

Acute congestion of the lungs.

Case No 2. Oct 22.

Acute congestion of the lungs. This was more than Bronchitis. It spread to lung tissue It got rapidly worse & was so severe that on the 4th day it threatened to be fatal.
It was one of those cases one rarely meets with & which too often proves fatal most unexpectedly.

Two days before Fig 438 was taken the patient got a chill. Complained yesterday of pain in the left side & had rigors The pain continues & there are signs of pleurisy.

On 3d day Had a cough. Resonance was impaired Bronchial respiration & moist rales. Bronchophony Rusty sputum. T.C 102. R 48. Pros. bounding. hard
Fig 438
4th Day. very bad night. At 11 a.m. appeared to be rapidly sinking. Face livid & dusky Great dyspnoea, ~~mucous~~ mucous rales in the throat. Sputum ~~no~~ frothy mucous. It was more

Rusty Sputa has bright red blood in it
This is inferred to be from a deep congested
surface. There was also hemoptysis in the
morning. Percussion dull over left base upto
angle of the scapula & to the axillary line in
front, vocal resonance altered & fremitus
absent. Friction Sounds Masked by the loud
Bronchial respiration & coarse moist
Sounds which were heard all over the chest.
not snoring bronchial rales.
Percussion note was impaired slightly over the
right base.
R 48 Shallow, vocal resonance was increased
except on left side. Weak T.C. 104 TP 103.
Fig 439 Shows very low arterial tension.
Being very urgent & unaffected by
mustard & linseed pontices I performed
dry cupping with wine glasses, putting on
16 over both bases. Each of which caused
powerful suction & were well filled.
This gave remarkable & speedy relief to the
breathing. Respiration became deeper
& the patient expressed himself as much
easier. I omitted to say that the pain of
the pleurisy which did not yield to
mustard was relieved by strong A. B. C. Liniment.

Cupping in about 20 minutes caused a marked change in the physical signs. The Bronchial respiration became less loud & softer & the moist sounds almost disappeared. While vocal resonance was not much increased. P 132. weak R. 40. Fig 440 taken immediately after the cupping shows more feble impulse. As patient was lying on his face this may account for it. Fig 441 20 mnts after cupping. Prescription. to take 1 m Tr Aconite every half hour.

6 p m. Has taken 8 m Aconite. Perspired freely. Much easier. Dirrhœa has come also rales from the throat. Bloody Sputum is much less more rusty. R 24 deeper. that is half the number. P 120 T. C. 103. T P 102½

Coarse pleural friction heard on left side. Respiration bronchial. but soft. Moist Sounds almost absent. Sometimes crepitation on deep inspiration. Percussion normal except on left side. Fig 442 Shows the radial pulse. Tension low, blood vessel entering easily & suddenly. No depression from the aconite. Fig 443 Shows cardiac tracing. Being a muscular man that may affect the size of the tracing. It shows feeble

impulse. Systolic plateau is rounded or sloping. Terminal systolic wave is rounded or absent for which reason the predicrotic wave is also absent from the radial tracing.

5th Day. R. 36. P 120 T.C. 103 4/5. T.P. 99 1/2. Heart sounds weak. 20 m. Tr Digit prescribed.

Fig 438

Fig 439

Fig 440

Fig 441

Fig 442

Fig 443

Fig 444

" 445

" 446

" 447

" 448

" 449

Fig 444 is before Rx digitalis Fig 445 20 mnts after. Pt line descends with inspiration Pleurisy is complicated with effusion. Bronchial respiration, moist rales. Percussion. Clear except over left base. Sputum rusty & bloody.
Digit repeated at 9.30. & 11-30.

Dr. Pigit

12 · 30 after 2nd in four hours. P 112. R. 28
T. C. 103. T. P 103 ½ Figs 446 & 7 show radial & heart tracing. In the latter the terminal Systolic wave is more marked.
10 p.m. P 100. R 36. T.C. 100. T.P. 100 ¼
Patient is weak from a powerful purging with Castor oil. It has lowered central temperature 5 degrees & it has fallen more rapidly than the peripheral.
Figs 448 & 9 show an improvement in both heart & pulse. The arterial tension is increased.
6th Day. Pulse 96 Soft weak. T.C. 101 ¼ T.P 99. R 30. Heart Sounds muffled Continual cough. Patient weaker. Fig 450 Shows very low tension & increased dicrotism. Fig 451 Shows a flat or rounded Systolic plateau. on acct. of the imperfect repletion of ventricle. Which in turn is caused by the low arterial tension. Treatment 5 grs. Am. Carb. & 5 m Am. Spec every two hours.
10 p.m. Pg2. R. 36. T.C. 101 ¼ T.P 100.
Heart Sounds weak.
20 m Fr. Camph. Co. added to former dose. Figs 452, 453 Show heart & pulse

Tracings the latter is altered by the cough.

Fig 450

" 451

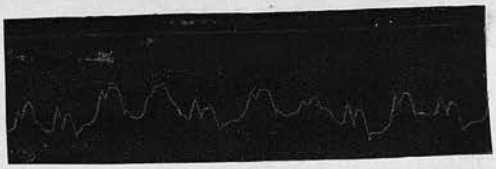
Fig 452

Fig 453

4th day 10. a.m After eight doses of last medicine which caused great drowsiness. There is more dyspnoea & lividity the effect of the opium. R 48. P 120. T.C. 104. T.P 98. Heart Sounds muffled. Fig 454 is the radial & 455 the apex tracing. Arterial tension is low & the patient is exhausted. I prescribed ℥i of Spt. Rect every ½ hour 10 p.m. after 11 doses Since 2-30 patient feels Stronger, cough less, perspires. dyspnoea relieved. R 36. P 108 less

compressible & fuller. T.C. 102'5. T.P 101
Heart Sounds Strong & Bronchitis less
Fig 45 6. Shows a return of predicrotic
wave for the first time. Whilst in the
heart tracing 457 there is the triple
oscillation of Systolic plateau.

Fig 454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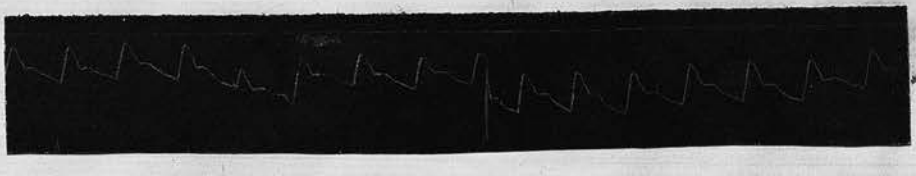
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8th Day. R. 28. Pg6. T.C. 99½ T.P 99½

After 7 3ss of Rect Spt. Fig 458 shows increasing arterial tension Fig 459 is the heart tracing. Bronchitis disappearing Pleural effusion disappeared. Area of dullness diminishing. P
The alcohol was stopped & 5 grs Am. Carb. with X m. Tr. Scillae was given every 2 or 3 hours.
From now patient continued to improve rapidly.
Fig 460 shows heart & pulse tracing on 9th day. Arterial tension is lower

Fig 460

Fig 461

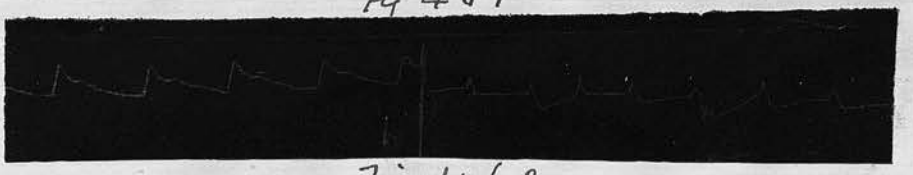


Fig 462

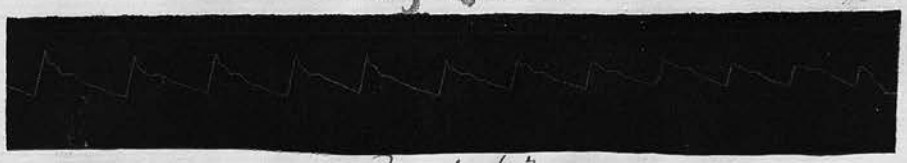


Fig 463

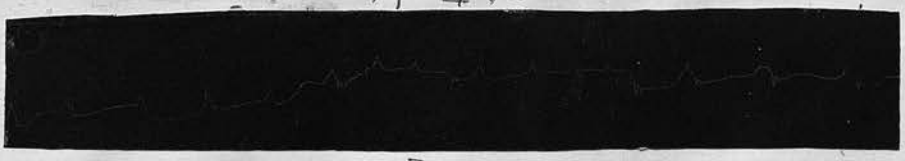


Fig 464

10 Day. P80. R28. T.C. 98½ T Pg 6. Fig 461
12 Day. Fig 462 Patient convalescent
Pulse 60.
14th Day Fig 463 & 4 show the pulse & heart tracing P. 60. Apex beat barely felt

Remarks.

I consider this case was saved by dry cupping or patient would have died on the 4th day. The arterial tension was low predicrotism absent. Systolic plateau flat & rounded. Digitalis given at the early stage, when the symptoms were acute, was of no service. A purge of castor oil lowered the temperature considerably which increased the arterial tension But it was very depressing. Alcohol administered for a period of exhaustion in small & frequent doses restored the patients strength. It reduced the temperature & frequency of the pulse It brought back the predicrotic wave & the oscillations of the systolic plateau increasing the arterial tension, the physical signs of the disease also improved. After it was stopped there was a slight temporary fall of arterial pressure.

Bronchitis

Case. F. H. male 15.

3d Day of disease which was acute.
T102. P120. Tr 465 1/m. Tr. Aconit every hour.

Fig 465

Fig 466

Fig 467

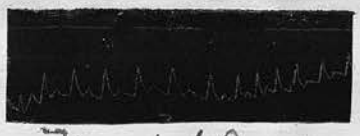


Fig 468.

Fig 469

Fig 466 taken following day. It shows great depression of systolic pressure. The dicrotic wave ascending on the following upstroke. P120. Small weak. T100. Patient feels weak but bronchitis improves
5th Day. After 24 grs. Am. Carb & 3vi Brandy

T 102. P 120 Stronger Patient better. Fig 467 Shows Stronger impulse & Slight pre-dicrotism.
2 days later I took Fig 468 Pulse 120.
Four days after Fig 469 patient almost well. Treatment been Ammon & Spec.

Acute Tonsillitis
Case R. Male aet 30.

Rigors, Headache Sore throat. T 103. P 108 Full bounding but compressible.
Fig 470 Shows low tension but Slight Predicrotism.
Treatment 2 m. Tr Aconit every 2 hours.
2nd day. After 24. m. Tr. Aconit: Throat not better, Patient very weak. T 99. '6. P 92. weak Fig 471 Shows diminished Systolic force & absence of predicrotism.
Prescribed 5 m. Tr. Bellad. every two hrs
3d Day. after 50 m. Tr Bellad Throat much easier. He derived more benefit for his trav Tr. to Aconite Throat dry pupils dilated T 99. P 96. Fig 472
4th day after 30 m. Tr. Bellad. T 99 '8 P 68. Throat feels well. Fig 473 indicates low tension but predicrotism has returned.

Fig 470

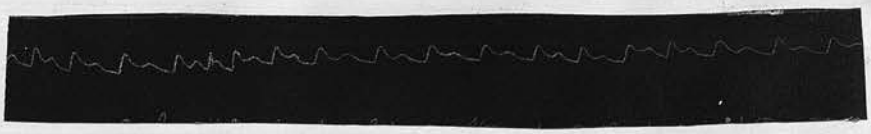


Fig 471

Fig 472

Fig 473

Fig 474

Treatment 5. m. liq. Ferri per chlor. f. with 20 m. ac. Hydrobrom. every four hours. 5th Day. after 8 doses. Fig 474

Case of Acute Catarrh.

F. Strong navvy aet 25.

Suffers from Catarrh and Rheumatic pains in the joints. T 103. P 96 full hard & Sthenic. Fig 475 Shows exaggerated precicrotism. no dicrotism. Copious

perspiration ℞m. ℞ aconite every 2 hours.

Fig 475.

Fig 476

Fig 477

Fig 478

2nd Day after 4 doses. Pains quite gone. Perspiration checked. Sore throat unaffected Tqq'8. P 68 much softer & compressible Fig 476 shows great depression of the systolic impulse.
Treatment 15 m. ℞ Belladt. d to relieve the throat.
3d day after 45 m. ℞ Bellad. Throat easier but dry. Pupils dilated. Tqq'8. P 68 full but compressible. Fig 477.
Treatment ℞m. Liquor Ferri p.q. t.d
4 Day after 3 doses P 60 strong. Fig 478

Remarks. These three cases illustrate the depressing effect of aconite on the pulse. The heart is lowered upstroke & rounded apex indicate diminished Systolic force. It does not exert much effect on the electric wave. The pulse & temperature are reduced. The arterial tension is unaffected by it which supports the view that it does not affect the vasomotor centre or nerves. Its action is on the muscle of the heart It does not relieve sore throat so effectually as Belladonna. The temperature & pulse fall during the administration of Belladonna in disease whilst the arterial tension rises.

Acute parotid abscess.

Mr. P. Oct 35.

3 days ago gland inflamed. P 120 small Fig 479 after 3ss Sod. Sal in last 24 hours. The following day fig 480 after the same amount. Similarly Fig 481+2 in the 2 next 24 hours. The Salicylate of Soda has not exerted any depression on the pulse.

Fig 479

Fig 480

Fig 481

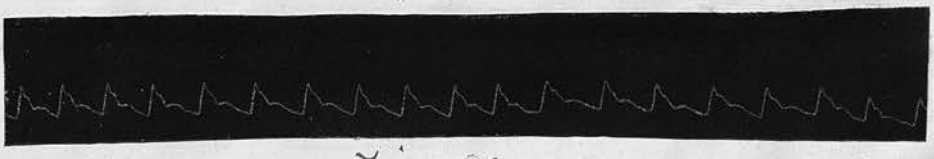


Fig 482

Fig 483

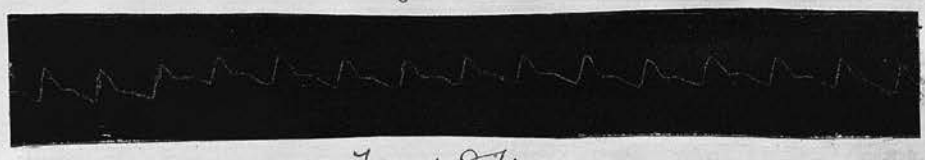


Fig 484

Fig 485

Fig 486

The patient was treated with 20 grs.

Ppt. Tod. t.d. After 3 doses Rise was severe Coryza. P 108. full bounding. Fig 483 Shows depression & low tension. Rx dose was reduced to 5 grs & Rx Iodism got less. P96. Fig 484 taken 2 days later & Fig 485 the following day When Iodism had almost disappeared. Rx abcess was opened & treated antiseptically Fig 486 taken 2 months later When the patient was quite well.

Pleurisy.

Mrs. A. Oct 10.

Has been discribed under Atheroma Had an attack of pleurisy with bronchitis.

Fig 487

Fig 488

Fig 489

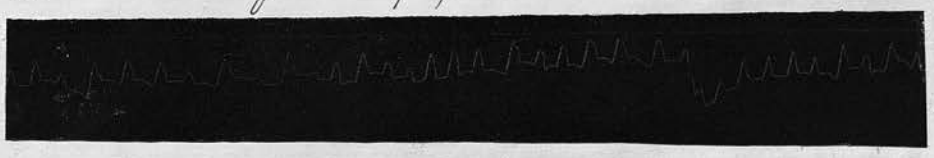
T 101. P 100. Fig 487 Shows a new feature

absence of dicrotism. This is caused by the inelasticity of the arteries. The other indication of low tension is present. namely the pointed & high apex in the ventricular Systole. Which shows the sudden entrance of small blood waves. Fig 488 Fig 489 is in health

Case Miss B. 6yr. Bronchitis

Well marked atheroma. Fig 492 Shows normal pulse.

Fig. 490 & 491 Shows pulse Heart Tracing during an attack of acute Bronchitis. Patient was the subject of phthisis.



Figs 490

491

492

493

Fig 493 taken from a patient far advanced in phthisis (female ~~æt~~ 32)

Case S. 5. Acute peritonitis

Subject to attacks of supposed colic & biliousness. Figs 494 & 495 show radial & heart tracing on 3d day of illness

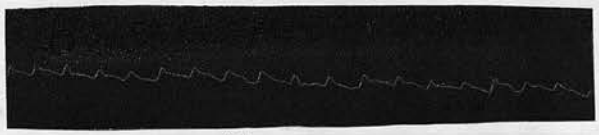


Fig 494

Fig 495

Fig 496

The two previous days there had been inflammation with extreme tenderness over the gall bladder. During last night perforation occured. There has since been uncontrollable vomiting of thick green bile. Patient is in extreme agony even the bed clothes touching the abdomen causing exquisite torture. Distension of abdomen & tympanitis. Pulse 130 small & thread. Tracing ascends with inspiration (showing abdominal influences). This also occurs in the heart

tracing which is affected by the respiratory curves. T.C. 103. R. 50 shallow & painful. Hot baths & poultices were applied to relieve pain. Fig 496 was taken same evening at 7 p.m. Patient died the following night.

Diarrhoea & vomiting have a marked effect on the pulse in lowering arterial pressure. The following tracing are from a patient described under mitral Stenosis at HB page 93
Fig 497 was taken in health. Very slightly under the influence of Belladonna. P. 60.

[redacted]

Fig 497

[redacted]

Fig 498

[redacted]

Fig 499

Fig 498 during an attack of diarrhoea.

P80. Fig 499 shows the heart tracing.

The next two tracings were taken (Fig 500 & 501) during a bad attack of diarrhoea the latter when recovered from a youth with abscess

Fig 500

" 501

From this large collection of tracings, during different fevers and inflammatory diseases, important facts are to be adduced.

Mild cases, producing no constitutional disturbance, do not affect the tracing & so have not been shown. In severer cases the arterial tension is lowered. Dicrotism is increased. In many such cases there is no increase of Sigmoid wave. Here this is the case the dicrotic wave depends entirely on changes in the arterial System for its exaggeration. This is demonstrated

in the case of L. D. page 66. where, by the inhalation of amyl, the dicrotism was increased without affecting the heart tracing. It may happen that while the sigmoid wave is exaggerated the dicrotic is not. as in the case Miss B. page 230 where senile changes affected the elasticity of the arteries.

Whilst the dicrotic wave indicates the state of the arterial system, the predicrotic wave bears special relations to the state of the ventricle.

The predicrotic wave is present in some severe cases absent in others equally severe.

What then is predicrotism? It has been stated that the predicrotic wave represents & is caused by the terminal wave of the systolic plateau of the left ventricle.

As in aortic incompetence the dicrotic wave disappears, so in mitral incompetence the predicrotic wave is absent. In the latter the mitral oscillations of the systolic plateau cannot occur. The plateau

is slanting, the terminal wave absent or incomplete.

In cases where cardiac & radial tracings have been taken attention has been called to the fact that while predicrotism is absent in the latter the terminal wave has disappeared from the former. The systolic plateau is flat & rounded or slanting into an absence more or less complete of the mitral oscillations.

This condition of the ventricular wave indicates that the mitral valve is not sufficiently stretched to cause the oscillations which normally appear.

The cause of its diminished tension might be that the ventricle is not contracting with sufficient force or that its repletion is imperfect. It is not the former because where the heart has been strengthened by digitalis during the acuter stages of the disease, predicrotism has not resulted.

It is therefore due to imperfect repletion of the ventricle.

This explains why predicrotism does not always appear & at the same time, the theory is supported by this fact

Predicrotism disappears in those diseases where, by the congestion of large areas, much blood is drawn from the general circulation. Thus, in severe diphtheria the predicrotic wave remains, whilst in scarlet fever, bronchitis, or the severer cases of measles it disappears. This condition is favoured by the low arterial tension which accompanies it where the imperfectly filled ventricle empties its self more easily.

In old age the inelastic arteries increase the arterial tension, this resistance causes increased tension of the mitral valves, magnified more by the hypertrophied ventricle. Consequently the predicrotic wave is much exaggerated but even here the predicrotism diminishes while the terminal systolic wave disappears.

Therapeutics

As the action of the various drugs has been described as they have been employed I will not prolong the thesis by needless repetition

The Sphygmograph faithfully interprets their action on the human body, sometimes confirming, sometimes upsetting the conclusions which the symptoms have led one to infer.

Thus the Sphygmograph shows the depressing effect of Aconite more clearly than the finger, easily misled, detects.

Again, although under the influence of Digitalis, the pulse seems small & weak to the finger yet, the tracing shows, by the return of the predicrotic wave, an approach to the normal.

By the Sphygmograph we learn that Aconite must only be used in Sthenic cases, or, if Arterial tension be low the tracing indicates the period of depression when it must be stopped.

Belladonna, as will be seen in an experiment on myself, lowers the arterial tension in health; given in disease it does not lower & sometimes raises the arterial tension. Nor does it quicken the pulse it may retard it.

Belladonna in health.

Fig 502 Shows my pulse before the morning bath. Fig 503 was taken after the bath & indicates increased tension. Fig 504 is a tracing taken after breakfast on a previous day. At nine a.m. I took 20 ms Fl. Bella P 80. At ~~9~~ 9-30 Fig 505 was taken P 80. slightly increased dicrotism. No effects felt yet. A light breakfast of coffee & bread & butter was taken.

At 10 a.m. the throat mouth & nose felt as dry as a board. There was brow ache over the frontal sinuses, dimness of vision, slight dilatation of the pupils P 100 & dicrotic. Fig 506 Shows very low arterial tension. During the next half hour I felt much

worse, I went out but could not walk feeling stupid from the catarrh & dimness of vision.

The cold air caused a sudden stoppage of the nose.

At 10-15 I took ℥ss Hydrobromic Acid freely diluted. Repeated at 10-40 & 11 a.m. It gave me great relief, relieving the thirst & dryness of the mucous membrane but producing tinnitus aurium.

Fig 502

Fig 503

Fig 504

Fig 505

Fig 506

Fig 507

Fig 508

Fig 509

At 10-40 I took a tracing Fig 507 & again at 11-20. Fig 508. the latter being standing while the others were Sitting.
The arterial tension is increased in both; the Symptoms having partly Subsided. At one p.m. the effects had passed off, & I felt just as if I had recovered from a Severe cold.
P 84. Fig 509

This tracing Shows that Belladonna lowers the blood pressure which is contrary to Harley's Opinion (See Ringer), he also considers it a powerful heart tonic & to Strengthen the heart, it however does ~~the latter~~ only by diminishing peripheral resistance. Belladonna paralyses the terminal

filaments of the Vagus or inhibitory nerves. It also paralyses the cord, or in mild doses Stimulates it (Traer).

Harley believes that it Stimulates the Sympathetic of the neck & thus accelerates the heart. When the Vagi are divided the heart beats quicker but the arterial tension rises. Whereas after Belladonna the arterial tension falls. This occurs if the Sympathetic or accelerator be Stimulated. Stimulation of the accelerators increases the cardiac rhythm which gives the heart less time to fill it consequently sends smaller waves & the pressure falls.

Donders (Nederland Arch. vol II. p 180) considers that the acceleration of the heart is associated with a shortening of the diastolic period.

Bert (Arch für Anat u Phys 1878) maintains the same view.

Another fact to support the theory that Belladonna Stimulates the Sympathetic is that Stimulation of the cervical Sympathetic dilates the

pupil. Belladonna given internally dilates the pupil; this, though not generally maintained might be through its action on the Sympathetic.

The value of Belladonna in pericarditis has been referred to. By lowering the arterial pressure it diminishes the peripheral resistance & the ventricle can do its work easier.

Digitalis

has been referred to as a cardiac stimulant increasing the systolic force, retarding the heart whilst blood pressure rises. It is of value during convalescence, but no good during the acute processes.

At this period of disease the proper cardiac stimulant is alcohol.

Alcohol

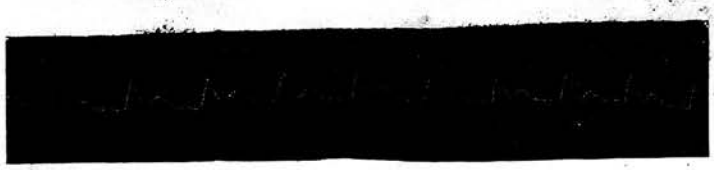
has found useless in the early stage of a case of Bronchopneumonia (See p208). When the period of convalescence arrives, during acute disease

Then alcohol improves the pulse bringing back the predicrotic wave, besides lowering the temperature & strengthening the heart. When this has been obtained alcohol should be at once stopped. If administered too long it keeps up the temperature & pulse. As is shown by the falls in T° & P which occured after alcohol was stopped in cases which had benefitted by it.

Iodide of potassium.

lowers the arterial tension & depresses the heart slightly. The former is due to the coryza, the latter is the effect of the potassium. The action of this drug is demonstrated in tracing 483. p 228. Fig 510 also illustrates its action. Fig 510 was taken two days previously. It was a case of intense headache treated with 10 grs of Iodide t.d. There was slight coryza. Fig 512 taken the following day when

Pot. Iodide was combined with 30 grs of bromide of ammonium.



7g 510

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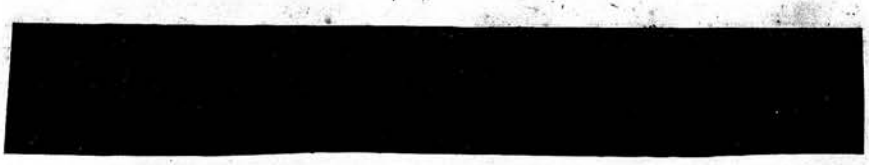

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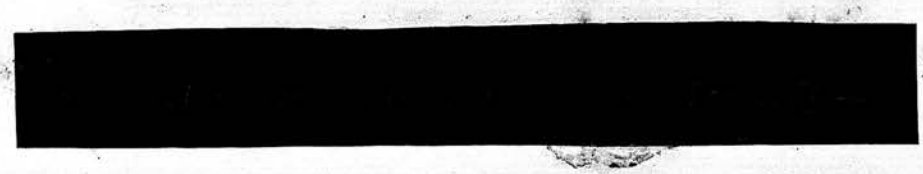


514

This drug is largely given with beneficial results in aneurism.

From the above tracings it is evident that it acts by lowering the blood pressure & at the same time depressing the heart. In this way the tension of the aneurismal Sac is diminished which would

account for the disappearance of pain & the apparent contraction of the Sac which is supposed to follow the continued use of this drug.

—

Bromides.

contract all blood vessels, producing anemia of the brain & cord, acting thro' the vasomotor centre. They lessen the frequency & force of the heart shortening the Systole & prolonging diastole arresting the heart in diastole (See Ringer). These facts are confirmed by the tracings of the last case in the latter the patient took 30 grs Ammon. Brom. four times a day, producing slight bromism. The patient sleeping all day. The arterial tension is raised. Fig 514 shows his pulse in health. Fig 517, 3.

Chloroform.

It was found by the scientific grants committee. (B. M. J. Dec 18th 1880)

that if chloroform be administered in excess, artificial respiration being kept up, the heart ceases to beat with enlargement of the right ventricle & large veins. The pulse rate falls while that of the respiration increases. There is first a transient rise & then a fall in the arterial tension & the pulse becomes dicrotic. When the vagi were both cut the pressure fell but not so much nor so quickly & when the chloroform was pushed to the fullest the pressure did not fall to the lowest, whence the use of atropine in surgical practice.

In the frog chloroform affects the heart by retarding the pulmonary circulation 1st in the arterioles then in the larger vessels. The hearts impulse becomes weaker & the backward pressure causes distention of the right ventricle.

I show tracings from three cases under the influence of chloroform. In the early excitable

Stage the pulse increases, when fully under Chloroform it is Slow

Case T. male vet 25.

Fig 515 Shows normal pulse in health

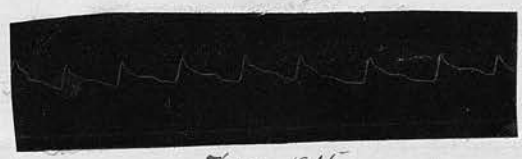


Fig 515

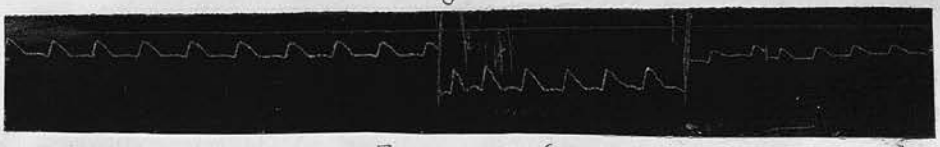


Fig 516

Fig 517

Fig 516 Shows the early excitable Stage. In the third division, the patient held his breath for some time, the impulse of the heart immediately becomes weaker, the whole tracing shows lowered arterial tension. Fig 517 was taken when the patient was more deeply under Chloroform the 2nd division when he stopped breathing from an over dose, the 4th division when completely under.

This shows feeble impulse & the circulation indicates low tension.

Case Mrs A. act 40.

Fig 518 shows the normal tracing.

Fig 518

Fig 519

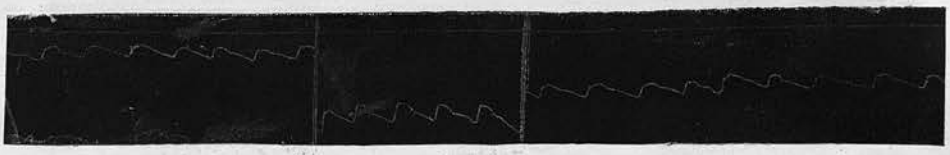


Fig 520

Fig 519 was taken during the early stage of excitement. It shows lowered tension & feeble impulse. Fig 520 1st part when patient was nearly under. 2nd part when she recovered slightly & was excitable, & 3rd part when she was completely under the anaesthetic. It resembles very closely the tracing of fatty heart Fig 8

Case H. act 34. male

Fig 521 shows normal pulse in health. He was a very heavy drinker

which probably affected the arteries as they are thickened. & the tracing is that of atheroma P. 76.

Fig 521

Fig 522

Fig 523

Fig 522 taken when patient was fully under Chloroform P. 68. the characteristic of case II. Fig 523 was taken early one morning after a night's heavy drinking followed by delirium tremens. P 108 compressible & weak. It somewhat resembles that taken under Chloroform but shows a stronger impulse.

Nitrite of Amyl

This drug by its effect on the capillary circulation of the head lowers the blood pressure.

Fig 524

Fig 524 is a typical example of a pulse influenced by Amyl. It is taken from a healthy subject. Mr Whose normal tracing may be seen in Fig 37. Similar tracings may be seen referring to the case of W. E. figs 137 b, 134.

As I have taken tracings in cases of Epileptic coma, parturition, & one or two pathological conditions which are interesting I should like to show them before concluding.

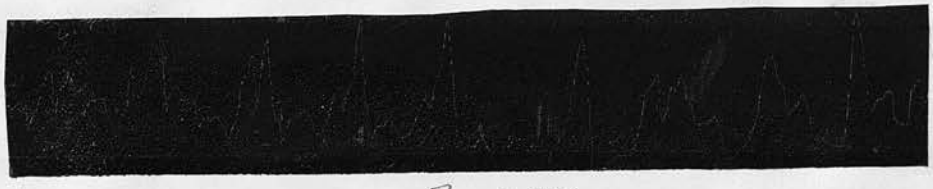
Epileptic Coma

Case P male set five.

When the tracing was taken the patient had fallen into a coma after an epileptic attack. The body was not convulsed & the Respirometer. Pupils contracted. Conjunctiva insensible. The pulse could not be counted so rapid & so small & the pulse curve Fig 525 is devoid of any ordinary characters. Fig 526 shows the heart tracing which has a rounded apex & marked Sigmoid wave. It was taken when patient was quiet & indicates a low blood pressure. Fig 527 was taken during excitement. Respiration hurried when another convulsion was

Zy 525

Zy 526



Zy 527

anticipated.

Aneurism of the Aorta ??

Case F. vet 60.

This patient complained of breathlessness on exertion. Palpitation & flatulence. The heart sounds are weak inaudible in the Aortic area. There is slight dullness to the right of the manubrium sterni. There is marked visible pulsation of all the arteries even the Ulnar. There is no appreciable delay in the different radials though the symptoms are vague I suspected innominate aneu

Fig 528

Fig 529

Fig 530

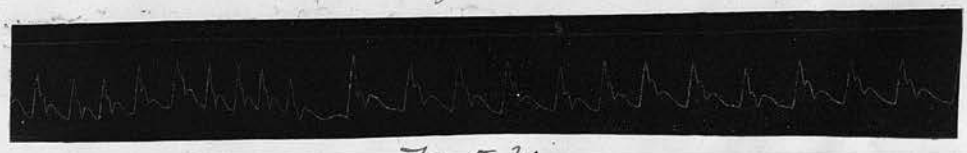


Fig 531

Fig 532

Fig 533

Fig 534

aneurism. The pulse was irregular, intermittent & of the Corrigan type. I treated him for flatulence only, & he improved. Dicrotism is in 2 ces. This occurs in aortic aneurism when the sigmoids are intact. The blood recoiling on the closed sigmoids dilates the aneurism, whose suddenly stretched walls reacting, add to the intensity of the sigmoid wave (Marey)

Fig 528 & 530 were after the exertion of walking on different days. Fig 531 was after a short rest. Fig 529 shows the ulnar pulse taken at the same time as fig 528 of the radial. Fig 532 When he was better & Fig 534 When he discharged himself. The pulse varied from 70 to 90

Gout (Supposed) & Chronic Prostatitis

Case W. H. Oct 00.

Fig 535 Shows the pulse When first seen Arteries Thickened. P. 88. Fig. 536 When treated with atropine Fig 537 When under the influence of Iodide.

Fig 538 after continued use of hydrobromic Acid, & Patient in good health

Fig 535

Fig 536

Fig 537

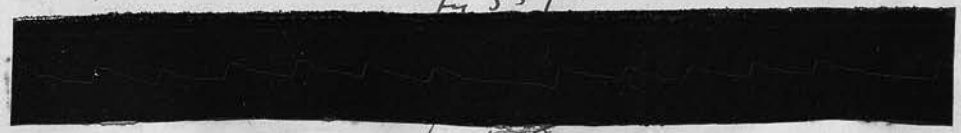


Fig 538

Parturition

This subject is too vast to be dealt with fully in the present thesis. I shall only show tracings from a few cases. The character of the tracing during & just after labour is that of Exhaustion. Arterial tension is normal or perhaps increased, Pulse slow & weak. This is Nature's safeguard against hoemorrhage. The impulse of the blood wave is too feeble to dislodge the clots in the contracted uterine vessels. Hence the custom of giving stimulants after natural labour is bad, it increases the risk of hoemorrhage, by making the pulse stronger. If the frequency of the pulse be increased to 100 or more, the blood pressure falls. The rapid, sudden, & more forcible penetration of the blood wave dislodges the clots from the orifices of the relaxed uterine vessels, & hoemorrhage results.

Besides local treatment for closing the mouths of the bleeding vessels, means are employed for reducing the frequency of the pulse. Whilst this occurs arterial tension increases & the arteries contract. This object may be obtained by

lowering the head, & by digitalis in large doses, ℥ss to ℥i are not too large doses at such times. Probably ergot by contracting the arterioles raises arterial tension outlands the heart. If there be great prostration alcohol is then indicated. It reduces the pulse & increases the arterial tension at such times. (See figs 135 & 137 page 120.)

Case Mrs B. act 40

Fig 539 was taken 5 minutes after the expulsion of the placenta, half an hour after the birth of the child. P96 full

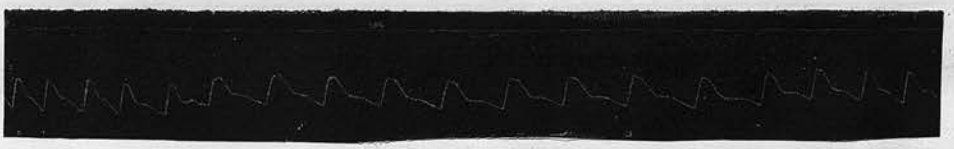


Fig 539

Case Mrs E. act 36

Fig 540 was taken when labour was commencing 12 hours before the child was born. P84 Mitral sound weak, 2nd accentuated

Fig 541 was taken 5 minutes after the child was born. The slanting ascent around apex denotes cardiac exhaustion. P68 small weak compressible. Fig 542 (1st half) was taken 10 minutes later after the removal of the placenta P72 Fig 542 (2nd half) was taken half an hour later

and after ʒii Ext Digit hq had been taken.
There was 'after pains' & no hæmorrhage P84 stronger

Fig 540

Fig 541

Fig 542

Fig 543

Fig 544

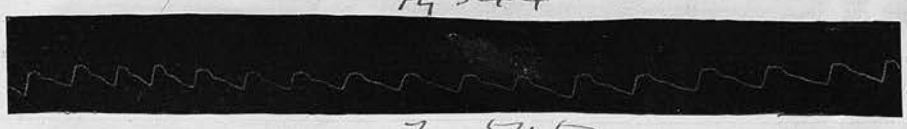


Fig 545

Fig 546

Fig 543 at 1pm 8 hours after the child was born P84
Fig 544 Next day P84 Lies comfortably Heart sounds clear
Fig 545 on the 3rd day P80, Fig 546 on the 5th day P80
The patient progressed favourably the whole time

Case

Mrs S oct 38

Fig 547 was taken during labour, 2 minutes after a pain. P84 compressible. The tracing descends with inspiration, showing thoracic influence. Fig 548 5 minutes after an easy labour P72. Fig 549 half an hour later & after 4grs Ergotin P72 Fig 550 a week after

Fig 547 Fig 548

Fig 549 Fig 550

Case Mrs H. oct 27

Fig 551 Fig 552

Fig 553

Fig 551 ½ an hour after labour, slight haem. P64. Fig 552 ¼ hr after 3gr Pit Pyrst liq. P64 less Comp Fig 553 a week later P72

Case Mrs W. oct 38

Forceps delivery with post partum haem. Fig 554 P96 before haem. 5 min. after 3grs Ergotin. Fig 555 P78 less comp. after 3gr Ergotin & 3ss Brandy. after haemorrhage Fig 556 shows the normal 7 days later

Fig 554 Fig 555

Fig 556