The Physiological Action, and some of the Therapeutical uses of Strong Doses of "Digitalis".

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This Thesis will be divided into two parts, the first treating of the action of large doses of Digitalis, frequently repeated. The second of some of the Therapeutical uses of Digitalis so employed. The Thesis is based upon cases which I took myself when I was Resident Physician to the Edinburgh Infirmary under Dr Geo. Balfour.

The cases consist of four Pneumonias, Two Cardiac cases complicated with conditions producing high Temperature, Three Cardiac cases; Two cases of Bright's. All these cases with the exception of two were treated by the administration of 75 grains of Digitalis, every four hours, some of the cases had other Medicines combined with the Digitalis.

By referring to the sheets the treatment of each case will be seen. In order to ensure the proper strength of the Drug, a special infusion was prepared containing 15 grains to the ounce; thus each dose of half an ounce corresponded in strength to two and a half ounces of the ordinary British Pharmacopoeia infusion.

Owing to my handwriting being indistinct, the Thesis has been copied for me. The case sheets I have written myself.

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Pneumonia

Rapidity of Pulse

1. Large doses of Digitalis, frequently repeated, do not always reduce the rapidity of the pulse; the pulse may rise very high.

But in all cases, when the physiological effects of the drug are produced, the pulse rate comes down in a marked manner, in the course of a few hours.

2. When Digitalis lowers the pulse rate before the time of production of physiological effects, it does so gradually, but the lowering is accompanied by fluctuations.

3. The lowering of the Pulse, though accompanied by a lowering of the Temperature, does not bear a constant relation to it.
Cardiac cases without high Temperature, rapidity of Pulse.

In two cases pulse was lowered in a marked degree from the first, with fluctuations.
In the third case there was no fall, rather a slight rise. All cases were lowered markedly when physiological effects were produced.

Doughly, Davies.

Cardiac cases with high Temperature.

In one case the pulse was lowered in a marked degree from the very first.
In the other case, pulse was lowered in a steady manner from the first.

Gallie

Chronic Bright.

There was lowering of the pulse.

General conclusions from all the cases: Rapidity of Pulse.

1. Large doses of Digitalis, frequently repeated, as a rule, tend to lower the rapidity of the pulse. They may leave no effect on the rapidity, and they may increase it. In all cases however, when the physiological effects are produced, there is a marked lowering in the rapidity.

2. When Digitalis lowers the pulse, it may do so, gradually, steadily, or in a marked degree from the first, and there are always fluctuations.

3. In cases where the temperature is high, the lowering of the pulse is accompanied by lowering of the temperature, but the relation is not uniformly constant.

Physiological effects of the Drug are:

(A) Feeling of Sickness. (B) Actual Vomiting.
(C) Irregularity of the Pulse. (D) Marked lowering of the pulse rate.
Time of production of physiological effects.

1/8 grains of Digitalis taken every four hours will generally produce no physiological effects before 16 hours—60 hours may elapse and probably more without these effects being produced. In one case 31/4 grains took 5½ days to produce the effects—1/8 grains may however bring on these effects in less than 24 hours.

Time required for the pulse to regain its normal rate of rapidity and to become regular after interdiction of the drug.

A rule the pulse attains its normal rate of rapidity and becomes regular in 24 hours or even less.

(As I cannot attach undue importance to this last paraphrase, as being unable to be constantly present with the cases, I could not ascertain the exact time when the pulse became irregular.)

Condition of the pulse—rate after being lowered and after interdiction of the drug.

It appears that the rate of the pulse, when it has been lowered and when the administration of the Digitalis has been stopped, increases then once more decreases, and again increases in a steady manner for some time.

Strength, fullness, compressibility of pulse.

The strength of the pulse appears to increase until the physiological effects are produced (In some cases the strength remains the same), but in these cases, as pulse is noticed as “strong,” the strength might have been increased, without it having become apparent to tactile perception.

When the physiological effects have declared themselves, the strength is diminished, and in some cases (possibly in all) after a time the strength is increased again, in more than half the cases, the fullness of the pulse increased up to the time of physiological effects.
In other cases fullness appeared to remain in "status quo", but here again tactile sensibility might have been unable to appreciate a change. In those cases in which the fullness was noticed to increase, it decreased at time of Physiological effects and after a time again increased. The pulse appears to increase in hardness up to the time of production of physiological effects, then to decrease in hardness and after a time again to increase.

Cardiac Impulse

The Cardiac impulse appears as a rule to get stronger, until time of Physiological effects, then to lessen in strength and after a time to increase in strength again. (The drug was stopped after the physiological effects appeared)

Cardiac Sounds and Murmurs, Pneumonia.

Of the four cases of Pneumonia, the state of the heart is only recorded in three.

Ecteral and Auricular Area.

Two of the three cases had systolic murmurs in the Ecteral and Auricular areas (by Auricular systolic murmur, I mean that murmur heard over a space a little to the left of the pulmonic area, and which is synchronous with the Ventricular Systole). In one case where the Digita was stopped in less than 36 hours, as the crises had come on and the patient was convalescent, the murmurs continued up to second day, (his heart not examined after that.)

In the other case the Ecteral systolic murmur disappeared in 24 hours, and the existence of the Auricular murmur is noted as "very doubtful", next day there was no Auricular murmur. In the third case where there were no murmurs, the Ecteral first sound appears to have increased in strength a little at first. (This was the case that died.)

Pulmonary Area.

The pulmonic second sound was accentuated in the three cases. In first case it continued for two days, when it was not examined again. In second case accentuation decreased at time of Physiological effects, then increased, and once more decreased.
In third case whole died, accentuation had diminished on second day, when heart was not further examined.

**Mitrail and Aortic Regurgitation**

"Wilson"

**Sounds and Murmurs.**

This was a case of Mitrail and Aortic regurgitation, presenting urgent symptoms. The physical signs were a Systolic murmur in Mitrail and Triuspid areas.

Aortic heard rather feeble, Pulmonary heard accentuated

In 24 hours Aortic heard sound became louder.

In 48 hours Aortic diastolic murmur, and in Triuspid area systolic murmur is now accompanied by first sound.

In 72 hours Physiological effects produced between the 48 and 72 hours Systolic murmur disappeared in Triuspid area.

Diastolic Aortic Murmur propagated to Pulmonary area.

In 216 hours, that is 9 days, there is a return of the Systolic murmur accompanying the first sound in the Triuspid area, and the diastolic Aortic is no longer propagated to the Pulmonary area.

This case lead undergone the same treatment and ended it only 10 days before, but as the symptoms had again got worse the treatment was renewed.

When the Physiological effects were produced the Drug was discontinued.

**Aortic Regurgitation**

"Dall"

**Sounds and Murmurs.**

This was a case of Aortic regurgitation with some Bronchitis, great dyspnoea. Physical signs were Mitrail first thumping, but not strong. Diastolic murmur heard in every area! - Systolic Aortic Murmurs.

In 24 hours, Mitrail first louder. Aortic systolic murmur much more distinct and now propagated to the Pulmonary area Physiological effects produced in 48 hours or a little time after that.

In 5 days the Systolic murmur still continues to be propagated to the Pulmonary area.
Case of Dilated Heart with Bronchitis

"Davies."

Sounds and Shivers

From my notes the sounds in the case of Davies, Donoughill, do not give much evidence of changes in the power of contraction and I will refer further on to these changes by sphygmmographic tracings. All these cases will be more fully referred to afterwards. They are only noted here in connection with the changes in the cardiac muscle shown by the condition of the sounds & shivers.

Quantity of Urine - General Results

Quantity of Urine increases up to the time of the production of physiological effects.

Their generally diminishes, but not always so.

In those cases in which it diminishes, at the time of physiological effects it again increases, and in those cases in which there is no decrease, it either continues high or increases more.

Interpretation of Sphygmmographic Tracings

Before analysing the sphygmmographic tracings of some of the cases I would make some remarks in regard to their meaning.

If the blood pressure is good, the height and perpendicularity of the upstroke will correspond to the distensibility of the Ventricle and to its contractile power, showing that a large wave has left the Ventricle.

The first downstroke I will call the "Elastic" stroke and suppose it to be produced mainly, if not, solely, by the elastic coat of the Artery.

The second downstroke I will call the "Muscular" stroke and suppose it to be produced mainly, if not, solely, by the muscular coat of the Artery. - The reasons for holding this view are the following:

(A) The interruption between the two downstrokes is not owing to the closure of the Aortic valves. When the Ventricle contracts the valves are not thrown back against the walls, but according to Landini are kept in a state of equilibrium by the aortal and recurrent streams and close just at the end of the systole, so that in a tracing taken from a large artery we would expect the interruption between the two downstrokes to be placed high up, whereas such is not the case.
If the interferences were due to the closure of the valves, as the close at the end of the systole, the interference must at the latest be synchronous with the beginning of the Arterial Systole, but the Tracings from a big Artery do not exhibit that condition.

(B) The larger Arteries have more elastic tissue in proportion to Muscular tissue than the smaller Arteries. And Tracings from different sized Arteries, in the same subject, show that the first downstroke or Elastic Stroke in the larger Arteries is relatively larger than the second downstroke or Muscular Stroke in the smaller Arteries,

(C) Let us take any Artery, say, the radial. A Wave reaches it and distends it. In this distension, the elastic coat must have been put on the stretch, consequently it will at once react. Now it is not likely that the Muscular coat will act at once any the same time with the elastic coat, being of such different nature. It is more reasonable to suppose that the first part of the Arterial Systole is due to the elastic coat alone; that the rebound then meeting with greater resistance receives a check, and that at that moment the Muscular element comes into play (assisted passively by the elastic coat) and continues the emptying of the vessel. It is for these reasons that I will speak of the Elastic Stroke and of the Muscular Stroke when describing the Tracings. We hear of the Muscular coat in the small Arteries leaving the function of regulating the Calibre of the Capillaries, but the Muscular coat of Arteries like the radial and also the larger Arteries, must have some function also, and their function must consist not in regulating the Calibre of Capillaries but in acting as one of the driving forces of the Circulation, as a supplementary Heart.

Height and Perpendicularity of Uprroke

Now, whether this explanation be true or not, the height and perpendicularity of the Uprroke will depend upon the size of the blood Wave that has left the Ventricle and upon the power with which it has been driven out, that is, upon the Distensibility and Contracting power of the Ventricle.
3. The more obtuse the angle of the tracing, the lower will the blood pressure be.

(For the following tracings the readings are often unreliable, owing to the fact that the sphygmograph, gives different result according to the amount of pressure used & it is impossible always to leave the same pressure)

Please refer to the Tracings, each set is on a different page, with the name of the patient.

**Pneumonia - Burns**

Burns, a case of Pneumonia. On Admission, Murmurs indicating a Dilated Heart were present.

Tracing 1. Corroborated this by showing low blood pressure.

Tracing 2. (24 Hours after Digitalis was began) shows an improvement in the size of the wave & in the blood pressure.

Tracing 3. (48 Hours after Digitalis was began, but Digitalis was stopped 12 Hours before the Tracing was taken, as patient was convalescent) has evidently been taken under too high pressure, as it is, we may infer from it, that the blood pressure was even higher than in tracing 2.

**Pneumonia - Lynch**

Lynch, a case of Pneumonia. On admission, Murmurs indicative of Dilated Heart were present.

Tracing, corroborated this by showing low blood pressure.

Tracing 2. (24 Hours after Digitalis began) shows improved cardiac action and increased blood pressure.

Tracing 3. (48 Hours after Digitalis began. Digitalis stopped 5 Hours before Tracing - as physiological effects appeared) shows a feeble action of heart and lowering of the blood pressure.

(That these two conditions are not due to partial paralysis of the heart. I will endeavour to prove afterwards. For the present I will state that they are due to over contraction of heart.

Tracing 14. (about 24 Hours after Digitalis was discontinued) has also been taken under too high pressure; but it evidently shows from the perpendicularity of Upstroke, a more powerful action of heart, and from the height of the end of the elastic stroke, it shows that the blood pressure is greatly increased.
Tracing 5. (48 hours after Digitalis was discontinued) shows same condition as 4th day, or rather an improvement.

Pneumonia "Daly"

Daly, a case of Pneumonia, admitted in a semi-conscious state, having driven into some several miles in a cart, after some days illness auscultation detected a dilated heart.

Tracing 1. Shows great weakness of heart and low blood pressure. Tracing 2. (24 hours after Digitalis was began) shows same condition.

Tracing 3. (48 hours after Digitalis was began) shows increased power of heart, and increased blood pressure. This patient was too far gone to recover and he died two days after.

Mitral and Aortic Regurgitation. Great Dyspnea'

"Wilson," a case of above. Patient had suffered from great dyspnea, and lead administered to him. Strong Digitalis. After a temporary improvement she again became very dyspneic and was again put under the same treatment. 10 days elapsed between the two treatments.

Tracing 1. Shows rather low blood pressure.

Tracing 2. (24 Hours after Digitalis began) appears to indicate a worse condition, but auscultation & symptom of dyspnea being relieved show that the Tracing must have been taken under too high pressure and gives an incorrect reading. Most or all of the 3 tracings of this set appear to have been taken under too high pressure.

I shall therefore not refer to these afterwards, but judge of the state of the Cardiac from auscultation and condition of Symptoms.

Mitral Stenosis. Great Dyspnea.

MacGregor, a case of above.

Tracing 1. taken as before, before Administration of Digitalis. Tracing 2. (24 Hours after) Shows that the blood wave sent from the Ventricles has been small and sent with little force; blood pressure also low.

This case developed the physiological effects a few hours before Tracing was taken.
Bracing 3. (about 24 Hours after stopping Digitalis) Administration of Brandy shows a better condition, pulse still irregular.

Bracing 4. (48 Hours after) Still better.

Bracing 5. (72 Hours after, Brandy discontinued) 24 Hours before shows, the blood pressure slightly less. Patient was now put on small doses of Digitalis and Equino.

**Aortic Regurgitation, Great Dypsnoea.**

**Dall.** A case of Aortic regurgitation with some Bronchitis.

**Dall.** Shows good action of the heart but blood pressure inclined to be low.

**Dall.** (24 Hours after Digitalis) does not indicate much change.

**Dall.** (48 Hours after... do...) is more or less the same as 48.

**Dall.** (about 24 Hours after Digitalis was stopped, physiological effects produced about 17 Hours before, and 5 Hours before tracing was taken, pulse was irregular.) Appears to show a decrease of blood pressure

**Dall.** (48 Hours after Digitalis was discontinued) shows a good action of the Heart and blood pressure improved since 4 days, but in about same condition as 4. (Patient healthy has been improving every day.)

**Dilated Heart, Great Dypsnoea.**

**Davies.** A case of Dilated Heart, Bronchitis, Great Dypsnoea.

**Davies.** (evidently taken under too great pressure) shows weak action of heart, and low Blood pressure.

**Davies.** (24 Hours after Digitalis, Carbonate of Ammonium was added to Digitalis) Heart action stronger and increase of blood pressure.

**Davies.** (48 Hours after Digitalis, Physiological effects present) Shows a lowering of Blood pressure.

**Davies.** (About 24 Hours after Digitalis was discontinued) Still Blood pressure low, or even lower

**Davies.** (About 48 Hours after Digitalis was discontinued, Blood pressure lower.

**Davies.** 13 Blood pressure still better.

**Davies.** (84 days after Digitalis was stopped) Good action of Heart, and very good blood pressure.
Aortic and Mitral Regurgitation  "Douagly".

Douagly, Aortic and Mitral Regurgitation

**Tracing 1.** Low Blood Pressure.

**Tracing 2.** (24 Hours after Digitalis) In this case Digitalis given was 5 1/2 grains every 4 Hours. Blood pressure still low, or even lower.

**Tracing 3.** (48 Hours after Digitalis) Blood pressure increased.

**Tracing 4.** (72 Hours. — For the last 9 Hours dose was reduced to 12 grains every 4 Hours. Blood pressure very much increased.

**Tracing 5.** (4 Days to)
Blood pressure about the same.

**Tracing 6.** (5 Days to) Digitalis stopped yesterday.
Blood pressure still better.

**Tracing 7.** (6 Days — )
Blood pressure still greater.
Three Stages of Blood Pressure

From all these facts it will be seen that there are three stages in the condition of the blood pressure, if strong doses of Digitalis are administered at frequent intervals until the physiological effects of the drug have been produced.

These stages are the following:

1st. High Blood Pressure Stage, in which there is an increase of the blood pressure up to the time when the physiological effect are about to be produced.

2nd. Low Blood Pressure Stage, in which the blood pressure decreases very much and this stage is synchronous with the time of production of physiological effects.

3rd. Second High Blood Pressure Stage, in which the blood pressure again rises, this stage follows the cessation of physiological effects. (It must be understood that the drug is stopped at the beginning of the Low Blood Pressure Stage, that is when the physiological effects appear.)

High Blood Pressure Stage - Increase of Contractile Power of Heart

That in the "High Blood Pressure Stage", there is increased power in the action of the Heart, is proved by the following facts:

A) Case of Pneumonia, "Lyde", with dilated Heart.

The mitral systolic murmur disappeared in 24 Hours, and the existence of the Auricular systolic is marked very doubtfully showing that at least, it must have disappeared in part.

B) Pneumonia, "Day", (Patient who died) Dilated Heart.

The mitral first sound appears to have increased in strength a little at first, and second pulmonary accentuation lost diminished on the second day.

C) Mitral and Aortic Regurgitation, "Wilson".

In 24 Hours, Aortic second became louder. In 48 Hours, Aortic second was replaced by a diastolic murmur.

D) Aortic Regurgitation, "Dale".

In 24 Hours, Mitral first sound louder, Aortic systolic murmur much more distinct and now propagated to Pulmonary Area: (In the preceding lines I have only noticed those Murmur, which indicated changes in the contracting power of the Heart.)
(E) The sphygmoographic tracings of Burns', Lychee', and Daly.
(Frœmminos) indicate stronger action of heart, and also the
tracings of Davies' (Dilated Heart)

(F) The cardiac impulse appears to increase in this stage.
(G) The strength of the pulse appears to increase in this stage.
(In some cases pulse remains strong, but in these cases
increase of strength might have escaped tactile perception)

Increase of Blood Pressure in 1st Stage.

That during this stage the Blood pressure is increased, is
proved by the following facts:

(A) Freneness of Pulse increased in half the number of cases.
(If possible however that increase of freneness might have
escaped detection in these latter cases)

(B) Pulse appears to increase in Hardness.

(C) Sphygmoographic tracings of Burns', Lychee', Dale',
(Frœmminos) and Davies' (Dilated Heart) indicate increase
of Blood Pressure. The Tracing of D. Douglas.'(Aortie & Mitral
regurgitation') appears to show a decrease of Blood Pressure
after the first 24 Hours; but this must be an error in the
tracing as his pulse is marked "not so easily Compressible
as yesterday", and he was better. However the next tracing
after another day showed an increase of Blood Pressure.

Low Blood Pressure Stage—Diminished Contractile
Power of Heart.

In the second stage, that of Low Blood Pressure, there is
a diminished contractile power of Heart, this is the stage
when the Physiological effects are being produced, and at
this stage the exhibition of the Drug is stopped.
I shall endeavour to show further on, that under the
Condition of the Heart at this stage is not due to paralysis, but to
tonic contraction of part of its walls.

(A) During this stage strength of Pulse is diminished

(B) Sphygmoographic tracings of Lychee', (Frœmminos)
and E. Gregor' (Mitral Stenosis) show diminished Contractile
Power of Heart. For obvious reasons all the Tracings cannot
be noticed here, for example, in some cases the upperête
was so high and straight all throughout, that the diminution in the contractile power of the heart would have had to be very great, in order to make a difference in the condition of the "upstroke.

(c) Cardiac impulse lessened.

**Blood Pressure decreased 2nd Stage**

During this stage blood pressure is decreased

(A) In those cases, in which increase in the fulness of pulse was noticed in the first stage, a decrease was noted in the 2nd stage.

(B) Pulse appears to diminish in hardness during this stage.

(C) Sphygmographic tracings of "Lyle" (Pneumonia)
   "Dall" (Aortic incompetence) "Davies" (Dilated Heart)
   "Mc Gregor" (Mitral Stenosis) indicate lowering of the blood pressure during this stage.

**Second High Blood Pressure Stage - Renewed Vigorous action of Heart.**

After the second stage is over, the third stage comes on, and here the heart begins to regain its contractile power.

(A) The cardiac impulse appears to increase in strength.

(B) The strength of the pulse appears to increase in some (possibly in all).

(C) Sphygmographic tracings of "Lyle" (Pneumonia)
   "Dall" (Aortic incompetence) "Mc Gregor" (Mitral Stenosis)
   "Davies" (Dilated Heart) indicate renewed contractile power of heart.

**Increase of Blood Pressure**

In this stage the blood pressure is increased.

(A) The sphygmographic tracings of the above four cases indicate an increase of blood pressure.

(B) In those cases where fulness of pulse was lessened during the second stage, an increase in the fulness appeared to arise in the third stage.

(C) Pulse appears to increase in hardness.

**Condition of Cardiac Muscle during the Three Stages of Digatalis**

Having seen that there are three stages in the exhibition of "Digatalis" (when used in large and frequently repeated doses until its physiological effects are reduced) - and that the
The contractile power of the heart increases in the first stage, diminishes in the second, and again increases in the third. The question arises as to what is the actual condition of the cardiac muscle during these stages.

Experiments of Paget & Stephenson. 

Digitalis causes irregularity of heart's action, followed by complete stoppage of pulsations, the ventricle remaining rigidly contracted, after it has ceased to beat.

More frequently the irregularity consists in one or more portions of the ventricle (especially apex) becoming rigid and contracted, while remainder of organ continues to dilate regularly.

Experiments of Dr. Pollock. 

Digitalis: Then the distension becomes less complete, especially at the apex, which remained firmly contracted.

Experiments of Bochini. 

Digitalis: The heart acted with greater force, but larger doses diminished its power. Finally, the heart stopped with every drop of serum squeezed out of its ventricles.

The loss of power after large doses appeared to be due partly to the great slowing of the heart, partly to the incompleteness of the diastole and consequent imperfect filling of the ventricles.

From these experiments it will be evident that the cardiac muscle in the first stage becomes much more powerful, that its contractile power is increased.

It is also evident that the diminished power of the heart in the second stage is due to certain parts of the heart (more especially the apex) becoming tonically contracted.

Then the ventricles of the heart cannot dilate to their full capacity and however powerful the systole may be, still it is the systole of ventricles, practically diminished in size, insufficient as only part of their walls can contract, the others being
tonically contracted and incapable of expanding. And thus it is brought about, that the Cardiac power becomes lessened at this stage, not from any paralyzing condition, but from the very contrary, from a condition of Over Action, from a condition of Over Contraction.

This is clearly proved by finding the Heart after death, rigidly contracted. And so, when Death takes place from Digitalis, it is due to too great a part of the Ventricles having become tonically contracted, and therefore the exhibition of the Drug must be stopped at the beginning of the second stage, when this tonic Contraction begins to appear.

The above experiments do not go far enough to explain directly the condition of the Cardiac Muscle in the third stage. But it seems pretty clear that the increased power of the Heart in the third stage is due to the disappearance of the tonic Contraction. Then the Ventricles is able to dilate to its full capacity, and while losing its partial tonic Contraction, it retains a powerful Contracting Action, and thus the action of the Heart is found to increase in this stage.

Condition of Blood Pressure during the Three Stages of Digitalis

And now as to the blood pressure, it has been seen that it increases in the first stage, decreases in the second, and again, increases in the third. Now are these conditions produced?

The blood pressure increases with the force and frequency of the Heart’s Contractions and with the Contraction of the arterioles. These are the three factors of increase of blood pressure.

(A) The heart generally contracts less frequently during the first stage. This factor does not come into play in the production of increase of blood pressure in the first stage of Digitalis.

(B) The heart contracts more powerfully, and thus this more powerful contraction of Heart is one of the factors of increased blood pressure in the first stage. Especially is this the case when the heart to begin with, has been a dilated one from whatever cause. Then the Contraction was but partial and only emptied part of the contents of the Ventricles, but Digitalis causes the contraction to be complete, and so
not only is a wave thrown out with greater force, but it is a larger wave, and in this way the blood pressure is increased in the first stage.

(c) But contraction of arterioles causes increase of blood pressure. That digitalis in the first stage produces the contraction, is proved by the following experiment of Landau Bruntou.

(Landau Bruntou on Digitalis Page 31)

In a Dog experimented on, the Cardiac pulsations were reduced from 140 to 78 and yet the mean tension remained the same. Now it is not likely that the heat's contraction would by their extra power counter balance the diminished blood tension, which would result from such a reduction of the pulse rate. Therefore it must be inferred that the contraction of the arterioles is one of the causes of increased blood pressure. - Thus in the first stage the increase of blood pressure is due to the more powerful contraction of the heart, and to the contraction of the arterioles.

(Landau Bruntou Page 32)

In the second stage the blood pressure is found to be diminished. This has been ascribed to paralysis of the arterioles, but there appears to be no foundation for such a theory - Dr. Landau Bruntou, speaking of the low blood pressure, "(He refers to what I have called in these notes, the Second Stage)" in the arterioles states that it is due to dilatation of arterioles, and as one proof, says that - "Almost after death the arterial system is empty, and the venous full and turgid." Now it is surely evident from this fact observed in the lower animals that it is a great contraction of the arterioles, which is the cause of the emptying of the arterial system. If it were dilatation of the arterioles, the arterial system would not be found empty so soon. For then the elastic tissue of the arteries would be left by themselves to empty the vessels. But the elastic tissue cannot empty the arterial system immediately as all arteries after death are found to be patent, that is, the elastic tissue is at rest and powerless where the arteries are not dilated. Then and only then, does the Elastic Element come into play. There is nothing therefore left to
account for this quick emptying of the Arterial system, but the
supposition that the Muscular element of the arteries is very active
that is, is greatly contracted and this state most certainly would
cause the blood out of the Arterial system.
Another reason for believing that the arterioles at the second stage
are greatly contracted (and this contracted state will be found to
have an important bearing on the treatment of Digitalis) is,
that it is against analogy to suppose the opposite. It has been
seen that Digitalis in the first stage contracts more powerfully
the Cardiac muscle & the muscle of Arteries. It has been also
seen that in the second stage the Heart instead of being paralyzed
is overcontracted. Is it not rational to suppose then that the
muscle of the arteries is affected in the same way, both being
involuntary muscles. But how is the low pressure to be
accounted for, if great contraction of arterioles is admitted, seeing
that this contraction is one of the three factors of the production
of blood pressure? The explanation is this, - the Heart in
the second stage is practically feeble, owing to the tone Contracting
or part of its wall, and at the same time the pulse rate is
markedly lowered, and so only a small wave leaves the heart
and that at comparatively long intervals, this conditions account
fully for the low blood pressure and more than counterbalanced
the effect produced by the contraction of the arterioles on account
of the small amount of Blood passing thro' the heart, and
that at long intervals, the Arterial System contains so little
blood, that the contraction of arterioles added diminishing the
vessels arterial calibre, is nevertheless unable to raise the blood
pressure, or even to keep it up, at its former degree.
In the third stage, the increase of blood pressure is easily
accounted for. The Heart has no longer any tone contraction
but the whole wall dilates and contracts powerfully, also the
pulse rate is increased. The arterioles though not so Con-
tracted as in the second stage, still are Contracted. All these
conditions therefore explain the increase of blood pressure in
the third stage.
This then is the action of Digitalis given in large doses
and frequently repeated. In the first place, the Heart Contracted
are powerfully (and generally at longer intervals)
The arterioles are contracted and the blood pressure is increased.
Since the physiological effects of the drug are ushered in, we feel a feeling of sickness, actual vomiting, irregularity of the pulse, markedly reduced pulse rate. This is the second stage, and now the cardiac muscle is tonically contracted in one or more parts so that only a part of the heart can act, the heart contracts at comparatively long intervals. The arteries are greatly contracted. The blood pressure is diminished at the beginning of the second stage, the drug is interdicted after a time the third stage appears, and now the heart is dilating to its full capacity, and contracting powerfully; the heart contracts at shorter intervals, the arterioles are still contracted, though not so much as in the second stage. The blood pressure is increased.
The Therapeutical Uses of Strong Digitalis

Pneumonia

In describing the breath sounds, I shall adopt Skoda’s classification into Bronchial, Indeterminate, and Vesicular — Bronchial being the form of breathing heard in the second stage of Pneumonia;

Indeterminate — every form between Bronchial and Vesicular.

When indeterminate breathing is more Bronchial than Vesicular, it will be described as "indeterminate approaching the Bronchial."

"First". Pneumonia

First, Female aged 24. Had Pneumonia on admission the Temperature was 104. She had 3/4 grains of Digitalis and 10 grains of Chloral, every four hours. The next day she was slightly better her temperature having been reduced to 103.6 and she had a good Night’s rest. On the third day the temperature was still further lowered 102. On the fourth day signs of resolution commenced shown by Bronchial breathing at base having become indeterminate. Temp. 102.6 — On the fifth day there seemed to be an improvement again, the Respiration remaining same, but Temp. came down to 99.4 towards Evg. at Evg Temp. 100. This day owing to her weakness Brandy was added to the Digitalis. On the sixth day she became Convalescent in the evening, the Temp. having come down in the course of two hours from 100.2 to 99.4.

This patient on one or two occasions got out of Bed at Night which might account for her not improving sooner, on more than one occasion her face became of a purplish colour, and she seemed to be in a very serious condition for the time.

The colour was in part attributed to the Chloral.

"Burns". Pneumonia

Burns, Male, aged 19. Admitted July 6th with signs of Pneumonia of Right Base, at base of Base, percussion note was increased in pitch, vocal resonance increased. Respiration Bronchial, The upper part of the lobe gave Crepitations, Chlorides 2/10 Temp. at 11 PM 101. Heart dilated, Digitalis was
administered in 1/2 grains doses every four hours, at Night 40 grains of chloral. Next day patient was better as the Respiration was now bronchial only at the very base, and indeterminate elsewhere, showing that resolution was proceeding downwards. Resp. decreased by 12. Temp. 3.4 less than last night. Chlorides increased by 110 more. Next day again patient is convalescent. Bronchial Respiration gave way altogether. At very base breathing is indeterminate approaching bronchial, elsewhere it is indeterminate approaching Vesicular Resp. 99.4. Chlorides 6 10.

"Lycele". Pneumonia.

Lycele - Male, aged 32. Admitted June 28th with double Pneumonia, that on the right side, being a little more advanced. Upper lobes Vocal resonance increased on right side, Breathing indeterminate on both sides, accompanied by crepitations on left and approaching very nearly bronchial type at lower part.


Digitalis was given in 1/2 grains every four hours Chloral 40 grains at Night. Next day the Pneumonia process had spread, but patient was in a better Condition.

Upper Lobes - Respiration on right side extended to "very near bronchial type", to near the Apex and on the left side, Condition was similar.

Lower Lobes - Pneumonia spread here also. Respiration at upper parts approached very nearly Bronchial type with Crepitations at lower parts on right side. Respiration bronchial on left side indeterminate with crepitations. Yet while the Pneumonia had thus spread the Heart is in a much better Condition, the Murmurs having disappeared except the Atricular Systolic and its existence is noticed as "doubtful", while the Temp. is more than 3 degrees less than 4th day. On the third day Digitalis was stopped after 1 pill. at 5 Pill pulse was irregular and the patient vomited. On examination that Ves. respiration had begun.

Upper Lobes - Indeterminate approaching Vesicular type.

Lower Lobes - Right - Respiration indeterminate, very much less bronchial in Character than 4th day, approaching Vesicular type. At base and bronchial at upper part. Crepitations -
Left Base Respiration indeterminate, approaching vesicular, at upper part a little inclined to bronchial. Expectations. The Respiration came down to 31. The Auricular Rhythm disappeared.

Temp. at 10 P.M. 1 Degree less. Chlorides increased to 4 1/10.

Fourth day. - Patient may be said to be now Convalescent. Resolution proceeding. Temp. 98.4.

"Daly" Pneumonia

Daly, Male, aged 50. Admitted June 25th, in a semi-mortal state, with Right Pneumonia. Has been ill for some days and to day was driven several miles in a conveyance into town from the country. Great prostration, passes urine under him. Back of Right Lung dull up to 4 inches from Axil. Vocal resonance increased over the greater part of the dull portion. Respiration bronchial at lower part, higher is indeterminate inclining very much to the bronchial.

Left side. Full of minute Expectations. Resp. 35. Heart much weakened. Temp. 100.2. Digitalis 1/6 Grains every four hours. Chloral 30 Grains at Night. Was very restless at Night,icking the clothes of bed. Next day patient was worse, but left side had got rid of all the minute Expectations, thus showing that the Heart must have been much strengthened, so that it was able to rid the left lung of its passive Oedema. Temp. at 12 A M 103. and pulse had risen from 93 to 123. At Night had two doses of Chloral 40 Grains and afterward 10 Grains, after second dose slept for four hours.

Third day. Patient was in same condition, a little better if anything. Pneumonia state same as 4 day, except that at upper lob of percussion note is increased in pitch, and Respiration more inclined to Bronchial type, at its lower part. No return of Expectations on left side. Temp. 101.2. Pulse 125. (From 12 Noon 1/6 Grains every 2 Hours) Patient greatly prostrated. Treatment was followed as described in the case, but patient died on the following day.

Treatment of Pneumonia

Of the four cases, three did well and one died. When it is observed that Daly was admitted in a semi-mortal condition, that he had on the day of admission been driven several miles, his case can scarcely be deemed a fair one, for...
showing the effects of the Digitalis treatment. The patient was so far gone that probably no treatment would have been of any avail. That there was a great improvement in the condition of the heart is seen, by the fact, that in one day the minute capillaries in the left lung— the result of passive congestion— disappeared.

A Pneumonia is a disease running a certain course and when it is fatal, causing Death from Atheroma of the Heart (according to Prof. Gurguenew).

Prof. Gurguenew. Treatment of Pneumonia

German Clinical Lectures Page 317 Lyceumium Society

Without following Prof. Gurguenew in the enumeration of the cases bringing about Atheroma I shall mention two only, viz., that the right ventricle has increased work to do owing to its having to divide the pulmonary circulation at a disadvantage, and secondly, that the whole heart suffers from the fever—

Now in my four cases of Pneumonia, dilatation & great weakness of the heart is recorded in three (In the case of the woman Fisk, the cardiac condition is not noticed, but she was in a very weak state) and this goes strongly to corroborate Prof. Gurguenew’s theory that Pneumonia die from Atheroma of the heart.

If it be asked why not give Digitalis to most diseases, as most of them are fatal from Atheroma of the Heart? In chronic cases, Digitalis could not prove of much benefit, as it would not be able to keep up the strength of the heart, for any length of time, the diseased condition would in the long run overcome the influence of the Drug. But in acute cases running a certain course, and proving fatal from Cardiac Atheroma, if the strength of the heart can be sustained despite the reducing influence of the disease, the patient will be placed under the most favorable conditions for recovery, that is, strong Digitalis has this strengthening property, its exhibition in these cases is rational. There may be cases where from special circumstances, Digitalis would be contra indicated. And there are cases also where the Disease has so far advanced that the nervous system is dead to all influence. Here, neither Digitalis nor anything else will do good...
Pneumonia being one of the acute diseases, which prove fatal when the heart gives way, its treatment with Digitalis is therefore natural.

B. Digitalis is also indicated in Pneumonia, because it brings down the temperature and thus prevents the burning away and waste of the heart.

C. Digitalis is again indicated in Pneumonia, because it generally reduces the number of the heart's contractions and enables it to obtain more rest and thus prevents it wearing itself out. There is a maximum of energy in the body developing the pulmonary inflammation, and in the accompanying fever.

D. In the three cases improvement began after the first day, that is constitutional improvement, for in one case the Pneumonia process had spread, yet the temperature was lower, the pulse rate reduced, and the condition of the lungs improved. This is very important, that under the Digitalis treatment, though the Disease Continued to spread on the second day, yet the state of Heart and Temperature had improved. Whether Digitalis is able to hasten resolution or not, this one thing it does: it keeps up or even improves the Vitality, even though the local process be spreading. and since the development of the local process must lower the vitality, another reason is here found for the exhibition of Digitalis in Pneumonia.

E. There is a maximum of energy in the body. In Pneumonia a great deal of energy must be spent in keeping up the local process and the accompanying fever. The other parts of the body must therefore be deprived of some of their energy. This accounts in part for the dilated heart of Pneumonia, and as all parts must suffer, it follows that the muscular coat of Arteries must be weak. Now the muscular coat of Arteries is a powerful factor in the carrying on of the circulation, its function is probably more important than is generally ascribed to it. The function of the muscular element of Arteries is not simply to regulate the calibre of the Capillary System, else it would not be found in every artery from the Aorta downwards. Its function must also be that of a secondary heart and this is also rendered likely by the fact that in
Atherosis the heart dilates. It dilates because it has partially lost the help of the arterial muscle in driving the circulation. It has been shown that Digitalis contracts arteries, that is, it stimulates the muscle of arteries and it is only natural to suppose therefore that it stimulates the muscle of all arteries and since the arterial muscle is weak in pneumonia, there is here another reason for the exhibition of Digitalis.

It may be asked, granting that Digitalis keeps up and improves the vitality during the course of the Disease, does it not act perniciously on the local process, by increasing the blood pressure on the inflamed part? I do not know of any direct evidence that Digitalis contracts the arteries of an inflamed part. That, in the frog the arterial muscle of a congested part responds to nerve influence was shown by the experiment of Dr. Roy & Graham Browne.

The web of a frog was congested by means of phlebopleura and the peripheral end of the cutaneous nerve was galvanised and the result being that the dilated arteries contracted.

It is fair to infer from this experiment that Digitalis will also act on the dilated arteries of an inflamed part, at least in the early stage of inflammation.

In inflammation there is a paralysis of arterial muscle as there is good reason to believe that it contracts them. When they are beginning to get paralysed, in inflammation there is therefore ground for supposing that Digitalis may influence the paralysed muscle of arteries even beyond the very first stage of inflammation. If Digitalis has this action on inflamed arteries, it would be of great benefit in inflammation. The blood pressure would be lessened in an inflamed part, for whereas the arteries were before dilated and contained an excess of blood, they would now be brought to their normal calibre and the amount of blood in them and therefore in the capillaries would be less.

But the question must be decided by direct experiment. In the meantime, we must fall back upon clinical evidence and this in the three cases points to the fact, that besides the action of Digitalis on the arteries of inflammation the patients were not harmed by its exhibition.
If Digitalis has any influence on these arteries, then of course its exhibition would be rendered still rational. I am speaking of Digitalis administered in large doses. But why give such large doses? The disease runs a short course and the heart depressing influence of the disease is very great and does its work quickly. The influence must be therefore counteracted with a heart tonic which will act powerfully and speedily. Such a tonic is Strong Digitalis. A question arises as to whether it is right to push on Digitalis until the physiological effects of the Drug are produced. The advantage of using Digitalis in this way is, that the heart is strengthened to its maximum extent, and that after the state of over-contraction is past, it will continue to act strongly for some time certainly this plan is very convenient as it is a definite one, and in an ordinary pneumonia would do very well. But in treating a very asthmatic type of pneumonia by this plan, is there not a danger that at the time of the physiological effects, when the heart and arteries are overcontracted and (as a result) the circulation feeble, is there not a danger that the great nervous centres might give way, thus a poor supply of blood? This danger can be altogether averted by careful administration of the Drug, and when the first sign of overcontraction appears the Digitalis must be stopped. If the Heart is allowed to reach that stage when it begins to be overcontracted, then there need be no fear. The circulation will not be so very much weakened if the nervous centres will not suffer. In P.T. Balfour's Wards, Brandy was administered during the second stage of Digitalis, with a satisfactory result.

In conclusion, in the administration of Digitalis in pneumonia, the Drug must be interdicted on the first appearance of physiological effects, that is, when there is a feeling of sickness, or actual vomiting, or irregularity of pulse, or very marked lowering of pulse rate. In very asthmatic types (to be more certain) the Drug must be stopped, when the pulse begins to get weaker, as this is a sign that overcontraction is commencing. All cases of pneumonia should have Brandy administered to them, on the appearance and during the continuance of the physiological effects. After the heart has began to act powerfully again and the pulse is improved, Brandy should be stopped, as Brandy after a time, is said to weaken the heart.

Owing to want of time I shall not speak of the Therapeutical...
Therapeutic uses of Strong Digitalis when combined with other means in cases of Bright's disease. I will include the three cases I have amongst the others, so as to refer from them also for the physiological action of Strong Digitalis.

I must further add that in the first part of these notes, I have confined myself almost entirely to the effects of the drug on the Heart and circulation.
Mitr valve Stenosis  
John Mc Gregor, Oct 50

Patient had been ill for three months and was admitted in a very bad state, the convulsion of the heart having been so far ruptured, that the left lung was extremely oedematous, and the right lung oedematous and probably containing some effusion. (Pericardium not so clear as on left side.) Abdominal and lower limbs swollen, chest walls oedematous. Urine contained a slight trace of albumin. Vomiting of recent duration. Patient suffers from great dyspepsia. Mitral and Sinusoid septum ruffling.

He was put on 1/2 grains of Digitalis every four hours. Before 24 hours had passed the physiological effects of the drug appeared. The pulse is now irregular, reduced 5 beats in rate, has lost its strength, is more easily compressible. Phlebographic tracing shows a lowering of heart's action and blood pressure.

Patient states he feels lie is breathing better.

In this case the Digitalis had a very rapid action, having brought on the state of Cardiac and Arterial overcontraction in less than 24 hours. The improved condition of the breathing was due to the pulmonary and systemic circulations having been stimulated during the administration of the drug, until the physiological effects appeared.

The Digitalis was now stopped and half an ounce of Brandy given every three hours.

Next day the pulse still irregular, the same rate, not so irregular as yesterday, getting stronger and appeared not to be so easily compressible. Phlebographic tracing shows a raising of blood pressure. Breathing same. The overconstrictions of Heart and arteries is thus slowly passing off.

Brandy half an ounce every 1 hour. Had 2 doses of 5 Squills.

Third day, pulse has gained 7 beats in rate, is now regular, pretty strong, and rather hard to compressible. Tracing shows increase of blood pressure. Breathing better in day time, got worse at night. Brandy every 6 hours, no more after midnight.

Fourth day, pulse pretty strong, seems to be less compressible. The blood pressure more or less like yesterday. Brandy same as last night. After this day the patient was put on small doses of Digitalis and 3 Squills, and after two days...
Carbonate of ammonia was added. Patient was discharged in two months; muscle improved.

An interesting point in this case is the short time that Digitalis took in bringing about the state of circuption, still in 24 hours the heart and arteries were found to be emerging from this state. That his symptom of dyspnea did not improve muscle at first can hardly be wondered at considering the amount of edema in the lungs and that he had been ill for 3 months.

The evidence that the Digitalis did good is the following: On the first day the breathing is easier; on the second day breathing same; on third day the albumen disappeared from the urine.

In silice disease with great rupture of circuption, there is a slightly dilated left ventricle, unable to carry on the circulation. The pressure is thrown back upon the right heart, which also dilates and gives way, and then come on congestion of lungs and edema of body. What is the indication of treatment in these cases? It must be to strengthen the heart powerfully, and that at once; small doses of Digitalis would not be suitable, as they would take too long a time in strengthening the heart, and the heart might give way in the meantime.

I am not speaking of ordinary cases of silice disease with edema of lungs and anasarca; these cases will do well with small doses of Digitalis; large doses are not indicated because there is no extreme rupture of compensation.

But when there is this extreme rupture, the indication is to resort to strong measures. Strong Digitalis will strengthen the left ventricle and so help to restore the circulation, it will also strengthen the right heart, and will have the effect, not only of helping to restore the pulmonary circulation, but of removing or reducing the edema of the lungs, and thus of relieving the most distressing symptom of dyspnea, which of itself will weaken the heart.

But the arterial muscle having also become stimulated, will materially help to restore the circulation, and specially beneficial will this action of the arterial muscle prove in the pulmonary circulation, for the activity of the arterioles will greatly tend to reduce the congestion of the lungs.
The first appearance of physiological effects will indicate that the heart is getting overcontracted, when the drug must be stopped and the heart after a time especially with the aid of Brandy will emerge from the state of overcontraction, and will continue for sometime to act powerfully. Now there is no danger that the heart will give way during the second stage of Digitalis, as the blood pressure will fall. If the second stage were due to paralysis of the heart, the exhibition of Digitalis would be most dangerous, but the second stage is due to the very opposite condition, owing to a condition of over contraction, which will pass off. If to death takes place in the second stage, it is because the heart has tonically contracted all over, the circulation consequently stopped and the great nervous centres have been deprived of blood. There is thus a risk of contracting the heart too much, if the second stage is allowed to go on too far, but only then. But it is a risk which can be avoided with care and a treatment must not be passed over, because want of care in its administration is attended with danger. When the frequent administration of aconite and other similar treatments must be also abandoned.

If the Digitalis is stopped on the first appearance of physiological effects there is no danger whatever. It must be remembered however, that the use of strong Digitalis in these urgent Mitral cases is only an accidental element of their treatment. It is only given to relieve the urgent symptoms and acting directly on the cause of those symptoms. After a few days the effect of the drug would pass off and the heart would return to its former condition. Therefore after the third stage of Digitalis (that is, after the heart has emerged from its state of overcontraction) has continued for some time, smaller doses of Digitalis must be given to keep up the contractile power. Thus the treatment consists, so to speak, in giving the heart a good start at first and then keeping up its strength. Such was the treatment adopted in the case of Mr. Gregor and in two months he was discharged much improved. All Mitral Cases do not require this start, and therefore, all do not require strong Digitalis, but there are urgent cases which require the heart to get a good start. Such a case was that of Mr. Gregor.
"Fall"

Aortic Regurgitation

This patient had a great fall 20 years ago, when one of the aortic valves was supposed to have been ruptured. During all these years the compensation of the heart had been sufficient to keep all symptoms away. But an attack of bronchitis from which he had suffered three months ruptured the compensation and he was admitted complaining of great breathlessness, not being able to lie down in bed. Resp. 28. There is a diastolic rumour in every area and a Systolic in the Aortic.

1/2 Grains of Digitalis every four hours, after 24 hours the pulse instead of being slower increased 4 beats in the minute. Pulse is stronger. Yesterday it was not easily compressible, to day it is "very hardly compressible". Pulssal 1st. louder than yesterday, and the Systolic Aortic is now propagated to the pulmonary area. All of which signs show a more powerful action of the heart, and an increase in the blood pressure. His "breathing is better", and he slept to night lying down.

Second day pulse was reduced 11 beats, still very hardly Compressible, strong. (4th day very strong) Paroxysmic impulses. 4th day general and weak, to day, general & strong. The Aortic Systolic is not so well marked as 4th day - nor is it propagated to the pulmonary area. Now some of these signs appear Contradictory, but it is difficult to judge from comparing sensations from one day to another, but taking all these signs together, I think there is evidence that the heart is not acting so strongly, that it is beginning to become over contracted, and this is rendered more likely by the fact that seven hours after the physiological effects appeared 13 breathing is still improving. Digitalis stopped at Night. Third day (12 hours after vomiting) pulse was reduced by 10 beats and was irregular. Sphygmographic tracings shows a decrease of blood pressure.

Fourth day - pulse gained 23 beats.

Fifth day - pulse rate same as 4th day. Systolic Aortic Murmur propagated to pulmonary area.

Breathing shows an increase of blood pressure. Breathing is always improving. Has been up to day for 2 Hours.

This patient 9 days after was again put on the same treatment, on the second day after vomiting, Digitalis was stopped.
After three days small doses of Digitalis and Carbonate of Ammonia were administered for 11 days, when 1/3 grains of Digitalis was again given, but patients having vomiting after first dose, the strong Digitalis was stopped. A week after the Digitaline granule was given twice a day for about a month, and patient was discharged three months and a half after admission very much improved. In the midst amongst the respiratory signe I have put down rules. These rules must have been minute observations from Dr. Granville of long while I carelessly attributed to the Bronchitis. It lead phlebothemic. Later on I became aware of the regulations. This is a case of Aortic regurgitation, with ruptured perforation, the last being so great that the patient could not sleep lying down. (The Bronchitis would also have helped to bring about the dyspnea.) The dilated and hypertrophied Ventricle is unable to fulfil its proper amount of work, the pressure is thrown upon the pulmonary circulation — already aggravated by the Bronchitis andatherous stenosis, the right heart now is also unable to carry on its work. What is wanted is to strengthen the two Ventricles at once, and as strong doses of Digitalis will effect this, the exhibition is indicated here. With regard to the left Ventricle first — some authorities object to Digitalis in Aortic cases, because the reduction of the pulse rate will allow the Ventricle to be longer exposed to the dilating influence of the Aortic column. But authorities ignore the fact that while the heart contracts less frequently, it contracts more powerfully. That is the advantage of small doses of Digitalis; the latter element overbalances the former in Aortic cases may be seen any day, but it may be objected that in the administration of large doses, the case may not be the same. Unfortunately in the present instance the heart’s contractions, after 24 hours increased instead diminished and the disadvantage of reduced pulse rate was not present. But it may be safely inferred that in Aortic cases, where there is lowering of the pulse, the ill effects of this would be overbalanced by the increased powerful contraction of Ventricle. In the second stage there was a marked lowering of pulse from 90 of blood pressure but the latter condition is seen in all cases during the second stage; the Aortic column of blood all lies having plenty of time to dilate the Ventricle at this stage, could not do much harm as the Heart was tonically contracted in part, and in the 3rd stage the same condition would obtain as in the first stage.
With regard to the right Ventricle, as in urgent Mitrail case, so in Aortic. Strong Digitalis would be most beneficial in Contracting it powerfully and improving the left pulmonary circulation. And as in Mitrail Cases, so in Aortic the exhibition of strong Digitalis is only an element in the treatment of the Disease. The treatment is intended to relieve the urgent symptoms, by Contracting powerfully the two Ventriles and improving systemic & pulmonary circulations. The treatment must be followed after a few days by the exhibition of small doses of Digitalis, to keep up the contractile power of the heart. Or it may be advisable as in the present case, to subject the heart again to the influence of strong Digitalis and once more to continue the administration of small doses of the Drug. The danger in the second stage is not so great as in Mitrail Cases, still the Drug must be stopped when the Physiological effects are pronounced; the danger is not so great as the Digitalis will probably take sometime in over contracting too much the two dilated Ventriles.

From these considerations it may be stated, that in Aortic regurgitation cases with great rupture of compensation, the exhibition of strong doses of Digitalis frequently repeated is indicated as a first step in their treatment.

"Wilbor"

Mitrail and Aortic Regurgitation

This patient was admitted on May 11th on the 31st she was put on strong Digitalis which was discontinued after Vomiting on June 2nd. Ten days later her condition is the following — Swelling of feet and legs, great dyspnoea, cannot sit up in Bed Resp: 35 Peduncle of both bases and slight effusion on right side. A Systolic Murmur is heard in Mitrail & triicuspid Areas. Apet beat 65 inter-space. Pulmonary 2nd Acentuated, Aortic 2nd rather feeble. As will be seen further on this is a case of Mitrail and Aortic regurgitation in which the Compensation was greatly ruptured.

1/2 grain of Digitalis every 4 Hours — next day Cardiac impulse is stronger. Murmurs same as 4 day, only the 2nd Aortic is stronger. Pulse has been reduced by 10 beats. Patient can now lie on her back.

Second day Cardiac impulse strong. The 2nd Aortic sound
Was now given place to a diastolic Murmur. Pulse not so hardly compressible as 4 day.

Third day. Vomited in the morning. Digitalis stopped. Pulse reduced by 9 beats - states that breathing is a good deal better than what it was before she took the Digitalis this time.

Fourth day. The Aortic diastolic Murmur not only continues but is now propagated to pulmonary Area, and the Murmur in the tricuspid area has disappeared. The pulse reduced by 3 beats.

Two days later same condition of Murmurs. Pulse has gained by 5 beats. Resp: 24.

Three days later Aortic diastolic Murmur is no longer propagated to pulmonary Area. In bicuspid area. Systolic Murmur again appearing with the first sound. Pulse 12 more rapid of bases than last time. This case is very interesting on account of the changes in the conditions showing changes in the state of the cardiac Muscle - In this case there is enlargement of both sides of the Heart and great rupture of contraction in urgent diphtheria. What is required is to strengthen the contractions of both sides, and that strong Digitalis effected this is proved by the 2nd Aortic having become stronger in one day, showing that the left Ventricle must have contracted more powerfully and as a result increased the Arterial pressure which increased pressure closed the semilunar Valves with greater force. Or if the Modern view advocated by Oerard, that the semilunar Valves close at the very end of the Ventricular Systole, be considered in its light, the increase in loudness of the 2nd Aortic proves that the left Ventricle is acting more powerfully. That the right ventricle is also acting more powerfully is shown by the fact that the Oedema of lungs was so far lessened, that whereas before she had to sit up, now she can lie on her back. And all this is the effect of one days Administration of Strong Digitalis. With regard to the left Ventricle, in this case the pulse was reduced by 19 beats, yet this diminution in the number of Contractions and consequent longer exposure of the Ventricular surface to the dilatating influence of the arterial Column has had no ill effects on the Ventricle, but the increased power of the latter has overbalanced the increased power of the former. On the second day there is evidence of still greater Contracting power of the Heart, at least of the left Ventricle, for to day, a diastolic Aortic Murmur has appeared...
This points to the fact that the blood pressure has increased, before the blood pressure was not sufficiently great to produce a 
Murmur. The increase of blood pressure points to increase 
of Ventricular power aided in all probability by contraction of 
Arterioles. The third day Condition is the same, allied pulse 
rate is 9 less and Digitalis was stopped in the morning. 
On the Fourth day there is evidence of still greater blood 
pressure - (the diastolic Murmur propagated to Pulmonary area) 
and consequent increased Contracting power of the left Ventricle 
this notwithstanding that pulse rate is 22 less than before 
Digitalis was administered. This goes some way to prove 
that in Aortic cases, at least with strong doses of Digitalis 
the larger exposure of the Ventricle surface to the column of 
blood is not to be feared. The disappearance this day 
of the triphasic systolic Murmur (if this was not a propagated 
Mitrval) shows a greater Contracting power of right Ventricle. 
Six days after the Digitalis was stopped Signs show that 
the Contracting power of the heart is beginning to give way. 
Patient a fortnight after was again put on strong Digitalis 
and this case will illustrate the fact that the Administration 
of strong Digitalis in Cardiac cases with great rupture 
of Compensation brings about only a temporary improvement 
of the Cardiac Muscle & that after some days, after the Dissox 
Tunacence of the Drug, the Heart will probably relapse into 
its former state. It could not be otherwise, a Heart that 
has been diseased for Years is not going to be improved for 
any length of time by two or three days treatment. 
Therefore the treatment must be continued by the Administration 
of small doses of Digitalis, so that the Strength which was 
imported to both Ventricle, at the beginning may be kept up. 
The patient was sent Improved to the Convalescent Home about 
two Months after she began to be treated with strong Digitalis. 
This case proves that in Mitrval and Aortic Regurgitation 
Combined, strong Digitalis is indicated where the Heart has 
given way to a great extent. And it is only what should be 
Expected after seeing that Mitrval cases and Aortic Cases are 
improved by the same treatment. For the left Ventricle is 
enlarged by the Arterial column of Blood, while the right is 
enlarged by the accumulation of Blood due to Regurgitation.
at the mitral orifice—blunt both sides are enlarged and hence are in a most suitable condition to be acted upon by Digitalis. Such cases will be most free from danger of overcontraction, in pure mitral cases, as the left Ventricle is not enlarged to any extent, a state of too great contraction must be guarded against, and also in pure aortic cases, as the right side is not greatly enlarged, a state of too much overcontraction of the right Ventricle must likewise be guarded against.

But in cases of combined mitral and aortic, both sides must be greatly enlarged, and this must be the case, whether the mitral regurgitation be secondary to the aortic lesion, or whether it be the result of Valvular lesion.
William Davies aged 50.

Dilated Heart

Patient has been ill for Eight weeks, and was admitted in a very critical state suffering from intense dyspnoea. so weak so, that he could not lie on his back.

The legs, abdomen, scrotum, penis, swollen. Urine contains 1/10 Albumen. Both lungs contain question marks.

To account for his backward pressure, I could not make much out of the sounds of the Heart. Unfortunately there was no note stating whether the Arteries were atheromatous. But it may be taken for granted from the other signs, that the Arteries were atheromatous and that this was a case of dilated Heart, due to arteriosclerotic of the Arteries. There was also some Bronchitis.

He coughed a great deal, moist rales, large and middle sized at bases. Temperature 100.2. 1/5 Grains of Digitalis were given every four hours. After second dose, every two hours, After fourth dose every four hours again.

Next day pulse is reduced by 21 beats, and in a better condition. Veins of neck not so swollen. Heart sounds pretty well audible, accentuated 2d Pulmonary.

The tracing shows increased blood pressure. There is only a trace of Albumen now, and the dyspnoea though great is not so bad as 1st day. 5 Grains of Carbonate of Ammonia added to each dose of Digitalis to day on account of the Bronchitis.

Second day. Pulse reduced by 33 beats more and is now irregular. Cardiac impulse strong, sounds strong. The Spirographographic tracing shows a lowering of the blood pressure. The pathological effects have appeared. The Heart and Arteries are in a state of over contraction. As to his symptoms, his breathing is better he is now able to be more on his back. though he cannot lie down quite flat yet. Temperature normal since 1st day. Bronchitis continues. After pulse became irregular, I allowed him to leave three doses more of Digitalis, after the last dose he tonicity and the Drug was stopped.

Third day. Pulse to day is regular. Pulse rate same as 1st day. Cardiac impulse less strong than 1st day. Tracing shows that the blood pressure is still lowered. Thus it is seen that the second stage of Digitalis still continues, or at least the third stage has not yet appeared. As to symptoms breathing
is same as 4th day. Slightly better, if anything. A trace of Albinism.
Sequence of Bronchitis much improved. Swelling appears to be subsiding.
Fourth day. Pulse reduced in rapidity. Very slightly irregular, the
heart sounds as before. 1st impure 2nd pulmonary accentuated.
Tracing shows an increase of blood pressure. Breathing same
as 4th day. The beginning of third stage is becoming apparent.
Fifth day. Pulse reduced still more in rate. Tracing shows increased
blood pressure. Breathing better.
Seventh day. Pulse still more reduced in rate. Breathing shows
good action of heart and good blood pressure.
Eighth day. Pulse increased in rate. Breathing better every day.
On the eighth day the breathing was not so good, and next day
remained same. 3/4 grains Digitalis were then given every
12 hours and stopped two days after, about this time he developed
an attack of subacute Rheumatic which seriously interfered
with the progress of the case. He left after three months
still with rheumatic pains but greatly improved from his condition
on admission.

In Atheros of Arteries, the heart works at a great disadvantage
as the arterial muscle cannot do its share of work and also
possibly because the elastic element is powerless. Hence the left
ventricle dilates and afterwards hypertrophies. But a time
may come when the ventricle may be unable to carry on the
circulation, and then will follow the ordinary conditions
enlargement of right heart, oedema of lungs, anasarca.
When the rupture of the coronary is extreme, as in the
foregoing cardiac cases powerful and quick contractile power of
both sides is required and has been seen strong Digitalis
will bring about this effect. Here again the strengthening of
the left ventricle will improve the systemic circulation & the
strengthening of the right ventricle will improve the pulmonary
circulation and help to relieve the oedema, also the improved
condition of arteries will be a great help in restoring the
circulation. The presence of Bronchitis will act perniciously
on such cases for the Bronchitic congestion will secondarily
retard the pulmonary circulation, and will thus put the
right ventricle to a greater strain. The right ventricle
already weak will be rendered more so. Hence the Croup of
Bronchitis in these cases is only another indication
for the use of strong Digitalis.
That the influence of Digitalis on the congested arterioles of the Brain and Arteries was not deleterious may be fairly assumed from the improved condition of the breathing in the present case.

As to the continued irregularity of the pulse in this case, it cannot have been due to the Digitalis for the reason that throughout this illness he often had his pulse irregular. It must have been due to the dilated Ventricle. Such cases according to Dr. Balfour leave irregular pulses. It is interesting to see that during the second stage of Digitalis the patient's symptoms of Depræcea did not get worse, but rather grew better if anything.

With regard to the continued reduction of the pulse rate for days, even after the Digitalis was stopped, it must be remembered that the pulse was 121 to begin with and that it was never lower than 62. - Here is another reason for the use of Strong Digitalis, because the Heart by contracting at longer intervals will get more rest, will be nourished better, and will be placed in a better condition for arming itself with the increased strength required to drive on the circulation under the existing disadvantageous circumstances.

The fact that the depraecæ after a few days got worse is probably owing to the complication of the subarachnæniae, for the first day that the breathing got worse the temperature had risen. But even if this be not the explanation, it again shows, that, as in the other Cardiac cases, the Heart may require to be subjected to the action of Strong Digitalis, two or three times before it will be strong enough to do its increased work, aided by small doses of Digitalis for a time. So that in cases of dilated Heart with great rupture of compensation the use of Strong Digitalis is only an element in their treatment, after a time such cases must be treated with small doses of Digitalis to keep up the strength gained at first.

I have brought forward the case of the patient Davies because all this the subarachnæniae interfered with the progress so much afterwards, till it shows the benefit derived by the use of Strong Digitalis before the complication set in.
<table>
<thead>
<tr>
<th>Date</th>
<th>Temperature</th>
<th>Heart Rate</th>
<th>resp</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 6, 7:00 PM</td>
<td>97°F</td>
<td>Regular, fast, weak</td>
<td>80</td>
<td>100% RH, short of breath</td>
</tr>
<tr>
<td>July 7, 9:00 AM</td>
<td>97°F</td>
<td>Regular, fast, weak</td>
<td>80</td>
<td>Heart rate: 100%</td>
</tr>
<tr>
<td>July 7, 8:00 PM</td>
<td>97°F</td>
<td>Regular, fast, weak</td>
<td>80</td>
<td>Heart rate: 100%</td>
</tr>
<tr>
<td>July 8, 9:00 AM</td>
<td>97°F</td>
<td>Regular, fast, weak</td>
<td>80</td>
<td>Heart rate: 100%</td>
</tr>
<tr>
<td>July 8, 8:00 PM</td>
<td>97°F</td>
<td>Regular, fast, weak</td>
<td>80</td>
<td>Heart rate: 100%</td>
</tr>
</tbody>
</table>

**Pneumonia**

- July 6: 10:00 PM: R. Regular, fast, weak; short of breath.
- July 7: 8:00 AM: R. Regular, fast, weak; short of breath.
- July 7: 8:00 PM: R. Regular, fast, weak; short of breath.
- July 8: 9:00 AM: R. Regular, fast, weak; short of breath.
- July 8: 8:00 PM: R. Regular, fast, weak; short of breath.

**Resp.**

- July 6: 10:00 PM: 80, 100% RH, short of breath.
- July 7: 8:00 AM: 80, 100% RH, short of breath.
- July 7: 8:00 PM: 80, 100% RH, short of breath.
- July 8: 9:00 AM: 80, 100% RH, short of breath.
- July 8: 8:00 PM: 80, 100% RH, short of breath.

**Pulse**

- July 6: 10:00 PM: 80
- July 7: 8:00 AM: 80
- July 7: 8:00 PM: 80
- July 8: 9:00 AM: 80
- July 8: 8:00 PM: 80

**Temperature**

- July 6: 10:00 PM: 97°F
- July 7: 8:00 AM: 97°F
- July 7: 8:00 PM: 97°F
- July 8: 9:00 AM: 97°F
- July 8: 8:00 PM: 97°F
June 29 7:30 P.M.


June 30 7:30 A.M.


July 1 3:00 P.M.


Pneumonia, Double

Cardiac impulse very weak.

Pulmonary 2nd accentuated.

Pulmonary 2nd accentuated.

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<td>June 22</td>
<td>9 a.m.</td>
<td>Patient admitted in a semi-recumbent condition. Slight cyanosis, moist breath, cold and clammy skin. Patients' pulse quick and strong. Pneumonic rale heard.</td>
</tr>
<tr>
<td>June 23</td>
<td>9 a.m.</td>
<td>Paper cutaneous rash. Back of the neck was dry. Patient was restless. Pulse was quick and strong. Back of the neck was dry.</td>
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<tr>
<td>June 24</td>
<td>9 a.m.</td>
<td>Back pain. Back pain was dull and aching. Backache was not severe. Patient was restless. Pulse was quick and strong.</td>
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**Daily Report**

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<tr>
<td>Date</td>
<td>Duration</td>
<td>Temperature</td>
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</tr>
<tr>
<td>Aug 25</td>
<td>Morning</td>
<td>102°F</td>
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<tr>
<td></td>
<td>Noon</td>
<td>102°F</td>
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<tr>
<td></td>
<td>Evening</td>
<td>103.6°F</td>
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<tr>
<td>Aug 26</td>
<td>Morning</td>
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<td>Aug 28</td>
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<td>Aug 29</td>
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<td>Aug 31</td>
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**Notes:**
- Temperature readings are normal.
- Pulse rate higher in the evening.
- Respirations are steady.
- Urine output is normal.
- No significant changes in vital signs observed.
<table>
<thead>
<tr>
<th>Time</th>
<th>Pulse</th>
<th>Liver</th>
<th>Abdomen</th>
<th>Navel</th>
<th>Urethra</th>
<th>Bladder</th>
<th>Bloods</th>
<th>Sputum</th>
<th>Temperature</th>
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</thead>
<tbody>
<tr>
<td>18th 10:30</td>
<td>76</td>
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<td></td>
<td></td>
<td></td>
<td>98.6</td>
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<tr>
<td>19th 10:30</td>
<td>76</td>
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<td>98.6</td>
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<tr>
<td>20th 11:00</td>
<td>72</td>
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<td></td>
<td>98.2</td>
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<table>
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<tr>
<th>Pulse</th>
<th>Liver</th>
<th>Abdomen</th>
<th>Navel</th>
<th>Urethra</th>
<th>Bladder</th>
<th>Bloods</th>
<th>Sputum</th>
<th>Temperature</th>
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<tbody>
<tr>
<td>21st 10:30</td>
<td>72</td>
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<td></td>
<td></td>
<td></td>
<td>98.2</td>
</tr>
</tbody>
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**Notes:**
- Liver: 7/2 Pm, 2 hours.
- Abdomen: 7/2 Pm.
- Navel: 7/2 Pm.
- Urethra: 7/2 Pm.
- Bladder: 7/2 Pm.
- Bloods: 7/2 Pm.
- Sputum: 7/2 Pm.
- Temperature: 7/2 Pm.
June 20, 3 PM

*George Dall* at 46

**Aortic incompetence**

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<tr>
<td>2</td>
<td>1 PM</td>
<td>1/2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>5 PM</td>
<td>4</td>
<td>5 PM</td>
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</table>

July 79

- *Receu.* in good shape, but some confusion.
- Nervous system unsteady.
- Able to write 1/2.

**Breathing**

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<td>2</td>
<td>4 PM</td>
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**Temperature**

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<tr>
<td>2</td>
<td>4 PM</td>
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**Abdomen**

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<td>4 PM</td>
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**Blood Pressure**

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<td>2</td>
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**Pulse**

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<tr>
<td>2</td>
<td>4 PM</td>
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**Parch**

- *Receu.* in good shape, but some confusion.
- Nervous system unsteady.
- Able to write 1/2.

**Breathing**

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<tr>
<td>2</td>
<td>4 PM</td>
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**Temperature**

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<tbody>
<tr>
<td>2</td>
<td>4 PM</td>
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</table>

**Abdomen**

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<tbody>
<tr>
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**Blood Pressure**

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<tbody>
<tr>
<td>2</td>
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**Pulse**

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<tbody>
<tr>
<td>2</td>
<td>4 PM</td>
</tr>
<tr>
<td>Date</td>
<td>Heart Rate (BPM)</td>
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<tr>
<td>------------</td>
<td>------------------</td>
</tr>
<tr>
<td>June 12th</td>
<td>101</td>
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<tr>
<td>June 13th</td>
<td>82</td>
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<td>June 21st</td>
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The patient was admitted May 11th.
May 12th, 7 1/2 grains of digitalis every four hours. Digitalis stopped on the morning of June 2nd. Leave hospital.

The pulse has continued. May 11th.
May 12th, 7 1/2 grains of digitalis every four hours. Digitalis stopped on the morning of June 2nd, leave hospital.

July 22nd, discharged returned.
<table>
<thead>
<tr>
<th>Date</th>
<th>Initial &amp; Name</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>Aug 7, 10 30 A.M.</td>
<td>Initial &amp; Name</td>
<td>Remarks</td>
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<td>Aug 9, 9.30 A.M.</td>
<td>Initial &amp; Name</td>
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<td>Aug 10, 11 A.M.</td>
<td>Initial &amp; Name</td>
<td>Remarks</td>
</tr>
<tr>
<td>Aug 11, 11 A.M.</td>
<td>Initial &amp; Name</td>
<td>Remarks</td>
</tr>
<tr>
<td>Aug 12, 11 A.M.</td>
<td>Initial &amp; Name</td>
<td>Remarks</td>
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- 10 3 Regular. High. Full. Best. Head. Not too good. Enzyme and enzyme. HARDY ENZYME. 3 6 4.5 4.5 3.3\% 1.6 1.6 1.6.
- 114 Regular. Short. High. Full. BEST HEAD. Not too weak. COMPENSATED by enzyme. 3 4 4 2.8 2.8 2.8 2.8 2.8 2.8 2.8.
- 115 Regular. Short. High. Full. BEST HEAD. Not too weak. COMPENSATED by enzyme. 3 4 4 2.8 2.8 2.8 2.8 2.8 2.8 2.8.
- 116 Regular. Short. High. Full. BEST HEAD. Not too weak. COMPENSATED by enzyme. 3 4 4 2.8 2.8 2.8 2.8 2.8 2.8 2.8.
- 117 Regular. Short. High. Full. BEST HEAD. Not too weak. COMPENSATED by enzyme. 3 4 4 2.8 2.8 2.8 2.8 2.8 2.8 2.8.
- 118 Regular. Short. High. Full. BEST HEAD. Not too weak. COMPENSATED by enzyme. 3 4 4 2.8 2.8 2.8 2.8 2.8 2.8 2.8.

- *Note*: enzyme and enzyme. Hard. Hardy enzyme.
**Chronic Febrile with acute exacerbation**

<table>
<thead>
<tr>
<th>Date</th>
<th>Jan 7</th>
<th>Jan 8</th>
<th>Jan 9</th>
<th>Jan 10</th>
<th>Jan 11</th>
<th>Jan 12</th>
<th>Jan 14</th>
<th>Jan 16</th>
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Robert was placed under an intravenous drip on 6th May. He died on 8th May.
<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
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<tbody>
<tr>
<td>June 8th</td>
<td>Admitted suffering from acute Bright of six weeks duration, urine loaded with albumen.</td>
</tr>
<tr>
<td>June 9th</td>
<td>Cardiac Depressor. Deceased 9 days. Medium 1 oz. Kahlbaum 2 oz. albumen.</td>
</tr>
<tr>
<td>June 10th</td>
<td>Cardiac Depressor. Late story. Medium 1 oz. Queen’s 2 oz. albumen.</td>
</tr>
</tbody>
</table>
| June 11th | 120 albumen.

<table>
<thead>
<tr>
<th>Date</th>
<th>Observations</th>
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<tbody>
<tr>
<td>June 24th</td>
<td>Urine 4 oz.</td>
</tr>
<tr>
<td>June 29th</td>
<td>Urea 74 oz.</td>
</tr>
<tr>
<td>July 10th</td>
<td>Urea 12 oz.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Meds</th>
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</thead>
<tbody>
<tr>
<td>July 10th</td>
<td>Pelocarpine 1/2</td>
</tr>
<tr>
<td>July 14th</td>
<td>71/2 Grain of &quot;Depot&quot; over four hours. Urea 12 oz.</td>
</tr>
<tr>
<td>July 16th</td>
<td>Pelocarpine 1/2</td>
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</tbody>
</table>


day patient feel so much better, he beseemed in leaving hospital.