THESIS.

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Subject: "Clinical Heart Studies in Childhood and Youth".

by

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Part I. General Principles. Pages 1-34.

Part II. Consideration of Cases. Pages 35-78.

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accepted

Notations

Previous observations presented in a different manner - may be original but doubtfully so.

J. H.
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Clinical Heart Studies in Childhood and Youth.

Part I. General Principles.

Heart Disease having assumed such important aspects during the last five years, this thesis has been written in order to correlate some of the writer's experience of "Soldiers Hearts" with that of civil life.

In all disease processes there are two main considerations:
(1) Prevention.
(2) Efficient treatment to allay or arrest the process.

One obtains most information by studying the above two aspects in children because it is in them that most of the disease processes begin, which a few years later manifest themselves in adult life, either in the gross form easy of recognition, or, more important in incipient form and not easy of recognition.
These aspects of disease are of most importance when the Heart is affected, as the functions of all organs of the body depend on an efficient blood supply.

Disease processes of such a nature tend to restrict the usefulness of the persons afflicted; in adolescence they present the normal development of the physical powers, with the result, that the sufferers unconsciously in many cases, but often consciously restrict their lives to occupations of a sedentary form.

This was very evident during the war when certain of such persons being called up for active service, it was found, that unless they were subjected to special care during training their weakness soon became manifest, the effect being that the man-power of the nation was depleted at a time when every life was of paramount importance.

It must be remembered also that though some such early cases never manifest signs of a physical nature, in many cases the myocardial
weakness betrays itself by a weakening of the intellectual powers, and concentration seems to me to be the faculty of the mind that suffers first.

I have had personal experience in this aspect of the question, as consequent on a severe septicaemia followed by severe myocardial weakness all the physical and subjective symptoms of such had disappeared before the mental faculties as evidenced by concentration returned to normal.

Without concentration most mental processes are impossible; and this lack of concentration in the type of case under consideration occurs in childhood and adolescence, while education is in progress; consequently, mentally, many of this type of case are severely handicapped; the cause of such mental backwardness in many cases cannot be ascertained.
The Subject matter has been arranged under three headings.

(1) General Principles.
(2) Series of twelve cases.
(3) Conclusions and Summary.

The affections of the circulatory system under consideration will be studied from the following points of view:

(1) Aetiology and Pathology. (Functional and Organic)
(2) Diagnosis.
(3) Prognosis.
(4) Treatment.

Aetiology:

a. Congenital.
b. Lack of Normal Development.
c. Toxaemia.
d. Strain in association with myocarditis.
e. Response to abnormal psychic impulses.
f. Incipient or wellmasked organic disease.
g. Certain cases where heart affection is secondary to affection of another system.
5.

a. Congenital Cases:

(a. Heart organically affected before birth.
(b. Hearts congenitally weak.

The first group under congenital cases includes those hearts which at birth are suffering from defective development or from Prenatal Inflammation and does not come into consideration in any of the subsequent cases.

b. Hearts congenitally weak.

To my mind this type of congenital case is the more important of the two; the first group (a) is comparatively easy to diagnose; the group (b) at present under consideration very often presents no physical signs of any sort and one has to depend on subjective phenomena; and these coupled with an outwardly backward child serve in many instances to enable a diagnosis to be made.

The only lesion in the above cases seems to be a deficiency in the reserve force of the heart to greater or less degree.
Thus this group complain of breathlessness and palpitation on exertion and often with very slight exertion and much less than would make a normal person breathless.

Furthermore if one watches this type of case it will often be found that as stated already, they have found the limits of their activities; and restrict their lives accordingly.

**b. Lack of Normal Development of Heart and Vessels.**

This type of case is well represented in adolescents who have sought sedentary occupations; such cases have a marked decrease in the reserve force of the heart, not manifest while at light work.

However if the heart muscle is not given sufficient time to adapt itself to more strenuous physical action then symptoms will result.

It is a normal circumstance for children to take an interest and to participate in any game be it laborious or not; By such means the
reserve power is kept up to the standard required for the various ages and no symptoms result on moderate exertion.

But in certain cases symptoms result from diminution in reserve force following various factors.

A very common cause is the forced inactivity of a child by its parents; such parents usually being of neurotic temperament and who pay more attention to the Education of the child than to its physical development.

Lack of normal development no doubt is often due to disturbance of the Endocrine Organs; At present such subtle changes are beyond our knowledge; but there is no doubt that many cases are due to such changes.

C. Toxaemia. a. Inorganic.
   b. Organic.
   c. Metabolic.

a. Inorganic Toxaemia:—

Very many inorganic sub-
stances have a deleterious effect on the heart muscle but this cannot be very common in children and no case occurs in the series.

Organic Toxaemia:

This is probably the greatest cause of diminution in Reserve Force. During the progress of an active infection, the reserve force is progressively diminished. This is from the direct action of the toxine on the cardiac musculature; when the rest force is affected as it often is, the heart is unable to maintain an efficient circulation and too frequently death is the outcome in such cases.

These types of case are well illustrated in osteomyelities in boys and also in pneumonia where the cardiac musculature is paralysed by the overwhelming force of the toxine present.

Of much more importance are the chronic toxaemias of organic origin, the toxines circulating in the blood stream cause changes in the cardiac musculature with diminution of reserve and the production of symptoms.
Toxaemia of Metabolic Origin:

Alimentary Toxaemia comes under this group as do also those which occur through defective action of the Excretory Organs.

Hyperthyroidism can be conveniently considered at this point, as in the opinion of many, the secretion from the thyroid in this condition is a perverted one. There is no doubt that such cases are common, as during the war many sufferers from D.A.H. had undoubted Hyperthyroidism, and there is a great probability that it occurs also in younger patients.

Strain in association with toxaemia or myocarditis, or following a toxaemia before the heart muscle has recovered.

It seems hard to believe that strain in a normal person can damage the heart yet such causation has been assigned to many cases.

Very unpleasant symptoms may be produced at the time by severe strain but these seem invariably to be recovered from quickly.
The most primitive of races never seem to be afflicted in this way and in like manner animals also seem to be exempt and in both of these classes occasional and excessive muscular exertion is a necessity for their very existence.

Such severe muscular exertion is no doubt in many cases carried to the extreme exhaustion of the individual but the skeletal muscles seem to be the ones that first give out.

Evidently the depressor nerve from the heart is quite sufficient to protect it when it has been pushed to extremes and in such cases the signals from the heart of distress are so strong that the individual is forced against his will in some cases into inaction.

Such an example we have in the historic retreat from Mons where the men of the original British Army were so exhausted that considerable numbers fell by the roadside and no amount of fear or Will Power was sufficient to move them into action again until a certain amount of very needed rest had been obtained.
11.

But in the presence of myocardial damage permanent or transient strain is a very potent factor in causing lessening of the reserve force for a considerable time. Such cases have been common during the war and are also very common in children.

e. **Response to abnormal Psychic Impulses following strain, exposure and excessive fatigue.**

This type of case though very frequent during the war cannot be of much importance in children.

But we do meet children of unstable nervous system who exhibit night terrors, enuresis etc. and as one theory of the psycho neuroses is that they follow some nervous traumatism of youth, this type of case cannot entirely be neglected in the cases under consideration.

§ **Incipient or well marked organic disease of the heart.**

There is usually not much trouble concerning the well marked cases of organic disease. In association with a good history the physical signs make a diagnosis certain in many cases.
In incipient cases however there is great difficulty and the division into functional and organic cases becomes impossible.

§. Certain cases where the heart suffers secondarily to affections in other organs.

Gastric disturbance is a frequent cause of the cases under consideration.

The haemopoietic system is also very important and anaemia should be considered as a possibility in every case.

As it is only with mild forms that I have to deal in these cases, it emphasises the importance and necessity of a thorough examination of all systems when dealing with any type of heart case.

The foregoing seven divisions of Aetiology are practically the same as those that have been assigned to the D.A.H. group in soldiers. This however has been modified to fit in with the requirements of youth and from the experience of causation of symptoms in youth.
Pathology:-

Heart disease has for many years been divided into two great classes.

a. Functional.
b. Organic.

From most points of view the above arrangement is ideal but our methods of diagnosis have not reached a state of efficiency where the above arrangement can be fulfilled.

It is almost impossible in many cases and quite impossible in some to arrive at a definite opinion either way.

To my mind the really great objection to the use of the word functional is that it tends to obscure the influence of outside influences on the cardiac musculature.

Thus if one meets with a case with certain signs and symptoms one is apt to call it a functional case when it in reality may be a secondary case to a focus of infection elsewhere.
However if the effect of outside influences is kept in mind the foregoing classification serves very well and when one is uncertain very often it is better to give the patient the benefit of the doubt and to tell him that he is suffering from a functional defect.

Functions of the heart muscle.

1. Stimulus Production.
2. Excitability.
3. Contractility.
5. Tonicity.

All of these functions are independent of the nervous system though under its control.

The five functions acting in unison all succeed in maintaining the circulation against the needs of the body.

Thus the maintenance of the circulation is the fundamental function of the heart.

The heart to maintain the circulation against the needs of the body is possessed of two forces.
1. **Rest Force.**
2. **Reserve Force.**

The Rest Force is that which maintains the circulation while the body is at rest.

The Reserve Force is that called into action when there is required increased production of energy over the body as a whole as in exercise.

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**Diagram Description:**

- **I:** Rest Force | Reserve. **Normal Heart.**
- **II:** RF. | Reserve. **Diminution of Reserve. Symptoms on Moderate Exertion.**
- **III:** RF. | No Reserve. **Total Diminution of Reserve. Unpleasant Symptoms on Slight Exertion.**
- **IV:** RF Diminished. **Rest Force Encroached Upon. Extreme Heart Failure.**

In the above four diagrams I have endeavoured to represent graphically the two forces of the heart muscle under varying conditions.

**Figure I** represents a normal heart muscle for any
age period, it is seen that the reserve force is very large in comparison with the rest force.

Figure II. represents heart muscle when there has been diminution in the reserve force to some extent. Under this class can be represented all types of case right down to the next type. This type of case only shows physical signs and symptoms on exertion and all the cases to be considered later come into this group more or less.

Figure III. represents heart muscle where the reserve force has totally disappeared, theoretically the heart will be able to maintain the circulation while the individual is at rest but response to effort will be impossible. Practically speaking this type of case will not be definable but it assists in the conception of the production of symptoms.

Figure IV. represents heart muscle where the rest force even has been encroached upon. This type of case is seen commonly in hospital wards and it is always a question of life and death to the patient. The physical signs and symptoms will be extreme and death is usually the result except in a few well treated cases.
The graphic representations help from the point of view of Prognosis and treatment and one should always endeavour to picture graphically individual cases as they come under observation.

In the discussion of aetiology one endeavoured to group the factors acting on the myocardium associated with a diminution in reserve force.

The diminution in reserve may be due to actual disease of the myocardium itself or of the other structures of the heart or it may be due to disarrangements of other organs of the body with a secondary effect on the heart.

A few words are necessary concerning organic affections of the heart. Practically speaking the effects of rheumatism chorea, scarlet fever or congenital syphilis are all that need be considered.

In the above diseases the structures of the heart are liable to be involved with inflammatory processes, these processes are permanent in character and a permanent impairment of heart function to greater or less extent always occurs.
Diagnosis.

This depends upon two sets of circumstances.

1. **Subjective Phenomena**

2. **Physical Signs**

In the milder types of case which are described later the subjective phenomena are of far more value than the physical signs which are always indefinite and hard to estimate in mild cases.

**Subjective phenomena.**

Breathlessness is the most important of all in children and indeed it is very difficult to make sure of the other symptoms as we cannot depend on answers to questions as in adults. However one can observe breathlessness and so can the friends.

**Palpitation.**

This is of uncertain value in children and often also in adults owing to the fact that patients do not understand the term, however by careful questioning one can sometimes obtain information of some value.

**Fatigue and Exhaustion.**

These symptoms are of great value in children, one is certain that if a child is suffering from either of the above symptoms that its
guardians will notice it; activity and vivacity are the invariable concomitants of health in childhood and their absence is usually very noticeable.

Pain:
This symptom is not of much value in children but in association with other symptoms it may be of great value.

Giddiness and Fainting:
These two phenomena are fairly common in childhood from other causes than the heart so one must be careful to look for other causes and not jump to conclusions concerning the heart.

Vasomotor Phenomena:
These are very important in children though again they occur with extraneous causes, however blueness of hands and feet with coldness alternating with clamminess are often common symptoms.

It must be emphasised that in children one cannot so definitely depend on individual signs and
symptoms as one can in the adult; it is the mass of information that we obtain by careful questioning of patient and friends, associated with keen observation of both local and general signs that is of value. Nowhere are one's faculties of observation called into such use as they are in all children's complaints; such observation can only be acquired by assiduous practice until one sees and perceives all in a glance, the whole process ultimately becoming a part of the subconscious mind.

Physical Signs.

Inspection:–

This includes general and local inspection, while the child walks into your presence, one can ascertain quite an amount of information, any nervousness or breathlessness is at once apparent to the trained observer. The general look of the patient is also of value as the child's appearance so readily responds to changes in the general health.

The size and nutrition of the body for the various age groups should also be observed and here again practice is essential. Often a little experience one can tell at a glance whether or not a given child's development is below par.
The general appearance and shape of the thorax is most important as any chronic pulmonary or cardiac trouble is so liable to produce changes in the shape of the chest owing to the active growth and softness of the various structures involved.

The position of the apex beat is best defined by inspection and at the same time one observes whether it is localised or diffuse and whether the impulse is heaving or excited and flicking in action.

**Palpation:**

This ranks with inspection as the best method of defining the apex beat; in children practically without exception the position of the apex beat can be determined in this manner.

The palpation of thrills is often very important as often in rheumatic disease of the heart a definite thrill helps one in making up one's mind as to whether a murmur is organic or functional. In my opinion a thrill is practically diagnostic of an organic murmur.
Percussion:—

Recently much criticism has been thrown on this method of ascertaining the size of the heart. This criticism has arisen mainly from the use of the orthodiagnostic methods, the findings of which are at great variance with those of percussion. However percussion gives a relative idea of the size of the heart and is of great value where there are quick changes in size as in dilatation and in pericarditis with effusion.

Auscultation:—

Here again we are very often in doubt as to the meaning of our findings and their significance. With certain murmurs such as the auricular systolic we can be certain of our diagnosis but with systolic murmurs we are very often in deep water.

A case recorded by the late Sir William Gairdner illustrates that these may be a fallacy even with the auricular Systolic murmur as in one of his cases it was due to a pedunculated tumour of the auricle and not to endocarditis as surmised.

Even more pronounced cases of difficulty are those
with great accentuation of the first sound followed by an accentuated pulmonary second sound; these cases very often give an impression of Mitral stenosis and yet two weeks later one finds that the presystolic character has entirely disappeared.

The above types of heart sounds are in my opinion very common in children and always are as far as I have ascertained due to a deficiency in muscular tone. They give a relatively good idea as to the treatment required and it may be found in the future that this type of children's heart is that which most commonly later on is followed by the effort syndrome.

This auscultation is really only of relative importance in diagnosis and its findings unless absolute are not to be considered alone; however it puts the physician on the alert where an abnormal sound or murmur is heard, and then the other methods of diagnosis can be called in to assist in the elucidation of cases.

Some of the cases in the series to follow were mainly discovered by auscultation and then the other signs and symptoms were elucidated; thus auscultation forms a ready and valuable method of sorting out cases.
The pulse is of extreme value in diagnosis. One is always struck by the rhythm in most children, the respiratory irregularity being so common in them.

The rate is also very important usually between 80-90 in children of the age under consideration and very easily influenced by slight causes such as emotion or moderate exercise.

Other types of irregularity beside the respiratory form may be present but in only one of my cases has any other irregularity occurred namely the Extrasystole.

The response in pulse rate to effort has been considered in each case and will be dealt with later individually.

After examination of all the foregoing methods of diagnosis we must consider finally the method of diagnosis of impairment of function.

This method has come to the fore recently and on looking back one is surprised that it has not been made more use of in the past.

An athlete in attempting to obtain a place, for example, in a football team is always judged by the
results of his actions. His position in a team is utterly useless unless he is able to maintain his activity right up to the end of a game. This activity is the direct result of an efficient reserve power in the heart and without being aware of the fact the selectors of the team are applying a functional test to the various members of a team during a trial game.

On looking back over our methods of diagnosis one is surprised to see how little importance was ever laid on the response to effort. A heart may appear practically normal to all our methods of diagnosis yet the response to effort may be deficient and here we have a valuable means of corroborating our diagnosis and even of making a diagnosis in some cases.

The method of carrying out this functional test is very simple and should be resorted to in every case as the prognosis and treatment are also so much influenced by its results.

The method of its execution in this series was very simple and the exercise adopted was constant for all age groups.
It consisted in the individuals with arms fully extended above their heads bending down and touching the ground rapidly for twenty successive times.

The results of such an exercise are both qualitative and quantitative.

The qualitative results are appreciated by keen observation during the execution of the exercise; the amount of vigour being carefully noted and also any tendency to make the exercise as easy as possible. Any breathlessness cyanosis or visible distress is quickly appreciated and after some experience the method gives valuable results.

The quantitative results consist of an enumeration of the pulse rate before and at the completion of the exercise and the time taken for a return to normal is also noticed.

Two minutes may be taken as the limit of time taken for the pulse to return to normal, anything above one minute indicates some diminution of reserve.

Quantitative functional tests in normal children.

Average normal pulse rate. 70 - 90.
Rate after exercise. Does not exceed 140.

Normal rate regained in one minute.
Results in 8 normal boys.


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Prognosis:

In all heart conditions this assumes two aspects.

a. Immediate prognosis.

b. Remote prognosis.

Immediate prognosis.

This subject does not enter into consideration in any of the present series of cases and consequently this will not be dealt with at present.
Remote prognosis:—

This is a very important question and one that will exercise all the skill and judgment that can be thrown upon it. In considering this question in heart disease it is a good working rule first of all to differentiate our cases into two groups.

a. Primary.  

b. Secondary.

By such a classification one necessarily must think of the causal element in each case and the possibility of its removal; and in the secondary type of case much can be hoped for by attention to other systems, with in most cases the gratifying result of a myocardium quickly restored to normal.

In the primary type of case the first question to be answered is:— What exactly is the pathological change present? This question having been answered other ones follow as a natural sequence. Now we must consider the question as to whether the change present is permanent or transient.

Transient cases are seen after toxaemia and strain for instance and with proper treatment one hopes that the normal will ultimately be regained.
Now in consideration of permanent structural changes other questions must be answered.

**Will the lesion be stationary?** This question is difficult to answer but assuming that no more inflammation occurs, in certain cases one can hope that the lesion will be stationary.

**Will the lesion be progressive?** Again we can answer this question in that we know that certain lesions undoubtedly are progressive.

**Will the lesion be accentuated in middle age when the retrogressive body changes occur?**

Here again we know that in many instances the retrogressive changes in middle age undoubtedly have a bad effect.

In the consideration of all these questions the aetiological factor is of primary importance and especially rheumatism, this condition being so susceptible to more inflammation.

Again we must not neglect the possibility of infective endocarditis in later years and very often between 20 - 25 years; this has amply been demonstrated within the last year when infective endocarditis has been more common in young men than usual and this following on very slight previous affection in most cases.
Lastly after consideration of all these factors one must finally resort to the functional test. The efficiency of the heart depends on its myocardi and by means of the exercise tolerance tests the state of this structure can be ascertained with great accuracy.

**TREATMENT.**

This subject will be considered under two main headings:—

a. Hygienic management.

b. Medicinal Treatment.

Hygienic Principles:—

Clothing:—

The rheumatic element being so prevalent an aetiological factor one must guard against its onset by the use of warm woollen clothing; this also is a prophylactic against any catarrhal infection which might arise and adversely affect a patient.

Place of Residence:—

As in all cases of disease
these cases are much better in the country and fresh air may be looked on as as much an essential as it is in tuberculosis.

Diet also should be considered in both primary and secondary cases where the alimentary system may be affected. In such cases a light diet to suit individual requirements is necessary.

Education:—

This question always crops up in children. In most of these cases no curtailment of school hours is necessary though some of them should not be pushed at their studies; and as already mentioned there is no doubt that in some cases the mental faculties are not functioning normally.

Exercises, sports, Games.

These factors are of great importance. Many of these cases are undoubtedly due to wrong and too severe forms of exercise in the presence of an already existing myocardial change. In such cases complete rest is essential until the myocardium recovers. Later on milder forms of games and exercises should be permitted and even ordered in some
cases subject to the strict supervision of a competent person.

By increasing the severity of these games the myocardium can be cultivated to withstand greater strains and by this method we have the therapeutic element of greater value at our disposal.

Ultimately in most cases the reserve power of the heart regains or almost regains normal.

Medicinal Treatment:-

We do not rely on drugs in the treatment of these cases, no doubt in some instances tonics seem to be of some value but we should not place too much reliance on them to the detriment of other and more advantageous methods.

In the functional types of congenital cases we can expect good results and especially from the method of graduated exercises.

In the organic types of congenital cases we cannot hope for much improvement, and only by careful hygienic management can we hope to lessen the deficiencies of a damaged structure.
In the next type of cases, those due to lack of development from disease. Here again our sheet anchor rests in properly regulated exercises but we must be careful not to overdo the process.

In the toxæmia cases the first consideration is the eradication of the forms of infection and only after this has been done can we consider the question of games and exercises.

In the next type of case those due to strain in association with a myocardial change, the method of treatment is practically the same as in the preceding type.

The next type of case is that due to a response to an abnormal psychic impulse. The treatment here rests in psycho therapeutics and by its aid and the removal of a buried complex is aimed at, and after the nervous element has received attention then and then only can we have resort to exercises.

In the organic cases in the absence of active infection the idea is to give just enough exercise without causing unpleasant symptoms.
In the secondary cases the removal of the cause is the first consideration followed by the education of the myocardium by graduated exercises.
PART II.

Cases illustrative of the foregoing principles.

Case I. Myocardial weakness due to strain in association with toxaemia.

Boy aged 12 years.

History:-

His health has always been quite good except for a pronounced tendency to severe catarrh of all the respiratory mucus membranes. He has had severe sore throats on more than one occasion.

Growing pains have been present but have never been marked. No other history of rheumatism.

The patient first came under observation two years ago on his joining his school. Oct. 1917.

In the routine examination at that time his heart was practically normal. However during his first term at school he had several severe bronchitic attacks which kept him in bed for some months eventually, but before he gave in finally, he had been attempting to carry on with his ordinary games of football etc.
Following these factors of strain in association with toxaemia he began to complain of cardiac symptoms:— Breathlessness on exertion was a marked feature. Palpitation was also present with giddiness and extreme exhaustion.

The physical examination revealed:—

A rapid pulse rate between 90 - 100, the rate responding rapidly to emotion.
The respiratory irregularity was present.
Inspection of the thorax revealed diffuse excited pulsation with the outer limit on the left side slightly outside the nipple line.
Auscultation revealed a Blowing systolic murmur in the mitral area not conducted into axilla.
The second pulmonary sound was very accentuated.

Patient was in bed for several months at this time, then had a long holiday from school and returned markedly improved, though his reserve force was still deficient.

Oct. 1919. Practically no symptoms present now, heart normal in size, apex beat localised but auscultation revealed a faint systolic murmur in the mitral area and an accentuated pulmonary second sound.
Jan. 1920. Physical signs still present in the shape of an accentuated first mitral sound and an accentuated pulmonary second sound. All other systems appear normal.

Diagnosis:-

This was made from symptoms and physical signs present. The difficulty at first was to determine what was the exciting cause but the general health of the patient and the character of the physical signs helped one to the conclusion that we were dealing with a case of Toxaemic myocarditis and strain.

Diagrams illustrating myocardial condition.
Actiology and Pathology:-

There seems to be no doubt after the lapse of over two years that here we are dealing with a functional myocardial defect brought on by recurring infection without the precaution of restricted exercise.

Prognosis:-

This is very good in this case and the continued improvement under treatment makes one sanguine of complete recovery.

Exercise tolerance test.

Normal Pulse. 88.
After Exercise. 120.
Normal again after a lapse of 1½ minutes.
Breathlessness not very marked and exercise performed with vigour.
This test is practically normal though the pulse rate has taken a little extra time to return to normal in comparison with the eight normal cases. This test further justifies one in the hope of ultimate recovery.
The sinus irregularity was always present and was taken as a good prognostic sign.
Treatment:-

During the more acute phases of the illness the patient was in bed and all attention was directed to the respiratory system and throat which were recognised to be causal factors. Later general tonic treatment with careful supervision of all muscular performances was resorted to.

At present the patient is playing practically all the games of the school but on the least sign of infection of any sort his activities are curtailed immediately.
Case II. Toxaemia Myocarditis and Strain.

Boy aged 12 years.

History:

Jan, 1919. Heart condition discovered on admission to school.
Previous health moderately good, whooping cough and measles as a child.
Has had a sore throat on several occasions recently accompanied by growing pains.
No other history of rheumatism.

During the physical examination it was discovered that there was a diffuse excited pulsation in the praecordium. The heart was slightly enlarged to the left. There was a slight mitral systolic murmur with an accentuated pulmonary second sound. The sinus irregularity was always present. The symptoms consisted merely of a slight amount of dyspnoea on exertion and he could not play football in consequence.

Jan, 1920. The only abnormality in the physical signs at the present moment are accentuations of both the first and second sounds, with a slight increase of pulse rate due to emotion while under examination. All other systems appear normal.
Diagnosis:

This was made practically from the physical signs alone, there was a history of infection which justified one in the belief that again one was dealing with a toxaemia myocarditis.

Aetiology and Pathology:

The focus of infection was probably located in the tonsil and may have been of a rheumatic nature as growing pains were also severe.

Prognosis:

Very good. The patient never had many symptoms and the physical signs were always negligible as regards ultimate prognosis. However it was thought best to be on the safe side and patient's activities were restricted for a short time and then again allowed mild exercise at first, and increasing in difficulty with time.
Exercise tolerance tests:—

Normal Pulse. 68.

After Exercise. 110.

Normal in 1\frac{1}{2} minutes.

Breathlessness very slight and test performed with vigour.

This test exhibits a slight decrease in reserve power in comparison with the normal.

Treatment:—

This was very simple in this case.

The throat condition was recognised as the basal factor and appropriately treated, the boy's games were restricted for a week or two and then he was allowed mild ones at first and now he plays Rugby football almost as well as the normal boy.

Again his activities are curtailed on the least trace of infection.
Case. III. Secondary Myocardial weakness following alimentary disturbance.

Boy aged 12 years.

History:-

Oct. 1919. Heart condition discovered at the beginning of the October term, previously his heart condition had been passed as normal.

Complained of slight breathlessness on exertion, the mental faculties were not up to the standard and he looked tired and exhausted.

His previous health had been very good though he had had the usual children's ailments.

Chicken pox. Whooping Cough. Scarlet fever and slight growing pains.

The physical Examination at that time revealed a faint mitral systolic murmur (not conducted) and an accentuated pulmonary second sound. The apex beat was slightly diffuse and a trace outside the normal situation.

However the condition of the alimentary system was far from normal; the appetite was poor, the boy often complained of nausea and had occasionally vomited after meals. The tongue was furred and flabby and also tremulous.
There was also associated constipation. Slight anaemia appeared to be present also.

Condition much improved all gastric symptoms have disappeared. The physical examination of the heart revealed no murmur now but accentuated mitral and pulmonary sounds. The heart was normal in size. Sinus irregularity present.

Diagnosis:—

This was made from the symptoms and physical signs present, the gastric condition was thought to be the exciting cause and this was justified by the response to treatment of this system alone.

Aetiology and Pathology:—

This is a case of secondary myocardial weakness of very temporary nature brought on by the influence of a badly functioning alimentary system. Probably there was a toxin action on muscle, but the effect may have been purely nutritional.
Prpno.g.iIfU-

Very good, this boy should grow up with a normal heart, the condition was never severe but illustrates the danger of overexertion with abnormality of any system. If this boy had been allowed to play football at first he would have taken much longer to recover.

Exercise tolerance test.

Qualitative:-- Test performed with vigour just a little below normal, breathlessness very slight.

Quantitative:--

Normal Pulse rate. 82.
After exercise. 135.
Normal in 1 minute.

Thus the myocardium may be considered normal for all practical purposes at the moment.

Treatment:-- This was that of the exciting cause, the alimentary system; by careful dieting and gastric sedatives his gastric condition soon improved. He was not allowed any exercise till gastric condition improved. Later on he received graduated exercises and is now playing football as before.
Case IV. Toxic myocarditis following an incipient tubercular lesion at the apices of the lungs.

Boy aged 12 years.

History:

Oct. 1916. This boy's condition was discovered on his attempting to play football with his fellows; it was found that he became very breathless, was inclined to be sick after a game, and also was always left in an exhausted condition.

The physical examination at that time revealed a slight enlargement of the left ventricle with diffuse excitable action. There was also a loud mitral murmur (systolic) in time followed by an accentuated pulmonary second sound.

The respiratory system was also abnormal. Extremely poorly developed chest, retraction above both clavicles but more marked on left side. Dullness at left apex with bronchial breathing. Broncho-Vesicular breathing at right apex.
The previous health had been bad.
Had double pneumonia when very young.
Bronchitis several times.
Scarlet fever, sore throat and growing pains.

Symptoms much improved, merely slight breathlessness on exertion now.
Heart now normal in size, Apex beat localised.
Slight mitral systolic whiff still present.
Second pulmonary sound accentuated and re-duplicated.

The respiratory signs in the chest are practically the same as they were on first examination.

Diagnosis:
This boy attempted to carry on with his chums, his heart was not equal to the strain and betrayed itself with signs of exhaustion. The physical examination then revealed slight cardiac enlargement with a mitral systolic murmur.
The lung apices were examined and found slightly infiltrated, the physique of the boy was very poor.

![Myocardial Diagrams and Tubular Tumour](oct-1916)
Aetiology and pathology:-

In this case we have a well marked history of severe respiratory illness. At present there are well marked physical signs in the lungs and other signs are taken as representing an incipient tuberculosis.

Prognosis:-

This is guarded in this case, the boy is under-developed in every way and will never be able to do any heavy work. With a suitable light occupation and proper environment he will probably manage to carry on for a long time. The sinus irregularity was present in this case.

Exercise tolerance test:-

Qualitative:- Test performed with marked lack of vigour, breathlessness marked at its termination.

Quantitative:- Normal pulse rate. 72.

After exercise. 130.

Normal in 1½ mins.

This test exhibits a slightly deficient myocardium.
Treatment:

This is essentially that of the causal condition. The patient should choose an open-air occupation and indulge in small forms of exercise.

At first all his physical activities were entirely stopped, now he is beginning to play games again and is managing very well though as yet his games are of a very mild type.
Case V. Myocardial weakness due to abnormal psychic impulses.

Boy aged 10 years.

History:

Condition discovered in October 1919 on admission to school. His heart action was excited. There were no murmurs but there was marked accentuation of first mitral and second pulmonary sounds.

Symptoms of slight breathlessness on exertion.

His previous health was very good, merely the ordinary forms of children's illness: measles, rubella, whooping-cough and slight growing pains. However, the important fact about the previous history and even the present is that the patient is a somnambulist and is of a nervous and unstable temperament. During physical examination he was very nervous and had to run away to micturate in the middle of it; he still suffers to a slight extent from sleep walking but is improving.

Physical examination.

Cardiac condition much improved but slight accentuation of heart sounds still present.
Practically no cardiac symptoms now apparent. Sinus irregularity present.

**Diagnosis:**

This was made from a consideration of the history and the physical signs present. No definite cause beyond the psychic factor, obtainable.

**Aetiology and pathology:**

In this case we are on less secure ground than we were in the previous cases. A careful enquiry into the history does not reveal any cause for organic trouble; the physical signs and symptoms at the time were vague but were a departure from normal. Just as in the war abnormal psychic impulses were a cause of cardiac disturbance so I think that a similar though different process is at work here. In this case however the process seems to lie in a congenital nerve weakness which however has been aggravated by the strain of educational methods.
Prognosis:

Very good, this boy should to all intents and purposes regain normal health; however the whole outlook depends on a correct understanding of his mental condition.

Exercise tolerance tests:

Qualitative: Test performed with moderate vigour, breathlessness moderate.

Quantitative: Normal pulse 88.

After exercise 124.

Normal in 1½ minutes.

This test indicates a very slight deficiency in reserve power as evidenced by a slightly longer time for pulse rate to return to normal.

Treatment:

This depends on the thorough and comprehensive treatment of the nervous condition. The boy should not be pushed at his work; should receive a great amount of open air life with moderate exercises increasing in strength. Treatment by suggestion of the nervous condition should also be carried out.
Case VI. Secondary myocardial weakness following a focus of tubercular infection at the left apex.

Boy aged 11 years:

History:

Came to this school 3 years ago.

Oct. 1916. Was perfectly well on admission and remained so for two years, then he began to show symptoms of circulatory distress:

Breathlessness, palpitation, fatigue and giddiness. He was physically examined at this time in consequence and his condition diagnosed.

Previous health:

Has had measles and chicken pox, he has had sore throats frequently. There has been no rheumatism. But the outstanding fact during the last three years has been the amount of pulmonary trouble. Acute bronchitis has been a marked feature and finally the opinion which one had formed as to the origin of his trouble has been confirmed by a specialist that he was suffering from early pulmonary tuberculosis.
Physical examination:—

At the present moment there is a very little to be made out in the circulatory system. The heart is normal in size but both the sounds are accentuated, previously there was a mitral systolic murmur which has disappeared, under treatment.

Respiratory system:—

The physical signs are those of a definite consolidation at the left apex with a similar though less advanced process at the right apex.

Diagnosis:—

This depended on the history; the physical signs in the circulatory system, but more important, the fact is impressed upon one of the value of thorough physical examination of all the other systems in all cases.
Aetiology and Pathology:-

I do not think that there is much doubt that we are dealing with a secondary heart case following a tubercular focus of infection in the lungs.

Prognosis:-

This is very good in this case, there has been so much improvement under general treatment and as the lung changes seem to be retrogressing, the hope is that gradually the body processes will prevail and that the focus of infection will be eradicated.

Exercise tolerance tests.

Qualitative:—Lack of vigour in execution.
Breathlessness marked.

Quantitative:—Normal pulse rate. 92
After exercise. 135.
Normal in 2 minutes.

This test still further demonstrates that the myocardium is below par.
Treatment:—

That of the pulmonary condition with proper regulated exercises all strain being carefully avoided.
Case VII. Toxic myocardial weakness, the focus of infection lying in the throat.

Boy aged 14½ years.

History:—

Patient has been a pupil at this school for almost three years. No physical signs or symptoms on admission and was allowed to play the usual games. However after one year at School he began to complain of symptoms suggestive of cardiac involvement. Was then examined and found to be suffering from the type of heart mentioned in the heading.

The symptoms were the usual ones of breathlessness and fatigue on exertion.

The physical signs were very marked at the time. The left ventricle was slightly dilated, apex beat diffuse and excited cardiac action. The first mitral sound was much accentuated and quite like a presystolic murmur in character, however time has justified one in the belief that this was not a mitral stenosis. The second pulmonary sound was also accentuated.
Previous health:— Not very good.
Has had measles, mumps, whooping cough, chickenpox.
There is no history of rheumatism or growing pains.
He has always been liable to respiratory catarrh
and has often been in the sick room on this account.
The most important fact of all is that he has had
several acute attacks of tonsilitis and his tonsils
were removed, on this account one year ago.

Physical examination—
Jan. 1920.
The condition is now much improved from the time
when first he came under observation.
The apex beat is now localised and heart not
excited in action. There were no thrills present.
The mitral first sound is still a little accentuated as is also the pulmonary second sound. This
examination dispels the suspicion that perhaps we
were dealing with an early mitral stenosis as there
has been so much improvement during the last two
years.

There is also some slight degree of flattening
and dulness at the apices of the lungs but it is
very slight and I do not think that it is of
importance in this case.
Diagnosis:--

This was made by thorough physical examination of all systems after the occurrence of cardiac symptoms.

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<th>Myocardial Diagrams</th>
<th>Tonsillar Infection</th>
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<td>Reserve</td>
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Aetiology and Pathology:--

In this case it is my opinion that the entire aetiological factor was located in the tonsils, at this situation there was a chronic source of toxin absorption with a secondary effect on all the musculature of the body and particularly the cardiac musculature.

Prognosis:--

This is very good in this case, the patient has improved wonderfully since his tonsils have been removed, he is not so liable to respiratory catarrh and is looking healthier in every respect. Ultimately he should attain a normal condition.
**Exercise tolerance tests:**

**Qualitative:**- Test performed with slight diminution of vigour but breathlessness not very marked.

**Quantitative:**-

Normal pulse rate 90. (Emotional acceleration)

After Exercise 132.

108 again in two minutes.

There is thus a slight diminution of reserve which may lead us ultimately to alter our diagnosis in this case.

**Treatment:**-

This has been very simple, at first he was not allowed any games, later when he had improved his physical life was made a little more strenuous as time went on. On the least sign of cold or sore throat all his activities were curtailed until all sign of infection had disappeared. At present he is being allowed a fair measure of physical exercise but is not being allowed to play football which would probably be too strenuous for his powers to respond to.
Case VIII. Myocardial weakness in association with a slight infiltration at the left apex of the lung.

Boy aged 10 years.

History:

Patient was admitted to this school four months ago. He was not allowed the usual games on admission.

Physical examination:

This was made not because there were any physical signs or symptoms but in the ordinary routine manner at the beginning of a term. The heart was normal in size. Both first and second sounds were accentuated. The cardiac action was excited and there was a well marked respiratory irregularity present.

There is a slight infiltration at the left apex of the lung but one would not go the length of saying that it was tubercular in nature.

Previous health: He has had numerous colds and sore throats during the last few months and also previous to that time, and he has had a severe rheumatic pain in the left knee during the last week.
Diagnosis:–

This was made in the ordinary routine physical examination of all new boys.

Aetiology and pathology:–

Here we are no doubt dealing with a general want of muscular tone following catarrh of the respiratory mucus membranes which has been a marked feature in this boy's history for some time. I do not think that the apical lesion of the lung should be considered of tubercular nature as there are no other appearances to lend colour to this supposition.

Prognosis:–

Very good, this boy will probably soon attain a normal degree of health.
Exercise tolerance tests: -

Qualitative: -
Test performed with ordinary vigour.

Quantitative: -
Normal pulse rate. 81.
After exercise. 120.
Normal again one minute.

Treatment: -
This has been very simple in this case merely a slight restriction of muscular exercise followed later by a graduated increase in same. The boy is improving every day and will soon be allowed a full measure of exercise.
Case IX. Organic myocardial and endocardial 

disease following an attack of rheumatic fever.

Boy aged 13½ years.

History:--

Came to this school 15 months ago. Was never allowed to play games as the physical signs of heart disease were unmistakeable on admission.

Physical examination on first appearance and also symptoms. Left ventricle slightly enlarged apex in nipple line. Impulse diffuse and rapid and excited in action.

Loud systolic mitral murmur propagated to axilla.

Second pulmonary sound accentuated.

The symptoms at that time were not very marked.

Breathlessness and slight cyanosis on exertion and patient was often giddy and easily fatigued.

Previous Health:--

He had what was evidently an attack of rheumatic fever when he was about 10 years old. He was in bed for three months at that time and had pains in most of his joints. During his time at this school he has been very well and infections of any sort have been uncommon but he has had sore throats frequently.
Physical examination at present date.
Apex beat slightly lateral to nipple line.
Impulse localised and heaving in character.
Systolic thrill palpable.
Loud blowing mitral systolic murmur propagated well into axilla.
Second pulmonary sound very accentuated and reduplicated.
No sinus irregularity present in this patient.

Diagnosis:
In this case it was comparatively easy with a definite history of rheumatism and such well marked physical signs in the chest there could hardly be any other diagnosis than that of organic disease.

Aetiology and pathology:
The lesion in this case is organic in nature, the rheumatic infection being the cause. There is undoubted affection of the endocardium and one can safely conclude that the myocardium is also affected, the enlargement of the
left ventricle being sufficient evidence of such a state of affairs.

**Prognosis:**

This is difficult in this case, in my opinion this boy will have trouble in middle life if he ever reaches that stage however one can predict that such a lesion will shorten life to a considerable extent and also curtail the activities of the patient to a like extent.

**Exercise tolerance tests:**

**Qualitative:** Breathlessness, very marked, also slight cyanosis.

**Quantitative:**

- Normal pulse rate. 90.
- After exercise. 140.
- Normal in 2½ minutes.

This test exhibits that there is quite a deficiency of reserve force, and the prognosis is also rendered worse in consequence.

**Treatment:**

No special line of treatment, here, one should avoid infection, and games should not be too strenuous.
Case X. Secondary Myocardial weakness following anaemia and general debility.

Boy aged 9 years.

History:

Jan. 1920.

Patient admitted to this School one month ago.

His condition was discovered in the routine physical examination of new boys.

Previous health:

Practically no severe illnesses.

Has never suffered from any form of rheumatism.

Physical examination:

The patient is not looking as fit as he should be, the skeletal muscles are flabby, he has a pale complexion and also mucus membranes. A slight degree of anaemia is present. The only abnormality in the heart is a slight accentuation of both first mitral sound and also the pulmonary second sound. There is also a slight systolic whiff in the pulmonary area.
Diagnosis:--

This is made mainly by a process of exclusion in this case. The only abnormality seems to be in the haemopoietic system.

Aetiology and Pathology:--

This depends on the same factors as the diagnosis, the general condition of the patient was taken as the cause of the slight physical signs in the heart.

Prognosis:--

Very good. With proper attention to his general health this boy should be normal in a few weeks.

Exercise tolerance tests:--

Qualitative:-- Practically a normal result.
Quantitative:--

Normal pulse rate. 92.
After exercise. 130.
Normal in 1 minute.
Practically no myocardial weakness evident now.

Treatment:-- That of the anaemia and no heavy games till general condition improves.
Case XI. Severe case of rheumatic organic disease.

Boy aged 11 years.

History:—

Came first under observation 11:7:19. Had noticed 3 days before that his ankles were swollen and sore and that he could not walk. Then the knees were affected followed by the hips. The hands and elbows then became affected and also the mandibular joints. Each joint was affected in turn and each recovered as regards pain to suffer from a further recrudescence. There was also some pain in the chest some breathlessness and slight cough. The previous health had been very good. There had been several attacks of tonsillitis and some growing pains.

Physical examination:—

Ankles slightly swollen, red and tender. Second metacarpophalangeal joints of hands swollen and tender. Subjective symptoms of pain on movement in the joints. Temperature elevated to 103 F.
Cardiovascular system:

Pulse rapid. Regular in force and time. Pressure low. Heart slightly enlarged both to right and left and pulsation in praecordia tending to be diffuse.

Soft systolic murmur in mitral area, localised and not conducted.
Second pulmonary sound accentuated.

General Facts:

The boy looked very ill, was very uneasy suffering from considerable praecordial distress. Face flushed and beads of perspiration continually on forehead. Slight anaemia present.

16.7.19. Heart decreased in size, murmur still present but not conducted. General condition much improved.

22.7.19. Double Aortic murmur now detected in the routine examination of the heart. General condition not affected.

23.7.19. The double aortic murmur became musical in character and could be heard a yard away from patient who could also hear it himself.

13.8.19. Thrill gone to-day.


Patient now allowed up with no untoward effect and general condition and strength quickly regained to a certain extent but patient did not play with other boys in ward and did not seem able for much.


Aetiology and Pathology:

Here we are undoubtedly dealing with a case of acute rheumatism with both the myocardium and endocardium affected. The boy was 3 days ill before any murmur was detected in heart but the muscle must have been affected before that as shewn by prostration, Praecordial distress and dyspnoea.
This case illustrates the difficulty of diagnosing organic changes in acute rheumatism, it was undoubtedly present here, as evidenced by the later history but according to the usual rules given for such cases it was absent. In my opinion the stethoscope cannot be relied on here, the general condition of the patient seems to me to offer a more certain means of detecting cardiac mischief and here is seen the value of keen observation of general symptoms. This patient was studied with the electrocardiograph but no change from normal was ever detected. The pathological condition in the patient seems to me to be undoubtedly rheumatic endocarditis of mitral and aortic valves with an associated myocarditis.

Diagnosis:-

This was comparatively easy in this case, there was no doubt about the rheumatic nature of the febrile attack. Attention was directed to heart and any change was noticed immediately it had occurred. The diagnosis rested on the physical signs as evidenced by the stethoscope associated with observation of all other signs and symptoms and the associated complex made up a picture not to be easily missed.
Prognosis:

Very poor. No exercise tolerance, test possible. We have positive evidence of rheumatic endocarditis with affection of two valves. We can conclude almost with certainty that the myocardium was also affected. The immediate prognosis at one time even was doubtful but luckily the infection subsided. This boy will never be fit for very much work and the duration of life in my opinion will not be beyond 25-30 years. It is noteworthy in this case that the sinus irregularity was never present which may be taken as a further evidence of myocardial damage.
Treatment:

This patient responded very well at first to large doses of salicylates that was before the heart was affected. The temperature was rapidly controlled but a day or two later the heart was found to be affected which rather shakes our belief in the efficacy of salicylates in rheumatic hearts. Later on the salicylates had no effect and one was reduced to the mere enforcement of extreme rest not allowing patient to move a muscle unnecessarily.

The throat condition was attended to and on discharge the patient's parents were told the nature of the process and the need for care and guarding against infection and also the need for complete rest and skilled attention should any more rheumatism develop.
Case XII. Severe organic disease of heart following chorea sore throats and rheumatic pains.

Girl aged 11 years.

History:
First came under observation 21.3.19. Then complaining of muscular twitchings, prostration, palpitation and dyspnoea.

Previous health:
Nothing of importance beyond growing pains and sore throats.

The condition was diagnosed as a case of simple chorea and the time and the usual measures for that condition were adopted. As she was very refractory to treatment the Weir Mitchell Treatment had ultimately to be adopted. At this time also the heart was affected. There was slight enlargement of left ventricle diffuse and excited pulsation and a well marked systolic murmur conducted well into ascilla. The second pulmonary sound was also markedly accentuated.

The patient did not receive any salicylate at this time but arsenic was given and she was discharged cured on May 23th 1919.
She remained comparatively well till August 1919, when her mother noticed that she was not very well.

Aug. 1919.

Extreme prostration, giddiness and palpitation with praecordial distress.

11.7.19.

Patient kept in bed from this date. Her temperature was swinging in character, normal in the morning and elevated in the evening to 101. No change could be detected in the heart from the condition some months previously but there was an area of congestion in the left lung lateral to the heart and adjoining it. Tuberculosis was suspected at first but as the temperature was settling rapidly and was normal in a week no anxiety was occasioned. However on the 8th of July pericardial friction was detected in the region of the apex beat and now one came to the conclusion that it was a case of pericarditis of rheumatic origin with secondary lung congestion in the neighbourhood.

The patient rapidly improved whether as a result of salicylate treatment or rest is doubtful.

18.8.19.

Patient discharged to convalescent. Heart much stronger, patient running about quite briskly, very bright and fit for anything in the nature of amusement in the ward.
Aetiology and pathology:-

This case illustrates another affection of the heart with rheumatism and also the frequent association of *rheumatism, heart disease and chorea.*

This patient gave a history of growing pains and sore throats before her chorea was apparent and at the same time the endocardium was affected. In a few months there was a recrudescence of the rheumatic process with its seat of election this time in the *pericardium.*

Diagnosis:-

This case illustrates beautifully the difficulty of diagnosis in some cases of pericarditis, the pulmonary condition obscured the heart condition here, but the general symptoms again were more reliable than local and the precordial distress and the prostration with palpitation and dyspnoea always suggested the possibility of pericardial trouble.

Prognosis:-

Not very good.

The heart is undoubtedly affected organically with pericarditis the myocardium so frequently suffers.
A cautious prognosis was given to the parents so as not to alarm them unnecessarily.

**Treatment:**

Here again the value of rest was emphasised as the primary factor in the treatment of the rheumatic heart. The patient must be rigidly confined to bed and not allowed a muscular movement beyond the absolute necessities. Salicylates again were not of much value in this case. The after treatment was also important and the parents were warned about the future as in the previous case.
PART III.

Conclusions & Summary.

After consideration of the foregoing principles and cases, naturally the first question to be asked is - For what purpose was the investigation undertaken?

The answer to that question lies in the belief that the best method of treatments in medicine is the preventive method.

In order that this method of treatment be practised it is necessary to go right back and endeavour to diagnose cases at the very commencement of disease and one may even attempt the task of ascertaining what are the predisposing factors in disease; the latter being still a greater step in progress.

Only by the study of the above two factors can we hope ever to ascertain and adopt measures and remedies by which we can prevent the occurrence of disease or modify its onset once it has begun.
In the past the study of heart disease in particular has mainly been carried out in the postmortem room, where, however, one sees only the end results of the disease process; by comparing these results with the symptoms present just before death valuable results have been obtained; in fact, most of our knowledge rests on this method of study.

As our methods still further advanced, so did our knowledge of the previous type of case increase until one was able during life to foretell with sometimes almost incredible accuracy the condition of an organ and its effect on the future efficiency of the individual.

Still later those engaged in research have been attempting to get to the very beginnings of disease and to its predisposing causes, the cases at present under consideration are most of them very mild ones, each has been treated in a like manner and the predisposing factors have been carefully enquired into in every case.

The investigation has been undertaken in childhood and youth for an obvious reason as in them and in them only is one likely to meet with disease at its earliest onset.
One cannot hope for phenomenal results as the result of observations conducted for so limited a time; the clinical method of investigation not lending itself to quick results, however by the examination of cases on the lines already laid down and their subsequent behaviour in later life much useful information can be obtained.

In fact it is only by this method of investigation that we shall ever be able to interpret accurately and justly the meaning of any abnormal sign; and no injustice will be done to any patient who manifests some abnormal sign the exact meaning of which may be unknown.

Heart disease has assumed vast importance at the present day, so many of our returned soldiers manifesting signs which point to an affection of the circulatory system.

Having seen considerable numbers of these patients, some with very mild symptoms others unfortunately with severe symptoms one has always been struck with the fact that in a considerable proportion of cases no aetiological factor of any value could be obtained from the history.
On thinking this matter over carefully one always had the feeling that the proper time to commence an investigation was in childhood.

The present series of cases was taken from two schools with about 120 inmates between them. From this it is seen that roughly 10% of boys of the age-group 3 - 14 manifest signs and symptoms of circulatory embarrassment.

Most of the cases are very mild, and one hopes, that with proper treatment complete recovery will eventuate, and that none will manifest later any symptoms which might be comparable to the D.A.H. group in soldiers.

However the question arises, what will happen to this type of case if circumstances arise which will necessitate a great strain being thrown on the heart?

My own opinion is that these are the types of case which will later break down under strain and give rise to symptoms comparable to the D.A.H. group; This hypothesis being subject to similar conditions as found during the last five years; and no doubt in ordinary civil life such conditions occur to some of our population,
This is borne out by the experience acquired by watching these cases over a comparatively short time; if these boys are allowed to play rugby football without proper preparation, invariably they break down and manifest more unpleasant symptoms than they have already shown.

All the symptoms already enumerated belong to what is called the functional group and their presence is an evidence of an inefficient blood supply to the various organs.

From this we can infer with certainty that the heart is not functioning as well as normal, and that this loss of function is due to some factor which is adversely affecting the reserve force of the heart muscle.

The interdependence of the various organs and their functions is a very important factor in all these cases.

Every organ in the body will be adversely affected by an inefficient blood supply and so this deficiency of function will lead to secondary deficiencies in all organs, the evidence of which in most cases will be very slight and quite beyond our present methods of diagnosis.
In a like manner the heart is secondarily affected by deficiencies in other organs and some of the cases in the series illustrate this factor very well.

In conclusion one would emphasise the fact, that no one sign should be taken as a criterion in diagnosis, only by the presence of several signs are we justified in forming an opinion and however much value any given sign may be, it is the functional efficiency of the heart as a whole which is the dominant factor in diagnosis and prognosis in all cases.

In the preceding pages many ideas have been obtained from other writers and from my former teachers; to the latter I cannot convey sufficient acknowledgment of help received and it is in trying to emulate their example that this work has been undertaken.