The Early Diagnosis of Pathosis Pulmonalis

Pulmonary Tuberculosis

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"A case presenting the ordinary first stage symptoms of the out-patient room, if for our father an incipient case, is in our eyes an advanced case."

—from Professor Clifford Allbutt
In the Transactions of the British Congress on Tuberculosis, 1902.
The Early Diagnosis of Pulmonary Tuberculosis

Preliminary Observations.

Everyone is now agreed that for treatment to successfully attack and completely or even partially overcome this disease, the earlier it is detected the better is the result. Therefore every medical man ought to endeavour to make himself familiar with any special test or method of examining the chest that may in any way help early diagnosis; nor, however neglecting the ordinary careful physical examination, that many early cases are missed is undoubtedly and unfortunately true. The records of many hospitals contain notes of cases, where healed cavitaries, tubercular nodules, or even cavities were found in the lungs or post-mortem examination, which were not suspected from the symptoms, or detected by physical examination, during the life of the patient.
Laennec—in his Treatise on Medical Auscultation, and in Diseases of the Lung & Heart—English Edition 1846 page 293 says:

"Nothing is more common than to find, on the dissection of those who have died of diseases unconnected with the thoracic organs, a small number of tubercles, sometimes a vast volume disseminated through a pulmonary tissue otherwise entirely healthy, and some of which are already softened or excavated. Nothing having announced in these cases the existence of tubercles, we ought, I conceive, to conclude that this same thing must often happen in individuals enjoying excellent health; and that the softening of the tuberculous matter, and its evacuation either by the bronchi, or by the action of the abscess, must be followed by a creative commonly too small, and too similar in texture to the pulmonary tissue itself, to render it possible to distinguish it easily, especially..."
at first sight, and without that patient explanation which those who undertake to examine, whilst influenced by unfavorable prepossessions are unwilling to bestow." Laennec then narrates two cases when old creatures were found in the lungs.

West, page 502, says: "In a few instances there is absolutely no history at all of any illness, or indeed of any cough. The most remarkable instance of this, I have ever met with, occurred in the case of a young woman, whose whole right upper lobe was excised, the left lung being in a condition of well marked complimentary hypertrophy. The patient looked the picture of health, was fat and well developed, and there was nothing whatever to point to the chest as the seat of disease, and the condition of the lung was only discovered on systematic examination. I have myself amongst the Mount Vernon hospital out patients seen many men with big well developed chests who undoubtedly
had well marked pulmonary tuberculosis.
All pathologists and physicians must come across many cases, where the evidence of the disease has been missed both in an early and advanced stage, perhaps in some cases through the incompetence or carelessness of previous examiners, but also often because the patient either had no symptoms to induce him to consult a practitioner, or only such symptoms as seemed to point to other diseases.

3. Turban, p. 11 cites a case illustrating apparently the great lengths of time elapsing between exposure to infection and the manifestation of the disease.

4. The same author, p. 7 quotes Thomson and Syngy who assert that they were able to produce tuberculosis in animals with material from healthy bronchial glands, the conclusion being drawn that the tubule bacillus can persist in a viable condition in an insusceptible host.

5. Curet, p. 360 states that a single tubule takes from two to four weeks for its complete evolution, and does not itself cause any symptoms during that time; the breaking down of the tubule
and the further distribution of the bacilli may take many months depending on the virulence of the infection. In early tuberculosis when many bacilli invade the body at the same time, symptoms may occur in three or four weeks, and death in a few more weeks.

By the term "early diagnosis" do not mean diagnosis of pulmonary tuberculosis itself in the active stage, but conclude cases that may be fairly advanced, and yet which are difficult to detect on account of the meagerness of the symptoms and signs.

**General Symptoms and Characteristics.**

Individuals who are prejudiced to tuberculosis are inclined to be tall and thin, and to grow rapidly in youth; they are often pale and anaemic, and often change colour frequently; they are susceptible but easily tired in body and mind, with variable appetite, and they lose flesh.

The hair is usually long and silky, but...
Symptom, brittleness of the nails and dryness of the hair and skin.

7. Infants often have a lot of downy hair on the back. The skin on the trunk often shows large patches of pityriasis roseacea, the growth being hampered by the frequent scabs. The forehead and cheeks sometimes show shiny, scaly, pigment spots, the so-called "Cicatrices Whiticymi".

The eyes are bright and the pupils are sometimes irregularly dilated. This was first described by Roque in 1869, and more recently by Justre 1854, cited by Turner p. 30.

This sign is said to occur very rarely in some cases, and the cause is by irritation of the vagus by the tubercular enlargement of the tracheo-laryngeal glands.

9. Turner p. 30 has noticed dilatation of the pupils on one or both sides in different stages of the disease ranging in intensity and duration and disappearing later.

Fclouding, and Thompson sign.

Compt. p. 395 - "This may be line along the margin of the gums, red in the acute, and blue in the chronic form. Stated quoted by Compt. p. 395 says that there is one of the earliest signs of
Tuberculosis especially in young individuals. But, it occurs in pregnancy and the disease is said to exist in three stages, and so careful treatment is necessary. Much more useful and diagnostic value.

Swelling of the thyroid has been noted by Turban p. 131 in the early stage in a number of cases.

The circulation is often affected in the early stage. There is weakness of both heart and nervous system.

The pulse is usually quick and irregular, it quickens easily on exertion or excitement, and usually patients often complain of palpitation and oppression of breathing—perhaps justly or unjustly or mental excitement.

The cause is said to be due to tubercular infiltration. Fairsays quoted by Turban p. 16 believes the tachycardia is due in some cases to toxins, in others to the vagus being implicated in the enlarged bronchial glands, or the latter may in some cases cause Bradycardia. Arterial tension, according to the observations of Margar, Brahman and Bostan 392 yellow flutters.

Clubbing of the finger may occur as in the fingers, but sometimes until later it occurs as in other disease of the chest.
General Symptoms which more closely indicate the disease

Cough

Is the popular symptom drawing the attention of the patient and friends to the chest. Unfortunately it is not always present, and is not peculiar to pulmonary tuberculosis. It gives no true indication of the intensity of the disease, or of its progress for extensive areas may persist for years and the patient may be seriously inconvenienced by his cough; while cicatrizing small changes may be associated with coughing of a violent paroxysmal nature. Eberle p 364

But as a rule cough usually precedes expectoration by months or even years; it is usually a short, dry cough but may be accompanied by the bringing up of phlegm at first only a greyish brown mass in which the tubercle bacillus may never be found; later it may become mucous and profuse.

Cough is most intense in the mornings, on arising, post meals, or on lying down at night.

Cough may depend on or be increased by

Naso-pharyngeal catarrh; laryngitis, pleurisy,
only enlarged bronchial glands present on the neck. The amount of coughing depends much on the patient’s nervous system.

Lindsey, p. 304, says, “Cough is rarely absent with this except during periods of complete latency of the disease.” I saw myself notice while living in a sanatorium in Wales, that patients in the early stage may soon lose their cough after beginning sanatorium treatment.

West, p. 462, says, “There are certain rare cases where the disease may run its course to the end without any cough at all, or any expectoration.” West mentions these special cases.

Expectoration

Varies much, it is often absent at first, later it is a gray viscous mucus, later still yellow streaks appear and it becomes more opaque, and gradually acquires a homogenous yellow appearance. There may be red spots of blood in it, or it may have a rusty appearance from being mixed with escharosed blood. In the escharum may be found adheren
epithelium, and myelin cells, various cocci and tubule bacilli. Look out especially for the small opaque white or yellowish masses in the sputum likened by Bayle to boiled rice. Later on elastic fibers are found. But the essential feature and the one that clinches the diagnosis is the presence of tubule bacilli, no matter what the character of amount of the sputum may be, but as we shall see even although the case is of self tuberculosis, tubule bacilli are not always found even though the lesion is of long standing.

According to Teichmüller, quoted by Thibert, one finds eosinophile cells in the sputum long before tubule bacilli are found, and the cells gradually diminish in number as the bacilli increase. But they are found also in the sputum of asthmatic patients and those suffering from bronchial catarrh.

The colour of the sputum varies later from the action of the Chromogenic bacteria, yellow or due to the presence of bacillus anginosus, green to bacillus pyogenes, and the bacillus floccosus. We will consider the examination of the sputum for tubule bacilli later.
Catarh.

Those who are inclined to the tuberculous are often troubled with various catarh, pharyngitis, laryngitis, bronchitis, and even pneumonia.

If hoarseness remains it is a very suspicious symptom of tuberculosis of the larynx. Influenza is a plentiful precursor of phthisis. There may be a mixed infection; tracheitis, dyspnoea, stertor, coci, tetragenus, and many other coci causing expectoration febrile attacks. - Turban p. 24.

"The local disease of any kind may smooth the way to tuberculosis, just as possible as the common. In fact in this respect there appears to be a regular vicious circle, from chronic catarh of the air passages to tuberculosis and back again." - Turban p. 24.

"The bronchial catarrh in such cases is far oftener the effect of a tubercular deposit already present than the cause of such a deposit." - Linton p. 302.

The same author also says, "experience amply demonstrates that the tendency to bronchitis and the tendency to tuberculosis, have in general little in common."
Hoarseness. They occur independently of Laryngitis, and may be caused due to the general weakness of lungs and muscles generally. There is a far more hoarseness mentioned by Schaffers, the same partly due to external the vocal cords are reddened and swollen and come with tough sensation. Sometimes in must not forget that there may be syphilitic Laryngitis plus tuberculosis. In this hoarseness may depend on paralysis of the inferior Laryngeal nerve on one or both sides, they may be involved in pleuritis thickening of the lungs. Conr. p. 375.

Hoarseness is a symptom that ought to be fully investigated in all cases by an expert Laryngologist. In other the larynx is involved but it may be affected when the disease is far advanced. To give the Laryngologist a chance, he ought to see the case early as possible. Very often by this time this symptom comes on the disease is very far advanced and rapidly prove fatal.
Hæmoptysis

They occur in the early stage of tuberculosis—mainly from congestion, or later from necrosis of the lung tissue.

Laennec p. 309. says—"Tuberculosis pathosis, after lying long latent, is often manifested immediately after an hæmoptysis, which has supervenied without any appreciable cause, and which in reality has no other cause than the presence of tubercles in the lungs."

We should suspect tubercular disease in any case of hæmoptysis, but unless it is very evident that it comes from the lungs, i.e. definite coughed up, or sudden well up into the mouth, we should endeavor to find the source of the blood. Examine the nose, mouth, especially the gums, tongue, pharynx, and judge from the history of it whether it is due to ulcers of the stomach, respiratory, cirrhosis of liver, or splenic congestion. Examine the lungs for, although the blood may come from the lungs it may be due to other diseases than tubercle, namely—early pneumonia, late cancer,
a sometimes it occurs in bronchitis, bronchietasis, emphysema, asthma, or gangrene of the lung. or it may be due to carbonic disease, mitral stenosis, incompetent eustachian tube, congestion or an affection of the lung. In pulmonary artery or the large vessel, blood may rupture into or flow into the bronchial trachea.

In old people arteriofibrinous de-

vessel may be the cause of the haemorrhage. Also in Pneumonia haemorrhagica, Scoury, Haemophilia, and Scurvy. Anaemia we may have haemorrhage from the lungs. We may have the blood coming from an Erythema of the

corpuscles. Vicarious menstruation is also mentioned as a cause. Compl.

Persons in good health are said to have

recurrent attacks sometimes.

Lindsay says it is undeniable that some persons suffer from frequent attacks of haemoptysis and yet remain in good health. But he doubts the correctness of Sir Andrew Clark's cases of haemoptysis occurring in persons of the "Arthritic"
deaths, and not due to any definite pulmonary lesion. Wilson Fox had hemoptysis in 161 out of 257 cases. Walsh had it in 80% of his cases; Brunton found it in 66%, quoted by Tempest, p. 441. Turban found hemoptysis in 235 out of 408 cases of phthisis; it was the first symptom noticed in 47 out of 408 cases. Hemoptysis may occur in infants and young children. Sec. 24. Sec. 469 mentions a number of cases collected from various writers.

In judging as to the source of the blood, we must remember that blood from the lungs is mixed with air, and so is greyish and bright red, alkaline in reaction, and has little taste; but remember that it may be effused into a cavity and become dark and clotted and then be ejected. Sec. 25. Otherwise it does not clot so readily as blood from the stomach. On further examination we may find in it pus, alveolar cells, and sometimes tubular bacilli.

When the blood comes from the stomach, it is not mixed with air, it is darker in
color, and more clotted, has acid test and reaction and may be found to be mixed with food — then may have been a history of pain in the stomach.

Dyspnea.
Is a symptom in some early cases, it varies in intensity.
It is partly due to lassitude of the respiratory area, and partly to nervous influence from irritation of the Vagus endings by the tubercle, this is especially seen in ordinary tuberculosis of the lung when inspiration is seriously embarrassed. Enlarged chest glands pressing on the Vagus may cause severe dyspnea and coughing spells. — Corr. 372
Dyspnea also depends to a large extent on the nervous condition of the patient, if irritable they suffer more.
Then may be actual attacks resembling Asthma.

Pains
Is often complained of. It may be a plastic pain over the seat of the disease, or it may be a characteristic dull, boring, or stabbing pain.
in the shoulder and down the arm, and this may be mistaken for rheumatism.
The pain tends to be localized at the apex, or in the anterior chest wall below.
The chest is the 5th rib in the interspace.

Pain may also be experienced in palpation or percussion of the infraclavicular region, then usually unilateral. One must be careful in auscultating as to the patient by the presence of the stethoscope.
The pain is usually intermittent, and after an increase by deep inspiration, coughing, sneezing, laughing.

The causes of the pain are narrowing, traction, or pleuritic adhesions. Sometimes it indicates pulmonary congestion and may precede pneumonia.

The pain may also be due to involvement of the intercostal nerves.

If severe pain comes on suddenly we must think of pneumothorax.
The Temperature

Is a very important guide in pulmonary tuberculosis.
Some cases show an early rise before auscultation gives any sign; in other cases the temperature may remain normal throughout the entire course of the disease even though auscultation gives marked signs.
As a rule, the temperature in a well-marked case of consumption often continues as a guide to the condition of the patient and its treatment.
The temperature is best taken in the rectum.
Healthy people show a rectal rise of temperature after exercise but this falls off about half an hour while in tuberculosis it takes much longer to subside.
Sometimes the temperature is intermittent or remittent.

27 West page 457 says: "A special form of temperature curve can be associated with the different forms of fevers, except that if the process is acute the pyrexia is high, if not very active, moderate, and when it is stationary absent altogether."
26 Lindsay p. 306 says: "The most frequent
type is a characteristic case of the hectic
type, having an irregular and unstable
temperature with sharp oscillations and
a marked daily curve— a heated afternoon
or evening rise, and a fall to a below
normal at the end hours of the morning.
The maximum temperature usually occurs
between 2 and 5 P.M.
The minimum temperature usually
occurs between 2 and 4 A.M.
Hypothermia is rare. The minimum
is often much below normal.
A high afternoon rise followed by a low
morning minimum is a very unfavorable
type. Sometimes the temperature keeps
continuously high in an active case. Sometimes the rise of temperature
occurs in the morning instead of the
evening.
In women we must remember the influence
of menstruation, there may be a regular
monthly rise before and a fall after
menstruation. Hering first described
this—see Tuber 17—this rise may last
for months and be associated with night
sweats.
The injection of tuberculin causes that the tubercular virus itself can cause pyrexia but for half much injection has much to do with it, this is a point that one should look to in treatment.

Complications such as pneumonia or pleurisy or other active inflammation may send up the temperature of fever. We must therefore bear this in mind of the fever rises high. 15°1, 11°8, 8°9. Pneumothorax is severe haemoptysis may cause a considerable fall of the temperature.

The mean average temperature gives the best indication of the course the disease is taking. Sometimes, the temperature remains up 8° or 9° a time that it may be missed, here the need of taking the temperature at frequent intervals.

From generally indicates an advance of the disease, so a remission of it often indicates a halt. Cornet p. 387.

The rise in the evening is probably due to a morning absorption of the toxin, it resembles the effect produced by an injection of tuberculin. It takes several hours to influence the Wassermann.
It is the morning cough and anorexia (early during) that famous absorption.

The fever has many injurious effects:
it causes a great consumption of
albumene and tissue material, and
leads to loss of weight; this is also
favoured by the loss of appetite
induced by the fever. The loss of
weight again forms an increase
of absorption, and this in turn leads to
more fever. The fever also causes
weakening of the heart, and loss of
strength through sweating and
generally depresses the patient. [Page 390]

Sweating - Weight and health.

It is most apt to occur during sleep - hence
the term - night sweats.

Or depends partly on the pyrexia.

It may occur with a low temperature
in one case, and be absent in another
with a high temperature. [Page 460]

In the early stage when there is no pyrexia
some patients tend to sweat in slight quantity,
other do not sweat at all.

Sweating occurs most in cases where there
is much debility, with a high temperature, and
a low morning temperature from 34 to 31. We
must, however, remember that weight
sweating may occur in cases of debility
quite apart from phthisis.

Loss of weight is often an early symptom,
and attracts attention.
The weighing machine is of great service
in giving information regarding the
progress of a case--favorable or
otherwise. We must not, however jump
to the conclusion that a case is rapidly
improving because weight is put on when
a patient, who has eaten little for months,
has been induced to feed well after
entering a Sanatorium.

Loss of flesh may be due to many causes,
loss of appetite, indigestion,
diarrhoea, sweating, loss of blood.
Perhaps deficient oxygenation due to
lesserened respiratory area may be cause.
Toxin produced by the tubercle bacillus partly
also plays its part. The loss of weight may be
gradual or very rapid. Loss of strength may also
be a symptom--the patient may be always weary.
Dyspepsia — is a common trouble in lithiasis, and is the most obstru-cted symptom. It seems to me that doctors of Sanatine have to overcome — it is often most distressing and distressing to the patient.

We have seen that loss of appetite is one of the symptoms, but severe indigestion also often precedes lithiasis and has been described by many writers.

Solrunn Senwick in his book on the dyspepsia of lithiasis goes many steps with the subject and describes two forms preceding the onset of lithiasic disease.

First. The atomic variety. When the symptoms are those of weak digestion. It affects females from 13 to 25 years of age.

It usually comes on after some acute fever. It may begin insidiously or with some pain in the stomach after food, then there may be nausea, vomiting, thirst, and loss of appetite, though at times the appetite may be ravenous. Patients take a dislike to fat or oily foods. There is obstinate constipation. The tongue is large, pale
and flabby. This variety usually arises as a slow, chronic form of tuberculous.

Second. The Irresistible variety is characterized by scanty pain and vomiting; it is common in men from 25 to 40 years of age, who are as a rule of a highly nervous temperament.

First. Pain comes gradually after a meal, dinner or dinner after heavy meals, with flatulence and acid emesis.

Patients take a dislike to fat and sugar because they cause acidity. The patient is irritable and depressed. The appetite is variable.

The tongue is pointed, deep red in color, well often enlarged and injected papilla at the tip — but it may show other appearances, it may chalk as if covered with a whitish film. According to General in every tuberculosis of the lungs begins in such cases, it runs a rapid course.

Independently of the above forms many patients show an aversion to fats and carbohydrates months before the onset of pulmonary disease. Tuberculosis of the stomach is said to accompany phthisis. Fistulae may occur before tuberculosis shows itself in the lungs, but usually it occurs after the commencement of fever.
Dyspepsia of old age. Continued.

Patients often feel very hungry, and yet after eating a small amount, they feel sated, and can eat no more; these patients have usually been small eaters; but it is

marvellous how in a sanatorium such patients can often be induced to take fairly large meals regularly.

One is apt to overlook this during troubled

times. The patient comes complaining

of his stomach troubles and has no cough.

The cause of the stomach trouble is partly

due to the absorption of the proteins into the

blood, to the fever, and in some cases to

compression of the vagus by enlarged

glands, in the latter case causing the other

symptoms, cough and tachycardia. Cohen 339

patients often complain of a feeling of fulness after

eating, although little has been eaten.

In the more advanced stage nausea, retching, and

vomiting: a severe fit of emesis of the

stomach emptying itself out in the compression of

the abdomen. Another cause of gastric

trouble is caused by swallowing air. This,

which produces fermentation by means of the

trains in it.
Intestinal symptoms are not marked in the early stage.

Urinary system. The urine is at first normal, but when wasting begins, polyuria occurs. This is diminished but extra fluid demand treatment increases it.

Charcot-leeve Reaction - see note below.

Nervous system.

Nervous excitability, the presence of enlarged glands on the vagus causes tachycardia, palpiation, cough, lassiness, and sometimes from peripheral neuritis caused by toxemia or syphilis may occur.

The thoracic lesion have been mentioned, also varying motor disturbances.

Mental changes are most seen later on in the disease - "From pathosis".

The brain's reaction is not diagnostic of tuberculosis as it is obtained in several other diseases and conditions especially encephalitis - but it is said the presence of chronic pulmonary tuberculosis in regard to professor of persisting it is held to denote a rapidly progressing form of disease with a very remote termination - but there are exceptions to this.

see Babock p. 498.
Physical Signs

May be entirely absent in the early stage, or very indefinite, no single sign must be relied on for a positive diagnosis. There must be an agreement of the results obtained from inspection, palpation, percussion and auscultation, although each method of examination may yield little. When in doubt, if the results seem negative in a suspicious case then examine again carefully a week or two later.

Where it is possible the best time for examination is early in the morning before the patient has moved or coughed, or had breakfast, and the examination should be repeated at the same time of day for each patient. If the results are negative after the early examination, repeat it later after the patient has taken a walk, at the same time note the rectal temperature. Remember that alcohol taken by the patient preceding to the examination increases expectoration while severe perspiration may reduce the cataract.

The moisture or dryness of the atmosphere...
affects this secretion. Balsams, tar, and
diminish secretion, while rubifes and
certain mineral waters increase it.
Examine in a good light.
It is difficult sometimes to determine whether
the disease has just begun, or has existed
for some time without progress—
or it may be an old case of limited
tuberculosis plus an added cataract,
or slight tuberculosis disease plus some
emphysema, in all such doubtful
cases take the history very carefully.

Inception
Does not usually give much information
in early cases.
Peripheral signs may be noted but they
are not peculiar to the tubercular, and are
not so well marked as in mediastinal tumors
or the latter they are mild and occur mostly
on each side of the manubrium sterni, and on
the lower ribs; while in tubercular cases,
they are blue and spread over the front
of the chest.” Timber 156.

Note the shape of the tongue, the type of
breathing, its depth, and the general movements.
back and front. Fowler – p. 373-advices: the observer to stand behind the patient and look over his shoulder, or to stand right and place his thumbs upon the second ribs below the clavicle and watch the thumbs while the patient breathes. Individuals predisposed to illnesses have a narrow and shallow thorax, and they may be hollows above and below the clavicle, they can turn with from muscular development. But hollows may occur in well built and apparently robust people.

Deficiency or absence of the pectoral muscles must be noted, and not mistaken for flattening of the chest, to effect this raise the arms, stretching the muscles. Compare the movements on the two sides. Dyspnoea on one side may be delayed especially at the apex, but of both apices are affected they may not expand well, and comparison will be useless. Therefore also watch the general movements of the chest and the expansion of the lower part of the breathing is costal or abdominal, remembering of course that abdominal disease may affect expansion,
of the lower parts; also such as in early life may limit the costal movements.
Note the expansion of the back of the chest and the movement of the two scapulae. Tuberculoses may hinder the movements of the chest and mark the region of tuberculoses.
"The apex may be flattened and yet expand fairly well; the other may not be flattened and yet not expand as well as it ought. That means that the flattened apex is first-affected" Turban 61.
The Scapular Phenomenon.
This was first described by Litten in 1892.
The light requires the good, and the patient in a good position Turban 64.
The normal movement of the diaphragm is 2½ to 2 3/4 inches in healthy persons—a large amount of fat prevents an upward movement.
Slight apical division does not lessen the stroke (see examination by Roentgen Rays, etc.), but if it reaches the 3rd rib a middle of the Scapula behind, or when nodules occur in the lower lobes then the movement is restricted, much more so if pleurisy is present.
Expansion of the lung is chiefly downward. Complete absence of the phenomenon means that there is fluid or air in the pleura, or extensive adhesions—and a desquamation of the movement is due to pleural or pulmonary disease, but it is often of much diagnostic value as abdominal disease affects it, and testing for it is often to fatigue the patient over its to the deep breathing required. The patient ought to be in the horizontal position with the clothes removed down to the lowest ribs.

**Palpation**

Vocal fremitus is diminished by pleural adhesions—in cases with old thickening it may be either increased or diminished according to its consistency. It is increased above the effusion as the lung is compressed. It varies over tubercular nodules. If the fremitus on both sides is the same, it means often that it is really increased on the left, as normal fremitus on the right is greater than on the left side. Measurement of the chest is taken just below
The angle of the scapula in the respiratory pause, the arms being outstretched. The perimeter in health should equal half the body length.

Respiratory expansion should be about two inches. The Cystometer introduced by Lear consists of two rods of flexible lead alloy, united behind by piece of rubber tubing; it is useful for comparing the two sides.

Percussion

For ordinary use this finger is best, in any case the finger is the best hammer, as the sense of resistance can be best estimated, although some observers use the percussed finger for that purpose. The feeling of resistance is an important factor in diagnosis. Some observers use Allenburger's direct one handed method of percussion, noting especially the feeling of resistance. In the first stage of tuberculosis there is often no appreciable change in the percussion note.

We must remember that many things influence the note. Every patient is said to have his own percussion note.
This resemblance of chronic mucus cataract and tuberculous phlegmon of the lungs pulmonary is said to succussion cannot remove the difficulty since in many cases the resonance of the chest is perfect in consumptive persons. The stethoscope supplies much more certain indications on this point. Sir Astley Cooper (in his text book of Pathology 1st ed. p. 262) quoted by Jewky p. 326 says: "He who lays too great stress on the uncertain results of succussion will often make a false diagnosis."

The vessels must be compared with those elevated by auscultation.

Latime also says: "Flatly. Spleen parietes give a duller, more tender sound than the air in the opposite hemithorax than from well-tempered ones.

Ordinary succussion should be light and the breathing should be shallow at the time; the fingers of the finger should be held firmly to the chest.

But the two-handed succussion is best. If both spaces are affected then comparison does not help us. In early cases the pull on one or other may actually be tympanitic, sometimes
...and the floor not quite flat, often leaving the

ceiling of the room on the right.

It is sometimes necessary to

consider the placing of an observer in the room.

If the observer is on the right,

the floor may be tilted slightly.

And another concern is the height.

After examining the

Lyon...
condition of the lung is unchanging, the
percussion note may become more indistinct
and the breath sounds louder and more
prolonged, even if he suspects the formation
of connective tissue during the contracting
stage. Berneig quoted by Timken p 275
calls attention to the unfixed note over the
spaces in emasculated patients - no definite
sound found on post-mortem examination - the
explanation being the looseness of the
air capacity, as wasted subjects are usually
bed ridden, and do not expand their
lungs well
At the lower edge of the lung especially
behind, one may sometimes find narrow
strips of dullness % to 12 in wide due to slight
pleural exudate, this must not be confused
with the relative dullness due to the forming
up of the vault of the diaphragm by the
abdominal viscera; to distinguish this
diaphragm phenomenon, vocal fremitus,
and by auscultation - if due to pleural
exudate it is murrenally as long as
adhesions have not formed Timken p 80-
Reduplication of the heart dullness % in or more
toward the right is a symptom of old apical disease.
Myotonia may be mentioned here. It is described by West p 492, as a local contraction of a muscle, produced by direct percussion, and causing a nodular swelling, which recedes after percussion, lasts a second or two, and then gradually subsides. Myotonia is a muscular contraction and must be distinguished from the fascicular contraction, where you get a deep fungus produced along the whole length of the muscle by the contraction of the fasciculus then produced. Myotonia is due to a muscular contractility which through no fascicular fibers is common to it.

West p 492 says, "It is always most evident in the earlier periods, and in incipient palsy occurs over the primary seat of irritation, while in confirmed and chronic cases may find it absent over the limbs first dressed, and strongly marked over the side last and least engaged." It is therefore of little clinical value, but should be noted as suspicious, if seen when examining a patient.
Auscultation

Is the method that as a rule reveals most in the early stage of pulmonary tuberculosis.

The first sign is an harsh and prolonged inspiration with a crepitation on two.

Practically, the first signs are often similar to those of slight Bronchitis, with this all-important difference, that here the signs are strictly limited to the affected area whereas in Bronchitis they are diffused over the whole chest. - Prof. Byfield.

Remember that the breathing heard on the right upper or right upper may be harsher and more prolonged than over the left owing to the higher position of the right bronchus.

Summary p. 326. I give the following rules  of regard to the quality of the breath sounds in Pneumonia.

1. The alternation of the quality of the breath sounds are always localized and in the great majority of the cases they are audible in situation.
2. The breathing may be harsh, weak, or cough-like in character.
3. The expiration is usually somewhat prolonged.
When the breathing is weak coughing often
increases its distinctness,
we may get with the above, a fine bubbling
or obviously crepitating rale, often heard of
after coughing, sometimes this an Rhonie
Vesicles the patient has nasal obstruction, he
should breathe through the nose gently, but
deeper than usual. When few the rales may
be heard of all the height of the inspiration
if no abnormal sounds are heard over
the apex, examine the whole lung
as the disease sometimes begins
in the lower lobes.
Examine the margins of the lungs;
listen even over the absolute heart's base
as the edge of the lung may overlay.
Bubbling rales is said to be due to narrowing
of the bronchioli. If is heard in
inspiration more and in expiration, it is
heard over the apexes and over
the lower lobes.
Cough with breathing, is associated with
the secretory action of the Gastroplas,
seen by aid of the Roentgen Rays—it is
said to be due to cataracts causing vascular
swelling of the Mucus Membrane.
Another form of coughed breathing is due to nervous action of the respiratory muscles, or communicated movements from a palpitating heart causing jeryky thoracic movement.

Voiceless breathing is an early sign of phthisis; it is said to be caused by considerable swelling of the bronchi, suppressed or smushed breathing is due to that of pleuritic excitation, or plugging of a bronchus with secretion, if due to the latter a strong cough may clear away the secretion and reveal bronchiial or even amphotic breathing, and numerous consonant grades of a cavity, a dilated bronchus has been blocked by the secretion. Turban p. 96. Respiratory sounds are varied also, namely harsh vesic bronchial, broncho vascular, and bronchiial. Not fast if the inspiration is prolonged; sometimes it is no, even audible, or it may be even harsher than inspiration.

If prolonged inspiration is heard over all the lung it is a sign of bronchial asthma, or asthma phrenic; it may be due to obstructed nasal breathing. The latter may be detected by
causing the patient to breathe through his mouth.

Bronchial breathing is heard to some extent
- but more especially when the bronchial
- glands are enlarged at the level of the
- 2nd to 4th intercostal spaces.

Rough sounds; we may have fine rales
or coarse crepitations.

We must however remember that
hemoptysis which is apt to occur in the
early stage may cause rales which later
may clear up. That if a patient give short
coughs is of much value during auscultation.
Belled sounds and rales are often
difficult to differentiate but these heard
after coughing are usually from the lung.
Inspection of the voice in the ear, stage
is most of much use.

Förster p. 378 says: "The diagnosis may
be attended with difficulty. When the symptoms
suggest tuberculosis disease but the physical
signs are of doubtful import, and there is no
suspectraion. The case in which these alone
conditions are fulfilled are very often
delicate having young women suffering
from anemia. In such cases and all others
included in this category, it is a golden
rule, never to make a diagnosis of tuberculosis from doubtful physical signs and particularly not from a single sign.

The examination of the chest must be systematic. The evidence obtained on inspection and palpation must be considered with and must agree with that derived from percussion and auscultation.

When the signs are not considered as definite or as in harmony, and all points on direction a positive opinion may be given. But the observer must beware of relying upon auscultation with its many fallacies, and a definite diagnosis should rarely be given in doubtful cases, unless the record of the morning and evening temperature for at least a week is available.”
Demonstration of Tubercle Bacilli in the Sputum.

It is looked upon by many as a sine qua non, and some Sanatorium authorities will not accept a case unless tubercle bacilli are found in the sputum; but this is a great mistake. For although the disease is distinctly manifested by the physical signs, bacilli may not be found, or only after often repeated examinations, or found at one time, and not at another.

On the other hand, it is said that bacilli (T.B.) have been found in sputum long before physical signs were noted. Lattamon mentions the case of a medical student who accidentally found T.B. in his sputum and physical signs did not show until much later — we must, however, remember that there are often acid-fast bacilli resembling T.B. which may be found in the mouth, namely, the grass or Timothy bacillus, and the butte bacillus.

Again in old standing cases T.B. may not be found, also they may be numerous and yet the patient not seem very ill. Foster p. 369 says, "The continued presence of bacilli in the sputum does not appear necessarily to imply that..."
The disease is in active progress — a case so
mentioned where T.B. was found in the sputum
every time it was examined since 1882. The patient
during that time has been actively at work, and
has generally enjoyed good health; he is
certainly as well if not better now than he was
of fourteen years ago.

The Ziehl-Nelsen method of staining is the
best for detecting T.B. Gabe's method of
using the decolourising sulphuric acid solution
and the Methylene Blue solution together is the
quickest; it is known condemned by most
authorities. I have times myself used
Gabe's method and it seemed to be satisfactory.

If a great number of bacilli are found, it usually
indicates that the disease is active, if the num-
ber is a smaller number that is a favourable indication — but
two them are many exceptions. 

Some examiners lay stress on the appearance
and staining qualities of the bacilli.

For early diagnosis when it is difficult to
find any T.B. Here — quoted by Conner — "is
recommended that the sputum be enriched
it is intended to cause the bacilli of
frosts, to multiply, he makes
up a nutritive medium thus —
Heyden's Nahkstoff 5 gm. Salt 5 gm
Glycerin 30 gm. Agar agar 10 gm
Normal salt solution 5 cc. Distilled water 1,000 cc
Put about 20 cc of this mixture in a double
Petri dish. Let the patient expectorate
into a sterilized glass, pick up with a
platinum wire a small piece of sputum,
and draw it over the surface of the
culture medium. Leave it in the
incubator for 48 hours, and then examine
the mucus in the usual way for T.B.
Another method—Rubbert quoted by
Park 1312— is to boil the sputum with
an equal amount of a 2% solution of
caustic potash until the mucus is
dissolved; add an equal amount of
water and let the whole settle in a
cylindrical glass, or centrifugalize, and
then examine the sediment.

Moeller speaks several small pieces
of sputum on the bottom of a Petri dish, which
is put into a moist chamber, and the whole
placed in an incubator for 48 hours. The
T.B. are said to found most easily on the
under surface of the flecks of sputum.
Sometimes T.B. can be detected in the blood.
in an early haematogenous. Loewen and Peyronie reported by Timbs in 1917 were able to produce tuberculosis in animals with material from apparently healthy lymphoid glands, and they conclude that T.B. may be dormant in an unexposed host.

Stockton, 1891, reported by Timbs in 1917, found that in patients without expectoration, by giving small doses of iodides of Potassium for several days, a local catarrh is produced causing some expectoration, and with this as a rule T.B. can be found—also local physical signs, muscular, but this fails sometimes, and Latham in p. 26 condemns the use of Iodides of Potassium as a diagnostic, and says it is no mattered with danger.

Certain animal waters, namely those of Deer Island and Sin have been shown by Schaud and around to produce a similar reaction.

Experiment on animals—with punctured injections of suspected tuberculous material are useful in demonstrating in doubtful cases, whether or not a case is tuberculous. The guinea pig is the most suitable animal for the purpose.
Parks' 3/13 states that 62% times due to the tubercle bacilli alone is not common, when it occurs, it is usually not severe, and third are the cases that yield the best results from tubercular treatment. Mostly thin is a mixed infection with streptococci and pneumococcus, tetracyclines, and the influence bacilli work from that the mixed bacilli become come from the lungs and nose from the mouth or naso-pharynx the sputum might the washed very soon after it has been coughed up. To wash the sputum from some into a dish containing sterile water, then with a sterile & platinum wire withdraw one of the cheesy masses, or balls of mucus. Pass this five times through sterile water in another dish, re-fuse through sterile water three times, and then examine the pieces of sputum for T.B. Dr. Moeller - Tuberculosis Congress London 1901.

said: The resistance of the tubercle bacilli to acids depends upon a peculiar fatty and waxy envelope with which the adult T.B. is surrounded but which the young T.B. does not possess. The substances of which the envelope is formed may be chemically extracted and removed and the T.B. still remain alive.
and retain its specific properties.

Other acid-fast bacilli resembling the tubercle bacillus are

1. Treponema bacillus (syphilis) which resembles also the Smegma bacillus. Treponema bacillus is destroyed by prolonged action of acids but resists the action of alcohol while

2. The Smegma bacillus is quickly destroyed by alcohol but resists 5% Sulphuric acid solution.

3. The Lepra bacillus - Leprony - retains its stain both with acids and alcohol besides many other places than are found in the Oronasal membrane of the mouth, gums and larynx and so have been found in sputum. Leprony is said to react to the injection of Tuberculin, but differentiated diagnosis is usually easy from other considerations, and in Leprony large numbers of bacilli are found in the nature of the round or oval cells of the granulation tissue. Leprony and Tuberculos is one said sometimes to occur in the same patient.

4. Other bacilli resembling T B wi
appearances and staining properties are:

(a) The grass or Timothy bacillus found in various grasses.
(b) The butte bacillus. (c) The manure bacillus found in the faeces of animals. They can be distinguished from the TB by cultivation, as they form colonies at room temperature in 24 hours, whilst the TB requires several days at incubation temperature to form colonies; still they introduce an element of doubt especially as they produce in animals small disseminated areas which both on naked eye and microscopically are said to resemble ordinary tubercles caused by tubercle bacilli.

These animals however do not respond to tuberculin injections.
The value of tuberculin as a diagnostic has been well demonstrated by veterinary surgeons.

In the Report of the Royal Commission on Tuberculosis - Part I, p. 43, it is stated that "Every bovine animal used has been tested with tuberculin."

Tuberculin is also of value as a test for tuberculosis in the human subject. Professor McCall Anderson, in his "Plea for the more general use of tuberculin by the profession," says, p. 9:

"How is it that the tuberculin test is confidently relied upon for the diagnosis of tuberculosis in animals, while medical men who profess its use in animals, with rare exceptions, fail to take advantage of it in the case of human beings when a doubt exists as to the diagnosis? It may possibly be due to the belief that, though useful in the case of animals, it is not to be relied upon, or is not free from danger in man. But I can say, after having used it many thousands of times, that, with reasonable care, it is both safe and equally efficient in the human subject.

Professor Anderson then gives several illustrations of
of the use of Tuberculin as a safe and sure
 diagnostic aid. — also on p. 13 he says, — 596
 "as a matter of routine Tuberculin is always
 used in any wards of doubtful cases, so that there
 is no question that it is of service in
 diagnosis."

If the subject reacts to tuberculin we get:
Price of temperature, local swelling of the
 lesion and exacerbation.

The test does not however locate the focus
 of the disease, and it is not infallible as
 some patients fail to react.

Turban — of p. 36 — found that patients
with commencing chronic Tuberculosis reacted
with especial intensity to small doses of Tuberculin
even 2 to 3 mgm or even at temp 98.6, 02-04,
besides for diagnostic evidence of irritation at the
suspected apex — dulness and fine rales.

Turban declares he has never seen any bad
result from the use of tuberculin as an aid to
diagnosis.

Moeller and Hayenbrink cited by Comte p. 459
say they have used Tuberculin freely and regard it
as valuable and harmless agent. They point
out that recent cases even if slight react to
small doses, while chronic cases remain
large doses and gain a slight reaction.

Tucker—(John Hopkins Hospital Report, vol. 21, 1903)

used tuberculin for diagnosis in 400 surgical cases. He found that it was of great value in differentiating tuberculous disease, and was never harmful.

Roch—quoted by Latham p. 28

states that after an experience of 3,000 cases he considers it almost an absolute test.

On the other hand

Virchow (see Latham p. 28) avers that tuberculin injections in some cases tended to generalize the disease, and in this he was upheld by a report of eight physicians of the Bonn crappy Hospital including Drs. Theodore Williams and J. Latham.

But much of the dispute into which the use of tuberculin fell after it was first brought out by Roch was due to the improper method of its use by careless or incompetent observers, many made the mistake of giving too large doses too often, and many of the cases were too far advanced for such treatment, and that it was not required as a diagnostic agent in such cases.

Latham page 27 says tuberculin showed no
He used to find that whether an attack of general bronchitis is tubercular or not, it is to make a diagnosis between bronchitis and tuberculosis; but if the disease is so slight that a diagnosis cannot be made from the physical signs, and no tubercle bacilli can be found in the sputum then, more often than injections of Koch's old tuberculin (O.T.) may be used without risk.

Tuberculin should not be used if the patient temperature is raised.

Most observers agree that Koch's old tuberculin is the best preparation for diagnosis purposes although other preparations are used. Before use it should be diluted with a sufficient quantity of a 0.5 per cent carbolic acid solution. The injection is best given late at night as the reaction sets in after about 12 hours (6-16 hours).

Methods of different observers.

Corner 455 admits that

The patient's temperature should be taken every 2 hours for three days before the injection, so as to note the variation of the temperature.

Then inject one milligram of Koch's O.T.

On the next day take the temperature every two hours. If there is no reaction, wait from one to 10 days.
as sometimes the reaction is delayed. If the reaction is negative then on the fourth day inject 3 milligrams, take temperature as before, and watch; if negative result is again obtained then on the seventh day inject 6 milligrams. If the result is still negative the the case is probably not tuberculous.

Other workers use smaller doses.

Turban page 37 says: \\
"Take the temperature every 2 hours for two days previously between the hours of 8 am. and 10 pm., also make a careful physical examination, then inject at first 1/2, then 2, and finally 5 milligrams of Koch's old tuberculin, intervals of two days. In children use one tenth to half this dose. Take the temperature two hours after the injections and make a physical examination at a fixed hour every day, and examine the sputum for tubercle bacilli.

Keep the patient in bed until the fever disappears, but even if no fever comes on examine the sputum for physical signs and the sputum for tubercle bacilli as reaction may occur without fever.

Latham's method - see page 29.

Use Koch's O.T. dilute with 0.5% solution of carbolic acid until a one per cent. solution of tuberculin...
is obtained, it must not be kept for more than two days—better always use it fresh.

Take the patient's temperature—best in rectum—every 4 hours for 3 days previous to the injection and if fever is discerned post from the injection.

Inject into the muscles of the loin—after the injection take the temperature every 4 hours for 48 hours.

Amount to be used—if the patient is feeble, or the symptoms slight begin with 0.001 cc of tuberculin that is equal to 1 milligramme in children use 0.0005 cc = half milligramme.

Use a syringe of 1 cc capacity containing a tenth cent of tuberculin solution and inject a tenth of its contents.

A rise of 1.5 degree's is considered to be a positive reaction, but it may not occur in 36 hours.

If no reaction occurs wait three days and then inject an additional 3 milligrammes in adults, or if there has been a slight rise of temperature use 3 milligrammes for the second injection. If still no reaction wait 3 days and then inject one centigramme. If no reaction follows then tuberculosis may be concluded.

A more robust patient 5 milligrammes may be used for the first injection; one centigramme for the 2nd and 2 centigrammes for the third injection.
After the patient is bed until reaction has passed off.

Letter goes to illustrate cases on pages 31-33.

The reaction was positive in two, negative in one

Professor McCall Anderson — adds p. 54 states

that for diagnostic purposes Koch’s old tuberculin or

should be used.

The initial dose in case of an adult should not

generally exceed ½ cc of a 1 in 1000 solution

and sometimes it is safer to begin with ¼ cc.

If a quick dose yields little or no reaction it is

usually safer to give a second of the same

strength as the first, because the latter often

acts much sooner than the former.

At the International Congress on Tuberculosis Paris 1905

see Lancet report Oct 21 1905.

Professor A. Müller, Dr. Lowenstein, Dr. Ostroumow

in an address advocated the use of small doses

of Koch’s tuberculin — namely

two tenth of a milligram in adults and

one tenth in children;

repeating the same dose after an interval of 3-4 days

usually a reaction was obtained by from one to
four injections in tuberculous cases.

The results had been confirmed by 150 further

observations in a period of two years.

The advantages claimed were —
1. The reaction produced by the injection of tuberculin in doses of \( \frac{1}{10} \) of a milligram can easily be obtained in patients suffering from tuberculosis, and therefore was of special use when the disease had no tested a short time, and when the diagnosis was frequently doubtful.

2. The tuberculin focus in the lungs were not influenced by such small doses, but not more than four injections should be given.

3. The unpleasant symptoms sometimes experienced after receiving large doses can not occur with the uniform small doses.

If reaction is obtained is that a positive sign?

Against this

Goldschmidt, Biede, Ko.

Say they have obtained the reaction in Tepary, but that disease may be excluded in this country, and the true disease may exist.

Netter, states that he obtained the reaction in 27 out of 100 cases suffering from other chronic tuberculous, but without a post-mortem examination that is not disease, as tuberculosis may have been present from the other disease.

Strauss & Tenner

got a reaction in some cases of syphilis.
Healed tubercles are known to react; though usually a large dose is required. — Corr. p. 68.

France at the Chalbury Asylum injected 535 patients; 25 with tuberculin and 450 gave a positive reaction, of those 34 subsequently died; a post-mortem examination was made in 29, and in every case active tuberculosis was found — of those who gave no reaction 5 afterwards died, and in some of these cases active tuberculosis found on post-mortem examination.

II. Is the reaction sometimes not obtained when tuberculosis is present?

Corr. p. 458 says, "Some cases fail to react, in spite of the presence of disease. These latter exceptions however are rare, and are chiefly contributed by individuals with an exquisitely delicate constitution, such as are seldom found, in which the reaction is superfluous. On the other hand, those cases in which the reaction was positive but in which the disease failed to develop, leave it an open question whether or not latent focus was not actually present."

Andersi of Ural has seen cases where no reaction occurred. — Corr. p. 29.
Conclusions regarding Tuberculosis as a diagnostic aid

Dr. Macdonald in the transactions of the British Congress on Tuberculosis in 1901 says:

1. Slight may react to tuberculin and no evidence of tuberculosis may be found at post-mortem examination—my experience,
2. Completely healthy tuberculin may react,
3. Evidence is not conclusive that often discloses that tuberculin may react to tuberculosi—vis-confined by antitoxin,
4. The error of margin of the tuberculin test is considerable, for half 25 per cent. ten per cent.
5. The maximum dose should be higher than 4 mg. or more. Very small percentage does an apparent cause reaction on account of the tuberculin sometimes reduced.
6. The temperature should be normal before injection, if not a negative result is of no value—patient shown expect.
7. The carbolic solution should be made fresh, and the granin extract of tuberculin should be kept up in sterile.

Determination of the tuberculin is the principal factor in producing delayed reaction.

Beranek's Tuberculin is also of diagnostic value.

Von Behring's Toulase may also be used as a diagnostic—it is said the safer than Koch's tuberculin.

Von Behring believes that about 0.1 milligram should be about the dose used.

Deloring & Courage make a serum (Homogenus Culture A)

favors a diagnostic, but others observers do not confirm it.
Use of the Obumex index in the diagnosis of Tuberculosis

This method as modified by Guffenn & R. Wright appeared to me at first nothing of great use to the general practitioner as it is not difficult to learn, and the apparatus required is comparatively cheap— but when one comes to put the method into practice it is very disappointing to any one but an expert— because of

1° The many things that influence the index— the time of day when blood is taken— the effect of exercise nursing absorption of food— effect of fever— etc. Those who have previously suffered from diptheria, who have had anti-tuberculin injected, and found it to have a persistent low index for months or years afterwards.

2° The extreme accuracy and manipulative dexterity required.

3° The time occupied in carrying out the method, especially if any mistake is made and it requires to be done all over again.
So the method is unsatisfactory when done by an expert, and it should be repeated several times to avoid error, and of course that makes it very expensive. The index is found to vary even in healthy people.

I was much interested recently in a note communicated to the Edinburgh Medical-Chirurgical Society by S. J. Suthers Stewart and W. J. C. Reid Paton.

see Lancet, report March 23, 1907, p. 809.

The modification of the method then described consists in the injection of a minute dose of tuberculin R. in conjunction with the observation of the intracutaneous index of the blood before and after the circulation.

They took 122 consecutive medical and surgical cases.

One group consisted of 82 tuberculin cases (formed 50 by other means) of whom the indices of 41 fell within the normal limits (0.8 to 1.2) and 41 outside.

The second group comprised 40 non-tuberculose cases, of which 29 were within and 11 outside normal limits.
A diagnosis based on an examination of the tuberculin serum index would have resulted in an error of diagnosis in half this number.

In the 20 tuberculous cases 27.5 were outside the normal limits and therefore the test might have led to an error of that extent. In acute tuberculous cases the swing in index might alone cause an error in diagnosis.

David Lawrence and his co-workers showed that if a small quantity of tuberculoin was injected into a tuberculous patient there was a diminution in this index but the reverse occurred in a healthy case.

The method is thus described. The patient's blood was taken on the first day, tuberculoin was injected and the index estimated on the first and two succeeding days. The index of 1.0 was obtained from the blood of two healthy people. The bacilli injected by at least 120 days myofibrilar elements were counted. The most suitable dose of tuberculoin was 0.5 milligramme for adults and 0.25 milligramme for children.
less when the primary index was low than when the primary index was high in an infected person. The usual fall in a tuberculous patient was 0.2. In 62 tuberculous patients inoculated a negative phase was observed in 56 or 90.3%.

In 13 normal or non-tuberculous cases a negative phase was not obtained after inoculation.

The conclusions were:

1. The primary index in se was an unsatisfactory means of diagnosis, as both tuberculous and non-tuberculous cases fell within and without normal limits;
2. If a negative phase appeared after inoculation, the existence of tuberculosis might be diagnosed;
3. The absence of a negative phase indicated the absence of a tuberculous infection.

continued
Wright's method of finding the
Tuberculo-ophmic index

See Snyers Clinical Bacteriology pp. 164-147.

The requisites are:

1. The patient's blood serum,
   obtain this by pricking the cleaned finger or ear, collect the blood in a Wright's
curved pipette and centrifugalize for a few minutes.

2. The serum from a healthy person obtained in the same way.

3. An emulsion of living Lepraocytes.
   To prepare it—take 10 cc of normal saline solution containing ½% of
   sodium citrate to prevent coagulation, and the emulsion in a centrifugal
   tube and warm to blood heat.

Take the blood from the ear or finger of a healthy person by pricking the first, and allowing about 1 cc of the blood
to drip into the fluid in the tube—just
rattle with the centrifuge, count well
exactly, and centrifugalize until all
the corpuscles are at the bottom and
the fluid above is clear—this takes
several minutes. The red corpuscles
sink to the bottom, and above them is a thin
white layer of leucocytes; then
pipette all the clear fluid off as close to
the leucocytes as possible without
disturbing them - near the layer of
leucocytes and about a quarter of the
column of red corpuscles must be
pipetted off and put into a small tube
and well mixed by repeatedly then
into the pipette and expelling them.
This makes an emulsion of leucocytes
mixed with red corpuscles. Some
people work them again to get rid of the
crystals of salm.


Take a piece of sterile tubercle mass
about the size of a grain of rice - put it
in an agate mortar and grind it up with
an agate pestle, and gradually add
day by day about 2 cc of normal saline
solution grinding it all the time - then this
in curved pipette and centrifugalize to
get rid of the clumps of bacilli, so that
the bacilli are well isolated.
5. Two lengths of rete (straight) are made. These are about as thick as a knitting needle and about six inches long. The end when properly made should taper to a point.

Fit where the rete is the thick end, and mark the other end with rule about an inch from the point = 1 unit.

If pointed end of the rete is the emulsion of bacilli and allow the fluid to run up the tube mark = 1 unit.

Then allow a small column of air between, then draw up 2 units of emulsion of bacilli, a column of air between them, then another column of air, and then a unit of serum, so that counting from the rete end there will be: 1 unit of emulsion of bacilli

\[ \frac{1}{2} \text{ column of air} \]

and then a unit of serum.

It takes a good deal of practice and nicety to make this accurately.

Some make it 3 units of serum 3 of bacilli—others make it 3 or 1 unit each. Then express the contents of the rete into a clean slide, mix well by sucking up and
expelling repeatedly; when mixed suchAgain into pipette plus a short column of air after thaw seal the tip of the pipette
in the flame.
Place pipette point downwards in the
incubater warmed to 37°C and leave in
15 minutes, this must always be timed
exactly.

A vessel of water kept at blood heat for
the necessary time will do to stop the
pipette in if an incubator is not to hand.
So the control in the same way.
After incubating for 15 minutes, remove
the pipette, break off the end, fit the
pipette again to the thick end and
exposed the contents of pipette onto a clean
slide, prepare a film by either putting a
small drop of the mixture on the middle of
a clean glass slide - lower a clean cover
glass on this, then slide the two apart, the
slide on the used for examination or
after putting some of the mixture at one end of a slide, spread it in waves
by drawing the end of another slide along it.
To stain the films - first just with a
saturated solution of perchloride of mercury
for one or two minutes, wash, then stain in the ordinary way with hot carbol fuchsin, give it a little longer than usual, decolorize for half to one minute in 2 1/2% Sulphuric acid in methylated spirit - counterstain with acid haematoxylin for five minutes, wash and dry.
Examine films with oil immersion lens. Count the number of bacilli in 50 polymorphonuclear leukocytes on both slides - patient's serum and control. The ratio between the two gives the opsonic index. For example, if 50 polymorphonuclear leukocytes on patients slide, taken as they come, contain altogether 75 bacilli, and the same number of similar leukocytes on the control slide contain 170 bacilli - then the ratio 75 / 170 = 0.5 gives the opsonic index showing that the patient's serum contains only half the amount of opamines compared with normal serum, and therefore the patient's resisting power to the tubercle.
bacillus is only half the normal, but one examination is enough for a positive diagnosis.
It is probable that a patient has tuberculosis if the index is below 0.7 or above 1.2. See Penny, p. 149.
A low chronic index shows either that the patient is infected with the organism, or else has a low power of resistance against the organism.
A high chronic index indicates that the patient has had an attack of disease due to the organism and has overcome it—but in old cases of tuberculosis the index may gradually rise above normal although the disease is progressing, probably owing to mixed infection.
In miliary tuberculosis the index is often high. See Penny, p. 149.
The Röntgen Rays as aids in the Diagnosis of Pulmonary Tuberculosis

Professor Conrad Röntgen of Würzburg in 1895 first described his discovery of a new form of radiation to which he gave the name of "X" rays.

The X rays enable both physician and surgeon to use the sense of sight in diagnosis in an entirely new way. The eye can now by aid of the shadows cast on the fluorescent screen, distinguish the position, shape, size and movements of the various viscera.

In August 1896, Oldin and Barthélemy at the medical congress held at Nancy, described how they had been able to see the movement of the heart and pulsations of the aorta, also the rise and fall of the diaphragm by means of the X rays.

Williams of Boston, in the Boston medical and surgical Journal, October 1896 described how he found that by the fluoroscope he could both determine the location and extent of the disease (pulmonary tuberculosis) better than by the ordinary physical examination.

Professor Bouchard of Paris on December 7, 1896
described his method of examining the chest by the
X-rays both for sinewy and tuberculous, and
expressed his opinion of the great value of the
X-rays in the diagnosis of diseases of the chest.
alone is quoted from Walsham & Orton.
Walsham and Orton, page 26 say the X
rays are useful in diagnosis in the
following ways:
1. The movement of the diaphragm restricted
on the affected side on sides, usually in the lower
part of the esophagus.
2. The right aorta opacifies fail to lighten on deep
inspiration.
3. The increased density of lungs casts a dark
shadow.
4. The heart in a large majority of cases is
smaller than normal, and is placed more
vertically in the chest.
Displacement of the heart in advanced cases can
often be better made out by the X-rays than by
percussion.
5. Alteration in the shape of the chest and
position of the ribs can in many cases be
determined more easily by means of the X-rays
then by any other method.
10. In determining the extent of the movement of the diaphragm.

Baskham et al. say 26 - Restricted movement is an early sign, and is often seen before any other appearance can be detected.

Brodie Ten at the British Congress on Tuberculosis 1902 called the restricted movement a "pituitary sign" and said it occurs in three forms of tuberculosis patients.

Baskham & Ashton 1927 give a case of a man who was examined in December 1906 by X-rays in a case of some obscure cardiac symptoms. The movements of the diaphragm on the right side were seen to be much restricted, and there were no symptoms or signs of lung disease found either by X-ray or other examinations, and it was not until October 1905 that definite signs were found in the right lung, although he had been several times examined by several physicians. The disease advanced so that there was no doubt of its being due to tuberculosis - see where saving of time the rays afford in such cases.

The cause of the defective movement is not definitely known.
Dr. Jarman's inference is:
1. Toxic causes
2. Loss of elasticity of the lung
3. Pleuritic adhesions not previously recognized
4. Reflex faulty innervation.

R. Haldane has shown that the movement of the diaphragm is a vertical one; he called it the 'platon' movement—it moves downward during inspiration and upward during expiration, preserving its dome shape throughout. And when flattening occurs, it must have been taught to see Sir Michael Foster's text book of Physiology, 6th Ed. Part II, 1890, where he says, "When we rest the diaphragm, drawn up by the negative intra-thoracic pressure presents a smooth surface to the thorax, when contracted it becomes much flatter."

In some cases where rapid shallow breathing has been noticed at one apex, the diaphragm instead of plunging smoothly up and down is seen by the fluoroscope to have a peculiar hesitating or jumpy movement on the horizontal side. This dome of the diaphragm is normally
slightly higher about \( \frac{1}{2} \) in on the right side, and the movement is slightly greater on the right. Hall, Fall.\(^{63}\) The maximum downward movement of the diaphragm during forced inspiration is roughly about \( \frac{1}{2} \) in on the right side compared with \( \frac{3}{8} \) in on the left side.

Larson in Sotage's clinical lectures (66) says, "One of the earliest changes noticed when tubercle attacks the apex is upward movement of the diaphragm on that side. This has often been noticed when in shadow could be seen at the root of the lesion or physical signs be found."

Dr. G. A. Gibson of Edinburgh explains that (see quotation from letter to D. Larson in the Practitioners' special X-ray number 1916) as probably being the result of reflex action - the afferent impulses passing by the vagus and the efferent impulses by the phrenic nerve. Dr. Boermeister also noted by Larson in some number of the Practitioner asserts that out of 100 cases in which the condition of the diaphragm is examined associated with no physical signs, in 90 there was found sooner or later clear evidence of tuberculous.
In some cases the diaphragm will be found to be fixed; this may be due to pleuritic adhesions: but it may occur without adhesions - see case described by Lewis in the Journal of Medical Electrology and Radiology March 1904. In this case the diaphragm was quite immovable, but movement gradually returned. Also strange to say, in some advanced cases the movement of the diaphragm regresses on the more affected side than on the less affected. In this case described by Lewis, Myasthenic movements on the affected side were less during the stage of active disease than on the sound side; but as the patient improved compensatory breathing was established and the diaphragmatic movements altered until that of the affected side surpassed that of the sound side - this is of importance in helping to determine if the lesion is active or not. Walshe later in 1924, the situation of the lesion affects the degree of movement. If the lesion is posterior then the movement is restricted behind the
Shades of the esophagus is said to be at a higher level than the larynx is posterior, and rectified, this was pointed out by Janson in Medical ship Patoxy March 1904, and confirmed by Stanley Green in Archie of Patoxy Ray April 1906, and by Delaham & Batesi: thus occurs book 1906. In all cases more than one examination should be made or mistakes may occur.

2. A. One or both apices may fail to light up on deep inspiration. This is an early radiographic sign of phthisis and can often be made out before mottling can be seen. Wolfe & Patoxy say - but can be regained in adequate light.

D. Francis Williams of Boston in his article in Conf. Clifford Bullitt's System of Medicine Vol 2 3rd Ed. says

'The light should be turned down; so that the fluoroscopic screen over the normal lung is scarcely illuminated, as the contrast between the diseased and healthy areas is too small apparent, and the difference in density between them which would be wholly overlited until a bright light are obvious. If both apices
an. A highly diseased the physician must compare the brightness which he sees with the mental picture of what it should be for an individual of the patient's build. In the lungs, young slept people would not normally appear so bright as those of the persons, but as a rule both apices are seldom affected in the early stage so that a comparison can usually be made.

Dr. Williams also gives the caution that before examining a chest, the condition of the practitioners eyes should be carefully tested by the Spontaneous, and the examination should not be made until the scintillation is in an clear eyes.

One must also remember that a shallow apex and restricted movement of the diaphragm may be due to a recent pneumonia, or to the habit of smoking, but the history of the case and a chest examination will determine this.

The X-rays are a great aid to diagnosis when the signs of tuberculosis are observed by accompanying emphyseme bronchitis, pneumonia, or pneumoia.

The X-rays are useful also in showing the progress of the disease and the areas involved.
Halls sadly compares results obtained by the methods of examination—thus:

Prontgen Rays:  
Brightness = Hyper-resonance  
Translucency = Normal resonance  
Faint shadow = Impaired resonance  
Dense shadow = Dullness.

Opacity = Absolute dullness.

Professor Bouchard of Paris in 1896, quoted by Walsham & Linton, said, "In all instances subject examined by the moving screen, there established pulmonary lesions by a shadow, the area of which corresponded well with that mapped out by other methods of physical examination and the intensity of which was in relation to the gravity of the lesion.

In two instances the appearance of clear spaces pointed to cavities, a diagnosis verified by auscultation. But in a third case when auscultation led one to suspect the existence of cavities nothing of this kind was visible on the screen. In another case the general symptoms pointed to early phthisis but no tuberculous bacilli were found in the sputum. The physical signs were indefinite.
The fluoroscope showed that the apex of one lung
was less permeable to the rays and in a
few days, both auscultation and
bacteriological examination of the
sputum yielded positive results.
In 1837 Cusserman in Vienna (with Dr
Laskman and Berth.) showed a case of phthisis
in had diagnosed by the X-rays, it was
a case affecting the right lung, where the
cavernous signs could not be made out
by percussion or auscultation — under the
rays the left side of the chest appeared
clear, while the right showed diffuse
shadows representing infiltration,
and in one place was a small area that
to the appearance corresponded exactly
Laskman and Berth. 29-30. say
I in health the lungs are translucent but
there is a marked difference between the
appearance seen in deep inspiration and
expiration. The fluorescence being greatly
increased during deep inspiration
of an lung fails to light of well during
inspiration that is an early sign of tubercous
later a mere a mottled shadow, and when
advanced a dark shadow of the lesion are.
Cases of calcified miliary cause a dense shadow, grey and yellow tubercles on dense. The same author mentions a case where a child admitted to hospital as a case of interstate fever—a streaky was shown. Taken of the chest and the shadows of confluence tuberculosis could be seen, a few days later the child died and on postmortem examination the X-ray diagnosis was confirmed. And also it was seen that the tuberculosis had no chance to cause death.

Often when physical signs are found in one are on alone, the X-rays show that both sides are affected.

Also in Pneumonia when the signs of tuberculosis are marked in an uncamouflaged, the lesion is easily revealed by the X-rays. On the other hand, Williams of Boston reports that he had two cases with physical signs of tuberculosis of the lungs that he was unable to detect by the X-rays, but that may have been due to faulty technique, as it was some years ago, but tuberculosis also to Williams said failed to reach in these cases, so they seem doubtful.

We must also remember that in cases of Mitral Stenosis we get finger resembling
Tuberculosis of the lung, such as in phthisis pulmonani, prolonged and harsh expectoration and dry cough due to pulmonary congestion or infarction. Similar signs may also be found after hooping cough, and yet they are clear.

To distinguish between an early and an old healed lesion, let the patient inspire deeply, then if the shadow becomes lighter, and the shaded area becomes illuminated, it is an early case; as in an old healed case the fibrous tissue prevents the entrance of enough air to affect its transparency. Walsham says also that the shadow of an old lesion is darker than that cast by an early lesion; but in some cases if recovery the shadow is entirely lost.

Radiography is often of more help than radiography in doubtful cases, as the finer details are better shown on a 5 diagram than on the screen and one has more time to study them.
Study of results obtained by X-ray examination of the chest continued.

Professor Bouhnik and Dr. Balthazar in Lancet report Oct 21, 1906 of the International Congress on Tuberculosis stated that by the X-ray it was now possible to measure the exact dimensions of the heart orthogonal projection. They found that in the 1st and 2nd stage of pulmonary tuberculosis the heart is smaller than normal. The small heart-thorax is characteristic of a tuberculous soil, that is to say it is one of the dystrophies which precede to tuberculosis.

In the 3rd stage they found that the heart was larger than normal. Hypertrophy developed without dilatation. This is probably due to the increased tension in the pulmonary circulation caused by the development of caseous or fibrous lesions in the lungs.

This observation explains the apparent contradictions which have existed in the observations of other authorities.
the dimensions of the heart in tuberculosis having been mainly studied in the post-mortem room and not during life as may so easily be done by means of the X rays.

Spottiswoode in Annesley of the Röntgen Rays. Nov. 1st 1905. Jan. 1806 says he considers that a heart above the normal size helps in the cure of the disease.

Borchieri in Nottnage, p. 353, regarded diminution of the heart's size as a fore-runner of phthisis. While Bixst found the heart in fatal cases smaller, and Andral, Louis,Rothardt say the same that the heart is small in advanced cases. (Nottnage p. 353)

David Lawson in special X-ray much of the Exehtia. 1906 says the typical heart of an ordinary case of phthisic cancerous or fibroid disease is smaller than normal, and that an enlarged heart is seldom found in pulmonary disease. In more advanced cases we see displacement of the heart owing to infiltration of the lung.
If the shadow caused by the right border of the heart does not appear within 1/2 inch of the right border of the sternum then displacement is almost certainly present. The position of the apex heart is no guide in atria, if as the shadow projected by the apex is down as far as the 9" or 10" interface. The X-rays also show the difference in the movement of the ribs on either side and the narrowing of the intercostal spaces on the diseased side causing a roentgenographic appearance as described by Lawson; the opacification of the diaphragm is seen in emphysema and pneumothorax when the ribs separate to a greater extent and become more horizontal.

Walsham & Dorton p. 35-36 say –

Cavities can be well made out and their size determined by the rays – if empty they appear as light areas, if containing pus a retained mural the area can dark, as there is usually a good deal of consolidation around cavities, knowing may not help in the diagnosis of the
cavity is full, that is if it is a small one, even the X-rays may not show it in some cases.

In regard to pleurisy the Strangman shows that the spaces between the ribs on the affected side is less than on the sound side - Larran speculates many of the atelectasis 1506 - this is opposite to the teaching of clinical examinations.

The X-rays also show the enlargement of the bronchial glands - Lobsham and Ashton 56.35 mention several cases when the physical signs were slight or nil, but the X-rays showed the extent of the lung and diminished movement of the diaphragm.

Further opinions on the value of X-rays in diagnosis of diseases of the chest.

St. Halls Sally. January 27, 1903 says - "I find the diagnosis of tuberculosis of the lung the Hosten Ray reach their widest and most practical everyday application."
Dr. Stanley Green in Medical Electronics Radiology Dec 1908. says: "I am most firmly convinced myself that not only can the disease be detected earlier and with more certainty by this (X-ray) method of diagnosis, but that the extent of the mischief can be gauged, and in many cases will be found to be greater than the physical signs denoted." Further he says: "It is also possible by examining the patients at intervals to follow the progress of the disease. Dr. Green also mentions a case of primary tuberculosi in a child detected by X-ray examination.

Dr. Hammecey (Sedan) at the International Congress on Tuberculosis, Paris. December 1910. advocated the use of X-ray in diagnosis. Of 59 cases examined, 76% showed a diminution in transparency on the affected areas. 52% showed sinking of the diaphragm on the affected side. 30% showed a want of clearness of the
Lung Stabto - he urged that on account of the ease, rapidity, and safety with which such examinations could be made all students ought to be examined at least once by the Röntgen Rays.

Dr. Lewis Jones in his book on Medical Electray, p. 282 says, "Tumours, emphysema, both pneumonic and pleuropneumonic and effusion into the pleura are all easily recognised in good X-ray photographs of these facts.

Cavities can also be seen.

Its employment in the study of chest disease is perhaps one of the most striking of all the applications of X-ray work to medical practice."
Differential Diagnosis

We shall first consider

The special points distinguishing Pulmonary Tuberculosis from other diseases of the lungs.

1. Tuberculosis tends especially to affect the apex.
2. It is unilateral at first, when chronic it is bilateral.
3. It usually follows a special "line of march" as described by Fowler and Godlee, see p. 354. viz., it begins usually in front, at a point corresponding to either the supra-clavicular fossa, or a spot just below the centre of the clavicle, spreading downward along the anterior aspect of the upper lobe about \( \frac{3}{4} \) inch within its margins—

or behind it begins at a spot near the middle of the supra-scapular fossa about an inch below the summit of the lung, from this it spreads downward and backward later it spreads to the apex of the
opposite lung, due to the upper part of the lower lobe on the side first affected, and then to the upper part of the lower lobe of the lung secondarily affected. Then throughout the lung generally, the bases being the last affected as a rule.

But, one must remember, it may begin in the lower or middle lobe. So far also says if the whole lower lobe is continuously affected the lesion is probably tubercular; if the base is affected but the apex free, the lesion is probably not tubercular but is some other kind of the lung collapse, catarrhal pneumonia, fibrosing or if tubercular, then the resisting power of the base has been diminished by some previous affection.

Pathological patients often do not seem acutely ill, they tend to minimise their symptoms; they are hopeful, and they have periods of improvement, alternate with bad spells.
Differential Diagnosis - continued
Other diseases likely to be mistaken for Tuberculosis and vice versa.

1. Cases of hysteria or hypochondria
In these cases there may be wasting and anaemia, and indigestion.
Cough is usually present, but it is harder and louder than that of Tuberculosis; there is usually no expectoration; haemoptysis may be simulated intentionally or accidentally, by sucking the gums - there is no dyspnoea - no definite physical signs, although the percussion note may be impaired, and no tubercle bacilli can be found.
The patient makes much of his symptoms, unlike a truly Tubercular patient.

2. Bronchitis
Here the physical signs are well marked on both sides, and more toward the base than the apex - thoracoscopic bubbling resonant note, percussion may give a resonant note. If a case is suspicious
examine the sputum at intervals and watch the temperature closely.

3. Broncho-pneumonia

It is difficult to distinguish in some cases but a history of measles, whooping cough, etc. may help.
The symptoms usually come on more quickly than in phthisis, and are more acute, and the patient seems much ill. No tubercle bacilli are found in sputum.
The physical signs of broncho-pneumonia are usually more acute than in case of bilateral from the past. Tincturj 3/16

"Time alone will show as many cases as Oler's Practice of Medicine I 6 4 6
Phthisis sometimes follows Broncho-pneumonia.

4. Pleurisy

One must always be very careful of diagnosis and prognosis in this matter, so many cases lend on to phthisis, sometimes after long intervals. Tincturj says I 3/18. "A pleurisy apparently completely recovered from and clearing without physical signs of inflammation of the general health seems to involve a legacy of increased proclivity to phthisis."
If the effusion is found to be serous it does not help us, while if it is blood it is suspicious of pleurisy; if purulent it is usually non-tubercular.

Tubercle bacilli are rarely found in tubercular effusions. Watch the temperature even after the patient seems to recover, the X-ray examination is often useful in these cases.

5. Asthma.

Some cases of pleurisy get attacks of spasmodic dyspnoea resembling asthma, but it is not typical of that disease. Observe the temperature and examine the sputum in all cases and if it is pleurisy the physical signs in one or both sides will become evident.

6. Uncrystallized Pneumonia.

The history is a guide here, but the case should be watched and the temperature noted. In tuberculosis may follow pneumonia, or pneumonia may supervene in a case of tuberculosis and we do not find the temperature dropping, but if no crisis, the temperature remains more or less constant.
7. Influenza
Often lowers the system so that latent or quiescent tuberculosis is resumed its activity. As in many cases of early phthisis are apt to be mistaken for influenza if that disease is smoldering at the time. Watch the temperature and physical signs, and examine often for tubercle bacilli of patent expectorates.

8. Pulmonary Embolesm
When small may cause difficulty of diagnosis, as one may get hemoptysis, fever, and later abscesses in the lungs. The history of a sudden onset with rigors and Independence of tubular disease may help.

9. Bronchiectasis
May be difficult to differentiate as there is usually a long history of bronchitis or phlegm. But for that reason one is not apt to confuse it with early phthisis, later on of course the two may co-exist. The symptom of bronchiectasis is very abundant at certain times but contains no tubercle bacilli or elastic fibers. The physical signs are usually basic.
Differential Diagnosis—continued

10. Pulmonary Syphilis.

Is rare, and it may be combined with phthisis. See Corns, p. 471 and Lindsay, p. 38057.

It is said to come on five to fifteen years after the primary infection.

It involves mostly the middle lobe. Usually evidence of syphilis in other organs can be found. There are on

the huge bacilli found in the sputum. In suspected cases iodide of

potassium is found useful in treatment.

11. Actinomycosis

May affect the lungs and simulate phthisis.

The patients are usually country men whose work is amongst cattle. Before

suspect the disease we should examine for the rag fungous lesions, also be found in other parts of the

body especially the jaws.

In actinomycosis the physical signs are usually found at the base of the lung

not at the apex, and the lesion does not
proceed along the "line of march" of phthisis. There are no elastic fibres in the sputum. Treatment by injection of potassium has a good effect, but there also we may find actinomycosis and phthisis in the same patient.


May give all the symptoms and signs of tuberculosis.

1. The history may assert.
2. Hydatids mostly affect the base of the lung, and the right lung more than the left.
3. Usually the liver is also affected, or other organs.
4. The sputum is often bloody, expectorated, and may contain hooklets, or pieces of membrane, and no tubercle bacilli.


The only case of this disease that has been simulated pulmonary tuberculosis very closely, but no tubercle bacilli could ever be found in the sputum though well searched for.

1. Physical signs and symptoms being much the same we must investi the history thoroughly in a suspicious case, but patients are apt to withhold important information.
2. Examine for enlarged supraclavicular, axillary glands, and evidence of pressure on veins and nerves.
3. Pain is often localized.
4. The right upper lobe is most often affected.
5. The sputum may be of the red cancers jelly type.
6. The disease usually proceeds rapidly.
7. Treatment is quite useless including this disease.

14. Nodular growths and abscesses may cause dulness or pectoris, etc. Other signs from pressure on bronchi but by that time, other symptoms and signs and the history will help us to exclude pulmonary tuberculosis.
In conclusion I think I have fairly well shown the difficulties of the diagnosis of some cases of pulmonary phthisis, and the strong and weak points connected with the different methods of investigating this disease. One might, however, fill many pages with the views of different observers, but space does not permit me to add more in a paper of this sort.

We have seen that we cannot rely on symptoms, and although detection of tubercle bacilli in the sputum definitely settles the fact that a patient has pulmonary tuberculosis, still their absence does not prove the contrary. The estimation of the tuberculo-somatic index may help us in some cases but requires much manipulative skill and accuracy in the observer, and must be repeated, and so takes both time and money.

The tuberculin test takes time but otherwise need not be costly, but it is neither absolutely safe, nor reliable; and the patient may object to have it.
though a second time if the first injection does not show a definite reaction. Therefore we see that in most cases the ordinary physical examination carefully carried out is the most useful of all, and in any case must always supplement all other methods. But in all doubtful cases when physical signs though not definite yet indicate that all is not right — then I have found in my small experience there is nothing that helps us so definitely and so quickly as a Roentgen Ray examination, and it may be repeated as often as desired, without trouble or discomfort to either patient or observer.

Of course the apparatus costs money and requires the services of a well trained and experienced radiographer to work it, but when one considers the ease and quickness with which a patient can be examined with the fluorescent screen, or even a screen and a film taken, this in my opinion it excels all other special methods, both in saving time in diagnosis and enabling us to start the proper treatment. Another great
advantage is that although it requires a trained man to work the apparatus, yet any one who has previously seen aigram and understands where to be looked for can see the appearance presented on the screen for himself; in fact several observers can see at the same time and discuss any doubtful point with the subject before them. If only the ordinary physical examination is relied on in doubtful cases, ten months or even years may be lost before a definite diagnosis is established, and until that is clear, one cannot very well advise a patient to give up his work and devote all his time to effecting a cure when that may mean that he must sacrifice his career, besides spending a large sum of money on treatment. Of course every physician cannot afford to have the apparatus installed, but he ought at least to go and see for himself the rays being used, and send all doubtful cases to be examined, when distance
is not an uncommon one. I can testify that the physicians in charge of the Portier Ray department are always most courteous and willing to show cases and explain the use of the apparatus, as I worked for a time with Dr. Howard Jones at the Tottenham Hospital, London W., and was shown several cases at the City Road Hospital for diseases of the chest by Dr. Jordan. Most hospitals are now having the apparatus installed, as the Ray, or x-ray, may be useful in both the diagnosis and treatment of many other faulty conditions, especially tuberculosis glands. Some practitioners actually say that the rays are useful in the treatment of pulmonary tuberculosis, but this has not yet been established, and most observers at present do not believe that the rays are of any service in the treatment of tuberculosis.

The recent report of the Royal Commission on tuberculosis proves that milk infected with tubercle bacilli is dangerous and highly common, and therefore it is a
fruitful cause of tuberculosis in the human subject. We ought therefore to double our efforts to perfect all methods likely to help us in the early diagnosis of pulmonary and other forms of tuberculosis.

John Thomson

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