

larged, passing deeply into the hilus, adjoining, and in some instances even merging with, areas of caseation of the pulmonary tissue itself.

There is a special danger of infection of the pericardium by tuberculous lymph-glands in the anterior mediastinum.

(c) *Mesenteric; Tabes mesenterica*.—In this affection, the abdominal scrofula of old writers, the glands of the mesentery and retro-peritonæum become enlarged and caseate; more rarely they suppurate or calcify. A slight tuberculous adenitis is extremely common in children, and is often accidentally found (post mortem) when the children have died of other diseases. It may be a primary lesion associated with intestinal catarrh, or it may be secondary to tuberculous disease of the intestines.

The primary cases are very common in children, as may be gathered from Woodhead's figures. The general involvement of the glands interferes seriously with nutrition, and the patients are puny, wasted, and anæmic. The abdomen is enlarged and tympanitic; diarrhoea is a constant feature; the stools are thin and offensive. There is moderate fever, but the general wasting and debility are the most characteristic features. The enlarged glands cannot often be felt, owing to the distended condition of the bowels. These cases are often spoken of as consumption of the bowels, but in a majority of them the intestines do not present tuberculous lesions. In a considerable number of the cases of tabes mesenterica the peritonæum is also involved, and in such the abdomen is large and hard, and nodules may be felt. The condition is one to which the French have given the name *carreau*.

In adults tuberculous disease of the mesenteric glands may occur as a primary affection, or in association with pulmonary disease. Gairdner* gives a remarkable instance of the kind in a man aged twenty-one. Instances of this sort are not uncommon in the literature. Large tumors may exist without tuberculous disease in the intestines or in any other parts.

The diagnosis of local and general tuberculous adenitis from lymphadenoma will be subsequently considered.

IV. PULMONARY TUBERCULOSIS (*Phthisis, Consumption*).

Three clinical groups may be conveniently recognized: (1) *tuberculo-pneumonic phthisis*—acute phthisis; (2) *chronic ulcerative phthisis*; and (3) *fibroid phthisis*.

According to the mode of infection there are two distinct types of lesions:

(a) When the bacilli reach the lungs through the blood-vessels, the primary lesion is usually in the tissues of the alveolar walls, in the capillary vessels, the epithelium of the air-cells, and in the connective-tissue

* Lectures to Practitioners, Gairdner and Coats, 1888.

framework of the septa. The process of cell division proceeds as already described in the general histology of tubercle. The irritation of the bacilli produces, within a few days, the small, gray miliary nodules, involving several alveoli and consisting largely of round, cuboidal, uninuclear epithelioid cells. Depending upon the number of bacilli which reach the lung in this way, either a localized or a general tuberculosis is excited. The tubercles may be uniformly scattered through both lungs and form a part of a general miliary tuberculosis, or they may be confined to the lungs, or even in great part to one lung. The changes which the tubercles undergo have already been referred to. The further changes may be: (1) Arrest of the process of cell division, gradual sclerosis of the tubercle, and ultimately complete fibroid transformation. (2) Caseation of the centre of the tubercle, extension at the periphery by proliferation of the epithelioid and lymphoid cells, so that the individual tubercles or small groups become confluent and form diffuse areas which undergo caseation and softening. (3) Occasionally as a result of intense infection of a localized region through the blood-vessels the tubercles are thickly set. The intervening tissue becomes acutely inflamed, the air-cells are filled with the products of a desquamative pneumonia, and many lobules are involved.

(b) When the bacilli reach the lung through the bronchi—inhalation tuberculosis—the picture differs. The smaller bronchi and bronchioles are more extensively affected; the process is not confined to single groups of alveoli, but has a more lobular arrangement, and the tuberculous masses from the outset are larger, more diffuse, and may in some cases involve an entire lobe or the greater part of a lung. It is in this mode of infection that we see the characteristic peri-bronchial granulations and the areas of the so-called nodular broncho-pneumonia. These broncho-pneumonic areas, with on the one hand caseation, ulceration, and cavity formation, and on the other sclerosis and limitation, make up the essential elements in the anatomical picture of tuberculous phthisis.

1. Acute Pneumonic Phthisis.

This form, known also by the name of galloping consumption, is met with both in children and adults. In the former many of the cases are mistaken for simple broncho-pneumonia.

Two types may be recognized, the *pneumonic* and *broncho-pneumonic*.

(a) In the *pneumonic form* one lobe may be involved, or in some instances an entire lung. The organ is heavy, the affected portion airless, the pleura usually covered with thin exudation, and on section the picture resembles closely that of ordinary hepatization. The following is an extract from the post-mortem report of a case in which death occurred twenty-nine days after the onset of the illness, having all the characters of an acute pneumonia: "Left lung weighs 1,500 grammes (double the weight of the

other organ) and is heavy and airless, crepitant only at the anterior margins. Section shows a small cavity the size of a walnut at the apex, about which are scattered tubercles in a consolidated tissue. The greater part of the lung presents a grayish-white appearance due to the aggregation of tubercles which in some places have a continuous, uniform appearance, in others are surrounded by an injected and consolidated lung-tissue. Toward the margins of the lower lobe strands of this firm reddish tissue separate anæmic, dry areas. There are in the right lung three or four small groups of tubercles but no caseous masses. The bronchial glands are not tuberculous." Here the intense local infection was due to the small focus at the apex of the lung, probably an aspiration process.

Only the most careful inspection may reveal the presence of miliary tubercles, or the attention may be arrested by the detection of tubercles in the other lung or in the bronchial glands. The process may involve only one lobe. There may be older areas which are of a peculiarly yellowish-white color and distinctly caseous. The most remarkable picture is presented by cases of this kind in which the disease lasts for some months. A lobe or an entire lung may be enlarged, firm, airless throughout, and converted into a dry, yellowish-white, cheesy substance. Cases are met with in which the entire lung from apex to base is in this condition, with perhaps only a small, narrow area of air-containing tissue on the margin. More commonly, if the case has lasted for two or three months, rapid softening has taken place at the apex. The following brief extract gives the actual condition of the lung in a case in which death occurred in the eleventh week: "Left lung is solid and heavy, weighing 1,490 grammes, and is nowhere crepitant. The upper third of the upper lobe is occupied by a cavity, containing blood and pus, the walls of which are formed by ragged caseous masses. The rest of the lung is firm and solid, and on section presents a uniform opaque white color. The surface is dry, and all parts present the same cheesy appearance."

Symptoms.—The attack sets in abruptly with a chill, usually in an individual who has enjoyed good health, although in many cases the onset has been preceded by exposure to cold, or there have been debilitating circumstances. The temperature rises rapidly after the chill, there are pain in the side, and cough, with at first mucoid, subsequently rusty-colored expectoration. The dyspnoea may become extreme and the patient may have suffocative attacks. The physical examination shows involvement of one lobe or of one lung, with signs of consolidation, dullness, increased fremitus, at first feeble or suppressed vesicular murmur, and subsequently well-marked bronchial breathing. The upper or lower lobe may be involved, or in some cases the entire lung.

At this time, as a rule, no suspicion enters the mind of the practitioner that the case is anything but one of frank lobar pneumonia. Occasionally there may be suspicious circumstances in the history of the patient or in his family; but, as a rule, no stress is laid upon them in comparison

with the intense and characteristic mode of onset. Between the eighth and tenth day, instead of the expected crisis, the condition becomes aggravated, the temperature is irregular, and the pulse more rapid. There may be sweating, and the expectoration becomes muco-purulent. Even in the second or third week, with the persistence of these symptoms, the physician tries to console himself with the idea that the case is one of unresolved pneumonia, and that all will yet be well. Gradually, however, the severity of the symptoms, the presence of physical signs indicating softening, the existence of elastic tissue and tubercle bacilli in the sputa present the mournful proofs that the case is one of acute pneumonic phthisis. Death may occur before softening takes place, even in the second or third week. In other cases there is extensive destruction at the apex, with rapid formation of cavity, and the case may drag on for two or three months.

Diagnosis.—It is by no means widely recognized in the profession that there is a form of acute phthisis which may closely simulate ordinary pneumonia. Waters, of Liverpool, gave an admirable description of these cases, and called attention to the difficulty in distinguishing them from ordinary pneumonia. Certainly the mode of onset affords no criterion whatever. A healthy, robust-looking young Irishman, a cab-driver, who had been kept waiting on a cold, blustering night until three in the morning, was seized the next afternoon with a violent chill, and the following day was admitted to my wards at the University Hospital, Philadelphia. He was made the subject of a clinical lecture on the fifth day, when there was absent no single feature in history, symptoms, or physical signs of acute lobar pneumonia of the right upper lobe. It was not until ten days later, when bacilli were found in his expectoration, that we were made aware of the true nature of the case. I know of no criterion by which cases of this kind can be distinguished in the early stage. The tubercle bacilli are not present at first. A point to which Traube called attention, and which is also referred to as important by Herard and Cornil, is the absence of breath-sounds in the consolidated region; but this, I am sure, does not hold good in all cases. The tubular breathing may be intense and marked as early as the fourth day; and again, how common it is to have, as one of the earliest and most suggestive symptoms of lobar pneumonia, suppression or enfeeblement of the vesicular murmur! In many cases, however, there are suspicious circumstances in the onset; the patient has been in bad health, or may have had previous pulmonary trouble, or there are recurring chills. Careful examination of the sputa and a study of the physical signs from day to day can alone determine the true nature of the case. A point of some moment is the character of the fever, which in true pneumonia is more continuous, particularly in severe cases, whereas in this form of tuberculosis remissions of 1.5° or 2° are not infrequent.

(b) *Acute tuberculous broncho-pneumonia* is more common, particu-

larly in children, and forms a majority of the cases of *phthisis florida* or "galloping consumption." It is an acute caseous broncho-pneumonia, starting in the smaller tubes, which become blocked with a cheesy substance, while the air-cells of the lobule are filled with the products of a catarrhal pneumonia. In the early stage the areas have a grayish-red, later an opaque-white, caseous appearance. By the fusion of contiguous masses an entire lobe may be rendered nearly solid, but there can usually be seen between the groups areas of crepitant air tissue. This is not an uncommon picture in the acute phthisis of adults, but it is still more frequent in children. The following is an extract from the post-mortem of a case on a child aged four months, which died in the sixth week of illness: "The upper lobe of the right lung is scarcely anywhere crepitant except at the anterior edge. The middle and lower lobes are heavy and slightly crepitant; the visceral pleura is beset with tubercles which have grown into it from the lung. On section the right upper lobe is occupied with caseous masses from five to twelve millimetres in diameter, separated from each other by an intervening tissue of a deep-red color. The bronchi are filled with cheesy substance. The middle and lower lobes are stuffed with tubercles, many of which are becoming caseous. Toward the diaphragmatic surface of the lower lobe there is a small cavity, the size of a marble. The left lung is more crepitant and uniformly studded with tubercles of all sizes, some as large as peas. There is an acute tuberculous bronchitis in the smaller and larger branches, and extending into the trachea. The bronchial glands are very large, and one contains a tuberculous abscess."

In children the enlarged bronchial glands usually surround the root of the lung, and even pass deeply into the substance, and the lobules are often involved by direct contact.*

In other cases the caseous broncho-pneumonia involves groups of alveoli or lobules in different portions of the lungs, more commonly at both apices, forming areas from one to three centimetres in diameter. The size of the mass depends largely upon that of the bronchus involved. There are cases which probably should come in this category, in which, with a history of an acute illness of from four to eight weeks, the lungs are extensively studded with large gray tubercles, ranging in size from five to ten millimetres. In some instances there are cheesy masses the size of a cherry. All of these are grayish-white in color, distinctly cheesy, and between the adjacent ones, particularly in the lower lobe, there may be recent pneumonia, or the condition of lung which has been termed splenization. In a case of this kind at the Philadelphia Hospital death took place about the eighth week from the abrupt onset of the illness with hæmorrhage. There were no extensive areas of consolidation, but the cheesy nodules were uniformly scattered throughout both lungs. No softening had taken place.

* *Vide* the drawings illustrating Northrup's article; New York Medical Journal, February 21, 1891.

Symptoms.—The symptoms of acute broncho-pneumonic phthisis are very variable. In adults the disease may attack persons in good health, but who are overworked or "run down" from any cause. Hæmorrhage initiates the attack in a few cases. There may be repeated chills; the temperature is high, the pulse rapid, and the respirations are increased. The loss of flesh and strength is very striking.

The physical signs may at first be uncertain and indefinite, but finally there are areas of impaired resonance, usually at the apices; the breath-sounds are harsh and tubular, with numerous râles. The sputa may early show elastic tissue and tubercle bacilli. In the acute cases, within three weeks, the patient may be in a marked typhoid state, with delirium, dry tongue, and high fever. Death may occur within three weeks. In other cases the onset is severe, with high fever, rapid loss of flesh and strength, and signs of extensive unilateral or bilateral disease. Softening takes place; there are sweats, chills, and progressive emaciation, and all the features of *phthisis florida*. Six or eight weeks or later the patient may begin to improve, the fever lessens, the general symptoms mitigate, and a case which looked as if it would certainly terminate fatally within a few weeks drags on and becomes chronic.

In children the disease most commonly follows the infectious diseases, particularly measles and whooping-cough.* The profession is gradually recognizing the fact that a majority of all such cases are tuberculous. At least *three groups* of these cases of tuberculous broncho-pneumonia may be recognized. In the *first* the child is taken ill suddenly while teething or during convalescence from fever; the temperature rises rapidly, the cough is severe, and there may be signs of consolidation at one or both apices with râles. Death may occur within a few days, and the lung shows areas of broncho-pneumonia, with perhaps here and there scattered opaque grayish-yellow nodules. Macroscopically the affection does not look tuberculous, but histologically miliary granulations and bacilli may be found.† Tubercles are usually present in the bronchial glands, but the appearance of the broncho-pneumonia may be exceedingly deceptive, and it may require careful microscopical examination to determine its tuberculous character. The *second group* is represented by the case of the child previously quoted, which died at the sixth week with the ordinary symptoms of severe broncho-pneumonia. And the *third group* is that in which, during the convalescence from an infectious disease, the child is taken ill with fever, cough, and shortness of breath. The severity of the symptoms mitigates within the first fortnight; but there is loss of flesh, the general condition is bad, and the physical examination shows the presence of scattered râles throughout the lungs, and here and there areas of defective resonance. The child has sweats, the fever becomes hectic in

* "Tussis convulsiva vestibulum tabis" (Willis).

† Cornil and Babes, *Les Bactéries*, tome ii, 1890.

character, and in many cases the clinical picture gradually develops into that of chronic phthisis.

2. Chronic Ulcerative Phthisis.

Under this heading may be grouped the great majority of cases of pulmonary tuberculosis, in which the lesions proceed to ulceration and softening, and ultimately produce the well-known picture of chronic phthisis. At first a strictly tuberculous affection, it ultimately becomes, in a majority of cases, a mixed disease, many of the most prominent symptoms of which are due to septic infection from purulent foci and cavities.

Morbid Anatomy.—Inspection of the lungs in a case of chronic phthisis shows a remarkable variety of lesions, comprising nodular tubercles, diffuse tuberculous infiltration, caseous masses, pneumonic areas, cavities of various size, with changes in the pleura, bronchi, and bronchial glands.

1. **The Distribution of the Lesions.**—For years it has been recognized that the most advanced lesions are at the apices, and that the disease progresses downward, usually more rapidly in one of the lungs. This general statement, which has passed current in the text-books ever since the masterly description of Laennec, has recently been carefully elaborated by Kingston Fowler, who finds that the disease in its onward progress through the lungs follows, in a majority of the cases, distinct routes. In the upper lobe the primary lesion is not, as a rule, at the extreme apex, but from an inch to an inch and a half below the summit of the lung, and nearer to the posterior and external borders. The lesion here tends to spread downward, probably from inhalation of the virus, and this accounts for the frequent circumstance that examination behind, in the supraspinus fossa, will give indications of disease before any evidences exist at the apex in front. Anteriorly this initial focus corresponds to a spot just below the centre of the clavicle, and the direction of extension in front is along the anterior aspect of the upper lobe, along a line running about an inch and a half from the inner ends of the first, second, and third interspaces. A second less common site of the primary lesion in the apex "corresponds on the chest wall with the first and second interspaces below the outer third of the clavicle." The extension is downward, so that the outer part of the upper lobe is chiefly involved.

In the middle lobe of the right lung the affection usually follows the upper lobe on the same side. In the involvement of the lower lobe the first secondary infiltration is about an inch to an inch and a half below the posterior extremity of its apex, and corresponds on the chest wall to a spot opposite the fifth dorsal spine. This involvement is of the greatest importance clinically, as "in the great majority of cases, when the physical signs of the disease at the apex are sufficiently definite to allow of the diagnosis of phthisis being made, the lower lobe is already affected." Ex-

amination, therefore, should be made carefully of this posterior apex in all suspicious cases. In this situation the lesion spreads downward and laterally along the line of the interlobular septa, a line which is marked by the vertebral border of the scapula, when the hand is placed on the opposite scapula and the elbow raised above the level of the shoulder. Once present in an apex, the disease usually extends in time to the opposite upper lobe; but not, as a rule, until the apex of the lower lobe of the lung first affected has been attacked.

Of 427 cases above mentioned, the right apex was involved in 172, the left in 130, both in 111.

Lesions of the base may be primary, though this is rare. Percy Kidd makes the proportion of basic to apical phthisis one to five hundred, a smaller number than existed in my series. In very chronic cases there may be arrested lesions at the apex and more recent lesions at the base.

2. **Summary of the Lesions in Chronic Ulcerative Phthisis.**—(a) *Miliary Tubercles.*—These may not be evident on microscopical examination, or there may be a few colonies, "the secondary crop" of Laennec, about the caseous areas. In other instances, with old lesions at the apex, there are, throughout the lower lobes, scattered groups of miliary tubercles which have undergone fibroid and pigmentary changes. Sometimes, in cases with cavity formation at the apex, the greater part of the lower lobes present many groups of firm, sclerotic, miliary tubercles, which may indeed form the distinguishing anatomical feature—a chronic miliary tuberculosis.

(b) *Tuberculous Broncho-pneumonia.*—In a large proportion of the cases of chronic phthisis the terminal bronchiole is the point of origin of the process, consequently we find the smaller bronchi and their alveolar territories blocked with the accumulated products of inflammation in all stages of caseation. At an early period a cross-section of an area of tuberculous broncho-pneumonia gives the most characteristic appearance. The central bronchiole is seen as a small orifice, or it is plugged with cheesy contents, while surrounding it is a caseous nodule, the so-called peribronchial tubercle. The longitudinal section has a somewhat dendritic or foliaceous appearance. The condition of the picture depends much upon the slowness or rapidity with which the process has advanced. The following changes may occur:

Ulceration.—When the caseation takes place rapidly or ulceration occurs in the bronchial wall, the mass may break down and form a small cavity.

Sclerosis.—In other instances the process is more chronic. Fibroid changes gradually produce a sclerosis of the affected area, a condition which is sometimes called *cirrhosis nodosa tuberculosa*. The sclerosis may be confined to the margin of the mass, forming a limiting capsule, within which is a uniform, firm, cheesy substance, in which lime salts are often deposited. This represents the healing of one of these areas of caseous