

ease should not be nursed by a tuberculous mother, but should have a wet-nurse, thus avoiding the drain on the mother, the infection of the offspring, and the dangers of artificial feeding. Later, an out-of-door life in a pure, wholesome atmosphere should be ordered. The city is a poor place of residence for such cases, on account of the dusty and infected air and the difficulty of tempting the child to indulge in out-of-door sports. Parks afford an approach to the desired purity of air; and where it is impossible to send children away, they should live in these open places as much as possible. Their studies should never be permitted to interfere with their physical development. Good, wholesome food, plenty of milk and cream, and cod-liver oil during the colder seasons, tend to increase their resisting power. They should have sunny, well-ventilated rooms, which should be kept fairly cool; and even in winter direct access of fresh air should always exist. Cool morning sponge baths with a brisk towelling tend to lessen the chance of catarrhal troubles and to harden the child. These general hygienic measures when begun at an early age are more easily continued, and, it is needless to add, they should be employed throughout life. When the general health of predisposed individuals becomes run down, we should order a rest and change of climate until they have fully recuperated. Especially is this true when the respiratory organs are damaged after influenza, measles, or pertussis. Apparently slight catarrhal conditions may either predispose to tuberculosis or be really such in a form too mild to recognize.

In acute and subacute pulmonary phthisis the patient should be kept in bed and every endeavor made to build up the strength by nutritious food. If possible, overfeeding should be employed. Milk and raw eggs at frequent intervals should be administered to the point of toleration. This cannot be insisted upon too much. Hæmoptyses are best treated by rest and opium. Fever is best controlled by a sponge bath in the late afternoon or evening. Antipyretics are generally best avoided. If the acute symptoms subside, creosote inhalations are to be employed; and, if the strength warrants the procedure, a dry inland climate must be sought. A few cases do well on ocean voyages if they can be well fed and have an airy cabin, and if at the same time they are good sailors. Arsenic, iron, and cod-liver oil may be used later. Codeine and heroin are useful when cough is exhausting.

All sputa from tuberculous members of a family should be destroyed, preferably by burning. The danger lies in the dried pulverized expectoration, which is then in a condition to be blown about, and not in that which is kept moist, as it is in the sputum cup. Carbolic-acid solutions (twenty per cent.) are a fair substitute for burning where the latter is not convenient. Handkerchiefs, napkins, bed clothes, and table utensils should be scalded and thoroughly cleaned, or, better, boiled in an alkaline solution before cleansing. In this way, with care, the danger of infection within the house is rendered less than that which exists in an ordinary life in the city. At Seton Hospital, during its eight years of occupation by consumptives, only one case, and that a doubtful one, has occurred among the physicians, nurses, or other occupants of the institution; and yet this hospital harbors from one hundred and fifty to two hundred consumptives most of the time. In the single case just referred to, there was a history of pneumonia which may have been tuberculous in character.

Of the curative measures diet, climate, out-of-door life, and rest are the essentials. The diet must necessarily be suited to the individual; generally, rather small, frequent meals serve our purpose best. In certain cases the three ordinary meals of the day should be taken, while milk and raw eggs should be administered between times and on retiring. A limited overfeeding can thus be taught to some who are by habit light eaters. The point to be gained is to have the patient take as much wholesome, nutritious food as his digestive organs can assimilate. Perhaps a little wine or beer might be taken by these patients when they serve as appetizers, but great care

should be observed that we do not irritate that most important organ of the consumptive, the stomach. If any course of treatment upsets the digestion it is a safe rule to discontinue it, for by no method can we obtain strength for the patient unless feeding is possible; and in consumptives we have to feed our patient, and also to make up for the constant drain caused by the disease. A carefully selected dietary, varied, digestible, and appetizing, will often coax the patient to eat quite heartily. Much skill in serving dishes—by making them attractive, by not overloading the plates, and by division into dainty courses—can be shown, and this well repays the trouble. Milk and raw eggs can often be given in large amounts when solid food is rejected. I have known some patients who could retain raw eggs, taken whole, like a soft capsule, and flavored with a little sherry, when milk and broths were promptly vomited by them. Cod-liver oil in not too large doses is of help if it does not impair appetite. Cream and ice-cream also are palatable forms of fatty food, which is of course particularly indicated in consumption. Butter spread on very thin slices of bread is well taken at times. Rest is also important, due regard being paid to individual peculiarities. If fever is present, the rule is to keep the patient at rest. If the afternoon fever does not exceed 100° F., exercise may be permitted, but should be carefully watched. Exhaustion and lack of appetite after a walk mean that harm is being done; and the temperature, if taken immediately after exertion, should not exceed 101° F. Of the different forms of exercise, walking, bicycling, and horseback are perhaps the best, and should be leisurely but steady in character. The general opinion among those specially dealing with tuberculosis is rapidly forming in favor of a rest-cure in cases which are at all active. Under this régime the appetite, instead of suffering, improves, the fever and emaciation become less marked, and often flesh is quite actively gained. A steamer chair or couch should be placed on the porch in a place which is shielded from wind and rain, and should be occupied for at least eight hours daily. Coldness of the weather should be disregarded, but ample covering of body and limbs should serve to keep the patient comfortable. At first these measures are not kindly accepted by the patient, to whom cold is often disagreeable, but a tolerance is soon established, and he soon learns to love the method and ceases to criticise. In a few cases moderate exercise agrees somewhat better, but these are exceptions.

The well-known beneficial effect of change of climate compels us to select a locality which will suit the individual case. If, after a trial of two or three months, the results are not satisfactory, we should seek another region, with the hope that it may prove more favorable. Simply a change at fair intervals acts beneficially in the case of those of a restless temperament; but if we are satisfied that all is going well, we should be slow to allow a departure from a region which is accomplishing our purposes. We can judge of the effects as being beneficial when the patient begins to feel stronger, improves in appetite, sleeps well, and gains in weight, while cough and expectoration lessen. The essential requirements of any region should be plentiful sunshine, purity of atmosphere, and an equable temperature. A climate in which the individual may be out of doors most of the time, which is dry and of fair altitude, should be selected if possible. All these requirements cannot be supplied by a single locality, but we should select one which answers as nearly as possible to the desired standard. The Adirondacks, Sullivan County in New York, Görbersdorf in Silesia, and Falkenstein in Southwest Germany, together with those vast areas in the southwestern portion of the United States, such as portions of Arizona, New Mexico, and Texas, are deservedly popular. Southern California has given good results and is a delightful, sunny region. The higher altitudes, such as the Colorado resorts (5,000–6,000 feet), Davos (5,000 feet) and St. Moritz (6,000 feet), are preferred by some, but they have the disadvantage of making the cured cases so dependent upon this bracing atmosphere that a

return to the seaboard is often impossible. The emphysema which follows residence in these high places may account for this peculiarity. Cases with weak hearts, marked emphysema, arteriosclerosis, diabetes, and active or advanced lesions, should not be sent to great altitudes. Patients who have occasional hæmoptyses may be allowed to go to the mountainous regions, but they should make the ascent gradually, resting for several days at intermediate levels. In the case of those who are in the advanced stages of the disease, the question of a congenial home life must be weighed against the beneficial effects of climate. We must bear in mind that many apparently hopeless cases are enabled to live an active life in a suitable region, and we must not lightly allow sentimental reasons to overthrow our judgment. Although benefit is improbable it is not impossible.

The use of tuberculin as a curative measure is still in the experimental stage, but there is some evidence that it has beneficial results, both as a healing agent and as a preventive of relapses. It should be given cautiously, in doses of from 0.2 to 0.5 mgm., to be gradually increased; but care must be taken not to increase the dose to the point at which it produces any marked constitutional symptoms. It should be employed only in the incipient cases, which of course are those which give the best results under all methods of treatment.

Creosote still holds its place as the main drug in treatment. It seems to benefit the cough, to lessen the expectoration, and to improve digestion. The enormous doses often prescribed are not to be recommended; five or six drops well diluted and given after meals, should suffice. Creosote can also be given by inhalation, a few drops of a solution of equal parts of creosote, alcohol, and chloroform being placed daily on the sponge of a perforated zinc inhaler. Carbonate of guaiacol, creosote carbonate, and palmitic acid have the advantage of not being so irritating to the stomach, and should be used when the crude drug disagrees. Ichthyol, arsenic, and strychnine are employed with varying success by some clinicians.

The symptomatic treatment is of importance, and is sure to tax the resources of the physician. Cough is necessary, and is sometimes best left untreated; but, again, if it is unnecessarily harassing, it may cause lack of rest and even vomiting, and drugs then are useful. The morning cough has the purpose of ridding the lungs of the accumulated secretions of the night. A hot alkaline drink here serves our purpose best, for we wish to promote and not to check it. A mixture made by adding bicarbonate of soda and a little glycerin to a couple of ounces of hot water, will be found to answer well the desired purpose. The severe coughs with but little expectoration can often be benefited by treating the pharynx and larynx locally. Ipecac, ammonia, steam inhalations, heroin, codeine, and morphine also render effective aid at times. The use of morphine is absolutely necessary in advanced cases, but we should wait as long as possible before employing it, as it upsets digestion only too often. If the cough is pleuritic in origin, adhesive straps and counter-irritation may prove useful.

Anorexia is difficult to combat and is frequently present. A simple alkaline bitter, such as bicarbonate of soda with nux vomica and compound tincture of cardamom, taken before meals, is often most successful. Acids with nux vomica after meals suit some cases better. Vomiting may be relieved by oxalate of cerium, bismuth, and pepsin, by lavage, and by dietetics. Some light wine with meals may serve to start digestion, while often simply looking after the cough will stop the vomiting and remove the dread of eating from the patient. Diarrhoea may be avoided or stopped by dieting and by the use of opium, tannic acid and derivatives, by rest, and by the application of warmth over the abdomen. If it is of ulcerative origin we have a most intractable condition, but it should be checked as much as possible, in order to prevent the terrific drain on the patient's strength. The measures enumerated above may be supplemented by starch and laudanum enemata and by astringent acid draughts.

Dyspnœa, which occurs in attacks, is best managed by rest, alcohol, heart stimulants, and oxygen. If the cause be a pleural effusion, aspiration should of course be employed; if pneumothorax, adhesive straps should be applied to the side at fault, and morphine, as well as cardiac stimulants, should be administered cautiously. Finally, if there be much intrapleural pressure, the air should be withdrawn under aseptic precautions.

Hæmoptyses are best managed by prescribing absolute rest in a half reclining position. The patient should be thoroughly reassured, and all interruptions to quiet reduced to a minimum. Only the attendants should enter the room, which should be located in a quiet part of the house. The bowels should be emptied thoroughly with a saline purge in order to divert as much blood as possible to the intestines. Cold may be applied to the affected side. In extreme cases ligation of the limbs may be indicated, the blood being allowed to return at intervals from each limb in turn. This method keeps the blood stored up in the veins and lessens its loss. The diet should be served cold, and must not be stimulating unless urgently needed. A poor circulation is rather beneficial under those circumstances and should be favored. As regards the use of drugs the writer prefers morphine, about one-fourth of a grain to be administered hypodermatically. The disadvantage of pushing this narcotic lies in the fact that the benumbing of the reflexes which it produces, may cause the blood to be too readily retained in the lungs and so drown the patient. The danger, therefore, lies in asphyxiation rather than in the direct loss of blood. Consequently, our aim should be merely to lessen cough, restlessness, and anxiety, but not to make the patient semicomatose. Atropine, ergot, gallic acid, hydrastis, and ipecac are recommended, but probably do no good. Ergot contracts the arteries, but it does not follow logically that it contracts the rupture in a vessel; in fact, quite the contrary may be true. The rise in arterial tension, which this drug causes, is also a distinct disadvantage.

Chills are best treated by warmth, rest, and alcohol. Night sweats can often be checked by a hot bath taken just before retiring, and limited to five minutes' duration. A good remedy for the relief of this symptom is a pill which may be made of zinc oxide (gr. ii.), extract hyoscyamus (gr. ss.-i.), and strychnine (gr.  $\frac{1}{10}$ –gr.  $\frac{3}{10}$ ). Camphoric acid (gr. xx.) is often very useful. Agaricin in large doses works well in some cases. A light midnight meal and sponging with dilute acid washes are measures which should also be tried. Atropine sulphate is the most reliable drug, given hypodermatically in gr.  $\frac{1}{100}$  doses, but it has a disagreeable effect on many.

Pyrexia is best treated by rest and cold sponging; rarely should we employ the coal-tar derivatives. If the stomach is not irritable, quinine in large doses may control the fever to some extent. Pleuritic pains are most effectively relieved by a tight strap of adhesive zinc oxide plaster, applied to the affected side in such a manner as to lessen its mobility. Counter-irritation by blisters, iodine, or cupping, is helpful.

In conclusion, we may add that the general weakness is best combated by good feeding, rest, alcohol, and such means as promote the patient's comfort. Morphine is necessary in many cases, and when the patient's condition is hopeless we are justified in giving large doses as tolerance becomes established. The treatment of the many complications is considered elsewhere.

Arthur Melville Shradly.

**LUNGS, DISEASES OF: TUMORS.**—Benign neoplasms in the lungs, whether arising in the bronchi or in the alveoli, are apparently of very rare occurrence, although, as they cause very slight disturbance during life, they may often have been overlooked. The few cases reported seem to have been discovered accidentally at autopsy; only one, that of Mackenzie, having been discovered during life. The list of benign growths which have been found in the lungs and bronchi—exclusive of the trachea—includes lipoma, lipomyoma, papilloma.

myxoma, osteoma, enchondroma, chondro-angioma, lipochondro-angioma, mucous adenoma, and colloid adenoma, most of them being represented by only one, or, at the most, two cases. Rokitsky reported a submucous lipoma growing in the wall of a bronchus, and in another case a colloid adenoma, apparently originating in a misplaced portion of thyroid tissue within the wall of the right bronchus. Chiari found a mucous adenoma in the wall of a bronchiectatic cavity, and a lipochondro-adenoma in the wall of a second similar cavity. He quotes Laboulbène as having examined a lipoma with areas of spindle cells—perhaps smooth muscle fibres—from the bronchial submucosa. Papillomata were described by Williams in non-carcinomatous bronchi in a patient dying of mediastinal carcinoma. The case reported by Mackenzie leaves some doubt as to the exact situation of the papilloma. A polypus had been removed from the larynx of the patient, but the attacks of dyspnoea still recurred, and finally, after severe coughing, a small mucous polypus was expectorated. The greater frequency of tracheal polypi as compared with bronchial makes it probable that this growth also was in the trachea.

The statement is usually made in the text-books that enchondroma is a comparatively common tumor of the lung, and that it arises from the cartilage of the bronchi. A careful examination of the literature, however, shows that very few cases of enchondroma have been reported, and that of those few, not nearly all can be traced to the pre-existing bronchial cartilage. It is even denied by Cornil and Ranvier that such growths ever occur in the lung, but we have the testimony of no less an authority than Virchow to their occasional occurrence at the root of the lung, and even, rarely, in the parenchyma near the surface, arising from the connective tissue. Siegert's case is one of the few instances of an enchondroma which could be directly traced to the bronchial cartilage, growing within the wall of the bronchus and covered with ciliated epithelium. Hyaline cartilage is the form usually found, although sometimes the elastic variety is observed; the cells may be typical or larger than usual, arranged in islands surrounded by an elastic or a hyaline matrix. Usually the growth is surrounded by a vascular capsule which passes in and divides it into lobules. Ossification of the stroma and calcification and mucous degeneration with cyst-formations have been found. Virchow has described an enchondroma with a very vascular stroma under the name of enchondroma telangiectoides; Siegert, a similar growth under the name of chondro-angioma. Virchow has also described a pure myxoma of the lung, and Rindfleisch a case of multiple osteomata.

It has for a long time been supposed that primary malignant tumors of the lung were among the rarities of pathology, but a careful collection of statistics shows that they are not so uncommon, and that they make up an appreciable percentage of all malignant neoplasms. Of the different varieties, carcinoma, sarcoma, and endothelioma, the first is by far the most important numerically, although it is not always possible to be sure that endotheliomata have not been included in the list. The later statistics of malignant tumors of the lung show an increase over the earlier. Thus Reinhard, of the Dresden City Hospital, found in 545 carcinomata only 5 primary in the lung, or 0.9 per cent., while Wolf, thirty years later, found a steady increase since Reinhard's time. There were 31 cases of primary lung carcinoma in 7,228 autopsies, or .428 per cent. of all cases. Pässler's figures from Breslau are: 16 primary carcinomata of the lung in 870 carcinomata, 4 primary sarcomata of the lung in 130 sarcomata, making lung carcinoma 1.3 per cent. of all primary carcinomata. Men are far more frequently affected than women, the proportion being about 76 to 24, although Wolf finds the excess of men over women even greater than this. As to the most susceptible period of life, there are different opinions; Reinhard, Pässler, and Wolf place it between the ages of forty and sixty years; Osler and Hassa, on the contrary, find it most common between the twentieth and fortieth years, and Fuchs found

that the sixty cases analyzed by him were distributed about evenly between the twentieth and fiftieth years.

The exact origin of malignant epithelial tumors of the lung is a disputed point among pathologists. On the one hand, we have the epithelial cells of the bronchi, both the lining cells\* and the cells† of the mucous glands; on the other, the squamous cells of the alveoli.‡ It is this last which has aroused the liveliest controversy, and which is still a disputed point.

Primary carcinoma in the lung may appear as multiple nodular growths along the wall of one of the larger bronchi, spreading through the lymph spaces of the peribronchial connective tissue in the form of a chain of beads. In this variety the relation between the bronchial branches and the neoplasm is easily demonstrable. A second form is the large, soft, isolated node or nodes, which although often near a bronchus, small or large, and including it in the growth, yet spreads not by invading the peribronchial lymph spaces, but by filling the alveoli. There is finally a third form which lies between these two, and which, although it apparently has its origin in the epithelium of the bronchial mucous glands or in the cylindrical cells of the mucosa, does not remain confined to the peribronchial connective tissue, but spreads out into the parenchyma, filling the alveoli. In both of these last two forms it is difficult to determine the exact origin of the growth, and it is here that the controversy arises as to the part played by the alveolar epithelium. The well-known tendency of proliferating epithelium to undergo metaplasia is well shown in these carcinomata, in which all varieties of epithelial cells may be found side by side. Pure cylindrical-celled carcinoma is not common, and even those growths which can be proved to have originated in the cylindrical epithelium of the bronchial mucosa often show transitional, polymorphous, and squamous cells; as in a case described by Siegert in which the original cylindrical cells of the bronchial epithelium gave rise to a squamous-celled carcinoma. On the other hand, tumors in which connection with the alveolar epithelium seemed to be established beyond a doubt, have shown a metaplasia from squamous cells to cylindrical cells.

The character of the cells cannot, therefore, be depended upon as an exact index to their origin, yet it is probably not merely a coincidence that the largest number of carcinomata in the lung contain cylindrical cells and that the largest number are situated in the bronchial walls. The disappearance of the mucous glands or the filling of the bronchi by the proliferated epithelium, can frequently be proven. In the case of carcinomata of parenchymal origin the point is harder to prove, as in such cases smaller bronchi are always included in the mass and might be regarded as the starting-point. There seems, however, no *a priori* objection to the development of a carcinoma from the alveolar epithelium; rather the contrary. Atypical proliferation of these same cells, leading to the formation of papillary outgrowths into the alveoli or of masses of large non-pigmented cells which lie free within the alveoli, may be observed in several chronic pathological processes in the lung: in chronic passive congestion, in syphilis of the lung (Ziemssen), in chronic productive inflammation following incomplete resolution after pneumonia (Siegert, Perls, Ribbert), and in the epithelium of alveoli which are in the neighborhood of, but not yet invaded by, a carcinomatous or sarcomatous growth (Friedländer, Wagner, Schulz). Metaplasia of the cells is often seen in these cases, the squamous cells giving place to tall cylindrical ones, and there is every reason to believe that these elements, which have taken on an embryonal character, might be the starting-place for a malignant growth. In Friedländer's case the carcinoma arose from squamous cells covering a tuberculous scar in the bronchial wall.

It can readily be seen from the above that the structure

\* Chiari, Strümpell, Siegert, Ebstein, Schwenninger, Ziegler.

† Langhans, Pässler, Birch-Hirschfeld, Schafer.

‡ Perls, Lataste-Malassez, Grünwald, Friedländer, Wolf, Boix, Fuchs.

of carcinoma of the lung is subject to wide variations. The most common form is that which arises in the bronchial wall and consists of anastomosing cords of cylindrical and cubical cells, with a stroma formed from the peribronchial connective tissue, the growth extending along the lymph spaces. Less common are the polymorphous-celled form and the squamous-celled form with typical pearls and hornification.

The stroma of carcinoma of the lung is usually scanty, formed by the peribronchial connective tissue and the alveolar walls. Cornil and Ranvier deny that any new stroma is ever formed, and this is probably true in the earlier stages of the growth; but in older growths the centre may contain a very dense stroma with corresponding decrease of cells (Boix).

Mucous degeneration of the cells is quite common, especially in the peribronchial carcinomata; necrosis, fatty degeneration, and hornification have been found. In the case of tumors which communicate directly with a bronchus or a bronchiectatic cavity suppuration and gangrene may supervene. Carcinoma is probably the underlying cause of many of the cases of so-called spontaneous gangrene of the lung. Concretions corresponding to the corpora amylacea and corpora flava of Siegert, as well as calcareous concretions, have been described. Siegert found partial ossification of the stroma in a squamous-celled carcinoma.

The differentiation between carcinoma of the lung and endothelioma is extremely difficult. Pässler, after a careful review of the one hundred and thirty-two cases of so-called primary carcinoma of the lung, reported in the literature up to 1896, rejects no less than sixty cases, on the ground that the tumors described belonged to the endotheliomata, not to the carcinomata. The point is one which often cannot be decided with absolute certainty. In both we find large nests of epithelial cells filling the lymph spaces, and the crucial point, whether or not the endothelium of these lymph spaces participates in the growth, can hardly ever be determined positively. Malassez, Stilling, Siegert, and Schulz succeeded in demonstrating the unaltered endothelium surrounding the nests of carcinoma cells; while Rokitsky, Schulz, Schottelius, Neelsen, Schwenninger, and Wagner proved the endothelial origin of the growth in their cases. Usually a tumor composed of nests of large cells is pronounced a carcinoma without question; and Klebs is of opinion that in all cases in which the lymph spaces are invaded the endothelial cells participate in the growth. Practically it is very difficult to determine whether the endothelium merely surrounds the cell nests or blends with them, and the difficulty is still greater in those cases in which the atypical proliferation of alveolar epithelium, already described, occurs, and gives the appearance of an early stage of alveolar invasion.

Primary endothelioma may arise from either of the two systems of lymphatics, the superficial or subpleural, in which case the pleura is invariably involved, and the deep or pulmonary, in which case the tumor is apt to form near the root of the lung. It spreads along the interlobular lymphatics, forming chains of nodules.

The coincidence of tuberculosis and carcinoma in the same organ has roused much interest of late, and several cases have been reported of these two processes in the lung. Friedländer and Hildebrand both found squamous-celled carcinoma developing in the epithelium lining a tuberculous cavity. Schwalbe reported three cases of carcinoma and tuberculosis in the same lung and Wolf thirteen. Wolf's statement is somewhat startling; out of thirty-one cases of primary carcinoma of the lung he found thirteen complicated with tuberculosis, a number far exceeding all of those reported in the literature up to that time. Wolf's descriptions, however, leave nothing to be desired. Typical tuberculous nodules, caseation, giant cells, bacilli, in one case general miliary tuberculosis, seem to prove his assertion beyond a doubt.

Metastases from carcinoma of the lung are most common in the regional lymphatic glands, in the other lung, and in the liver, but may be found in any organ or tissue

of the body. Pleura, pericardium, and bone come next to the above-named in order of frequency; less common are metastases in the heart muscle, diaphragm, kidney, adrenals, brain, and spleen; still less common are those in the peritoneum, thyroid gland, pancreas, and gall bladder. A singular situation for a metastatic growth was the centre of a myoma of the uterus. The wall of the oesophagus was invaded in one case, the venæ pulmonales in four, the arteria pulmonalis in four, and the venæ cavæ in five. There is no record of extension to the aorta.

Primary sarcoma of the lung is much less common than carcinoma. Pässler finds four of the former to sixteen of the latter. Sarcoma arises in the peribronchial or interlobular connective tissue. All varieties have been described—round-celled, spindle-celled, giant-celled, mixed-celled.

Secondary carcinoma and secondary sarcoma of the lung are of comparatively frequent occurrence. According to Reinhard the proportion of secondary malignant growths to primary is seventy-four of the former to five of the latter. In the case of secondary carcinoma the original tumor is apt to be situated in the mammary gland, pleura, liver, or stomach; in the case of secondary sarcoma the primary tumor is usually in bone. Secondary growths are apt to be multiple and to involve both lungs. Osler reports a secondary colloid carcinoma which filled both lungs, the primary growth being in the pancreas. In rare instances a single metastasis is found; as in another case of Osler's, a solitary tumor in the pleura, secondary to a myeloid sarcoma of the wrist. The mode of extension of secondary growths is almost always along the lymphatics; very rarely is there an infiltration of the parenchyma. They arise either by extension from neighboring tissues, as the oesophagus, bronchi, mediastinal glands, etc.; or from the pleura along the subpleural lymphatics, or from a distance along the pulmonary lymphatics; or, finally, by an embolus in the pulmonary artery. Aufrecht reports an interesting case of embolism, in a branch of the pulmonary artery, from a carcinoma in the gall bladder; the growth of the embolic carcinoma had not yet penetrated the adventitia of the vessel in which it had lodged.

The etiology of primary malignant tumors of the lung can be only a matter of conjecture in the great majority of cases. Trauma is undoubtedly an important factor; the great preponderance of male over female patients is enough to show that. Osler remarks on the frequency of primary lung carcinoma among the workers of the cobalt mines of Schneeberg. Two of the four cases reported by Aufrecht had a history of severe injury to the affected side of the chest, and Georgi and Löwenthal also could trace their cases to trauma.

In the diagnosis of primary malignant tumors of the lung a distinction between carcinoma, sarcoma, and endothelioma can be made only in those rare instances in which a portion of the tumor is coughed up with the sputum. The greater frequency of carcinoma makes that the most probable diagnosis. Clinically, the distinction is made not between malignant growths of different character, but between the deep-seated ones which arise at the root of the lung and the more superficial or subpleural ones. Roughly speaking, the former simulate mediastinal disease, the latter pleurisy.

Certain general symptoms are common to both the deep and the superficial growths, the most important of which is cachexia, in several instances the only symptom which pointed to a malignant tumor. Pain is a very variable symptom, probably depending largely on the extent to which the pleura is involved. It is sometimes entirely absent, sometimes very severe, like intercostal neuralgia, and it may run down the arm as well as the chest. A feeling of tension without definite pain is sometimes felt. Fever is not common, and when present should be regarded as a complication rather than as an inherent part of the disease, being due not to the tumor but to a pneumonic process, or to putrid infection of a bronchiectatic cavity, or to suppuration or gangrene of the affected part of the lung. Many clinicians lay stress upon the

enlargement of the supra- and infraclavicular lymph glands, but a careful review of the reported cases shows this to be a rare occurrence; nor could it, if present, be regarded as particularly significant, as such an enlargement might be caused by tuberculosis. Osler speaks of swelling of the axillary and even of the inguinal glands, but those cases are very exceptional.

Cough is often absent; when present it may be slight, with little sputum, or severe and persistent, with abundant sputum. A decided difference of opinion exists among the authorities on the subject of the sputum of malignant tumor of the lung. The majority of text-books on medicine lay great stress on this point and consider the characteristic sputum to be the most valuable of all aids to the diagnosis of this obscure affection. As to the kind of sputum, however, which is to be considered characteristic, the opinions differ widely. Some describe it as thin, mucoid, of purplish-brown color, the "prune-juice" sputum. Stokes found this present in ten out of eighteen cases, and thinks it of great diagnostic value. Others describe a reddish, jelly-like substance, sometimes likened to raspberry jelly, sometimes to currant jelly; still others describe it as bright green in color, with large green balls of muco-pus. It may be scanty and non-odorous or abundant and fetid. Blood is often found; Boyd found it in the sputum of more than half of his forty-nine cases. The truth is, that the sputum in malignant tumors of the lung depends not on the primary disease so much as on the extent and character of the bronchial inflammation, the amount of hemorrhage, and the formation of bronchiectatic cavities, etc. The color of the sputum, the presence or absence of blood, the consistence, odor, etc., cannot be regarded as diagnostic, for tuberculosis, bronchiectasis, pneumonia with slow resolution, lung abscess, may cause any of the different kinds of sputum which have been described as characteristic of lung tumor. The only kind of sputum which is absolutely pathognomonic is that which contains portions of the tumor. The references to these in the current text-books would lead one to infer that such sputum is not unusual; but a study of the literature reveals the fact that only five cases have been reported in which portions of the tumor were found in the sputum, three of these five being primary carcinoma, two secondary sarcoma. In the case described by Haempel, of secondary sarcoma of the lung following a primary bone sarcoma, fragments of tissue were found in the sputum, and these proved to be round-celled sarcoma. Eichhorst's case of secondary sarcoma was similar to this. The three cases of carcinoma were not quite so clear, for the sputum did not contain shreds of tissue but only single cells, resembling alveolar epithelium but much larger, multinucleated, and non-pigmented. The case of Krönig is interesting in this connection. He made an exploratory puncture to ascertain whether the dulness present was caused by a collection of fluid; and, failing to obtain any fluid, he made a second attempt with a larger needle and succeeded in removing bits of tissue composed of round cells. The growth proved to be a sarcoma.

The involvement of the pleura often gives rise to the most prominent symptoms, masking the underlying disease. By many authors the hemorrhagic character of the effusion is emphasized; but Moutard-Martin found hemorrhagic pleurisy in only twelve per cent. of the two hundred cases analyzed by him, and Aufrecht goes so far as to say that this form of pleurisy is more common in non-carcinomatous than in carcinomatous cases. The effusion may be abundant, sero-fibrinous, or purulent. The attempt to find cancer cells in the exudate has never succeeded.

So far, the symptoms have been the same for both the deep and the superficial tumors, but in considering the physical signs the two forms must be dealt with separately. Generally speaking, the subjective symptoms are more pronounced in the deep tumors, the physical signs in the superficial. In the deep tumors we have chiefly the disturbances due to pressure upon the nerves, vessels, bronchi, and œsophagus, while the physical signs

of a new growth may be entirely absent. Inspection sometimes reveals a fulness of the affected side with obliteration of the intercostal spaces, but this is more common in the superficial tumors. Later on, contraction of the connective tissue and collapse of atelectatic lung tissue may cause a narrowing of the chest wall. There may be diminished expansion of the affected side. Lividity of the chest on that side and of the corresponding arm has been observed, but usually only late in the course of the disease. Gradually increasing dyspnea is greater in this form than in the superficial, and is both inspiratory and expiratory; sometimes more extreme than is the case in tuberculosis.

Percussion reveals no abnormality in the early stages, but often there is a sudden development of dulness with loss of respiratory sounds, more absolute and more rapid than is usually the case in tuberculosis. Woillez speaks of a tympanitic note on percussion during the earlier stages due to loss of elasticity of the lung tissue, this note then changing suddenly to complete dulness.

The signs on auscultation are those produced by pressure on the bronchi—stridor or weakness or complete absence of the respiratory sounds. The normal tracheal breathing is also apt to be weakened. Curschmann has pointed out the fact that in tumor of the left lung the heart sounds are better conducted through the solid mass than they would be through a pleuritic effusion.

Pressure on the neighboring structures is responsible for the most prominent physical signs and symptoms in the deeply seated tumors. The heart may be displaced; the veins may be compressed and lividity with œdema of the upper, less often of the lower extremity, may result from this narrowing; pressure on the recurrent laryngeal nerve may cause changes in the voice; pressure on the œsophagus may cause difficulty in swallowing. As to this last, a slight compression is not unusual; an extensive compression, however, is very rare. Pressure on nerves other than the recurrent laryngeal almost never occurs. The growth may not only compress the vessels but may involve their walls and lead to rupture with fatal hemorrhage. Such extension has been observed in the case of the vena cava, the vena pulmonales, and the arteria pulmonalis; never in that of the aorta.

As to the diagnosis between carcinoma at the root of the lung and mediastinal tumor, the chief points are: that the mediastinal growth is apt to attain greater dimensions than the lung tumor, so that a large area of dulness under the sternum would more probably mean the former; that dyspnea develops earlier in lung tumor than in mediastinal tumor; and that compression of the vessels with lividity develops earlier in the mediastinal. Signs of compression of the vena cava superior coming on early and followed by dyspnea would, therefore, speak for a mediastinal growth; the reverse order is the rule in lung tumors. On the other hand, involvement of both recurrent laryngeal nerves, without signs of aortic aneurism and without compression of the vena cava superior, would speak for the lung tumor.

The second class of tumors, those which arise in the smaller bronchi or in the parenchyma and are more superficially situated, give often the clinical picture of pleuritis alone, especially when confined to the lower lobes. The line of dulness, which does not change with change of position, is a valuable diagnostic point. Dulness and loss of respiratory sounds are easier to demonstrate in these tumors than in the deeper ones; pain is more severe; but dyspnea and symptoms due to pressure on vessels and nerves are often entirely absent. The diagnosis between these more superficial tumors and tuberculosis is extremely difficult. The absence of tubercle bacilli in the sputum, the late involvement or non-involvement of the apex, the fact that dulness is apt to be greater in front than behind, and to be absolute with complete disappearance of respiratory sounds, these are the chief aids to differentiation between the two processes.

The diagnosis of secondary growths is necessarily simpler. Symptoms referable to the lungs arising in a patient with a previous history of carcinoma or sarcoma

would at once arouse suspicion and lead to a diagnosis which might not have been possible in the absence of a primary growth. However, in both primary and secondary growths inflammatory processes in lung and pleura may completely mask the true nature of the disease, and consequently it is not strange that many cases are reported in which the diagnosis of pleurisy with effusion was made; while there are others which were diagnosed as lung syphilis, lung abscess, gangrene, chronic pneumonia, tuberculosis, etc. Pässler records a case of fatal hemorrhage from the right branch of the pulmonary artery which had become invaded by a lung carcinoma, although there had been, up to the end, no symptoms that could be referred to the lung.

The duration of the disease is said to be from six to eight months, but Ziemssen reports a case which extended over several years, and which, strangely enough, improved temporarily on antisyphilitic treatment. On the other hand, Jaccoud reports one which was fatal within a week after the first appearance of symptoms.

TREATMENT of the disease is necessarily palliative only and must be directed to controlling complications and relieving pain. No possible therapeutics for malignant growths in the lung can be formulated.

Alice Hamilton.

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LUNGS, DISEASES OF: WOUNDS. See Thorax, Surgery of the.

LUNGS, PHYSIOLOGY OF. See Respiration.

LUNGS, SURGERY OF. See Thorax, Surgery of the.

LUPETAZINE—dimethyl piperazine, dipropylene diamine, [HN(CH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>NH]—is a white crystalline powder of the same dosage and therapeutic uses as piperazine. W. A. Bastedo.

LUPULIN.—LUPULINUM.—"The glandular powder separated from the strobiles of" hops, U. S. P. The origin of this substance has been fully described under Hops. It is thus described in the Pharmacopœia:

"Bright brownish-yellow, becoming yellowish-brown, resinous, consisting of minute granules which, as seen under the microscope, are subglobular, or rather hood-shaped, and reticulate; aromatic and bitter.

"When lupulin is agitated with water and the mixture allowed to stand, no considerable sediment (sand, etc.) should be deposited. When ignited, lupulin should not leave more than ten per cent. of ash."

It is obtained from the hops by abrasion, and should then be stirred upon the surface of water to remove heavy impurities, with which it is often greatly adulterated. Such adulteration is readily detected by estimating the percentage of ash, for which the above-named ten per cent. is too liberal an allowance.

The differences in composition and action between hops and lupulin are chiefly those of degree. It yields about three per cent. of volatile oil and a proportionately greater amount of the bitter principle, but lacks the tannin. It is given in doses of from five to thirty grains. The Pharmacopœia provides a fluid extract and an oleoresin, the dose of the latter being from one to five grains.

Henry H. Rusby.

LUPUS ERYTHEMATOSUS.—A disease of the skin which has some of the clinical features of lupus vulgaris, but from which it is absolutely distinct in that the tubercle bacillus of Koch is now known to be absent from its lesions. The name was first used by Cazenave in 1850, and is to-day the recognized name for the disease throughout the world. Unfortunately, the nature of the process

is obscure, there being nothing in the histological appearance of the lesions which can be said to be distinctive of lupus erythematosus. The process commences in the upper corium and consists of an exudation of round cells. This has caused some investigators to regard the nature of the process as inflammatory, and they have accordingly assigned the disease a place in that group. Although this is a decided advance from the position of the earlier dermatologists who placed the disease among the cellular neoplasms, the truth is that even to-day one can find very little in the enormous mass of literature on lupus erythematosus that is available as a basis for a comprehensive definition of the disease.

In sharp contrast with the vagueness of its etiology, the clinical position, in dermatology, of lupus erythematosus is clearly defined. Typical examples of the disease are easy of recognition, for they all have certain marked characteristics. The lesion consists of areas of persistent erythema extending at the margin at a slow rate, and showing a marked tendency to sink in at the oldest portion, a phenomenon to which the name of central atrophy has been given.

SYMPTOMATOLOGY.—Lupus erythematosus, as it first appears, consists in the formation of one or several slightly raised areas of a bright red color, from the size of a pinhead to that of a bean. These areas do not entirely disappear on pressure, and their color is apt to vary a good deal from day to day, sometimes nearly fading out and at other times being intensely red. After the disease has remained in this state for an uncertain period peripheral extension occurs; that is, the sharply defined patch of erythema gradually increases in area through the involvement of the adjacent skin. At the same time the central area is seen to be covered with scales. These scales are usually small and very adherent. On attempting to remove them, one sees that they are attached to the sides of the mouths of the sebaceous follicles, which seem to be early affected in the disease by an abnormal hyperkeratosis that extends deeply into the glands. The rate of extension varies greatly, but the process has always a chronic course. Sometimes there is extension at one part of the border without any change at the remainder, and often the entire patch may remain for months without appreciable enlargement. The changes in the central area of the patches are equally uncertain, but usually the atrophic tendency can be recognized in most cases. This consists in a sinking-in of the patch in this region with a decided lessening of the color. When the lesion is fully developed, the atrophic skin is white and glistening, somewhat resembling a cicatrix, from which it differs microscopically and clinically by the absence of true scar tissue. Furthermore, it does not contract and displace the adjacent parts. In favorable cases the erythematous border may entirely disappear, leaving only the atrophic centre which is absolutely permanent. This termination is rare, however, most cases showing activity in some part of the integument for years. Sometimes the lesions are the site of other processes, among which true lupus and epithelioma are the most important.

The commonest seat of lupus erythematosus is upon the face. Here the disease often shows itself with absolute bilateral symmetry. The "butterfly lesion" of Hebra is classical and is formed by the involvement of the cheeks and the dorsum of the nose, the areas on the cheeks representing the two outstretched wings of the butterfly and that on the nose its body. At times in connection with this lesion, and at other times existing alone, lesions of the ears, scalp, eyebrows, and lips may be seen. Another occasional site for the disease is the back of the hands, the fingers, and the toes. The lesions in these different places are apt to be modified somewhat by the variations in the anatomy of the skin in the different regions. This is especially true of the scalp, where the characteristic red border is not well marked, and where the permanent loss of hair over the area of central atrophy is a predominating symptom.

Lupus erythematosus of the mucous membrane is ex-