

THE RELATION OF APICAL TUBERCULOSIS OF ADULTS TO THE FOCAL TUBERCULOSIS OF CHILDREN.

BY EUGENE L. OPIE, M.D.

(From the Department of Pathology of Washington University Medical School,
St. Louis.)

PLATES 20 AND 21.

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In a previous article¹ I have shown that the lungs of almost every individual who has reached adult life (18 years) contain foci of tuberculosis which, occurring in any part of the lung and associated with tuberculosis of the regional lymphatic nodes, have the characters of pulmonary tuberculosis in childhood. In infancy tuberculosis is almost invariably fatal, but between the ages of 2 and 18 years tuberculous lesions of the lung heal with increasing frequency as age advances. Almost every child is spontaneously inoculated or "vaccinated" with tuberculosis. The early experiments of Koch² confirmed by subsequent observers have shown that a first infection with tuberculosis modifies the course of a second infection. Koch's fundamental experiment showed that the injection of tubercle bacilli into the subcutaneous tissue of animals already infected with tuberculosis caused a reaction at the site of infection more severe than that of the first infection, but the lesion did not progress and there was no involvement of the regional lymphatic nodes. Experience acquired by attempted immunization of small animals and by the inoculation of cattle with tubercle bacilli of human type has demonstrated that immunity conferred by a first infection with tubercle bacilli is relative and not absolute, and tends to diminish and perhaps disappear after complete healing of the tuberculous lesions caused by inoculation.

Fatal pulmonary tuberculosis of adults and of older children with few exceptions has its origin in the apices of the lungs and like the second infection of animals, produced by Koch and others, is unaccompanied by caseous lesions of the regional lymphatic nodes. These characters serve to separate adult from infantile tuberculosis. The incidence of focal and apical tuberculosis of the lungs in a series of autopsies on children and adults has already been shown.³ It

¹ Opie, E. L., *J. Exp. Med.*, 1917, xxv, 855.

² Koch, *Deutsch. med. Woch.*, 1891, xvii, 101.

³ See Tables I and III of the previous article,¹ pp. 857 and 865.

is probable that the percentage of focal infections in adults is greater than that indicated by the tables³ and closely approximates 100 per cent, for in those instances in which no pulmonary lesion was found tuberculosis of lymphatic nodes in two instances demonstrated only by microscopic examination suggested the probability that corresponding pulmonary lesions had been overlooked. Even if this view is incorrect it may be assumed that tuberculosis of lymphatic nodes or of other organs would exert an influence upon resistance similar to that of primary pulmonary tuberculosis. Nevertheless the identification of a focal pulmonary lesion accompanied by tuberculosis of regional lymphatic nodes in the lungs of an adult is significant, for, as the tables show, it indicates that tuberculosis has been acquired in childhood and presumably antedates an apical lesion with which it may be associated. Orth⁴ states that the experience of pathological anatomy contradicts the view that there is in every instance of phthisis an older lesion which has had its origin in childhood, and in most individuals who have died of phthisis he has found no such older lesion.

In view of the character of the material which has been available for study it has been the primary purpose of the present investigation to study the relation of non-lethal apical tuberculosis to the focal tuberculosis of childhood. Incidentally there has been an opportunity to compare healed or encapsulated apical tuberculosis with progressive apical phthisis and to determine as far as possible whether apical tuberculosis has a greater tendency to a fatal issue in those who have escaped infection in childhood.

Apical lesions have been regarded as tuberculous when microscopic examination has demonstrated the presence of recognizable tubercles, when caseation has occurred, or when calcified nodules which represent the site of former caseation are embedded within fibrous tissue. There is little reason for doubting that the fibrous scars which often pucker the apical pleura and usually extend as wedge-shaped masses into the lung substance have their origin in tuberculous infection, but in the absence of recognizable tubercles, caseation, or calcification these lesions have not been designated tuberculous. A healed tuberculous focus consisting of fibrous tissue in which are

⁴ Orth, J., *Drei Vorträge über Tuberkulose*, Berlin, 1913.

calcified nodules may be found at one apex, whereas at the other there is only fibrous induration. There is more doubt concerning the nature of fibrous induration which not infrequently involves the pleura over a circumscribed area at the apex of the lung and does not penetrate into the underlying lung tissue. This pleural induration is not infrequently found at the apex of one lung, whereas there is a fibrous scar at the apex of the other lung, and occasionally with a caseous lesion of one lung the opposite apical pleura is indurated.

Table I shows the frequency with which apical tuberculous lesions have occurred at various ages in autopsies on adults and children.

TABLE I.

Age.	No. of autopsies.	Active apical tuberculosis.	Encapsulated apical tuberculosis.	Total apical pulmonary tuberculosis.		
Children.						
<i>yrs.</i>			<i>per cent</i>		<i>per cent</i>	<i>per cent</i>
Under 1	43	—	—	—	—	—
1-2	16	—	—	—	—	—
2-5	14	—	—	—	—	—
5-10	11	—	—	—	—	—
10-18	9	1	11.1	—	—	11.1
Adults.						
18-30	6	1	16.7	—	—	16.7
30-50	23	1	4.3	2	8.7	13.0
50-70	15	1	6.7	3	20.0	26.7
70+	6	—	—	3	50.0	50.0

The number of cases in each group is small and the percentages represent only crudely the incidence of the various lesions at various ages. Nevertheless they show that the incidence of encapsulated and healed tuberculosis increases with increasing age whereas there is no similar increase in the incidence of active tuberculosis.

Table II shows the frequency of induration affecting the apical pleura and of fibrous scars at the apices of the lungs.

The table shows that these purely fibrous lesions like healing or healed apical lesions which are demonstrably tuberculous are uncom-

TABLE II.

Age.	No. of autopsies.	Induration of apical pleura.		Scars within apex.	
Children.					
<i>yrs.</i>			<i>per cent</i>		<i>per cent</i>
Under 1	43	—	—	—	—
1- 2	16	—	—	—	—
2- 5	14	—	—	—	—
5-10	11	—	—	—	—
10-18	9	—	—	—	—
Adults.					
18-30	6	1	16.7	1	16.7
30-50	23	4	17.4	4	17.4
50-70	15	6	40.0	5	33.3
70+	6	2	33.3	1	16.7

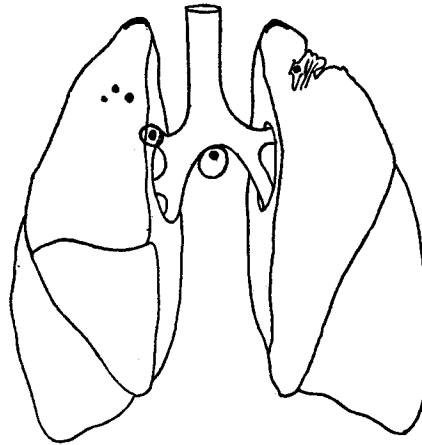
mon in early adult life, but increase in frequency as age progresses. They do not increase after the age of 70 years because at this time pulmonary apices of over half of all individuals are occupied by frankly tuberculous lesions.

Apical pleural induration in all instances has been accompanied by demonstrably tuberculous lesions in some other part of the lungs.

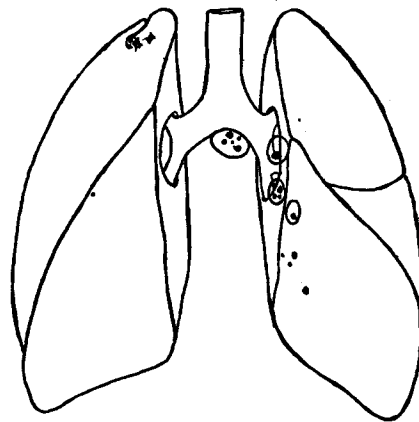
Table I contains eight instances of encapsulated apical tuberculosis. In these lungs focal tuberculous lesions have been found in association with the apical lesions and without doubt have antedated them. The situation of the focal lesion in relation to the apical lesion is shown by Text-figs. 1 to 7^{5, 6} and in x-ray plates (Figs. 1, 2, and 3). These focal lesions have been in most instances firmly calcified and completely healed; in five (Text-figs. 1 to 3^{5, 6}) of eight instances the focal nodules have been of almost stony hardness. In two instances (Text-figs. 4 and 5) the focal lesions have been caseous and partly calcified (mortar-like), and in one instance (Text-fig. 6) calcified, partially calcified, and encapsulated caseous foci have been found in the lungs.

⁵ See also Text-fig. 7 of the previous article.¹

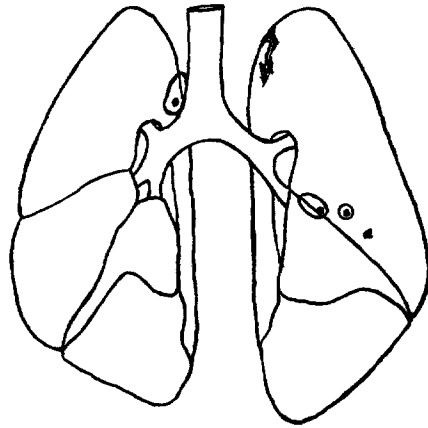
⁶ See also Text-fig. 8 of the previous article.¹



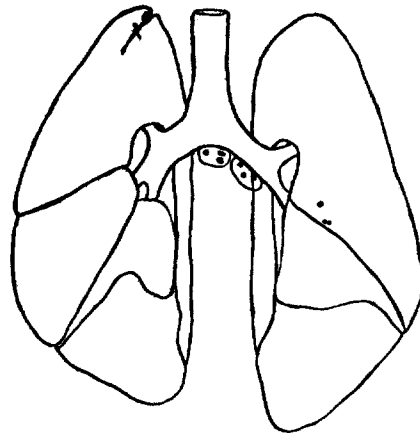
TEXT-FIG. 1. Anterior view of the lungs of a white woman, age 54 years, who died after hysterectomy for carcinoma of the cervix. There are three encapsulated nodules in the upper part of the right upper lobe and calcified nodules are found in lymph glands at the hilus of the right upper lobe and at the bifurcation of the trachea. There is an indurated fibrous area containing a caseous focus situated in contact with the pleura of the external surface of the left upper lobe a short distance below the apex of the lung. The pleura over this area is puckered and at one place drawn far into the substance of the lung.



TEXT-FIG. 2. Posterior view of the lungs of a colored woman, age 60 years, who died of chronic endocarditis, general arteriosclerosis, and cerebral embolism. In the right lower lobe below the pleura of the external surface are three small encapsulated calcified nodules and in the substance of the lobe is a fourth calcified nodule. In the lymph nodes at the hilus of the right lower lobe and at the bifurcation of the trachea are calcified nodules. Just below the apex of the left upper lobe continuous with the indrawn pleura is a thick strand of pigmented fibrous tissue which passes into the substance of the lobe and is continuous with an area of fibrous induration containing two caseous areas.



TEXT-FIG. 3. Median view of the lungs of a white man, age 61 years, who died of hypernephroma of the kidney with metastases to the liver, lymph nodes, and bone, general arteriosclerosis, chronic passive congestion of viscera, ascites, and pleural effusion. There is a calcified nodule in the lower part of the upper left lobe and calcified nodules occur in adjacent lymphatic nodes and in a lymphatic node above the right bronchus. At the apex of the left lung continuous with the pleura of the median surface just below the apex is a narrow mass of fibrous tissue containing a small caseous area.



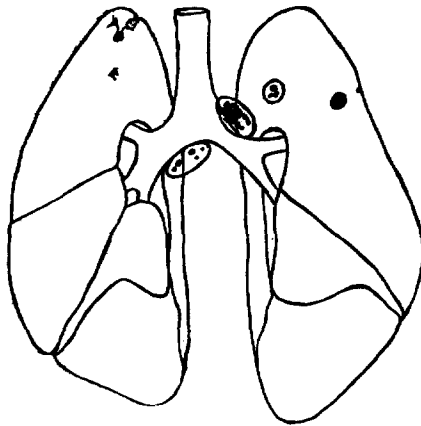
TEXT-FIG. 4. Median view of the lungs of a white man, age 73 years, who died with carcinoma of the sigmoid flexure of the colon, intestinal obstruction, perforation of the intestine and peritonitis, arteriosclerosis, chronic nephritis with granular kidneys, hypertrophy of the heart, and myocarditis. In the lower part of the left upper lobe are three encapsulated partially calcified caseous nodules. In lymph nodes below the left bronchus and at the bifurcation of the trachea are partially calcified caseous nodules. Just below the apex of the right upper lobe extending from the indrawn pleura into the substance of the lung is a coarse strand of fibrous tissue within which is a partially calcified caseous nodule.

The apical lesions have in several instances occupied the greater part of one or both apices and have consisted of numerous caseous tubercles embedded in fibrous tissue pigmented black by inhalation pigment (Figs. 1 and 3 and Text-figs. 6 and 7^{b, c}). In other instances the lesion has consisted of strands or masses of fibrous tissue in which are caseous or caseous and partially calcified nodules (Fig. 2 and Text-figs. 1 to 5). In every instance the lesion is at some point in contact with the pleural surface near the apex of the lung. The pleura at the site of contact with the lesion is puckered and not infrequently deeply drawn into the lesion (Text-figs. 1, 2, and 4).

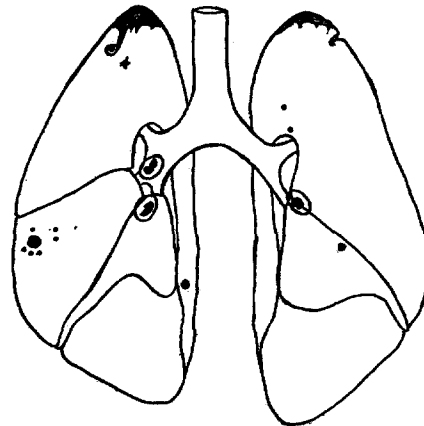
In the instances which have been cited slowly progressive tuberculosis characterized by abundant formation of fibrous tissue has occurred at the apex of the lung and has been associated with focal pulmonary lesions doubtless acquired in childhood. In one instance slowly progressive tuberculosis of organs other than the lung, namely the adrenals, accompanied focal encapsulated caseous lesions of the lower part of the upper lobe of the right lung and encapsulated caseous lesions of the regional lymphatic nodes. Pigmentation of the skin with general weakness had been noted 4 years before death and at autopsy the adrenals were found transformed into masses of dense fibrous tissue containing caseous spots. It is noteworthy that the lesions in this instance were all caseous and encapsulated; beginning calcification of the pulmonary lesion indicated that it was older than those found in other organs.

In one instance (Text-fig. 7) chronic apical tuberculosis in a woman aged 39 years was active and implicated a considerable part of the left lung but found in association with carcinoma of the stomach with metastases in the ovaries, liver, and peritoneum was not the cause of death. In the upper and lower lobes on the right side there were firmly calcified nodules and the regional lymphatic nodes contained similar foci. The presence of abundant pigmented fibrous tissue was index of the slow progress of the lesion. It is not improbable that associated cancer produced conditions favorable to the extension of an apical lesion.

One instance of fatal tuberculosis of the lung complicated by the presence of chronic peritonitis and chronic unilateral pleurisy does not admit of any conclusion concerning the primary seat of infection;



TEXT-FIG. 5.



TEXT-FIG. 6.

TEXT-FIG. 5. Median view of the lungs of a white man, age 40 years, who died of anthracosis of the lungs, hypertrophy of the right heart, and central necrosis of the liver. In the left upper lobe are two caseous partly calcified nodules, the larger 1.2 cm. across; in regional lymphatic nodes within the lung above the right bronchus and at the bifurcation of the trachea are caseous partly calcified nodules. At the apex of the right lung continuous with the puckered pleura is deeply pigmented fibrous tissue containing three small calcified nodules and one caseous area. In the substance of the upper right lobe near the apex is a fibrous area in which are two calcified nodules.

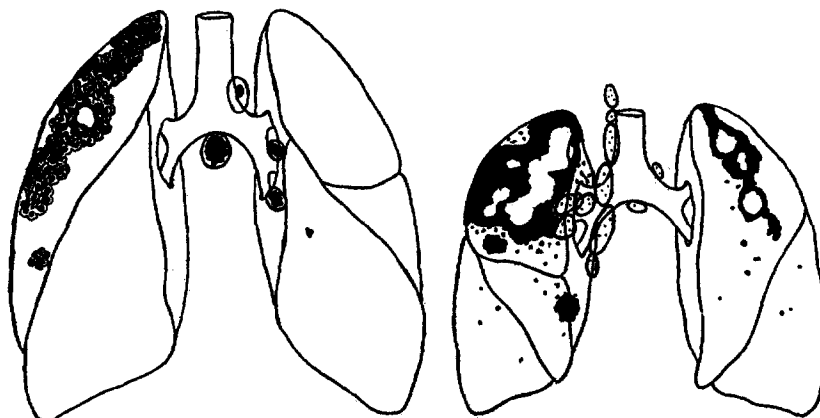
TEXT-FIG. 6. Median view of the lungs of a white man, age 74 years, who died after resection of the cecum for carcinoma with purulent peritonitis, general arteriosclerosis, and chronic nephritis. In the right middle lobe is a calcified nodule 1.2 cm. across, and nearby just below the pleura are a number of small calcified nodules. In the right lower lobe is a partially calcified encapsulated caseous nodule. At the hilus of the right middle and lower lobes are two lymphatic nodes containing encapsulated caseous foci. In the left lower lobe is an encapsulated partially calcified caseous focus, and a similar focus occurs in an adjacent lymph node. Two small calcified nodules occur below the pleura of the median surface of the left upper lobe. The apex of the right upper lobe is occupied by a consolidated fibrous area 1.5 cm. in thickness. It contains several small smooth-walled cavities about 3 mm. in diameter. A fibrous strand extends downward from this indurated area and surrounds a caseous focus. A second caseous focus surrounded by fibrous tissue occurs in the lung substance nearby. The apex of the left upper lobe shows fibrous induration similar to that on the right side forming a zone 0.5 cm. in thickness.

there was a small caseous focal lesion in the upper lobe of the right lung but the lymphatic nodes at the hilus of the lobe contained no tuberculous lesions. This focal lesion was recognized by its shadow 2 mm. across cast upon an x-ray plate and doubtless contained some calcium salts, although there was no macroscopic evidence of calcification. With chronic tuberculous pleurisy there was effusion into the left pleural cavity, atelectasis of the left lung, and chronic tuberculous peritonitis with adhesions firmly matting together the intestines. There was active caseous tuberculosis of the right lung most advanced near the median surface of the organ where the lung had been subjected to the pressure of the effusion in the left pleural cavity. There was some fibrous induration at the apex of the compressed left lung. The tuberculous lesion of the peritoneum and pleura was characterized by the new formation of abundant fibrous tissue and had pursued a chronic course.

It is noteworthy that in two instances pulmonary tuberculosis has been the cause of death and in neither of these cases were pre-existing focal lesions found in the lungs.

Text-fig. 8 is a diagram of tuberculous lesions in the lungs of a child 11 years of age. Almost the entire right upper lobe including the apex is consolidated, in large part caseous, and contains numerous cavities. The upper part of the left upper lobe contains similar consolidated areas in which are cavities. The remainder of the lungs contains scattered tubercles. Lymphatic nodes at the hilus of the right lung and along the right side of the trachea are much enlarged and succulent; there is no evident caseation, but microscopic examination shows the presence of scattered caseous tubercles. The lungs were cut into thin sections and no focal lesions were recognized. There were tuberculosis of the larynx, tuberculous ulcers of the intestine, and tuberculous peritonitis. The von Pirquet tuberculin test was negative 6 weeks before death.

The second instance of fatal tuberculosis (Text-fig. 9) is a remarkable example of acute rapidly progressive disease terminating with tuberculosis of the bodies of the lumbar vertebræ, psoas abscess, tuberculosis of retroperitoneal lymphatic nodes, tuberculosis of the thoracic duct, and disseminated miliary tuberculosis in a man with no old focal tuberculous lesion of the lung. An apical lesion which



TEXT-FIG. 7.

TEXT-FIG. 8.

TEXT-FIG. 7. Posterior view of the lungs of a white woman, age 39 years, who died of carcinoma of the stomach and metastatic carcinoma of the ovaries, liver, and peritoneum. There is chronic pulmonary tuberculosis with abundant formation of fibrous tissue at the upper part of the left upper lobe; cavities have been formed. Several scattered areas of similar consolidation occur in other parts of the lungs; a consolidated partially caseous area in the mid-part of the right lung has been omitted from the diagram. There is an encapsulated calcified nodule 3.5 cm. across in the upper part of the right lower lobe; calcified foci are found in lymphatic nodes at the hilus of the same lobe, at the bifurcation of the trachea, and above the right bronchus.

TEXT-FIG. 8. Anterior view of the lungs of a white child, age 11 years, who died of pulmonary tuberculosis with cavity formation, tuberculous ulceration of the larynx, tubercles in tonsil, intestine, and liver, and tuberculous peritonitis. The von Pirquet tuberculin reaction was negative 6 weeks before death. There is tuberculosis with cavity formation involving both apices but much more advanced on the right side. Lymphatic nodes at the hilus of the right upper lobe, about the right bronchus, and along the right side of the trachea are much enlarged and contain tubercles.

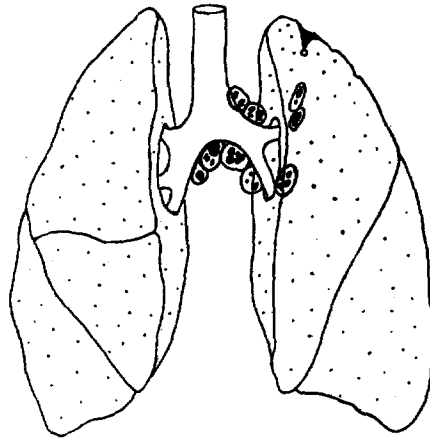
had undergone caseation was found in the left lung immediately below the pleura. In continuity with this lesion was a small dilated bronchus, of which the wall was caseous. Below the level of this caseous bronchus were numerous patches of tuberculous bronchopneumonia. The remainder of both lungs was occupied by numerous miliary tubercles. An x-ray plate (Fig. 4) demonstrates the absence of calcified nodules within the substance of the lung or in the regional lymphatic nodes.

It is particularly significant that in the absence of focal pulmonary lesions lymphatic nodes within the substance of the left upper lobe in proximity to the apical lesion and at the hilus of the lobe are enlarged and caseous (Text-fig. 9). It may be assumed that in the absence of preexisting tuberculosis the apical lesion has caused active tuberculosis of the regional lymphatic nodes. The apical lesion has acted as a first infection.

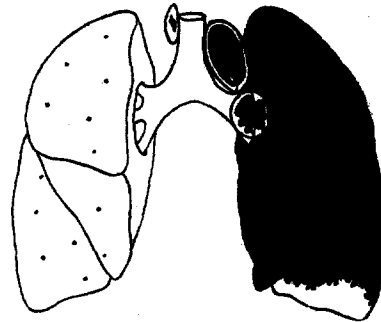
This relation of the regional lymphatic nodes to a first infection with tuberculosis is well illustrated by the spontaneous occurrence of tuberculosis in a macaque monkey kept in confinement. The entire left lung with the exception of a small area at the base is the site of tuberculous pneumonia with widespread caseation (Text-fig. 10). The lymphatic nodes at the hilus of the affected lung are greatly enlarged and partially caseous.

The relation of the focal tuberculous lesions usually acquired in childhood and of the corresponding lesions of regional lymphatic nodes to coexisting apical tuberculosis furnishes no evidence that the apical lesion is derived from the preexisting focal lesion. In most instances the focal pulmonary lesion and the accompanying lesions of lymphatic nodes have been firmly calcified and completely healed whereas the apical lesion is caseous (Text-figs. 1 to 3^{5, 6}).

There is little probability that tuberculous infection has been transmitted by way of the lymphatics from the focal lesion of the lung or of the regional lymphatic nodes to the apex. The large lymphatic trunks of the lung fall into two groups; namely, superficial collecting trunks which, situated below the pleura, pass to the lymphatic nodes at the hilus of the lung, and deep collecting trunks which follow the bronchi, the pulmonary arteries, and the pulmonary veins to the nodes at the hilus of the lungs. It is not improbable that



TEXT-FIG. 9.



TEXT-FIG. 10.

TEXT-FIG. 9. Anterior view of the lungs of a colored man, age 28 years, who died of pulmonary tuberculosis, tuberculosis of the body of the second lumbar vertebra, psoas abscess, tuberculosis of retroperitoneal lymphatic nodes, tuberculosis of the thoracic duct, and disseminated miliary tuberculosis. The lungs are studded with miliary tubercles. At the apex of the left lung below the pleura of the external aspect of the lung is a caseous area 2 by 2 cm. on the surface extending in wedge-shaped form 1.5 cm. into the lung. At the apex of the wedge is a dilated bronchus with caseous wall. In the substance of the left upper lobe in a line between the tuberculous lesion in the apex and the hilus of the lung are enlarged partially caseous lymphatic nodes. About the left bronchus and at the bifurcation of the trachea are similar freshly caseous enlarged lymphatic nodes.

TEXT-FIG. 10. Anterior view of the lungs of a macaque monkey which died of tuberculous pneumonia involving almost the entire left lung. Lymphatic nodes at the hilus of the left lung are greatly enlarged and caseous.

lesions of lymphatic trunks or of lymphatic nodes may cause a reversal of the current within lymphatics. In four instances (Text-figs. 1, 2, and 7⁶) focal pulmonary lesions have been situated in the right lung whereas there has been an apical lesion only on the left side. In two instances (Text-fig. 4⁵) with focal lesions in the left lung apical lesions have been found only on the right side. The probability of transmission by lymphatic channels from the lung or lymphatic nodes on the one side to the apex of the opposite lung is scant.

SUMMARY.

The age incidence of focal tuberculous lesions of the lungs demonstrates that they have their origin in most instances in childhood. Focal lesions which heal have been found at all ages after the 2nd year of life, but in more than half of all individuals these lesions are acquired between the ages of 10 and 18 years. In the period between 18 and 30 years at least 85 per cent of all individuals have acquired focal tuberculous lesions. The occurrence of tuberculous infection in the lungs, in regional lymphatic nodes, or in some other organs of the body such as the gastrointestinal tract and its lymphatic system, is nearly universal but doubtless a few individuals escape. That focal tuberculous lesions of the lung are occasionally acquired during adult life is shown by the slight increase in the proportion of those with these lesions as age increases from 18 years to old age.⁸

Apical lesions of the lung make their appearance in later childhood and occur with increasing frequency from adolescence to old age (50 per cent). After the 2nd year of life focal tuberculous lesions occurring in situations other than the apices of the lungs tend to heal and after the 10th year focal lesions are almost invariably encapsulated and latent or healed. Fatal tuberculosis after the 10th year is with few exceptions apical in origin. The apices are not only more susceptible to infection in later life but once infected afford less resistance to the extension of the lesion.

The present series of cases has furnished opportunity to observe the character of the apical lesion in lungs of individuals previously infected with tuberculosis. With one exception the apical lesion (in eight instances) has pursued a chronic course and, encapsulated

by fibrous tissue, has remained limited to the extreme apex of the lung. In one instance in a woman with advanced malignant disease chronic pulmonary tuberculosis has been progressive. Tuberculosis of the apices in those who have previously acquired a focal tuberculous lesion has pursued a chronic course and in most instances has remained latent or has completely healed.

A very small group of instances of fatal pulmonary tuberculosis suggests that apical lesions in those who have not undergone previous infection may assume an unusually severe character. One instance of apical tuberculosis unaccompanied by focal lesions and followed by tuberculosis of the thoracic duct and disseminated miliary tuberculosis has been especially significant. Apical tuberculosis unaccompanied by evidence of preexisting tuberculosis may be accompanied by tuberculosis of the regional lymphatic nodes, whereas apical tuberculosis in an individual with a preexistent focal tuberculous lesion is not followed by tuberculosis of adjacent lymphatic nodes. It is well known that tuberculosis in previously uninfected animals is followed by tuberculosis of adjacent lymphatic nodes, whereas a second infection fails to implicate the regional lymphatic nodes. This relation has been well illustrated by the lungs of a monkey which acquired in confinement acute tuberculous pneumonia limited to the left lung; the lymphatic nodes on this side were greatly enlarged and caseous.

The following observations indicate that apical tuberculosis of adults is not the result of infantile tuberculosis but is caused by subsequent infection: (a) Apical tuberculosis does not have its highest incidence, in accordance with common belief, in early adult life when focal infections acquired in childhood are relatively fresh and active but is more common in later life when the focal lesions of childhood have in most instances completely healed. It is noteworthy that most of these apical lesions of later life pursue a chronic course and are discovered at autopsy in individuals who have died from other causes. (b) The well characterized lesions of tuberculosis acquired in childhood and found in adults with apical lesions are almost invariably calcified and healed. The apical lesion is in most instances relatively fresh and caseous whereas the focal pulmonary lesion and associated lesions of regional lymphatic nodes exhibit no evidence

of activity. (c) In a large proportion of instances of associated focal and apical tuberculosis the focal lesion is in one lung, whereas the apical lesion is limited to the opposite apex. This relation affords no support to the view that tuberculous lesions may be transmitted to the apex by way of the lymphatics.

EXPLANATION OF PLATES.

PLATE 20.

FIG. 1. X-ray plate of the lungs of a man, age 74 years. There is a consolidated area at the left apex containing caseous foci impregnated with enough calcium salts to cast shadows upon the plate. In the right lower lobe and in adjacent lymphatic nodes are completely healed firmly calcified nodules.⁷

FIG. 2. X-ray plate of the lungs of a man, age 40 years. The positions of the right and left lungs are reversed in the plate. At the right apex continuous with the pleura are strands of fibrous tissue in which occur small caseous and calcified areas. In the right upper lobe below the apex is a small fibrous patch containing two caseous partially calcified spots. In the left upper lobe near the inner surface is a firmly calcified encapsulated nodule 1 cm. across. Caseous areas of mortar-like consistency occur in regional lymphatic nodes. No nodule was found, after prolonged search, corresponding to the shadow 2 cm. across in the lower right lobe. Compare with Text-fig. 5 from the same lungs.

PLATE 21.

FIG. 3. X-ray plate of the lungs of a man, age 74 years. The positions of the right and left lungs are reversed in the plate. At the apex of the right lung there is an indurated area containing a caseous spot. The apex of the left lung is indurated. In the right middle and lower lobes, in the left lower lobe, and in regional lymphatic nodes are calcified, partially calcified, or caseous nodules. Compare with Text-fig. 6 from the same lungs.

FIG. 4. X-ray plate of the lungs of a man, age 28 years, who died of acute miliary tuberculosis. There are no shadows suggesting the presence of calcified nodules in the lungs or in their lymphatic nodes. Compare with Text-fig. 9 from the same lungs.

⁷ Text-fig. 8 of the previous article¹ is a diagram of these lungs.

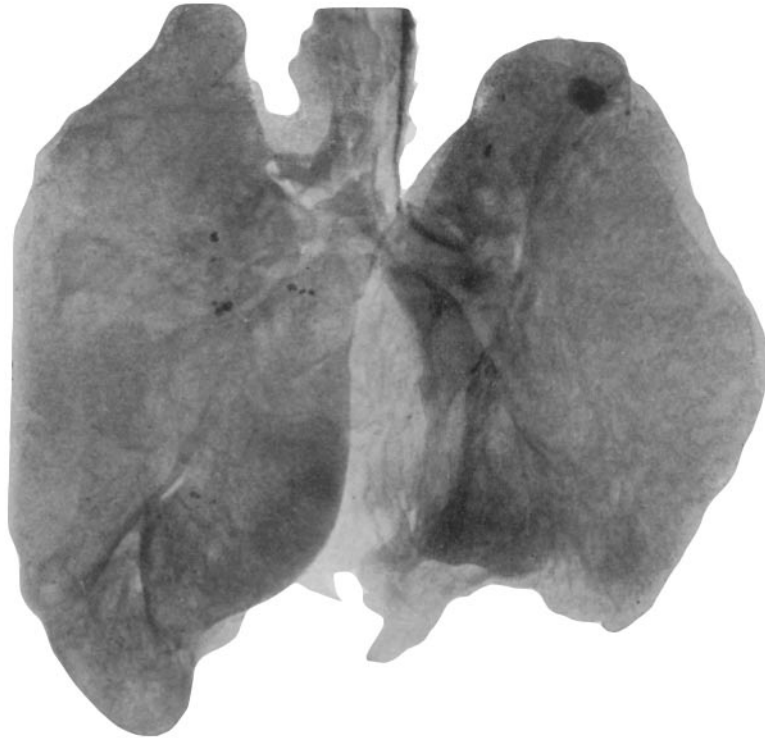


FIG. 1.

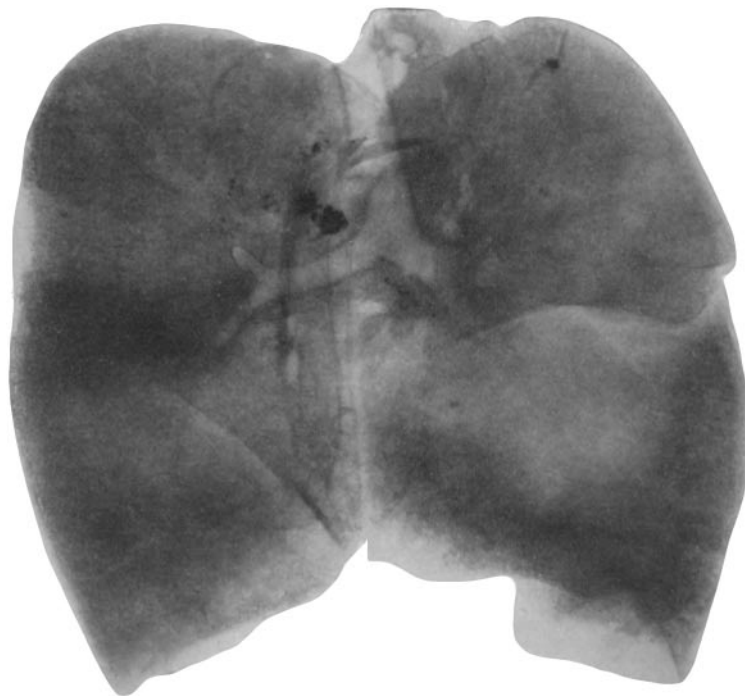


FIG. 2.

(Opie: Tuberculosis of adults and children.)

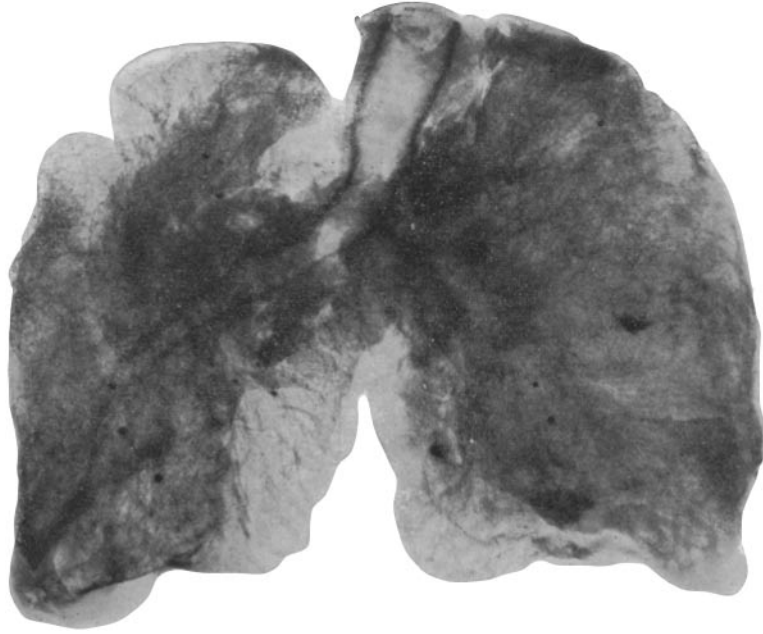


FIG. 3.

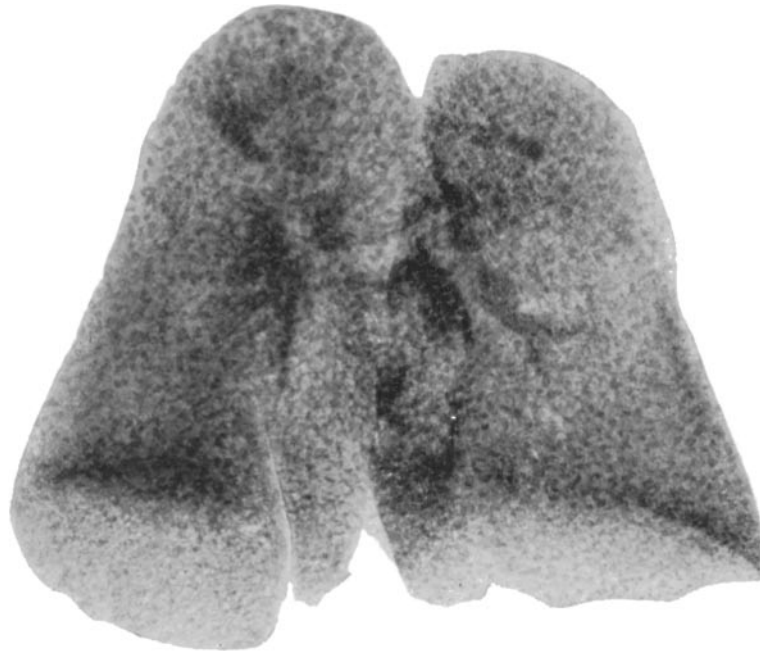


FIG. 4.

(Opie: Tuberculosis of adults and children.)