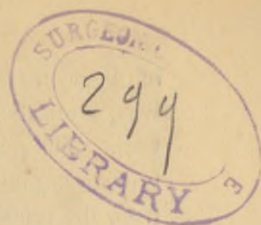


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INFLAMMATION AND ABSCESSSES OF THE LUNG

CAUSED BY

CLOSURE OF THE PRIMARY BRONCHUS.

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On February 29th, 1856, an intemperate woman was brought to the Massachusetts General Hospital, with a fracture of the left tibia and fibula, and a great effusion of blood into the thigh. With the exception of a tendency to delirium tremens, nothing remarkable occurred, until March 17th, when she was reported to have coughed much in the night. On the following day, dulness and bronchial respiration were detected in front, over the left side of the chest. The tongue was brown, dry and cracked. Pulse 80. On the 19th, the physical signs remained the same, and the patient declared that the expectoration had been of a reddish color, but nothing of the kind was seen by the nurse or house-surgeon. Its appearance was not at this time, nor afterwards, in any way remarkable. On March 27th, the upper part of the left side of the chest, as she lay in bed, was more resonant, but on sitting up the dulness became universal. The prostration at first was such that the back could not be examined, but bronchophony was now heard in the upper part, where there was an absence of fremitus. On June 24th, the resonance was reported as much more marked in the left side of the chest. Here the record of the physical signs ceased. The cough in the mean time had been occasionally troublesome, but was not generally so. During two or three days, in the early part

of April, there was considerable heat of the skin, and the patient was, a number of times afterwards, troubled with profuse perspiration. The pulse generally varied from 82 to 96. Pain was several times complained of in the lower part of the left chest, but, judging from the record, this was neither a prominent nor frequent symptom.

From the first the debility was marked, but, as the fractured bones united, she was able to move about on crutches. On June 29th, however, the pulse became quick, the perspiration profuse, and she was confined to her bed. On the 30th of August she was able to sit up, but on Sept. 5th there was a marked loss of strength and appetite. On the 7th, she had a violent paroxysm of cough, raised herself in bed, expectorated two ounces of blood, and then expired, her mouth being filled with a dark, dirty fluid.

Autopsy, 11 hours after death. The *dura mater* was flaccid. Attached to, but easily separable from, the under surface of that portion covering the convexity of the brain, was a pretty firm, yellowish-white, semi-gelatinous layer, about a line in thickness. There was more serum than usual beneath the arachnoid. The substance of the *brain* was rather soft.

The upper and posterior part of the *left lung* was firmly adherent to the parietes, the uniting membrane being very old and strong. The remaining cavity was lined with an old, thick, irregular false membrane, within which were found three pints of pus. Floating in this were a number of long cylindrical coagula, evidently recent, and moulded in some narrow passage. Several of these were also found hanging from openings in the false membrane, through one of which a probe passed into a cavity in the lung, to be described hereafter. The *arch of the aorta* was considerably dilated. In the descending portion was an abrupt aneurismal dilatation, perhaps two inches in diameter, with a smooth, well-defined mouth of about half that size. At the bottom of the sac was an opening through which a probe passed into the left primary bronchus, at a point between two and three inches from the bifurcation of the trachea. Above the opening was an old pale-red coagulum, which had apparently closed the passage, but the blood from the ruptured aneurism had forced its way into the trachea. The *bronchi* contained many coagula, and much dirty brownish fluid. The *lung* was but five inches in length. Scattered throughout its substance were cavities from three lines to an inch in diameter, communicating freely with the bronchi, with the mucous membrane of which their rough,

ragged walls were continuous. They also contained much dirty-brownish fluid and coagula. The intervening substance was quite firm, and of a dark-gray color, looking very much like pumice-stone. There was no tuberculous disease; no pneumonia; no gangrenous odor. It was evident that the coagula found in the pleural cavity had the same source as those in the air passages.

Two ounces of serum existed in the *right pleural cavity*. The *right lung* was very large and fully distended with air. In its substance were many bloody spots, evidently owing to the entrance of blood into the bronchi. The *pericardium* contained about two ounces of whitish serum. The *heart* was flaccid. Blood thin.

There was one pint of serum in the *peritoneal cavity*. The *arch of the colon* was adherent to the parietes.

The *spleen* was of large size; weight, $10\frac{1}{2}$ ounces.

The *kidneys* were large.

The condition of the lung was considered very interesting in connection with the closure of the primary bronchus. It may, however, be maintained that, as the rupture took place below the coagulum and was followed by hæmoptysis, there could not have been complete closure; but it is evident that the blood forced its way beyond the obstruction, at the time of the accident, as it was only after this that the mouth was filled with the dirty fluid, found in such abundance throughout the lung. Nor is the existence of bronchial respiration incompatible with complete closure, for it is well known that sounds formed in one side of the chest may be heard in the other, and the dense tissue of the left lung might readily transmit a sound formed in the lower part of the trachea or right primary bronchus.

The appearances, in this case, recalled a similar one, seen a number of years since. The examination was made by Dr. J. B. S. Jackson, to whom I am indebted for the following facts.

The patient was perfectly healthy before his last illness, and was engaged in active business, in which he had exerted himself more than usual. While in California, in the latter part of May, 1848, he went to bed as well as usual, and awoke in the morning with dyspnoea and a sense of oppression about the upper part of the sternum, symptoms which never afterwards disappeared. On Dec. 10th, he returned to Boston, having borne the journey across the Isthmus pretty well, though much reduced in general health. Examined three days afterwards, the pulsations of the heart were felt more towards

the right side than usual. The pulse was the same in both wrists. A pulsating tumor or fulness was found about the cartilage of the second left rib, where there was dulness on percussion. The respiration was feeble over the whole of the left side of the chest, and a click was heard in forced inspiration.

During the last three months of his life he was confined to his bed, lying most easily on his back, the dyspnœa not being urgent, though increased if he sat up in bed. Through the winter, there was a slight cough, attended by a little frothy expectoration.

Five weeks before his death he suddenly raised half a pint of pus, and from that time expectorated the same copiously. He would sometimes speak of oppression in his chest, turn upon the right side, expectorate a large quantity of pus, obtain relief, turn back and go to sleep. The tumor about the second rib disappeared after the pus was first raised, and never returned.

Two weeks before death an abscess pointed, not far from the outside of the left nipple. On the following day it was punctured, and about a quart of offensive pus discharged. The expectoration then ceased. Finally, on the 6th of April, 1849, after being raised in bed by an assistant, he expectorated a little blood, a gurgling was felt in his chest, and he expired; two or three ounces of fresh, frothy blood flowing from the external opening.

At the examination, the body was found much emaciated.

Rising from the arch of the aorta, and involving the whole circumference with the exception of a strip, perhaps three fourths of an inch wide, from which the pervious brachio-cephalic trunks arose, was a rounded aneurismal tumor, of the size of an orange. Its cavity was filled with fibrine, whitish, in layers and rather soft. The parietes of the sac were, in some parts, continuous with those of the aorta, and contained many patches, presenting the same appearance as the wall of the vessel itself. In some places the parietes were entirely destroyed, and, where the sac approached the left primary bronchus, it had sloughed, or was about sloughing, to the extent, perhaps, of three fourths of an inch.

The right branch of the *pulmonary artery* was much compressed.

The *left lung* was the seat of an abscess extending from the apex to the base, containing a thick and rather bloody fluid. What little remained of the lung consisted of a solid, crumbling, gray substance, projecting most irregularly into the cavity of the abscess. There was no gangrene, nor any offensive odor. The pleural cavity was entirely obliterated.

The *left primary bronchus* must have been pushed back, as it was cut into during the removal of the œsophagus. The parietes were soft and discolored, and the cartilaginous rings to a considerable extent detached, standing up like the ribs of a boiled fish. The lower portion of the trachea was of a deep-red color, and the seat of what appeared to be minute ulcers.

In the *right pleural cavity* were about three pints of fluid. The lung contained a few gray granulations in the upper half, but was in other respects healthy.

The other organs were not remarkable.

In remarks appended to this case, the peculiar condition of the lung and its connection with closure of the bronchus, are particularly alluded to by Dr. Jackson, who refers to a similar case which occurred in the Hospital many years before, an account of which we here subjoin.

A man 30 years of age entered the Massachusetts General Hospital on July 25th, 1835. Five months before, he was attacked, while in Liverpool, with severe pain in the abdomen, which lasted for three months. A fortnight after its disappearance, while on his way to this country, he was again seized with severe pain in the epigastrium, which continued until he entered the Hospital, and was then accompanied by tenderness on pressure. For a month, he had been troubled with a dry, harassing cough, by which the pain was increased. Much heat in the night, but no chills. No appetite. He was obliged to give up work on July 19th, and never resumed it.

When first examined, there was a sibilant râle in both backs, and several days after, a strong mucous râle in the trachea; but the physical signs reported during a number of weeks were so variable and contradictory, that it was thought best to omit them. As early as August 10th, however, the respiratory murmur was much louder in the right side than in the left. On Sept. 2d, the lateral part of the left chest was more resonant than the corresponding portion of the right, but, behind, the lower part of the left back was less resonant than that of the right. On Sept. 10th, there was dulness on percussion over the whole of the left back, while the resonance over the right back was good. On forced inspiration, the murmur was distinct over the left side. On Oct. 3d, the left side of the chest was perfectly flat on percussion, with the exception of the axillary re-

gion, where there was slight resonance. The two sides of the chest presented the same appearance, with the exception of a little variation, incidental to a slight lateral curvature of the spine. On Oct. 23d, the respiratory murmur in the upper part of the left back, near the spine, was as strong as on the opposite side, and somewhat coarse, but was, elsewhere, inaudible. When lying on his back, the respiration was quite audible above the nipple, with bronchial respiration, particularly at the upper and inner parts; slightly audible, also, at the lower part, but not at all decided. The left side of the chest was at this time the smallest, measuring, just below the mamma, one fourth of an inch less than the right; while lower down, the difference was a little more marked. On Nov. 16th, however, the left side appeared to be enlarged, and the intercostal spaces, in some measure, filled out. Still later, there was flatness on percussion, over the whole of the left side of the chest, which could be reached, with the exception of a region five or six inches in diameter, extending from the seventh rib to the cartilage of the twelfth, and from a vertical line through the nipple backward five or six inches. This part was tympanitic. No respiratory murmur was here heard, but occasionally gurgling, or a sound almost metallic. The voice was several times reported as modified on the diseased side.

While these changes were taking place in the chest, the cough continued in frequent, severe paroxysms. At the time of his entrance, it was spoken of as a little like that of laryngitis. The expectoration was at first reported as serous, white and frothy, afterwards as mucous, then as opaque, and twice there was a gruel-like deposit. The quantity was seldom noticed, and when so, varied from two to four ounces. Blood was occasionally seen, and during the last month became almost constant, but the quantity was never large. For the first few days, he complained of great dyspnoea, but soon obtained relief, and though it remained afterwards a constant symptom, was only occasionally spoken of as urgent. There was much pain in the left side of the chest and in the epigastrium. The tongue, though at first slightly coated, soon became clean and continued so until the close. The appetite was generally good. Though frequently troubled with profuse perspiration, febrile heat of the skin was noticed but twice. The pulse generally ranged from 84 to 96, occasionally falling below or rising above these points. On Sept. 30th, he was reported to have lost flesh, but a

month after he had apparently gained. During the greater part of the time he was able to move about, and on Oct. 29th walked in the yard twice.

On the 26th of November, after a violent paroxysm of coughing, he was seized with copious hæmoptysis. When first seen, he was sitting in a chair, having risen at the commencement of the attack. In five minutes he was unable to support his head, and gasped for breath, while the blood poured from his mouth and nose. In twelve or fifteen minutes the pulsations of the heart had ceased.

At the examination, made by Dr. J. B. S. Jackson, there were found, on the left side, old and very strong pleural adhesions, universal except at the apex, where there was a cavity containing a few ounces of liquid, which had depressed the lung at this part. The false membrane was from one to two or three lines in thickness, for the most part soft, reddish, striated, and so infiltrated with serum as to appear gelatinous.

The *lung* was much smaller than the other, and dense to the feel. At first view, it seemed to contain numerous small abscesses, but on close examination these were found to be mostly owing to dilated bronchi, those of the smaller size being, perhaps, three or four times as large as natural, while the larger were little, if at all, dilated. The inner surface of most of them was rough, and, in many others, was a little soft yellowish lymph. There were, however, a few small abscesses, lined with a yellow curdy substance, and opening rather abruptly into the bronchi. All of these cavities were filled with thick reddish pus, mixed with some dark coagulated blood, but the latter was much the most abundant in the right lung. The disease occupied, mostly, the centre and back part of the organ. The intervening portion contained no air. The tissue about the apex was grayish, dense, and semi-transparent; towards the base more red, but, examined with a lens, was found to be mixed with much of the same grayish substance, found at the apex, where were several small, white, opaque bodies resembling tubercles, but which Dr. James Jackson thought were not so. Just outside of the lining membrane of the dilated bronchi there was, in many places, a layer of opaque, yellow, curdy substance, like that already noticed. A portion of the lung was also examined by Dr. John Ware, who found no trace of tubercle, and observed the same appearances described above, with the exception of the abscesses, which the part examined by him did not happen to contain. Four

aneurisms of the aorta were found: one, one third of an inch in diameter, at the arch; another of large size, just beyond, and two at the entrance of the vessel into the abdomen. The largest commenced at the point of origin of the left subclavian artery, and extended two and one third inches along the course of the thoracic aorta. It was of the mixed kind, and would contain, perhaps, four ounces. Upon the right side of this were engrafted two false aneurisms, the upper about two thirds of an inch in diameter, closely connected with the membranous portion of the trachea, just above the bifurcation. The second was situated just below, was somewhat larger and thicker than the first, and contained a thin layer of fibrine and coagulated blood. It lay upon, and was very intimately connected with, the left primary bronchus, just below the bifurcation of the trachea. This bronchus, which was not at all compressed or flattened, appeared to be filled by a firm coagulum, an inch and a half in length, consisting partly of fibrine, partly of recent blood, and evidently formed before death. The coagulum separated, for the most part, easily from the inner surface of the bronchus, leaving it, however, rough. Near its upper termination, there was discovered at once an opening into the aneurism, through which a common director was readily passed. It was filled by a dark recent clot.

Upon the right side there were universal old adhesions. The lung was scarcely at all collapsed, the anterior edge extending to the median line, and the upper lobe even beyond it. It was healthy in its structure, except for some small dark ecchymoses. No tubercles. The bronchi contained much coagulated blood, but were not dilated.

The cartilages of the *larynx* were ossified. The *pericardium* contained three ounces of clear yellow serum. The *heart* lay further to the left side than usual, but was normal, with the exception of some thickening of the parietes of the left ventricle.

There were extensive old peritoneal adhesions. The *spleen* was large, and covered with a thick, dense, white, opaque coat.

Struck with the similarity of these cases, it was thought that others like them must have been noticed, and, on examination of a large number of journals, two were found. Others undoubtedly exist, for it is hardly possible that, exposed as the bronchi are to closure from various causes, it should not have oftener taken place.

A brief summary only is given, as the details may be found in the journals referred to. The first is reported by Dr. Banks, in the *Dublin Quarterly* for August, 1851.

The patient was a tailor, 40 years of age. On percussion, both lungs appeared equally resonant posteriorly, but the respiratory murmur in the left was extremely feeble. The whole of that side afterwards became dull, and no respiration was heard in any part of it. He died of an attack of diarrhœa.

An aneurism, of nearly the size of a cocoa-nut, involved that part of the arch of the aorta from which the left carotid and subclavian arteries arose. It pressed backwards upon the œsophagus, and was mostly imbedded in the upper part of the left lung, "upon the root of which it impinged." The lung was universally adherent, except near the base behind, where were found eight ounces of pus. It was in a "cirrhosed" condition, tough, gristly, and riddled with small abscesses, varying in size from that of a walnut to that of a pea. The *right lung* was healthy. The *large intestine* was extensively ulcerated.

This case was reported on account of the atrophy of the laryngeal muscles on one side, but the peculiar condition of the lung excited no remark.

The second case may be found in the *Medical Times and Gazette* for Sept. 11th, 1852. A man, 51 years of age, was admitted as an out-patient of St. Thomas's Hospital on Jan. 3d, 1852. Three weeks before, a swelling as large as a marble was noticed under the right clavicle. There was a severe cough and dyspnœa, the difficulty of breathing being increased by exertion. He could not lie down comfortably at night, sometimes not at all. On Feb. 9th, the respiratory murmur was attended by a loud ronchus. On March 8th, there was decisive evidence of a tumor pressing upon the left bronchus, for, while that side was resonant on percussion, the respiratory murmur was wholly abolished, a slight râle only being perceptible after forced inspiration. On May 27th, he was seized with pain in the throat and difficulty of swallowing, and vomited everything taken. On the 31st, he had a severe paroxysm of coughing, and vomited blood mixed with pus. Afterwards he was able to swallow small portions of food. The dyspnœa was so great that he could scarcely lie down, and, at intervals, he coughed, and expectorated bloody matter. The respiration in the right side was very audible; in the left it was attended by general

crepitus, and the side was dull on percussion. He died on the 2d of June.

At the autopsy, on the following day, there was found a very large aneurism of the ascending aorta, which had pressed somewhat upon the left primary bronchus; but the real cause of the closure of the latter was a collection of pus, contained within a cavity lying between the bronchus and œsophagus, into each of which it had opened. The mucous membrane of the *bronchus* was very dark colored, and, in places, deeply ulcerated. Apertures of considerable size established a communication with the abscess. The latter probably originated in one of the bronchial glands, as those adjacent were soft and apparently passing into suppuration. The left lung was, throughout, adherent to the parietes, entirely solidified and passing into the stage of purulent infiltration. In some portions, more especially at the lower and posterior margin, it was studded with numerous small cavities, containing pus and gangrenous pulmonary tissue. These cavities had probably originated in the smaller bronchial tubes, as the mucous membrane was everywhere of a deep leaden hue, and, in places, ulcerated. The tubes, especially those of small size, contained much dark offensive secretion. The *right lung* was congested, but not otherwise diseased. *Heart* normal.

These cases vary in some respects: in three there was more or less pleuritic disease; in one the bronchi were dilated; and in one, gangrenous tissue was spoken of, but certain features are common to them all. In every one the left primary bronchus was closed, and there is as great a similarity in the descriptions of the corresponding lung as could be reasonably expected from independent observers, who had no special point to establish. Moreover, this closure was not caused in every instance by pressure, but, in two of the cases, by a coagulum which filled the bronchus. We may, therefore, safely assert that the disease was not the result of compression of the bronchial arteries, or of other parts, upon the integrity of which the healthy condition of the lungs depends, but of *the interruption to the entrance of the air*. Taking this view, the following explanation does not seem unreasonable.

The circulation in the capillaries of the lungs is, probably, mostly dependent upon the interchange of elements between the blood and the air. The bronchus being closed, there is, therefore, an absence of the physiological conditions upon which this circulation

depends, and stagnation is the result. Now, here, as in other parts of the body under similar circumstances, inflammation is excited and extends to the surrounding tissues. In other words, the primary disease is capillary phlebitis. It might seem that where such extensive obstruction of the smallest vessels exists, the large trunks should also be plugged; but in the second case, where nearly the whole lung was destroyed, nothing of the kind is mentioned, which proves that the obstruction may be very general in the capillaries without extending to the primary branches of the pulmonary artery.

However, this is only a theory, and the cases were not brought forward for the purpose of introducing it. They were intended to show that, in consequence of the closure of a primary bronchus, the lung may become inflamed, suppurate, and finally be destroyed.

Of this fact no mention is made in any work on pathological anatomy, as far as has been ascertained. Dr. J. B. S. Jackson, in his private notes as above stated, speaks of the changes in the lung, and of its connection with closure of the primary bronchus; but in neither of the cases reported has it attracted attention as anything striking or peculiar.

