ON THE TREATMENT
OF
PUS-SECRETING BASIC CAVITIES OF
THE LUNG
BY THE METHOD OF
PARACENTESIS AND FREE DRAINAGE.

BY
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THERE are, perhaps, few questions in the practical treatment of pulmonary disease which are more interesting and more responsible than those which concern the course proper to be followed in certain cases of basic lung cavities, from the walls of which an abundant purulent secretion continuously exudes. Doubtless there are many instances of this condition in which the state or age of the patient, the comparative mildness of the symptoms, or other qualifying circumstances, place it beyond question that, whatever treatment may be adopted, surgical interference is absolutely unjustifiable. But there are others in which very different conditions obtain, and dictate the measures to be followed. For when the discharge, by its abundance

and fœtor, harasses, disgusts, and steadily enfeebles the patient, destroying his appetite, and draining blood and tissues of essential albuminoid elements ; or when a febrile condition is induced with hectic symptoms and loss of flesh and strength ; or, again, should pyæmic indications appear, especially metastatic suppurations, it is easy to discern that a limit has been reached beyond which abstention from surgical measures for the evacuation and free drainage of the cavity—whatever risks may be involved—will be inevitably fatal.

There is, however, a third class of cases of this nature, in which the physician's interest and responsibility reach their climax—a class which, in its clinical aspects, the severity of the symptoms, the constitutional proclivities and possibilities of the individual patient, and the bearing of other important particulars, lies intermediate between those already recited in which the operation of paracentesis is either forbidden or compelled.

In the cases of this intermediate class, the prospects of success by operative measures are sufficiently hopeful to warrant the risks incurred by the operation. This being so, it is certainly an inquiry of the highest importance whether such cases can be differentiated from others, and by what signs they may be distinguished and classified. For, it must be remembered, that while there are certain acknowledged risks involved in the puncture of the lung through the chest wall for the evacuation of the cavity, fatal results cannot be averted by inaction when continued suppuration is proceeding ; and, on the other hand, valuable time and chances may be lost. If, therefore, it be possible to determine by a discussion of the elements of diagnosis and prognosis existing in this form of disease, and a comparison of the results of operations, what facts and principles are to guide to the operation of paracentesis, a valuable position in practical medicine will be reached.

With this view I venture to bring before the Society a case of basic cavity belonging, I conceive, to the third of the classes mentioned, in which paracentesis of the lung was decided upon. It is that of a patient who came under

my care at the Hospital for Consumption, Brompton, in November of last year, with a series of cavities in the lower part of the right lung. The operation was successfully performed with great relief to his symptoms, but he died eventually of pyæmia.

J. L—, a resident of Kensington, æt. 32, a letter-carrier by calling, was admitted on October 3rd, 1883, into Corry Ward, under the care of Dr. Reginald Thompson, by whose kindness I am permitted to bring the case forward, and to state that part of its history which transpired under his observation. The family history was rather indefinitely given, but the patient's father was living and healthy, as also were three brothers and four sisters. His mother had died of "bronchitis:" one brother had died as an infant from some unknown cause.

His own previous history was unimportant. He had "never had a day's illness in his life;" and, though following a calling which exposed him to all weathers, he had not suffered from coughs. There was no reason to suppose he had ever been intemperate, nor that he had ever contracted syphilis.

His illness appeared to have commenced six months before admission. He "caught a severe cold" and was obliged to give up work, but had not been confined to bed. A troublesome cough had come on and grown worse, attended by copious expectoration, and the sputa had been noticed to be slightly offensive. He had suffered from night-sweatings, shortness of breath, and progressive loss of flesh. A month after his illness began slight hæmoptysis appeared, and for a fortnight the sputa contained more or less blood, but never very much. He had grown gradually worse, and eventually sought admission to the hospital.

The note of his condition made at the first examination describes him as a man of middle height and spare build, considerably wasted, of a waxy pallid complexion, and with a dull worn-out expression. His breath was short, cough troublesome, and expectoration profuse and foetid; the

tongue was thinly furred, appetite lost, and he felt too weak to care to leave his bed. The bowels acted regularly, and he had never suffered from diarrhoea; the urine was normal in every way.

He had no physical signs except those found in the thorax. The chest was narrow, but fairly well formed. The left lung was free from any morbid indications, and its breath-sounds were rather exaggerated. The condition of the right lung is thus described in a brief note made

FIG. 1.

by Dr. Thompson :—"Bulging in scapular region and below. Absence of fremitus and total absence of breath-sounds; marked dulness of percussion (over that area). Dilated lung in front. Heart's apex outside nipple-line" (see Fig. 1).

With this history, and these physical signs, the case was regarded as that of an abscess situated near the posterior base of the lung, and accompanied by a slight effusion into the adjacent pleura. In the formation of this diagnosis great stress was naturally laid upon two points: (1) The total absence of breath-sounds from the affected base; and (2) the displacement of the cardiac apex, which was felt

distinctly, though feebly, at a spot a little to the left of the nipple-line. The concurrence of these signs was regarded as evidence of an accumulation of fluid either in the pleural sac, or in the lung itself; and in order to clear up the point, a fine needle connected with an ordinary hypodermic syringe was introduced at the mid-axillary line in the sixth space, but with a negative result. A week later another exploration was made, with a somewhat larger needle, in the ninth space below the angle of the scapula. A drachm of pure blood was withdrawn but no pus, and a little air bubbled out through the needle, a little hæmoptysis occurring at the same time. It was concluded that there was no fluid in the pleura, that the lung was probably adherent to the parietes of the thorax, and that the needle had passed into the lung itself.

As the patient had slightly improved since his admission, his cough being rather better and expectoration less, it was decided to give him the full benefit of medicinal means before resorting to operative measures. He was accordingly directed to use an inhalation of iodoform through a respirator, and, a little later, he was placed on three grains of the Pil. Picis every six hours. The note made of his chest on the 10th October is: "There is complete dulness behind on the right side, with absence of respiratory murmur below the sixth rib; above that the respiratory murmur is weak. General surface friction audible in dorsal region. In front, chest is hyper-resonant." This absence of respiratory sounds over the posterior dull area is remarkable in the light of what follows.

A week later (17th October) his general condition had not altered much, but the temperature had risen, ranging from 101° to 102°. He was bringing up much expectoration, but it was less foetid. The physical signs were, however, materially changed, for over the dull posterior area there was now audible marked cavernous respiration, with bronchophony and pectoriloquy; and after cough small crackling crepitation within the same limits. A week later these signs were unaltered.

On the 15th November the charge of the case devolved upon me in Dr. Thompson's absence; and upon making an examination I found the chest in the condition just described, with the addition of a loud friction-sound over the right axilla, where much pain was felt at the time. I was particularly struck by the following points:

1. That the left lung was perfectly free from morbid signs.
2. That the cardiac displacement persisted, the apex beating very distinctly about an inch outside its normal site, and the superficial cardiac dulness extending to the same point.
3. That there was no evidence of disease at the *apex* of the right lung, the breath-sounds though weak being normal, the percussion note unaltered, and no râles audible.
4. That over the dull posterior area where loud cavernous breathing was still heard, the râles had disappeared.

On the 5th December another exploration was made with a rather larger aspirating needle than that previously used, the puncture being made in the eighth space below the angle of the scapula, but no fluid was obtained. The needle passed deeply inwards and seemed to penetrate a solid resisting mass, suggesting as before, adhesion of the pleural layers with fibroid changes in the subjacent lung.

Up to December 21st the patient had made no progress, and was still bringing up daily a pint of diffuent, purulent, and somewhat offensive expectoration. Microscopic examinations yielded no trace of tubercle-bacilli; and it may here be remarked that although the sputa were many times examined by Dr. Kidd, pathologist to the hospital, Mr. Downes, the clinical assistant in charge of the case (to whom I am indebted for much valuable help), and myself, no tubercle-bacilli were ever found. The temperature continued to range high, the patient sweated a good deal, and was evidently slowly losing ground. The physical signs remained as last described, except that the axillary area of friction was now completely dull to percussion, and the breath-sounds over it partook of the same cavernous character as those audible behind. Dr. Douglas Powell

and Dr. Kidd now saw the case in consultation, and careful exploratory punctures were again made over the areas of more intense cavernous respiration in the mid-axilla and close to the right nipple, but no fluid was withdrawn. As the evidence pointed so strongly to the cavity which yielded the copious sputa being within the lung base, and the condition of the patient indicated the necessity of operative relief, it was resolved to open the chest-wall posteriorly, and to endeavour to reach and freely drain the cavity through the wound.

Operation by Mr. Marshall.—On December 23rd the patient was placed under ether, and turned on his left side as far as could be done without embarrassment to his breathing. The posterior dull area yielding the cavernous breath-sounds and pectoriloquy, having been most carefully marked out, it was decided to open the thorax at the centre of that space. This point corresponded to the tenth intercostal space just anterior to a perpendicular let fall from the angle of the scapula (see Fig 3) ; and there Mr.

Physical signs at date of operation.

FIG. 2.—A. Weak breath-sounds ; no râles. B. Cavernous breath-sounds ; pectoriloquy. C. Hyper-resonance ; loud breath-sounds.

FIG. 3.—A. Increased vocal fremitus, cavernous breathing and pectoriloquy, gurgling, and crepitant râles. B. Operation incision.

Marshall made a horizontal incision, two inches in length, along the centre of the intercostal space, cautiously deepening it until the pleura was recognised. It was then found that the costal and visceral layers were firmly adherent, as had been anticipated; and after they had been incised the lung-tissue was laid open by a shallow nick or two of the knife, to save bleeding, and a trocar with which a director was combined (an instrument specially designed for such operations by Dr. Hicks, late resident medical officer to the hospital) was pushed into the lung to the depth of two inches. Dark blood flowed, but no pus. A pair of long-pointed dressing-forceps was passed along the groove of the director, expanded, and withdrawn, but no evidence appeared of the cavity having been reached. The trocar was then pressed onwards about two inches deeper, and seemed to enter a cavity for, though no pus flowed, air began to be freely passed out at the wound in short, gasping puffs, and was observed to be distinctly foetid. A long probe was introduced along the director, and it could be distinctly felt that a cavity had been entered, apparently of no great size, but with an opening at its upper extremity, along which the probe passed with the greatest ease a considerable distance towards the root of the lung. This was clearly a bronchus opening into the cavity, and it was hoped that the object of the operation had been successfully accomplished. A strip of gauze moistened with carbolic oil was packed into the cavity, and a gauze dressing applied. As the patient had spat blood during the operation, he was placed on a draught containing the tincture of digitalis with sulphuric acid, and only cold fluid food administered. No further loss of blood occurred.

On the following afternoon the plug of gauze was withdrawn from the cavity in the lung, and an india-rubber drainage-tube of about half an inch in diameter introduced. No hæmorrhage occurred. The tube was easily kept in place by the pressure of a gauze dressing applied over it, and it was soon found that the wound was draining very freely indeed; the fluid passed out, being thin, purulent,

offensive, and only slightly blood-stained. So profusely did the drainage continue that it became necessary to renew the dressings every few hours, oakum being used with the gauze to obviate the fœtor. The expectoration all but ceased, and the patient professed himself much relieved. Physical examination revealed no notable change in the signs: the position of the cardiac apex-beat was unaffected by the operation.

For the next four days the cavity in the lung was cautiously washed out with Condy's fluid and water, but as this always caused a severe fit of coughing, and the wound was draining very freely, it was discontinued. The whole of the symptoms rapidly improved. The temperature fell to nearly a normal range, appetite returned, the cough was much moderated, and the expectoration was greatly diminished in quantity.

On the 23rd of January the patient was found in the morning much altered for the worse. He had lapsed into a drowsy incoherent state, and about 11 a.m. was suddenly seized with a convulsive attack. He became livid, breathed very hurriedly, coughed continuously and distressingly, seemed unable to expectorate, and presently passed into a comatose condition. On examining his chest loud rhonchus was heard over the sound lung, and it was feared that a quantity of secretion might have found its way thither and occasioned these apparently asphyxial symptoms. This supposition was strengthened by the fact that the drainage-tube was found to have become displaced, and the drainage stopped. The tube was immediately reinstated and the symptoms then subsided. An hour later a fresh paroxysm occurred of the same kind as the former, but this passed off in a short time and the patient had a good night. For the next eight days the case presented no striking change, but no improvement was observed. Severe headache then set in, and in twenty-four hours the patient fell into a comatose condition, cough and expectoration ceased, and he gradually sank and died forty-eight hours later. The cavity drained freely to the last, the wound looked healthy,

but it was noticed that the upper surface of the rib below the incision had become denuded of its periosteum for the whole length of the wound.

The post-mortem examination was made twenty-four hours after death by Dr. Percy Kidd, pathologist to the hospital, and the following particulars are compiled from his notes. A layer of pus was found at the base of the brain. There was a little pus in the lateral ventricles, and their walls were greatly softened and discoloured. In the left temporo-sphenoidal lobe an abscess as large as an egg-plum was discovered, communicating with the posterior horn of the adjacent ventricle; and in the frontal lobe of the same side there was an abscess about as large as a filbert. No miliary tubercles were seen anywhere. On opening the chest, the right lung was found universally adherent except at the right upper sternal border, the adhesions being very firm, and at the posterior and lateral borders of cartilaginous hardness. The margin was firmly adherent to the pericardium. The lung was much contracted, and the overlying pleura enormously thickened and of a fleshy consistency, the thickening being marked even in those processes which dipped down between the lobes. The lung contained a number of multilocular cavities of different sizes, one or two as large as a pigeon's egg, in both upper and lower lobes, which had thin but distinct walls of a dirty-reddish colour and were uninterruptedly continuous with dilated bronchial tubes. These cavities contained whitish, mortary, exceedingly foetid matter, which was not adherent to the walls, and could be scooped out without any difficulty. No true caseation was observed anywhere, nor any miliary tubercles. The external wound corresponded to a spot about two inches below the bifurcation of the trachea, and communicated with one of the largest of the cavities. The left lung was œdematous and rather congested, its bronchi reddened throughout and filled with frothy secretion. It had a few pleuro-pericardial adhesions. There were no other traces of disease; the other organs were healthy.

Remarks.—It will be seen from the post-mortem report

that the case proved to be one of saccular bronchiectasis limited to one lung, although it wore a different clinical aspect, especially in the earlier part of its history. It is, of course, admitted that the diagnosis of bronchial dilatation was possible from the first, but in several respects the signs varied from those usually characteristic of that affection, and pointed to the possibility of suppuration in the lung itself, or in some part of the pleural sac, with a discharge of the pus through the bronchi. The diagnosis may be briefly passed under review in connection with the three following points :

1. The absence of any history of pulmonary disease prior to the fatal illness.

2. The altered position of the cardiac apex beat.

3. The total absence of vocal fremitus, breath-sounds, and râles, from the dull posterior base of the chest, which was found on the patient's admission to the hospital, persisted for a fortnight longer, and then gave place to noisy cavernous respiration with pectoriloquy and fine crepitation, in a word, to signs signifying excavation of the affected area.

These points will be discussed in succession :

1. Considering the extent of disease found in the lung, the number of the cavities, and size of some of them, it is difficult to resist the conviction that these morbid changes must have occupied a much longer time than the six months' history given by the patient on his admission. It will be remembered that he stated he had never suffered from any pulmonary symptoms before his illness commenced; and therefore, unless this account of himself be totally disregarded, chronic pulmonary catarrh must be shut out of the category of causes which led to the fibrotic changes in the lung. Neither does the history present any other indication suggesting slowly progressive disease. It suggests rather a recent and acute origin; and this point was considered of importance in the formation of the original diagnosis of suppuration within the lung. But upon a review of the whole case it appears most likely that chronic pneumonia, originating from causes that are not obvious and at

a date anterior to the supervention of the symptoms that drove the patient to seek medical relief, must be regarded as the true explanation of the origin of the disease.

2. Doubtless in all cases of fluid accumulations in the pleura, displacement of the cardiac apex is one of the most important diagnostic signs. Again, when the right lung is the subject of chronic fibrosis, it is certain that, sooner or later the resulting contraction will draw over the heart and transfer its apex-impulse to some point at the right of its normal site. In this case the signs were apparently contradictory of the facts: there was no effusion, and there was advanced fibrotic contraction of the right lung, and yet the cardiac apex beat in the fifth intercostal space at a spot a little external to the nipple line.¹ The explanation is difficult, and can only be hypothetically attempted. It may be supposed, and is not improbable, that in the early stage of the disease an effusion took place into the right pleura, displacing the heart leftwards, and originating the pleural and pleuro-pericardial adhesions that were found. Can any force have been in action capable of retaining the heart in its dislocated position after the subsidence of the effusion? If the dynamics which normally control the relative positions of the intrathoracic organs be considered, it will be seen that some explanation is possible.

It has been pointed out and experimentally demonstrated by Dr. Douglas Powell, that "the moment equilibrium between the two lungs is destroyed by the relaxation of the elasticity of one of them, it is restored by the partial contraction of the opposite lung, and the shifting with it of the mediastinum and heart."² This condition is produced whenever an effusion takes place into one pleural sac; the elastic tension of the opposite lung gains an advantage proportionate to the relaxation of its fellow, and this traction draws over the heart to the sound side. Supposing then that an effusion occurred in the case under review, and that the absorption of the fluid was followed by

¹ The left lung was normal and there was no cardiac enlargement.

² 'On Consumption, and some Diseases of the Lungs and Pleura,' p. 283.

pleural adhesions and rapidly progressing fibrotic changes, tending to impair the normal elastic tension of the right lung, the traction of the left lung would continue acting, and retain the cardiac apex in its position of leftwards displacement. This explanation may not be correct, and is at best hypothetical; but as the importance of cardiac displacement as a physical sign cannot be overrated, anything tending to throw light upon the question is of interest.

3. The total absence of respiratory sounds and vocal fremitus over the posterior dull area, which existed during the first fortnight that the case was under observation in the hospital, is somewhat remarkable when the fact of the number and size of the cavities in the lung and their free communication with the bronchi is considered; and especially in comparison with the intense cavernous sounds heard later on. It can only be explained on the supposition that the cavities were at first loaded with the puriform secretions, and that afterwards the pent-up discharge found a freer vent.

In raising the question of the advisability of attempting paracentesis of basic lung cavities, as illustrated by this case, the first point to be considered is the possibility of estimating justly the risks of operation. Were the cerebral abscesses (obviously pyæmic in their nature) due to septic absorption in the operation-wound, or at some other part of the pulmonary tissue? Now, the pus that flowed from the wound was thin and but very slightly fœtid, while the retained contents of the sacculations of the bronchi were horribly offensive. Moreover, it is clear that the fœtid sputa drained backwards, so to speak, down the bronchi of the sound lung, as was evidenced by the congested and irritated condition of the mucous membranes lining those tubes; and if so, there must have been a continual possibility of infective absorption taking place there. A parallel case has been placed on record by Dr. C. Theodore Williams, in vol. vi of the 'Proceedings of the Medical Society,' in which a patient, suffering from bronchiectasis

with profuse foetid secretion, was subjected to paracentesis of the lung with great relief to all the symptoms, but nineteen days later he became comatose and died soon after with an abscess in his cerebrum. In this case, also, it might be held that the wound was the seat of the septic absorption, but this is by no means certain. An instructive case has recently been observed at the Brompton Hospital, in which a patient suffering from bronchiectasis in the upper lobe of the right lung, suddenly developed cerebral symptoms and sank. The autopsy revealed an abscess in the left hemisphere of the brain. Here, at least, there was no question of septic absorption from a wound; and in the others it is quite possible that the absorption took place, as in this case, at some point of the pulmonary tissue.

The danger of absorption of the retained secretions in such cases is doubtless great, especially by regurgitation into the sound lung; and it is a grave question whether the operation of paracentesis ought not on this account to be more frequently performed than it is. Abscesses of the lung, pneumonic, embolic, or pyæmic, and the pus-secreting cavities of bronchiectasis in which the puriform secretions are always more or less retained, must rank under the general rule that, in whatever part of the body decomposing matter is confined, and when its presence is evidenced by constitutional disturbance, and a standing risk to life involved by its retention, it must, if at all practicable, be found and evacuated. Probably a larger experience of such operations would prove that their risks were comparatively small and their benefits great.

It is suggested that a concurrence of the following conditions should, ordinarily, determine surgical interference, although, no doubt, there will occasionally be cases in which operative treatment would be justifiable even under other conditions:

1. The diagnosis of the case being distinct, so that the physician is assured that he is dealing with a case of abscess, or a suppurating cavity, *apart from phthisis*.

2. The patient's general state being such as not to forbid the operation.

3. The pleura being adherent over the site selected for paracentesis. If it can be known that such is the case, this would be a distinct encouragement to the performance of the operation; but the contrary ought not to be allowed to be a prohibition. In such a case it would probably be better to prelude the paracentesis by incising the chest-wall and stitching the lung to the wound, so as to induce inflammatory adhesion, and to defer the puncture of the lung until such union was complete, than to resign the operation altogether on the ground of the non-adhesion of the pleural layers. The dangers of pneumothorax are practically not so great as to be prohibitory. The incision of the pleura in such cases ought to be done under strict antiseptic precautions.

The literature of this subject (apart from the question of empyema, irregular cases of which, where the pus has been discharged through the lung, may have closely simulated pulmonary suppurations) is meagre. Dr. Douglas Powell and Mr. Lyell, in an exhaustive paper on this subject printed in vol. lxiii of the 'Transactions' of this Society, have pointed out several reports of cases extant prior to that date. The case described by Dr. C. T. Williams, already cited, is of especial interest, from its similarity to that which forms the subject of this paper. Reference may also be made to a singular case, and one of unusual importance, of "gangrene of the lung treated by incision and drainage" recently reported in the 'Transactions' of the Northumberland and Durham Medical Society for 1883, by Dr. Drinkwater, of Sunderland, in which he opened a gangrenous abscess supposed to be of embolic origin, which formed at the apex of the lung, the pus burrowing and pointing under the pectoral muscles. At the bottom of the wound an opening could be felt in the subjacent intercostal space, and this was enlarged, when the lung underneath was found pulpy and partially solidified. The pleura was adherent. A piece of the third rib having been excised, the abscess

cavity in the lung was reached and cleared out. The patient rapidly and completely recovered. Although this case was not one of basic cavity, nor treated by paracentesis in the way suggested by this paper, it is very pertinent to the present inquiry, because it enforces the principle here urged, namely, that suppurating pulmonary cavities (apart from phthisis) should be opened and drained *under the conditions specified*, with as little hesitation and as good hopes of success as collections of pus in other viscera.