Treatment of pleurisy & empyema / by John E. Morgan.

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TREATMENT

OF

PLEURISY & EMPYEMA.

BY

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Treatment of Pleurisy and Empyema.

DURING the last thirteen years a large number of cases of pleurisy and empyema have come under my care in the wards of the Manchester Infirmary. In the treatment of these cases I have adopted various curative procedures, with a view of meeting special complications and combating symptoms of unusual gravity. In some instances these measures appeared to act favourably, and to contribute largely to the recovery of my patients. In my remarks on this subject I do not intend to classify the whole series of cases I have been called upon to treat, nor to show what proportion of these cases terminated in a return to health. Such statistics are necessarily misleading; and the conclusions drawn from them of comparatively little value. Some cases in which the symptoms are very acute, and the temperature also excessively high are almost certain to prove rapidly fatal; others, though protracted for years, will yet eventually make a good recovery.

In this paper I propose, in the first place, to direct attention to the spirometer in the treatment of all cases accompanied by pleuritic effusion. I shall refer also to the use of compressed air in assisting to expand the occluded vesicles of the lungs. I shall further call attention to the most satisfactory methods of dealing with some of the difficulties which too often beset us in the protracted after-treatment of many chronic cases of empyema—difficulties which interfere with recovery and sow the seeds of future disease.

Since I paid special attention to the various effusions of the pleural sac, I have felt strongly that if we desire to make ourselves accurately acquainted with the variations in the amount of the fluid present from time to time in the cavity of the chest, something more is needed than the usual methods of physical examination. Percussion, auscultation, and palpation will not give us the information we require. By their aid we cannot even form a rough estimate of the amount of fluid compressing the lung where there are old adhesions. Where also the costal and pulmonary pleuræ are held together by those adhesions, and the pleuritic effusion is encapsulated, a comparatively small amount of fluid is sufficient to cause absolute dulness on percussion, and a total absence of the vocal fremitus, even though the portion of lung actually compressed be altogether insignificant. If we would measure the extent to which the lung is encroached upon, we shall best succeed in our object by ascertaining how far its air containing capacity is impaired. This information we can only obtain by such an instrument as the spirometer, an

instrument which can estimate for us the number of cubic inches of air the lungs contain. By means of Mr. Hutchinson's spirometer very accurate and valuable information may in this manner be obtained. I have used this instrument in several cases, and am prepared to bear my testimony to its value. Still, it is not an instrument that has ever come into general use. It is cumbrous and messy; requires to be adjusted before it can be used, and is by no means portable. These objections do not apply to a spirometer invented by Dr. Jagielski, and manufactured by Messrs. Mayer and Meltzer, of London. The attention of the British Medical Association was drawn to this instrument in the year 1874 at Norwich. Ever since these instruments were introduced to the notice of the profession I have constantly used them. Indeed I have three of them in my possession at present. I have carefully tested them in a large number of cases both in health and in disease. In healthy persons my observations coincide generally with the conclusions arrived at by Mr. Hutchinson and published by him in an interesting and exhaustive article in the twenty ninth volume of the Medico-Chirurgical Transactions. In this article Mr. Hutchinson shows that what is termed the vital capacity of man is modified by four circumstances. Height, weight, age, and disease. The influence of height, however, is very much more marked than that of the remaining factors. Mr. Hutchinson states that for every additional inch of height from five to six feet, eight additional cubic inches of air at 60° are given out by a forced expiration. Hence it follows that if the vital capacity of a man five feet in height is 174 cubic inches, that of a man five feet six inches will be 222; while a man of six feet will be able to expire 264 cubic inches. A very large number of observations on healthy individuals engaged in various occupations led Mr. Hutchinson to the conclusion that the vital capacity of different individuals bears a very close relation to their height—so close indeed that the results obtained from experiments almost exactly tally with the numbers of arithmetical progression.

This relation between height and vital capacity will be found of great value in cases of disease of the chest, especially in such a disorder as pleurisy accompanied with effusion, where by far the most important factor we have to consider is the height. Other considerations, such as those relating to weight and age, may for all practical purposes be omitted. The expression "vital capacity" signifies the number of cubic inches of air given out by the most forcible expiration following the deepest possible inspiration. It includes what has been termed the supplemental air no less than the tidal and complemental air. It does not apply to what is known as the residual air, which the lungs cannot get rid of by any effort of the expiratory muscles. This residual air, in a man of average height, may be estimated at about 100 cubic inches. The supplemental air which remains in the chest after an ordinary expiration may be set down at another hundred cubic inches, The tidal air which

enters and passes out of the lungs during ordinary quiet breathing at about 30 inches, and the complemental air, or that portion which the lungs can accommodate after a deep drawn inspiration, at an additional 100 cubic inches. Hence, when a man takes what is popularly termed a long breath, filling his lungs to the utmost possible extent, and then empties them with as much force as he is able into the blowpipe of the spirometer—when supplemental, tidal, and complemental air are together expired—he enables us to measure the air-containing resources of his lungs; in other words, to gauge his vital capacity. If, then, the spirometer in this manner indicates to us the space available within the lungs for the storage of air and for the purposes of respiration, it will readily be seen that when from any cause the boundaries of the thoracic cavity are encroached upon—when, for example, seven or eight pints of serum are effused into the pleural sac—the quantity of air which the lungs then contain must be proportionately reduced. There is no disease in which a diminution in the vital capacity is so rapidly induced as in pleurisy accompanied with effusion. In one case which I have recorded, the air income of the lungs (if I may be allowed to use the expression), fell from 250 to 80 inches in the course of forty-eight hours. Such changes we can measure with peculiar facility by means of the spirometer. This instrument teaches us whether it is necessary to perform paracentesis, and when the operation should be performed. I am in the habit of availing myself of the assistance it affords even in the acute stages of pleurisy, so soon as I discover that the amount of effusion is at all considerable, and I have never known any ill effects to result from its use.

In the very early stages of the disease, however, when the "stitch" in the side is still a troublesome symptom, we would naturally refrain from using this instrument. But so soon as even a moderate serous exudation has occurred the pain usually disappears, and then the information which it affords is very valuable. Objections have been raised to the spirometer on the ground that a certain amount of practice is required before the patient can familiarise himself with its use, and effectively empty his lungs. This objection is altogether groundless, it does not tally with my own experience, or with the far more extensive observations of Mr. Hutchinson. In making his experiments, Mr. Hutchinson directed those whose chests he desired to test to blow three times into the instrument. On each occasion the reading was noted. From these three readings a mean reading, indicating the vital capacity, was deduced. The slight difference usually observed between these several readings testify to the general accuracy of the instrument and the readiness with which our patients learn to use it. By means of this instrument I have carefully tested in a considerable number of cases the value of some of the different remedies which have been recommended in the treatment of pleurisy with effusion. The general conclusion at which I have arrived is that whenever the amount of fluid is excessive and the

disease of long standing none of them can be said materially to influence absorption. Thus in some cases I have persistently tried the most powerful diuretics, prescribing them in large and frequently repeated doses. But I never found that they exerted any decidely curative effects. In other instances I have tested the efficacy of diaphoretics, subjecting my patients to severe courses of hot air baths, prescribing at the same time such active drugs as the jaborandi. But though excessive perspiration has in this manner been induced, and the weight of the body considerably reduced, I have never learnt from the spirometer that absorption in the pleural sac has been very largely influenced by the energetic action of the skin.

In two cases likewise I adopted a plan of treatment strongly recommended by Niemeyer. It consists in placing the patient on as dry a diet as possible, allowing him to partake of a very small quantity of liquid. Although, however the inconvenience and discomfort to which I subjected the pleuritic sufferers was very considerable, I did not find any decided increase in the vital capacity when gauged by the spirometer. Drastic purgatives also (including such active drugs as elaterium, scammony and jalap) have in my hands proved equally unavailing. It would appear that in these cases various internal remedies fail to promote absorption. because the pressure upon the orifices of the lymphatics prevents them from fulfilling their normal functions. This is shown by the fact that when a portion of the fluid contained within the pleura is withdrawn by the aspirator, the remainder is often speedily taken up through their agency. In other cases, again. we may assume that absorption is impossible, partly by reason of the composition of those inflammatory products which surround the effusion, partly because the effusion itself is but little prone to undergo absorption.

In using the spirometer it is my invariable practice to test the vital capacity of my pleuritic patients two or three times every week Thus we may readily ascertain whether or not the fluid is being absorbed. In some cases we are surprised to find how greatly vital capacity is affected by what appears to be, on percussion, a comparatively moderate exudation. For example, where the area of dulness occupies less than half of one lung the spirometer frequently shows that the vital capacity is reduced, not to one-fourth its normal amount (as we would naturally expect), but to less than half the estimated standard. This is, no doubt, partly owing to the fact that the affected side encroaches to some extent on the sound side; and it is in part also due to the hyperæmic condition of the healthy lung. It must be further remembered that though the effusion occupies but half the pleural sac, the lung floats on the surface of that effusion, and by reason of the compression to which it is subjected admits comparatively little air.

The great value of the spirometer, however, consists in the information it gives regarding the ebb and flow of the fluid in the

chest. If the vital capacity steadily increases, if each succeeding week the lungs admit an augmented volume of air, it is our duty to avoid all operative interference. We shall, I think, act prudently if we even abstain from inserting the needle of a subcutaneous injection syringe into the chest, for the sake of satisfying ourselves as to the nature of the effused fluid. Simple as this procedure undoubtedly is, it is not altogether devoid of risk ; indeed, I have my suspicions that from this cause a serous exudation is occasionally converted into one that is purulent.

When, however, the spirometer, teaches us that the vital capacity of the chest, so far from increasing, is actually diminishing, or at all events remaining stationary, we may rest satisfied that the time has arrived when paracentesis cannot any longer be prudently delayed. The first question we have then to decide is where should the opening be made. In the opinion of Dr. Bowditch, the thorax may be most appropriately punctured in one of the intercostal spaces between the seventh and tenth ribs, immediately beneath the lower angle of the scapula. He recommends that a spot be selected about an inch and a half higher than the lowest point at which the respiratory murmur can be heard in the healthy lung of the opposite side. It has appeared to me that the differential stethoscope is peculiarly valuable in enabling us to obtain this information, by mapping out for us the exact boundaries of the two lungs, and enabling us to measure the comparative intensity of the breath sounds on the opposite sides of the back. In a large number of my cases I followed Dr. Bowditch's advice and performed paracentesis in the dorsal portion of the Thorax. Of late, however, I have given up this practice. The muscles of the back are frequently thick, and consequently it is at times no easy matter to make out the exact boundaries of the intercostal spaces. Here also we often find, on using the aspirator, that the contents of the pleural sac flow out far less readily than when the puncture is made in some other portion of the thoracic wall. This is probably owing to the trocar having entered a thick layer of fibrin, which naturally gravitates towards the dorsal aspect of the costal pleura when the patient occupies the supine position. It is not possible, however, to lay down absolutely rigid rules regarding the exact spot at which paracentesis should be performed. Each case must be specially studied and dealt with on its own merits. It may be laid down as a general rule that when the effusion is serous the puncture should be made directly in the axillary line just above the sixth rib. If, however, it be purulent, then the anterior portion of the chest should be the place selected for the operation. For, under these circumstances, we may find it expedient to keep the wound open for a considerable time. Here there is less danger of the aperture becoming occluded in consequence of the ribs colliding or actually overlapping one another, as so frequently occurs when the side contracts. Another matter of some importance (if we decide upon operating) is the instru-

ment we should select for the purpose. In many cases I prefer such a syringe as that used by Dr. Bowditch, to the aspirator generally employed. A double perforated cock is attached to this syringe, through one of whose apertures the fluid is drawn into the syringe, while it is discharged externally through the other by a quarter turn of the regulating cock. Whatever plan of emptying the thorax be adopted, it is not advisable to remove any large quantity of fluid at one and the same time.

Among the writers who have discussed this subject, we read of six or seven pints of serum having been withdrawn at a single sitting. If we follow this practice, we shall find that in not a few instances a serous exudation will be succeeded by one which is purulent. In expressing this opinion I am well aware that I run counter to the views of so high an authority as Trousseau, who distinctly states that there is a great advantage in emptying the chest as completely as possible. This, he maintains, is the best means of putting the lung into favourable conditions for expanding freely, and consequently of expediting the cure. These views have not been generally accepted by those who have had the largest experience of this operation ; for in not a few instances the lung is too firmly bound down to admit of expansion ; while the vessels of the inflamed pleura are greatly distended, and the newly formed capillaries delicate and yielding. Hence we can understand that if the pressure exerted by the fluid on these vessels be suddenly withdrawn, both serum and lymph corpuscles will more readily exude. In this manner a serous effusion is converted into one that is purulent. The condition of the new vessels found in embryonic tissue is naturally favourable to exudation. If exudation be stimulated we get an over-production of cells constituting suppuration. It has further appeared to me that when the effusion is suddenly and completely withdrawn troublesome paroxysms of coughing are liable to occur, while the patient complains of a sense of constriction in the region of the epigastrium. Hence, in cases of serofibrinous effusion, unless the symptons of oppression and dyspnœa be very marked, I seldom withdraw more than from twenty to thirty ounces of serum at one sitting. The removal of so comparatively small a quantity of fluid is often sufficient to stimulate absorption, which afterwards proceeds in a more satisfactory and energetic manner. After the tapping I direct the patient to inhale compressed air once or twice daily for ten or fifteen minutes from a pneumatic apparatus invented by Dr. Geigel, of Wurzburg. The operation for paracentesis is repeated at stated intervals until the whole of the fluid is withdrawn. As it is withdrawn an attempt is made to expand the affected lung by pressure from within.

It is said, indeed, that in such cases the contracted airless lung fills itself from its pervious colleague during fits of coughing and other expiratory efforts, while the glottis is closed. This re-expansion of the lung may, I believe, be very much more satisfactorily accomplished by means of compressed air.

Such, then, is the mode of treatment I have found most efficacious in pleurisy with serous effusion. By means of the spirometer we decide whether or not absorption is going on; if not, paracentesis is performed, and a small quantity of fluid only removed, the patient at the same time being directed to inflate his lungs with compressed air. But we will assume that the disease is empyema, and the pleural sac filled with pus. What, then, must be our treatment? In the first place, how shall we decide whether or not the exudation really is purulent? This question it is impossible to answer with any degree of certainty, unless we make an exploratory puncture. If the temperature be high; if the heat of the skin over the affected side is persistently a degree or more higher than that of the healthy side; if also the skin over the region of the effusion be œdematous,—we shall then have strong grounds for concluding that the exudation is purulent. Still, none of these signs is pathognomonic. An exploratory puncture may readily be made by means of a subcutaneous injection syringe. In this manner we may prove to ocular demonstration whether pus be present or not. If it be present, we shall be merely wasting our time in attempting to get rid of it either by means of the aspirator or syringe. We may withdraw it as often as we please, but it will certainly reaccumulate. So long as it does so, the pulmonary and costal pleuræ are liable to suffer from the corrosive properties of the purulent exudation; while the adhesions, which will inevitably bind down the lung, become week by week more firm and unyielding. Thus, delay in acting energetically is not alone harmless, it is absolutely mischievous. No time should be lost. But how are we to proceed?

In the first place an incision should be made in the fifth or sixth intercostal space, midway between the two ribs, about an inch and a half in length. Into this incision a cannula should be inserted, with a view of keeping the wound open, the cannula being covered with tow steeped in carbolic acid. The aperture ought to be made as near the mammary line as possible. The patient should be directed to lie on his side for about forty-eight hours, in such a position as shall favour the escape of pus from the thorax. At the end of that time the cannula must be withdrawn, and a silver catheter inserted into the wound. A four-ounce exhausting syringe should be attached to the catheter, and with it the remaining portion of the purulent exudation should be thoroughly removed. Unless a syringe or aspirator be used, comparatively little fluid will escape. It will not, in fact, flow out unless the pressure within the pleural sac exceeds the atmospheric pressure without.

For this reason we often find that when the chest is opened, fluid only wells out during expiration. During inspiration not only does the pus cease to flow, but air is liable to be sucked through the orifice. After removing the purulent contents of the thorax, the most effective way of dealing with the suppurating surface of

the pleura consists in conveying spray from a Lister spray-producer directly into the chest along a catheter. In this manner the spray diffuses itself through the interior of the thoracic cavity, and seems to act less injuriously on the delicate granulations of the pleura than when fluid in considerable quantities is introduced either by the irrigator or the syringe. Before, however, the spray is directed into the sac, all pus must be entirely removed, and as each syringeful of pus is withdrawn, a solution of carbolic acid must be injected in its place, till all trace of purulent contamination has entirely disappeared. In protracted cases it is very necessary to change the disinfecting lotions as often as we find the one we are using ceases to act beneficially. If carbolic acid be employed for any length of time in large quantities, the urine is liable to assume a dark olive-green colour, which should warn us to discontinue its use. In place of it we may try iodine, in the proportion of half a drachm of the tincture to the ounce of water, or if there be much depression, quinine may be substituted. If the discharge be offensive, a solution of the permanganate of potash answers remarkably well. After the operation, the cannula is usually allowed to remain in the wound for two or three days ; it is then removed, and the aperture kept open by means of a small plug of lint steeped in a solution of carbolic acid. The presence of the cannula often occasions considerable pain and discomfort. If there is any tendency in the wound to close to such an extent as not to admit a catheter, it is dilated by means of a sponge pessary.

During the whole treatment the temperature must be closely watched. It should be taken twice daily, and in some cases three or four times. If the lungs generally are healthy, and there is no tuberculous disease, a rise of two or three degrees in the thermometer will almost certainly indicate that pus is collecting in some portion of the pleural sac, and is poisoning the system. If the pus be fetid, four or five degrees Fahrenheit will probably be indicated. Here the plan of treatment by means of silver catheters will be found peculiarly valuable, and we shall likewise discover the advantage of having mastered the physical geography of the pleural sac ; for if we are to bring down the temperature we must break down adhesions and liberate the imprisoned receptacles of pus. Traube, who has written very ably on this subject, maintains that whenever it is necessary to have recourse to the radical operation, Nélaton's catheters should be used, because they are softer than any others. In my opinion, it is their softness which renders them unsuitable for the work we now require of them. We cannot by their means release the encapsulated reservoirs of pus. In the literature of this subject we find frequent reference to failures arising from this cause. Thus, Frantzel (in speaking of five cases in which the radical operation was performed by Moutard Martin, which terminated fatally) observed "in these five cases, the pleural cavity was sub-divided into several

sacs by false membranes, and these could not be sufficiently cleared out by the rinsings; in consequence of this the pleural sac ichorised." The experience I have had has convinced me that sufficient care is not taken to get rid of the pus thoroughly and completely. I have frequently seen patients treated after the orthodox fashion (a perforated tube being passed through the thorax along which the pus was expected to find a free outlet), apparently make a good recovery. The discharge gradually ceased, the wound closed, and the patient left the hospital nominally well. The cure, however, was not permanent; caseous degenerative changes occurred in the retained pus, tubercular disease was set up, and death supervened after a protracted illness. To prevent such accidents free egress must be found for the pus. In several cases in which the temperature rose rapidly and unexpectedly during treatment the feverish symptons were attributed to the presence of pus, which it was impossible to liberate from within. Here a second or even a third opening was made in the thoracic wall, through which the peccant fluid was readily withdrawn. The situation for this outlet being determined by the thermometer. For where there are underlying purulent deposits there the temperature of the superimposed skin will be higher than over the remaining portions of the surface of the chest.

In treating empyema we must never forget that certain products of inflammation are destructive, and incapable of being organised. So long as they remain in the system they will inevitably prove a source of irritation. It should be our constant endeavour to assist in removing these destructive products of inflammation. The bands of fibrin we should also, as far as practicable, break down as they are forming. They contribute largely to that unsightly retraction of the chest which is so frequent an attendant on protracted cases of empyema. It has been proved to demonstration that the fibrin takes no very active share in the organising process. It cripples the expansion of the lnng and binds it down to the ribs. Rindfleisch, in describing the inflammation of serous membranes in cases of pleurisy, observes:—"We must divide the layer of exudation which lies loosely on the serous surface into two strata—an upper one, which consists of fibrin, and a deeper stratum of young connective tissue formed by a proliferation of the connective tissue of the serous membrane. Upon the surface of the serous membrane connective tissue corpuscles appear embedded in a clear matrix, containing mucin, together with which they make up the layer of embryonic tissue. From these cells and matrix the true 'plastic exudation' is really formed, and not, as used erroneously to be supposed, by the fibrin."

I propose, in the next place, to refer to two typical cases, which appear to me to illustrate the preceding remarks. In these cases the difficulties I have discussed were strikingly exemplified, still the results of treatment proved eminently satisfactory. The

first is that of a youth named Charles M —, aged nineteen, who was admitted into the Manchester Infirmary under my care on the 19th of February, 1877. At that time he was suffering from multilocular empyema. On two previous occasions he had been an inmate of the Infirmary, and three times considerable quantities of purulent fluid had been removed from the right side of the thorax. Soon after his admission he was again tapped, two pints and eight ounces of pus being withdrawn. The chest, however, rapidly refilled, and the condition of the patient became very critical. Though 5 ft. 4 in. in height, his vital capacity was only 70 cubic inches, instead of being about 200 inches, the normal standard for persons of his height. The evening temperature averaged 103. The pulse ranged from 110 to 120, and the respiration from 40 to 50 in the minute. The urine likewise contained considerable quantities of albumen, and there were signs of amyloid disease about the kidneys and liver. The digestive organs also were in an irritable state. Frequent attacks of sickness and uncontrollable diarrhœa rendered him day by day more prostrate and reduced. I determined, therefore, to have recourse to the radical operation without further delay. In the early part of April an incision was made between the fourth and fifth ribs on the right side in the mammary line. Into this aperture a cannula was inserted, and the pus permitted, as far as possible, to empty itself from the thoracic cavity. The quantity that escaped, however, was comparatively small; and on exploring the interior of the pleural sac with a long bent probe, I discovered that its cavity was intersected by tough fibrous ribbons, which subdivided it into pouches, within which considerable quantities of pus were encapsulated. As the adhesions were of long standing and very tough, it was found impossible to liberate the imprisoned contents of these receptacles with the catheter or probe. It appeared to me, therefore, that the only way of meeting the difficulty was to carry a trocar and cannula completely through the chest. This was done under chloroform by my friend and colleague, Professor Lund. A long trocar and cannula specially constructed for the operation, were inserted into the chest through the incision previously made. Whenever resistance was offered to the advance of the cannula, it was overcome by the protrusion of the trocar. In this manner numerous pent-up reservoirs of fetid pus were laid freely open, the instrument at times being diverted from its direct course and forced through the obstructing mass of adhesions which impeded its progress. As the different receptacles were entered large quantities of pus welled out of the anterior aperture of the chest; and when finally the extremity of the instrument was felt at the posterior part of the thorax, the trocar was forced through the ninth intercostal space, about two inches from the corresponding vertebra. The cannula was then withdrawn through the anterior opening, and the trocar, with a piece of perforated gutta-percha

tubing threaded through its upper extremity, was carried completely through the chest. The two ends of the tube were then tied together, and the pleural sac daily washed out with a carbolic acid lotion In this case it was found necessary to make a double opening, with a view of finding free egress for the pus. Unless, however, the case be very chronic and the adhesions exceptionally firm, I prefer breaking down the bands of fibrin and liberating the pus by a single opening.

This was a most tedious and protracted case, and clearly demonstrated the importance of keeping the plueral sac thoroughly clean, and not allowing pus to accumulate or stagnate in any portion of the chest. Over and over again, whenever the temperature rose, the interior of the pleural sac was carefully explored until the particular spot was discovered in which the pus was collected As soon as this was liberated by the catheter and the source of irritation drawn off the temperature immediately fell. The case was instructive in other ways also, for whenever the temperature rose only two degrees, the patient lost weight, and was unable to take cod-liver oil, from which when the feverish symptons were absent, he invariably derived much benefit albumen also reappeared in the urine, while diarrhœa and sickness returned. For twelve months the chest was washed out every day. During this time the amount of fluid which the pleural sac was capable of containing was at stated times carefully measured. Immediately after the operation it held four pints and two ounces; but in the course of seven months it did not admit more than eight ounces. In the early part of the treatment the chest was washed out with carbolic acid and water. After a time however when the progress of the case seemed slow, tincture of iodine, in the proportion of half a drachm to the ounce of water, was substituted. On other occasions, again, chloride of sodium, quinine, and permanganate of potash were used. The temperature of the lotion employed ranged from 92° to 98°. while the dressing was proceeding a Lister spray-producer was directed upon the thorax, and after the rinsing out of the cavity was completed the spray was directed along a catheter into the pleural sac. During the treatment, likewise, the patient daily inhaled compressed air from Seigel's pneumatic apparatus. From the description I have given of this case it will be admitted that it was one of very great gravity. The remedial measures were perseveringly continued for eighteen months. The patient made an excellent recovery. This was one of three cases of empyema introduced by me to the notice of the Medical Society of Manchester in 1879. The patient then looked muscular and healthy. The difference between the two sides was comparatively insignificant. There was very little retraction. The chest was well developed and freely admitted air into the regions which at one time had been rudely perforated by the trocar and cannula. The temperature was normal, the pulse regular and even, and the vital capacity had increased from 70 to

145 cubic inches. When I last saw this patient, some months ago, he informed me that he had completely regained health and strength, and felt sufficiently robust to undertake employment as a striker in an iron foundry, and was able to get through this laborious calling without experiencing any inconvenience or discomfort.

In another case, in which the patient was younger and the disease of shorter duration, the cure also was proportionately less protracted. An errand-boy, named James R——, aged thirteen, was admitted under my care into the Manchester Infirmary on Nov. 6th, 1878. The boy came direct from the fever hospital at Monsall, where he had been invalided with a slight attack of typhoid fever. When he was received at the Infirmary the right side was found loaded with pus, and as he seemed well-nigh moribund a free incision was made in the anterior portion of the right side, between the fifth and sixth ribs, by Mr. Frederick Southam. A cannula was inserted into the wound, and the pus permitted to drain away for three days. The thoracic cavity was then explored in the manner I have described, and the chest washed out with a carbolic acid lotion every day, Lister's spray-producer being directed upon the aperture at the same time. In the notes of the case I observe that on several occasions the temperature, which had been nearly normal, suddenly rose to 102° and 103°. When such a rise occurred the cavity was probed with the catheter until a receptacle of pus was discovered and tapped when the fever immediately ceased. The pulse at the same time became normal, and the appetite returned. In this case the incision into the chest was made on Nov. 6th, and on the 14th of the following February the wound had healed, and the cure was complete. During the whole time the patient daily inhaled compressed air. As the lung expanded he rapidly put on flesh; thus in the early part of November he weighed only 4 st. 6lb., whereas on the first of the following March his weight was 5st. 12 lb. The vital capacity also, as measured by the spirometer, increased in a corresponding ratio. On Nov. 16th. ten days after the operation, it did not exceed 50 cubic inches; on Jan. 8th he was able to expire 70 cubic inches; on Feb. 22nd, 79; on March 5th, 88; and three months later, 100 cubic inches. From enquiries I have lately made regarding this boy I find that he is now muscular and robust, and able to take part in such violent games as football and cricket.

In the two examples I have given it will be noted that the patients were young, one being nineteen, the other thirteen years of age, and it will readily be admitted that in the treatment of such a disease as empyema youth is a very potent and valuable ally. It may be said, indeed, that in early life the results of our curative measures will here be peculiarly satisfactory. No pains or care should then be spared, for even though the lung be reduced to an extreme degree of carnification, and though its tissue be hard and airless, and it has ceased to crepitate, still, if once the pressure be

fairly taken off, and the lung be placed under favourable conditions for re-expansion, it will respond to our efforts, and once more become pervious to the air. We shall find also, that even the non-vascular membranes which have invaded the pleura may, after a time become vascular, and themselves assist in promoting absorption.

Still, though among the young we shall naturally achieve the greatest amount of success, yet even among older persons many seemingly desperate cases will reward us if we are prepared to bestow upon them the unceasing attention they require. This care must not be grudged. In protracted and anxious cases we shall need all the help we can obtain. That physician will be most successful who can count (as I acknowledge with gratitude was my case) on the loyal support of able assistants, energetic and intelligent clinical clerks, and skilled attentive nurses.