

cles. When the nerve is injured, the nutrition of the muscles is interfered with, and they undergo atrophy.

Electricity in the form of faradism, if that current will contract the muscles, or galvanism, if it will not, unquestionably delays this atrophic change, so that when the nerve recovers from its injury the muscles will be in such a good state of preservation that complete recovery soon follows. On the other hand, if electricity is not used the muscles atrophy rapidly, and in severe cases may almost entirely disappear. In such cases it will be months before recovery takes place. The positive electrode should be placed just in front of the lobe of the ear, and the negative electrode applied successively to the paralyzed muscles, care being taken to interrupt the current so as to make the muscles contract with each interruption. Strong currents should not be used, on account of the likelihood of inducing severe vertigo from the action of the electricity upon the brain. As a rule, the current from six or eight cells will be sufficient. Application should be begun as soon after the advent of the paralysis as possible, and should be made certainly daily, and twice a day if possible, and from ten to fifteen minutes at each *séance*. A small blister should be applied behind the lobe of the ear, or the skin in the same location may be lightly cauterized. Counter-irritation is quite serviceable when applied directly over the seat of the inflammation. This may be accomplished by touching the skin behind the lobe of the ear lightly with a cautery, or else by applying a small blister to the same locality.

The paralyzed muscles are further weakened by being continually pulled and stretched by the contraction of the muscles on the sound side of the face. To overcome this I use a simple apparatus consisting of an S-shaped hook, one end of which fits in the angle of the mouth on the paralyzed side. To the other end of the hook an elastic band is attached which can also be fastened to the ear by means of a loop of cord. By regulating the length of the elastic the tension on the muscles is greatly diminished. A very good hook can be made by putting a piece of whalebone into hot water for a few minutes, then bending it to the desired shape, and tying it. When cold and dry it will retain its form. This apparatus should be worn all night, and also during the day when practicable. Medicinal treatment, except when syphilis is the cause, is ineffectual. We are obliged to wait for nature to remedy the injury. But we can render some assistance by applying counter-irritation over the seat of the lesion, keeping up the nutrition of the muscles by electricity, and relieving the strain on the paralyzed muscles by the apparatus just described.

Pediatrics.

THE SURGICAL TREATMENT OF PLEURISY AND EMPYEMA IN CHILDREN.

CLINICAL LECTURE DELIVERED AT THE MEETING OF THE BRITISH MEDICAL ASSOCIATION, BOURNEMOUTH.

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PLEURISY.

GENTLEMEN,—The first part of my subject may be passed over in a very few words; because in dealing with the surgical treatment of pleurisy in children it is only necessary to refer to the operation of aspiration, an operation so simple that it is even included in the practice of the most orthodox Fellows of the College of Physicians. And for this reason it happens that a surgeon has, with exceptional opportunities, but little familiarity with it. Still, he is not unfrequently asked to do it, and sometimes to express an opinion as to the advisability of its being done. To this I always answer that I have never seen any harm result from it, and that I consider it not only advisable but indicated:

1st. When the fluid—whether in large or small amount—shows no tendency to become absorbed, and especially if the temperature keeps above the normal; and

2d. When the fluid is in sufficient quantity to interfere with the action of the heart or the respiration. It must be remembered that the extent of the dulness and the displacement of the heart give a very imperfect indication of the amount of fluid in the chest, for, if the lung on the affected side be consolidated, a small amount of fluid may cause more displacement than a large quantity where the lung is healthy enough to be capable of considerable compression; but, fortunately, under these circumstances the withdrawal of a small amount of fluid gives as much relief as the evacuation of a large quantity would if the lung were much collapsed.

I can suggest no improvement on the usual method of performing the operation. The bottle aspirator, or a siphon arrangement, may be used: personally I prefer the former, perhaps because I have had greater experience with it. The child is to be placed on the back, close to the edge of the bed, and the skin and needles are to be well purified by the use of a carbolic acid lotion, one to twenty. A fine but rather long needle (three or four inches) should be used, and it may be introduced just in front of the posterior fold of the axilla in the sixth or seventh interspace. The intercostal space is felt with the index finger of the left hand, and the needle is introduced with a firm thrust into the cavity of the pleura. It should be passed far enough to enable the operator to manipulate it freely, so that he can push it back to the angle of the ribs if necessary. The bottle should not be completely exhausted, but should be gradually filled by a slow process of pumping, which can be stopped at a moment's notice if pain or coughing be set up. The danger of cardiac failure owing to the sudden withdrawal of a large amount of fluid is thus avoided. It is not necessary to attempt the complete evacuation of the pleura; indeed, unless the lung is capable of complete expansion—a rather unlikely contingency—it is physically impossible. The indications for stopping are, first, the arrest of the flow of fluid; second, the appearance of blood in the fluid; third, persistent pain or coughing.

Sometimes it is impossible to obtain any fluid from a chest which obviously contains plenty, or the flow may suddenly stop. This is usually caused by a piece of lymph becoming sucked against the canula. The difficulty may be overcome by introducing a plunger smaller but longer than the canula, and keeping it in position during the process of exhaustion. This is often of the greatest service also in the aspiration of an abdomen for ascites, the contact of a piece of intestine stopping the flow in the same way as a flake of lymph in the cavity of the pleura. The same thing may be done if the siphon be used instead of the aspirator.

When the operation is completed, a little manipulation of the part will prevent the escape of any fluid through the puncture. A scrap of antiseptic wool is then luted down over the wound with some collodion. After this I prefer to leave things alone, or, at most, to apply mild counter-irritation by means of some tincture of iodine applied just sufficiently often to make the part hot but not sore; and I am not quite convinced of the advisability of even this mild application.

EMPYEMA.

The surgical treatment of empyema in children can only be by means of an operation, except: first, in those rare cases complicating phthisis, when the same rule applies as for adults,—namely, that, unless the breathing or the heart's action is materially interfered with, the case had better be left alone, because, while a cure is very unlikely, it appears to be almost certain that the tubercular process is accelerated if the pleural cavity be opened. Secondly, if the empyema has ruptured into the bronchus, in which case a *certain* length of time must be allowed to see if nature will effect a cure by this means. I say a "certain" time advisedly, because I do not believe it is possible to fix a definite limit in days or weeks. If the expectoration is obviously diminishing and the child is gaining flesh, whilst the temperature remains normal, the surgeon need not be in a hurry to interfere; but it must be remembered that it is very difficult to estimate the amount of expectoration in children, as they are so often in the habit of swallowing it. The result of a free opening into the pleura is, however, now almost invariably successful, and therefore if there be any doubt about the satisfactory progress of the case it is far better not to delay, but to operate at once; for it must not be forgotten that if a large amount of pus is being coughed up, and especially if it be coughed up with difficulty, some of it may easily be drawn into the bronchi of both the affected and the healthy lung and may set up destructive processes in them. Some may maintain that if spontaneous rupture have taken place externally, nature should be allowed the chance of effecting a cure, but with this I do not agree. The surgeon's help is, I think, always desirable, if not actually necessary.

In dealing with an empyema which is not being expectorated, whether it be a localized or a complete one, the question of aspiration versus free incision is the first to be considered. And I would say at once that I do not believe—taking the average of a considerable number of cases—that aspiration, even if successful, saves time. That it is successful in a few cases has been amply proved by experience; though seldom until the process has been repeated two or three times. It must be remembered that this method of cure involves the absorption of a certain amount of pus, and probably the leaving behind of flakes of lymph in the pleural cavity. It is evidently impossible to evacuate the whole of the contents of the pleura by means of the aspirator, unless the lung can expand completely, or unless the thoracic parietes can contract to such an extent as to come into perfect

apposition with it,—a very unlikely condition of things. It is pretty certain that a considerable number of empyemata in children are never diagnosed, and recover spontaneously; but this is no argument in favor of neglecting a process which must leave behind what theoretically, at all events, may be the source of mischief later on. Therefore, taking all these points into consideration, I am strongly in favor of free incision at the earliest possible opportunity. Every day that is allowed to pass after the presence of pus has been ascertained is a day wasted. The lung becomes more compressed and less able to expand, whilst the walls of the thorax are rendered more rigid by the inflammatory processes taking place in them.

The question of the anæsthetic hardly needs discussion, because one is not tempted to give ether to a child. For adults, chloroform is, in my opinion, better, if the respiration be in any way interfered with, and I certainly should not think of giving anything except chloroform to a child with empyema. It is not necessary to push the anæsthesia far, and it is essential to avoid doing so if rupture into the bronchus has occurred, for an escape of matter into the trachea of a patient deeply under the influence of chloroform may put him into very great peril.

In dealing with a general empyema, I believe the most favorable position for the opening is opposite the ninth rib, a little outside the line of the angle of the scapula. I have made the incision here for several years, and experience confirms the opinion that it affords the most satisfactory drainage, both when the patient is lying down and when he is standing up, and that it is not so low as to involve an awkward obliquity of the drainage-tube when the diaphragm becomes drawn out towards the chest-walls. If a lower position be selected behind, this obliquity of the drainage-tube is often a source of much inconvenience. If the so-called seat of election—namely, the sixth or seventh interspace in front of the posterior axillary fold—be chosen, a pocket not unfrequently remains behind, which necessitates a subsequent posterior opening. In a child I almost always take out a portion of rib about two inches long, because it is seldom, if ever, possible to explore the cavity with the finger without doing so, to introduce a drainage-tube of sufficient size to be of any value, or to evacuate those large flakes of lymph which are often abundant, especially in acute cases. If the patient be very ill, and it appears dangerous to turn him, even a little, on to the sound side, the incision at the spot indicated may easily be made by turning him well over on to the affected side, and operating from behind.

It seems almost unnecessary to discuss again the much-debated question of the advisability or not of removing a portion of rib, because I believe most surgeons at the present day adopt this plan. It is to some extent a question of expediency, and no doubt many long series of recoveries after simple incision of an intercostal space might be produced. But it may be fairly claimed that the operation is not rendered materially more severe or more difficult, that it affords better drainage and a better means of diagnosis, and that the objection urged against it that a weak spot may be left in the chest is not a valid one, for the rib is reproduced in from six to eight weeks in a young child. It is only in very putrid cases that I feel shy of removing a portion of rib; and that for two reasons. First, there is the objection—perhaps only a theoretical one—that septic absorption is more likely to follow the flow of pus over a cut surface of bone than over freshly-divided soft parts. Secondly, by removal of the rib the vessels are exposed to the pressure of the drainage-tube, from which they would otherwise have been protected. This risk is, however, obviated by cutting the artery across and tying it before introducing the tube. But that the danger is a real one is shown by the case of a young lady who had a very putrid empyema of some weeks' standing, by which her health had been very much reduced. As the ribs were very close together, I removed a portion of one of them. A few days afterwards free hemorrhage took place into the pleura, as the result of which she ultimately died. I do not know for certain that it was the intercostal artery which gave way, for I had no opportunity of seeing, but it seems the likeliest explanation of the disaster.

I know of no better drainage-tube to employ than the simple flanged one, which any one can make for himself by splitting the end of the tube into four parts, introducing them through a hole cut in a piece of rubber, and stitching them down with silver wire. But I say this without prejudice, as I believe there are other forms which find favor with other surgeons. Its length should be just sufficient to enter well into the cavity of the pleura, and its size about that of the little finger. No hole should be cut in it, or at most one at a point corresponding exactly to the inner surface of the ribs. This tube is not intended to be shortened, but it may be replaced if necessary at a later date by one of equal length but smaller bore, and when the time comes for it to be dispensed with it may be taken out altogether.

The length of time that the tube should be kept in varies very much, and depends upon the amount of discharge. In young children, I have found on the average (taking long and short cases together)

that a week or ten days is sufficient. But it would be absurd to remove the tube if there were much discharge, and especially if it were purulent. It is not always necessary to wait until the cavity is almost or quite obliterated, but if the cavity remains large whilst the discharge from it is very small, I have frequently found the following method of great use, both in children and in adults. The tube is removed, and the next day—or two days after—a gum-elastic railroad catheter is introduced into the wound, and the contents of the pleura are allowed to escape through it. Very likely when it is introduced a slight whiff of air may be heard, and in some cases—not in all—it may be found by holding a lighted match at the end of the tube that this is being sucked into the chest, not expelled from it. If this be the case, it shows that another means of bringing about expansion of the lung is at work,—namely, the absorption of the air of a pneumothorax. If the fluid which escapes be serous, and each time diminishing in quantity, the tapping may be repeated at intervals of three or four days, and stopped when it has become very slight. In this way it has often been found possible to bring cases to a rapid conclusion that have promised to be very tedious. But if the discharge remains purulent notwithstanding the adoption of this plan, it will be found better to continue the use of the drainage-tube.

CASE I.—I employed this method first in the year 1887 in a lady, aged about twenty-five, who had suffered from a right empyema for a year, which was discharging through an opening opposite the fifth interspace in front, which led upward and inward obliquely to an opening in the fourth interspace behind the mamma. I made a large opening opposite the ninth rib, outside the scapular line, and the discharge rapidly diminished and became serous. But, owing to the rigidity of the walls of the cavity, closure was taking place very slowly until I adopted this method, which in a few weeks effected a permanent cure.

CASE II.—The next case was that of a gentleman, aged sixty, who had an old localized empyema on the left side which had been treated by poulticing from the commencement. The result was a cavity beneath the scapula containing about six ounces of stinking pus and discharging itself through an oblique opening near the posterior fold about opposite the eighth rib. I removed about four inches of this rib, and so obtained free access to the anterior part of the cavity. The effect upon his general health was wonderful. Before the operation he was feeble, pale, blue, with clubbed fingers and weak pulse, so that I was disinclined to operate upon him at his age. Afterwards the circulation

improved, the numbness and clubbing of the fingers disappeared, and the cavity, though it remained of some size, stopped discharging almost completely. There appears to have been great difficulty in keeping the tube in, and I had the opportunity of seeing him at intervals of several days and ascertaining by means of a catheter that the cavity had almost ceased to secrete, although the opening was practically closed. Thus, though I did not methodically adopt the plan I am describing here, it was a great encouragement to continue its use in other cases; which I have frequently done since, and generally with most satisfactory results.

CASE III.—One particular case may be mentioned,—that of a young man, aged twenty-four, who had a left empyema with an acute onset, in which after the first evacuation the temperature came down for only a few days, and then assumed a hectic type, whilst the discharge remained very copious and purulent. After a prolonged period of irrigation with a weak solution of iodine and a one-per-cent. emulsion of creolin, the discharge diminished, but remained purulent. The tube, however, caused so much discomfort that it was removed about six weeks after the operation, and the periodical tapping was begun. In a short time the discharge became serous, and in a little more than three weeks we were able to discontinue the process altogether.

Injecting the pleura at the time of the operation is, I think, never advisable. It is a process not free from danger, as it is well known that many cases of sudden death have occurred during its performance, both in old and in recent empyemata. For this no sufficient explanation has been given, though many have been suggested. The only case I ever saw was many years ago in a child with a small old cavity with dense fibrous walls. If during the subsequent treatment it seems advisable to employ injections, care should be taken that no pressure is caused inside the chest, which may be avoided by using a tube much smaller than the opening, and by introducing the fluid through an irrigator held at a height not greater than eighteen inches above the level of the bed. The tube employed may be either an india-rubber drainage-tube or a gum-elastic catheter. The latter has the advantage that it can be directed to any part of the cavity, and, if desired, it may be provided at the end with a rose, which will allow the fluid to escape in a spray instead of in a single jet. I am in the habit of employing either tincture of iodine added to water until a pale sherry color is produced, or a one-per-cent. emulsion of creolin. Sometimes it is useful to blow finely-powdered iodoform into the cavity. The temperature of the solutions employed should be about 100°.

The spray has now practically gone out of use, but it is as essential as ever to prevent the entrance of those coarser fragments of dust into the chest which are now known to be the principal vehicles of the organisms that produce septic changes. It is therefore well, at the time of the operation, to allow the matter to escape, and to perform the subsequent manipulations as far as possible beneath a veil of muslin or lint soaked in some antiseptic solution. The same method may be adopted in changing the dressing. When the deeper part of the dressing is to be removed, the patient is told to hold his breath, the tube is removed, and the veil is placed over the wound. When the tube is to be reintroduced, the same manœuvre is repeated. It is thus easy for any one to keep an empyema perfectly aseptic without the use of the spray. The double cyanide gauze (of mercury and zinc), now employed by Sir Joseph Lister, forms an excellent dressing for these cases. It is far superior to the alembroth gauze, because this double salt is very insoluble. When the alembroth gauze was used, if the discharge was copious, a stronger and stronger solution was produced as it gradually soaked its way towards the edge of the dressing. This not infrequently caused an eczema near the margin of the dressings, which was not only troublesome to the patient, but often a source of putrefaction spreading to the wound. If the pus be already offensive, it will not be necessary to employ so expensive a material. A piece of boric lint soaked in one to two-thousand sublimate lotion beneath a pad of oakum or wood-wool makes a very excellent application, and there are many other suitable dressings, which I need not mention. If the discharge be copious in a very chronic or incurable case, the dried and compressed moss introduced some years ago from Germany will be found very useful. Nothing further need be said with regard to the treatment of a *localized empyema*, except this: that the opening must be, if possible, in the most dependent situation.

If an empyema has already ruptured externally, it is right to consider whether the opening is in a sufficiently favorable situation for good drainage. If it be, it may be utilized after it has been enlarged. If it be not, the surgeon must not hesitate to make a second opening in the most favorable situation. It is bad practice to delay the cure for the sake of avoiding a second scar which will never be seen. If a second opening be made, the first may probably be left without a drainage-tube, but sometimes the presence of the second opening appears to favor the escape of the fluid, perhaps in the same way as the flow of beer from a cask is rendered possible by the removal of the spigot.

I have previously referred to cases which have ruptured through the lung, and hinted that it is unwise to delay making an external opening. In most cases, when this is done, the internal opening rapidly closes, and cure proceeds as if no such opening had ever existed. But occasionally, either because the opening is very large, or from some other cause which has not been explained, the communication with the lung remains patent, and often very free. This is shown by the peculiar whiffing sound when the patient expires, exactly like that which is heard when a pulmonary abscess has been opened, and by the rapidity with which any sapid material, such as iodoform, injected into the wound, is tasted in the mouth. These cases are very unpromising to deal with, and indeed sometimes appear to be absolutely hopeless. The best that can be done is to keep the external opening free for a very long period, and cautiously to shorten the drainage-tube. If the injection of such a cavity be attempted, a most painful fit of coughing may be set up.

It remains only to deal with those cases—happily, I believe, becoming more rare since the early treatment of empyema has been put upon a more satisfactory basis—where the lung has expanded to the utmost possible extent, the chest-walls have fallen in as far as they can, producing sometimes great deformity, and the diaphragm has risen to its highest limit, and yet there remains a cavity bounded by dense fibrous walls. Here it is only possible—and it is right—to perform the operation named after Estlander, its inventor,—namely, to remove large portions of ribs from that part of the chest-wall which bounds the cavity. The rule is to take away the longest portions opposite the middle of the cavity, and smaller ones as the upper and lower limits are reached. Thus portions of as many as seven or eight ribs have sometimes been removed, and occasionally a good result has been obtained. But it is obvious that if the cavity extends to the apex of the thorax it will be impossible to deal with it in this way; and even under apparently favorable circumstances it has not unfrequently happened that, although the cavity has been very much diminished, an incurable sinus has remained. In performing this operation a flap may be reflected corresponding in size to the part of the chest-wall which has to be opened. Or, if it be preferred, the ribs may be removed through incisions parallel to their long axes. It is quite easy to remove portions of three ribs through each of such incisions. The hemorrhage is often rather free whilst the ribs are being exposed, but after this removal no trouble is usually given by the intercostal arteries. The whole of the periosteum and thickened pleura corresponding to the ribs

that have been removed must be cut away, to prevent the reformation of the bone. In doing this all the intercostal arteries of the part are necessarily divided, but often they do not bleed at all, and they seldom give any trouble to speak of. It has often struck me (and I think the suggestion was made by the late Mr. Marshall) that it would be a good plan to supplement this procedure by dividing the ribs from which portions have been removed, both near the spine and near the sternum, so as to allow of their more complete collapse; but I have never yet put this plan into practice.

PLEURISY IN CHILDHOOD.

CLINICAL LECTURE DELIVERED AT THE EVELINA HOSPITAL.

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GENTLEMEN,—Recently we have seen several cases of pleurisy among the out-patients, and to-day I shall tell you about its peculiarities, causation, diagnosis, course, and treatment. In the first place, a very free formation of fibrin is usual, and, secondly, purulent effusions are frequent. Of 190 cases there were 114 males and 76 females. The fibrinous variety totalled 85,—48 right-sided, 36 left-sided, and 1 double. There were 105 empyemas,—50 right, 53 left, and 2 double. Of the former 7 died, and of the latter 31, and one was suffering from lardaceous disease. Two or three were doubtful. Of these cases 114 were five years of age or under, 75 of them being empyemas. Many commenced with a sudden sharp febrile attack; some few gave a history of a preceding exposure to wet and cold (10 in 101). Occasionally injury in the shape of a fall or other traumatism appears in the history as the starting-point. Many were caused by pneumonia, broncho-pneumonia, bronchitis, and pertussis followed by pneumonia, etc., also scarlatina and measles, rheumatism, tuberculosis of the lungs and pleuræ, typhoid fever, diphtheria, mumps, and varicella. In many cases a rheumatic or a tubercular family history can be obtained. Children with Bright's disease are very liable to pleurisy. In acute nephritis the effusion may be double, without lymph, and therefore more of the nature of dropsy. Some cases are associated with a general tubercular implication of the serous cavities, or septicæmia with a rapidly fatal issue: in the latter colonies of micro-organisms will be found in the affected parts and organs. Pulmonary apoplexies may be complicated by pleuritis. In pyæmia the local condition may mask the general. Pleuritis may exist with or without infarcts, and infarcts without pleurisy. It may occur as an extension from pericarditis, or the converse, or it may even extend to the great vessels.

In a female of two years, with double empyema, a swollen left