CLINICAL OBSERVATIONS

ON

CASES OF TRACHEOTOMY.

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FOR the remarks on tracheotomy which I am about to read I can claim this merit, that they are based entirely on personal observation and experience of the matters with which they treat; and it will be my object to stray very little, if at all, beyond these limitations. I cannot, however, promise that they will refer to any points of novel interest, except such as grow out of the fresh illustration of well known facts and previously recorded incidents. My object, indeed, will be served if they give rise to a discussion among the members of the Society present on a subject of such general interest to all practitioners as that of opening the windpipe for the relief of obstructed breathing. I shall, then, first detail shortly the history of two cases very similar to one another, but differing widely from all the rest of which I have had experience.

On September 19th, 1872, I was asked by a medical friend to visit with him a young married woman, about thirty years of age, said to be suffering from laryngitis, with dangerously obstructed respiration. On arriving at the house, we found the patient in a condition of extreme gravity. She was in the sixth or seventh month of her first pregnancy, and, during the last few hours, labour-pains had come on, and were recurring at intervals, although with no great severity. From an examination, the doctor in attendance had already ascertained that the os was considerably dilated and the membranes protruding. Three or four days before this, she had been attacked with acute laryngitis, but it was only on the previous evening that distressing dyspnoea had come on. At present, her breathing was almost completely obstructed, and the lividity of her face was extreme. It was evident that she must die very shortly if unrelieved. My friend appeared to think that some amelioration might be expected to follow upon her delivery, and, accordingly, proceeded to rupture the membranes and turn the child. During this operation, she became markedly worse—indeed, completely asphyxiated. As soon, therefore, as the child was delivered, I opened the trachea; and although, for a quarter of an hour or so, the result seemed doubtful, breathing by the tube was ultimately fairly established with the aid of artificial respiration. In a short time, her face (livid before) became preternaturally flushed; she breathed tranquilly; and, in reply to an inquiry from her husband, indicated that she was comfortable and free from pain. She took nourishment and enjoyed some sleep during the day. My friend, at his evening visit, deemed it right to remove the placenta: a procedure which caused her some pain, and brought about an unusual complication in the wound, to which I shall refer again. Suffice it at present to say, that during the night she began to lose strength, and continued gradually to sink until next day, when she peaceably expired, without any recurrence of the difficulty of breathing.

The second case was in many respects very similar. The operation was performed, with the kind assistance of Dr. Coats and Dr. Scanlan, who were in attendance upon the patient, at midnight of Wednesday, the 13th September last. She was a young and healthy woman about twenty-five years of age, and said to be in the last month of her second pregnancy. She had been suffering for three or four days from acute laryngitis, accompanied by distressing dyspnoea. When we saw her together, she was in a state bordering on asphyxia. The lividity of the whole countenance was great, and during coughing, which occasionally occurred, grew even more intense. After the tube was introduced, breathing became rapidly re-established, and this change was quickly followed by all its usual beneficial effects. We left her in the course of an hour greatly relieved, and as comfortable as could be expected in the circumstances. I saw her again at eight o'clock the following morning, when her state was by no means unsatisfactory. About twelve o'clock, however, she was delivered of three children, and immediately expired.

The strictly parallel character of these two cases is sufficiently obvious. Both patients were strong, healthy, and young women far advanced

in pregnancy; in both, the disease was essentially the same and the symptoms of suffocation equally urgent; in both, the operation was successful in restoring easy breathing; in both, premature labour was commenced and completed; and lastly, after this occurrence, in both cases a fatal result ensued.

There are one or two points of interest here, to which I may be allowed to refer at greater length. And, first of all, it is evident that both of these patients were in the worst possible state, on account of their pregnant condition, to struggle with impeded breathing; while, on the other hand, it is interesting to observe that Nature made an attempt, as it were, to relieve the patient by emptying the uterus and so setting free the diaphragm to co-operate with the other respiratory muscles in the struggle for life. I was much struck by a very analogous occurrence, in the case of a woman who was under my care in the Royal Infirmary a short time ago, and in whose progress the public took not a little interest. I refer to the case of Mrs. Barr, for whose murder, and that of her mother, her husband was condemned and hanged in Glasgow last spring. At the time when the murderous assault was made upon her, she was in the sixth month of her second pregnancy. Amongst numerous stabs inflicted, there were two which were especially severe, viz., a penetrating wound of the abdomen with prolapse of a piece of omentum, and a penetrating wound of the left side of the chest. Had this woman been specially disposed to abortion, here were circumstances which might well have brought it about. But neither the mental emotion which was caused by witnessing her mother's murder and in being herself the object of a similar attack, nor the bodily injury which is implied by a penetrating wound of the pregnant abdomen, caused the slightest threatening of any such result; and in a few days, under antiseptic treatment, all the wounds had healed. A fortnight afterwards, a large collection of fluid and air existed in the left pleura as a consequence of the wound of the chest already referred to. For purposes of respiration, the left lung was entirely crippled and the heart was displaced to the right side, the apex-beat being discernible under the right mamma. The breathing now became greatly embarrassed and lividity of the countenance well-marked; and what was the result? I left her bedside one evening resolved to perform paracentesis of the chest on the following day if I found her no better. Premature labour, however, came on during the night, and she was delivered of her child. This relieved her breathing, but left her, for the time being, very prostrate. Now, gentleman, there can be no reasonable doubt that, in all of these cases, the onset of labour was a direct consequence of the asphyxial symptoms from which these women suffered; or, in other words, uterine contractions were excited by the circulation in their systems of non-aerated or imperfectly aerated blood. The presence of carbonic acid in the blood is fully recognised by obstetricians as a cause of abortion. Tyler Smith, in his work on *Parturition*, writes of it as follows:—"The inhalation of carbonic acid rapidly excites abortion, and, during accidental or intentional poisoning by this gas, the ovum is often expelled. During the celebrated *razzia* in Algeria, in which a great number of Arab women were suffocated in the caverns of Dahra, those of them who were pregnant were found to have aborted. Military histories offer examples of the same kind in other countries." Leishman, in his treatise on *Midwifery*, in reference to the same subject writes as follows:—"A similar action of the uterus (*i.e.*, contraction) is produced by carbonic acid, as has been abundantly proved by the records of cases of accidental or intentional poisoning. A precisely similar effect follows the retention of carbonic acid in the blood in asphyxia—a condition under which the expulsion of the ovum has very frequently been found to occur. Of five hundred Arabs, who were suffocated in the caves of Dahra in 1845—as is said, by the orders of the Duc de Malakoff—a considerable proportion were women, and of these many who were pregnant were found to have aborted, and other instances of a similar nature have also been recorded. The same fact has been proved experimentally by the researches of Dr. Brown-Séquard, who further believes that the oxytocic action of carbonic acid is the determining cause of labour at the full term, exciting, by the direct contact of venous blood, the irritable uterine fibre to contract."

I have been thus explicit in endeavouring to show the connection between the interference with the respiration and the supervention of labour in order to point out a lesson which, it seems to me, is logically deducible from the history of these two cases, and it is this: that in the case of a pregnant woman suffering from any form of obstructed breathing remediable by tracheotomy, the operation ought to be performed at a very early stage of the disease. If matters be allowed to go so far as that non-aerated blood shall continue circulating for some time in the patient's system, the strong probability is, that abortion will ensue and prove the last straw to break the camel's back. In fact, a delay, which in a non-pregnant woman might be just and reasonable, in a pregnant woman must be dangerous, since it introduces a very

* Read before the Glasgow Medico-Chirurgical Society.

serious, and probably fatal, complication. I should be disposed also in future to prefer, in similar cases, laryngotomy to tracheotomy, since the obstruction must necessarily be above the true vocal cords, and the operation is easier, more rapid, and inflicts a less serious wound.

One other point seems worthy of notice before passing from this subject. It is well understood that natural labour is accomplished by voluntary expulsive efforts on the part of the woman as well as by the involuntary contractions of the uterus. In order to bring about these expulsive or bearing-down movements, the lungs are filled with air, the glottis entirely or partially closed, and violent, laborious expiratory efforts are made. In the second case detailed above, this combination of actions was, of course, a physical impossibility, seeing that there was a tube in the wind-pipe. She could make no expulsive efforts whatever, and labour was therefore necessarily commenced and completed by the unaided action of the womb. Such an occurrence must be sufficiently rare to deserve notice here.

In addition to these two cases, I have performed tracheotomy in ten children suffering from croup and diphtheria. In two of these, breathing had already ceased, and all attempts to re-establish it by artificial means, after opening the wind-pipe, proved futile. Of the remaining eight cases, five died and three recovered. The ages of those who recovered were respectively two years, seven years, and four years; of those who died, nine years, three years, twelve years, four years, and four years. Two cases of diphtheria and one of croup recovered, while four cases of diphtheria and one of croup died. Of the fatal cases, three died on the fourth day, one on the second day, and one on the fourteenth day after operation. In what remains of this paper, I propose to consider some of the complications and difficulties of the operation and its after-treatment, with which this experience has more or less familiarised me.

Of all the complications which occur during the operation, probably the most to be dreaded, because the most embarrassing, is hæmorrhage. In only one of my cases did I experience inconvenience from this source. The venous bleeding was profuse and rapid, and although constantly sponged away by Professor Andrew Buchanan, who kindly assisted me, it proved a source of considerable embarrassment. It entirely and quickly ceased, however, on the introduction of the tube. To guard against hæmorrhage and the mishaps to which it leads, I believe it is only necessary to attend to three points, all of which have been often insisted upon. These are to make the first incision scrupulously in the middle line; secondly, to make no attempt to open the trachea until its rings are visible, or felt with the forefinger of the left hand to be quite exposed and bare; and lastly (and, in my opinion, most important of all) the operator must be careful to make his deep dissection correspond as much as possible to the centre of his original wound, or, in other words, it is necessary that he should avoid cutting too much towards the trunk. The veins are largest and most numerous in this situation, and any free dissection here cannot fail to give rise to most undesirable hæmorrhage. Let the first incision, by all means, be free, extending through skin and fat from the cricoid cartilage nearly to the episternal notch. The deepening of this wound, however, must take place only in its central portion. As a French writer has well said: "An ideal operation would be that in which the wound of the integuments would form the base of a triangle, of which the apex would be represented by the tracheal wound."

Another reason for avoiding free dissection at the lower end of the wound is, that it facilitates the occurrence of the second complication to which I shall refer, viz., prolapse of the thymus gland from below. This accident is one not generally noted in surgical works, although it was pointed out many years ago by Dr. George Buchanan. Why it should have escaped attention it is difficult to understand, for its occurrence is apparently by no means very rare. I first met with it when operating in a case of croup, aged three years, with the assistance of Dr. Suttie, who had asked me to see the patient. Suddenly and quite unexpectedly, a large pinkish mass of tissue, of tolerably firm consistence, rolled out from the lower angle of the wound and entirely filled up and obscured it. It was clearly not fat, and a little examination served to show that it was the thymus gland. It was readily reducible, and, being kept in position by Dr. Suttie's forefinger during the rest of the operation, showed no disposition to prolapse again after the tube was introduced. On two subsequent occasions, I have exposed and seen part of the gland at the side of the trachea, where it lies under cover of the sterno-hyoid and sterno-thyroid muscles, but on neither occasion did it give trouble. I need hardly add, that the occurrence is of little significance, except in so far as it interferes with the safe and comfortable performance of the operation.

Another accident sometimes met with is emphysema. It is said that this may occur before the trachea has been opened. The loose cellular tissue of the neck having been incised, air is induced to enter it; and

this is not difficult of belief, when one recalls how, with every forced inspiration of the patient, the wound (and more especially that part of it corresponding to the episternal notch) is deepened and hollowed, and sucked in towards the chest; and I have myself observed emphysema follow the removal of a fatty tumour from this situation, in the case of a patient suffering from severe cardiac dyspnoea. The same conditions, it is well to remember, which produce emphysema at this stage, have in some instances, produced a much more dreadful accident, viz., the passage of air into the open mouths of divided veins, leading to the immediate death of the patient.* There is a condition sometimes in the wound, associated with the suction into it of air during each inspiration, but stopping short of emphysema, which is of some interest, since I suspect it may sometimes give rise to an awkward mistake. I have observed in several cases an intimate mixing of blood and air in the deeper recesses of the wound, causing a frothy and finely bubbling appearance, which may lead to the belief that the trachea has been opened, when, in reality, this has not yet been accomplished. We know that this mistake has sometimes happened, and I cannot help thinking that the condition I have just described may have had some share in occasionally giving rise to it.†

When emphysema occurs after the opening of the trachea—and this is the stage at which it commonly occurs—it is usually because the wound in that organ does not correspond in situation with the wound in the skin and fat, and the obvious treatment is to enlarge the latter, either upwards or downwards, or in both directions. I have met with it in one instance only, and it occurred under quite exceptional circumstances. It was in the first of the two cases of laryngitis in pregnant women, which I have already detailed. When the medical man in attendance on that case proceeded to remove the placenta, several hours after the tracheotomy had been performed, the patient complained a good deal of the pain, and probably, through her uneasy movements, caused the tube to slip out of the wind-pipe. Attempting, no doubt, to make expulsive efforts, while the hand of the operator was in the uterus, she blew up the cellular tissue of the right side of her neck and face with air which passed out of the trachea, but failed to escape from the wound.

A complication is met with during the after progress of some cases of tracheotomy which, if the surgeon be not forewarned in regard to it, is apt to occasion surprise and alarm; viz., the escape from the wound of fluids which are swallowed. This I have observed in two of my cases. In the first it was very slight. On one or two occasions at the conclusion of a hurried and lengthy draught of milk, a few drops of it were observed to escape by the wound, but, apparently, if the patient drank slowly and deliberately, the accident was avoided. In the second instance, however, the evil was very great, and, as I believe, had a serious bearing on the ultimate issue of the case. The patient was a little girl, about four years of age, who was under the care of Dr. Scott Orr. She had been suffering from diphtheria for ten days before it was found necessary to open the windpipe. Several days after I had operated, it was observed that a large proportion of every drink which she took escaped by the wound and through the tube. This continued until her death, which occurred during an unexpected and sudden convulsion, on the fourteenth day after the operation. In such a case, Guersant advises that the child should be fed by a tube passed through the nose into the œsophagus, and the advice seems worthy of all consideration. The causation of this accident is somewhat obscure. When I first observed it, having heard much of ulceration caused by the pressure of the end of the tube, I dreaded lest a communication had been so formed between the trachea and the œsophagus, and this is exactly what would suggest itself to anyone's mind who witnessed the occurrence for the first time. But this certainly is an incorrect explanation. Holmes, in his treatise on *Surgery*, writes, in reference to this subject, as follows:—"It seems to depend on the obstacle which the presence of the foreign body causes to the elevation of the larynx under cover of the epiglottis, and possibly to effusion into the aryteno-epiglottidean folds from inflammation." If this were the case, however, surely the accident would be a more common one than it is, and would be present from the first insertion of the tube. But in both of my cases, and in the only other reported one which I have happened to see (viz., one of Dr. George Buchanan's), the complication did not show itself until the lapse of several days after the operation. Dr. Buchanan writes of the case in question as follows:—"On the fourth day milk and other fluids were observed to come out of the wound along the tube, and I could not determine whether this

* A case of this sort is referred to at length in the *Edinburgh Monthly Journal of Medical Science* for November 1847.

† Since writing the above, a case has come under my observation, in which a medical man failed satisfactorily to insert the tube, after performing the operation. Post mortem examination showed us that no opening had been made in the trachea, although both he and his assistants fully believed at the time that this had been done.

was owing to the insensibility of the glottis, or whether the displaced cannula had made an opening into the œsophagus from the pressure of its point against the back of the trachea." It is quite conceivable, no doubt, that the sensibility of the glottis may become impaired, seeing that, so far as respiration is concerned, it is now in a state of disuse; but there occurs to me still one other possible explanation of, at least, some of the cases. In all the three to which I have referred, the original disease was diphtheria; and may the passage of liquids into the trachea not be accounted for by the awkwardness of deglutition, which, we know, does exist during this stage, and which often leads to the regurgitation by the nostrils of part, at all events, of the fluids which are swallowed? May it not, indeed, be a paralytic symptom?

I have mentioned, incidentally, ulceration of the trachea by pressure from the end of the tube, but I am entirely without experience of it. If, as is averred by some, a bloody character of the sputa coughed through the tube be an indication of its occurrence, then, to this extent, I have observed it. But this is just as much an indication of the separation of false membranes, for I have seen blood flow from the mouth in considerable quantity during convalescence from diphtheria affecting the nostrils and fauces, but not at any time implicating the larynx, and therefore never at any time calling for tracheotomy. To mitigate, however, any evils due to the pressure of the tube, it is well to use one in which the cannula is movable upon the shield. Such tubes have, at all events, the merit of being worn with much greater comfort.

The management of false membranes or inspissated mucus obstructing the windpipe below the tube, and so frustrating the object of the operation, is a matter of some difficulty. Frequently Nature effects their expulsion in good time, and, on the whole, it is probably best to trust to what may be done in this way. I have in one case, as has been advised, removed the tube, and introducing forceps down the trachea, laid hold of whatever they could catch between their blades and withdrawn it. But it produced no improvement; on the contrary, it was probably prejudicial. Guersant and others advise sucking the tube, but in diphtheria the practice is a highly dangerous one, and hardly warranted in view of its small chance of success. Speaking of this recommendation, Giraldès says in his admirable *Clinical Lectures on the Surgical Diseases of Children*,—"The counsel is excellent, but, in acting thus you run the risk of contracting diphtheria, a disease, in my opinion, essentially contagious. You find yourselves, then, face to face with a question of feeling (*question de sentiment*). If you have courage to face the danger, your conduct will merit the greatest praise. Give over, on the other hand, to Nature the task of unloading the bronchial tubes, and no one can accuse you, no one can blame you." That the disease is essentially contagious is indicated, I have sometimes thought, by two facts, in regard to which I shall be glad to have the experience of any gentleman present. I have a strong impression, first, that while surgeons, who operate in a case of diphtheria, or remain in pretty close attendance upon it afterwards, often contract the disease, physicians visiting and prescribing for a case requiring no operation do not appear to run the same risk; and, secondly, that when an adult in a family contracts the disease from a child, that adult is most frequently the mother. Maternal affection and grief lead to the frequent kissing of the child in spite of warning.

All of us are familiar with the difficulty often experienced in supplying warm and moist air to the little patient who breathes by a tracheotomy tube; and many must have had experience of the trouble and toil which is implied in keeping up a supply of steam in the neighbourhood of the child's head. I am satisfied that this may be dispensed with for the following much more simple mode of after-treatment. If a sponge—the larger the better, a bath-sponge answers well—be wrung out of boiling-water and placed lightly over the tube, it will be found to be an excellent respirator, furnishing an abundance of warmth and moisture for at least a quarter of an hour; at the end of which time it ought again to be wrung out. The child inspires through the pores of the warm sponge, and, by its expirations, tends to keep the under surface warm even after other parts of it are being cooled. It may be fixed lightly in position by a tape or piece of bandage tied over it, and can be easily removed and re-applied even during sleep. It is, moreover, a grateful application to the part, especially when, towards the close of the second or beginning of the third day, a slight blush of inflammation surrounds the wound, and the necessity for slackening the tapes tying in the tube indicates some swelling of the neck.

I must now conclude these very disconnected observations, and I take leave to do so by commenting in a single sentence on a matter which, in spite of much that has been said and written, is not generally sufficiently borne in mind. It is this, that the successful issue of a tracheotomy case is the relief of asphyxia, and not the cure either of croup or diphtheria. The little child who has been snatched from

a death by suffocation to die a week or fortnight hence from gradual asthenia, a sudden syncope, or an unexpected convulsion, is as real, though not so apparent an example of the benefits of the operation, as that other who ultimately survives both operation and disease. Let us not, then, be either too elated by successful statistics of recovery or too discouraged by the reverse. Provided the operation have been performed without accident and the breathing fairly re-established, there is much good fortune in the one experience and but small blame in the other. If we deal with large numbers, all statistics seem to be pretty much equalised, and recovery is found to take place about once in every three or four cases; but it is well to remember, that this leaves out of sight altogether much genuine success achieved by the operation. By the performance of it, we do nothing towards curing the disease; indeed, we are rather apt to encourage its extension. All that we can do—and, therefore, all that we should pretend to attempt—is to restore Breath, and with it its companion—Hope.

REMARKS

ON

THE PATHOLOGY OF CHOREA.

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Etiology of the Disease.

It may, perhaps, be safely affirmed that nearly nine-tenths of the cases of ordinary chorea or St. Vitus's dance occur in individuals either—

1. In relation with rheumatic fever;
2. As a sequence of fright; or
3. In association with anæmia, chlorosis, or some other cachectic condition.

We know also that it tends to occur all the more readily in children, especially between the sixth and fifteenth years, who have been born from nervous parents, and who themselves show signs of an undue excitability of the nervous system. Occasionally it occurs in adults, or in persons who seem in other respects healthy, except it may be for some slight menstrual disorder, or for the fact of the coexistence of pregnancy, as in cases specially referred to by Dr. Barnes.

These are the known facts, and the question is how we are to deduce from them a pathogenesis for the disease which shall be broad enough to be compatible with the whole of them.

The "*Embolio Theory*" seems to me to be lamentably defective in this respect. It is (1) so narrow that, even if more were capable of being said for it than now seems possible, it could only be considered to apply to one small section of the total number of cases of chorea, and would necessitate our framing some wholly independent hypothesis in explanation of the remainder. That I am not overstating the case against the theory will be plain to those who recollect that, in the large majority of the cases of chorea supervening in individuals belonging to the second and third categories, there is no evidence of the existence of endocarditis at the time of the onset of the disease; and that this is also true of a certain number even of the cases belonging to the first category—that is, to those by no means uncommon cases in which chorea follows rheumatism where there is no heart-disease, as well as to those rare cases in which it precedes the articular affection. But other strong evidence against the "*embolio theory*" may also be cited. Thus (2), chorea is not sudden in its mode of onset, as it should be if this theory were true. In the large majority of cases, it is quite the reverse, so that it may be said to be the rule for chorea to manifest itself gradually. (3.) The valvular disease which does coexist with a large proportion of the cases of chorea, when the disease is fully established, is usually not of a kind to favour the separation of embolic particles, consisting as it does, for the most part, of a row of small bead-like elevations near the free margins of the mitral valve on its auricular surface. It is, in fact, an incipient endocarditis of low intensity, in which the elevations are in the main composed of a coherent overgrowth of the valve-substance, without the addition of those more brittle fibrinous concretions which form so large a part of

* Concluded from page 38 of last number.