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Diphtheritic Croup Dangerous?

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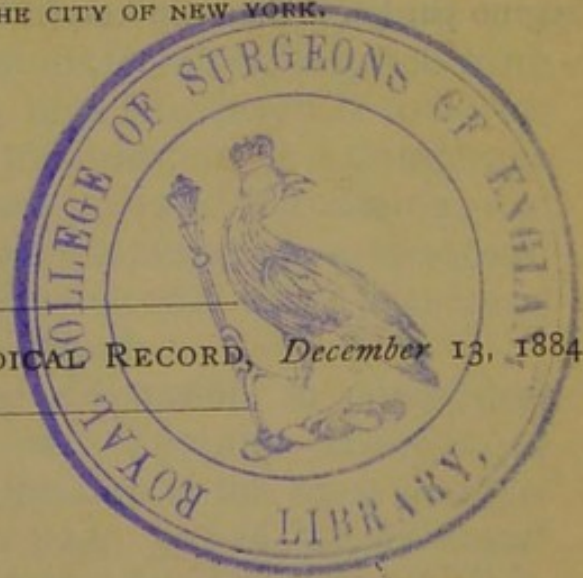
WHEN SHOULD THE OPERATION BE PERFORMED?

BY

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PRESENTED
BY THE
AUTHOR.



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“Read, and fear not thine own understanding ; this book will create a clear one in thee.”—SHIRLEY.

“Do not open it at adventures, and, by reading the broken pieces of two or three lines, judge it ; but read it through, and then I beg no pardon if thou dislikest it.”—THOMAS ADAMS.

IS THE OPERATION OF TRACHEOTOMY IN DIPHThERITIC CROUP DANGEROUS?¹

WHEN SHOULD THE OPERATION BE PERFORMED?

By JOSEPH E. WINTERS, M.D.,

CLINICAL PROFESSOR OF DISEASES OF CHILDREN, MEDICAL DEPARTMENT UNIVERSITY OF THE CITY OF NEW YORK.

At the March meeting of the Obstetrical Section of this Academy it was stated² that "tracheotomy is an operation attended with great immediate danger to the life of the patient."³ This statement was so startling to me and so at variance with my impressions from reading, and from my own personal experience, that I believed it to be erroneous. The opinion that tracheotomy is a dangerous surgical operation I believe has no valid foundation, nor will it bear the test of a close examination, and should not be accepted with the confidence with which it seemed to be received in this hall last March.

The speaker, in the closing discussion, in corroboration of his opinion, quoted Mr. Timothy Holmes, of London, as saying that the operation is the most dangerous of any in surgery. On page 303 of Mr. Holmes' work on the "Surgical Treatment on Diseases of Children" will be found the following: "I think that, of all the operations which we are commonly called upon to

¹ Read before the Section of Obstetrics and Diseases of Women and Children, New York Academy of Medicine, October 23d; and by invitation was re-read before the Academy at large, December 4th.

² Dr. Ripley, *MEDICAL RECORD*, April 5, 1884, page 369.

³ "The operation of tracheotomy in young children for croup, in its imminent peril to life, is one of the most dangerous operations in surgery." (Dr. Ripley, *MEDICAL RECORD*, July 31, 1880, page 118.)

perform on children, tracheotomy is the most dangerous, both in its immediate performance and in its secondary complications." And further, "I would not recommend tracheotomy while any prospect of recovery existed otherwise." If this suggestion of Mr. Holmes is followed, *delay* in the performance of the operation should be ascribed as the cause of both the secondary complications, and of death, rather than the operation itself. On page 302 he says: "In thirty-one cases the causes of death have been noted; and in *very few* of these cases was the cause of death connected in any way with the operation." . . . The original disease caused death in fourteen cases, "pneumonia and catarrh in twelve, scarlet fever in three, collapse of the lung in one, secondary hemorrhage (fifth day) in one," making the total number thirty-one, in none of which was the cause of death in any way connected with the performance of the operation, for Mr. Holmes states on page 326 that the ulceration which caused the secondary hemorrhage was produced by the tube. On page 316 he says: "Considering the risk of operating below the thyroid isthmus, and the large size and vascularity of that body at an early age, I would urge the propriety of making the opening above the isthmus. . . . After the age of five, or thereabouts, the surgeon can, if he prefer it, open the trachea below the thyroid isthmus. But I do not myself recommend this operation, at any rate before puberty." On page 318 it is stated: "To cut through the isthmus of the thyroid is, in early life at least, a dangerous proceeding."

Speaking of hemorrhage, Mr. Holmes, on page 317, says: "I have three times seen death on the table during tracheotomy; and twice from this cause. In one case, in which I was myself the operator, the child was very young (age not given). On exposing the parts, I dared not divide the centre of the thyroid body, on account of its thickness, and the large size of the vessels visible in it. On the other hand, to open the trachea below I had to *plunge* my knife almost beneath the sternum. . . . In the incision a vein was cut very near to its opening into the left innominate, and the bleeding proved fatal before I could get the tube in."

In the first volume of Trousseau, page 423, he says: "I have often witnessed the difficulties and dangers of a too

nimble tracheotomy, even when performed by an able operator."¹

Marsh² says: "It would be nearly as reasonable to cut straight down upon the subclavian artery as to attempt tracheotomy as it is very often performed, and it would be scarcely more dangerous. The amount of hemorrhage during tracheotomy will depend almost entirely on the method of operating."

Mr. Durham³ says that of one hundred and eight cases of tracheotomy at Guy's Hospital, performed during a period of twelve years, there was not a single case of serious hemorrhage, and the operations were performed by the house surgeons in a very large proportion of the cases, and that, too, very often under circumstances of peculiar emergency and difficulty.

Of eighty-seven cases reported in vol. ix. of *The Medical Times and Gazette*, collected from various London and provincial hospitals, there was but one case of hemorrhage, and in this Marshall Hall's tracheotome was used, and a vessel cut, ending in fatal hemorrhage. Durham says of this, that it is "an instrument which to mention is to condemn."

Regarding the thyroid isthmus, Trousseau⁴ says: "If the isthmus of the thyroid body presents itself under your bistoury, never hesitate to divide it in the mesial line; there is usually an arterial jet as large as a thread, which ceases after some seconds, and by this section you have signally facilitated the operation." Of one hundred and nine tracheotomies for croup in children, Trousseau never found it necessary to have recourse to the ligature or torsion for a single vessel; the hemorrhage always ceased as the canula was introduced.

Holmes, on page 323, says the operator in trying to insert the tube into the trachea sometimes "pushes the canula down the cellular tissue in front of the windpipe, causing pressure on the trachea, and obstructing respira-

¹ "Professor Trousseau, in all his articles, strongly repudiated haste, and . . . spoke words to this effect: 'A certain surgeon (naming him) has reproached me with operating like a physician and not like a surgeon. Well, he had an opportunity, on one occasion, to operate like a surgeon, and with one stroke of his knife he divided the œsophagus as well as the trachea. Some time afterward he lost another patient by hemorrhage during his brilliant operation. Since then M. — has operated more like a physician, and after a while he will become a very fair tracheotomist'" (Cohen: *Croup in its Relations to Tracheotomy*, p. 38. Philadelphia, 1874.)

² St. Bartholomew's Hospital Reports, vol. iii., p. 334.

³ The Practitioner, 1869, vol. ii., p. 212. ⁴ Trousseau in the *Union Médicale*.

tion still further." . . . "The third (case) in which I have seen death during the operation, the fatal event seemed to me due mainly to this error."

One of the three fatal cases of Mr. Holmes, then, was due to what Trousseau would have termed a "too nimble tracheotomy;" and in another, death was caused by pushing the canula into the cellular tissue outside of the trachea, and thus adding to the original difficulty. Comments on Mr. Holmes' tracheotomies are unnecessary.

The speaker then quoted Professor S. D. Gross as saying "the same thing" as Mr. Holmes. In Professor Gross' "Treatise on Foreign Bodies in the Air-Passages," on page 231, regarding tracheotomy in children, he says: "I know hardly an operation in all surgery that I would not rather undertake than this. . . . The amputation of a limb, the extirpation of a glandular tumor, lithotomy, and even the perineal section are *trifling matters* in comparison with tracheotomy in a short, thick-necked, and restive child." On pages 232, 233 he says: "The isthmus of the thyroid gland, even when it descends considerably lower than usual, will seldom embarrass our progress; should it do so, it must be held out of the way, although it has sometimes been divided with impunity."

He adds: "Professor Van Buren, of New York, informs me that he has completely divided this process on several occasions without the slightest loss of blood, mischief, or inconvenience." Even after this Professor Gross says: "Generally, however, it will be well enough to avoid it by holding it out of harm's way; should this, however, be impracticable, any *bleeding* that may be apprehended can be effectually avoided by embracing the part in two ligatures, the knife being *afterwards* carried between them." Here Professor Gross's directions certainly complicate the operation and prolong it unnecessarily.

He next directs that the trachea be held by a tenaculum.

The operation is performed with much more ease and safety when the trachea is grasped between the thumb and index-finger of the left hand than when held by the tenaculum. The trachea should never be entered without our being guided by the touch. If the windpipe is very deeply placed, and is not readily brought into

view, it may be taken hold of with the double hook below where it is to be opened, and drawn upward and forward until brought into sight. The hook must, however, be held by an assistant, and the operator should keep his thumb and finger on the trachea.

On page 237 Dr. Gross says: "Great care is to be taken not to permit any blood to enter at the artificial opening, as the *smallest* quantity of this fluid may not only induce violent cough and spasm, but instant suffocation." Further: "The best plan to avoid this occurrence is not to injure any vessels, but to hold them carefully out of harm's way; or, where this is impracticable, *to wait until all hemorrhage has ceased before we penetrate the windpipe.*"

With reference to the first of these statements, it is known that the entrance into the trachea of a small quantity of blood is not dangerous, and many operators purposely introduce a quantity of fluid into it to excite cough in order to expel mucus and membrane. Brettonneau even recommended washing out the tube with a solution of nitrate of silver. Next to the hissing sound with which the air enters the opening in the trachea, one of the most striking things in connection with tracheotomy is the violence with which anything entering the trachea is ejected. To wait until all hemorrhage has ceased before opening the windpipe, would, in many cases, be to wait until the patient is dead. The surest way of arresting hemorrhage is to admit air freely to the lungs, so as to relieve the embarrassed venous circulation, and thus allow the blood to return to the heart. Time spent in trying to stanch the bleeding before opening the windpipe is generally to the injury of the patient.

With reference to this Professor Gross himself says on page 279: "It is worthy of remark that, when the hemorrhage is venous, it generally instantly ceases, even when it is *copious*, the moment the knife penetrates the windpipe." And again on page 266 he says: "I have never experienced the slightest inconvenience from any occurrence of this kind. Several of my operations, in fact, have been nearly bloodless."

Allow me to turn back and repeat a former quotation from Professor Gross, page 231, in order to make a comparison: "I know hardly an operation in all surgery I

would not rather undertake than this. . . . The amputation of a limb, the extirpation of a glandular tumor, lithotomy, and even the perineal section, are trifling matters in comparison with tracheotomy." On page 373 he says: "I am satisfied, from the facts before the profession, that bronchotomy, properly performed, is, in general, a perfectly safe procedure, . . . and rarely followed by fatal results."

Dr. Gross in his book does not report a case of tracheotomy for croup. After making a careful analysis of Dr. Gross' work, I am unwilling to accept his first statement regarding the dangerous character of tracheotomy, particularly when it is made to apply to the operation in croup.

Dr. A. Jacobi was quoted as saying that he never went to a tracheotomy operation without a feeling of fear and trembling. In the extensive writings of Dr. Jacobi on the subjects of diphtheria, croup, and tracheotomy, I fail to find any statements which would show that he considers the operation dangerous.

Now let us review the opinions of other authors:

Bretonneau, to whom we are indebted for the revival of tracheotomy in the nineteenth century, does not speak in any of his five memoirs of the operation as being a dangerous one, nor of skill in its performance being a necessity to insure success; his whole stress is upon the size of the canula, the temperature of the air the patient breathes, and the after-treatment and care. Bretonneau was so clear and decided in his convictions, which were always stated definitely, that had he felt the operation to be a dangerous one, he certainly would have mentioned it in one of his several communications.

Trousseau, whose contributions on tracheotomy have never yet been surpassed, said: "Tracheotomy in itself is an operation which is more delicate than difficult; it requires only care and presence of mind." He then says that he has performed the operation "more than two hundred times," and adds, "I have never had immediate accidents to deplore, except in an adult, who died of syncope at the *moment* I made the section of the skin." And again he says, "I have finished these operations, *apparently* so perilous, without fear and without accident."

M. Emangard¹ says: "The performance of this operation is exempt from all danger."

Rilliet and Barthez² say: "The operation in itself is not dangerous."

Bouchut, in 1852, said: "This operation is of easy execution—it presents no danger in itself, and if it does not succeed more frequently, it is because the cases in which it is employed are truly beyond the resources of art—the physician ought always to be ready to operate."

West says: "It is admitted on all hands that in itself the operation is not attended by serious hazard; and the uncertainty as to its issue depends not on any defect in the proceeding."

Meigs and Pepper speak in these terms: "*It is the uniform* testimony of those *experienced* in the matter, that the operation is in itself alone but *slightly* dangerous to life."

Vogel tells us that "the operation itself is not attended by any danger to life."

Dr. R. M. Edwards said:³ "The operation itself is so simple to a man accustomed to handle a scalpel and forceps, that it is surprising so much has been written about it, and so many instruments devised to simplify its performance."

Dr. W. H. Day, of the Samaritan Hospital for Children, says: "Tracheotomy in itself is not a dangerous operation."

Mr. Lawrence⁴ says: "We are fully justified in representing the operation of bronchotomy as attended with little pain and no danger." "The operation itself is so simple and so easy that there is very little to be said on the mode of executing it."

Conway Evans⁵ says: "That tracheotomy is in itself a very dangerous operation, the tendency of all evidence on the subject tends to disprove." He quotes from Professor Gross' work to show that the operation is not dangerous!

J. H. Pooley, M.D., Professor of Surgery, Starling

¹ Les Annales de la Méd. et Phys. Sep., 1827.

² Dis. of Children, vol. i., p. 386.

³ In the Edinburgh Med. Journal, October, 1856, vol. ii., part 1, p. 314.

⁴ Med. Chirurg. Trans., vol. vi. 1815.

⁵ Edinburgh Med. Journal, January, 1860, vol. v., part 2, p. 623.

Medical College,¹ says: "The operation itself involves very little danger to life."

Wm. M. Mastin,² in an article in which he gives an analysis of eight hundred and sixty-three tracheotomies which he collected with much care, says: "I cannot see . . . how any one will venture to say that tracheotomy is *per se* of particular danger."

Mr. Howard Marsh,³ in an article entitled "Tracheotomy in Children, its Method, its Dangers, and its Difficulties," says: "I am convinced that tracheotomy should be regarded as a delicate operation, which requires coolness and caution in its performance, rather than as one that is necessarily either very difficult or very dangerous."

Robert Wm. Parker, Assistant Surgeon of the East London Hospital for Children, says: "By *common* consent the operation itself is not dangerous, and it hardly, if at all, complicates the primary disease which calls for it."

Thomas King Chambers said: "Tracheotomy is an alarming operation to hear of or to look at, but in reality it is not a dangerous one. . . . Do not, therefore, alarm the patient's friends by speaking of it as a 'last hope,' 'a final resource,' or by any similar weak, expression."

Let us see what was the verdict of the older authors on this operation. They always spoke from the force of their convictions, and in definite, unmistakable terms.

According to Galen, Asclepiades first invented and performed tracheotomy in cases of quinsy, about 100 B.C. Here the term "quinsy" relates to croup of the present day, for it is described as an affection which "presents no visible appearance either in the swallow or in the throat, which, while narrowing the glottis, renders the voice acute, and quickly manifests symptoms of strangulation."

Cælius Aurelianus says: "In this manner he (Asclepiades) saved a great many persons who were in danger of perishing from suffocation."

Fabricius, in the sixteenth century, said: "The operation is absolutely free from danger. . . . There is no

¹ Richmond and Louisville Med. Journal, June, 1877, p. 517.

² Gaillard's Med. Journal, January, 1880, vol. xxix., p. 15.

³ St. Bartholomew's Hospital Reports, vol. iii.

part of the least consequence exposed to injury in this operation." Fabricius was the first who spoke of the canula, and was the inventor of "wings" to prevent it from falling into the trachea.

Casseri¹ said: "Those are both ignorant and timorous who rashly neglect this safe, easy, and often salutary operation. It is easily performed, and cannot give rise to danger. . . . We have nothing to fear from the slight hemorrhage caused by opening the trachea." Casseri introduced the curved canula, and was the first who mentioned the thyroid gland in speaking of the operation.

In 1586 Sanctorius proposed puncture of the trachea with the trocar, which he had invented for performing abdominal paracentesis.

Bartholini entertained doubts respecting the use of the operation in quinsy, especially in infants.

René Moreau, in his reply, March 1, 1646, declared that the operation was neither difficult nor dangerous, and through his sound reasoning he served to convert Bartholini to the use of the operation.

In 1695 Dekker proposed to perform the operation with a cutting trocar.

Boerhaave,¹ in the first part of the eighteenth century, said: "The windpipe may be divided without any danger to the patient's life."

Detharding, in 1714, wrote, with reference to tracheotomy: "The skin only is divided, and a small portion of membrane. There is no ground for fear, even from the least dexterous operator. No blood-vessel from which one need fear hemorrhage, no nerve of which the division can produce any inconvenience."

Juncker, in treating of this operation, said: "It does not require great dexterity." The first vertical incision through the cartilages of the trachea was made by him.

In 1750 Dr. Lawrence Heister,² Professor of Physic and Surgery in the University of Helmstadt, wrote: "This is a safe, easy, and often salutary operation." Heister was the first to use the word tracheotomy.

Louis, in the early part of this century, said: "A little consideration as to the parts to be divided and the mode

¹Van Swieten's Commentaries upon Boerhaave's Aphorisms, vol. viii., p. 123. Edinburgh, 1776.

²General System of Surgery, fourth edition.

of doing it suffices to show that the operation could not be attended with the least danger."

Mr. Holmes' obvious misconception regarding the performance of tracheotomy, and the contradictory statements made by Professor Gross, show sources of fallacy on their part; and this, with the vast preponderance of authorities against their opinion, wholly overthrows it.

The operation of tracheotomy not being dangerous in itself, nothing connected with its mere performance should influence the time when it is to be resorted to.

How does diphtheria tend to cause death when left to itself? In a very large proportion of the fatal cases, the disease, in young children, ultimately causes death by mechanically obstructing the passage of air into the lungs. The object of tracheotomy is to supply a provisional air-passage in the place of the obstructed rima-glottidis, so as to allow the disease to run its full course, and to gain time for the administration of remedies; and if it accomplish this, it should be acknowledged, even though the patient should die afterward from the persistence of the original disease, or some of its complications. That it does accomplish this will be seen by the mode of death after the operation. This depends very much upon what time in the course of the disease the operation has been performed; the type of the disease, the condition of the patient, and the care with which the after-treatment has been carried into effect. When the operation has failed to save life, it has been generally either because it was postponed until it was too late, until secondary complications in the bronchi and lungs have arisen, to sudden collapse, to the persistence and extension of the original disease, causing death by asthenia, or acute nephritis and uræmia, or because efficient after-management and care were wanting.

Suppuration in the anterior mediastinum (this generally may be obviated by not extending the superficial incision too near the top of the sternum), erysipelas and gangrene around the wound, and the slipping of the canula from the tracheal opening have been experienced.

I wish you to mark that none of these causes of death are instances of failure of the operation when properly performed, or of its not removing the main source of danger when the disease is left to itself.

The only lesion that causes death, which is directly due to the operation when properly performed, is ulceration of the trachea from the mechanical irritation of the tube.

Vidand, in 1854, and Goupil, in 1856, exhibited before the Anatomical Society of Paris two specimens of ulceration of the trachea after tracheotomy, produced by irritation of the canula.

In 1859 Barthez called attention to this point, still almost unknown.

Roger, in the same year, in a monograph, published an analysis of twenty-one cases of ulceration of the trachea.¹

Sanné² in his work reports seventeen cases, collected in the service of Barthez. He says: "More or less redness of the trachea and bronchi have been noted in eleven of seventeen cases, out of which seven were accompanied with broncho-pneumonia. In one case there was abscess of the mediastinum, consecutive to a perforation of the posterior wall of the trachea, and one of œdema of the glottis."

In the *Trans. Path. Soc., London*, vol. xviii., p. 32, is recorded a case of death from pyæmia after tracheotomy, from ulceration caused by the tube. Two cases have happened in Guy's Hospital, in which ulceration extended through the anterior wall of the trachea into the innominate artery, and fatal hemorrhage of course resulted.

Mr. Marsh reports two instances of ulceration of the trachea out of thirteen operations in his own experience, and makes allusion to three others he has been told of.

There are many cases scattered through the literature on tracheotomy, but these are sufficient for us to recognize its importance, its frequency, and the different ways in which it tends to cause death.

The causes are the shape, the size, and the length of the tracheal tube, so that it presses against the walls of the trachea to the extent of producing mechanical irritation and ulceration.

Roger thinks that a small canula, by allowing of its too free movability and the consequent friction which results from it, can cause ulceration.

The symptoms are expectoration of more or less pure blood, along with the sanguinolent expectoration com

¹ Roger introduced the movable shield in 1859.

² Sanné: *Étude sur le Croup, après la Trachéotomie.*

mon to every case of tracheotomy for the first few days, in some cases pain referred to the point where the tube impinges against the wall of the trachea, and dark discoloration of the end of the canula.

The accident can almost always be prevented by having the canula short, curved at nearly a right angle,¹ and of proper size, so as to fit quite accurately the calibre of the trachea, but without making undue pressure, and having it freely movable on its shield, so that it shifts with the varying attitudes of the child. The tube should be carefully watched and the trachea daily examined for indications of irritation, and if detected, the tube must be removed and the opening in the trachea kept open by means of silver or hard-rubber or gutta-percha hooks, which are held in place by a tape going around the neck.

Tracheotomy, then, perfectly accomplishes its primary object—that is, to overcome a positive mechanical obstruction in the larynx, and to prevent that mode of death by which nearly all fatal cases of diphtheritic croup, in which it is not resorted to, terminate, namely, death by asphyxia.

We will now consider

The influence of the operation on the original disease.

—Sir James Paget² says: “I have never seen the wound become diphtheritic after tracheotomy.” Further he says³: “I have collected the particulars of upward of one hundred and twenty cases in which tracheotomy was performed in children suffering with diphtheria, and in none of them was the wound attacked by the disease.”

Mr. Spence, in a letter to Sir James Paget, wrote: “I have, on several occasions, seen the wound affected, and have known the child die from that, after the breathing was free and the tube removed.” He does not in this communication state, however, whether or not the disease had disappeared from the fauces; in other words, that death was not due to the persistence of the original disease, at its original site.

Mr. Parker, of London, says: “In my own practice it has only occurred twice, and on each occasion it was very slight. In one case, on removing the tube, I found

¹ Mr. Durham introduced the right-angled canula in 1868.

² Second edition of his Clinical Lectures, p. 24.

³ Op. cit., p. 463.

the wound patched over with little islands of false membrane. . . . In another case a similar condition of the wound was found."

Mr. Howard Marsh says: "Diphtheria of the wound is rare."

Trousseau says he has seen leech-bites, slight cuts, blisters, and excoriations and different wounds in various parts of the body became diphtheritic, but he does not speak of its occurrence on the tracheal wound, which, from his usual careful minute way he surely would have done had he ever observed it.

Sanné,¹ who was a pupil of Trousseau, and who bases his observations on six hundred and sixty-two operations on croup by tracheotomy, says in his excellent work: "Diphtheria of the wound is not so frequent as you might at first suppose. It seems that the false membrane appears more readily on the cutaneous ulcerated surface, or that only deprived of its epidermis, than in a wound which involves the profound parts. This is so commonly the case that in diphtheria of the wound the lesion is first to be seen on the superficial parts, or edges of the wound, where the skin has been cut. It then extends to the neighboring parts." . . . "I will not advance, however, that diphtheria never attacks the edges of the wound, . . . but I do insist on this point, that very often the pellicles of the wound have been confounded with plastic exudations." . . . "Diphtheria of the wound by itself is not very grave; of all the complications which belong to the wound it is the most natural, since it is but the propagation to the exterior of the lesion which characterizes anatomically the malady; it has then in a great many cases but a local importance."

I had expected in examining the German authorities to find frequent mention made of diphtheria of the wound, on account of their proneness to call every wound on which there is an exudation diphtheritic. I find, however, that their references to it are very infrequent, that it is always found to be very slight, and does not complicate the original disease or the operation, and that it is readily controlled by simple treatment.

Dr. O. Pinner,² in a report of one hundred and thirty-

¹ Étude sur le Croup après la Trachéotomie, par le Dr. Sanné. Paris, 1869.

² Deutsche Zeitschrift für Chirurg., B. xiv., p. 304.

seven cases of diphtheria and tracheotomy says : " In a few cases diphtheria of the wound occurred."

Dr. Max Schüller¹ says in his work : " As a rule diphtheria of the wound may be prevented entirely by the early employment of damp carbolic dressings." . . . " At any rate it seldom becomes necessary to employ energetic remedies, as diphtheria of the tracheal wound does well under carbolic treatment."

Dr. H. Lindner² says : " Diphtheria of the wound occurred in but three of one hundred and one cases operated on. Gauze compresses of carbolic acid was the only measure taken to prevent its occurrence."

We now come to

The influence of the operation on the cure of croup.
—The admission of air into the lungs through an artificial opening in the windpipe secures for the diseased larynx entire rest, and this leads to a suspension of diseased action there. Even if the patient die after the operation, and we find, *post-mortem*, that the diseased action has not ceased in the larynx, it is generally either because the operation has been too long delayed, and, as a result, death followed too soon for any reparative process to take place, or to the character of the original disease.

Mr. Spence's communication to Sir James Paget shows that the cure of croup may be accomplished by tracheotomy during the persistence of the original disease, and which afterward may destroy life.

The following cases from Sanné's interesting work are most instructive, and confirm the statement that tracheotomy tends to the cure of this very fatal complication :

CASE IX., page 202.—Aged four years ; operated on in second stage of croup. Died third day from exhaustion. Autopsy showed that the larynx contained no false membrane.

CASE XI., page 208.—Aged five years ; operated on in third period. Died sixteenth day. Larynx swollen and œdematous, but contained no false membrane. Died of Bright's and pulmonary complications.

CASE XII., page 213.—Aged eighteen months ; operated on in third period. Died fourth day. No false mem-

¹ Deutsche Chirurg. : Prof. Dr. Billroth und Prof. Dr. Leucke, L. 37. Dr. Max Schüller : Die Tracheotomie, etc., p. 96. Stuttgart, 1880.

² Deut. Zeit. für Chir., November 8, 1882, p. 453.

brane in the larynx. Bronchi contained a quantity of detritus and false membrane. Marked congestion of posterior part of the lungs.

CASE XIII., page 214.—Aged five years. Tracheotomy third period. Died eleventh day. No false membrane in larynx; right lung healthy; left lung seat of pneumonia.

CASE XXVII., page 252.—Aged twenty-three months; operated on in *extremis*. Death eleventh day after operation. No false membrane in larynx.

CASE XXVIII., page 256.—Aged two years; operated second stage of croup. Died one hundred and fifty-fourth day. Nothing in larynx.

In every recorded case in which death occurred within twenty-four or forty-eight hours after the operation, false membrane was found in the larynx on autopsy.

In "Guy's Hospital Reports," Third Series, volume xxii., the autopsies in cases of croup show the same results as those given above.

Some interesting cases bearing on this are found in *The Medical Times and Gazette*,¹ in an article entitled "Comments on Tracheotomy for Scald of the Glottis." There were three cases which ended in recovery. The ages of the patients were one year, two and a half years, and three years, respectively. "It would appear that when cases do well after tracheotomy for this accident, that the restoration of a healthy condition of the laryngeal mucous membrane is rapid. In one case the canula was kept in place for six days, in another for five, and in a third for three." *

The following case from "Guy's Hospital Reports,"² with remarks by Mr. Howse, shows still more strongly the value of tracheotomy in the cure of laryngeal disease: A child aged twenty-six months, with chronic laryngitis. Breathing stridulous. Tracheotomy performed by the house surgeon October 8th, died on the night of the 12th. Autopsy showed the larynx and epiglottis to be normal in appearance.

Remarks by Mr. H. G. Howse, one of the editors of the "Reports:" "The normal appearance of the larynx is of great interest, as it tends to show that when

¹ October 22, 1859, page 404.

² Guy's Hospital Reports, 1875, vol. xx., pages 507-8.

the part is put in a state of perfect rest after a tracheotomy operation, all signs of inflammation may subside within five days—the period which elapsed between the operation and death.”

The cure of many cases of ulceration of the larynx by tracheotomy, occurring in the course of pulmonary phthisis, and which return after the tracheal opening is allowed to close, but again subside when the functions of the organ are once more suspended, might be quoted if time and space permitted.

The influence of tracheotomy in arresting diseased action in the larynx, leads us quite naturally to contemplate the relation of laryngeal to laryngo-tracheal diphtheria. The diphtheritic process stops at the level of the vocal cords much more commonly than is generally supposed. That this is true of a large percentage of the cases is shown by some valuable autopsies recorded by Krönlein.¹ Of 200 autopsies reported by Krönlein, in 46 there was false membrane in the *larynx and trachea*; and there were 164 with membrane in the *larynx* and on the parts above, and *no membrane in the trachea*.

When the disease involves the trachea it is by *propagation from the larynx, and not by a simultaneous attack on the larynx, trachea, and bronchi*. In many cases this extension downward may be prevented by early making a way for sublaryngeal respiration, so that the inflamed larynx may be allowed to rest and be saved from irritation by the passing breath, and thus cause the arrest of diseased action there.

If tracheotomy *per se* is not dangerous, if it meet the complication of obstruction of the glottis, and is promotive of the cure of this complication; if the specific disease is in no way aggravated by it, and very rarely indeed appear on the wound, it certainly brings with it no element of added danger.

Influence of delay.—The next consideration in deciding when to operate would be the result to the patient of delay in the performance of the operation. When we see that medicinal remedies fail to influence the arrest of croup, to relieve, or even to alleviate its symptoms, shall we trust to the occurrence of that rare accident, the

¹ Krönlein in Langenbeck's Archives for Clinical Surgery, page 253. Berlin, 1877.

expulsion of the membrane, or shall we operate without delay?

As to expectoration of the membrane and cure of the disease without operation, Dr. J. Lewis Smith stated at the April meeting that about one in eight recovered when medicinal treatment only was used. Upward of four hundred cases of diphtheria have been admitted to the Boston City Hospital during the past eight years. Forty of these patients suffered from diphtheritic croup, and every one died. *Not a single case of pseudo-membranous laryngitis has ever recovered in this hospital without an operation.*¹ Statistics of croup (membranous), taken collectively, show that the disease is fatal in about ninety per cent. of the total cases.

After tracheotomy the recoveries are from one-third to one-half. Trousseau gives one-third in hospital, and one-half in private practice. During the past twenty years, one-third of the cases operated on in the Boston City Hospital have recovered.² Collected statistics from English and Scotch hospitals and private practice show that two-fifths recover after the operation.³ Sanné⁴ gives 89 operations by eleven operators in France, with 39 cures. In another table, 39 operations by five operators with 17 cures. Dr. Revilliod, Geneva, Switzerland, 87 operations with 38 cures. In all these the recoveries are more than two-fifths.⁵ These figures at once decide clearly the only course to pursue.

Does delay in the performance of tracheotomy compromise its success? I cannot conceive a case where delay would be more dangerous; there is constant risk of suffocation, which sometimes comes on very suddenly. We gain nothing by delay, while the success of the operation is interfered with to a great extent.

When the rima glottidis is obstructed less air enters the lungs with every inspiration, and the lungs are less expanded, and in proportion as the circulation of air through these organs becomes diminished, the circulation of the blood will be embarrassed, and this soon causes this fluid to become vitiated by defective oxygenation. When the

¹ Gay, Phila. Med. News, July 12, 1884, p. 33.

² Ibid.

³ Medical Times and Gazette, November 25, 1876, page 600.

⁴ Sanné: Diphtherie, page 467. Paris, 1877.

⁵ L'Union Medicale, 1876, third series, vol. xxii., p. 136.

operation is long delayed the impeded state of respiration and circulation produce a violent constitutional disturbance ; venous congestion has become general, the veins of the head and neck are turgid, the entire body cyanosed, cold, and bathed in clammy perspiration, the pulse at the wrist imperceptible, the face livid and ghastly, the child tossing in agony from one position to another, hoping to find relief, the inspiratory muscles, especially the auxiliaries, making violent, but fruitless efforts to get more air through the contracted glottis. The vessels of the bronchial mucous membrane and the lungs become passively distended, and a little later serum infiltrates into the parenchyma of these organs, and the bronchi become choked up with mucus, thus impeding respiration still further. The weakened and overtaxed heart, with the brain, being supplied only with venous blood—the patient, in fact, poisoned by his own vital fluid—becomes comatose or convulsed, and the sensorial functions blunted and nearly destroyed. Yet it is advised that the patient be allowed to reach this stage, that the immediate precursors of death appear, before making an opening in the windpipe to allow the passage of air to the lungs ! ¹

If under these circumstances the operation fails to save life, it is spoken of as being dangerous and perilous, of inducing secondary complications, and similar absurd expressions !

It would be as rational to persist with taxis in a strangulated hernia until gangrene has set in, before relieving the constriction with the knife, as to continue medicinal treatment in a case of obstruction of the glottis until the patient has arrived at the stage described, before making an opening for sublaryngeal respiration. And in the same proportion that delay in strangulated hernia is dangerous, so it is in a case of membranous obstruction of the glottis.

He who has made autopsies in cases of croup where

¹ Justice to my patient, justice to myself, fidelity to the profession I represent, all unite in demanding that *now*, early, before the development of conditions which will make any interference but a forlorn hope, tracheotomy should be done ! (L. S. Pilcher, Proceedings Kings County Society, Brooklyn, May, 1877, p. 82.)

It will not be easy for you, gentlemen, to perform tracheotomy "too early" in the laryngeal affections of synanche, for it is doubtful whether the operation can ever be done too soon (Dr. H. Senator, German Clinical Lectures, Second Series, p. 452. New Sydenham Society).

tracheotomy has not been resorted to, and death has occurred from asphyxia, has seen that the lungs and bronchi are in a state of venous congestion.

My own records show this invariably. I have examined the records of a large number of autopsies and have found that, where carefully made and recorded, the appearances were quite uniformly the following :

First, where tracheotomy had not been performed, the lungs and bronchi were congested, and there was *always* an excessive quantity of mucus on the bronchial mucous membrane. In a smaller number of cases, œdema of the lungs and pneumonic changes.

Second, where tracheotomy had been performed in the third stage of croup, and death had followed soon after, the post-mortem appearances were much the same as in the cases not operated on.

Third, where death had taken place from several days to two or three weeks after the operation, the mucous membrane of the bronchi and the pulmonary vessels was quite normal.

Showing how quickly obstruction to respiration may induce changes in the bronchi, Mr. Thomas Bryant,¹ relates the case of a child three years old, in whom tracheotomy was performed for foreign body, and it could not be removed. The operation was performed one hour after the accident. The respiration remained unaltered, and nine hours after the operation, and ten after the accident, the child died. On autopsy, the bronchial tubes were found filled with tenacious mucus—in some parts completely obstructing the passage of air to the lungs, which were *airless*. A piece of nutshell was found in the rima between the cords.

The condition of the pulmonary and bronchial vessels, found so constantly after death from croup, results from obstruction in the larynx and impeded respiration, for when diphtheria exists in the throat only, and there is no implication of the larynx, the disease tends to destroy life by exhaustion and blood-poisoning, and rarely do any of the secondary bronchial or pulmonary complications occur.

Where these complications are found on post-mortem examination, after tracheotomy, they are not the result

¹ Guy's Hospital Reports, Third Series, 1860, vol. vi., p. 13.

of the operation, for they seldom occur when tracheotomy has been performed on healthy organs, or in cases of syphilitic, and even tubercular laryngeal disease, with chronic pulmonary disease, and the tube is worn for months, and in some instances for many years. The repeated performance of the operation on the same patient within a short period, without accident or complication, and with ultimate recovery, shows the utter harmlessness of tracheotomy, both in its immediate effects and in its remote consequences.

Mr. Greenfield¹ relates that tracheotomy on a child ten months old, with croup, was repeated nine days after the first operation, and seven days after the removal of the tube by the nurse. During the latter part of this operation the child appeared to be dead. Artificial respiration was performed and the child revived. Recovery was perfect. Dr. H. Z. Gill² performed two operations of tracheotomy on a boy, aged three years and one month, with croup, at an interval of fifty-one days, with ultimate recovery. No bronchial or pulmonary complications after either operation. Pugin Thornton³ performed tracheotomy four times in five years on a man sixty-seven years old, with syphilitic laryngitis, without accident or subsequent complication, and the case ended in complete recovery.

The great reason why bronchial and pulmonary complications follow tracheotomy where it is performed for croup is, that where obstruction has continued a long time the lungs are in a state of congestion, and in this condition any slight irritating cause, such as would act harmlessly on healthy lungs, will hasten on into a dangerous inflammation.

When it has been decided that a positive mechanical obstruction to the entrance of air into the lungs exists, do not wait until lividity sets in, before making a way for free and easy respiration. Let the operation be done before secondary complications have arisen, or the accession of those symptoms which are in themselves extremely dangerous to life, which often render all treatment

¹ St. Thomas' Hospital Reports, vol. viii., p. 263.

² Illinois State Medical Society Transactions, 1878, p. 167.

³ British Medical Journal, February 17, 1877, p. 205.

unavailing, and make the removal of the mechanical obstruction of less importance.

While estimating the effect of protracted obstruction to respiration with the devitalizing influence on the blood of the rapidly accumulating carbonic acid gas, its depressing action on the organic nervous system and on the heart, we should keep in view that these combined influences are promotive of the spread of that depressing disease, diphtheria.

We must also take into consideration the life-giving and disease-destroying power of oxygen. Oxygen is the most potent of all tonics, and pure, warm air is the most valuable remedial agent that we possess for diphtheria. Let a child with severe diphtheria be kept literally out of doors, in warm, dry, sunny, summer weather, and an almost immediate and uninterrupted improvement in all the symptoms will be observed, both in the general condition and in the local manifestations. In the majority of cases of croup the patient dies from want of oxygen and exhaustion of the organic nervous system; and the object of tracheotomy is to render oxygen accessible to the child; and it should be remembered that every draught of fresh air assists in the process of cure. Do not wait, therefore, until the patient's strength is worn out with gasping and fighting for breath before granting him nature's sovereign restorative.

Who can watch a child struggling for breath with all the agony which in consequence ensues without feeling impelled to have recourse without delay to the simple procedure of tracheotomy? Let those who counsel that tracheotomy be the last resort witness the extraordinary relief which follows it, how the breathing becomes tranquil, easy, and regular, the countenance natural, the cold sweat ceases, the pulse is again felt at the wrist, and perhaps the child sits up and takes nourishment, or falls into a quiet, peaceful sleep; and I think they will regret not having granted the child access to air sooner, and lifted in one instant an agony of suspense from the parents!

Guersant ascertained that the resolution of pneumonia is facilitated by the greater freedom with which the respiratory functions are accomplished after tracheotomy. But while the symptoms of suffocation and of pneumonic changes may be relieved by the late performance of

tracheotomy, they may often be *prevented* by the early introduction of air into the lungs. It is said that if we advise early operation we may operate on many who would have recovered without resource to this proceeding; and that we may see our patient recover after the operation has been rejected by the parents, but this will happen very rarely indeed, and it is better to err on the safe side, as the operation can never increase the danger, while delay has many times deprived the patient of that chance of life which the operation can offer.

Though there are, undoubtedly, isolated cases of recovery from diphtheritic croup, the proportion of these is so small after we are *positive* that membranous exudation has invaded the larynx, that we ought to have early recourse to the only mode of arresting death in the majority of cases.

It is a far weightier responsibility to decide when to operate than merely to open the windpipe. We must first determine the existence of false membrane in the larynx, or, that there is continued and increasing laryngeal stenosis.

Though recession of the soft parts of the chest-walls with every inspiration is a valuable test of the amount of interference with that act, it does not necessarily indicate the presence of a pseudo-membrane in the larynx, and it is not a reliable guide if the expiration is free and easy, for these symptoms may be due in great part to spasm. The dyspnœa due to spasm alone is intermittent or remittent, never continuous. But if there is suppression of the voice, and expiration is labored, prolonged, and audible, there is no longer doubt about the presence of membrane, for nothing but mechanical obstruction could produce these symptoms. As soon as they appear, and there are no longer *remissions* between the croupal paroxysms, but the dyspnœa is *continuous*; if insufflations of alum, or of alum and sulphur, with ipecacuanha cease to afford relief, or emesis can no longer be produced, and if ipecac only purges, and poultices and steam have been fairly tried, it may be said that all remedial measures have failed to control the disease, and the operation should at once be performed.

There is nothing in the operation itself incompatible with recovery, even at the early age of six and nine weeks.

In 1830, Dr. Scoutetten, Professor of Surgery, Military Hospital, Strasburg, operated successfully on his own child, six weeks old.

The diagnosis of croup in this case has been questioned, but it is stated in the original report that there was expectoration of membrane for two days after the operation.

In 1880, Dr. Steinmeyer¹ performed a successful tracheotomy on a child nine weeks old. I have during this research found recorded² an astonishing number of recoveries from tracheotomy in infants from a few months to two years old, which shows that the tender age of the patient should not be allowed to contra-indicate tracheotomy; and the recollection of these may induce many to perform the operation who now oppose it on the ground of the early age at which we are frequently called upon to have recourse to it in many cases of diphtheritic croup.

In very young children the disease advances much more rapidly, and the liability to bronchial and pneumonic complications is greater, and they come on earlier in the disease than they do in older children, therefore we should operate earlier in the younger. In young children the trachea is deeply imbedded in cellular tissue and fat; it is small and freely movable, and the other structures of the neck are closely connected with it. Thus the operation presents *difficulties* which are not met with in older children.

Prognosis.—Early age, previous ill health, especially chronic catarrh, scrofula, bronchial and chronic pneumonic changes, all make the prognosis more serious. If scarlet fever or measles are prevailing at the time of the operation, and the patient has not had them, he contracts them with increased facility, and the prognosis is rendered very grave by this added danger. Nasal diphtheria makes the prognosis worse and severe epistaxis before or after the operation is of bad prognostic omen. When croup comes on very early in the disease, and makes its appearance very suddenly, and the obstruction* is at once extreme, the prognosis is far more serious, for in such a case the membranous exudation early tends to

¹ Berlin. klinisch. Wochen., No. 46, 1880. Operation for retro-pharyngeal abscess.

² See table, p. 30.

spread into the bronchi, and even to the alveoli. When the lymphatics of the neck are much enlarged, and the neck greatly swollen, the operation has less chance of success. The presence in the urine of albumen and casts make the case more unfavorable. When the breathing is very laborious in character, and the supra-sternal, supra clavicular, infra-clavicular, and the scrobiculus cordis depressions are not marked, the prognosis is less favorable than when recession at these places is very considerable.

When the bronchi and lungs are free, and the obstruction to inspiration is only in the larynx, the recession of the soft parts is very great. Less marked depression denotes obstruction below the larynx and the existence of secondary complications.

It is an unfavorable sign if the breathing does not become perfectly free and regular after the operation, and indicates either the existence of false membrane below the tracheal opening, or a large quantity of mucus in the tubes, or pneumonic changes. Difficulty in swallowing after the operation is a bad symptom. This arises from fluids passing through the glottis, where they excite convulsive coughing and escape through the canula.

After-management.—Success after tracheotomy is to be obtained more by careful nursing than from the perfection of the operation itself. From careful observation I am convinced that the two main causes of failure of tracheotomy in saving life are the late performance of the operation, and inefficient after-care, and among the last-named want of proper attention to the canula. Obstruction at the inner end of the tube from false membrane or mucus, causes more deaths after tracheotomy, than either pulmonary diseases or the original malady which rendered the operation needful.¹ The physician should not forget that his whole duty is not performed when the operation is completed; that tracheotomy does not tend to *cure* the disease, but that it allows time for the application of the treatment found to be most successful in controlling it.

The sustaining of the patient, the administration of the

¹ Seventy-eight per cent. die in the first four days (Wanscher). Seventy-nine and one-half per cent. die in the first four days, and nearly sixty-three per cent. during the first two days (Krönlein, in Langenbeck's Archives).

remedies for the arrest of the disease, attention to measures for subduing the local process and reducing inflammation, the temperature, quality, and amount of moisture in the air that the patient breathes, the care of the canula; and the condition of the trachea and bronchi are not generally carried out with enough thoroughness to give the patient all the advantages which the operation is capable of affording.

I must again revert to the most important of all the questions just now in connection with our subject—the danger of the operation itself. The quotations from so many eminent authorities of vast experience in the performance of tracheotomy prove beyond all peradventure that the opinion that it is a dangerous operation is erroneous—and it is not only erroneous, but dangerous.

To the majority of people in this city the proposal of tracheotomy seems equivalent to pronouncing sentence of death; and from the operation being represented as formidable comes the unwillingness of parents to consent to it until the child is about to expire, and of physicians to undertake its performance.

In many cases where tracheotomy is required it is as much a case of emergency as that of a bleeding artery. When danger is imminent, an operation is often needed even without a consultation, and a delay of a few minutes might cost the life of the patient; but owing to the practitioner being afraid to operate, he often leaves his patient struggling for breath and rushes after a *tracheotomist*, and returns, perhaps, to find that his patient has died strangulated.

At the March meeting one of the speakers said that he had been summoned to half a dozen such cases, and then, in alluding to the danger of tracheotomy, he stated that he "was willing to go upon record as saying that there have been more deaths upon the table in tracheotomy than from any other operation which is performed."¹ From this he inferred its danger! It would have been as logical to have said that tracheotomy is dangerous because more patients have died during the delay attendant on the bringing of a tracheotomist to the patient.

An eminent physician in the early part of this century

¹ Dr. Ripley, MEDICAL RECORD, April 5, 1884, p. 388.

was allowed to perish from this very neglect. Dr. Matthew Baillie in the third volume of the "Transactions of the Society for the Improvement of Medical and Surgical Knowledge," records the fatal illness of Sir John Macnamara Hayes. He was taken ill on July 16, 1809. His disease was croup. On the night of the 18th tracheotomy was proposed. Mr. Home and Mr. Wilson were sent for to perform bronchotomy. Mr. Wilson was out of town, and Mr. Home did not come until four in the morning, but the patient was then in a dying state; he expired at six. Autopsy, 20th: "The cavity of the glottis was found to be almost obliterated by the thickening of the inner membrane of the larynx at that part."

A prominent practitioner in this city left a case of diphtheritic croup in the care of a young surgeon, who had been on the surgical staff of Bellevue Hospital for eighteen months, with the instruction that he should go for Dr. X. if he thought tracheotomy necessary. It did become so and he obeyed instructions. Dr. X. not being at home, another surgeon was sought and found. The trachea was opened immediately, but the child died soon after from exhaustion, owing to the late performance of the operation.

Contrast this absurd proceeding with the custom in the hospitals in England, where nearly all the tracheotomies are performed by the house-surgeons.

In this connection the action of Dr. J. G. Ehrhardt,¹ in the light of a single experience of the kind, is interesting and instructive: Case of diphtheritic croup, summoned at 2 P.M., December 12th, and found child much worse. Tracheotomy only thing that offered benefit. Time was lost while waiting for my father to assist me, when he arrived the boy was nearly dead. There were two or three respirations after the tube was inserted. I do not believe that the operation hastened death. December 15th, called to a boy of five years. Time was too precious to send for a surgical assistant; operated at once. Child recovered.

The physician who leaves his patient in a state of rapidly advancing asphyxia and goes in quest, perhaps in vain, of a surgeon merely to make an opening in the

¹ American Journal of the Medical Sciences, April, 1873, p. 421.

windpipe, is as culpable of neglect as he would be if he left a spurting artery and went for a surgeon to arrest the bleeding.

Another reason why an exaggeration of the danger of tracheotomy should not prevail is that in country districts it almost entirely prevents recourse to it. A physician but eighty miles from this city, who is in the habit of doing capital operations, has told me that he would not dare to undertake tracheotomy, because there is a *universal* impression that the operation is extremely dangerous to life.

I hope, as a result of the proper appreciation of this life-saving measure, and a thorough understanding of its harmlessness, that when diphtheritic croup is epidemic in the country, tracheotomy will be as frequently performed by the "family physician" as common bleeding used to be.

This misrepresentation of the danger of tracheotomy has caused its abandonment several times in its history. After its proving successful in the hands of Asclepiades, 100 B.C., from its being scorned and being spoken of as a crime by Cælius Aurelianus, it was lost sight of for more than two hundred years, when it was revived by Antyllus about 340 A.D. After this the writings of Rhazes, Avicenna, and others caused its suspension until the time of Paulus Ægineta in the seventh century, who seems to have repeatedly opened the windpipe. From that date until the attempted reintroduction by Guieto de Cauliaco, in the fourteenth century, we hear nothing of the operation. During the first half of the sixteenth century Benivieni performed it successfully, and about the same time Saliceto and Rolandi. Brasavola, in the middle of the sixteenth century, asserts in his "Commentaries" that he himself opened the trachea¹ in the case of a patient laboring under quinsy, and on the point of death, and thus saved his life, the surgeon not daring to perform the operation.

In 1730 Dr. George Martyn² performed tracheotomy on a young lad for croup, and "with such success that in less than four days, his breathing being perfectly easy, we removed the canula, and left the glottis to do its own office." He introduced the double canula.

Dr. Michaelis³ in a letter from New York, dated 1780,

¹ 1546.

² Phil. Trans. for the year 1730, p. 438. London, 1809.

³ Richter's Chirurg. Biblioth., vol. vi., p. 120. Voss: N. Y. Journ. Med., January, 1860, p. 31.

advised early operation in these words : "It is unpardonable if it is not resorted to in time."

In 1807 Napoleon offered a prize for the best essay on diphtheria. The men between whom the prize was divided, and all who were gathered at the great medical concourse in Paris when it was awarded in 1808, were, with one exception, opposed to tracheotomy. Caron upheld the operation with great energy and indefatigable perseverance. So strong were his convictions, and so great his ardor, that he offered a prize of a thousand francs to the man who would cure croup with the aid of this operation. But the opinion of the judges and the writers of the prize essays so influenced men that there was no advance made in tracheotomy until Bretonneau. It was given to Bretonneau to restore a supreme resource so unjustly condemned. Four consecutive reverses did not discourage him, and in 1825 he had the happiness of saving the daughter of his best friend by the operation.

In 1814 Thomas Chevalier,¹ of London, made a successful tracheotomy in diphtheritic croup in a boy seven years old. Such, however, was the opposition to and dread of the operation, that² "in 1820 a medical gentleman of high standing in this city (Edinburgh) who was anxious to afford relief to two of his children affected by croup could not prevail upon any of the principal surgeons to perform tracheotomy. At his urgent request Dr. Bryce, a gentleman in general practice, operated on one of the children without ultimate success, as both of them died."

Though we need not apprehend the abandonment of the operation to-day, an exaggeration of its dangers might be the means of its being withheld from many who could be saved by it, or of its not being resorted to until it is too late to accomplish any good. Let not the erroneous and dangerous opinion go forth from this Academy that tracheotomy is the most dangerous of all surgical operations! The diffusion of this dictum emanating from such a representative body of medical men, will be the means of destroying far more lives in a comparatively short period, than the operation itself or anything directly connected with its performance has from the

¹ Med. Chirurg. Trans., 1815, vol. vi., p. 150. This operation, though attributed to Mr. Chevalier, was done by Mr. Lightfoot, the house surgeon.

² James Spence at the Forty-third meeting of the British Medical Association.

time that it was first instituted, more than two thousand years ago.

Conclusions.—Tracheotomy of itself, performed with care, involves little if any danger to life.

Accidents during the operation generally result from want of care.

It prevents asphyxia, and thus gives more time for the administration of remedies, and for the system ultimately to throw off the disease.

It prevents laborious and rapid breathing and lessens exhaustion.

It allows a free supply of air, and thus assists in the cure of the original malady.

It is the supreme resource, and as the patient cannot be made worse by it, do not postpone it until there is but a forlorn hope even from it.

Persistence of the original disease, delay in the performance of the operation, and neglect after, are the chief causes of its failure.

Operate early, very slowly, deliberately, and carefully.

It is never too late to operate: even though the child has stopped breathing, if life is not extinct, open the windpipe and perform artificial respiration—many children have been saved under just such conditions.

If strangulation is the main symptom, neither age, constitutional condition, nor complications can furnish a contra-indication to its performance.

It alleviates suffering.

It mitigates all the symptoms.

It obviates secondary complications.

It never adds one element of danger to the original disease.

Statistics taken collectively show that nine-tenths of the cases which render the operation needful will suffocate without it.

Performed early it snatches from certain death fully two-fifths of all the cases.

No patient that dies after the operation would have lived if it had not been performed.

When it fails to save life the relief afforded and the substitution for the most agonizing mode of death—strangulation—one of the least, by asthenia, are sufficient reasons to justify its performance.

The dictates of science, facts, and common humanity, unite in demanding it.

Severinus must have been inspired when in the seventeenth century he said of it: "It is a divine invention."

Allow me one more quotation, gentlemen. In THE MEDICAL RECORD of June 28, 1884, Professor Letamendi says: "In the days of more knowledge and less nonsense, tracheotomy will be ranked among the minor surgical operations."

Successful Tracheotomies for Croup in Children One Year of Age and Under.

Case.	Age.	Disease.	Operator.	Authority.
1	Wks 6	Croup.	Scoutetten (1830).	Soc. Med. des Hôp. de Paris, 1867.
2	Mos. 3	Croup.	Annandale. ¹	Ed. Med. Jour., vol. vii., part 2, June, 1862, p. 1121.
3	6	Croup.	Küster.	Elias, Deutsche Med. Wochen., Nov. 9, 1878, p. 555.
4	6½	Croup.	Jos. Bell.	Bell: Letter to Brit. Med. Jour., April 8, 1871.
5	7	Croup.	Tait.	Brit. Med. Jour., April 15, 1871, p. 391.
6	7	Croup.	} Lindner.	{ Deutsche Zeitschrift f. Chir., Band xvii., Heft 5 und 6.
7	7	Croup.		
8	7	Croup.	Wegner.	Krönlein: Archiv f. klin. Chir., vol. xxi., 1877, p. 266.
9	7	Croup.	Krönlein.	Rauchfuss in Gerhardt's Handb. Kind., vol. iii., p. 202.
10	7	Croup.	————— ²	Elias, op. cit. from St. Petersburg Med. Zeitung, 1877.
11	7½	Croup.	Jos. Bell. ³	Syme: Ed. Med. Jour., vol. vi., part 2, April, 1861, p. 956.
12	8¾	Croup.	Elias.	Deutsche Med. Wochen., November 9, 1878.

¹ Child lived seven weeks after the operation. On autopsy lungs were found to be perfectly healthy.

² Name not given.

³ Communication to Med. Chirurg. Society, Edinburgh. Professor Syme thought that the operation would not do any good in this case, but yielded to Bell, the house-surgeon, who did the tracheotomy, which was followed by instant relief to the child.

Case.	Age.	Disease.	Operator.	Authority.
13	Mos. 10	Croup.	Day.	Greenfield in St. Thomas' Hosp. Rep., vol. viii., p. 263.
14	10	Croup.	Baizeau, ¹	Gaz. des Hôpitaux, 1867, p. 397.
15	10	Croup.	V. Winiwarter. ²	Jahrbuch f. Kind., 3 u. 4, p. 337, 1876.
16	10	Diphtheria.	Elias.	Deutsche Med. Woch., November 9, 1878.
17	10	Croup.	Bourdillat.	L'Union Méd., 1872, vol. xiii., 3d series, p. 826.
18	11	Croup.	Geo. F. Shrady. ³	N. Y. Med. Record, vol. xxii., Nov. 4, 1882, p. 512.
19	11.	Croup.	Trousseau.	Paris Theses, 1834, t. cclxxviii., No. 289, p. 13, Aussandon's Thesis.
20	11	Croup.	Rauchfuss.	Gerhardt's Handb. Kind., vol. iii., p. 202.
21	11	Croup.	J. Cooper Forster.	Brit. Med. Jour., March 25, 1871, p. 309.
22	11	Croup.	Derby.	Stevens: Boston Med. & Surg. Jour., vol. lxxi., October, 1869, p. 167.
23	12	Croup.	Lindner.	Deutsche Zeit. f. Chir., Band xvii., Heft 5 u. 6.
24	12	Croup.	Trendelenburg.	Gerhardt's Hand. Kind., vol. vi., p. 262.
25	12	Croup.	A. T. Woodward.	Mastin: Gaillard's Med. Jour., January 1880, p. 30.
26	12	Croup.	Dujardin.	L'Union Méd., 1872, 3d series, vol. xiv., p. 46.

From One to Two Years of Age.

27	13	Croup.	Wardner.	{ Gill: Ill. State Med. Soc. Trans., 1878, p. 164. Mastin: Gaillard's Jour., January, 1880, p. 30. Gaz. Hebdom., 1862, p. 806.
28	13	Croup.	Barthez.	
29	13	Croup.	Trousseau. ⁴	
30	13	Croup.	Archambault.	Jour. des Conn. Med.-Chirurg., September 3d, 1834, t. ii., p. 1. Gaz. des Hôpitaux, 1867, p. 307.
31	13	Diphtheria.	Steavenson. ⁵	St. Barthol. Hosp. Reports, vol. xviii., 1882, p. 313.

¹ Twelve children under two years operated on, four got well.

² Respiration stopped and artificial respiration was performed for ten minutes, and had to be resorted to three times within the first hour.

³ This is the youngest successful case operated upon in this country. This operation was performed between the tenth and eleventh month. Child is still living.

⁴ Operation same year as reported.

⁵ Child had scarlet fever and recovered.

Case.	Age.	Disease.	Operator.	Authority.
32	Mos. 14	Croup.	Cabot. ¹	Haywood: Boston Med. and Surg. Jour., vol. lxii., p. 273, 1860.
33	14	Croup.	V. Langenbeck.	Krönlein: Archiv. f. klin. Chir., vol. xxi., 1877, p. 268.
34	14	Croup.	Rapin.	Sanné: Traité de la Diphthérie, p. 481, Paris, 1877.
35	14½	Croup.	Millard et Hémey.	Sanné: op. cit., p. 481. Jour. de Therapeutique, 1874.
36	15	Croup.	Cabot.	Boston Med. and Surg. Jour., vol. lxx., p. 61.
37	15	Croup.	Hélie.	Gaz. des Hôpitaux, 1867, p. 397.
38	15	Croup.	Baizeau.	Gaz. des Hôpitaux, p. 397, 1867.
39	16	Croup.	Isambert.	Gaz. des Hôp., 1867, p. 307.
40	16	Croup.	Lindner.	Deutsche Zeit. f. Chir., Band xvii., Heft 5 u. 6.
41	16	Croup.	Wegner.	Krönlein: Archiv f. klin. Chir., vol. xxi., 1877.
42	17	Croup.	Nathan Jacobson.	N. Y. Med. Record, June 30, 1883, p. 705.
43	17	Croup.	Vigla.	Gaz. des Hôpitaux, 1867, p. 307.
44	18	Diphtheria.	Bartscher.	Deutsche Med. Wochen., 1880, p. 29.
45	18	Croup.	} C. Withusen. ²	{ Dub. Med. Press, April 5, 1865, p. 320, from Ugeskrift for Læger, March 16, 1865.
46	18	Croup.		
47	18	Croup.		
48	18	Diphtheria.	Josef Pauley.	Berlin. klin. Wochenschrift, February 25, 1878, p. 105-6.
49	18	Croup.	George Rachel.	Amer. Jour. Med. Sciences, July, 1877, p. 95.
50	18	Croup.	Collins.	Mastin: Gaillard's Med. Jour., vol. xxix., p. 30, January, 1880.
51	18	Diphtheria.	Voigt.	Jahrbuch f. Kind., vol. viii., p. 121, 1882.
52	18	Croup.	Moutard-Martin.	Gaz. des Hôp., 1867, p. 308.
53	18	Croup.	Potain.	Gaz. des Hôp., 1867, p. 308.
54	18	Croup.	Archambault.	Gaz. des Hôp., 1867, p. 307.
55	19	Croup.	Roger.	Gaz. des Hôp., 1867, p. 308.
56	19	Croup.	Pancoast.	Meigs: Amer. Jour. Med. Sciences, April, 1849.
57	19	Croup.	Bose.	Krönlein: Op. cit.
58	19	Croup.	Weber.	Zeitschrift f. Ration. Med. Neue Folge I, Band iii., Heft 1, p. 8, 1852.

¹ Child had double pneumonia and recovered.

² One case died on eighty-first day of exhaustion from tubercular diarrhœa.

Case.	Age.	Disease.	Operator.	Authority.
	Mos.			
59	19	Croup.	Wegner.	Krönlein: Op. cit.
60	19	Croup.	Trendelenburg.	Vaneschi: Berliner klin. Woch., April, 1872, p. 163.
61	19	Croup.	Jennings.	Archives of Pediatrics, vol. i., No. 9, Sept. 15, 1884, p. 546.
62	20	Croup.	Busch.	Vaneschi: Berliner klin. Woch., April, 1872, p. 163.
63	20	Croup.	Bose.	Vaneschi: Berliner klin. Woch., April, 1872, p. 163.
64	20	Croup.	Fitzau.	Berliner klin. Woch., April 25, 1879, p. 223.
65	21	Croup.	Krönlein.	Krönlein: Op. cit.
66	21	Croup.	T. Sandler.	Vierteljahrschrift f. Prak. Heil., vol. iv., p. 71.
67	21	Diphtheria.	House Surgeon. ¹	Poland, Brit. Med. Jour., Sept. 16, 1882, p. 523.
68	22	Croup.	{ Dower.	{ Brandt: N. Y. Med. Record, Jan. 13, 1883, p. 54.
69	22	Croup.		
70	22	Croup.	Isambert.	Sanné: Diph., p. 481.
71	22	Croup.	Cushing.	Pacific Med. and Surg. Jour., vol. vii., p. 14.
72	22	Croup.	Laborde.	Gaz. Hebdom., 1862, p. 807.
73	22	Croup.	Maslieurat-Lagémard.	Gaz. Méd. de Paris, 1841, p. 380; 1842, p. 170.
74	22	Croup.	Ferraux.	Gaz. Hebdom., 1862, p. 807.
75	22	Croup.	Johnson.	Ill. State Med. Soc. Trans., 1879, p. 120; reported by Gill.
76	22	Croup.	Wegner.	Krönlein: Op. cit.
77	22	Diphtheria.	Mayer.	N. Y. Med. Record, April 26, 1884, p. 457.
78	22	Diphtheria.	Parker.	Steavenson, St. Barthol. Hosp. Reports, vol. xviii., 1882, p. 323.
79	23	Croup.	Laborde.	Gaz. Hebdom., 1862, p. 807.
80	23	Croup.	Trousseau.	Sanné: Diph., p. 481.
81	23	Croup.	Bose.	Krönlein: Op. cit.
82	23	Croup.	Burland.	Gaz. Hebd., 1862, p. 808.

Cases Exact Ages not Given.

83	Yrs. -2	Croup.	Krackowizer.	Jacobi: Am. Jour. Ob., May, 1868.
84	1-2	{ Croup.	Körte (three cases).	Arch. für klin. Chir., Band xxv., p. 820.
85				
86	1-2	{ Croup.	Revilliod (six cases). ²	L'Union Méd., 3d series, t. xxii., 1876, p. 136.
87				
to 93				

¹ Name not given.

² Of sixteen children operated upon under two years of age, he obtained six cures, that is to say, 37.5 per cent. The youngest of his cases was fifteen months, the oldest twenty-three months.

IS THE OPERATION OF
Tracheotomy in Diphtheritic Croup
Dangerous?

WHEN SHOULD THE OPERATION BE PERFORMED?

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HAVING been honored in THE MEDICAL RECORD with a criticism on my article on the above questions, I desire to re-state some points which seem not to be clearly understood.

Early or late operation, and the danger of the operation, seem to be the two burning questions. We will first consider the former.

How does prolonged croup influence the pulmonary circulation? When there is obstruction at the rima glottidis, a limited supply of air enters the lungs with every inspiration, the lungs are less expanded, the aspiration force is lessened, the air in the lungs and bronchi becomes rarefied, and the blood not finding the same resistance in the air-cells and small bronchi, enters more freely and circulates more slowly than it does when sufficient air enters the lungs and there is proper expansion

and retraction of these organs. The blood in the pulmonary capillaries is imperfectly aërated, and becomes charged with carbonic acid, producing increasing distention of the capillaries; carbonized blood tending to accumulate in the capillary system.

This slowing of the circulation in the pulmonary capillaries leads to stasis, splenization, and œdema. The blood accumulates, therefore, in the trunk of the pulmonary artery, in the right heart, and in the systemic veins. The cutaneous capillaries become engorged, producing the well-known bluish tint of the external surfaces, especially the violet hue of the lips and nails. The bronchial veins through the vena azygos on the right side, and the superior intercostal on the left, opening respectively into the superior vena cava and the left innominate, early feel the influence of this retrograde engorgement, and this causes serous exudation into the bronchial tubes. This exudation impedes the entrance of air to the air-cells, and then follow all the well-known changes which occur in broncho-pneumonia. In contiguous lobules, and especially at the upper and anterior portions of the lungs, vicarious emphysema occurs. These emphysematous portions of the lungs are anæmic. But these are partially secondary, compensatory changes.

At that part of the lungs where air reaches, there is but little blood to act upon, and where there is blood, air cannot penetrate. When the thorax is opened the lungs do not collapse, owing to vicarious emphysema, and because the air in the bronchi is prevented from escaping by the mouth, by the large quantities of secretion in them. For this reason the *superficial* observer at once concludes that he has to do with emphysema pure and simple; whereas a *very* little reflection would convince one of his error. Where there is prolonged croup, congestion of the lungs is inevitable.

Dr. Rupp, quoting Dr. T. A. Barker to prove that laryngeal obstruction does not produce pulmonary congestion (be it marked that this was of a case of intra-

laryngeal growth), says :¹ "The child died asphyxiated, presenting the symptoms of croup."

The child having been leeches, tartar emetic and hydrarg. cum creta administered, blisters applied, and mercurial inunctions used, Dr. Barker's exact words are :² "Each report, on November 9th, 10th, and 11th, states he had improved ; the breathing was easier, the respirations remained about twenty-two in the minute, but were less labored, and there was an *interval* between expiration and inspiration, the pulse ranging from 80 to 95 ; but on the 12th, after a restless night, he died *very* suddenly. The statement of the sister of the ward was that he appeared much better when she had seen him on the night of the 11th ; and the night-nurse asserted that, although he had been restless, there had not been more *wheezing, cough, or difficulty of breathing* than she had noticed on former nights." (*Italics mine.*)

Dr. Barker says *nothing* about the child's "dying asphyxiated, presenting the symptoms of croup."

When, in the vain and delusive effort to prove a *theory*, the truth is put to such a strain as this, every statement must be suspected ; and this feeling is strengthened by the misquotations from my own article.

Observe Dr. Barker's comment : "It is almost superfluous to allude to the mischief which may arise in other parts when the operation [tracheotomy] is needlessly or unavoidably delayed ; so that whatever may be the immediate result, the operation fails to give permanent relief. The chief danger, of course, is that of congestion of the lungs."³

Dr. Fuller is quoted as supporting the theory of anæmia of the lungs. Let us examine his post-mortem records. These will include every autopsy recorded by Dr. Fuller. Cases 1 and 2 recovered. Case 3 died soon after operation.⁴ "The lungs were very œdematous, and the lower

¹ THE MEDICAL RECORD, March 21, 1885, p. 314.

² Med.-Chirurg. Tr., vol. xxxviii., p. 43.

³ Ibid., p. 231.

⁴ Ibid., vol. xl., pp. 43 et seq.

lobes on either side hepatized. The bronchial mucous membrane was vascular throughout, and was covered to a great extent by the same sort of soft albuminous matter which existed in the trachea. Many, even of the smallest bronchi, especially those leading to the inflamed and hepatized portions of the lungs, were full of this deposit." Case 4 died about twenty-four hours after operation. "The lungs were congested, and the smaller bronchi contained a good deal of thick mucus, mixed with blood." Case 5: death twenty-six and a half hours after operation. "The bronchial lining membrane congested and covered with thick mucus, and the right lung in one part passing into the early stage of red hepatization." Remarks by Dr. Fuller as to the *influence of delay in operating*: "Each minute that is lost afterward is so much against the patient's recovery; for with approaching suffocation the strength fails rapidly, and passive congestion of the lungs takes place." This is very bad support for those who would fain find anæmia of the lungs resulting from neglected croup!

The citation of the case from Bretonneau, with its *attendant treatment*, to bolster up the theory of anæmia of the lungs, is—pardon the expression—silly twaddle.

Passavant has been quoted in THE RECORD, with protective caution, however, on the changes in the pulmonary circulation in untracheotomized croup. He says: "The cause of the excess of blood in the lungs of croup patients is exactly the same as on the skin to which cups are applied. The consequences are bulging of the mucous membrane toward the rarefied space, overfilling of the capillaries, and consequent slowing of the circulation in the same, leading to stasis, splenization, ecchymosis, and increased secretion from the mucous membrane. The excess of blood in the lungs farther causes blood-stasis in right heart, filling up of the cervical veins, and livid countenance. Finally the hyperæmia of the lungs leads to pulmonary œdema."

¹ Deutsche Zeitschrift für Chirurgie, vol. xiv., pp. 364, 365.

To Niemeyer's pathology this is strikingly similar.

Hasse¹ says: "The lungs generally do not collapse, are dark-colored, turgid with blood, and occasionally exhibit isolated patches of inflammation."

It has been said, at the Pathological Society in this city, that anæmia followed instead of congestion, when the entrance of air to the lungs was partially prevented, and that this view "was certainly accepted by pathologists in general."² There are pathologists who seem to *accept* this view, but there is not one who *describes such changes*.

I would strongly urge those who would not feed upon blind illusions, but who are still trying to possess themselves of the *theory* of prolonged croup producing pulmonary anæmia, to read Niemeyer on "Croup," and Steiner in "Ziemssen," with comments on Niemeyer's article.

If the sage advice of Morgagni, "We should weigh, not *count* our cases" [*italics mine*], had been followed, the theory of anæmia of the lungs, with other equally preposterous and mistaken notions concerning croup and tracheotomy, would never have been concocted.

The following are a few additional authors who may be referred to as having found that croup leads to congestion of the lungs: Vogel, Oertel, Steiner,³ Gerhardt, Bohn, Bartels, Bouchut, Stokes, Loomis, Watson, Cheyne, Copland, William Squire, Porter, Condie, Thomas King, Chambers, Henoch,⁴ Tanner, Evanson and Maunsell, Cohen, Parker, Johnson, J. Lewis Smith, Henry Smith, Goodhart, Pilcher, Morell Mackenzie, Conway Evans, and others.

I am criticised for not mentioning Krönlein's autopsies, in which there were cases of laryngo-tracheal diphtheria, without discoverable disease in the parts above. Find-

¹ Pathological Anatomy, by Charles Ewald Hasse, Professor of Pathology and Clinical Medicine, University of Zurich, Syd. Soc. Trans., p. 281.

² THE MEDICAL RECORD, January 24, 1885, p. 108. ³ Ziemssen's Cyclopædia.

⁴ Diseases of Children, Wm. Wood & Co., 1882, p. 136.

ing post-mortem laryngo-tracheal diphtheria without any accompanying exudation in the throat or nose furnishes no evidence that the disease had *not* involved those parts, for the post-mortem examination does not reveal the progress of, but rather the completed disease only ; and all of us know from clinical experience that, as the disease invades the larynx, it not infrequently disappears from the throat.

I quoted Krönlein no farther then, for the obvious reason that I was considering the progress of the disease, and the prevention of the same. Dr. Latham's excellent words are here highly applicable : " So far as morbid anatomy contemplates the last or latest results of disease that are fixed and irremediable, and unalterable, its value is very small. But so far as morbid anatomy contemplates *disease in progress*, and scrutinizes and explains its organic processes, its value is very great."

I suggested that early operation in croup might prevent the spread of the disease into the deeper air-passages, and this suggestion was based on the fact that, in my own cases, there has been no tendency to an extension of the disease below the tracheal wound, *when it had not done so prior to the operation*. Passavant has since made the same suggestion. Guttman has since reported one hundred and sixty-five autopsies, in which the disease did not, in any instance, leap the larynx in extending into the trachea and bronchi, but always first involved the larynx in travelling downward. I have shown that tracheotomy, by securing for the diseased larynx entire rest, is promotive of the cure of croup. Based on these facts, have we not every reason to hope that early operation will prevent the spread of the disease into the passages below the larynx ?

If we weigh the reasons for and against early or late operation, everything is in favor of early operation.

" Performed early it [tracheotomy] snatches from certain death fully two-fifths of all the cases " has been termed by Dr. Rupp a " bald assertion," and yet he

knows that this conclusion was based on the statistics of a great number of operators in different countries—not including America, where the general practice is to *neglect* the patient until the operation offers but a forlorn hope.

The statements made in my article *are* in accord with every careful essay on croup and tracheotomy which is based upon experience and a careful study of pathological findings, and it does not contain one statement which contradicts the teachings of one *accepted* authority; and that it is in accord with the present state of feeling on the subject is evidenced by a notice of it in the London *Medical Press and Circular* for April 29, 1885.

Everything that has been recently said on this subject in France and Germany has corroborated and verified every position which I have taken.

As to tracheotomy for croup in its imminent peril to life being one of the most dangerous operations in surgery, sufficient has been said, and it has been negatived. Dr. Rupp seems to find it a very bloody operation, for he says: "I have tracheotomized once. . . . I had been ably assisted by Dr. Stubenbord. . . . I think more than two ounces of blood were lost."

I have seen Dr. Stubenbord tracheotomize a two-year-old child that was much cyanosed, and certainly not more than half a teaspoonful of blood was lost. More than thirty physicians in this city have on as many occasions witnessed the performance of this operation by myself, and in no instance did they see their patient lose a drachm of blood. In my essay *I* said nothing about the operation being one of the "easiest things in the world," or being "simple and easy," but on the contrary I urged early operation, so as not to encounter engorged veins, etc. I said: "Operate early, very slowly, deliberately, and carefully." No greater caution could be enjoined than is found in these few words. I said: "Tracheotomy of itself, performed with care, involves little, if any danger to life;" and he who will make

tracheotomy a bloody and dangerous operation is not competent to perform it. Much more skill is required in the safe administration of chloroform in advanced croup than in tracheotomizing, and if my own child were to be tracheotomized, I should be much more concerned as to who would administer chloroform than as to who should perform the operation.

Dr. Rupp's stricture on Professor Letamendi for saying, "In the days of more knowledge and less nonsense, tracheotomy will be ranked among the minor surgical operations," is a prophecy which was considered of sufficient value and importance to be at once quoted by THE MEDICAL RECORD, and has since appeared in many of the medical journals throughout the world. Dr. Rupp speaks highly of Passavant's work as a tracheotomist, and he (Passavant) says:¹ "Early tracheotomy does not belong to the dangerous operations."

The *critic* says: "We all praise Bretonneau's works on tracheotomy." Bretonneau says:² "We ought to hasten to perform an operation which of itself does not expose the patient to any danger."

¹ Deutsche Zeitschrift f. Chirurg., v. xix., p. 361.

² Memoirs on Diphtheria, Syd. Soc., Third Memoir, p. 132.

