

Remarks on the operation of bronchotomy / by William Martin, Esq. (Bengal Medical Service).

Contributors

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*The Editor of
The Edinburgh Monthly
Journal
with the author's Compliments*

REMARKS

(4)

ON THE

OPERATION

OF

BRONCHOTOMY.

BY

WILLIAM MARTIN, Esq.,

BENGAL MEDICAL SERVICE.

CALCUTTA:

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1853.

ERRATUM.

In page 14, line 16 from top, for *nervous* read *venous*.

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R E M A R K S
ON THE
OPERATION
OF
B R O N C H O T O M Y.

THE usual operation of Bronchotomy, by which I understand the making of an opening into the air-canal, at any part either of the larynx or trachea, as described by authors at some length and practised by surgeons generally, has always seemed to me to be attended by many disadvantages, particularly in the very young subject. The chief of these are :

The difficulty and delay caused by the supposed necessity of the operator making a dissection, that is, exposing successively the integument, muscles, &c., anterior to the air-canal.

The difficulty of making a suitable and safe incision with a bistoury from before backwards, in the proper situation.

The difficulty of stopping effusion of blood ; delay caused by tying small arteries, &c., in the progress of the operation.

The constrained position, in which it is necessary, for so long a time, to keep a patient, perhaps an infant, while these processes are going on.

And lastly, the great probability of some blood finding its way into the air-canal at the point of opening ; which is certain to obstruct breathing, and may lead to serious results.

I have for some time been of opinion, that a simple and comparatively easy operation might be substituted for the complicated proceeding generally practised.

It consists simply in passing into the part of the air-canal to be opened, a slight modification of the ordinary trocar and canula, such as are used in opening large abscesses, dropsies, &c., the calibre of the instrument varying according to the age of the patient, the size of the larynx or trachea, &c.

An ordinary cylindrical trocar, of moderate size, will suffice even with a young child, if care be taken to give the instrument, on its introduction, as much a slanting direction as possible, so as to avoid wounding the back part of the canal. This applies to occasions when the operation is performed near to the cricoid cartilage, in women and children, and in all situations in adult men ; but when it is performed lower down, in the trachea, in women and children, it will be more convenient and safe to employ a good-sized trocar and canula, with flattened surfaces, anteriorly and posteriorly.

The place of election, with either kind, for performing the operation, is the cricothyroid space ; but the same instruments can be used in any part of the larynx or trachea, which it may be considered advisable to open.

The modification, which I propose, of the trocar and canula, is—to diminish the length generally : (a canula of an inch and a quarter, or an inch and a half I consider sufficient for all purposes,) and to shorten the distance of the point and facets of the trocar from the lower end of the canula, in fact to bring the cutting edges nearly up to that point.

The accompanying diagram shows the modifications in size and shape of the trocar and canula, which are considered advisable :

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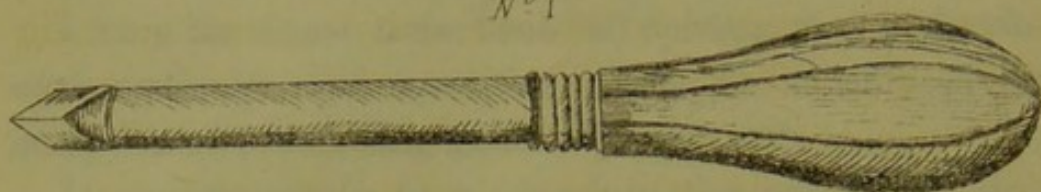
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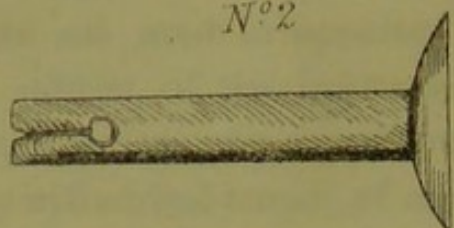
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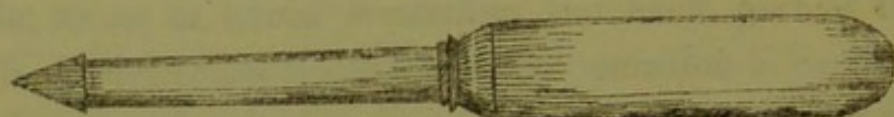
N^o 1



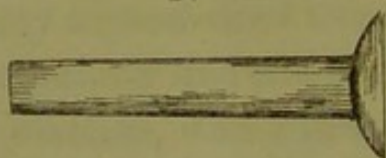
N^o 2



N^o 3



N^o 4



N^o 5



N^o 6



No. 1 represents the common full-sized cylindrical trocar, with its cutting part shortened, spoken of as having been used, below.

No. 2. The canula, with its lower edge approximated to the cutting edges of the trocar.

No. 3 shows the flat trocar, of size somewhat smaller, modified in the same way as to shape, and reduced in length.

No. 4. Canula to fit the trocar.

No. 5. A trocar, flattened below, its form gradually changing into the cylindrical.

No. 6. A canula, to correspond.

Of the latter instrument, I have not sufficient practical experience; but I am inclined to think it may be found to be even of a better form, than either the cylindrical or the flat instrument for operating on the trachea.

The flatness of the end will enable it to enter a trachea with greater facility, while the cylindrical upper part of the canula will form a better tube for the admission of air, and will exercise compression more accurately on the divided vessels. An instrument of this nature will probably be more worthy the name of tracheotomy trocar than any other.

This canula is somewhat enlarged above: from the absence of the usual head it will remain more firm and straight in the canal, and is furnished with two rings for the attachment of tape.

When the operation is performed on the adult in the cricothyroid space, I have found to answer the purpose very well, a trocar, the canula of which is nearly an inch in circumference on the outside, the point of the trocar not projecting above five lines, beyond the lower end of the canula. (*See Diagram, No. 1.*)

As I have before observed, in parts below the place of election, or the vicinity of the cricoid cartilage, in women and children generally, I recommend the trocar and canula (modified in like manner as to length) of the flat or oval kind.

The method of performing the operation is as follows :—

The patient's head being thrown as well back as is practicable, and slightly to the opposite side to that on which the operator stands, with one hand he fixes the canal, as securely as possible, so as to make evident its shape and position ; with the other, he passes the instrument to the necessary point, holding it with its long axis as nearly parallel as possible to the front of the throat ; he at once pushes it on, until the lower end of the canula is within the cricothyroid membrane, or the trachea ; the canula alone is then pushed on, until it lies securely in the passage ; at the same time the trocar is withdrawn.

The canula is prevented from becoming displaced, by means of broad tape fastened round its neck, or to rings on each side of its head and secured to the neck or shoulders of the patient.

This operation, although adapted for any part of the air-canal, seems particularly applicable to what I have called the place of election, viz., the cricothyroid space. In a patient of any age, an opening can generally be made with a trocar in this space between the thyroid and cricoid cartilages, sufficiently large to admit of a useful canula being passed. If there should be any difficulty on this head, the trocar being still pushed onwards and downwards, in a slanting direction, makes for itself an opening just sufficient by passing through a portion of or all the cricoid cartilage.

There can be no objection to the instrument being passed also through the upper part of the trachea, but I believe that it will scarcely ever be found necessary, to carry the incision so far ; at any rate, no harm will arise, if it should be done.

The chief advantages of this operation seem to be

That it is applicable to almost all cases—indeed, as far as my experience goes, to all cases without exception, in which it is thought necessary to practise Bronchotomy.

Easy of performance and quickly done, the ordinary operation being difficult and tedious.

Always safe, as no important part is endangered.

Certain in its immediate result or object, as it is always practicable in this way to open the canal.

It is exempt from the disadvantage

Of the distress caused to the patient and friends, by the elaborate and tedious process of dissection, practised generally as necessary preliminaries to the act of opening the air-canal ; and also

Of the hemorrhage caused by the division of blood-vessels by a scalpel, the pressure of the sides of the trocar and canula being not only sufficient to prevent blood entering the canal, but also to prevent the vessels bleeding at all, as long as the canula remains, and should it be necessary to remove the canula, this pressure will have converted the first incised wound into a contused wound, the one most likely of all to prevent the issue of blood altogether from the vessels.

The opportunities I have had of seeing the usual operation, impressed me with a conviction that it would be highly desirable, if it could in any way be simplified ; and it struck me, that the simple introduction of an ordinary trocar and canula into the cricothyroid space might answer the purpose.

I determined to carry it into effect on the first opportunity. This occurred in the case of a child, in whom suffocation was impending from closure of the glottis, in February, 1853. I was confirmed in my notion of the feasibility and safety of this operation by the opinion of my friend, Dr. Allan Webb, Professor of Clinical Surgery in the Calcutta Medical College, and with his sanction, and kind assistance, I commenced its performance on this occasion. It did not, however, succeed entirely to our satisfaction ; from deficient experience, I had not confidence that I might not carry the

cutting part of the trocar, a full-sized flat one, so far as to endanger the posterior surface of the larynx; and as time was pressing, I withdrew the instrument before the canula had perforated the cricothyroid membrane, stopped the external bleeding, which was not profuse, and as quickly as possible, with a scalpel, opened the larynx at this point, carrying the incision downwards through the cricoid cartilage. In this way a sufficient opening was made, the operation having been somewhat simplified by the preliminary introduction of the trocar.

This partial success led to my performing experiments on a considerable number of dead bodies of persons of all ages, from eighteen months upwards—the result of which is, the confirmation of my former opinion, that in most cases, a straight instrument alone is necessary for the operation, in any part of the canal, the danger of wounding the posterior surface of the larynx or trachea being purely imaginary, due caution being used, as to the ascertaining the exact shape and position of the canal, the way of holding the instrument, and the adaptation of its size to each particular case.

With the cylindrical trocar mentioned above, it was found that, when it was held in the position it might occupy if inserted in the place of election, as far as the edge of the canula, with the point directed straight backwards, there were about ten lines to spare between the point and the mucous membrane at the back of the larynx, in the body of a native female aged about sixteen.

The operation performed in the adult, in a few seconds, was found easily practicable in the larynx and trachea of a child aged about eighteen months, without the slightest danger of wounding any part of that canal, and I do not believe that any real difficulty will be found with a child of any age, however tender.

I am aware that the subject of using a trocar and

canula in Bronchotomy is not a new proposition. The Guy's Hospital Reports, Vol. VII., contain a paper by Mr. Hilton, in which he describes the use of a curved trocar and canula, which are figured in the accompanying illustration, and various curved trocars and instruments called Tracheotomes have been sometimes brought into use, particularly by the French. It seems to have been almost invariably the practice to use these means as secondary, to succeed the primary dissections, &c.; but I am of opinion, that in the large majority of cases, no dissection is necessary, and no instrument is required, but a shortened straight trocar with its canula, and the only considerations requisite are, as to the calibre of the instrument and whether it would be best to use a cylindrical or a flattened trocar. I am convinced, that in a large number of cases, particularly in children, a curved instrument, such as is above alluded to, if not quite impracticable, would not be so manageable, nor so completely under the command of the operator, as a short straight instrument; the latter may be completely guarded from doing the slightest injury by placing the fingers round and immediately posterior to the point and edges, whereas, when the larynx is, as is frequently the case with children, at any rate, in constant and convulsive movement, much harm might possibly be done by plunging in a long instrument with a considerable curve, which must be worked by medium of the handle, at a considerable distance from the part to be entered into the air passage. There would be the greatest danger, I conceive, of its point and sharp angles going too far, either anteriorly or posteriorly, so as to transfix the walls of the canal either way, or to either side; with a restless patient, it would be almost beyond the control of the operator.

In some cases, in which we might find, or have reason to suspect, that important blood-vessels are in the way, or we cannot exactly discern the shape of the trachea, from its being

unusually sunk in the neck, or concealed by an unusual amount of fat, &c., it may be advisable to begin by making a dissection of the parts over the canal; but I recommend that in these cases, as soon as the operator finds he can trace the shape and exact situation of the canal, without considering whether he should avoid the supposed locality of certain small vessels, or waiting to cut through, seriatim, each layer of fascia, &c. &c., he should at once plunge in a flattened trocar, the previous dissection offering no objection from the fact of blood being on the surface, as it could not possibly enter the trachea, the opening made by the trocar being accurately fitted by the canula, the straight instrument here aiding materially the efficiency and rapidity of the operation.

The instrument I propose for general adoption, either cylindrical or flattened will do, for any part close to the cricoid cartilage, its firmness causing so much prominence of the canal, that the trocar of either shape will pass readily, but in the trachea of a young child, the flat instrument will be the most efficient, its flattened or oval form will enable it to enter a canal, the walls of which may be in constant motion, with less danger of wounding any thing but the part to be opened, and it will give a sufficient opening, although I consider a cylindrical *canula* to be more efficient both for respiration and for the exercise of compression upon the divided vessels. As regards the size of the instrument, I think that the canula, in all cases, should be as large as can well be passed, in order that passage may be afforded to a stream of air as nearly large as natural.

An objection might possibly be made to a straight canula, that its lower end would protrude against the posterior wall of the canal; that, however, cannot be the case, if the upper end of the canula is firmly bound down by means of tapes or a bandage.

Another, that in cases in which a canula cannot be retained, or is not wanted, for instance where the operation is

performed for removal of a foreign body, an inconvenient or dangerous wound would be left on its being withdrawn. In such cases, as it is withdrawn, it would be necessary to observe any blood-vessels, which may have been divided, and to secure these ; or should there be any doubt as to the propriety of withdrawing it, while vessels below the surface might possibly pour blood into the canal, the operator may first dissect round about the tube and its sides, as far down as the canal ; while respiration is going on, at any rate sufficiently, through the canula, he will only have to look to the stopping hemorrhage. When that is done, he can remove the canula, and follow any of the methods recommended by authors, such as cautiously enlarging the opening if necessary, cutting out a portion of the tube, or by hooks keeping apart the sides of the opening, &c., &c. The most important point, viz., the forming an opening in the air passage, will have been effected promptly and safely, without prejudice to any ulterior proceeding rendered necessary by peculiar contingencies.

Again, another objection might be urged, that a curved instrument to remain in the canal, would be preferable to the straight canula : to which I answer, that in the experiments I have made on the dead subject, I find no inconvenience or difficulty apparently as regards the admission of air with a straight canula or its retention in the canal, but if a curved instrument should appear to be that most suited to the purpose, it can at any time be substituted for the straight canula, which may be removed at any period, during or after the operation, due care being taken to arrest hemorrhage in the way above stated.

I will now take a review of the chief points connected with the operation of Bronchotomy, which are mentioned in some of the principal surgical authors, by which it will be seen how far my statements and views are supported by previous experience.

Burns in his *Surgical Anatomy of the Head and Neck*, (published in 1811, Edinburgh,) speaking of Bronchotomy, says, "The propriety of Laryngotomy, in preference to Tracheotomy, may be doubted;" by it "we excite incessant and very distressing coughing," and he recommends in preference, at any rate in children and women, Tracheotomy. He then proceeds to say, that this operation requires great caution in some respects; the great arteria innominata is in risk in some subjects, even the right carotid is not always safe; and he speaks of the great probability, almost certainty, of finding in the way some vessels of good size. The thyroid gland itself may be in the way. He found in one case the gland reaching almost to the sternum.

Here I would remark, there seems to be no reason why the canal should not be opened, near the cricoid cartilage, above or below. I doubt whether, in the majority of cases, troublesome coughing would be produced; and whether the larynx or trachea be opened, I submit, that by the plan I recommend, there would be as little danger as in any other.

Charles Bell, in his *System of Operative Surgery*, (published 1809, London,) Article Bronchotomy, says—"The instrument to be kept in the opening is a simple canula having a slight but equal curve, and with a blunt stilette, for the perforation being made into the trachea by the common lancet, the conical point of the instrument would easily follow.

"The surgeon clears the blood away, and *if possible waits until the bleeding is stopped*, then with the point of his Lancet he perforates and introduces his canula obliquely downward and backward.

"It is recommended by some to push in a sharp stilette and canula, without a previous incision of the trachea. The intention of pushing a trocar and canula into the trachea, without making a cut, is that the canula may so exactly fill

‘ the opening in the trachea, that no drop of blood may fall
‘ into it.”

These extracts seem to corroborate my views on the subject of the trocar and canula for this operation. I have already stated my opinion as to the advantage of using only one cutting instrument, and of a straight over a curved canula.

Mr. Bell adds—“ In a child the Trachea is very small, and
‘ operating with canula and stilette, it has happened that the
‘ trachea was transfixed.”

An accident very likely to occur, should the operator use a curved instrument, or plunge in any other, before he has been able to note the exact shape and position of the canal.

The same author, in the Appendix to his *Institutes of Surgery*, published 1838, is made to say, of a case operated on in the Middlesex Hospital, in the cricothyroid space :—

“ Two small arteries, which threw out a stream of blood
‘ more than two feet, required to be secured by ligature. After
‘ dissecting a very little, the point of the knife was thrust
‘ into the membrane which joins the fore-part of the thyroid
‘ and cricoid cartilages, and *the blood in the wound showed by its*
‘ *frothiness that the air passage was opened.*

“ The patient could not bear a tube of any kind in the
‘ larynx, so it was resolved to remove as much of the crico-
‘ thyroid membrane as possible ; this was attended with great
‘ difficulty, from the irritability of the mucous membrane, constant
‘ movement of the larynx, *together with the filling up of*
‘ *the wound with blood, as quickly as it was sponged away.*

“ The veins bled with unexpected profusion, in consequence of the difficulty to the return of blood into the chest
‘ during this condition of obstructed breathing.”

With reference to the part of the air passage to be opened, he speaks of the difficulty of opening the trachea :—

“ If you cut upon the fore-part of the trachea, you have
‘ a deluge of blood from the thyroid gland, or guttural vein ;

‘ and *you must suspend the operation, or use the actual cautery*;
 ‘ and unless this precaution be taken, that may happen in your
 ‘ hands, which has happened again and again, that the patient
 ‘ has been suffocated—drowned, I may say, in his own blood.”

He recommends, if possible, in preference, to open below the cricoid cartilage, pushing down the thyroid gland and soft parts.

Might not the operation described above have been much shortened and simplified? and perseverance in keeping in a canula, for a time, counteracted the irritability? With a patient in imminent danger of suffocation, it seems as if no relief could have been afforded, and Tracheotomy seems, from the author's description, almost an impossible operation.

The same work gives an account of an operation in the cricothyroid space by Mr. Shaw in the Middlesex Hospital, where “considerable nervous hemorrhage continued to take place while cutting upon the membrane, and this necessarily obscured the bottom of the wound.

“ After the cricoid membrane had been sufficiently exposed, a little time was allowed for the hemorrhage to subside, before inserting the point of the bistoury into it.”

This again does not seem to be an operation, for any case in which there is imminent danger of suffocation.

Samuel Cooper, in his *First Lines of Surgery*, (published 1840, London,) page 739, says—“ In a child indeed the difficulty of the operation is great, not merely from these causes, but the struggles of so young a subject, the depth of the trachea from the fat in the neck, and the small diameter of the trachea itself.

The operation on the plan I recommend may be perfectly easy, and occupy a few seconds; it may be difficult, but is at any rate a simplification of the operations alluded to by these authors.

The author of the Article “Bronchotomy,” in the *Cyclopædia of Practical Surgery*, describes a tedious, difficult and

bloody operation, like most surgical authors, and alludes to the great difficulties, particularly of Tracheotomy—"The
 ' occurrence of hemorrhage is the principal danger to be ap-
 ' prehended during the operation, but this will almost always
 ' be prevented by proceeding in the cautious manner directed."

Pancoast, in his *Treatise of Operative Surgery*, (published 1844, Philadelphia,) Article Bronchotomy, gives also a detailed description of the usual tedious operation, alludes to the danger of the patient becoming suffocated by the blood being drawn into the trachea, and adds—"But the principles which
 ' it appear to the author should govern the conduct of the
 ' surgeon in regard to this operation, would be, under ordinary circumstances, to tie the vessels as directed in the
 ' text, and when from the urgency of the symptoms, time
 ' was not afforded for this, to puncture instantaneously the
 ' cricothyroid membrane."

As I consider all cases where it is necessary to open the air-canal, more or less urgent, in my opinion it would be better to make the puncture at once, and with a choice of evils, danger of suffocation from want of air, and danger from hemorrhage in consequence of the canula not being able to be borne, the latter, if it exist at all, is by far the least of the two.

He alludes to some Tracheotomy trocars, and particularly to one devised by Mr. Hilton, as the best of the kind. I have before, at page 9, stated the objections which I consider there are to the use of these curved instruments generally.

Mr. Carmichael, in a paper on Tracheotomy, in the *Dublin Journal of Medical and Physical Science*, for November, 1832, says—"It will be found often necessary to open the
 ' trachea close to the sternum, where it is most deeply situated,
 ' and where the surgeon runs the risk of opening the
 ' arteria innominata, or subclavian vein, or even one of the
 ' carotid arteries, where both arise from the arteria innominata.

"There is cause for as much anxiety in the performance

‘ of this as in any operation of surgery. At night the difficulty is greatly increased, for it is impossible, as I have often experienced, to throw the light of a candle into a narrow and deep wound, so as to enable the operator to see the parts it is necessary to divide.”

For this dangerous, and almost impossible operation, I would be glad to see substituted one that may be safe, speedy, and efficacious.

The same author, in the *Dublin Hospital Reports*, (published 1820,) speaks of the introduction of a canula as often a source of great distress, but in certain cases of its being indispensable, “and for obvious reasons, we should prefer a canula of as large a diameter as can be introduced.”

If a canula produces distress, there can be no difficulty in removing it or replacing it by one of another form. I have already stated why a large canula is preferable to a small one.

In a report of another case, he says—“ I waited near half an hour, applying sponges dipped in cold water to the part, before the hemorrhage ceased, when I proceeded to lay bare the trachea, to which I was directed by the touch, as my sight was of little avail. I succeeded in making an opening into the trachea, when an immediate suffocating cough succeeded, caused by the blood finding access into that canal, and which mixed with bubbles of air, was forcibly expelled from the wound.

“ I was enabled to introduce a canula into the trachea, through the opening that had been made on my first visit: *this excited a convulsive cough, but after a few minutes the parts becoming reconciled to its presence, it was without difficulty retained*, and she evidently experienced the most decided relief.”

It was found on post-mortem examination, that “ there was scarcely any additional redness excited by the canula in the trachea.”

It is not unreasonable to suppose that all this distress might have been saved, and danger averted, by the instantaneous introduction of the canula in the first instance ; and that in almost all cases, the parts will become in a short time reconciled to its presence, as in this, if it be perseveringly retained.

Chelius, in his *System of Surgery*, (edited by South, 1847,) says that operating through the thyroid cartilage is attended with much difficulty and hazard of doing harm.

“ Tracheotomy is always dangerous, and in children
 ‘ always very difficult, on account of the thickness of their neck
 ‘ and the depth of their windpipe. Opening the cricothyroid
 ‘ ligament, and enlarging the wound downwards through the
 ‘ cricoid cartilage, and the first two or three rings of the wind-
 ‘ pipe (laryngo tracheotomia) seems therefore to be the most
 ‘ advantageous proceeding, both where it is desired to assist
 ‘ the entrance of the air, and to remove a foreign body.”

This supports my view as to the place of election, which I have remarked upon above.

He describes the usual operation with a series of dissections, &c. His Editor objects to the use of the tracheotome, and says a tube in the cricothyroid space “ always excites in-
 ‘ convenient and frequently unbearable irritation, is frequently
 ‘ stopped up, and cannot be properly fastened.”

From my own experience, I can say that a tube does not always excite irritation ! I doubt if the irritation at any time is unbearable, so that the parts will not, as in Mr. Carmichael's case, noticed above, become reconciled to its presence, and there can be no real difficulty in keeping the interior of the canula clear, and preventing it from being ejected.

“ The cases in which cutting into the windpipe is per-
 ‘ formed are urgent, and the tracheotome cannot be suffi-
 ‘ ciently commanded.”

The cases are too urgent often to admit of a series of dissections, and I have already stated my opinion, that a curved instrument cannot be sufficiently commanded.

Samuel Cooper, in the *Dictionary of Surgery* (seventh edition) Article "Tracheotomy," says—"I once lost a patient after Bronchotomy, as it seemed to me, from the impossibility of procuring at the time a well-made canula."

I imagine there would have been no difficulty had the author used an ordinary full-sized trocar and canula, and from this remark, it would appear that in some cases, the introduction of a tube is indispensably necessary to save life.

Fergusson, in his *Practical Surgery* (latest edition), speaking of Tracheotomy, also describes a tedious and troublesome operation, not unattended by danger—"In most of the instances, which have come under my notice, the hemorrhage has been remarkably free.

"In asphyxia, it is evident there is no time to lose and therefore the surgeon should complete the operation at once, without heeding the hemorrhage, however copious it may be.

"Mr. Porter states, that it has happened that a patient has been lost whilst the surgeon delayed the opening into the trachea, in order previously to control an alarming hemorrhage."

Thus it seems to be a matter of the utmost moment, to determine upon the operation which may be at once safe and efficient. With reference to the introduction of a tube, he says—"Experience in these operations has shown, that the lining of the windpipe possesses as little of this peculiar delicacy as in most other mucous canals."

He gives a representation of a trocar and canula, which have been employed, and which seem to be nearly identical with Mr. Hilton's instrument. He looks upon it as a clumsy instrument, and certainly it does not look like one that could be manœuvred with facility or without danger.

He also gives a representation of an instrument invented for the purpose, by Garin of Lyons. It however is not fur-

nished with any canula, and seems to be deficient in the most necessary qualifications for completing the operation, for the admission of air into the canal.

Liston, in his *Operative Surgery*, describes the ordinary operation. After a series of preparatory steps, "the patient is desired to swallow his saliva; the moment is then seized, when by this action, the larynx is elevated and the tube elongated; the point of the knife is entered into the rings with its back towards the sternum, and by a slight sawing motion, three or four of them are divided," &c. &c.

An operation in practice both tedious and difficult, at any rate in children, and not calculated for a case of emergency.

In his account of a case, he says—"The incisions were made with difficulty, their depth much greater than usual, and from the matting of parts, it was impossible to see or feel what was being cut, consequently it would have been difficult to avoid parts of importance, such as the inferior thyroid artery, if pursuing an irregular course."

No operation, with a straight trocar, could I imagine be, by any possibility, more dangerous than that above described.

He recommends the use of a curved tube of a conical shape, flattened laterally. The edges of the incision are compressed by it, and oozing of blood prevented, &c.

To this there can be no objection, if a curved tube should be thought to answer the purpose of the straight: it can at any time be substituted for it.

Mr. Hilton, in *Guy's Hospital Reports*, Vol. VII., published 1842, gives a description of an instrument he used in a case of Laryngotomy. I have already stated my objections to a long curved instrument, but his remarks apply as well to the introduction of a straight trocar—"It is said some persons cannot bear a canula in the larynx or trachea. I apprehend that when this inconvenience arises, it occurs from the end of the canula touching the posterior part of the larynx

‘ or trachea.” In this I am inclined to agree with Mr. Hilton, but I have already shown that the canula I recommend cannot touch the back of the larynx or trachea, and if properly secured cannot be blown out of the tube by the patient coughing, as he suggests, might be the case with a straight tube.

He says—“ A trocar and canula very much curved, when ‘ introduced, hooks itself into the larynx or trachea.” I believe that it would be attended by the danger of hooking itself into some part it is not intended to touch, and would prove, in the great majority of cases, unmanageable.

I entirely coincide in the following observations Mr. Hilton makes :—

“ This operation with the trocar and canula may be done ‘ well, and almost in an instant, by any medical man—is not ‘ in any way dangerous—not painful—and almost invariably ‘ gives immediate relief, imposing very little inconvenience on ‘ the patient at the time or subsequently ; and when the ‘ necessity for the artificial opening no longer exists, the ‘ aperture closes with facility, and leaves but little cicatrix.

“ Cases of spasmodic croup in children, or in adults, &c., ‘ &c., are those in which delay may be considered as always ‘ dangerous.

“ One supposed valid objection to the use of the trocar ‘ is the impossibility of seeing what structures are divided by ‘ it, and that you consequently run the risk of opening some ‘ blood-vessel, which may bleed into the trachea and lungs. ‘ In the first place, no consideration of the kind ought to ‘ interfere to delay the puncturing the tube, when danger ‘ appears at hand, from suffocation, as the patient may be irretrievably dead, by the loss of time in the more prolonged ‘ operation of cutting systematically through the structures to ‘ arrive at the larynx or trachea ; but as the canula fits accurately the aperture made by the trocar, all the divided vessels, which could pour their blood into the wind-pipe, would

‘ be compressed by the canula, and so prevent the occurrence
‘ of hemorrhage.”

The above arguments, which I consider unanswerable in favor of the use of a trocar and canula, seem to me to be peculiarly applicable in the case of the instrument formed as I have recommended.

Malgaigne, in his *Manual of Operative Surgery*, (translation by Brittan, 1846, London) gives a description of the usual tedious and troublesome operation, by a series of dissections. Speaking of Tracheotomy, he says—“It is only when this
‘ bleeding has stopped, that you can safely open the trachea.
‘ Then place in the wound either a canula or a spring for-
‘ ceps.

“The two principal difficulties of the operation are the
‘ stoppage of the hemorrhage, and the expansion of the
‘ wound in the trachea.

“M. Recamier recommends performing the operation in
‘ two steps, and not opening the trachea until twelve or
‘ twenty-four hours afterwards, so as to be quite sure that the
‘ bleeding is stopped.

“Lastly, the situation for the tracheal incision is not un-
‘ nimonously settled on.

“We think it more prudent to include in the incision the
‘ first ring.”

From this it appears, that the operation he describes as generally practised by French surgeons, is not calculated for an emergency, is difficult, and not unattended by danger, and its several steps not by any means generally agreed upon.

S U M M A R Y.

In the preceding observations, I trust that I have been successful in demonstrating the following propositions :—

1. The conditions of the system, for which Bronchotomy is necessary, will not in general admit of delay.

2. The operation, as practised by the most eminent surgeons and described by authors English and Foreign, is tedious, dangerous, and calculated to excite alarm and dismay in the minds of the patient and the patient's friends.

3. It is a matter of the utmost moment, that surgeons should, if possible, determine upon a plan of operation, which may be suited to any emergency, safe and speedy.

4. Strong arguments have been adduced in favor of the use of a curved trocar and canula, and instruments of the same nature, denominated tracheotomes, as being very useful adjuncts to the operation and as enabling surgeons to dispense with the usual tedious process.

5. The chief objections to the use of these instruments are, that they are not sufficiently manageable and are in many cases liable to wound adjacent parts.

6. A shortened straight trocar, with its canula, appears to be exempt from these disadvantages, being perfectly manageable, easy and rapid of application, liable to wound no adjacent parts, applicable to the large majority of cases, either as the sole instrument required, or to be used secondarily ; in fact, of the highest utility in almost all cases.

CALCUTTA, }
March, 1853. }



