Synopsis of apoplexy and epilepsy, with observations on trachelismus, laryngismus, and tracheotomy; and the proposal for a hospital for epileptics / by Marshall Hall.

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SYNOPSIS

OF

APOPLEXY AND EPILEPSY;

WITH OBSERVATIONS ON

TRACHELISMUS, LARYNGISMUS, AND TRACHEOTOMY;

AND THE PROPOSAL FOR A

HOSPITAL FOR EPILEPTICS;

BY

MARSHALL HALL, M.D. F.R.SS. L. & E.

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS; FOREIGN ASSOCIATE OF THE ACADEMY OF MEDICINE OF PARIS; ETC. ETC.

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CONTENTS.

I propose Tracheotomy, not as a remedy for apoplexy, or for epilepsy; but for stertor or paralytic Laryngismus and its effects, in the former malady; and as a preventive and security against spasmodic Laryngismus and its effects, viz. Convulsion, and the injury apt to be inflicted on the cerebrum and the medulla oblongata, on the mind and limbs, in the latter dire calamity.

In the apoplexia gravior, with laryngal stertor, tracheotomy affords the chance for life; in the epilepsia gravior, tracheotomy supersedes the laryngismus, and the Convulsion and its dire effects.

ADVERTISEMENT.

THE present Croonian Lectures, with those of MDCCCL and MDCCCLI, and several other publications, are intended to be ultimately comprised in one volume. It is for this reason, and to preserve uniformity, that I have preserved the quarto form which will be required by some Plates in the other parts, and that I preserve the designation of *Synopsis*. I have been repeatedly requested to gather my various works together.

The terms *Trachelismus* and *Laryngismus*, which I have adopted in these pages, when viewed in connection with their exciting causes, the modes of action of these, first on the muscles of *the Neck*, and *the Larynx*, then on the *Venous Network* of this region, and then on the *Nervous Centres*, contain whole volumes of *living Pathology*.

This living pathology I recommend for further cultivation, in the place of that mere *caput mortuum* presented in post-mortem, or it might be designated post-morbum, appearances.

I also recommend that this pathology be pursued in a special manner in our private practice. It never can be adequately investigated in the patients who resort to our *Hospitals*, whose cases are chiefly those of organic *Origin*, or involving organic disease as *Effects* of the previous trachelismus and laryngismus.

I would finally observe, that, although I have treated of trachelismus and of laryngismus as distinct, and of apoplexy as cerebral, and of epilepsy as

spinal, generally, yet each of these involves the other. Trachelismus includes the larynx; laryngismus adds to trachelismus and its effects. Apoplexy beginning with trachelismus is spinal; for trachelismus is the result either of direct or diastaltic spinal action; epilepsy, in its turn, is cerebral in one of its immediate and many of its remote *effects*.

The Neck, *the Larynx* inclusive, is the *medical Region* in which all these influences *meet*. By means of the structure and actions in this region, the whole *Class* of the diseases of the nervous centres, of inorganic origin and of paroxysmal form, the threatenings of apoplexy and of epilepsy, are explained; and I trust we may no longer say, with Esquirol—" Les symptômes de l'épilepsie sont tellement extraordinaires, *tellement au-dessus de toute explication physiologique;* les causes de cette maladie sont tellement inconnues, que"—&c. Indeed, I think that in few diseases are the links of causes and effects, in a rather lengthened chain, so distinctly traced and explained. This has been accomplished by means of the light which has been thrown upon the whole subject of the diseases of the nervous system by our knowledge of *the Spinal System*. This knowledge is as a torch in the hand of the practical physician, and the source of all *Diagnosis* in regard to these diseases. *Physiology*, *Theory*, and *Observation* become *allies*, and lend each other a mutual aid.

I trust I may be allowed, in conclusion, to express a hope, that the suggestions which fill the following pages may be received with some degree of benevolence. They are amongst my last legacies to my noble and exalted profession—noble and exalted, were detraction within its own ranks, and derogatory views on the part of the public, to cease, and its Science to be duly appreciated. In Medicine alone is discovery a misfortune to its author.

SYNOPSIS

OF

APOPLEXY AND EPILEPSY;

WITH THE PROPOSAL FOR A

HOSPITAL FOR EPILEPTICS.

LECTURE I.

1. In the Croonian Lectures for MDCCCL, I gave an outline of *The Diastaltic Nervous System;* in those for MDCCCLI, I gave a view of the application of that system to the Pathology of a *Class of Diseases of the Nervous Centres of inorganic Origin;* I purpose, on the present occasion, to treat of a *branch* of this Pathology, in its turn, and especially to detail the progress made in its investigation during the present year.

2. The result of a sustained and almost exclusive attention to this subject, during a very considerable period, on my mind, is the conviction that those forms of disease of the nervous centres which are of *inorganic origin*, that is, by far the greater number of these affections, arise from causes acting on the structures of *the Neck*, or of *the Larynx*.

3. Apoplexy and Epilepsy are the two most formidable diseases of the Nervous Centres. Each may be divided into the *milder* and the *severer* forms, which may be designated the Apoplexia mitior and the Apoplexia gravior, and the Epilepsia mitior and the Epilepsia gravior.

4. Both apoplexy and epilepsy may have their origin in organic disease of the nervous centres, or of their vascular structure, arteries, veins, or *intermediate* vessels. Both may be of inorganic origin, and the effect of one or other of the *Emotions* or *Irritations*. Of these, the former act *directly*, the latter *diastaltically*, on *the Neck*, or on *the Larynx;* or the affection of the larynx may be secondary.

5. I have ventured to designate these affections *Trachelismus*, or *Laryngismus*, respectively.

6. I am as persuaded as I can be of any medical view, that the apoplexia mitior and the epilepsia mitior depend on trachelismus; and that they might be designated apoplexia or epilepsia *trachelea*. I am persuaded that the apoplexia gravior and the epilepsia gravior depend upon laryngismus, and that they, in their turn, might be designated apoplexia or epilepsia *laryngea*.

7. Seeing the importance which I attach to these distinctions, you will not, gentlemen, be surprised that I make them the foundation of the division of the present Lectures. The *first* will, indeed, treat of *Trachelismus;* the *second*, of *Laryngismus;* with their relations, anatomical, physiological, pathological, and therapeutic.

8. But if laryngismus be the essential link between the exciting causes and the apoplexia and epilepsia gravior, it is plain that *Tracheotomy*, in superseding the *effects* of this condition, must supersede the graver forms of those diseases, converting them into the milder respectively. But an essential part of the epilepsia gravior is *general convulsion;* laryngismus then is essential to this convulsion; and as tracheotomy supersedes the effects of laryngismus, it must supersede convulsion, with the further train of dire affections, in the epilepsia gravior.

9. This is the case in effect. If we institute tracheotomy, there can be no general convulsion. The epilepsy is cut short; it presents the

phenomena of the epilepsia mitior, those of the epilepsia gravior being superseded and prevented.

10 It is partly, chiefly I may say, but not entirely, on these views that I shall venture, in my *third* lecture, to propose the institution of a *Hospital for the Epileptic.*

11. I now return to the subject of the present Lecture, or *Trachelismus*—a subject which has not hitherto become an object of medical observation, or taken its place in medical literature.

I. ON TRACHELISMUS.

12. It is impossible to contemplate the muscular and vascular structures of *the Neck*, and their relative positions, without being impressed with the great influence which the action of the former *must* have on the condition of the latter, and especially of the *veins* of this important region.

13. And it is impossible not to perceive the momentous effect which these effects of muscular action on the cervical veins must have on the *encephalon.*

14. I have long wished for the opportunity of making a most careful dissection of *the Neck*, and of these *anatomical* relations between its muscular and venous structures. This opportunity has not yet occurred with all the leisure I desire; but I trust it is only a labour postponed.

15. Meantime it is obvious that, on the contraction of the muscles of the neck, the veins of this region must be compressed. The effect of this compression is, however, very various, according as that contraction is *clonic* or *tonic*, or otherwise inordinate.

16. A single contraction of muscles on a vein must tend to empty it. If this contraction be followed by relaxation, the vein is soon refilled.

And if this alternate contraction and relaxation be rapidly repeated, the circulation along such veins must be accelerated.

17. But if, instead of these clonic actions of the muscles, their contraction be tonic—if it be spasmodic, inordinate and sustained,—the veins are emptied, are *not* refilled, and the circulation at their *origins* becomes impeded or utterly interrupted, or even retrograde.

18. Let us imagine the effect of such an event on the veins and on the blood-channels intermediate between these and the arteries, in the delicate substance of the cerebrum and medulla oblongata !—the congestion, the ecchymosis, the rupture,—the danger,—to which these must be subjected !

19. We readily comprehend how these effects may manifest themselves. If this interrupted flow of the venous blood obtain in the exterior tissues of the head, we shall observe redness, purpurescence, intumescence, according to its degree : we see flushing, lividity, and fulness of the face and of the neck. If the interrupted flow occur within the encephalon, we observe *symptoms* of affection of the nervous centres, these symptoms assuming the varied apoplectic or epileptic character, according to the nervous centre specially affected.

20. To me it is wonderful that a heavy burthen can be poised on the head without interrupted flow of venous blood, so great as to induce cerebral symptoms. The fact can only be explained by the circumstance that mere poise does not imply either great, or constant, or inordinate action of the muscles. With every movement that is made, every step that is taken, a new order of muscular actions takes place, and, with this, an accelerated flow of venous blood.

21. Very different is the event in certain cases of inordinate action of the muscles of the neck. The late Professor Gregory used to mention the case of a man, who, being in a boat, suddenly turned his head so as

to look backwards, and fell down apoplectic. I have two patients, subject to vertigo, who cannot move the head rapidly to the right and left, without experiencing this symptom; although the same persons can turn the head and trunk together with equal rapidity, without experiencing that effect: yet the *difference* is only—the action of the muscles of the neck —or *trachelismus*. I have an epileptic patient who cannot turn the head extremely to the right, without experiencing a strange feeling of vertigo and confusion, and the threatening of a seizure. A similar action, turning the head to the left, produces no such effect. The phenomenon is obviously owing to the forcible contraction of *certain* muscles, compressing *certain* veins: the action is *special*. The patient being epileptic, these muscles and these veins may be those especially implicated in the paroxysms.

22. That the tonic contraction of the muscles of the neck really induces symptoms of affection of the nervous centres, is further proved by the following fact, for which I am indebted to Mr. Reynolds, formerly a pupil at University College:

23. "A girl, nineteen years of age, was admitted into University College Hospital for aphonia; and, amongst other things in the treatment, she was ordered to have galvanism applied to the larynx daily, by the electro-magnetic machine.

24. "While using this machine, I observed the effect upon the muscles of the neck, and remarked that, when the wheel was turned slowly, and the superficial muscles were alternately contracted and relaxed, *the colour of the face was heightened*, and of a florid hue, and no unpleasant feelings (further than those arising from the shocks) were experienced; but when the wheel was turned rapidly, with a less powerful current, and the muscles were maintained, during the rapidly intermitting action, in a state of almost permanent contraction, *the face became of a deep colour*,

the lips and angles of the mouth livid, *the eyes suffused*, and some feelings of confusion of thought, headache, and dimness of sight, alternating with flashing of light, were induced. The latter effects remained after the cessation of the current, for a few minutes, and then disappeared."

25. In these facts we have the *Proof* that a slight degree of contraction of the muscles of the neck, induced by the electric current, induces, in its turn, heightened colour of the face, of a florid hue; and that a greater degree of that contraction induces a deeper colour of the face, the lips and angles of the mouth being livid, and the eyes suffused, with confusion of thought, headache, dimness of sight, alternating with flashes of light; these latter remaining for a few minutes after the cessation of the current, and then disappearing. They present the *Demonstration* of the nature of trachelismus, and of its *effects*.

26. The usual causes of these contractions of the muscles of the neck, and the consequent impeded flow of blood along its veins, are

1. *The Emotions*, and
2. *The Irritations;*

and especially fright, indignation, anger,—excitement, pleasureable or painful,—amongst the former; and the gastric, the enteric, the hysteric, amongst the latter. These causes induce tonic and inordinate action of the muscles of the neck, of which the patient is frequently quite conscious, and which he describes as 'strings,' a sense of 'constriction,' &c. or he experiences 'choking fits,' with 'fulness of the face,' as was the case with a physician whose career has been one of the most remarkable of the present day.

27. The most constant of these feelings of trachelismus is that of the cravat being too tight, though it be really not so, the patient constantly or repeatedly endeavouring to loosen it, by drawing it forwards with the fingers.

28. There is no medical fact more familiar to us than that of the occurrence of seizures from the various emotions and irritations. The new and important question occurs—*How do these causes act in producing these effects ?*—the answer to which gives—*the true pathology of the forms of apoplexy and of epilepsy of inorganic origin.*

29. It is plain that they might act by augmenting the action of the heart and accelerating the circulation. But there is no known physiological principle by which such an effort can be supposed to implicate the nervous centres especially. If the circulation be thus accelerated, it is accelerated in every part of the system, at an equal distance from the heart, *equally*. The nervous centres may share in the general result. But they cannot be affected particularly.

30. The same observations apply to other forms and modes of accelerated and augmented circulation. Violent running induces no symptoms portending a seizure.

31. It is, in brief, not accelerated and augmented flow of blood *to* the nervous centres, but impeded flow of blood *from* those centres which endangers their function and structure, especially in the predisposed. An epileptic, whose case was detailed to me by Mr. George Webster, seeing some men endeavouring in vain to move a barrel, said—'let me try,' —made a violent effort, and fell into an epileptic paroxysm !

32. It is true that in this case, as in all efforts, closure of the larynx would be added to the impeded flow of blood along the cervical veins. So that the argument is not given as perfect.

33. But emotion or irritation may act on the muscles of the neck only, without involving the larynx, and thus it is that we see the isolated and distinct effect of trachelismus.

34. It is in this manner that shame and anger induce blushing and flushing, respectively. It is in this manner that I have traced the former

into epilepsy, and that the latter, as is well known, is apt to pass into apoplexy or epilepsy.

35. It is not less known that an indigestible meal or a loaded colon equally induce apoplectic or epileptic threatenings or seizures.

36. The emotions act through the nerves on the muscles of the neck *directly*. The irritations act on the same muscles *diastaltically*.

37. The muscular actions thus induced are not the *well-balanced* actions of voluntary motion, but *inordinate* action, both in the combination of the muscles involved and in the tonic form of that action. Hence the sustained compression of the veins, the *appearances* of flushing and fulness of the face and neck, the *symptoms* of apoplectic or epileptic seizure; &c.

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38. I have already, in the Croonian Lectures of last year, presented the argument of the relation of trachelismus to the *Class* of diseases of the nervous centres of inorganic origin and of paroxysmal form. It is my present object to trace the relation of *trachelismus* more especially to *one form and degree* of these maladies exclusively.

39. It is not to apoplexy and epilepsy, but to the apoplexia *mitior* and the epilepsia *mitior* that trachelismus, when uncomplicated with laryngismus, has its special relation.

40. As long as the affection is limited to the *muscles* and *veins* of the neck, so long the affection assumes the form of the apoplexia *mitior* and the epilepsia *mitior*, but especially the latter; when the larynx becomes implicated, the *severe* forms of this disease are induced, or superinduced.

41. In apoplexy this condition of the muscles and veins of the neck is more continued; in epilepsia it is more forcible, but less continued;

indeed it is frequently quite transitory. In both, however, the patient *may* become affected with vertigo and confusion, and even *fall*, and recover immediately.

42. In this state of the question, it is interesting to inquire whether other facts and phenomena are observed which may throw a ray of light on this important subject; and I am happy to be able to illustrate my views by a reference to various facts of this kind.

43. One of these is—the effect of a tight cravat applied round the neck; and in this place I must borrow several deeply interesting facts from my former Lectures:

44. It was observed by Dr. Donald Monro that soldiers were liable to be "carried off by apoplexy, in consequence of stricture of the veins of the neck, from being obliged to wear their cravats too tight*."

45. Abercrombie quotes a case from Zitzilius, of "a boy who had drawn his neckcloth remarkably tight, and was whipping his top, stooping and rising alternately, when, after a short time, he fell down apoplectic. The neckcloth being unloosed, and blood being drawn from the jugular vein, he speedily recovered†"

46. The following case occurred in the person of a most intelligent member of our own profession. I give it in his own words:

47. "A few weeks ago, my shirt collar was made too tight, and felt rather uncomfortable; yet not so much so as to induce me to change or slacken it. On looking into the mouth of a patient, in such a position as to twist my neck a little, I dropped down in my surgery as if I had been shot, in a moment, as helpless as a dead man. I soon got up; but my head was giddy for some time. I changed my shirt, and lost all fear of a

* See Cheyne on Apoplexy, p. 41.

† On the Brain and Spinal Cord, p. 202.

return of the accident. There can be no doubt that it arose from compression of the veins."

48. The influence of a tight collar or cravat is not duly appreciated. It may be slight, in a state of repose. But on moving the head variously, the muscles of the neck expand; this expansion cannot take place *outwardly;* it therefore takes place *inwardly*, and so compresses the subjacent veins! It is on this principle, not, I think, generally acknowledged, that a moderately tight cravat may prove an unsuspected source of danger. Under the influence of such a cravat or collar, the not unusual actions of the muscles of the neck become a sort of trachelismus, perhaps more frequently than is imagined. The cravat, too, which is not tight generally, may become so under the influence of sleep, of emotion, or of gastric repletion.

49. A further illustration of the same subject is afforded by the fearful events recorded in the history of Thuggee;—a crime which is perpetrated by the application of a ligature round the neck of the victim, inducing instant apoplectic insensibility.

50. Illustrations of the same fearful kind are afforded by every kind of *strangulation;* the first effect of which is instant apoplectic insensibility; the second, the epilepsia gravior; the third, asphyxia;—in a series of fearful interest.

51. Similar confirmations of these views have been presented by experiments on animals:

52. One of the most interesting of these was performed, at my request, by Mr. Martin Coates, of Salisbury; and is described in my former lectures.

53. The subject has been recently taken up by Dr. Wegg, who is engaged in a most interesting series of experiments, in illustration of the pathology of affections of the nervous centres. One of them I will briefly detail:

54. A leather strap was applied rather tightly round the neck of a little dog: from being lively and playful, the animal immediately became dull, turned round apparently to select a position, and went to *sleep!*

55 If the collar were drawn still more tightly, the larynx became implicated with the most extraordinary phenomenon of the formation of abundance of epileptic *foam*. But I must not further anticipate Dr. Wegg's account of his interesting investigation.

56. In order to produce the appearances and the symptoms of trachelismus, the action of the muscles must be, like that of the collar, *continuous*.

57. It is not in voluntary action, but in action the effect of emotion or iritation, that is, abnormal, inordinate, and spasmodic action, that these effects are observed.

58. It is also in the action of *certain* muscles, especially, I believe, the omo-hyoid, that impeded venous circulation, with its effects, is induced. I have repeatedly, both in hysteria and in epilepsy, *felt* the clonic action of this muscle under the finger; in apoplectic affections, its action, being tonic, would be less detectible.

59. In one case of spasmodic affection, clonic contractions were observed, both of the omo-hyoid and of the cleido-mastoid; of the former *as distinct* as of the latter.

60. The patient complained exceedingly of a sense of choking (the effect of the contraction of the omo-hyoid?) and of pain in the posterior part of the neck (the effect of contraction of the muscles of that region?).

61. We have thus the tangible contraction of the omo-hyoid. But is not contraction of this muscle frequently the cause of the sense of a '*cord*,' of a '*spike*,' and of '*choking*,' so variously felt in paroxysmal threatenings?

On Trachelismus in relation to the Apoplexia mitior.

62. I am daily consulted by persons who have experienced attacks of slight apoplectic affection; and I have daily the opportunity of tracing the apoplexia gravior to *antecedent*, but neglected, seizures of the same kind.

63. Vertigo, transient confusion of mind, or oblivium, nutation, falling,—are the symptoms which denote this affection. They are frequently attended by flushing of the face, a sense of tightness or constriction about the neck, the patient frequently endeavouring to loosen a cravat, already perfectly loose. In one case there were 'choking fits,' with 'fulness' of the face; once, falling to the ground; once, transient hemiplegia. In another case, similar symptoms were followed by severe apoplexy and lasting hemiplegia.

64. In all these cases, so long as there is no stertor, the seizure may be regarded as the apoplexia mitior; and I think the prognosis, in reference to *life*, favorable.

On Trachelismus in relation to the Epilepsia mitior.

65. But the distinction between the Epilepsia mitior and the Epilepsia gravior is still more marked.

66. Every kind of *spasmodic* affection may occur, as strabismus, distortion of the features, clonic actions of the limbs, &c. with vertigo, oblivium, nutatio, falling even; but if there be no laryngismus, there is no *general convulsion*, no *convulsive* dashing to the ground, and, in a word, no epilepsia *gravior*.

67. Some patients experience the epilepsia mitior, the 'petit mal' of the French writers, only. But no fact is so common as that of the same patient being subject to both the milder and the severer forms of epileptic seizure. In such cases, nothing is so easy, and indeed nothing is so fraught with deep interest, as to trace the two kinds of attack, distinctly and separately. In every case, laryngismus constitutes the fearful boundary which separates the epilepsia mitior from the epilepsia gravior.

68. In the former, the patient may *fall;* and this fall may be so as to lead to injury. But the state of unconsciousness, unlike that in the epilepsia gravior, is usually but for a moment, and the patient recovers and rises. There may be said, indeed, to be two forms of '*falling sickness*,' —one being the result of unconsciousness, the other of convulsion. The former may occur in the apoplexia or epilepsia mitior; the latter occurs in the epilepsia gravior only, and is the truly formidable malady.

69. The worst event, in regard to the mere falling, is that which occurs upon the stairs, or in a crowded street. These events I have known to occur. I have not known such an attack to lead to falling with violence, or into the fire, or into the water.

70. My object is to state the *truth*, however; and I do not attempt, for the sake of an opinion, or an object, however desirable, to give a colouring to facts which does not belong to them.

LECTURE II.

II. ON LARYNGISMUS.

71. Laryngismus has scarcely taken a more prominent place in medical observation and writings than trachelismus. The term has hitherto been applied and limited to a form of infantile convulsive affection. It ought to be extended and applied to *all* affections of *the Larynx* of a secondary and functional character, and not dependent on alteration in the structure of the larynx itself.

72. As in the case of trachelismus, I propose to trace this affection through its different forms, back to its various origin, and onwards to its most dire and dangerous consequences.

73. Trachelismus is, I believe, always spasmodic. Laryngismus is sometimes of a *spasmodic*, sometimes of a *paralytic* character.

74. The beautiful experiments of Legallois give us the type of the *paralytic* form of this affection. The recurrent laryngeal nerves being divided, the rima glottidis collapses partially and induces paralytic laryngismus.

75. A similar effect is produced whenever the influence of the cerebrum or of volition is withdrawn from this organ.

76. Even in the partial subtraction of this influence in *deep sleep*, we observe a first degree of paralytic laryngismus in the snoring or stertor of this state of the cerebrum.

77. As in the case of the muscles of the neck in general, volition being withdrawn, during sleep, from the muscles which preserve the larynx open, the constrictors contract, from tonic or spinal action ; and as the veins

are compressed in the former case, so, in this, the larynx is partially closed, and a slight stertor is induced.

78. The most familiar instance of *spasmodic* laryngismus is observed on allowing a drop of water or a crumb of bread incautiously to drop into the rima glottidis; or in the still more formidable case of choking.

79. One gentleman experiences a spasmodic laryngismus on attempting to take a *draught* of cold water.

80. From these slighter forms of laryngismus I pass on to the severer morbid forms of this affection observed in apoplexy and epilepsy.

81. In the milder cases of these affections, no affection of the larynx, or none of any degree of severity, is perceptible. It is when the severer forms of these maladies take place, that the paralytic (or apoplectic) and the spasmodic forms of laryngismus present themselves.

82. The occurrence of paralytic or of spasmodic laryngismus denotes the *severity* of the malady. But the *re-action* of this condition of the larynx, in augmenting that severity of the disease, is of a still more formidable character.

83. The influence of laryngismus and of the obstructed respiration on the veins and integuments of the neck and face, and of the encephalon, is of the most dangerous character. On it a distended condition of the veins, purpurescence, and intumescence of the face and neck, and coma, alike depend; the proof of which is afforded by the observed effects of tracheotomy.

84. The apoplectic affections may be divided, as I have already stated, into those of the milder and into those of the severer forms: the former of these depends on trachelismus; the latter, on laryngismus. By tracheotomy the apoplexia gravior is changed into the apoplexia mitior! —and even this may speedily subside. This conclusion is one of great practical, as well as pathological, importance.

85. Analogous remarks may be made upon the spasmodic laryngismus. Epilepsy also assumes two forms: the first, that of the epilepsia mitior; the second, that of the epilepsia gravior. As long as there is only trachelismus, the case assumes the form of epilepsia mitior only. If laryngismus supervenes, the case becomes the epilepsia gravior;—convulsion and its dire effects supervene. Tracheotomy restores the patient to the condition of the epilepsia mitior!

86. This spasmodic laryngismus is the effect of direct or diastaltic action by or through the *medulla oblongata*. It is direct when it is the effect of emotion, and when it is excited by the condition of the circulation in the medulla oblongata induced by trachelismus. It is diastaltic, when it is the effect of dental, gastric, enteric, or uterine irritation.

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87. That spasmodic laryngismus should be the essential condition of convulsion and all its dire consequences, and that tracheotomy should render such events impossible,—are surely conclusions of the deepest interest, both to the pathologist and the physician. I shall shortly adduce practical proofs of these inferences and conclusions from theory,—inferences and conclusions not deduced by any of the great *observers*.

88. To prevent convulsion, is, frequently, to save life, to preserve the intellect, to avert paralysis; in a word, to achieve a victory over the worst form of that malady which the ancients designated, κατ' ἐξοχην, the Herculean disease, the morbus sacer, &c. from its fearful immensity: this victory has been achieved by physiology, and especially by the discovery of *The Diastaltic Nervous System!*

89. Laryngismus, in its spasmodic form, is, like trachelismus, doubtless frequently the immediate effect of the emotions or the irritations.

But, in both its spasmodic and its apoplectic forms, it is frequently also the effect of trachelismus itself:

90. When trachelismus has induced cerebral congestion, and when this congestion has attained a certain degree of intensity, a degree of stertor or of apoplectic laryngismus supervenes, with an augmented degree of the same congestion in its turn;

91. When trachelismus has induced congestion of the medulla oblongata, laryngismus, convulsion, torticollis, bitten tongue, convulsive dashing to the floor, are the terrific consequences!

92. All these events I have observed and traced in patients with great care and attention. The chain of facts becomes, indeed, matter of *pure observation!*

93. The patient may be affected with the slightest apoplectic symptoms only. Or these may pass variously into deep apoplexy, with the most formidable stertor, with apoplectic laryngismus, or into epilepsy, with frightful convulsion, the result of spasmodic laryngismus.

On Laryngismus in relation to the Apoplexia gravior.

94. What is *stertor?*

95. The closure of the eye-lids during sleep is accomplished by a *positive* power; for, in cases of extreme debility or exhaustion, in which all the nervous centres participate, this closure is incomplete.

96. The orbicularis, during sleep, and especially in comatose affections, is, in reality, contracted by the influence of tonic or *spinal* action, unmodified by volition. This phenomenon presents the *type* of other phenomena belonging to the same class,—of the state of the muscles of the neck in the trachelismus of sleep, and of the muscles of the larynx

and of the isthmus faucium in the laryngismus of sleep. It is in this manner that sleep, and especially heavy sleep, so frequently passes into apoplectic or epileptic affection!

97. Volition being withdrawn, in heavy sleep and in coma, from those muscles whose office it is to preserve the larynx freely patent, partial closure, and apoplectic laryngismus, or *stertor*, is the consequence.

98. But this laryngismus brings with it impeded respiration, and with this, a still more impeded venous circulation in the neck, and an augmented apoplectic condition of the cerebral nervous centre. This condition of the larynx, of the respiration, and of the cervical venous circulation, is, in reality, one of the causes, if not the principal cause, of the fatal result in apoplectic and other comatose affections. M. Andral observes—" Le stertor de la respiration est en général un signe d'un très fâcheux augure; et il est rare que les individus qui le présentant d'une manière prononcée échappent à une mort prochaine." " C'est véritablement par la gêne de la respiration que succombent les sujets frappés d'hémorrhagie cérébrale, dans le cas où l'attaque est forte et où ils meurent promptement*."

99. But this fact, and indeed all that has been said relative to the influence of apoplectic laryngismus, are confirmed by the following cases of Mr. Sampson, formerly of Salisbury, now of Chester Street, Belgrave Square, and of Mr Cane, of Uxbridge,—cases the results of which are amongst—*the greatest achievements of the Medical Art.*

100. Mr. Sampson's case is extracted from the Transactions of the Royal Medical and Chirurgical Society, vol. xx, p. 45. Why Mr. Cane's case, which I recently presented to that learned body, was refused a place in those Transactions, it would puzzle any one, without imputing the most

* Clinique Médicale; ed. 2, t. v, p. 384.

unworthy motives, to explain. Mr. Sampson's skill saved the patient's life. Mr. Cane's prompt and energetic procedure not only saved the patient's life, but preserved him afterwards from frequent and dire attacks of *Epilepsy!*—an event certainly of no ordinary character in itself, and the fulfilment of a *prediction* of mine made many years ago!

101. I give Mr. Sampson's case without abridgment:

102. "Abraham Harris, aged 31, was brought to my house on the 31st of March last, in a state of complete insensibility from intoxication, the pupils being largely dilated, the breathing stertorous, and all voluntary motion having been lost for at least four hours before I saw him. The account given by those who came with him was, that he had attended a convivial meeting in the course of the day, at which he had drunk freely both of beer and brandy; his companions admitted that he had taken more than a pint of the latter; but it has since been ascertained that his glass was repeatedly filled up, without his knowledge, with white brandy instead of water, so that it is impossible to calculate what quantity of spirit he had actually taken.

103. "I immediately used the stomach-pump, and drew off between three and four pints of fluid, a great part of which appeared to consist of brandy; after which, tepid water with ipecacuanha diffused in it was several times injected into the stomach, and after a while withdrawn again, with a view to excite vomiting, and thus rouse the energies of the brain. Finding, however, that these means failed, a strong solution of salt in water, and afterwards the sulphate of zinc, were repeatedly tried, without any better result; he became, if possible, more comatose, the countenance turgid, the breathing more and more difficult; the pulse grew fainter, and was at last scarcely perceptible; at the same time, the whole surface of the body was cold and clammy, and he was insensible to every kind of stimulus. As he was some miles from his home, I had him removed to

the Infirmary, and called a consultation of the other medical attendants, who arrived in the course of half an hour; but as, in addition to the above symptoms, he had lost the power of swallowing, and every appearance indicated the rapid approach of death, nothing was ordered for him but a turpentine injection, there being no ground to justify a reasonable hope of recovery.

104. "At this period, it occurred to me, whilst standing by his bedside, that the comatose state in which he lay might not arise from apoplexy, but from torpor of the brain, in consequence of that organ being supplied with blood not duly oxygenated; for the shrill tone and extreme difficulty of respiration shewed the existence of collapse of the glottis, and imperfect transmission of air into the lungs, which might be accounted for by a paralyzed state of the eighth pair of nerves and recurrent branches. With this view of the case, I again appealed to my colleagues, and strongly urged that a trial should be given to the operation of tracheotomy; for I could not but hope, that, if mechanical respiration were carried on for a time, the blood might regain its proper stimulant properties, and restore the energies of the brain and nervous system. Upon their consenting to give him this chance, the operation was performed, without loss of time, by Mr. Andrews, under whose care, as surgeon for the week, the patient was now placed.

105. "The trachea was no sooner opened than the distension of the veins about the head and neck subsided, the violent efforts of the extra-respiratory muscles ceased, and in about half an hour regular and easy respiration through the wound was completely established; at the same time, the pupils became slightly sensible to the stimulus of light, and the pulse returned to the wrist. The immediate result of the operation being thus far satisfactory, nothing remained to be done but to give directions for the frequent removal of the mucus which appeared at the wound,

and to keep the surfaces of the incision asunder until the integuments and muscular layers had become agglutinated to each other: this latter object was effected by means of a piece of strong spring-wire, with a bow at each end of it, which, being introduced in a bent state, was allowed to expand, and the opening in the trachea was thus prevented from being covered by the muscles, even during the efforts of deglutition.

106. "He continued perfectly quiet during the night, but had no return of consciousness until the following morning, when he gave us to understand, by signs, that he suffered from headache and soreness at the pit of the stomach; there was a tendency to sickness, and the tongue was coated with a peculiar whiteness, as if rubbed over with chalk. Moderate purgatives, followed by mild alkaline medicines, soon removed these symptoms, and a few leeches were applied to the throat, for the purpose of checking too high a degree of inflammation; after which, no further treatment was required; but the wound being healed in about three weeks, he was discharged cured, and has continued up to this time in the enjoyment of perfect health."

107. To Mr. Cane's case I shall have to revert hereafter, in its relation to the treatment of epilepsy; for, as I have already stated, it possesses a double and an extraordinary claim to our attention and admiration. I give it in Mr. Cane's own words, as addressed to myself:

"Uxbridge, May 17, 1851.

108. "My dear Sir,—I was called suddenly to attend A. B. aged twenty-four, on February 1, 1851. I was told that he had been taken out of a canal-boat the day before, apparently in a dying state. On entering the house, I found the patient in convulsions, with a most turgid face, with extravasated blood on the conjunctivæ, which were of a perfectly livid colour, with cold extremities, and a pulse imperceptible at the

wrist, his heart acting most feebly. Respiration was impeded to such an extent, that I concluded that the whole mass of his blood was becoming rapidly of a venous character, and quickly losing the properties necessary to support life. The platysma myoides and the sterno-mastoidei were in powerful action, but most so on the right side, throwing the chin, which was kept in constant motion by spasm, nearly to the shoulder on the left. Inspiration was only accomplished by seldom and short catches. The veins of the head and neck were every where visible, and greatly distended. I was told by the bystanders that he had been in the same state for nineteen hours, with some intermissions, but without any return of sensibility. I looked upon this as a case commencing with spasm of the larynx and muscles of the neck in general—the insensibility being produced in the first instance by obstruction to the return of blood from the brain by this state of spasm, and kept up and brought to a state of coma by spasm of the arytænoid muscles preventing free access of air to the lungs, or even enough to arterialize the blood sufficiently to support life. With respect to the exciting cause of the spasm, I could learn nothing at the time; but if acidity in the stomach, or dyspepsia, will (as it frequently does) produce cramp in the legs, how readily can we understand how the same thing may happen with the muscles of the larynx, particularly when we remember the origin and distribution of the gastric and recurrent laryngeal branches of the pneumo-gastric nerves.

109. "Feeling convinced that the patient must shortly expire, and that the root of the evil was in the closure of the larynx, I at once proceeded to open the trachea—a matter of no small difficulty, on account of the twisted state of the neck, the engorged state of the vessels, and the constant action of the muscles. However, I felt it must be done, and I directly made an incision from the upper border of the sternum, extending in the median line upwards for about two inches. After separating the

edge of the sterno-hyoidei muscles, a large and much-distended vein protruded forwards (the middle thyroid), which, in its engorged state, was so troublesome, that I at once put two fine ligatures round it at each extremity of the wound, and removed the part between them. After this, the rings of the trachea were soon reached and divided, and the cut ends of the rings were then seized with a tenaculum, and small pieces removed from each.

110. " The immediate effect of the entrance of the air into the chest was to relieve all spasm. I was enabled to place the man's head straight, and in a remarkably short space of time the turgescence of the head was relieved. The face assumed a mottled appearance at first, then became red, and, in the course of ten minutes, pale; but, during these changes, the pulse had again become perceptible at the wrist, and means were used to induce circulation in the legs and feet.

111. " I proceeded to convert the stilet of a female catheter into hooks, which were placed in the wound, and fastened behind the neck, so as to keep the trachea open. This I was obliged to do, from being thrown in the way of the case with only my pocket instruments at hand.

112. " By the time I had done this, the patient was sufficiently sensible to try to speak, and I was able to tell him what had been done, and to induce him to be quiet. In an hour I left him, and shortly after returned with a canula, which I placed in the trachea, drawing the wound with the integuments together with strips of plaster, until it exactly fitted the silver tube. The two ligatures were brought out at the upper and lower extremities of the incision.

113. " On my next visit, on the following day, the pulse was about 90, and he was, in every respect, doing well; and on my placing my finger on the mouth of the canula, he was able to tell me that he had been the subject of epilepsy for seven or eight years, and that lately the attacks

had been more frequent and more violent, and that he did not think he had passed two days together, during the last two years, without an attack.

114. "He has done well from the first day, the ligatures coming away on the fourth and fifth days, and the wound uniting by the first intention, and closing round the canula.

115. "He remained under my care until the 15th of the month, without any return of his fits. He then went with his boat into Staffordshire, and has not yet returned; but I hear that he has remained quite well up to this time."

"To Dr. Marshall Hall."

116. No one can read the accounts given by Mr. Sampson and by Mr. Cane, of the immediate effect of the operation of tracheotomy on the circulation in the neck, without feelings of the deepest interest:

117. Mr. Sampson observes—"The trachea was no sooner opened, than the distension of the veins about the head and neck subsided."

118. Mr Cane states that—"the veins of the head and neck were every where visible and greatly distended;" that—"the immediate effect of the entrance of air into the chest was to relieve all spasm;" and that—"the face assumed a mottled appearance at first, then became red, and, in the course of ten minutes, pale."

119. I leave these facts to my reader's attentive consideration. I write for the candid lover of our profession and of truth.

On Laryngismus in Relation to the Epilepsia gravior.

120. *Observation* teaches us that laryngismus, more or less severe, intervenes as the essential cause of all that is *convulsive* and most formidable in epilepsy.

121. In the year 1841, before the relation of laryngismus to epilepsy, or rather, to epileptic *convulsion*, was known to me, I wrote the following paragraph:

122. "The other day, the mother of a most intelligent lady, whose husband is liable to epilepsy, was suddenly choked: the phenomena were precisely those which precede or commence the epileptic attack! This remark was made by the lady in question, who was but too well acquainted with the terrible appearances in that morbid affection*."

123. To this paragraph, I must add the following most interesting case from the able work of Dr. Stokes:

124. "A gentleman, aged twenty, *who had previously enjoyed the best health*, while conversing in the act of eating a piece of cheese after a hearty dinner, suddenly fell from his chair in a state of insensibility. On the supposition that a foreign body had become fixed in the œsophagus, a probang was speedily passed, and after about ten minutes he partially recovered. Soon, however, the attack recurred with great violence, the face was strongly congested, and the breathing spasmodic and stertorous. He was then freely bled; but no improvement followed. Stimulating injections and a second bleeding were employed, but still without relief, the situation of the patient becoming every moment more critical. A loud rattling in the throat now supervened. The patient tossed himself

* See Derangements of the Nervous System; p. 188.

on the bed, and threw his arms about so as to extend the chest as much as possible. All the muscles of inspiration were in the most violent action; and the surface of the body became pale and cold. Hours had now elapsed: the failure of all means employed led to the suspicion that the case might be one of asphyxia from tracheal obstruction, and a stethoscopic examination having been made, the following circumstances were observed:

125. "The chest sounded every where clear, but the vesicular murmur could scarcely be perceived in any portion of the lungs, the feebleness being equal and universal, notwithstanding that the patient made the most violent efforts of inspiration. A loud sonorous-mucous rattle, every moment increasing, was heard in the trachea, while the slight dilatation of the chest, compared with the respiratory efforts, clearly pointed out some obstruction in the windpipe.

126. "The question then arose, what was the nature of this obstruction? had a morsel of food passed into the trachea, or were the symptoms produced by a spasm of the glottis, consequent on cerebral irritation? The failure of treatment calculated to relieve the brain, and the evident secretion into the trachea, as shown by the loud rattle at the top of the sternum, were strongly in favour of the first opinion; and it was obvious that, as the patient was dying of laryngeal or tracheal obstruction, something should be done to give immediate relief. The operation of tracheotomy was then performed, and a crucial incision made through the tube; and, on the angular portions between the incisions being removed, a mass of pultaceous matter was forcibly ejected through the opening, with complete and instantaneous relief to the symptoms. Respiration became easy, the expansion of the lung full and audible, the patient breathed through the glottis, and recovered without a bad symptom.

127. "In about four weeks, however, he was attacked with symptoms

of cerebral irritation, and had *a fit resembling epilepsy;* during the next three months, these attacks recurred several times, becoming gradually less severe. They then altogether subsided; and for the last four years he has had no return of the disease. The treatment consisted in small bleedings, cold to the head, and the use of turpentine*."

128. Laryngismus, in its simplest form, proved the exciting cause of epilepsy, and of that condition of the spinal nervous centre which led to future attacks of epilepsy!

129. Such precisely is the effect of strangulation, when it does not prove fatal, as in a case detailed by the late Mr. Hey, of Leeds†:

130. "May 18, 1782, in the evening, Mr. ——, being greatly distressed, rashly hanged himself. He was discovered and cut down. A surgeon was sent for, and, finding him lying insensible and frothing at the mouth, took about a pound of blood from the arm. Soon after, Mr. —— was seized with convulsions."

131. In this point of view, nothing can be more interesting than the following sketch of a case by Mr. Martin Coates, of Salisbury:

"Salisbury, April 26, 1851.

132. "My dear Sir,—I have had a very interesting case of puerperal laryngismus. I was called to a rather corpulent, very indolent woman, who had had several natural labours. I arrived just in time to support the perinæum during the passage of the head of the fœtus. At this moment she complained of oppression of breathing, accompanied by a short cough, and, before I could tie and divide the funis, the dyspnœa was urgent, and she was soon in a state resembling that of a child who

* A Treatise on the Diagnosis and Treatment of Diseases of the Chest, Part I, by William Stokes, M.D.; 1837; p. 288.

† Observations in Surgery; ed. 3; p. 481.

has sucked boiling water from a tea-kettle; and, in a very short space of time, her lips and face became blue, her eyeballs protruded and fixed, and she was becoming unconscious. I felt her pulse, and found it full and bounding. I desired the persons in the room to raise her to a sitting posture, and opened a vein in both arms, having previously relieved the throat from any pressure from her dress. When I had allowed twenty ounces of blood to flow, she became sensible, and her breathing free, and in a quarter of an hour she was, and continued, quite well.

133. "The case so much resembled those above alluded to—that is, of closure of the glottis from injury—that, had she not been relieved at the moment, I should have taken my bistoury and opened the trachea.

134. "In this case there were—1, Spasm, and almost complete closure of the glottis; 2, A state approaching to apoplexy, or convulsion.

"Believe me to remain, my dear Sir, yours very truly,

"W. Martin Coates."

"Dr. Marshall Hall."

135. Can any one doubt that, but for the prompt treatment of Mr. Martin Coates, this slight laryngismus would have become more and more severe, and that the patient was on the very eve of convulsion?

136. Another most interesting fact of this kind is that afforded by the following graphic sketch of an epileptic attack by Dr. Henwood:

* * * * * *

137. "The attack occurred about an hour after his dinner. We were quietly seated, talking of something I had just read in the '*Times*,' when I observed him *turn his head* very oddly towards his left shoulder, which is *always* observed in the commencement of an attack. On this occasion I was enabled to watch every symptom, the attack having occurred whilst he was reclining on a large easy chair. It evidently commenced

with complete *laryngismus*, with evident *efforts of expiration*. I immediately applied the candle to his mouth and nose, and I am *positive* that he was unable to expire for *one or two minutes ;* and, during the spasmodic state of the muscles, his *neck* measured, as well as I could ascertain from a very loose shirt-collar becoming perfectly tight, rather more than an inch and a half more in circumference than before.

138. "I should like, were it possible, to see the effects of your valuable suggestion—viz. *Tracheotomy ;* for my decided impression is, that it would obviate the evil. On the day previous to the attack, I observed that the pitch or key-note of his voice had fallen more than a note."

139. In effect, the state of convulsion is attended by violent and ineffectual respiratory, and especially expiratory, efforts; and every kind of effort implies laryngismus. The acts of vomiting and of defæcation imply closure of the larynx. Many years ago, I investigated the nature of the acts of vomiting, and found that it was rendered *impossible* by *tracheotomy!* The patient on whom Mr. Anderson performed this operation (see § 143 —), when suffering from an attack of epilepsy,—now happily limited to the epilepsia *mitior!*—on one occasion blew out a candle brought near the tracheal orifice. Mr. Cane's patient inserts a cork into the tracheal tube when he wishes to speak loud, or lift a heavy object. One day he will, I fear, in this manner bring on a fit of epileptic convulsion!

140. But *the Proof* of the justice of these views is afforded by the successful issue of two cases of tracheotomy, instituted as a preventive of epileptic convulsion. I must here adduce two notes from Mr. Cane, written subsequently to that given, § 108, p. 21.

"Uxbridge, April 1st, 1851.

141. "My dear Sir,—I have inquired after my patient, and find that he has been laid up with variola, but has not, up to this time, had any

return of epilepsy. I wish now to close the canula, and observe whether there be any disposition to a return of his malady. I will, when he next comes this way, detain him for a week or two, and watch him, and give you the opportunity of seeing him.

" Believe me, my dear Sir, yours faithfully,

" W. H. CANE."

" To Dr. Marshall Hall."

" Uxbridge, October 15th, 1851.

142. " My dear Sir,—I have seen our patient, the boatman, and he tells me that he has continued up to this time without any return of epilepsy, even in the slightest form.

" I am, my dear Sir, yours faithfully,

" W. H. CANE."

" To Dr. Marshall Hall."

143. To these notes I add the following observations made by me at the Harveian Society, on the evening of Thursday, the 20th of November, 1851, in reference to a case of Mr. Anderson, of York Place, Portman Square, in which he had performed the operation of tracheotomy, with the view of preventing epileptic convulsion:

144. " It is impossible not to feel deeply interested in Mr. Anderson's admirable case; and I beg to make a few remarks upon it.

145. " The poor woman, who is thirty-six years of age, has been fearfully epileptic during twenty-four years, and her father had been afflicted with the same dire malady. Her seizures were of the most terrible character; she would frequently present herself at the dispensary, cut and bruised, and even burnt, in her convulsive falls and convulsions, and her face still bears the marks of these injuries. Her case is one, therefore, calculated to test the value of any remedy.

146. "The operation of tracheotomy was performed three months ago, and I think the opening into the trachea too small to be perfectly satisfactory: her inspiration is heard through the tube, and her speech is audible, and she can "snuff up," drawing in the alæ nasi, without closing its orifice. None of these events occur when the orifice into the trachea is of sufficient dimensions. The tube is also partly occupied by an inner tube, which, though it admits of easy removal for the purpose of being cleaned, is apt to become clogged with mucus, through neglect. Nevertheless, this poor woman has had *no* formidable fit since the tube was inserted. She has never bitten her tongue, which she used to do; once only has she fallen, and there was then no convulsion, and she experienced no injury; her fall was not convulsive. To use her own phrase, and those of the person who accompanied her to the Society, she does not now turn "black," her fits are not so "strong," and she is recovering from a state of "apathy," in which she was before. In a word, she has none of the formidable convulsions which were previously inducing havoc on her brain and mental faculties!

147. "I regard the success in this case as *complete; Convulsion*, with its train of dire effects, has been prevented!

148. "Epilepsy must be divided into two kinds: the epilepsia mitior, or the '*petit mal*' of the French; and the epilepsia gravior, or the '*grand mal*' or '*haut mal.*' Now, laryngismus is the event which marks and separates these two. The former consists of attacks of vertigo, confusion, unconsciousness, in which the patient may *fall*, and there may be partial spasmodic actions: the seizure is transient. But the laryngeal dyspnœa, the purple lividity of the face, the convulsion, the convulsive fall, the bitten tongue, the foam, the coma, and the delirium, belong to the latter. The milder form occurs without laryngismus. Tracheotomy can, therefore, have no application in such a case. The graver form, on

the contrary, essentially depends upon laryngismus, and is incompatible with a just and ample opening into the trachea.

149. " The same remark applies to every form of real, general, and complete convulsion—epileptic, puerperal, infantile. Being dependent on laryngismus, such convulsion *cannot* occur if tracheotomy be efficiently performed.

150. " We have to consider whether the *effects* of such convulsion —and they are surely dire enough—justify the heroic remedy.

151. " There is also another question. In what degree can the operation itself be simplified and improved?

152. " I am of opinion that a much lighter and more commodious *tube* may be used; and I think that where a protracted opening is required, its *edges* may be perfectly *healed*, leaving a permanent opening, which may be closed by removing those edges when this is thought to be desirable. The orifice ought, too, to be protected from the influence of the cold atmosphere by a cage of wire, covered by cotton net.

153. " I should add, that I regard Mr. Anderson's modification of my trachéotome as a very great improvement."

154. All, then, that may occur without laryngismus may be regarded as the 'petit mal;' all that occurs beyond laryngismus, as the 'haut mal.' Laryngismus is the event which divides or unites the two.

155. Sometimes no laryngismus occurs: it is the 'petit mal;' tracheotomy can avail nothing. Sometimes laryngismus supervenes: the case then passes into the 'haut mal:' this tracheotomy will supersede, the 'petit mal' remaining. Sometimes laryngismus is the very first symptom: it is then the 'haut mal' at once: tracheotomy is the effectual remedy.

156. There is no reason why the 'petit mal' should be prevented by tracheotomy. It is the 'haut mal' which is prevented by this operation freely performed.

III. ON TRACHEOTOMY.

157. Every kind of slight vertigo, oblivium, delirium, and morbid sensations, and even *falling*, may occur, without the suspicion of epilepsy; or, if there be epilepsy, they may occur with various spasmodic affections, as the 'petit mal.' They therefore may occur in spite of tracheotomy.

158. But the deep purple countenance, the bitten tongue, the foam, the severe and general convulsion, the deep coma, the subsequent mania, the danger to life, mind, or limb, can only occur as effects of laryngismus, and are prevented by tracheotomy.

159. By means of this measure, we therefore arrest the course of this terrific and dire disease, at the point at which it becomes a source of havoc and of danger!

160. But it must be remembered that, *more* than this, this measure cannot effect.

161. The epilepsy may be inveterate or hereditary; there may be defective development of the nervous centres; there may be *frequent* slight attacks, and only *occasional* severe attacks; havoc may already have been inflicted on the intellect, or on the sentient or motor powers; organic disease may have been a cause, or a consequence: the intelligent physician will readily comprehend what may and what may not be expected in such cases.

162. But in cases induced by emotion, or by one or more of the irritations; not yet inveterate; not yet involving diseased structure; and consisting chiefly of convulsive attacks, inducing lividity of the countenance, involving the bitten tongue, and the foam, and succeeded by stupor or

delirium ;—as the case depends on laryngismus, so it may be superseded by tracheotomy and the tracheal tube.

163. There *is* one case in which the propriety of the institution of tracheotomy can admit of no doubt. It is such a case as that of Mr. Cane, when life is at stake. The additional motive afforded by the hope that the measure may lead to the subsequent prevention of epileptic convulsion, is also illustrated by that case.

164. But, hereafter, perhaps the hope of saving mind or limb, when life itself is not in jeopardy, may be deemed a sufficient motive for tracheotomy. I think I may safely leave the question to those who have the opportunity of witnessing the various forms of convulsion—epileptic, puerperal, &c.—with its dire effects, to determine. It will come to be a question of *degree* and of *time*—it will come to be agitated when we behold our patient affected with coma and stertor, or with convulsion, and know that tracheotomy will remove the former, and prevent the recurrence of the latter, with their effects. Apoplexy and epilepsy occur in every form, in every degree, both in themselves and in their effects. They occur and recur in rapid succession, and so as to threaten life, or impair the faculties; they occur in a form and degree scarcely perceptible, and in the direst form; and they occur in every intermediate form and degree. What severity of malady will call for and justify the remedy?

165. As I have stated, I believe few will hesitate to perform the operation of tracheotomy, as the present remedy, when there is, from apoplectic laryngismus, imminent danger to life. But the question recurs —Are we justified in performing this operation in cases of epileptic and other convulsion, as a *preventive* of future evil? Are the somewhat remoter danger to mind, and limb, and life, and the hope that, whilst the faculties are spared, the patient may be rescued from the susceptibility to the attacks, the *dignus vindice nodus*, and sufficient motive for adopting

this measure in its more continuous mode of a tube worn in the trachea? After having witnessed the dire circumstances and effects of these frightful maladies more than any one—of epilepsy of inorganic origin especially—I unhesitatingly say—Yes. I regard the melancholy condition of the patient as justifying the heroic remedy.

166. The case, I repeat, may be violent and frightful *in any degree*. In what precise case is tracheotomy justifiable? This is a matter of pure *moral* calculation and choice, in regard to the terrors of the malady on one hand, and of the remedy on the other. Epilepsy may occur in the slightest form of mere transient oblivium, and it may occur in the gravest form of sudden and violent convulsion, dashing the patient to the ground, into the fire, or into the water, and be followed by coma or apoplexy, delirium or mania, paralysis, amentia.

167. The former of these attacks, or the *epilepsia mitior*, comprises all that is short of laryngismus—affections of the senses, as muscæ, tinnitus, the odour of musk, aura; vertigo, oblivium, confusion; loss of consciousness, nutatio, falling; various spasmodic affections of the face, the eyes, the neck, the extremities.

168. Then comes laryngismus, laryngeal dyspnœa, perhaps perfect closure of the larynx, with violent efforts of expiration. This, with all the other links of the dreadful chain, constitute the *epilepsia gravior*.

169. All that is on *this* side of the laryngismus must be unaffected by the operation of tracheotomy; all that is on *that* side of this laryngismus will, I trust and believe, be prevented by its efficient institution. By tracheotomy, the *epilepsia gravior*, or the '*grand mal*,' is converted into the *epilepsia mitior*, or the '*petit mal*.' If this, my hope, be realized, I shall deem the event a great victory achieved by physiology or theory over mere observation, and especially by the discovery of *the Diastaltic Nervous System*, of which it is an application. And I here adduce the admi-

rable words of one whom I have long regarded as the greatest physician of any age or any nation, pleading the act detailed § 100, as my apology :

170. " Encore qu'il ne soit pas très agréable de porter un tube dans la trachée artère, pour se préserver de l'épilepsie, cette maladie est néanmoins si affreuse, que vous aurez rendu un bien grand service à l'humanité, si le temps confirme vos vues, si l'expérience s'ajoute à l'heureuse expérience que vous avez faite une fois. Aussi ne saurais-je trop vous engager, mon cher ami, à expérimenter de nouveau, à recueillir des faits nombreux, avec les détails suffisans, avant d'annoncer votre découverte comme parfaitement positive au public. S'il y a plus qu'une coincidence (et je le crois) dans le fait que vous avez fait connaître, vous pouvez attendre sans trop d'impatience, car le monde savant est averti, et vous avez pris date. Courage, donc, mon cher ami ; continuez à interroger l'expérience avec la sagacité que vous apportez en toute chose ; et si vous êtes dans le vrai, vous ne serez pas plus heureux que moi de votre invention—grande et magnifique invention !—qu'on pourrait placer à côté du problème résolu par M. Leverrier."

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171. I now proceed to make a few remarks on the best mode of performing the operation of tracheotomy. This operation has not been hitherto an easy one. I once saw a little patient die on the operation-table, and I shall never forget the painful scene. My earnest wish is, now that I see a most important application of this operation as a remedy, beyond all former idea, to render it as safe and as easy as possible, so that the country practitioner of least experience need not be deterred from undertaking it.

172. I first propose to make a free incision through the integuments ; then to separate the other tissues by means of a blunt-pointed stilet, or the forceps, mechanically, without division, and of course without hæmor-

rhagy, and thus to denude the trachea. I have, then, to suggest the use of an instrument in the form of a trochar, or small trephine, supplied with a curved hook, which may be drawn upwards within it, and a circular cutting edge. As this last is made to revolve, the hook is drawn within it, and a circular piece of the trachea is removed.

173. Into the orifice thus made into the trachea, I propose to introduce a little instrument made of silver wire, much lighter than any tube, and admitting of being diminished in size for introduction and removal, and reintroduction, and so contrived as to be secure in the tracheal orifice, when introduced and allowed to expand.

174. I further propose that a cage of wire gauze, covered by cotton net, be fixed over the orifice, to prevent the ingress of cold dry air, especially when the easterly wind prevails.

175. It has occurred to me, too, that, in cases in which a protracted tracheal opening is required, the edges may be *healed* by means of the application of sulphate of copper, the edges of the integument being removed by the lancet or the scalpel, and brought together, when it is thought well to obliterate the orifice.

176. I repeat, in conclusion, what I have on several occasions stated, that, if tracheotomy were performed, and a tube worn in the trachea, the epileptic, the puerperal, or even the infantile *Convulsion* would be prevented, with its dire effects.

177. Experience is now added to theory, to confirm me in this *hope* —for it is but a just degree of caution *still* to regard the question as one of hope. (See § 170.)

178. I now generalize the idea, and apply the reasoning to paroxysmal apoplexy, as well as to convulsion; and I hope and trust that tracheotomy will be found a preventive or a remedy of the apoplexia gravior, as well as of the epilepsia gravior.

179. It is singular to observe how laryngismus becomes, in both apoplexy and epilepsy, the intermediate link between the milder and severer disease—the effect of the former, and the cause of the latter. The due appreciation of these facts will lead to an important principle of *treatment* in one of those affections, and of *prevention* in the other. The latter of these must be viewed in the light of a remarkable prediction fulfilled by the event.

180. The conclusions to which I have arrived, are—

181. 1. That, in cases of the apoplexia gravior without organic disease, the patient ought not to be permitted to die, without the institution of tracheotomy.

182. 2. That, in cases of the epilepsia gravior, laryngismus with convulsion, and danger to life, mind, or limb, ought not to be permitted to recur, without giving the patient the hope involved in the same operation.

183. 3. By tracheotomy, I repeat, the '*haut mal*' is converted into the '*petit mal*,' beyond which the dire affection, for want of obstruction to the breathing, with expiratory efforts, cannot proceed; and even this '*petit mal*' may, for want of renewed havoc made on the nervous structures, with induced susceptibility to returns, subside and disappear.

LECTURE III.

ON A HOSPITAL FOR EPILEPTICS.

184. I have long meditated the institution of a Hospital for the poor afflicted with Epilepsy. I have hitherto been deterred from prosecuting the idea, by the reflection that it would be injurious to those liable to seizures of this direst of chronic maladies, to be witness to the frightful scenes presented by their companions in this misfortune. I believe I have, in a great degree, obviated this objection.

185. Inorganic epilepsy occurs, as I have said, in two forms: the first, the *epilepsia mitior*, or the slighter epilepsy; the second, the *epilepsia gravior*, or the graver epilepsy.

186. I believe the slighter epilepsy depends on a condition of the muscles of *the Neck*, which I designate *trachelismus*, and by which the flow of blood from the brain and spinal marrow is impeded. This is only to be prevented by strict and persevering attention to avoid its exciting causes, which are, in general terms, the *emotions* and the *irritations;* the latter being chiefly dental, gastric, enteric, uterine, &c.

187. But the severer epilepsy depends upon another condition, that of *the Larynx*, termed *laryngismus*. As trachelismus impedes the flow of blood from the brain, so laryngismus impedes the ingress and egress of air to and from the lungs, especially the latter. The larynx is, in fact, more or less closed; and upon this closed larynx violent expiratory *efforts* are made. These events induce, in their turn, still greater impediment to the flow of blood from the brain and from the upper part of the spinal mar-

row, and, as a further consequence, all the direr forms and effects of this dire disease; viz. convulsion, convulsive falling, or rather dashing to the ground, &c. &c.

188. Now, the influence of this laryngismus, and all these dire effects, are, I believe, obviated by *Tracheotomy!*

189. The epileptic patient on whom tracheotomy is effectually performed, is preserved from all that is included in the *graver* form of the disease:—the patient may *fall;* but he is not thrown down violently, nor does he become affected with deep lividity of the countenance, convulsion, foaming, &c. He no longer presents the *frightful* spectacle to which I have adverted in the first paragraph of this Lecture! The objection to the institution of a hospital for these afflicted persons is therefore removed.

190. Having made these few preliminary remarks, I proceed to state my views in the suggestion that the duty of establishing a Hospital for Epileptics becomes specially imperative upon the humane and the charitable.

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191. Epilepsy is indubitably the direst of human maladies. It dashes the afflicted patient with convulsive violence to the ground, and exposes him to the danger of falling—down stairs—into the fire—or water—or under carriage wheels, and to the infliction of terrible wounds, injuries, burns, &c. It incapacitates him for any employment. It may impair his faculties, or cripple his limbs. Not unfrequently the attack passes into a fit of mania; occasionally it proves fatal, by inducing a state of apoplexy, or, still more speedily, from its violence, by spinal syncope. The ancients designated it the *Herculean malady!*

192. The epileptic becomes, then, from his peculiar helplessness and danger, the object of our peculiar care. It is his cause which I plead!

193. Happily, besides the care which may be taken of these afflicted persons, much may, as I believe, be done, by care, by regimen, by medicine, and by new modes of treatment, to mitigate, if not to remove, their dire calamity.

194. Each seizure is induced by one or more of a series of exciting causes, some of which, and these the most usual, may be avoided under judicious and watchful management.

195. The *severe* forms of the disease depend on the condition of the respiratory apparatus which I have described, and which may be obviated by a simple operation. By means of this operation we are enabled to avert the violence of the malady. We cannot, by *it*, avoid the cause or causes, or their first effects, the slighter forms of the affection ; but we *can* avoid the severer, the graver, the direr consequences of these causes. We can preserve the patient, as I have stated, not from *falling* indeed, but from being dashed to the ground violently and convulsively; we can secure him from *Convulsion*, and all its dire effects on the mind and on the limbs, and save him from mania, amentia, or paralysis!

196. Nay, we can, in a certain number of cases, yet unknown, even *cure* the patient; for, by avoiding the severe forms of the disease, we obviate the *susceptibility* to future attacks, induced and left by them. One patient, who used to experience a severe attack twice in every week, has had no attack whatever during twelve months. Another epileptic, from *hereditary* epilepsy, during four and twenty years, having the severest attacks frequently, and falling dangerously, on the fender, or into the fire, has, during four months, had the milder attack only.

197. That we may take *care* of those poor patients; that we may change their malady from the direst to a comparatively, or even to a positively, mild one; and, in a certain number of cases, even *cure* it entirely—is certain! Who will not lend a helping hand in so good a work?

198. My project is to bring those afflicted with epilepsy under one roof,—for shelter, for protection, for safety; to place them under a systematic, gentle course of medicine, of diet and regimen free from stimulus, of exercises free from all effort or fatigue, of occupation free from excitement or emotion; to arrange their bed so that the head may be high; to clothe them, and adopt measures for keeping their feet warm and dry, &c. &c.—for such are found to be important measures in the treatment.

199. Having thus done all that kindness and art can suggest for the solace and cure of our patients, the next point is to ascertain, in those whose cases prove fatal, what are the morbid appearances on post-mortem examination. These appearances may not, as is too generally supposed, be the *disease*, or the *cause* of the phenomena; but the *effect*.

200. Let us suppose that we meet with congestion, or ecchymosis, or a clot of blood, or effusion of serum; or even softening; or, in chronic cases, induration. Are these the disease, or the cause of the disease? Possibly not. They are even probably the *effect* of the violent congestion to which the nervous centres may have been subjected during the paroxysms. Without attention to this *living* pathology, even the morbid anatomy may lead to erroneous conclusions.

201. Why should epilepsy, more than apoplexy, be treated *empirically?* What should we say to the proposition to trust the treatment of apoplexy to the sulphate of zinc, the cotyledon umbilicus, &c.? Why should we act less *rationally* in the case of epilepsy?

202. The pathology of apoplexy and the pathology of epilepsy should be equally investigated, and upon this pathology the treatment should be founded. I would especially recommend that, whilst every exciting cause is removed, and the general health carefully maintained, the pilula hydrargyri be given for the removal of organic effects, and the strychnia for

the diminution of the susceptibility of the nervous centres, equally left by the epileptic seizures.

203. The real value of particular remedies is also still entirely unknown, notwithstanding the occasional publication of successes.

204. In a *Hospital for Epileptics*, the *truth* in regard to these topics may be ascertained; whilst we give the patients the advantage of every care, of every aid, of every remedy.

205. So much can scarcely be said to be accomplished by any of our other Hospitals.

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206. It is not, indeed, yet known what may be accomplished for the epileptic by an *extreme* and *sustained* attention—

207. 1. *To Diet and Regimen, excluding all Stimulants and indigestible Substances;*

208. 2. *To the Secretions and Excretions;*

209. 3. *To Security against all Emotion and Excitement;*

210. 4. *To Exercises and Occupations, avoiding all Effort and Fatigue;*

211. 5. *To Clothing, and especially to warmth and dryness of the Feet;*

212. 6. *To a raised Posture during Sleep; &c.*—

213. I mean such a *degree* of attention to diet and regimen, to the secretions and excretions, &c. and so sustained, as has never been attempted before!

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214. The great difficulty, in the treatment of epilepsy in private practice, is the impossibility of securing the necessary *degree* of attention to all this regimen. In a Hospital, this will be readily accomplished. It must be the great object of the Institution.

215. In this manner, I am persuaded that many more poor patients will recover from epilepsy than rich.

216. How instructive will be a series of statistics on this subject! The real value of regimen; the real value of remedies; the real value of tracheotomy; the real value of post-mortem appearances—will become known.

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217. The great difficulty, in regard to the *Hospital*, will be that of the selection of cases. Our expectations must be reasonable. Every one knows how little can be expected in the congenital, the hereditary, the inveterate cases,—not from the violence of the seizures, which may be averted, but from the organic condition, cause or effects, of the malady.

218. In such cases, the *care* of the afflicted patient must be our chief object. But, in very many others, I am persuaded, as I have stated, that we ought not to despair of *Cure*.

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219. I conclude this outline with the following Sketch:

1. *The Emotions;* 2. *The Irritations;*	*induce*	*Spasmodic Trachelismus;*	*Threatenings of* 1. *Apoplexy;* 2. *Epilepsy;*	*or*	*Congestion of* 1. *The Cerebrum;* 2. *The Medulla Oblongata;*	*with*	1. *Paralytic, or* 2. *Spasmodic, Laryngismus;*	*and*	1. *Stertor and augmented Coma;* 2. *Convulsion, and its Effects;*	*Superseded by Tracheotomy.*

Recapitulation.

219. 1. The cases of apoplexy and epilepsy of inorganic origin have not before been duly discriminated and investigated;

220. 2. Their causes are *the Emotions* and *the Irritations;* the former acting directly, the latter diastaltically—

221. 3. *First*, on the muscles of *the Neck*, and

222. 4. *Secondly*, on those of *the Larynx;*

223. 5. In the former case, the affection designated *Trachelismus* is the cause of the compression of the *Venous Network of the Neck*, of impeded return of blood from the encephalon, and of

224. 6. The *milder* forms or threatenings of Apoplexy, and of Epilepsy;

225. 7. In the latter case, the affection is designated *Laryngismus*, and it is of two kinds; viz.

226. 8. 1. Cerebral, and apoplectic or paralytic, with partial closure of the larynx, assuming the form of laryngal stertor,—chiefly, but not entirely, in *in*spiration—as in the experiments of Legallois;

227. 9. 2. Spinal, and spasmodic, with still greater closure of the larynx, and still more impeded respiration, and especially *ex*piration.

228. 10. The former of these is associated with apoplectic coma;

229. 11. The latter is the essential condition of *Convulsion*, and its effects;

230. 12. The effects of trachelismus would be superseded by venæsection;

231. 13. The effects of laryngismus are superseded by *Tracheotomy;*

232. 14. By this measure, paralytic laryngismus, or stertor, and its effects, or the *apoplectic state*, when of inorganic origin, is *removed* or *mitigated;*

233. 15. By this measure, *Convulsion*, with its effects, is *prevented;*

234. I trust that, whilst convulsion is thus prevented, all its dire *effects* will be obviated; and that one of these, the susceptibility to returns, may itself sudside, and the dire disease be entirely cured.

235. I conclude this recapitulation by observing that—

1. The difference between the Apoplexia mitior and the Epilepsia mitior, is the difference between obscure and evident Trachelismus.
2. The further difference is that between psychical and spasmodic symptoms, or that between affection of
    1. The Cerebrum, and of
    2. The Medulla Oblongata.
3. The difference between the Apoplexia gravior and the Epilepsia gravior, is that between
    1. Paralytic, and
    2. Spasmodic Laryngismus.
4. Apoplexy, when extreme, is attended by Convulsion; extreme Epilepsy induces apoplectic Coma, &c.
5. Both may terminate fatally—
    1. Without post-mortem appearances;
    2. With Congestion only (see pp. 47—50);
    3. With the *Effects* of this latter; viz. ecchymosis, rupture; serous effusion; softening.

SUPPLEMENTS.

Supplement I.

Extract from the "Clinique Médicale" of M. Andral.*

I beg my reader's attention to some remarkable paragraphs occurring in the *Clinique Médicale*, and to a very brief commentary upon them. The author is treating of *congestion*, without further lesion of the cerebrum:

"Les observations qu'on vient de lire nous ont montré les principales formes symptômatiques de l'hypérémie des hémisphères cérébraux. En rapprochant de ces cas peu nombreux terminés par la mort, beacoup d'autres cas de même genre, recueillis par nous, qui se sont terminés par la guérison, nous serons conduits à établir que la congestion cérébrale peut se traduire à nous par l'une des huit formes suivantes:

"La *première* forme est caractérisée surtout par des *étourdissemens*. Ils ont une intensité plus ou moins grande; les malades peuvent avoir en même temps de la céphalalgie, des éblouissemens, des tintemens d'oreille, des aberrations passagères de la vue, un embarras momentané de la parole, des fourmillemens dans les membres, et quelquefois à la face. La figure est ordinairement colorée; les yeux sont injectés; le pouls est ordinairement peu fréquent et de force variable.

"Cet état peut ne durer que quelques instans ou quelques heures; mais il peut aussi se prolonger pendant plusieurs mois, persister même pendant plusieurs années. Chez certains individus, il ne se montre qu'une fois; chez d'autres, il reparaît à des intervalles plus ou moins éloignés. Nous avons vu un homme, âgé de 59 ans, qui, depuis une trentaine d'années, n'avait pas passé un seul jour sans avoir à différens degrés l'un ou l'autre des symptômes signalés dans le précédent paragraphe. Un autre les avait éprouvés depuis l'âge de trente ans, jusqu'à celui de trente-quatre. Il en avait été ensuite complètement débarrassé jusqu'à l'âge de 48 ans, époque à laquelle il fut repris de violens étourdissemens. Nous avons recueilli l'observation de plusieurs individus chez lesquels, tous les ans, à peu près dans le même mois, ces étourdissemens reparaissaient. Chez quelques femmes ils se montrent, d'une manière régulière, au retour de chaque époque menstruelle."

This is amongst the most frequent forms of *paroxysmal* cerebral affection. Every word of this interesting description should be *studied* with care.

* Ed. 18. t. v, p. 245—250.

M. Andral proceeds—

" Après que ces étourdissemens ont duré plus ou moins long-temps, il peut arriver qu'ils acquièrent tout à coup assez d'intensité pour qu'ils se transforment en une *perte subite de connaissance* mais celle-ci peut également survenir, sans avoir été précédée d'étourdissemens. C'est cette perte instantanée de connaissance, avec ou sans étourdissemens antécédens, qui caractérise la *seconde* forme de congestion cérébrale. Dans cette forme, les malades *tombent à terre*, privés subitement de toute intelligence, de tout sentiment et de tout movement; mais si on soulève leurs membres, ils ne retombent pas de leur propre poids, et quelques-uns les soutiennent en l'air. Il n'y a donc pas, à proprement parler, de paralysie. Ils peuvent rester dans cet état depuis quelques minutes jusqu'à vingt-quatre ou trente heures; puis ils reviennent à eux, et se rétablissent promptement, sans conserver aucune lésion du mouvement ou du sentiment. D'autres, après être revenus à eux, conservent pendant quelques jours un peu de gêne dans l'accomplissement de quelques-unes des fonctions de la vie de relation. Ainsi leur parole est embarrassée, ou leurs divers mouvemens sont difficiles."

This too is a frequent form of paroxysmal cerebral affection. A case of this kind occurred in the year 1850, in a gentleman of Lancashire. Care in diet, exercises, and antacid medicines, completely removed these seizures, which only reappeared on some occasion of deviation from this plain and simple plan of treatment. In its milder form, it is as evanescent as sudden. In its severer form, it constitutes *paroxysmal apoplexy.*

M. Andral adds—

" En même temps que les malades tombent sans connaissance, ils peuvent être frappés de *paralysie*, soit générale, soit bornée à un seul côté du corps. Voilà la *troisième* forme de congestion cérébrale. Mais presque en même temps que se dissipe la perte de connaissance, on voit aussi disparaître la paralysie, de telle sorte qu'on ne saurait admettre qu'il y eut dans ce cas hémorrhagie cérébrale. Les observations que nous avons citées démontrent d'ailleurs la possibilité de cette paralysie, sans qu'aucun épanchement de sang ait eu lieu dans le cerveau."

This case constitutes the *paroxysmal paralysis.* M. Andral then adds—

" Au lieu d'une suspension générale ou partielle de la motilité, cette fonction peut s'accomplir d'une manière irrégulière, désordonnée, sans participation de la volonté. Alors, en même temps qu'il y a perte de connaissance, on observe, soit différens *mouvemens convulsifs*, soit la contraction permanente d'un certain nombre de muscles; tous ces accidens durent tout au plus quelques heures, puis ils disparaissent sans laisser aucune trace. C'est là ce qui constitue la *quatrième* forme de congestion cérébrale."

The attack of *paroxysmal paralysis*, which usually affects the speech, the fingers, the side, may occur *without* as well as *with* the loss of consciousness. Such is the *fifth* form of cerebral congestion, according to M. Andral:

" Dans une *cinquième* forme, il n'y a plus perte de connaissance: c'est une paralysie qui survient tout d'abord, tantôt limitée à quelques muscles de la face, tantôt étendue à tout une côté du corps. Cette paralysie disparait très promptement, peu d'heures souvent après avoir pris naissance; et dès-lors il n'est pas présumable qu'elle soit liée à une hémorrhagie ou à un ramollissement. Notre obs. IV prouve d'ailleurs positivement le contraire. La marche de cette paralysie fut bien remarquable dans le fait suivant.

" Un homme de moyen âge, travaillant aux carrières des environs de Paris, est pris tout à coup, au moment où il finissait de diner, d'un engourdissement de la main droite; une heure après, il ne peut plus imprimer le plus léger mouvement à tout le membre thoracique droit; il n'y ressent d'ailleurs aucune douleur: sa tête est exempte de souffrances. A cinq heures du soir, il ressent un fourmillement dans le pied droit; bientôt tout mouvement est également perdu dans le membre abdominal droit: il entre à l'hôpital Cochin. Le lendemain matin, à la visite, l'hémiplégie droite est complète; la sensibilité des membres paralysés est conservée; aucun mouvement ne peut être imprimé par le malade à la joue droite; et lorsqu'il parle, la commissure gauche des lèvres est entrainée en haut; la langue se tire droite; l'intelligence est intacte: le malade éprouve comme un engourdissement (c'est son expression) vers la région frontale: une saignée d'une livre est pratiquée. Dans la journée, la malade peut faire exécuter quelques mouvemens légers à ses membres droits. Le lendemain matin, il n'y a plus aucune trace de paralysie. Ce n'est point certainement ainsi que disparaissent les effets d'une hémorrhagie cérébrale, ou de toute lésion qui intéresse un peu profondément la pulpe nerveuse."

Again:

" La *sixième* forme de congestion cérébrale est caractérisée par l'apparition subite de *mouvemens convulsifs partiels ou généraux*, sans perte antécédente de connaissance. Ces mouvememens se dissipent promptement, sans laisser de trace à leur suite. Ils peuvent aussi survenir, après que les individus ont éprouvé pendant plus ou moins long-temps des étourdissemens, et ceux-ci peuvent leur survivre."

It is *paroxysmal convulsion*. In what does it differ from *epilepsy?*

Once more:

" Dans une *septième* forme, la congestion cérébrale ne produit plus de coma; elle n'exerce plus d'influence notable sur les mouvemens; c'est ici l'intelligence qui est spécialement troublée: on observe un *délire violent* accompagné d'un grand développement de forces musculaires. Le plus souvent, quelque temps avant la mort, le délire est remplacé par un état comateux qui devient de plus en plus profond: cependant nous-même avons vu des cas

dans lesquels, jusqu'au moment de la mort, les malades conservaient une agitation extrême, et ne cessaient de parler et de vociférer. Le cas le plus remarquable de ce genre que nous avons observé est celui d'un homme de moyen âge qui, depuis plusieurs heures, poussait sans relâche des cris assez forts pour que le repos la toute de salle en fût troublé. Tout à coup on ne l'entend plus; on s'approche de son lit; il était mort. La foudre ne l'aurait pas plus promptement frappé. A l'ouverture du corps, on ne trouva d'autre lésion qu'une injection très vive de la pulpe cérébrale."

Is not this *paroxysmal mania?* That is, admitting that the attack does not prove fatal, and that it recurs in the same patient. And such a case is, at this moment, under my care, at Moorcroft House, Hillingdon, the perfect model of an asylum for the insane.

Lastly, M. Andral notices another form of cerebral affection, the febrile:

" Il nous reste à signaler la *huitième* forme de congestion cérébrale, c'est celle dont notre obs. v nous a montré un exemple. Dans cette forme on voit apparaître une fièvre continue au début, et pendant la durée de laquelle prédominent surtout les symptômes qui appartiennent à la première forme de congestion cérébrale dont nous avons parlé. Nous avons particulièrement observé cette forme chez de jeunes soldats qui remplirent momentanément nos salles de la Pitié, au commencement de l'été de 1831."

It has not occurred to me to observe this form of the disease

Supplement II.—*On Pertussis.*

128 *b*. We have all witnessed the condition of the face and of the neck in *Pertussis;* and we have all met with cases of *Convulsion* induced by this strange and violent *laryngal* affection. Would not tracheotomy supersede both the first and the second phases of the malady?

128 *c*. The following note will be read with the deepest interest:

" 7, Pembridge Villas, Westbourne Grove,
" 1st March, 1850.

" Dear Sir,

" I venture to trouble you with some particulars of the following case, thinking it tends to confirm some important views which you have lately made known to the profession on the pathology of apoplexy and epilepsy.

The subject, a son of mine, a healthy boy, four years old, has been suffering for the last five weeks with hooping-cough. The symptoms, during the first and second stages, were mild, as compared with those of three others attacked on the same day; but, during the last fortnight, when all inflammatory symptoms have passed off, and the disease has become purely nervous or spasmodic, he has had ten or a dozen convulsive attacks, of a rather peculiar kind, which appeared in part to take the place of the ordinary paroxysms. He is aware when the cough is coming on, dreads it much, and gives intimation to those about him; but, on these occasions, instead of coughing, he suddenly loses all power and *falls*, if not supported; every muscle becomes rigid, the countenance and neck suffused, the eyes and lids convulsed; he foams at the mouth; the respiration is entirely suspended at the larynx for several moments; evacuations pass involuntarily; and there is distinct torticollis. The paroxysm lasts from one to two or three minutes, and is succeeded by some cough and hooping, but much less than on the ordinary occasions. He afterwards sleeps heavily for half an hour or an hour, and awakes tolerably well. There has been slight ecchymosis of the eye-lids, and considerable swelling, so much so as to lead, with some œdema of the feet, to a suspicion of renal disease. The latter evidently arises from debility, as he has lost much flesh and strength during the last ten days.

I look upon this as a case of epilepsy, caused by the perfect closure of the glottis, and as giving, in a very marked manner, support to your original view of the seat of the disease.

"I am, dear Sir, very faithfully yours,

"W. H. ALLCHIN, M.B."

"Dr. Marshall Hall."

This case is a beautiful illustration of the following remarkable observations on pertussis, of Heberden: "Puer advenientem præsentit,

et ad matrem, vel famulam, accurrit; at adulti, accessione victi, momento temporis, velut attoniti *concidunt;* illico vero resipiscunt; atque hoc est proprium hujus affectus signum in adultis. Qui enim præter solitum tussiunt, et nuper versati fuerunt inter aliquos tusse convulsiva laborantes, siquidem morbo concidant, nullum relinquunt locum dubitandi de natura ægrotationis. Ægri de quibus sermo est, majorem in modum queruntur inflationes*."

Supplement III.—*Experiments.*

I find that, on applying an accurate measure round the neck—the stethometer of Dr. R. Quain, for example,—and turning the head extremely to one side, the circumference of the neck is readily augmented by half an inch. This effect is produced by the bulging of the contracted muscles. This bulging must take place equally towards the centre of the neck, and must encroach on the contents of the vessels, especially the veins, of that region. Hence, when the contraction is tonic and considerable, impeded flow of the blood from the head, and *threatening* of apoplexy or epilepsy.

The same augmentation of the circumference of the neck is induced by closing the larynx and making an *effort*, the flow of blood being impeded and the veins becoming distended. Hence, when these events occur in an extreme degree, extreme apoplexy or epilepsy; and hence, the relief from tracheotomy.

Supplement IV.—*Tracheotomy.*

108 *b*, and 144 *b*. Mr. Cane saw his patient on or about March 1, the tracheal tube having been constantly worn during the interval of

* Com. ed. 1807, p. 376.

thirteen months since the operation. Not a symptom of his malady has recurred. On the 10th, Dr. J. W. Ogle was so kind as to visit Mr. Anderson's patient, who had worn the tube during half that period, and to take the following note:

108 *c*. "Ann Ross, ætat. 36, a washerwoman, has been subject to "fits" for twenty-four years. The only cause she can assign for them is the fact of her father's being also liable to them. These fits, the patient says, have followed no rule in their accession; at one time occurring many times in a week; at another time, having an interval of three weeks; but never any longer interval. Neither has she been able to refer them to any irregularity of diet. They were generally, but not invariably, preceded by 'shakings and jumpings of the limbs,' and 'confusion of ideas,' to use her own expressions. Oftentimes the startings of the limbs have come on, and no fit has supervened. Beyond this account, but little history concerning the character of the attacks can be elicited from the patient.

108 *d*. "Until eight years ago, the patient resided with friends, having no home; but they having got tired of her, she has been in lodgings since that period, subject in the same way to the fits. The present attendant's account of them is as follows:—The fits have been wont to be very violent, and attended by strong convulsions. She has generally 'gone very dark,' and 'at times almost black' in the face, and been often dashed forcibly to the ground, cutting her face and biting her tongue. She has generally foamed at the mouth during the fits, which have lasted, for the most part, for a quarter of an hour; and when the fits have been less frequent, the startings and jumpings of the limbs have been most numerous. Her general health has been tolerably good, and she has maintained herself by her needle, and by the assistance of friends. For the last three years, however, she has been getting thinner.

108 *e*. "On the 26th of July, 1851, the operation of tracheotomy was resorted to; and since that time the fits have been much less frequent, and less strong in character. The patient said she had had four or five fits; but the attendant, who is only with her occasionally, being within call, had not seen a single one until December 23rd. These four or five seem, however, from the patient's account, to have been much milder than previous ones. On the forementioned date, December 23, the attendant saw her in a fit, which was 'very bad and strong,' '*but not nearly so much so, or so lengthy, as formerly;*' and 'without blackness of the face,' 'foaming in the mouth,' or general convulsion as distinguished from partial spasms; and she thinks the benefit '*is owing to the breath coming out of the tube.*' During the last week of December, and the first two weeks of January 1852, the patient had three fits; but all of them were comparatively mild. One of them, stronger than the others, came on during the time (about ten, p. m.) that they were searching for the tube, which had fallen out of the throat. She has since lost the tube out of the throat again; but nothing then took place. When seen, January 1852, she came down stairs to open the door herself, and the re-ascent gave her much difficulty of breathing, and palpitation of the heart. Her countenance was very dusky, and had almost the appearance of one who has been treated with nitrate of silver. This aspect rather subsided, after a short time; but she always has somewhat of a dingy-coloured skin. She has a slight squint, and on her face there are various marks of former falls and injuries; the left eye-lid was bruised, and the conjunctiva ecchymosed from a recent fall. She spoke in a very low whisper; and, on inspiration, a rushing noise was made by the air entering the trachea through the artificial aperture. Moreover, when she spoke with effort, not closing the canula with her finger, there were slight movements of the alæ nasi. There was no irritation about the external wound;

and, when she feels it necessary, she takes out the inner tube and cleans it before replacement. On examination, her lungs and heart appeared to be healthy; her pulse was rather frequent; but her general health was tolerably good; tongue clean, and appetite good. She takes walks occasionally; but a long one generally makes her feet swell, and causes difficulty of breathing.

108 *f*. "Seen about the 10th of February. The patient had had no return of any fits, and was going on well.

108 *g*. "Seen March 10th. She had had one fit on the 26th of Feb. early in the morning, when, owing to previous warnings of 'jumpings,' &c. she was in bed. She has been tolerably well ever since. The fit appears to have been very mild; no foaming at the mouth occurring, although she very slightly bit her tongue."

108 *h*. The perfect remedy afforded by tracheotomy in the former case, *might*, by possibility, be a 'coincidence.' (See § 170.) But the benefit—the escape from *convulsion*—in the second, could not, even by possibility, be so. For attacks of various degrees of severity have occurred, and would, but for the operation, have indubitably led to the *severest*. The proof of the efficacy of the remedial means is, therefore, greater as afforded by the second case even than by the first. The nearer the approach to general convulsion, without its actual occurrence, the stronger that proof. I think the bitten tongue never occurred *without Convulsion*, the livid countenance, and the congested cerebrum, in this world before! The attacks are cut short—short of *convulsion*,—and the relief appeared to the witness of former and of the present attacks to arise from the escape of air through the tube!

108 *i*. Even in an hereditary and inveterate case, this good result has been obtained—the seizure, however otherwise severe, has been prevented

from passing into *Convulsion*. Again, then, I may remind my reader, that it is *not* epilepsy, but convulsion which is prevented by tracheotomy; and the remark may be extended to every kind of convulsion, epileptic, puerperal, and infantile. And it is precisely convulsion which induces havoc in the nervous centres, the cerebrum or the medulla oblongata, with impaired intellect or crippled limbs.

108 *k*. I must again add, that a larger tube and a freer exit for the expired air would have been more effectual still.

108 *l*. It has been proposed as a question whether laryngotomy or tracheotomy be the preferable operation as a preventive of convulsion. My choice of the latter is founded on the following considerations:

108 *m*. First; the textures involved in laryngotomy are more complicated than those involved in tracheotomy. In the latter case, the incision being made through the integuments, and the other tissues, the *veins* included, being *pushed aside*, nothing remains but the simple cartilaginous rings and mucous membrane of the trachea requiring division;

108 *n*. Secondly; the movements of the trachea are far less, and less complicated, than those of the larynx, in various acts, as of deglutition; &c.

108 *o*. Thirdly; if inflammatory action spread from the orifice, it may, in the case of laryngotomy, implicate the important tissues of the larynx;

108 *p*. The orifice in tracheotomy is also made at a more convenient spot, in regard to dress, than in laryngotomy.

108 *q*. It must be remembered that, in the case in question, many months, and even years, may elapse during which the tube is worn without intermission.

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POSTSCRIPT.

Further Remarks on Tracheotomy.

236. I THINK it right to state, or rather to repeat, for various reasons, that it is not *for Apoplexy*, or for *Epilepsy*, that I recommend Tracheotomy; but for *Laryngismus* with *laryngeal dyspnœa*, whenever this occurs, whether in Apoplexy, or Epilepsy, or congeneric disease, as the *cause* of danger to life, mind, or limb.

237. There are many cases of Apoplexy in which there is no stertor, no laryngeal dyspnœa. There are many cases of Epilepsy in which there is no laryngismus. In neither of these cases can tracheotomy be viewed as appropriate. This is self-evident.

238. But there are cases of simple Apoplexy in which, as M. Andral observes, in regard to other forms of apoplexy,—" C'est véritablement par la gêne de la respiration que succombent les sujets frappés d'hémorrhagie cérébrale, dans le cas où l'attaque est forte," &c. (See § 98.) And there are cases of Epilepsy in which Laryngismus and violent expiratory efforts, or dysecpnœa, are the source of all the subsequent events—the purple face, the congested brain, and the general convulsion. In these, tracheotomy presents a remedial measure of great and even vital importance.

239. In the prescription of this measure, we must be entirely guided by an *accurate Diagnosis;* and this is not always an object of easy accomplishment. A faulty diagnosis must, in this, as in every case, lead to an unsatisfactory result.

240. There must also, in every case in which tracheotomy is resorted to, be sufficient hope and expectation to justify the operation: not only must *life*, or *mind*, or *limb*, be in jeopardy, but there must be good and sufficient reason for hoping that they may be spared.

241. For this reason, apoplexy or epilepsy *of organic origin*, or in which organic changes have taken place, would not present the appropriate case for tracheotomy. The same remark applies to hereditary, congenital, or inveterate cases. In apoplexy, it will be essential to distinguish the case of *congestion* from that of effusion; and it must be *seen* that the laryngeal dyspnœa, or stertor, *is* the formidable symptom. In epilepsy, it must also be *seen* that the laryngismus, as the fulcrum on which expiratory efforts, or dysecpnœa, exerts itself, *is* the real source of the 'nigrities faciei,' cerebral congestion; &c.

242. The *simplest* case of apoplexy is that which follows a fit of epilepsy. If this be extreme; if there be heavy laryngeal stertor; if there be, as in Mr. Cane's case, evident danger to life; there can be *no doubt* of the propriety and necessity of instituting tracheotomy, as *the* mode, and the *only* mode, of conferring relief. But if the case be one of '*simple* apoplexy,' in the language of Dr. Abercrombie, or of mere 'hyperémie cérébrale,' in that of M. Andral; and if there be obvious danger, and that danger arise, as M. Andral justly asserts, from stertor or laryngeal dyspnœa, tracheotomy is equally indicated.

243. Mr. Cane's operation both saved the patient's life and preserved him from future attacks of epilepsy. If it had been performed, not at the critical moment it was, but during an interval, still it would have been a splendid achievement; and in *such* a case of epilepsy, tracheotomy is also imperatively called for. By such an operation, all the accidents and dangers of attacks, *in such a case*, would be obviated. By such an operation, one respectable patient—a clerk in an attorney's office—would have

been preserved from amentia and the workhouse, and another—a former pupil of my own—from permanent hemiplegia, or rather spasmo-paralysis of the arm and paralysis of the leg!

244. How many patients have been allowed to die, in cases of apoplectic stertor, whom tracheotomy would have saved! How many patients have been allowed to fall into amentia, whom tracheotomy would have rescued from so dire a calamity!

245. But I repeat, that the proposition to perform the operation of tracheotomy, in these cases, is still but a *suggestion*—still but a *thing of hope*. *Two* cases only of a just trial of this remedy have as yet occurred; viz. that of Mr. Sampson and of Mr. Cane. In the former, as I have said, life was preserved; in the latter, life was saved, *and* the patient was afterwards preserved from future attacks of epilepsy! In a third patient, the case being hereditary, and inveterate, and consisting of attacks of every kind and degree, the affection has been arrested at the epilepsia mitior, or the '*petit mal*,'—the epilepsia gravior, or the '*grand mal*,' with its *blackness of the face*, its *stupor* and its *damage to the intellect*, its '*strong*' *convulsion*, being prevented. In a further case, I fear a just diagnosis was not instituted, and that tracheotomy was performed when no laryngismus and consequent dyspnœa existed.

246. There are most distinctly two kinds of laryngismus: the first paralytic, the second spasmodic. Paralytic laryngismus occurs in apoplexy and in severe apoplectic or comatose affections; spasmodic laryngismus occurs in epilepsy and epileptoid affections.

247. In apoplexy—and by this term I mean apoplexy of inorganic origin,—and in comatose affections in general, the encephalon,—the cerebrum, the cerebellum, and the medulla oblongata, inclusive,—are congested with venous blood, the effect of trachelismus, or of previous spasmodic laryngismus and convulsion; stupor or paralysed cerebrum and intellect,

and stertor, the result of paralysed medulla oblongata, the nervous centre of the pneumogastric nerves, may be the results. This stertor is paralytic laryngismus. It is precisely what was induced in the beautiful experiment of Legallois, of the division of the pneumogastric nerves.

248. Laryngeal dyspnœa is the result, and becomes in its turn the cause of augmented venous congestion of the face, the neck, and the encephalon. The patient is in the most imminent danger; the animal is in a state of asphyxia; the carotids are filled with venous blood; the jugular and other veins are distended.

249. *All these effects are promptly relieved by Tracheotomy!*

250. Spasmodic laryngismus exists in the severer forms of another series of morbid affections,—the epileptoid and epilepsy. Epilepsy may be of the slightest character: it may *consist* in strabismus, or in a momentary vertigo; it may be somewhat severer, with trachelismus, congestion of the veins of the face, neck, and encephalon, stupor, with various and severe spasmodic affections; but be still short of laryngismus, the 'nigrities faciei,' deep coma, and general convulsions; for these latter are essentially linked together, laryngismus being the first and essential link in the chain.

251. *These last phenomena are prevented by Tracheotomy!*

252. The deep purpurescence of the face, the dysecpnœa or violent expiratory efforts, the convulsion, the supervening coma, all the results of laryngismus, are incompatible with tracheotomy. The consequences of these, the loss of mind, the paralysis, the occasional loss of life, are prevented by this measure!

253. I again appeal to the case of Mr. Cane. The patient's life was saved. But that is not all. He has, during sixteen months, had no subsequent attack of epilepsy! But he is in the habit of stopping the tube with a plug, when he wishes to lift a heavy weight or to speak loud.

I predict that on some occasion of this kind he will have a seizure—an event which, however it may be made to appear a failure of the measure, will in reality be a proof of its efficacy.

254. I also again appeal to the case of Mr. Anderson. Amidst attacks of the epilepsia mitior, even to biting of the tongue, and to falling, there has been no attack of "black face," or a 'strong fit' or general convulsion; the force of the attacks appears to expend itself in the rush of air through the tracheal tube!—and this, although the case was hereditary and inveterate, being of twenty-four years' duration in a person of thirty-six, and the tube, as I think, too small.

255. Legallois divided the *recurrent* nerves in a dog of three years old, and the entire *pneumogastric* in others. He observes—"La section des nerfs récurrens l'asphyxia complètement comme les précédens. La sensibilité était sur le point de s'éteindre, et il ne faisait plus que de rares efforts d'inspiration, lorsque je pratiquai une ouverture à la trachée-artère. A la première inspiration qu'il fit, l'air se précipita dans la poitrine par cette ouverture; les carotides de noires qu'elles étaient, devinrent d'un beau rouge, et l'animal se rétablit sans aucun autre secours. J'ai pareillement fait une ouverture à la trachée-artère sur d'autres petits chiens auxquels j'avais coupé les deux nerfs de la huitième paire; l'effet en a été le même, seulement la respiration est demeurée un peu plus haute qu'après la section des récurrens*."

256. Legallois adds—"J'avais coupé les nerfs vagues à un petit cochon d'Inde né seulement depuis quelques heures; il mourut au bout d'une heure. Aussitôt, pour terme de comparaison, j'en pris un autre de la même portée, auquel je ne coupai que les deux récurrens. Cinquante minutes après cette opération, la dyspnée étant devenue, par degrés, in-

* Œuvres, Paris, 1824; p. 172.

tolérable, il tomba sur le côté ; il paraissait mourant. Je fis alors une ouverture à la trachée-artère ; la respiration se rétablit d'elle-même, et il se remit assez vîte. Dix-huit heures plus tard, il était aussi bien portant, lorsque je lui fis la section des deux nerfs vagues : il n'y survécut que trois heures et demie*."

257. Now *simple* apoplexy may be regarded as inducing paralysis of the pneumogastric nerve, by pressure or counter-pressure on the medulla oblongata, *all* its branches included. The asphyxia, the effect of the partial closure of the larynx from paralytic laryngismus, is obviated by tracheotomy. But the rest of the pneumogastric, its pharyngeal, its pulmonary, cardiac, and gastric branches are in a state of paralysis. What ultimate good can therefore result to the patient? Why save him from a first asphyxia, if he must die from a second, from a failing circulation, or from inanition? In reference to this question I have a most interesting observation to make :—

258. The stertor,—the dyspnœa involved in this partial paralytic closure of the larynx, induces *augmented* coma and apoplexy. This, besides the asphyxia, is relieved by tracheotomy;—the paralytic state of the pulmonary, cardiac and gastric branches of the pneumogastric are relieved in their turn :—and the patient's life is saved! So it happened in Mr. Sampson's and Mr. Cane's cases.

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259. Finally, I have frequently thought that we might induce simple apoplexy in animals by alcohol, or narcotic poisons, so as to present the character of danger from stertor or paralytic laryngismus, and institute tracheotomy, and accurately ascertain its power to save life ;—and laryngeal

* Ibid. p. 173.

epilepsy, by means of strychnia given in small but repeated doses, and instituting the same operation, ascertain its power over *general* convulsion. Or dogs subject to epilepsy—and these domestic animals are very liable to this malady—may be made the subject of this experiment.

260. Such an inquiry would be a little more worthy of our profession than useless and pitiable criticism.

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261. I conclude—1. that if there be simple apoplexy or congeneric affection, with stertorous dyspnœa, the obvious source of imminent danger, tracheotomy may save life,—as in Mr. Sampson's and Mr. Cane's cases;—2. that if there be distinct epilepsia laryngea, the violence of the fit depending on closure of the larynx, and violent ineffectual efforts at expiration—i. e. or spasmodic laryngismus, with dysecpnœa,—this '*grand mal*,' with its consequences and danger to life, mind, and limb, may be obviated by this same operation.

262. Time, and cautious and candid trial, are required to ascertain the degree of value of my suggestion. I repeat that it is but a suggestion—but a thing of hope; but that hope is fervent and enthusiastic.

263. The case must be one of peril—to life, or mind, or limb; there must be the "dignus vindice nodus;" it must admit of cure, not being organic or inveterate; it must be viewed through a *just and adequate Diagnosis;* it must be really—*laryngeal.*

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264. One concluding observation. The proposition for the institution of tracheotomy for the relief of other cases besides those of disease, or injury, or accident in regard to the larynx or trachea, was made by an American physician, the late Dr. Physick, of Philadelphia: that distin-

guished physician *suggested* tracheotomy as a remedial means in hydrophobia, having observed the laryngismus which takes place in that most formidable of maladies. Dr. Herbert Mayo extended the proposition to tetanus. To Mr. Sampson belongs the honor of having *performed* this operation in a case of comatose affection; and to Dr. Johnson, that of having performed it in a case of laryngismus stridulus. All these gentlemen were, I believe, influenced by the *appearance* of the patient in these several affections, and limited their views to individual cases.

265. My proposition is the suggestion of *Physiology* and *Pathology*. It is also a *generalization*. It has saved one life, and rescued the poor man from dire epileptic attacks: *I know of no case in the annals of medicine of deeper interest.* And it has converted the epilepsia gravior, in another case, into the epilepsia mitior!

POSTSCRIPT II.

On the Relation of Apoplexy and of Epilepsy to the Pneumogastric Nerve.

266. THERE is no physiological experiment which has been so frequently performed as that of dividing the pneumogastric nerves; none on which the opinions of physiologists have been so variable as to the special *effects* of that operation.

267. Willis was of opinion that the fatal result which followed the division of the pneumogastric depends on its effects on the actions of the *heart;* Haller and Blainville concluded that the influence of the division of these nerves acts principally in impairing the functions of the *stomach;* Dupuytren and Provençal ascribed the death which followed this experiment to *asphyxia*, whilst it was observed that the bronchia became clogged with bloody mucus, and the lungs engorged with blood. The *heart*, the *lungs*, the *stomach*, were selected as the seat of the cause of death respectively.

268. To Legallois we owe the discovery of the influence of the conditions of the *larynx* in this experiment. He observed by accident that the division of the *recurrents* only, proved fatal in some animals as speedily as that of the pneumogastrics, in which the recurrents are included.

269. To the influence of impaired action of the heart, the lungs, and the stomach (and I think no exclusive view should be taken of the subject), that of the affection of the larynx, and that of the pharynx and œsophagus, must, in fact, be added.

270. But these are precisely the organs and functions affected in Apoplexy!—and in the second stage of some cases of Epilepsy!

271. Stertor; tracheal, and bronchial, and crepitant rattles; dysphagia; slowness, irregularity, and quickness with feebleness of the pulse; gastric distension and other derangements,—follow upon the apoplectic or the epileptic stupor or coma.

272. The engorged and tumefied condition of the brain induces counter-pressure on the medulla oblongata, paralysing its functions and those of the pneumogastric nerves, of the arcs of which it is, as it were, the key-stone. The patient is reduced to the condition of the animal in which the pneumogastric nerves have been divided!

273. There is especially, with the stertor, augmented congestion of the brain, augmented coma, and, if I may so express myself, augmented stertor; and with these, augmentation of all the symptoms and all the perils of the case.

274. But this laryngeal stertor is relieved by tracheotomy! And with this relief, follows relief to all the symptoms,—and life may be saved!

275. Both in animals in experiment, and in man in comatose disease, this relief has been observed to be prompt and effectual. I refer my reader to § 255, p. 61; and to the cases of Mr. Sampson and Mr. Cane, §§ 102—, 108—.

276. We are brought by these remarks to the case of paralytic laryngismus, or laryngeal stertor, and to its remedy, tracheotomy.

277. But there is, in the first stage of Epilepsy, another form of laryngismus, the spasmodic. Seen in its simplest form in *choking*, this symptom occurs in epilepsy, in puerperal convulsion, in the laryngismus stridulus, and in the convulsions of infants, variously and in greater or less degree, the larynx being more or less closed. This closed larynx becomes the *fulcrum* on which, in the severe cases, the *efforts* of convulsion, and the

effects of these in congestion of the brain, and, in their turn, the dire *effects* of this, depend. Life, mind, limb, are endangered. Tracheotomy affords the safety valve!

278. I conclude, then, that this measure deserves a cautious trial,—first, in the paralytic laryngismus of simple or inorganic apoplexy and other comatose affections; and secondly, in the spasmodic laryngismus which may occur in the first stage, and the paralytic laryngismus which may occur in the second or comatose stage of epilepsy.

279. In epilepsy, the *heart* is sometimes affected with violent *palpitation;* sometimes so enfeebled as to lead to the *syncopal* forms of that malady.

280. Sometimes there are *tracheal* and *bronchial* rattles.

281. Sometimes the *gastric* and other secretions are abnormal.

282. I propose to illustrate all these views by careful experiment and observation. All depends on the *Diagnosis.* I intend to *imitate* diseases by inducing definite lesions in animals, thus producing pure *Types* of such diseases; then cautiously to observe every symptom and the effect of this heroic remedial measure: and I think I shall be more worthily employed in endeavouring to extend the boundaries of our Science and our Art, than in vain and vapid criticism and opposition.

283. Medicine will be much raised when disease is viewed by the light of physiology; and when we cease from detraction, learn to respect each other, and exemplify the well-known immortal words of the immortal Harvey.

284. I conclude this *Postcript* by adducing the following brief remarks from the second series of my "Observations and Suggestions in Medicine," published in 1846:

285. "A short time ago I carefully examined a case of hemiplegia.

I stated it as my opinion that the patient would die. Not many days afterwards, I visited another case: the hemiplegia was as decided; yet I prognosticated that the patient would survive.

286. In both these cases, the face, the tongue, the arm, and the leg, were completely hemiplegic. This paralysis is an affection of the *cerebral* system. But, in the first case, the *spinal* system was involved in the attack, and, in spite of every proper remedy, the symptoms of spinal affection continued unremoved: there were dysphagia, dyspnœa,—defective action about the larynx and pharynx. In the second, the spinal system was spared.

287. Is it not interesting, at least, and something of a rather higher order than mere empiricism, to observe and trace these *physiological* phenomena?

288. If the case be limited to the *cerebral* system, the patient survives. If, with the cerebral, the *spinal* system be involved, and if this spinal affection does not speedily subside under the influence of the proper remedies, the prognosis is unfavorable, if not fatal.

289. I was taken recently, by my friend, Dr. Webster, of Dulwich, to see a patient who, shortly before, had suffered from an attack of an epileptic character. He had recovered in every respect but one. On carefully listening to the posterior part of the thorax, I discovered a diffused but distinct mucous rattle. It was *bronchial*, without being *bronchitic;* for the patient had had no bronchitis. It was the *death-rattle*, not in the trachea, but in the bronchial tubes. It most probably arose from compressed pneumogastric nerves."

290. I recently, July 9, 1852, observed similar tracheal and bronchial rattles after an alarming fit of epilepsy.

POSTSCRIPT III.

An Experiment; a Case of Puerperal Convulsion.

291. From the same work I make the following extract:

292. "THE dura mater is supplied by the trifacial nerve. See Arnold's Icones, Tab. II. I was anxious to determine whether, being so provided with a nerve usually excitor, this membrane was, in fact, in itself excitor; and I performed the following experiment, with Mr. H. Smith.

293. The application of the results of this experiment to the diagnosis of diseases within the cranium will be obvious. But it requires to be carefully and cautiously traced.

294. Injuries and diseases of the dura mater, and probably of the other membranes of the nervous centres, and diseases affecting them secondarily by irritation or pressure, may be attended with spasmodic affections. This is the important fact.

295. June 10, 1841. We removed a portion of the cranium of a spaniel dog, just over the *left* hemisphere of the cerebrum.

296. We made pressure—gradually augmented: the dog became quiet, appeared to sleep; the eye-lids closed; the breathing became audible, stertorous, slow, sighing, the pupils contracted; at length, spasmodic twitchings were observed, and, afterwards, continued spasms; the eyes rocked, the tail was drawn, and then all the limbs were agitated and became stiffened.

297. We removed the pressure, but the brain had been torn; the spasms ceased, the breathing became natural, the eye-lids opened, but the pupils remained contracted. The dog was *hemiplegic*, supporting his *right* side against the wall.

298. We repeated this; the result was the same.

299. We irritated the *nostril* and induced *sighing*, sometimes followed by sneezing, sometimes not. We irritated the meatus auditorius externus, and the head and limbs were much agitated. Sensibility was not entirely removed.

300. We removed the cerebrum entirely: the pupils became permanently *dilated*. On irritating the motor oculi, the eye-lids were a little drawn by the corrugator supercilii, and closed and drawn towards the outer angle of the eye; but there was no action of the *levator*. The eyes rocked.

301. On irritating the *dura mater* in various parts, these and other movements were also induced.

302. On drawing the cerebellum forwards, so stretching the medulla oblongata, convulsive movements were induced; but neither laceration of the cerebrum nor cerebellum seemed to induce muscular contraction.

303. When the animal appeared *blind*, approaching the candle induced closure of the eye-lids; as did always touching the eye-lashes.

304. The flow of saliva was constant, and in large quantity.

305. There are, doubtless, analogous facts in diseases and injuries of the head; but they are to this day undistinguished and unacknowleged in practice.

306. I have just carefully observed the case of a gentleman, which combined, in one attack, loss of smell, and taste, and slightly of hearing,

spasmodic affection of the face, and general convulsion. Is not this an example of disease at the base of the brain, compressing the nerves and irritating the dura mater?

307. On the 11th of May, 1845, I witnessed a most dreadful case of puerperal convulsion, admirably, though I fear unsuccessfully, treated by Dr. Bossi, of Hâvre.

308. The eye-lids were wide open, the eyes distorted, the pupil excessively dilated; the tongue protruded, swollen, and deeply livid, and only prevented from being bitten by a cork steadily kept between the teeth; the saliva flowed abundantly. There was absolute insensibility.

309. This state of things was fearfully aggravated from time to time by general convulsion, distorting every feature still more than before and contorting the limbs; the face becoming livid, and the tongue still more livid and tumid than before; the larynx being closed.

310. As the blood flowed, the countenance gradually lost its colour, the tongue its tumidity, and the pulse its power; whilst the paroxysms of convulsion became less frequent and severe, and the *convulsive* actions gradually passed into a state of *apoplexy:* the eye-lids closed, and the patient appeared as in sleep; the tongue was pushed by the nurse into the mouth, within the teeth; and the teeth were kept partly closed by gentle pressure on the chin, by which means the patient was enabled also to swallow the saliva, which had previously, if not allowed to flow from the mouth, obstructed the respiration at the larynx.

311. Let the reader compare this slight detail with that of the experiment, § 294—; and he will be struck with the precise similarity in the phenomena, and he will perceive the advantage of experimental physiology in its relation to clinical medicine.

312. After several hours, I saw the patient again. She had con-

tinued better for a time; but she had then relapsed into convulsions. No progress had been made in the labour. The os uteri remained unchanged.

313. There was every fear of a fatal issue, when I left Hâvre.

314. From the experiment formerly detailed, and from this case, it is evident that a certain degree of pressure on the brain induces mere apoplexy, whilst a higher degree of that pressure induces convulsions and spasmodic affection. Of how great importance is this remark in the diagnosis of cerebral disease!

315. It is evident that, in the case described, the first convulsion, and the relapse into convulsion, were owing to uterine irritation. It was, in fact, uterine or puerperal epilepsy. The convulsions induced the convulsive form of congestion, which was reduced by the blood-letting into the lower and comatose or apoplectic form of that condition of the brain: in the latter case, there is pressure on the substance of the brain; in the former, this pressure exists in a higher degree, so as to induce counter-pressure on the medulla oblongata. It was interesting to observe the wide, staring eye softly close, as in sleep.

316. These effects of pressure and of counter-pressure are general; and the experiment and the case which have been given, present a beautiful example of the fact, that experimental physiology and clinical medicine meet, and throw a mutual and instructive light on each other."

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