CASE
OF
HYDROPHOBIA,
AND THE
APPEARANCE OF THE BODY ON DISSECTION,
FOURTEEN HOURS AFTER DEATH,
WITH SOME REMARKS
ON
THE NATURE AND TREATMENT
OF THE DISEASE.
BY
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Read November 28, 1826.

FROM the time of Cælius Aurelianus, who first accurately described* the symptoms arising in the human frame from the bite of a rabid animal, to the present period, although much has been written on the subject of Hydrophobia, yet no advancement of our knowledge respecting the seat and nature of that disease has been gained, and no method of treating it has hitherto proved successful†. It is not easy to account for the sterility of

* De Morbis Acutis et Chronicis, Lib. III. c. 9.

† Many ancient writers boast of having effected cures; but

a field so assiduously cultivated ; but, as far as regards our own times, much of the disappointment of our hopes may be attributed to the causes stated by Boerhaave, “ inanis jactantia multorum specificorum, et neglectus methodi ex historia mali excogitata.”* Whether the statement of the following case, and the remarks upon it, which I am about to lay before the Society, are calculated to improve our knowledge of Hydrophobia, others must determine ; my object is to attempt such a theory of the disease, founded upon the recorded experience which we possess, as will, at least, enable us to approximate to a decided and methodical treatment of this frightful malady.

CASE.

Augustus Lange, a fine intelligent boy, eight years and a half old, the son of a tailor residing in Pond Place, Chelsea, whilst walking along the street, about nine o'clock in the forenoon of the

much doubt is thrown upon these by the manner in which they are detailed. Thus, Galen, who asserts that pulvis cancri *fluviatilis* had effected cures, says that it is to be prepared by burning the crabs alive on a plate of copper, after the rise of the dog-star, or when the Sun enters Leo ! Fulgosius, who regards the dog-rose (*κυνόρροdon*) an infallible remedy, reports that the secret was revealed to man from Heaven in a dream. *Gemma Cosmocris.* Lib. V. cap. 6. Palmarius relates a case of Hydrophobia in several children of the same family, to whom, he says, the disease was communicated by the father, who was dying of it, kissing them just before he died. *De Morbis Contagiosis*, p. 166.

* Aphor. 1141.

28th of September, 1826, was attacked and bitten on the naked hand by a cat which suddenly rushed from a house *. The body of the cat having been destroyed soon after it bit Master Lange, was dissected and examined by Mr. Gaskell, surgeon to the parish of Chelsea, and from the appearances which presented themselves, that gentleman was satisfied that the animal was rabid. The wounds caused by the bites, three in number, two on the back of the hand, and one on the back of the thumb, were freely excised at noon, on the day after the accident, and were completely healed in nineteen days. On discharging the patient, Mr. Gaskell imposed strict injunctions upon his father to apprise him, immediately, if any unfavourable symptoms should supervene.

On the 7th of November following, twenty days after the wounds were healed, Mr. Gaskell was desired to visit Master Lange at ten o'clock in the forenoon. He was informed that the boy had been

* Many instances are recorded of the disease being produced by the feline species. See Lusitanus de Prax. Admir. Lib. III. Obs. 87. Schenkus, Lib. VII. Obs. 9. de Ven. ex Animal. Amat. Lusit. Cent. VII. Curat. 65. Baccius in Prolegom. Ven. et Antid. p. 16. The following experiment demonstrates that it may occur spontaneously in cats. Professor Rossi confined a cat during four days without meat or drink. On the evening of the fourth day, two dogs were introduced into the room; the cat bit them both, the one on the nose, the other on the back. They both became rabid. Edinburgh Journal of Medical Science. Vol. III. p. 202.

taken ill on the 5th ; but, as his disease was considered to be a simple cold, no particular attention had been given to it. Mr. Gaskell found his little patient in a state of great agitation and alarm, and impressed with the idea that he could not drink, nor even endure the sight of water ; and the mere mention of it produced convulsions in the muscles of deglutition and respiration. His pulse was 120 ; his tongue covered with a brownish fur ; his eyes were wild, and the whole countenance indicated extreme anxiety and distress. When exposed to a current of air he was instantly affected with convulsive sobbings. He frequently placed his hand upon his stomach, where he said he felt pain ; and he complained of pains also in the elbow and the shoulder of the arm, the hand of which had been bitten ; yet the cicatrices of the wounds, which had remained easy since they were healed, were not now at all painful, even when they were pressed. Perceiving that the sight of various kinds of food, which were in the room, did not affect the patient, Mr. Gaskell persuaded him to eat a small piece of toasted bread, which he swallowed easily, and to take a little warm gruel in a teaspoon, but this was swallowed with difficulty, and he complained that it was cold. To obviate this objection, some hot water was added to the gruel, and he was urged to swallow a few more tea-spoonfuls, which was not effected without a great effort. A little gruel being spilt upon his lips and chin, he

was slightly convulsed, and he again complained of the coldness of the gruel.

As the bowels of the boy had not been moved since the previous day, Mr. Gaskell ordered him to take, directly, a powder, consisting of three grains of Calomel and seven grains of Jalap, and to repeat it every fifth hour, until he should have been freely purged. Mr. Gaskell also enjoined quiet, and a strict antiphlogistic diet. He now requested my assistance in the treatment of the case.

At three o'clock, p.m. I accompanied Mr. Gaskell to the residence of the little sufferer. He was in bed. On our entering the apartment, he turned upon us a countenance strongly expressive of terror and anxiety. He complained greatly of the uneasiness caused by the agitation of the air on opening the door of the room, adding, that "it took away his breath"; and he spoke in a hurried manner, in the midst of sobbings, resembling those convulsive respirations which are often experienced on going into the cold bath. These returned whenever the air was agitated by any one moving in the room, and were produced in a slighter degree when I blew gently upon his face without his perceiving what I was doing. His intellectual faculties were perfectly active, and he answered the questions put to him readily and sensibly. He said that he was now free from pain;

but that he could neither bear any cold air to blow upon him, nor any person to breathe upon him, as under either of these circumstances a sense of suffocation was induced. The convulsive sobbings were renewed even upon the mention of water; and when it was brought to him in a cup, he averted his face and requested that it might be taken away. The same antipathy was displayed towards a cup of gruel, yet he complained of thirst, and took gruel readily from a tea-spoon; but it was swallowed in a hurried manner, and with a convulsive effort, whilst his eyes seemed starting from their sockets. The pupils of the eyes were dilated, but were sensible, although not offended by the impression of light. The tongue was coated with a white mucous fur. The bowels had been moved three times by the Calomel and Jalap which Mr. Gaskell had prescribed. The pulse was 120, but was neither hard nor full.

On examining the parts which were bitten and excised, the cicatrices appeared fuller than they ought to have been, but they were not more florid than usual; there was no inflammation around them, nor were they painful on pressure.

As it was important to fix, at once, the method of treatment to be pursued, and as Mr. Gaskell agreed with me, that it would be only productive of loss of time to adopt any measure which had been tried and had failed, we determined to try

Opiate frictions externally, on the ground that Opium often exerts a more powerful influence in allaying irritation, removing spasm, and producing sleep, when applied to the surface, than when taken into the stomach; and we agreed at the same time to administer the Hydrocyanic acid, in as large doses as the strength of the little patient would permit. The following liniment was therefore prescribed:—

R Opii ʒij

Olei Olivæ fʒiij

Tere optime, ut fiat Linimentum, cujus fʒss,
spino dorsi et thoraci, 3tiâ quâque horâ, fricanda.

The bowels were ordered to be kept open by means of a powder containing five grains of Calomel and one-fifth of a grain of Tartar-emetic, to be taken every sixth hour.

Nine o'clock, p.m.—Our little patient appeared more composed than at our former visit. He had taken two of the powders; the bowels had acted freely, and the last stool was slimy, of a dark olive hue, and very foetid. He was greatly oppressed with flatulence, which frequently induced the sensation that the bowels were about to act, but wind only was passed. His pulse, at the commencement of our visit, was 120; but in an hour afterwards, it rose to 138, apparently from his being hurried by the questions which we put to him: it was soft throughout. The convulsive sobbings

were less violent, but were still induced, if his mother's breath fell upon his face, or if any one touched him. He had been twice rubbed with the liniment, to the use of which, however, he objected, as it excited convulsions in the same degree as cold air. He complained of slight headache; and his mother stated, that frequently he exclaimed that he could not breathe, and prayed to have the door open; and at other times, he complained with equal bitterness of cold. She stated also that he could not lie down without the convulsions recurring, although, from feeling very drowsy, he was desirous of going to bed; that he could not remain long in one position, but frequently demanded, in a quick, peremptory manner, to be instantly placed in a different position; and he would cling frequently to his mother's neck as if he dreaded something; yet, when questioned respecting the cause of his alarm, he replied that he knew not what made him afraid. The head was not hot; the skin was soft, and of a moderate temperature. I persuaded him to take a few teaspoonfuls of gruel, which were still swallowed with such an effort that the whole powers of volition seemed to be directed to the muscles of deglutition. He did not spit at this time, nor did there appear to be an increased secretion of saliva. The use of the Prussic acid was postponed.

8th of November, eight o'clock, a.m.—Our patient was out of bed, sitting on his mother's knee.

He had slept for three quarters of an hour during the night ; and when questioned as to the state of his feelings, he said he was better, that the headache had left him, and that he was free from all pain. His countenance was more composed than on the preceding evening ; and although the convulsive sobbings were still excited by the least agitation of the air, yet they were less severe than yesterday. His bowels had acted six times during the night : the motions were scanty, but more natural in aspect ; the urine was not high coloured, but clear, and sufficient in quantity. His head was cool ; the skin agreeable to the touch, both as to softness and temperature. The tongue was still much furred, but clean at the edges, which were very red ; and the pulse was soft, and only ninety-six. A blister had formed on the inside of his lower lip, which teased him ; but he was otherwise cheerful, and his mother said that he had been singing, according to his usual custom, early in the morning. He had also requested that some fluid might be given to him during the night, but he would take it from a tea-spoon only. I requested him to take some gruel, to which he assented, but the idea produced a slight attack of the sobbings ; and he still swallowed the gruel in the same manner as before, but neither so eagerly nor with so much apparent effort, nor with so great a protrusion of the eyes. Touching the face with a finger still excited the convulsions, but less strongly than during the last night.

On account of the apparent improvement, the use of the Prussic acid was postponed ; but the opiate frictions were directed to be employed every third hour, and a few drops of the compound spirit of Ammonia in a tea-spoonful of Camphor mixture to be taken as often as the patient would be prevailed upon to take the mixture.

Eight o'clock, p.m.—The patient took one dose only of the spirit of Ammonia, and was violently agitated after taking it. He has been, indeed, extremely restless since taking it, complaining sometimes of cold, sometimes of heat ; and at one period he said he was so hot that he wished to go out into the street. He is still greatly distressed if his mother, on whose knee he sits almost constantly, breathe on his face ; and is ever anxious to change his position. Sometimes he will stand, sometimes be seated ; now desiring to be placed in a chair that his back may be supported, and yet, in a few minutes after expressing his satisfaction at being so placed, and saying, “yes, that will do”, again returning to his mother’s knee. He starts frequently ; gazes timidly around ; says that he hears bells ringing in his ears, then sighs and exclaims “Oh, mother !” In the afternoon he had a degree of delirium accompanying the paroxysms of convulsions, during which he spoke frequently, and with horror, of the cat by which he was bitten, and threw about his arms in a manner which frightened his parents ; and his mother

fancied that he had snapped at her. He had been perfectly sensible between the paroxysms, and had requested his mother to be careful lest he should do her some injury in his struggles.

He has had several scanty stools since our former visit; the urine is milky, and he is still much oppressed with flatulence. He has had no sleep, and has complained occasionally, even during this visit, of his head; yet, when I inquired where he felt pain, he replied "nowhere." The pulse was 120, small and sharp, and intermitting once in every twenty beats. I poured some water from a tea-kettle into a jug, and from this into a basin, during which he averted his head with an expression of horror, and requested that I would not do so again, as he could not bear to see water, for it made him cold. His tongue was more coated than in the morning, and he complained of thirst, asking frequently for warm gruel, which he would not take, however, except from a tea-spoon, nor until after his mother had tasted it, in order to ascertain if it were warm. He took a tea-spoonful of gruel whilst he was standing on the floor, but before tasting it he desired his mother to raise the spoon above his eyes; then opening his mouth to receive it, said "now", and swallowed it as if he would have bitten the spoon in two, and was instantly so much convulsed that he must have fallen to the ground if he had not been supported. He says that when he attempts to drink any cold li-

quid, it causes a severe but transitory pain under the sternum. His bowels have been less disturbed, and they are not tense.

Mr. Gaskell and myself agreeing that the use of the Prussic acid should no longer be delayed, we directed one drop of it to be given in a teaspoonful of gruel every fifteen minutes. After the first dose, which Mr. Gaskell administered to the boy, the convulsions were evidently diminished in power, and the patient felt so much easier, that he requested to have another dose of it, even before ten minutes had elapsed. Another dose was given; and was followed by a similar degree of relief; it was therefore ordered to be continued; and with the view of procuring sleep, the following enema was directed to be administered at midnight.

R Opii ʒj,
Olei Olivæ f3vj,
Olei Succini f3ij,
Decocti Avenæ f3iij :
M. ut fiat Enema.

The pediluvium was also ordered to be used.

9th November, 8 o'clock, a.m.—The enema was not administered, nor was the pediluvium used, for our poor patient expressed so much horror at the sight of the water, that he could not be prevailed to put his feet into it. Mr. Gaskell saw him at ten o'clock, at which time he had taken six drops of the Hydrocyanic acid. He remained some time

with the boy, and gave him two drops more ; and ordered his assistant, Mr. Harness, to see him at midnight, and to give him fifteen drops of tincture of Opium, if he appeared restless. This opiate was given, and was twice repeated in the course of the night, but it produced no sleep, and the poor sufferer was alternately in and out of bed twenty times. No convulsive sobbings recurred, however ; and he drank freely towards morning, from a cup, for the first time since he had been ill.

On entering the apartment, I was struck with a change in the countenance of the boy. His features were composed, and the eye was natural ; but his face was pale, the cheeks were of a purplish hue, and the lips livid. The pulse was 130, and so small as to be scarcely felt ; yet he replied promptly to every question, and his arms and legs were in constant motion, not spasmodic but voluntary. He was now, however, unable to stand without support, and was so irritable and impatient that he kept his father and brothers in constant employment, in complying with his numerous whims. His tongue was rapidly becoming cleaner, and his bowels were much less irritable : the urine, however, still deposited a copious white sediment. The hydrophobic symptoms had rapidly abated ; he could drink freely, with very little convulsive agitation, from a tea-cup, and complained less when he was breathed upon ; and although he said that he felt uncomfortable when his head or face was touched, yet

this was not followed as before, by the convulsive sobbings.

The state of the pulse, the pallidness of the face, and the cold, clammy state of the hands, determined us to discontinue the Prussic acid. Our patient was ordered to take a table spoonful of strong white wine whey every half hour, until the pulse should rise; and to take Beef-tea, and any light article of diet, ad libitum.

Twelve o'clock, noon.—Mr. Gaskell, in visiting him at this hour, found him in a restless state, which had induced his parents to repeat the Hydrocyanic acid, contrary to our orders. He had eaten six oysters and some toasted bread; had drunk freely of the wine, and also of some porter. Mr. Gaskell gave him fifteen minims of Laudanum, and strictly forbade the repetition of the acid.

Four o'clock, p.m.—I visited our interesting patient, accompanied by Mr. Gaskell. He was perfectly composed, and free from every hydrophobic expression. His pulse was still feeble, but he could support himself better than in the morning; his tongue was cleaner, and his countenance was in every respect natural. He drank some wine out of a cup, without the least convulsive effort, and said that he felt quite well; and indeed our hopes of the favourable termination of the case began to

brighten. The wine and light diet were ordered to be continued.

Eleven o'clock, p.m.—The gleam of hope which had dawned in the early part of this day, vanished the moment I entered the apartment; for every bad symptom had recurred, and the convulsions were now general, and returned every two minutes, without any obvious exciting cause. They began, generally, with a sudden start and wild look; then tossing about of the legs and arms ensued, terminating by the face being bent down almost to the feet, or emprosthotonos, and by an attempt to bite his own clothes. These symptoms did not recur until seven o'clock in the evening, and they have gradually increased in violence. During the convulsive paroxysms, there was evidently delirium; but the attention could instantly be roused. Whilst it continued, he generally used the expressions: "See, there it goes! put it out;" and on being asked "what he wished to be put out," he replied, "the mad cat." During the intervals of these paroxysms, which, unless brought on sooner by the sight of water, returned every four or five minutes, he was perfectly collected. An excessive secretion of tenacious mucus was now constantly hawked up from the throat, and spit about the room. The struggles, which were often so violent that his father could scarcely hold him, were nevertheless lulled when a drop of the Prussic acid, in a tea-

spoonful of gruel, could be forced into the stomach, and the interval was more composed and extended. The pulse was scarcely perceptible.

We agreed to continue the acid, to support the *vis vitæ* with wine, given as frequently as it could be got down, and to continue the opiate frictions, which had been used throughout. He had had no sleep for upwards of forty-eight hours, and the convulsive paroxysms continuing to increase in frequency, until there was scarcely any intermission, except after the exhibition of the Prussic acid, he expired at a quarter past two o'clock this morning, the 10th of November. Mr. Gaskell had quitted the house a few minutes only before the event happened. The quantity of Prussic acid taken, was sixteen drops in the eighteen hours during which it was administered. Permission was granted to inspect the body, which was done fourteen hours after death.

Dissection of the Body.

The body, externally, presented no unusual appearance, except an ecchymosis on the lower portion of the face, which might have arisen from the bruises caused by the convulsions. There was, however, a greater rigidity of the extremities than usual, and the body exhaled a peculiar fœtor.

The first object being to examine the state of the spinal cord, an incision was made from the nape of

the neck to the loins; and the vertebræ on each side of the spinous processes being sawn through, the cervical portion, and part of the dorsal portion of the medulla spinalis, were exposed. The whole of the cellular membrane between the theca vertebralis and the parietes of the canal was loaded with suffused blood, which, in several places, lay in black coagula. See *a. a. a. a.* fig. 1. Six inches of the cord, from the third cervical vertebra to the fifth dorsal, being removed, and the dura mater slit up, the vessels of the spinal cord were seen turgid, *a. a. a.* fig. 2., particularly those which accompany the dorsal nerves.

On opening the cranium, the meningeal vessels were more turgid with blood than is usual, but certainly not so great as to indicate inflammation; nor were there any bloody points seen in the divided substance of the brain, such as present themselves in states of previous great excitement of that organ. The ventricles were empty: the choroid plexus rather more turgid and darker coloured than common; and, on the base of the brain, particularly in the pia mater covering the pons Varolii and the medulla oblongata, there were evident symptoms of inflammation having affected that membrane. The lungs were gorged with dark-coloured blood, but in other respects healthy; as was also the heart and the pericardium. The vessels accompanying the left phrenic nerve were turgid with blood; those of the right perfectly natural.

The larynx displayed a slight blush, which deepened on the outer surface of the epiglottis, and still more so in the inner surface. The lining membrane of the trachea was also slightly redder than usual. The pharynx shewed evident traces of inflammation; but there was no unhealthy appearance in the œsophagus. There were several patches of ecchymosis in the stomach; the liver, spleen, pancreas, and intestinal canal were apparently in a healthy state.

REMARKS.

IN this case, as in all the recorded cases of disease arising from the bite of a rabid animal, a considerable time elapsed between the infliction of the wound and the appearance of the hydrophobic symptoms. Reflecting on this fact, two queries present themselves to the mind, respecting the state of the virus in that interval: 1. Whether any change of action, sufficient to generate a poison similar to that left in the wound, takes place in the vessels of the part? 2. Whether the virus be absorbed into the system immediately before the accession of the disease?

I am not aware that any experiments have been instituted to ascertain the object of the first query; and if, in the absence of facts, we may reason from analogy, I am disposed to doubt the accuracy of

those observations by which it has been inferred, that a fluid is deposited under the cicatrix. Nothing of this kind was found on the most careful examination, in the case before us; and, if we reflect that, in inoculated Small-pox and Cow-pox, in Scabies, in Syphilis, and in other diseases, excited by the introduction of morbid poisons into the system through the skin, a *specific* time elapses, in every instance, between the inoculation and the formation of the constitutional disease*, whilst the interval after the bite of a rabid animal, and the commencement of Hydrophobia, scarcely agrees in any two cases, we cannot surely refer the operation of the rabid virus to the same laws that regulate the production of disease by the inoculation of other morbid poisons. Are we then to suppose, that the virus lies dormant during the whole of the interval, until a very short time previous to the appearance of the hydrophobic symptoms, and is then absorb-

* Lusitanus (de Prax. Admir. Lib. iii. Obs. 87), relates a case of Hydrophobia occurring in two children, four years after they were bitten by a rabid cat. Lusitanus (ibid.) and Schenkius (de Ven. ex Animal. Lib. VII. Obs. 9), relate cases of the disease having been caused by the wound of a sword, with which a mad dog had been killed years before! Albertus Magnus (Lib. VII. C. 2.) mentions a fatal case occurring seven years after the bite; and, what is remarkable, the part then inflamed: and Dr. Bardeley (Manchester Memoirs, Vol. IV.) one after twelve years. Many cases are recorded, in which the interval was from three weeks to six months. In the case detailed by Dr. Marcet, Vol. I. p. 132 of these Transactions, the period was two months. It is unnecessary to enumerate more cases; but, if the recorded instances be correct, the range is from three weeks to twelve years.

ed? Many authors, among whom are Dr. Darwin* and Dr. Percival†, have doubted whether the virus be absorbed; and certainly, with a few exceptions, the recorded cases do not state that the lymphatics or their glands were affected. In an interesting case, which fell under the care of Dr. Brandreth, of Liverpool‡, although the cutaneous nerves upon the inner side of the arm were inflamed, yet neither the absorbent gland at the inner side of the elbow, nor the axillary glands, nor the absorbents leading to them, were altered in any respect. Indeed, the whole lymphatic, arterial, venous, and glandular systems, were apparently free from disease, and the nerves only affected. The branches of the cutaneous nerves upon the inner side of the arm, leading up from the cicatrix, have, in several instances, been found in a state of inflammation§; a fact which, were it always observed, would readily explain why the disease has uniformly commenced with pain in the bitten limb or part. Dr. Percival, in maintaining that no absorption takes place, inquires whether all the symptoms induced are not of the nervous and spasmodic class? Or do any marks appear in the human kind, of a specific vitiation of fluids||? It is difficult not to accord with these remarks, especially when we reflect that, as

* Zoonomia, Sect. xxii. 33.

† Lond. Med. Journ. 1789, p. 299.

‡ Edin. Med. & Surg. Journ. Vol. XXIII. p. 235.

§ Professor Autenreith, Diss. de hactenus Prætervisa Nervorum Illustratione in Sectionibus Hydrophoborum. Tub. 1802, p. 13. 18. See also Edin. Journal, Vol. XXIII. p. 235.

|| Lond. Med. Journ. 1789, p. 299.

far at least as refers to the hydrophobic symptoms of the disease, the dread of fluids, and the convulsions attending deglutition, not only occur in sympathetic Hydrophobia, where no virus has been absorbed, but sometimes even in Tetanus. Thus in a case of Tetanus, detailed by Dr. Currie, of Liverpool, the sight of fluid “produced evident distress; and if it was advanced towards the mouth of the patient, it never failed to bring on convulsions.”* Similar instances of hydrophobic symptoms in Tetanus are recorded by Dr. Darwin†, Dr. Rush‡, and by several other writers.

But it may be demanded, by those who maintain that the virus is absorbed, why the effectual excision of the part, immediately after it has been bitten, is almost a security against the disease; whilst, if this operation be delayed for twenty-four hours, as in the case under consideration, it cannot be depended upon as affording the same security? There is, certainly, some difficulty in replying to this question; but, if it cannot be answered, it may be met by another interrogation. Where, I demand, if absorption take place so soon, does the absorbed virus lie dormant in the system, sometimes for years? It cannot enter the circulation, and remain in it; nor is it likely to lie so long inert in the glandular system. It should also be mentioned, that cases have occurred in which the disease has

* London Med. Journ. 1789, p. 299.

† Ibid.

‡ Rush's Essay on Hydrophobia.

not appeared, although the bitten part was not excised until twenty-four hours after the wound was inflicted; and, in one case, Professor Autenreith amputated a limb five days after the bite, and the disease did not supervene*. The subject is, indeed, one of great obscurity; and in the present state of our knowledge, any solution of the question that might be attempted must be regarded as purely hypothetical; under the conviction of which I would hazard the following conjecture: that the virus remains dormant in the part where it is deposited by the tooth of the rabid animal, until a certain state of habit renders the nerves in its vicinity susceptible of its influence; and this being communicated, a morbid action is begun in these nerves, and extended to the respiratory nerves, which induce the whole train of symptoms constituting the disease.

If the foregoing hypothesis be proved consonant with fact, it would not alter the prophylactic means which are, justly, considered as those only on which we ought to depend,—the complete excision of the bitten parts as soon after the accident as possible; for, although no absorption take place, yet, the virus may spread through the cellular and the muscular matter in the vicinity of the bitten part by the delay of this operation; and some of it being left, owing to its extending beyond the boundary of the excised part, may produce the disease. In

* *Dissertatio de hactenus Prætervisa Nervorum Illustratione in Sectionibus Hydrophoborum.* Tub. 1802.

performing this operation, the use of the cupping-glass, as lately revived by Dr. Barry, should not be neglected ; and, as the best glass for this purpose is that which is exhausted by the syringe, I would suggest the propriety of introducing a piece of moist sponge into the glass, moveable by a wire, passed through a collar of leathers, which would enable the virus to be detached from the wound, if the power of the exhausting glass be sufficient to bring it to the surface. The advantage of employing the cupping-glass, before excising the lacerated part, is indeed so obvious, that we cannot but wonder that it ever fell into disuse. It is recommended by Celsus, “ *Utique autem, si rabiosus canis fuit, cucurbitulâ virus ejus extrahendum est*” * ; and by several other ancient authors. Boerhaave advises a large cupping-glass to be applied to the bitten part † : scarification of the part, and the application of cupping-glasses, are mentioned by Turner ‡, as commended by the best practitioners of his day ; and Dr. John Hunter, in an Essay, which contains both the opinions and the practice of the period of its publication, remarks,—“ Judging from the analogy of some other poisons, the greater quantity that is conveyed into the blood, the more violent will the effects be ; good, therefore, might arise from lessening the quantity. With this view, deep and numerous scarifications might be made where the wound was, and cupping-glasses applied repeat-

* *De Medicina*, Lib. V. cap. xxvii. † *Aphor.* 1141.

‡ *Treatise on Diseases of the Skin*, 8vo. 1712.

edly.”* Dr. Percival, also, in speaking of washing out the virus from the wound, remarks, that it is at this time that the cupping-glass is useful, and it should be repeatedly applied.

Several other prophylactic measures have been strongly recommended, particularly the use of Mercury; and from the success which appears to have attended its employment by continental practitioners, and in India, by Mr. D. Johnson†, it certainly ought to be used when the smallest chance exists that the whole of the bitten part may not have been excised. Turner judiciously recommends the keeping open several blisters, applied to the arms, the thighs, and the legs. From a report of M. Marochetti, of Moscow‡, it appears that great success has followed the Russian practice of opening the pustules, which are said to appear under the tongue, in those bitten by rabid animals, and then cauterizing the parts; and one extraordinary case is detailed by Dr. Rossi§, in which the disease, after it had appeared, was checked by this operation. But, notwithstanding these authorities, I confess that my confidence in the practice is by no means considerable.

The diversity of symptoms which the disease ex-

* Trans. of a Society for the Improvement of Med. & Surg. Knowledge, 1793. p. 323.

† Med. Chirurg. Journ. No. 4.

‡ Edin. Journ. of Med. & Surg. Vol. XIX. p. 152.

§ Annali Universali, June, 1825.

hibits, has been commented upon by Morgagni *; but, nevertheless, some symptoms are universal, and if the pathology of these can be explained, and they can be traced to their sources, one step at least will be gained towards a rational method of treating the disease. In endeavouring to clear up the obscurity in which these symptoms are involved, I am sensible that I may fail, and that the attempt may be regarded as presumptuous; but, even in its failure, it may suggest a method of investigation, which shall prove successful in the hands of another.

One of the most universal symptoms of the disease is the sense of suffocation, which accompanies the dread of water, and the difficulty of swallowing liquids. I have no hesitation in referring the first symptom, the sense of suffocation, as well as the difficulty of swallowing liquids, to a morbid change in the pons Varolii, the medulla oblongata, and the medulla spinalis, communicated to those nerves which originate in these parts, and which have been justly denominated, from their functions, the respiratory nerves. These are the fourth pair, the fifth, the portio dura of the seventh, the glossa pharyngeal, the spinal accessory, the par vagum, the phrenic, and the intercostal nerves. To any one acquainted with the muscles, and the other parts which these nerves supply, and which are engaged in the functions of respiration, as pointed out by

* Epist. xxi. Art. 9, et seq.

Mr. C. Bell, it is unnecessary to explain the effect which any morbid state of the nerves that supply them must produce. Thus the gorged state of the lungs, displayed by the dissection of the case under consideration, which is an universal appearance, noticed in every recorded dissection of individuals who have died of Hydrophobia, is not to be attributed to any state of the larynx, but to an alteration in the whole of the parts concerned in the function of respiration, by which the blood, not undergoing the necessary change required for the purposes of the economy, the functions of the brain suffer, the nervous energy is exhausted, and the powers of life are destroyed. With regard to the convulsions, which are at first merely sobbings, these may, justly, be referred to the same set of nerves; and were the appearances of the spinal cord, as observed in this case, always detected, it would be easy to account for these by the fact, first, I believe, noticed by Portal, that slight pressure on the spinal marrow causes convulsions; greater pressure, paralysis. M. Lallemand, also, maintains that simple affections of the arachnoid produce spasm and convulsions, but that these are not followed by paralysis. In many of the recorded cases, also, of diseases in which the spinal marrow was found to be affected, the convulsions attending them very closely resemble those in Hydrophobia.

It is to be lamented that, in the numerous dissections of hydrophobic patients, the spinal marrow has been so seldom examined. I am aware that

in some of the cases in which it has been inspected, no obvious change was observable; but in the majority of instances, the appearances have resembled those detailed in this paper. I will notice a few only of them. In the dissection of the case already alluded to, which was treated by Dr. Brandreth, the par vagum was covered with a blush of inflammation, its sheath injected with blood-vessels, and small ramifications of vessels, running parallel to the fibres in the cellular structure which connects the fibres.—The 4th, 5th, 6th, and 7th cervical nerves were also highly vascular, both in the sheath and between the fibres*.—Some of them were so much altered as to resemble muscular fibres, being scarlet externally, and pink internally. In the same case, and also in another detailed by Dr. Brandreth, in which the state of the spinal cord was not examined, a fluid escaped from the vertebral case. In a dissection, detailed in the *Medico-Chirurgical Journal*, for October, 1817, the pons Varolii, medulla oblongata, and upper part of the spinal marrow, exhibited evident marks of inflammation. In Laennec's cases, the spinal arachnoid was found a little injected, and contained serum. Orfila also mentions the inflamed state of the spinal cord; and in a dissection described by Mr. Copeland, the inflammatory appearances, which were obvious in the vessels of the brain, were observed chiefly on its base, on the crura

* *Edin. Med. and Surg. Journ.* Vol. XXIII. p. 235.

cerebri and the tuberculum annulare*. In the dissection of Mr. Drake, who died from the bite of a rattle-snake, at Rouen, the only morbid appearance was redness of the theca of the spinal marrow; a fact which demonstrates the susceptibility of that organ to impressions of morbid poisons, introduced by the bites of venomous animals. It is impossible to say, whether these appearances were not the consequence of the existence of the diseased symptoms rather than their cause; but when we find that all the symptoms are, more or less, connected with the organs supplied by nerves arising from these parts, the probability is, that by whatever medium the poison may primarily excite diseased action, and an alteration of function in the medulla oblongata and in the spinal cord, the change of condition in these portions of the nervous system is the immediate cause of the sense of suffocation, and of the convulsions induced by swallowing liquids and by the blowing of cold air on the surface of the body.

With regard to the dread of water in this terrible disease, I am disposed to regard it altogether as a mental affection, connected with the sensation of suffocation, and the difficulty of deglutition experienced in drinking. I am induced to adopt this opinion, from what I remarked in the case which forms the subject of this paper. The intermission of the hydrophobic symptoms did not immediately

* London Medical Repository, Vol. III. p. 306.

take place, when the power of swallowing liquids with facility returned, but soon followed it, when the uneasiness which it had induced ceased to be intensely regarded. A curious fact, mentioned by Mr. Attenburrow, may be here noticed, illustrative of this opinion. In a case under his care, the patient was enabled to swallow fluids easily and without reluctance, when pressure was made in the smaller lobes of the ears*. I would explain this by saying, that the attention being diverted from those muscles, in which the convulsive action is excited in the efforts to swallow, to the parts compressed, the natural habits of the muscles of deglutition were enabled to overcome the diseased impression, and consequently less difficulty was opposed to the passage of the fluid into the œsophagus.

In remarking upon the treatment of this disease, it would be merely travelling over a record of unsuccessful attempts, were I to notice here the various means that have been hitherto employed to combat the fatal result, which has terminated every genuine case of the malady. Even blood-letting, a practice of so early a date as the period of Niger and Eudemius, who bled their patients and gave Hellebore, has not stood the test of experience, although it was revived, with the most promising prospect of proving successful, by Dr. Shoolbred

* Edin. Med. & Surg. Journ. Vol. V. p. 277. ,

and others. It has been maintained, that the want of success may be, in part, attributed to the abstraction of blood not having been carried to its utmost extent ; but in a case which was treated by Mr. George Ballingall, at Trichinopoly, and in five other cases which came within his knowledge, the patients were bled *ad deliquium animi*, without any benefit*. Dr. Albers, of Bremen, also, has recorded a case, in which blood-letting, carried to its utmost extent, was unavailing† ; and in a well-known case, treated by Dr. Rutherford, of Edinburgh, sixty-six ounces of blood were abstracted ; but, nevertheless, the patient fell a victim to the disease. Some benefit appears to be promised from the employment of emetics. In a case, treated by Dr. Satterly, during the operation of emetics, whilst the inverted action of the stomach continued, the symptoms abated in violence, and increased when it was suppressed‡ ; but subsequent experience has not yet confirmed the expectations founded upon that case.

In the instance now before the Society, from the evident relief which followed the administration of the Prussic acid, it might be supposed that I would strongly urge its employment in future cases of the disease ; and I am disposed to do so, regarding it as a powerful auxiliary for the abatement of the

* Edin. Med. & Surg. Journ. Vol. II. p. 74.

† Ibid. p. 413.

‡ Trans. of the College of Physicians of London, Vol. IV.

convulsive action which is so distressing ; but I am far from considering it in the light of a specific in Hydrophobia, or as a remedy at all likely to do more than it effected in Lange's case. If my notion of the pathology of the disease be admissible, the plan of treatment which it suggests, when the disease is fairly present, is directed, in the first place, to diminish excitement in the medulla oblongata and spinal cord ; to remove every source of irritation, both external and internal ; and, in the second place, as soon as an intermission is effected, to promote the tone of the system as rapidly as it can be accomplished. With these objects in view, I would propose to cup the patient repeatedly, along the whole course of the spine, and to follow this with blisters on the same part* ; to exhibit large doses, say twelve and fifteen grains of Calomel, combined with Tartar-emetic, whilst the strength remains unimpaired ; both with the view of clearing the *primæ viæ*, and of obtaining the sedative effect which Calomel in such doses produces. I would then recommend the administration of Prussic acid, in full doses ; for independent of the benefit, at least to the comfort of the patient, which I witnessed from the use of this powerful sedative, I am induced to look for more permanent advantage from it, by knowing the success which attended

* In a case of hysteria, accompanied with horror of fluids, which occurred in a lady, much benefit was derived from the application of the actual cautery to the nape of the neck. Vide *Omodei-Annali Universali de Medicina*. Jan. and Feb. 1826.

its employment by Professor Brera, in Rachialgitis. In Lange's case, Ammonia seemed to increase the violence of the symptoms, which may be explained if we reflect that Ammonia rouses the sensibility of the nervous system, which in hydrophobia is already too great. With respect to the tonics to be administered for answering the last indication proposed, the Sulphate of Quinina, from its power and the small compass in which it can be given, is likely to answer better than any of the bitters or the Cinchona in substance. It might be alternated with the Nitrate of Silver, which experience has proved to be a most powerful antispasmodic, as well as a tonic in chorea.

The excessive sensibility of the surface, throughout the disease, points out the necessity of keeping the temperature of the apartment of the patient rather higher than might otherwise be considered requisite.

3, Hinde Street, Manchester Square,
28th November, 1826.

Fig. 1.

on the Subject & on Stone by J. W. Perry.

Fig. 2.

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