ON SOME
ANALOGIES OF CHOLERA,
IN WHICH
SUPPRESSION OF URINE IS NOT ACCOMPANIED BY
SYMPTOMS OF URÆMIC POISONING.
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THE indirect aid afforded by analogy in the investigation of disease may be said to correspond with that of a reflecting mirror, in which there is presented a more or less clearly defined image of what would otherwise be obscure or hid; and, therefore, as an assistance towards lessening the difficulty which attends the investigation of cholera, which, although uniformly well marked as regards its symptoms, is exceptionally obscure as regards its nature, analogy, in so far as it enables us to trace out and establish a resemblance between it and other morbid conditions of the system, which admit of being more readily explained, will be useful, provided the principle be sound, on which the analogical reasoning is based. For it has become a necessary and, in some respects, an unpleasant duty to direct attention to the fact that, in the investigation of this as of other baffling diseases, attempts have on many occasions been made to establish false analogies in support of unfounded theories of the disease, or of ill-

devised plans of treatment, which, after attracting popular attention, have for the most part been soon slighted and forgotten. It may, moreover, be remarked that in some cases the attempt to establish an analogy, even if successful, would not be attended with any useful result, for with respect to our knowledge of the nature of the disease, it would be but the substitution of one difficulty for another; as, for example, when cholera is compared with tetanus, or alleged to be an epilepsy of the organic nervous system, or the cold stage of an incomplete attack of ague. In like manner the analogies which have been urged in support of some of the proposed remedies for the disease are equally defective in the information they are intended to convey, as when cholera is compared with sea-sickness, in consequence of its having been assumed that both admit of being prevented and cured by ice to the spine; or when, in support of the castor-oil or eliminative method of treatment, cholera is compared with smallpox. Even the term eliminative, as used in this latter case, is objectionable, since there is nothing in common between the two processes by which the characteristic discharge in smallpox is excluded from the system by the skin, or the characteristic discharge in cholera by the gastro-intestinal mucous membrane; and if, in support of this theory of so-called elimination, and apart from any preconceived theory of treatment, it were desirable, in consequence of the sympathetic connection which exists between the skin and the alimentary mucous membrane, to establish an analogy between cholera and some disease characterised by abnormal and excessive discharge from the skin, the most appropriate for that purpose would decidedly be the *sudor anglicus*, or sweating sickness of the Middle Ages, which has apparently prevailed though to a less noticeable extent in modern times, and which Dr. Roupell¹ has referred to as approaching nearer than any other epidemic disease to cholera. But it must be confessed that inquiry even in this direction, notwithstanding the parallelism presented by the profuse and characteristic discharges, could not be expected to lead to

¹ 'On Cholera' (the Croonian Lectures for 1833), p. 72.

any useful result, in consequence of the *sudor anglicus* being quite as great if not a greater pathological mystery than cholera itself. In order, therefore, to avoid the errors above referred to, and to check the ever-recurring tendency, in a discussion of this kind, to introduce assumption in the place of fact, it is proposed in the following attempts to trace an analogy between cholera and allied but less obscure affections of the system, to limit the inquiry to a comparison between the well-defined and characteristic group of symptoms and pathological changes which accompany the collapse of this disease, with special reference to suppression of urine during life, and an empty and contracted state of the bladder after death, and such cases of collapse resulting either from poison or from disease, in which a corresponding condition has been developed and observed.

It is a noteworthy fact that when cholera first attracted general attention, and before the public mind had become familiarised with the peculiar and fatal character of the disease, it was very commonly ascribed to irritant poisoning, and popular tumults were in many places the result of this belief. It is of some importance with reference to the present inquiry to remark that this now almost forgotten but once widespread delusion was suggested by the analogy which prevails between the chief symptoms of cholera and many of those poisons, the effects of which are more or less commonly known; and that, like other errors of a similar kind, the hasty and imperfect reasoning on which it was based contained, as it were, the germs of truth. For if we proceed to analyse the earliest of the analogies of cholera, it will be found that most of the symptoms which are met with in the collapsed stage of the disease occur also in the case of certain poisons, the action of which is essentially referable to the gastro-intestinal mucous membrane; and it may in consequence be not unreasonable to expect that if the inquiry be pursued in this direction, it will furnish us with a clue to the primary seat of the disease. In addition, however, to exciting early and popular attention, this analogy between cholera and cases of irritant poisoning seems to

have specially attracted the notice of many scientific observers in subsequent epidemics of the disease, by whom the importance of urging the inquiry in this direction has been fully recognised. In an able article on "Diseases which may simulate Poisoning," Devergie¹ assigns the first place to cholera, and mentions suppression of urine as one of the symptoms common to the collapse of both. Tardieu² has also published numerous illustrations in support of this statement. And among other observers whose evidence might be cited on this occasion is Dr. Horace Jeaffreson, who has had favorable opportunities for studying cholera at the London Hospital during the outbreak of the disease in the eastern districts of London in 1866; and who, in a lately published and instructive paper "On the Pathology of Cholera Collapse"³ has justly remarked, that "inquiry in this direction will give us some remarkable analogies."

In this preliminary stage of the investigation it will be sufficient to state that the cases in which such an analogy can be more or less clearly established, are acute poisoning by corrosive sublimate, by arsenic, and by mineral acids, especially nitric acid; the effects which follow the eating or drinking of poisonous animal matters, such as tainted or simply unwholesome meat or fish, and milk which has undergone some injurious but as yet unknown change, decomposing vegetables and some of the poisonous fungi; and the excessive action of certain drugs, for the most part belonging to the class of drastic purgatives, especially croton oil. After a brief consideration of some of the more important cases of this description, in which the collapse resulting from the gastro-intestinal action of an irritant poison has been noted as closely analogous to that of cholera, attention will be directed to a well-defined group of cases in which the symptoms from disease referrible to the same part of the system so far simulate choleraic collapse, as to have been occasionally and almost unavoidably mistaken for it.

¹ 'Médecine Légale,' 3e édit., tom. iii, chap. xxi, 1852.

² 'Etude Médico-Légale et Clinique sur l'Empoisonnement,' 1867.

³ 'Edinburgh Medical Journal,' Dec., 1866, pp. 520-538.

In cases of poisoning by corrosive sublimate, both the symptoms during life and the appearances after death are in many important particulars, and especially as regards the urinary secretion, closely analogous to those of cholera. This is well shown in the report of a case recorded by the late Dr. William Henry,¹ of Manchester, in which a woman, aged twenty years, died from the effects of this poison on the sixth day, in which it is mentioned that "no urine was voided after the third day; and on introducing the catheter repeatedly, the bladder was found empty;" and that after death "the bladder was empty and exceedingly contracted." In five cases in one family, recorded by the late Mr. J. W. Valentine,² of Bolsover, in which a mother and three children died, and one child recovered from poisoning by corrosive sublimate, suppression of urine was in like manner a characteristic symptom in the collapse, which in other respects also closely resembled that of cholera. In two of the fatal cases, the urinary bladder was contracted to "the size of a walnut;" in a third case, it was of very small size, and empty; and in a fourth case it was found "closely contracted to the size of a marble." The child who recovered was a girl, aged fourteen years, who swallowed only a small portion of the poison, and had suppression of urine for three days. Dr. Robert Venables³ has recorded a case of poisoning by corrosive sublimate, in which a servant girl died from the effects of the poison on the eighth day. In this case it was specially noted that "there was a total and permanent suppression of urine; and that there might be no room for doubt upon this subject afterwards, Mr. Marten, at my suggestion (adds Dr. Venables), introduced the catheter, but no urine flowed." After death "the bladder was (found) perfectly empty, and very much contracted in size." In a case of poisoning with corrosive sublimate, reported by Mr. Archibald Blacklock,⁴ of Dumfries, in which a man, aged

¹ 'Edinburgh Medical and Surgical Journal,' vol. vii, 2nd edit., pp. 150, 151, 1811.

² Ibid., vol. xiv, pp. 468-474, 1818.

³ 'London Medical Gazette,' vol. viii, pp. 616-623, 1831.

⁴ 'Edinburgh Medical and Surgical Journal,' vol. xxxvi, pp. 92-4, 1831.

fifty years, died on the fifth day; the urine was suppressed from the time the poison was taken, and we are informed that there was no inclination to pass it even when at stool. The pulse in this, as in many other cases recorded, was almost imperceptible for some hours before death. In Mr. (now Sir James) Syme's 'Clinical Report for the Winter Session 1834-5,'¹ there is the case of a man named James Maxwell, aged thirty-five years, who suffered severely, but did not die from the poisonous effects of mercury externally applied. In this case the urine was suppressed for five days, in consequence of which "the catheter was introduced repeatedly without allowing any to escape, except two or three teaspoonfuls of mucous-looking fluid destitute of urinous smell." * * * "The patient drank freely during the suppression of urine; he was quite sensible; and lay quiet without any disposition to coma." In commenting on this case, Mr. Syme remarks that it "is interesting on several accounts. In the *first* place, it affords an example of the suppression of urine, which results from poisonous doses of the oxy muriate of mercury given internally, occurring from the external application of a mercurial salt; *secondly*, the suppression of urine was not accompanied with coma; and *thirdly*, the patient recovered after suffering complete suppression of urine for five days." In a case of acute poisoning by corrosive sublimate, which was under observation in Guy's Hospital in February, 1843, it is recorded that there was "complete suppression of urine, and symptoms closely resembling those of cholera." * * * The patient lived four days, and did not pass any urine during the whole of this time;" and after death "the bladder was empty and contracted."² According, also, to Dr. Copland,³ it appears that in this form of poisoning there is suppression of urine or dysuria during life, and that after death "contraction of the urinary bladder is always observed." Ample evidence has, moreover, been cited by Dr. Taylor⁴ to show that sup-

¹ 'Edinburgh Medical and Surgical Journal,' vol. xlv, pp. 26, 27, 1835.

² 'Guy's Hospital Reports,' vol. ii, pp. 24-27, 1844.

³ 'Dictionary of Practical Medicine,' vol. iii, part i, pp. 349, 350.

⁴ 'On Poisons,' 2nd edit., pp. 446-459, 1859.

pression of urine, which, when unaccompanied by head-symptoms, has been thought to be almost peculiar to choleraic collapse, is a frequent result of poisoning by corrosive sublimate, both in those cases in which the poison has been swallowed, and in those in which it has been externally applied.

Among continental observers whose authority might be cited on this subject, is Casper,¹ who has specially noted that in cases of poisoning by corrosive sublimate, there is "suppression of urine;" and after death he has also found "the urinary bladder small and contracted." In like manner, Flandin² includes among the signs of poisoning by mercury "scantiness or total suppression of urine;" and in his summary of the comparative effects of mercury and arsenic (in poisonous doses) on the animal economy, which present, as he justly remarks, "great analogies," adds that "arsenic, in paralysing nervous action, diminishes or suspends the secretion and the emission of urine. Mercury produces the same effect; but, moreover, it irritates the bladder and urethra, and gives rise to fictitious and painful efforts to pass water."³ In one of the cases recorded by this observer,⁴ in which a young girl died from poisoning by corrosive sublimate on the third day, there was complete and prolonged suppression of urine, which was demonstrated by passing a catheter on the first, and again at the end of the second day, on both of which occasions no urine flowed. In another case recorded by the same observer,⁵ in which a lad, aged fifteen years, died five days and six hours after poisoning by corrosive sublimate, it was ascertained that "the urinary secretion, during all this time, was suspended," and the bladder after death was found to be contracted. Lastly, the evidence which has been published on this subject by Tardieu⁶

¹ 'A Handbook of the Practice of Forensic Medicine,' Sydenham Society, vol. ii, p. 62, 1862.

² 'Traité des Poisons,' tom. ii, p. 140, 1853.

³ Ibid., p. 113.

⁴ Ibid., pp. 114-116.

⁵ Ibid., pp. 116, 117.

⁶ Op. cit., 1867. See Obs. 2, p. 596; Obs. 4, p. 597; Obs. 5, p. 598; and Obs. 8, p. 605.

may be referred to as very conclusive in favour of the collapse from poisoning by corrosive sublimate being associated with suppression of urine, and other symptoms similar to those of cholera.

It is important, moreover, to notice that although in the preceding cases there was suppression of urine during collapse from this poison in the human subject, yet the opposite condition of a copious and free discharge of urine has been observed to result from corrosive sublimate given in large quantities to horses. This apparent discrepancy in the effect of the poison on the urinary secretion in men¹ and horses is not due, as perhaps might be hastily assumed, to difference in the composition of their urine, but chiefly, if not altogether, to the fact (which it would be useful to consider in connection with the comparative influence of epidemic cholera on man and the lower animals) that corrosive sublimate has no irritant effect on the stomach of the horse corresponding with what has been observed in man; and that it does not produce any analogous collapse. This has been satisfactorily established by the experiments of the late Mr. Stevenson,² veterinary surgeon, of Norwich, who found that considerable quantities of corrosive sublimate might be given with impunity to a horse; and that in this animal neither disorganization nor inflammation of the coats of the stomach

¹ In connection with this subject it should be mentioned that in a case observed by Mr. John Ward, of the Royal Cornwall Militia, in which two brothers were poisoned by the external application of corrosive sublimate, in one of them, aged 24 years, death occurred on the eleventh day, and it is stated that he passed urine freely on different occasions during the illness; but there was no opportunity of knowing what was the condition of the gastro-intestinal mucous membrane, as no examination of his body after death was made. In the other brother, aged 19 years, death occurred on the fifth day; the symptoms of collapse were more acute than in the former case, and throughout the illness the urine was completely suppressed, none being obtained on passing a catheter. After death the stomach was found highly inflamed and ulcerated, and the bladder was "healthy in appearance, but did not contain the least drop of urine."—('London Medical Gazette,' vol. iii, pp. 666-667, 1829.)

² 'Edinburgh Medical and Surgical Journal,' vol. v, pp. 254-256, 1809.

resulted from repeated doses, varying from two drachms to two ounces, of the poison.

In cases of poisoning by arsenic, as in the preceding class of cases, it has been observed that, in addition to the more common results of poisoning, there are others which sometimes closely assimilate its effects to cholera; in consequence of which Devergie¹ refers to it as "one of the poisons which best simulates cholera;" whilst Tardieu² emphatically states that of the spontaneous diseases most closely allied with arsenical poisoning, "the first of all is incontestably cholera." Among the symptoms and pathological appearances which have been noticed in some of these cases, and to which more especially attention should be directed, are suppression of urine, cyanosis, conjunctival injection, and a physical alteration in the condition of the blood closely analogous to that which occurs in cholera; together with such a failure of the circulation that, occasionally even for some hours before death, neither pulse nor beating of the heart can be perceived: in addition to which Tardieu³ mentions that there is sometimes "a serous and white diarrhœa." In a case of this description, reported by Dr. Wilks,⁴ the patient was a man, æt. 50, who was admitted into Guy's Hospital on May 3rd, 1855, and who died three hours and a half after admission, and nine hours after taking the poison. The symptoms throughout closely resembled those of cholera; the urine was suppressed, and after death the bladder was observed to be firmly contracted, and it contained only two drachms of opaque urine. Dr. Wilks, in commenting on this case, remarks, "it would have required more than ordinary observation and skill at such a time, and in the absence of a history, to have avoided a suspicion that the patient was not the subject of this disease (cholera). The collapse, the pulselessness, the coldness of the surface, the lividity, the restlessness, the violent cramps, and, moreover, the character of the stools (which might have passed well for choleraic after the ad-

¹ Op. cit., p. 774.

² Op. cit., p. 337.

³ Op. cit., p. 328.

⁴ 'Guy's Hospital Reports,' 3rd ser., vol. i, p. 364, 1855.

ministration of the eggs) all closely resembled the symptoms of that malady. The post-mortem examination also further carried out the similarity, and probably would have confirmed the diagnosis of cholera, if it had been superficially made, and the stomach had not been examined as is sometimes the case." Dr. Wilks in a note informs us that "during the epidemic of 1849, a practitioner in the neighbourhood of the hospital mistook, during the life of the patient, a case of arsenical poisoning for one of cholera, and his faulty diagnosis was severely animadverted upon by the coroner's jury." Tardieu,¹ in a paper on cases of death from natural causes which may be attributed to poisoning, mentions a mistake of an opposite character to that referred to by Dr. Wilks, in which a case of cholera, occurring in 1849, was at first assumed to be a case of suicide by arsenical (Schweinfurt's) green. A well-marked suicidal case of arsenical poisoning simulating cholera has been recorded by M. Flandin,² in which a prisoner on hearing his condemnation to death, swallowed twelve grammes of arsenious acid, and died in thirteen hours. There was immediate and violent vomiting and pain; and within little more than two hours after swallowing the poison the pulse was imperceptible, not the least movement of the artery being detected, and not the slightest beating of the heart could be felt on applying the hand to the præcordial region. The surface of the body became icy and cyanosed; whilst the intellectual faculties, up to the last hour, remained unimpaired. With regard to the urinary secretion it was noted that the patient, in the course of the illness, experienced a desire to pass water, but without the ability to satisfy it; and when the catheter was passed only a few spoonfuls of *clear urine* were obtained. After death the stomach was found to be in a state of complete disorganization; the bladder contained about a "glass of urine," which presented no special character; and it was moreover remarked that all the divisions of the pulmonary artery were filled with incoagulable blood, whilst, on the contrary, the

¹ 'Annales d'Hygiène Publique,' 2e sér., tom. ii, pp. 150-178, 1854.

² Op. cit., tom. i, pp. 494-501.

pulmonary veins were nearly empty. The same observer has recorded a case¹ of arsenical poisoning through a wound in the skin, in which the patient died seven days after the application of the poison. The intelligence in this case was preserved up to the last moment of life; the conjunctivæ were injected with blood; and the urinary secretion was very scanty. After death the bladder was found to be contracted and empty; and "the lungs, collapsed above and behind, presented hypostatic sanguine congestion at their base," similar to what is usually observed after death from choleraic collapse. In another case of "acute poisoning by cutaneous absorption" of arsenic, recorded by Flandin,² it was noted on the day following the poisoning that the urine, "since the beginning of the illness, was totally suppressed;" and after death, which occurred on the sixth day, the bladder was found to be empty; it is not, however, distinctly stated that the suppression of urine continued during the whole of the six days. The chief effects of the poison absorbed in this case appear to have been on the alimentary canal at the junction of the duodenum with the jejunum, where the ulceration had led to perforation. Among other cases of poisoning by arsenic to which reference might with advantage be made, are Casper's case No. 185,³ in which death occurred in twenty-four hours, and the urinary bladder was found to be empty; M. Delsol's⁴ case, in which there was marked cyanosis as well as suppression of urine; and some cases recorded by Tardieu,⁵ including that of the duc de Praslin.

With reference to the suppression of urine, which has been noted in the preceding and in other cases of arsenical poisoning, it is necessary to state that very opposite opinions have been published on the subject; for whilst Devergie⁶ mentions "complete suppression of the emission of urine," as one of

¹ Op. cit., tom. i, pp. 545-551.

² Ibid., pp. 502-509.

³ Op. cit., pp. 72, 73.

⁴ 'Bull. de la Soc. Anatom. de Paris,' 2e série, tom. vii, pp. 362-364, 1862.

⁵ Op. cit., 1867, pp. 379-380, 384-385, and 385-401.

⁶ Op. cit., tom. iii, pp. 505 and 552-553.

the symptoms produced by this poison ; and especially refers to the re-establishment of the urinary secretion as the turning point in favour of recovery in the case of a woman whose appearance had previously been such that "one would have said she had been attacked with most violent cholera ;" and, in like manner, Flandin,¹ supported by the evidence of many other observers, includes suppression of urine "among the general physiological effects" of poisoning by arsenic, and further remarks that it has been noted at all times and by all observers: on the other side, Orfila stated at the celebrated trial of Madame Leffarge that the flow of urine in these cases is absolutely free ;² and Dr. Taylor³ has remarked that, "with respect to the urinary secretion (in cases of poisoning by arsenic) there is no certain rule ; it is sometimes suppressed, as in several cases reported by Flandin ; at other times it is natural or only slightly diminished." This apparently conflicting testimony admits of being to some extent if not altogether accounted for by the fact that arsenic has a two-fold action on the living body, and produces, as Dr. Christison⁴ assures us is now generally acknowledged, two classes of phenomena. One action, which is local and purely irritant, affects chiefly that portion of the alimentary mucous membrane which corresponds with what appears to be the primary seat of disease in cholera ; and this action is manifested both in those cases in which the poison is swallowed and consequently applied directly to the mucous membrane, and in those in which it enters the system through the skin.

¹ Op. cit., tom. i, p. 514.

² In the latest publication of Orfila "On Poisoning by Arsenic" ('Dictionnaire Encyclopédique des Sciences Medicales,' tom. vi, p. 224, 1867), he informs us that there have been more frequently than otherwise noted "disorders which are observed in the algide period of cholera, smallness and irregularity of the pulse, coldness of the skin, prostration, cramps, cyanosis;" and, with regard to the urinary secretion, that "the emission of urine is in general suspended, but the secretion is only diminished, and, save in exceptional circumstances, it is possible to excite the urinary secretion by means of diuretic drinks."

³ 'On Poisons,' 2nd edit., p. 359, 1859.

⁴ 'A Treatise on Poisons,' 4th edit., p. 288, 1845.

The other action is of a more complex character, producing results which are to some extent secondary and remote; for whilst a state of collapse resembling that of cholera is caused by the irritant effects of the poison on the abdominal nervous system, injurious effects are produced on organs remote from the primary seat of mischief, through the irritant effects of the poison on the circulating blood. In the one case the irritant action of arsenic is circumscribed, and, in affecting chiefly that portion of the alimentary mucous membrane which corresponds with what may with great probability be assumed to be the primary seat of disease in cholera, produces, through the influence of the abdominal nervous system, a condition analogous to choleraic collapse; in the other case, through its presence in the blood, secondary and remote effects are produced beyond those which are developed in that disease.

The recognised difference in the action of arsenic on the animal economy may perhaps to some extent account for the contradictory character of some of the experimental evidence derived from the effects of arsenic on horses and dogs; although part of the difference which has been observed in these cases may possibly be due to arsenic, like corrosive sublimate, not having the same poisonous influence on man and the lower animals. For M. Delafont¹ in his elaborate memoir, in answer to the question "Is the urinary secretion suppressed in acute poisoning by arsenious acid?" which was read at the French Academy of Medicine, on July 5th, 1842, states, as the results of twelve experiments with arsenic on horses and dogs, that "in none of the animals submitted to the experiment has the secretion of urine been suppressed." At the same time it was observed that the urine passed in all these cases of fatal poisoning contained arsenic.

Besides the influence of this poison on the secretion of urine, the effects of arsenic on the vascular system and the blood afford further corroborative evidence in favour of the

¹ 'Gazette Médicale de Paris,' 2e sér., tom. x, p. 446, 1842.

analogy with cholera. Casper¹ has remarked that "the blood generally, in acute arsenical poisoning, is deficient in coagulating power, and never forms a firm clot;" which accords with the experiments of Brodie,² and the evidence³ also of Morgagni, Ruysch, and other observers. Novati,⁴ who has had the opportunity of opening the bodies of many individuals poisoned by arsenic, and has carefully studied the physical and physiological characters of this form of poisoning, states "that the blood in these patients is liquid and black as it is in cholera," and without any trace of coagulation. "It should not (Novati very justly adds) be forgotten meanwhile, 1st, that many diseases may give to the blood characters analogous to this; 2nd, that other poisonous substances will be capable of giving the same result; and 3rd, that when death has not occurred promptly, the inflammatory reaction determined by the eschars may quite change these characters of the blood." Lastly, both Orfila and Flandin have cited, with reference to the same subject, the evidence of Rognetta and other members of the Italian school, who agree in stating that "the blood in poisoning by arsenic is deliquescent, syrupy, and nearly the same as in cholera; and this state is not the result of a direct chemical action on the blood; it is altogether a physiological effect, a consequence of the hyposthenic action of the arsenic;" such hyposthenic action being referrible to the lowering influence of the poison on the nerves supplied to the vascular system, and not to any specific effect of arsenic on the blood. And this theory of action quite agrees with the latest opinion of Orfila⁵ on the subject, who states that "at the present day, after the beautiful researches of M. Claude Bernard and the ingenious experiments of M. Marey, establishing that inflammation and fever are associated with a state of depression or

¹ 'Op. cit., vol. ii, p. 55.

² 'Phil. Trans.,' 1812, part i, p. 214.

³ Cited by Orfila, 'Traité de Toxicologie,' 4e édit., tom. i, p. 344, 1843.

⁴ Cited in 'Gazette Médicale de Paris,' 3e sér., tom. vi, p. 571, 1838.

⁵ 'Dictionnaire Encyclopédique des Sciences Médicales, tom. vi, p. 224, 1867.

paralysis of certain parts of the great sympathetic, one would not know how to consider the action exercised by arsenious acid otherwise than as an action really hyposthenic."

With respect to poisoning by the mineral acids, it has been specially noted in some of the more carefully recorded cases that, apart from any absorption of the acid and consequently abnormal irritation of secreting organs from its presence in the blood, the corrosive action of the acid on the gastrointestinal mucous membrane and the resulting collapse lead to the urine being suppressed: and this analogical evidence is the more valuable from the fact that the suppression in cases of this description cannot be accounted for by a complementary discharge from the bowels, as there is usually obstinate constipation at the same time.

In a case of poisoning by hydrochloric acid, reported by Dr. Collas,¹ in which the patient was a Hindoo, æt. 28, in addition to coldness of the skin, small and frequent pulse, and other symptoms of collapse, "there was suppression of urine, but no purging." And Devergie² cites the case of a boy, æt. 3½, who was poisoned by hydrochloric acid, and in which after death it was noted that "the bladder contained no urine."

Among the symptoms of poisoning by sulphuric acid, Tardieu³ mentions that "the urine is suppressed," and that after death "the bladder is usually empty." Casper⁴ has recorded the case of a boy, æt. 16 (No. 194), in which the stomach internally appeared quite black, and perforation had occurred. There is no allusion in this case to the urinary secretion during life, but it was observed after death that the urinary bladder was empty; that the lungs were remarkably anæmic; and that the whole of the blood in the body, as is usual in such cases, was dark and syrupy. In Casper's case (No. 197) of a girl, æt. 20, the lungs were anæmic, and the bladder

¹ 'Annales d'Hygiène,' Janvier, 1858, p. 209, cited by Dr. Taylor, 'On Poisons,' 2nd edit., p. 290, 1859.

² Op. cit., tom. iii, pp. 290-296, 1852.

³ Op. cit., pp. 175 and 180.

⁴ Op. cit., vol. ii, 1862.

empty; and again in a case (No. 198) recorded by the same observer, of a child, aged six weeks, it is stated that the urinary bladder was empty and that the lungs contained no blood. Mr. Stanski¹ and Mr. Robinson² have also recorded cases in which the symptoms of poisoning by this acid were analogous to those of cholera.

From the elaborate researches of M. Tartra³ on poisoning by nitric acid, it appears that the corrosive action of this poison is chiefly noticeable in the stomach and upper portion of the intestinal canal, which are inflamed and disorganized, whilst "the large intestines are ordinarily filled with *faecal matters* excessively hard;" and, as M. Tartra adds, "it is useful to remark that the urinary bladder does not contain urine, although the patients have not passed any urine." In two of the patients who came under the notice of this observer, one of whom lived twenty, and the other thirty hours after taking the poison, perforation of the stomach occurred. In the first of these cases (Obs. 10) the patient was a lad, aged sixteen years, in whom "the pulse became extremely small, the skin cold, the flow of urine was suspended, and the constipation resisted the use of lavements." In the other case (Obs. 14) the patient was a woman of the town, aged thirty-five years, in whom the symptoms were similar as regards the superficial coldness and imperceptible pulse, but the state of the urinary secretion is not mentioned. In the case of a painter, aged thirty-two years (Obs. 9), who died in nineteen hours from poisoning by nitric acid, M. Tartra informs us that "there escaped towards the end some drops of urine;" and it was remarked that whilst the "hideous aspect of the body of this unfortunate sufferer resembled that of a corpse," the mind was unimpaired. Lastly, in the case of a man, aged forty-five years (Obs. 8), who recovered from the immediate effects of the poison, but who died after a long interval from marasmus, the usual urgent symptoms, such as repeated vomiting, extreme cold-

¹ 'Gazette Médicale de Paris,' 2e sér., tom. v, pp. 188, 189, 1837.

² 'London Journal of Medicine,' vol. iii, p. 443, 1851.

³ 'Traité de l'Empoisonnement par l'Acide Nitrique,' An. 10—1802.

ness of the surface, burning heat internally, and smallness of the pulse, were accompanied, M. Tartra informs us, by "absolute impossibility to pass urine," which from the history of the case appears to have been suppressed.

Poisonous and decomposing animal and vegetable matters have in like manner occasioned symptoms of collapse closely resembling those of cholera, if not the disease itself; but, as a rule, no attention has been paid to the urinary secretion in this class of cases. Dr. Christison¹ has remarked that "Game only decayed enough to please the palate of the epicure, has caused severe cholera in persons not accustomed to eat it in that state;" and similar cases have, some years since, come under my own observation, in which several members of the same family, after eating tainted mutton, suffered from cholera, three of whom died. On examination, it was found that the meat which had caused the mischief in this case, instead of being bad only on the surface, had undergone a rapid and peculiar decomposition near the bone. It is often, however, difficult, if not impossible, to recognise any morbid change in the animal matter to which this choleraic or pseudo-choleraic poisoning has been referred; and it is a curious fact that even milk itself, the secretion of which is commonly supposed to be altogether exempt from any choleraic influence, may in like manner undergo some unrecognisable change by which it acquires deleterious properties capable of producing symptoms of poisoning, which are sometimes analogous to and even identical with those of cholera. Among the more noticeable cases of this description is that which occurred in the year 1826 at Aurillac, a village in France, and which Professors Orfila and Marc were commissioned by the French Academy of Medicine to investigate. In this case fifteen or sixteen customers of a particular dealer in goat's milk were attacked on June 13th, with all the symptoms of violent cholera; and about twenty-four hours afterwards the goat too was taken ill with the same affection, and died in three days. Professors Orfila and Marc in their report stated that, in parallel cases which

¹ Op. cit., 4th edit., p. 635, 1845.

had been reported to them by the police of Paris, they had been unable to detect any mineral poison; that none of the received explanations were in their opinion satisfactory; and that they were disposed to ascribe the poisonous alteration of the milk to new principles formed by a vital process.¹ As an appendix to this case, it may be mentioned that on October 13th, 1856, about twenty persons in Malta were seized with violent vomiting and other symptoms of cholera, which were ascertained by the police physician, Dr. Felice Calleja, to be caused by drinking the milk of two goats, which was said to have acquired poisonous properties from the animals having fed on some wild herbs belonging to the genus *oxalis* or wood-sorrel.²

Among vegetable matters which are capable of producing injurious effects analogous to cholera are poisonous fungi, which in some cases produce narcotism, whilst in others the symptoms are those of gastro-intestinal irritation and collapse.³ Tardieu⁴ in his description of the symptoms produced by poisonous fungi, mentions that "the pulse is weak, the skin cold, and covered sometimes with violet-coloured blotches, and the urine suppressed;" death occurring in these cases "in from one to two or three days." He cites two cases in which a mother and daughter were poisoned by *amanita bulbosa*; the urine having been suppressed in the daughter from the time of the accident, whilst in the mother it was passed in the beginning of the illness, but subsequently her case like that of the daughter assumed the character of choleraic collapse. Flandin⁵ has cited a case in which four persons in the same family were poisoned by eating a quantity of *amanita muscaria*; and M. Girard, in his report on this case, remarks, "We have found much analogy between the symptoms of this poisoning and those of

¹ 'Archiv. Gén. de Méd.,' tom. xv, pp. 460-462, 1827, cited by Dr. Christison, op. cit., 4th edit., p. 644, 1845.

² 'Medical Times and Gazette,' vol. xiii, new series, p. 456, 1856.

³ Pereira, 'The Elements of Materia Medica and Therapeutics,' 4th edit., vol. ii, part i, p. 59, 1855.

⁴ Op. cit., pp. 821-822, and 828-829, 1867.

⁵ Op. cit., tom. iii, pp. 464-469, 1853.

Asiatic cholera. The alvine dejections have nearly always been white like rice-water and flaky." It is important moreover to notice that the analogy is strengthened by the post-mortem examination of the bodies in some of these cases, especially with reference to the condition of the blood, which has been observed to be "black and fluid."

There is little need to dwell on the analogy between cholera and the excessive action of drugs, for, like the poisons already referred to, it is chiefly those drugs whose normal action is limited to the gastro-intestinal mucous membrane which produce, when given in over-doses, effects similar to those of cholera. Among the more noticeable of these is croton oil, which in poisonous doses produces collapse closely analogous to that of cholera; but there is unfortunately no mention in the published records of such cases, either of the urinary secretion during life, or of the state of the bladder after death.¹ And similar omissions with respect both to the urinary secretion and the bladder occur in the records of other cases in which there has also been collapse resembling that of cholera; as, for example, in a case mentioned by Dr. Taylor,² in which a girl, aged eighteen years, was poisoned with castor-oil seeds, and whose appearance is described as "like one affected with malignant cholera;" and in the cases reported by Scot,³ in which "three men having eaten, at the same time, the seeds of the coral plant, had all the symptoms of severe cholera."⁴

¹ 'Journal de Chimie Médicale,' tom. v, 2e sér., pp. 509-511, 1839; Orfila, op. cit., tom. ii, p. 108; Dr. Adam, 'Edinburgh Medical Journal,' vol. i, p. 932, 1855-6; and Dr. Greenhow, 'Medical Times and Gazette,' August 11th, 1866, p. 142.

² 'Principles and Practice of Medical Jurisprudence,' p. 266, 1865.

³ 'Madras Report on Cholera,' p. xxxix, 1824.

⁴ The evidence in favour of the excessive action in these cases being due to local irritation of the gastro-intestinal mucous membrane is confirmed by the observations of Pereira (op. cit., vol. ii, part i, pp. 401-402 and 406-407), 'On the Inhalation of the Dust of Euphorbium and of Croton Seeds.' In the latter case, owing to the local irritation being primarily limited to the pulmonary mucous membrane, several doses of castor oil had to be given before the bowels could be induced to act.

With reference to the various cases which have been as yet cited, it must be admitted that the closeness of the analogy is, at first sight, not altogether unfavorable to the theory which refers cholera to a specific blood-poison; and that it would consequently be allowable to assume, if the reasoning from analogy were limited to such cases, that the abdominal centre of the sympathetic nervous system may be only secondarily affected through the ramifications of the vaso-motory nerves. For such a theory of action might to some extent, though not altogether, be reconcileable with the irritant and corrosive effects produced on the gastrointestinal mucous membrane, and which, in all of the preceding cases, were associated with, if they did not occasion and develop the collapse simulating that of cholera. But there remains to be considered a group of cases characterised by a closeness of analogy approaching in some respects almost to identity with cholera, in which it would not be allowable to assume that a blood-poison was the cause of the collapse. Well-marked illustrations of this occurrence of collapse, altogether independent of any possible connection with blood-poisoning, are to be met with in cases of perforation, rupture, and laceration of the stomach and small intestines; over distension of the stomach; and impassable obstruction in the small intestine. In all of these cases, with some others of an allied character, which will be incidentally noticed, there is usually a condition of collapse associated with suppression of urine, which not unfrequently has been, and, almost unavoidably, is very liable to be, mistaken for that of cholera; and if, as is sometimes alleged to be the case, such diagnostic errors are comparatively more often noticed in hospitals than elsewhere, it may be inferred that in private practice they are sometimes overlooked or concealed, and that in consequence the published records of their occurrence are incomplete.

The first cases of perforation of the stomach in which I noticed suppression of urine during life, with an empty and contracted state of the bladder after death, occurred before my attention had been specially directed to cholera; and

these earlier observations were subsequently embodied in a paper "On Perforating Ulcers of the Stomach," which was read at a meeting of the now extinct North London Medical Society in 1854. In this paper, of which an abstract was published in one or two medical journals, it was stated that "suppression of urine, although it does not appear to have attracted much notice, is as marked a symptom (in perforation) as it is in cholera, and that after death the urinary bladder is usually found to be empty and contracted." Among the cases occurring in my own practice which were cited on the occasion was that of a journeyman coach-painter, aged fifty-three years, in whom alarming hæmorrhage from the stomach had immediately preceded perforation; and although the patient survived nearly two days, no urine was passed, and the bladder after death was found empty and contracted. In the case of a Chelsea pensioner, aged fifty-nine years, employed as a potman, and in whom the immediate cause of perforation was a "dinner-treat" of roast pork and brandy, death occurred in thirty hours, during which time only six ounces of urine were passed, and after death the bladder was found empty and contracted. Whilst in the case of a bricklayer, aged sixty-six years, who died in sixteen hours and a half, and in the case of a retired publican, aged eighty-two years, who died in twenty-two hours, and whose case is of additional interest as one of the oldest on record,¹ there were no notes taken of the state of the urinary secretion during life, but in both of these cases, which occurred in the St. Marylebone Infirmary, the bladder after death was found empty and contracted.

Further inquiry in the same direction, and a more extended acquaintance with the literature of the subject, having convinced me that there is a very close relation between perforation and cholera, I endeavoured, in 1856, to prove in my work 'On the Nature of Cholera as a Guide to Treatment,'

¹ Dr. Brinton, "On Ulcer of the Stomach," 'Med.-Chir. Review,' vol. xvii, p. 171, 1856, states that the oldest case of perforation of the stomach he is acquainted with is that of a man who was, as in the above-mentioned case, aged 82 years.

that "the theory which ascribes cholera to an impression on the sympathetic nervous system, conveyed through the medium of the stomach or intestines," is very strongly supported by the analogical evidence of these and other allied cases which could be cited in its favour; and I proposed to include them with cholera, under the head of "Disorders of the Sympathetic Nervous System, depending on diminution or arrest of its functions, and produced chiefly through the medium of the stomach." There is no need for me to enter again into an exhaustive examination of the nature of this evidence, or to notice all the successive cases of mistaken identity, in which perforation and other morbid affections belonging to the same group have been from time to time confounded with cholera. In all of these cases there is essentially the same condition of collapse which is usually accompanied, as in cholera, with suppression of urine during life, and an empty and contracted state of the bladder after death; and although in a large number of the recorded cases of this description, including those which have and those which have not been mistaken for cholera, there is no allusion, after the perforation has occurred, to the secretion of urine during life, or the condition of the bladder after death; yet in all cases, so far as I can at present remember, in which I have sought and have been enabled to fill up this omission by subsequent inquiry, I have ascertained that suppression of urine, unaccompanied by any head-symptoms, is as well marked in such cases as it is in cholera. As an illustration of the extent to which this important condition in the analogy prevails, it may be mentioned that in the two cases of perforation simulating cholera, lately reported in the medical journals, and in neither of which is there any allusion to the urinary secretion or bladder, it has been ascertained on further inquiry that although in the St. George's Hospital case¹ of perforation of the stomach closely simulating but not apparently mistaken for cholera, no note was made of the state of the urinary secretion or bladder, and no information on the subject could be obtained; yet in

¹ 'Medical Press and Circular,' March 20th, 1867, pp. 271-272.

the other case¹ referred to, in which the patient died in the Cholera Ward of the London Hospital, after an illness of about two days and a half, from perforation of the duodenum near the pylorus, the acting resident medical officer who reported the case subsequently informed me by letter that there was "undoubted and continued suppression of urine." The additional information which was obtained in this latter case derives increased importance from the fact that in another case² of pseudo-choleraic collapse, which occurred in the same hospital only seven days after the last-mentioned case, and in a young female patient, who at the time had been an inmate of the hospital for more than a week on account of disease of the elbow-joint, the symptoms which led to her removal to and subsequent death in the Cholera Ward, were supposed to be indicative of "sudden cholera collapse;" her condition at the time being described as follows: "almost pulseless, quite cold, with general lividity of the surface, and blueness of the finger-nails." But it is important to notice in the history of this case, that whilst "several ounces of clear urine were drawn off," yet the patient was only semi-conscious. This difference in the symptoms, accompanying the collapse, of these two pseudo-choleraic cases in the London Hospital during the same month, admitted of being readily explained after death by the fact that the fatal collapse in the last case was due to Addison's disease, and that all the organs, with the exception of the supra-renal capsules, were found to be healthy; whilst in the other case, in which there was complete suppression of urine, the fatal collapse was the result of perforation of the duodenum near the pylorus.

So far as regards the literature of this subject, it must be acknowledged that the positive evidence in favour of suppression of urine during the collapse consequent on perforation is somewhat incomplete; for many of those who have published papers and cases descriptive of this lesion, have not apparently been aware of the significance of the symptom,

¹ 'Lancet,' Nov. 24th, 1866, p. 577.

² Ibid.; March 9th, 1867, p. 299.

even when, as seems to have been more often than otherwise the case, it has not been altogether overlooked. Devergie¹ indeed in his valuable work on legal medicine distinctly states that in perforation of the stomach, the urine is suppressed; and in like manner, Valleix² has remarked "that the suppression of urine is sometimes very remarkable" in peritonitis from perforation; but there are very few writers of importance who have recognised that it is a usual, if not a constant symptom in such cases. Dr. Reeves³ has indistinctly noticed that "the bladder is the organ most frequently affected" in perforation of the stomach; and that its implication is marked "by an incessant desire to pass water—a few drops only escaping;" and he has, moreover, remarked that "the bladder will be found on the introduction of a catheter, empty;" yet he refers to it merely as evidence of the peritoneal inflammation having become general, and does not connect it with shock to the abdominal sympathetic nervous system, although he has cited five cases of more or less sudden death from perforation of the stomach, and has further remarked that patients are sometimes liable to die suddenly in attempting to sit up after perforation has occurred. Dr. Stokes in his paper on "Peritonitis from Perforation of the Serous Membrane,"⁴ does not even allude to suppression of urine in connection with perforation of the stomach; and in the abstract published of Mr. Leonard's paper on "Perforating Ulcer of the Stomach,"⁵ which was read at the Medical Society of London in 1852, there is likewise no allusion to the urinary secretion, or to the state of the bladder. Dr. Crisp⁶ has so far overlooked both the frequency

¹ 'Médecine Légale,' 3e édit., tom. iii, p. 776, 1852.

² 'Guide du Médecin Practicien,' 3e édit., tom. iii, p. 308, 1853.

³ 'Diseases of the Stomach and Duodenum,' pp. 108, 109, 1856.

⁴ 'Cyclopædia of Practical Medicine,' vol. iii, 1834.

⁵ 'Medical Times,' vol. xxv, pp. 476, 477, 1852.

⁶ 'Cases of Perforation of the Stomach from Simple Ulceration,' pp. 3-7, 1843. In one other case recorded by this author (case 4, pp. 10-12) there is indirect evidence of the urine being suppressed, as it is stated that the patient, a girl, æt. 15½, on the evening before her death "had a small quantity of gin and water, and about as much nitre as would lie on a sixpence."

and the importance of this symptom, as merely to state, without comment, that in the case of a woman who had died at 10.30 a.m., on December 27, 1837, from perforation of the stomach, no water had been passed "since 12 o'clock last night; bladder not distended;" and it was found after death that "the bladder was empty."

Among French writers to whom it will be useful to refer is M. Cazeneuve,¹ who has bestowed much attention on this diagnostic symptom, more especially in perforation of the small intestines, and who was at one time disposed to claim the merit of having been the first to draw attention to it in this latter class of cases. He relates a very impressive case of cancerous perforation of the stomach in a man, æt. 28, which came under his observation in the Military Hospital at Lille, in 1833. As no urine was passed, after the perforation in this case occurred, a catheter was introduced, but only two spoonfuls of urine were obtained, and it was found to be impossible to turn the catheter about in the bladder, owing to the very strong contraction of that organ. Subsequently the catheter was again passed, but no urine was obtained, and after death it was noted that the bladder was contracted and hidden behind the pubes. Laisné,² Gerard,³ Lefevre,⁴ and many other observers, who have written on this lesion, have generally failed to notice the state of the urinary secretion; although they have sometimes incidentally mentioned without comment, in what appears to have been the only case in which any note was made of this patho-

¹ 'Gazette Médicale de Paris,' 3e sér., tom. vi, p. 814, 1838.

² (Fr. Chaussier) 'Médecine Légale,' par MM. Lecieux, Renard, Laisné, et Rieux, 1819. A second edition of the Thesis on Perforation, translated by Dr. Weatherhead and dedicated, by permission, to Lord Eldon, was published in 1821.

³ 'Des Perforations Spontanées de l'Estomac,' 1803. In a case cited by this author (Obs. 17, pp. 62, 63), in which a woman, aged 30 years, died from spontaneous perforation of the stomach, it may be inferred from the history of the case that there was suppression of urine during life; after death it was observed that "the bladder was very small."

⁴ 'Archives Générales de Médecine,' 3e sér., tom. xiv, pp. 377-428, and tom. xv, pp. 28-59, 1842.

logical fact, that the urinary bladder after death was found contracted.

Among the isolated cases which have been recorded of perforation of the stomach, in which there is any reference to the urinary secretion and bladder, is a case, observed by Dr. (afterwards Sir Philip) Crampton,¹ of perforating ulcer of the stomach in a lady, æt. 29, in which death occurred from collapse twelve hours after the accident. The condition of the urinary secretion during life is not mentioned; but it is stated that after death "the urinary bladder was empty and contracted." In a case recorded by Dr. Carson,² of rupture of the stomach from rapid development of gas, which occurred in a sailor æt. 20, and who lived for fifteen hours, the condition of the urinary secretion after the occurrence of the accident is not referred to; but it was ascertained after death that "the bladder was contracted and empty." This case appears to have been somewhat complicated, as a slight trace of arsenic was detected in the stomach. M. Desgranges³ has recorded the case of a young woman, æt. 18, who died in twenty hours from spontaneous perforation of the stomach, and in which the symptoms noted twelve hours before death were as follows:—"icy coldness of all the body, especially of the extremities; no pulse; eyes dull and hollow; temples sunk; face pale and cadaverous; and aphonia." There was desire but constant inability to pass urine, and later in the history of the case M. Desgranges refers to the fact of there being no urine. An instructive case of perforation mistaken for cholera has been recorded by Dr. Rigaud,⁴ in which the patient died in twenty hours. Dr. Hérard⁵ has recorded a case of perforation of the stomach in a woman, æt. 34, in which it was noted that the urine was suppressed. A female domestic servant, æt. 48, was admitted

¹ 'Transactions of the Association of Fellows and Licentiates of the King's and Queen's College of Physicians in Ireland,' vol. i, pp. 1-10, 1817.

² 'Edinburgh Medical and Surgical Journal,' vol. lxi, pp. 27-31, 1846.

³ 'Journal Général de Médecine,' 2e sér., tom. xv, pp. 145-164, 1821.

⁴ 'Gazette Médicale de Paris,' 3e sér., tom. xxviii, p. 768, 1858.

⁵ 'Bull. de la Soc. Méd. des Hôp. de Paris,' tom. iii, pp. 149-152, 1864.

into the Cholera Wards of St. Bartholomew's Hospital, Nov. 7, 1866, in whom, after death, there was found to be peritonitis from perforation of the stomach. Lastly, Dr. Barlow¹ has cited a case observed by Dr. Gull, of chronic ulcer of the stomach, with constriction of the pyloric extremity, in which there was excessive vomiting, and no urine was passed for forty-eight hours before death. In this case the bladder was found, after death, empty and contracted.

If from cases of perforation and injury of the stomach the attention be transferred to the corresponding class of cases affecting the small intestines, it will be found that suppression of urine is usually associated with the resulting collapse ; and that in consequence of the common occurrence in such cases of this symptom, it has been referred to by some writers as diagnostic of the seat of mischief. There will not, however, be much difficulty in recognising, on further inquiry, that whether the mischief be the result of perforation or of obstruction of the small intestines, the suppression of urine which results from it must be regarded chiefly as an indication of the intensity of the collapse, consequent on the comparative suddenness of the mischief, and its nearness to the abdominal centre of the sympathetic nervous system ; in the same way that a corresponding suppression occurs in severe cases of cholera, whilst in mild cases of this disease, which it has been customary to refer to as choleraic diarrhoea, there may be, and usually is, the characteristic cholera flux without any suppression of urine. If, for instance, the clinical history of those cases in which the mischief has been limited to one of the three divisions of the small intestines be carefully examined, it will be found that whilst suppression of urine is a very constant symptom in the collapse consequent on perforation or rupture of the duodenum, and also in corresponding cases affecting the jejunum, of which, however, there are but few examples on record, it is less constantly, although still very commonly observed in the strictly analogous cases in which the ileum has been the seat of mischief. With regard, moreover, to the comparative

¹ 'Medical Times and Gazette,' April 28th, 1866, p. 445.

value of this diagnostic symptom, it is important to notice that in a large proportion of the latter class of cases, in which the perforation has occurred in the course of typhoid fever, there has been diminution of the urinary secretion as a consequence of the fever, previous to and apart from any severe affection or injury of the ileum, and that this diminution, being associated with the continued formation and accumulation in the system of the urinary constituents, is pathologically a distinct condition from the diminution and suppression which occurs in those cases which are analogous to cholera, and in which, as in cholera, the failure of excrementitious elimination is an index of the extent to which the sympathetic nervous system is affected during collapse.

The following illustrative cases referrible to the duodenum may be cited in favour of these remarks:—1. The case already mentioned of spontaneous perforation of the duodenum, three lines from the pylorus, which was lately admitted into the Cholera Ward of the London Hospital, and in which there was “undoubted and continued suppression of urine.” 2. A case, reported by M. Petrequin,¹ of spontaneous perforation of the duodenum, eight lines from the pylorus, in which the collapse very closely resembled that of cholera, for there was suppression of urine, cyanosis, the Hippocratic face, and the pulse was imperceptible at the wrist. The state of the bladder after death was not noted. 3. A case, reported by Dr. Humphrey Sandwith,² of perforation of the middle of the duodenum by a worm, in which the pulse at times was scarcely perceptible at the wrist, and when a catheter was passed only a few ounces of urine were withdrawn. After death the bladder was found empty and contracted. 4. A case, reported by Dr. Symes,³ of laceration of the duodenum, from external violence, which the patient survived only twenty hours. In this case, which differs somewhat in character from the preceding, as the injury occurred from without inwards, there was a constant desire

¹ ‘Archiv. Gén. de Méd.,’ 2e sér., tom. xii, pp. 483-485, 1836.

² ‘British Medical Journal,’ March 9th, 1861, pp. 249, 250.

³ ‘Dublin Quarterly Journal,’ vol. xlii, pp. 497-498, 1866.

to pass water, but it is not stated that any was passed. After death the bladder was found empty and contracted. 5. A case, recorded by Prof. Rembold,¹ of strangulation of the first portion of the duodenum, in which, on passing a catheter, only some drops of urine were obtained. 6. A case of perforation of the duodenum in a clerk, aged thirty years, recorded by M. Oulmont,² in which there was suppression of urine with vesical tenesmus; and when, owing to the patient believing that the bladder was about to burst, a catheter was passed, not a drop of urine could be obtained. After death the bladder was found strongly contracted and quite empty. In this case there was for some hours before death persistent delirium, which appears, however, to have been due, not to the suppression of urine, but to the patient's previous habits of excessive drunkenness, which had led to occasional attacks of insanity, during which he had sought one day to strangle his child, and on another occasion to kill his wife. Lastly, in a small series of cases of duodenal perforation, recently published by Dr. Andrew Clarke,³ there is, beside the case already referred to as having died in the Cholera Ward of the London Hospital, a well-marked case (Obs. 2), of a lad, aged nineteen years, who was admitted into the London Hospital "in a state of partial collapse, and alleged to be suffering from retention of urine." By means of a catheter, easily introduced, the bladder was found empty. After death it was ascertained that the perforation of the duodenum had occurred about one inch and a half from the pylorus. "The right cavities of the heart were gorged with blood; the left empty." Dr. Clarke, in commenting on this case, remarks that "one could scarcely have wondered if it had been mistaken for cholera." In the case of a watchmaker, aged twenty years, which is the third case in this series, the urinary secretion and bladder are not referred to, but the appearance of the patient is described as "like that

¹ 'Gazette Hebdomadaire,' 28 Avril, 1865, pp. 271, 272.

² 'Archives Médicales de Strasbourg,' Août, 1836; cited by M. Forget, 'Gazette Médicale de Paris,' 2e sér., tom. v, p. 229, 1837.

³ 'British Medical Journal,' June, 1867.

of a choleraic in collapse.”¹ There are two other cases of perforation of the duodenum recorded by Dr. Clarke, which it may be useful to notice in connection with this subject, as they illustrate the relatively milder effect of a slight and gradual leakage compared with a more sudden and extensive escape of the duodenal contents. In one of these cases the patient was a man, aged thirty-five years, who died from perforation of the duodenum, which was situated about half an inch from the pylorus. When first seen, only a slight leakage had apparently occurred; the extremities were warm, and some healthy urine had, a short time previously, been passed. Six hours before death there was undoubted evidence of peritonitis from perforation, with the characteristic collapse. The perforation of the duodenum in this case was ascertained to be about half an inch from the pylorus; but the state of the bladder after death is not mentioned. In the other case (Obs. 6), which is of a somewhat doubtful character, a man, aged forty-three years, was supposed to have had a slight leakage from duodenal perforation, and it is stated that the urine was normal; but the diagnosis in this case could not be verified, as the patient recovered.²

Cases of perforation, of obstruction, or even of traumatic lesion of the jejunum, are, as already stated, rare; but among the few which have been recorded, there is one of considerable interest observed by M. Cazeneuve,³ in which a man, *æt.* 24, suffered from two attacks of peritonitis from

¹ Corresponding cases have been published by M. Poisson (*Bull. de la Soc. Anat. de Paris*, tom. xxx, pp. 300, 301, 1855;) by Mr. Stilwell (*Lancet*, July 18th, 1846, p. 67); and by Sir David J. H. Dickson (*Med.-Chir. Review*, vol. xxxiii, pp. 586, 587, 1840.)

² In connection with these cases it may be useful to notice that acute ulceration mostly limited to the first portion of the duodenum, and to which Mr. Curling (*Med.-Chir. Trans.*, vol. xxv, 1842) has directed attention as a not unfrequent sequel to burns, especially in young subjects, appears to be an occasional consequence of what at present can only be vaguely referred to as shock, which appears to act by causing an arrest of nutrition, and which would therefore be strictly allied to, though differing in degree from, what occurs in cholera and in some of its analogies.

³ *Gazette Médicale de Paris*, 3e sér., tom. vi, obs. 2, p. 813, 1838.

perforation, which occurred in January and in April of the same year. It is mentioned in the report of this case that there had been, at the time of the first attack in January, vesical tenesmus with difficulty in the urinary secretion: whilst in the fatal attack in April there had been suppression of urine. After death, perforation of the ileum near the ilio-cæcal valve, and of the jejunum near its middle were found; and the bladder was empty and hid behind the pubes. Dr. Barlow¹ has recorded a case of fatal obstruction of the jejunum, in which there was complete suppression of urine for six days; a catheter having been passed and no urine obtained. And a case of traumatic rupture of the jejunum in a labourer, æt. 31, which was followed by death in forty hours, occurred lately in the practice of Mr. Curling² at the London Hospital. In this case the collapse closely resembled that of cholera; there was intense pain in the hypogastric region; vomiting; coldness of the extremities and also of the tip of the nose; pulse imperceptible at the wrist, and very feeble in the brachial artery; and cyanosis. There is no reference, in the report of the case, to the state of the urinary secretion during life, but after death the bladder was found empty and contracted.

Although it must be admitted that comparatively little attention has been directed to the state of the urinary secretion in perforation or in other lesions of the stomach, duodenum, and jejunum, yet there has been great and, in some respects, undue importance assigned to it in those cases in which the ileum has been affected; and whilst some distinguished writers have referred to it as in some degree diagnostic of perforation, others have regarded it as an almost certain indication of obstruction in the small intestine, chiefly at this part. Among the former may be cited M. Cazeneuve,³ who has recorded three cases of perforation of the ileum (Obs. 1, 2, and 5) occurring in the course of typhoid fever, in which

¹ 'Guy's Hospital Reports,' vol. ii, pp. 378-380, 1844; and 'Medical Times and Gazette,' April 28th, 1866, p. 444.

² 'London Hospital Reports,' vol. ii, pp. 287-288, 1865.

³ 'Gazette Médicale de Paris,' 2e sér., tom. v, pp. 818-821, 1837.

there was more or less vesical tenesmus, with suppression of urine; and in each of these three cases the bladder was found empty and contracted. Subsequently, however, M. Caze-neuve¹ has remarked that "suppression of urine has not occurred in all cases; often, also, it is not complete. I should only have (he adds), in order to prove this, to cite the silence of authors on this point. In effect, it is not mentioned by M. Andral, Louis, Chomel. M. Broussais cites only two or three examples of it; moreover, cases have been related in which the urinary secretion has continued." Among those who have bestowed special attention on this symptom is M. Judas,² who, when Assistant Physician to the Gros-Caillou Military Hospital at Paris, recorded two cases of perforation of the ileum which occurred in that hospital, and in both of which there was suppression of urine. In one of these cases, that of a soldier aged twenty-three years, a catheter was passed without, however, obtaining a drop of urine; and after death the bladder was found empty and very much contracted. In the other case, when a catheter was passed, it could not be depressed, and only a few drops of clear and inodorous urine were withdrawn: the bladder, after death in this case, was found empty and contracted to the size of a pigeon's egg. In a case which occurred in the practice of M. Piorry,³ in which a man, aged thirty-one years, had perforation of the ileum in the course of typhoid fever, there was for some time suppression of urine as a result of the perforation, but subsequently, during the last few days of life, the urine was again secreted and passed; showing that the suppression in these cases is not so much due to either the fever or the inflammation, as to the shock consequent on the perforation. Whilst in cases unconnected with typhoid fever, as, for example, in those produced by a worm, or by external injury, suppression of urine, with an empty and contracted state of the bladder after death, has been noted by Mr. Kell,⁴

¹ 'Gazette Médicale de Paris,' 3e sér., tom. vi, p. 814, 1838.

² Ibid., pp. 722, 723.

³ Ibid., pp. 44, 45.

⁴ 'London Medical Gazette,' vol. ii, pp. 649-650, 1828.

by M. Andral,¹ by M. Baraduc,² and by some other observers.

But far more importance has been assigned to suppression of urine in the collapse which results from intestinal obstruction than, perhaps, in any other class of cases; and the following case of strangulation of the lower part of the ileum, which has been lately recorded by M. Dexpers,³ affords a good illustration of the analogy between such cases and cholera. The patient was a soldier, who, when brought to the hospital, presented, we are informed, the appearance of a patient suffering from cholera; his eyes were sunk; his complexion cyanosed; his hands blue and cold; the skin wrinkled; and the pulse small, hard, and very frequent. The succeeding night was passed in mortal agony; in spite of frequent desires, it was impossible for him to pass either fæces or urine, and the introduction of a catheter brought away only a few drops of urine. The intellectual faculties were unimpaired. After death the bladder was observed to be empty and completely hid behind the pubes. Dr. Besnier,⁴ in a valuable memoir on intestinal obstruction, has recorded a fatal case (Obs. 128) of strangulation of the small intestine in a woman, aged forty-seven years, who, "in consequence of a bath too hot taken immediately after having eaten, was suddenly seized with a very sharp and sudden pain in the abdomen." There was the usual collapse with constipation and suppression of urine from that time, and it was ascertained on the day after her admission that the bladder was empty. And Mr. Robinson⁵ has recorded the case of a woman, aged sixty-three years, who died in thirteen hours from collapse with suppression of urine, which was supposed to be cholera, but after death it was ascertained that there was strangulation of the ileum. With reference to such cases it is curious to notice

¹ 'Clinique Médicale,' tom. ii, 3e édit., pp. 602-604, 1834.

² 'Bull. de la Soc. Anat. de Paris,' tom. xiii, pp. 336-340, 1838.

³ 'Recueil de Mémoires de Médecine, de Chirurgie, et de Pharmacie Militaires,' tom. xviii, 3e sér., pp. 195, 196, 1867.

⁴ 'Des Etranglements Internes de l'Intestin,' Paris, pp. 194-196, 1860.

⁵ 'London Journal of Medicine,' vol. iii, pp. 443-446, 1851.

the great difference of opinion which has prevailed respecting the importance and the meaning of this suppression of urine; for whilst, on the one side, the late Dr. Barlow,¹ in common with some other observers, alleged that it might be considered diagnostic of that form of constipation which results from obstruction of the bowels situated high up, and that when the obstruction is low down then the urine is not suppressed in these cases of obstinate constipation, owing, as was erroneously supposed, to a sufficient amount of fluid for carrying on the urinary secretion being allowed to enter the system in the latter class of cases, but not in the former; on the other side it will be found that a different explanation of the fact has been given in the lately published and posthumous work of Dr. Brinton² on intestinal obstruction, in which the diagnostic value attached to this symptom by Dr. Barlow is altogether denied, and Dr. Brinton, in admitting the frequent occurrence in these cases of suppression of urine, expresses his belief that "the amount of vomiting is the truest symptomatic correlative of the diminution of the urine," and consequently agrees to some extent with Dr. Besnier,³ who, in directing attention to the opinions on this subject of "English physicians," remarks, that the state of the urinary secretion, although "useful to consult, nevertheless does not furnish any indication which has an absolute value;" and that to enable us to infer something from the small quantity of urine secreted there must be neither peritoneal inflammation nor any considerable or frequent vomiting; "for these conditions (he adds) are sufficient to bring about diminution or even suppression of the urinary secretion." It may here, perhaps, be allowable to remark that any correlation which may exist between vomiting and suppression of urine in these cases appears to be simply the result of both conditions being primarily dependent on the affection of the abdominal

¹ 'Guy's Hospital Reports,' 1844; and 'Medical Times and Gazette,' April 28th, 1866.

² 'Intestinal Obstruction,' by William Brinton, M.D., F.R.S., edited by Thomas Buzzard, M.D., London, 1867.

³ Op. cit., pp. 305, 306.

sympathetic nervous system; and this seems to have been subsequently, though very imperfectly, recognised by Dr. Brinton, who refers with evident hesitation and doubt to the connection between this form of suppression of urine and what he terms "mere collapse."

The opinions which have been expressed by the above-cited and other authorities respecting the diagnostic value of suppression of urine in such cases as the preceding appear to be all defective, in so far that the suppression is alleged to be connected with or dependent on something which is not essential to its occurrence, although it may be, and perhaps often is, associated with it. Hence the importance of carefully collating the clinical history of all those cases in which, as in cholera, it characterises the collapse; for by thus extending the range of the inquiry it will be conclusively proved that this symptom may occur in corresponding conditions of collapse, independent, for example, of any one of those four cardinal phenomena, of pain, vomiting, intestinal obstruction, and intestinal flux, which have each been referred to by distinguished writers on the subject as its correlative, since by means of such extended inquiry it can be clearly demonstrated that suppression of urine is not necessarily dependent on any of these associated conditions. This will become more and more evident as the inquiry proceeds, but it will be convenient on this occasion to remark that its occasionally more or less complete independence of pain is fully proved by the fact that there may be epigastric pain quite equal in intensity to that of cholera, or any analogous disease, without any suppression of urine; that cases of painless choleraic diarrhoea have been observed in which the urine has been suppressed; and that in cases of cholera itself the suppression is often maintained for a long time after all pain has ceased in patients who ultimately recover. Whilst its alleged dependence, either on intestinal obstruction or on flux from the stomach or bowels, is in like manner fully disproved by cases in which neither of these two apparently opposite conditions has been observed, the term apparently being here introduced in consequence of these two conditions,

so far as the suppression of urine is concerned, admitting of being reconciled. For the suppression of urine in these cases is supposed to represent simply a want of water, and this deficiency is alleged to be consequent on the supply being so completely shut off in cases of intestinal obstruction, and so completely drawn off in cases of intestinal flux, as to reduce the remaining fluid in the body very considerably below what is required to carry off the excrementitious matters usually eliminated by the kidneys. Ample evidence of a very conclusive kind could be cited in opposition to this theory of the suppression of urine during collapse being due to a reduced supply of fluid; but it will be sufficient for the present to quote the two following cases to show that the urine may be suppressed during collapse from structural lesions in the immediate neighbourhood of the stomach, without the integrity of the gastro-intestinal mucous membrane being impaired. In the first of these illustrations, which has been recorded by Dr. McSwiney,¹ a man, aged forty-five years, died from collapse with suppression of urine, fifty-eight hours after the spontaneous rupture of the common bile-duct. The lesion, which occurred about three quarters of an inch from the entrance of the duct into the duodenum, was probably connected with over-distension of the gall-bladder from starvation; and although the lower portion of the ileum in this case was much diminished in calibre, it was pervious to the passage of fluid. In the second illustration, which was observed by Dr. Wolf,² of Bonn, there was a corresponding rupture of the hepatic duct in a woman, aged sixty years, who died twenty-four hours after the occurrence of this lesion. The resulting collapse in this case closely resembled that of cholera, and only a few drops of urine were discharged. The urine has in like manner been sometimes observed to be suppressed in severe abdominal operations, and among the more distinguished observers who have specially noted this fact is M. Claude-Bernard,³ who informs us that in the operations

¹ 'Dublin Quarterly Journal,' Nov., 1866, pp. 518, 519.

² 'Journal des Progrès des Sciences et Institutions Médicales,' tom. xiv, pp. 245, 246, 1829; cited from 'Journal von Graafe,' 12e, B. S., 370.

³ 'Comptes Rendus,' tom. xlvi, p. 161, note, 1858.

required to expose the renal vein, in which it is necessary to open largely the abdomen, there is "nearly always (as a consequence of the operation) in the dog and in the rabbit, if not immediately, at least after a few moments, suppression of urine."

The importance which has been attached to suppression of urine in cases of collapse simulating that of cholera must not, however, lead to other points in the analogy being undervalued or overlooked; for in some recorded cases belonging to the preceding group, in which there is no mention of the urinary secretion or bladder, much useful information on some other facts in pathology may not infrequently be obtained. With reference more especially to the condition of the vascular system, it should be observed that there is often a very close resemblance between these cases and cholera, not only as regards the frequent occurrence of cyanosis, and the failure, often for several hours before death, of the pulse at the wrist, which have been noted in many of the cases already cited, as well as in others in which there is no mention of the urinary secretion; but even the physical condition of the blood and the spasmodic contraction of the blood-vessels have occasionally been observed to be also similar. In a case, for example, of spontaneous perforation of the stomach in a girl, aged twenty-one years, observed by M. Ubersaal,¹ Senior Physician to the Orphan Asylum at Strasburg (a preparation of which has been preserved in the Museum of the Faculty of Medicine), it was found, on bleeding the patient from the arm to the extent of eight ounces, that the blood drawn from the vein was so thick as to flow with difficulty; and although the collapse in this case was not at first so well marked as it usually is after perforation has occurred, yet only a small quantity of urine was passed. The state of the bladder after death was not noticed. And Dr. Ebermaier,² in an ably written article on perforation of the stomach, states that in two of the cases which he has cited (cases 2 and 8) the patients were ordered

¹ 'Archiv. Gén. de Médecine,' tom. xxvi, pp. 412-414, 1831.

² 'Journal Complémentaire du Dictionnaire des Sciences Médicales,' tom. xxxi, pp. 34 and 164, 1828.

to be bled, and that in each case the attempt to obtain blood from a vein failed.

Another point in the analogy between these cases and cholera, to which it may be useful to refer, is the spasmodic contraction of the muscles, which has been specially noticed by M. Gerard¹ in a well-marked case of spontaneous perforation of the stomach in a man, from twenty-eight to thirty years of age, in whom "the muscles of the abdomen were in a state of such violent contraction that the anterior wall of this cavity appeared glued to the vertebral column, and offered the hardness of a board." The patient was ordered to be bled, in accordance with the usual practice at that time, and it was noticed that "as soon as the lancet was withdrawn from the vessel the blood spurted out more than ten feet, and immediately stopped, without the possibility of the surgeon, who was very dexterous, being able to obtain more." M. Gerard, in commenting on this case, informs us that these violent contractions are not an infrequent symptom also in wounds of the stomach, and he has cited a remarkable instance which occurred in the military hospital at Strasburg, into which a soldier had been admitted apparently dead from a large wound in the abdomen below the zypmoid cartilage, and through which the contents of the stomach escaped. The patient rallied, but died the next morning, after suffering great pain; and in dissecting the body it was found that in the muscles of the arm, but especially in those of the thighs, an innumerable number of the muscular fibres were broken. In like manner it has been remarked by Orfila,² and other observers, that spasmodic rigidity of the muscles during life is "among the lesions of tissue produced by arsenious acid."

Well-marked pulmonary collapse, which has been already noticed in connection with irritant poisoning, was observed by Dr. Cotton³ in a case of large perforating ulcer of the stomach communicating with the transverse colon. The

¹ Op. cit., pp. 1-4, 1803.

² Op. cit., tom. i, 4e édit., p. 344, 1843.

³ 'Medical Times and Gazette,' Jan. 12, 1856, pp. 38, 39.

patient in this case was a shoemaker, aged forty years, who died in the Brompton Hospital, eighteen days after faecal vomiting had occurred, from "exhaustion or collapse;" and the lungs, which were found after death to be free from tubercle, were "very much collapsed." In connection, moreover, with pulmonary collapse it may be remarked that an alteration characterised by diminution or absence of the voice, such as is common in cholera, is also very noticeable in many of these cases of analogous collapse, and it has been specially referred to by Dr. Murchison¹ in his elaborate paper on gastro-colic fistula.

In directing attention to these and other accompanying conditions in collapse, it is necessary at the same time to state that even if they could all be detected and analysed with the same facility as suppression of urine, which, generally speaking, is not possible, yet none of them indicates either so clearly or so exactly the character and the extent of that general affection of the system which, in the case of cholera and its analogies, has been inferred to result from a central arrest of organic function. Failure of the circulation, cyanosis, and superficial coldness, are none of them so distinctive as suppression of urine is of such an arrest of organic function, for they may to some extent occur without it. In like manner, the pulmonary function also fails to supply any corresponding amount of information; for even if, in relation to organic life, carbonic acid could reasonably be assumed to be the correlative of urea, yet there is not the same facility for ascertaining either the extent to which its development has been arrested or the extent to which it has been unduly retained in the blood. With reference, therefore, to the alleged connection between the lungs and cholera through the medium of the blood, to which great and apparently undue importance has sometimes been attached, although there is evidence to show that the development of carbonic acid during intense collapse is more or less completely arrested, and that consequently the air inhaled only partially enters the lungs, and is expired almost, if not occasionally

¹ 'Edinburgh (Monthly) Medical Journal,' vol. iii, p. 132, 1858.

altogether, unchanged, still it must be admitted that the lungs can never, like the urinary bladder, be empty and contracted for an equally lengthened period of life, nor can the formation of carbonic acid, like that of urea, be so completely interrupted for the same time. It may consequently be affirmed that the state of the urinary secretion is the best guide that could be selected in investigating the nature of choleraic and allied forms of collapse, the assistance afforded by it being twofold, and derived partly from direct observation and partly from analogy. With respect to the former, it has been satisfactorily demonstrated by the researches of Dr. Garrod¹ and other able investigators² of the chemical pathology of cholera, that the formation of urea is checked or suspended during choleraic collapse; and although there are no corresponding observations on the suppression of urine in analogous cases of collapse, and consequently no direct authority for stating that the suppression in such cases is due to a like arrest of organic function, yet it must be admitted that the presumptive evidence is very great, if not almost conclusive, in its favour. For unless we are prepared to admit that the suppression of urine in these cases of analogous collapse is connected with the arrested formation of urea, it would be impossible to avoid coming in contact with one of two dangerous fallacies, which represent Scylla and Charybdis in the pathology of collapse. For if, in these cases, urea is uninterruptedly formed during collapse, it must be either discharged or retained; in the one case we should have to face the insurmountable obstacle of vicarious secretion, insurmountable at least on this occasion, because it would be necessary to assume that the amount of fluid might be reduced below that required for renal secretion, and yet suffice, not only for a distant and extra-visceral secretion like that from the mammary gland, but also for an adjoining and vicarious secretion; whilst in the other case we should have

¹ "On the Pathological Condition of the Blood in Cholera," *London Journal of Medicine*, 1849.

² Dr. O'Shaughnessy 'On the Chemical Pathology of Malignant Cholera,' p. 61, 1832.

to admit that urea might accumulate in the blood during collapse without causing mischief, although all past experience and all direct observation on the subject lead to the inference that uræmic poisoning would follow with unusual rapidity the accumulation of urea in blood which, although too inspissated, as it is alleged, for renal secretion to occur, is yet not so inspissated as to arrest the mammary secretion or to impede the circulation through the brain.

Apart from analogy it would, perhaps, be scarcely possible to estimate correctly the value of this symptom as indicative of collapse, for it is still very generally supposed that the suppression of urine, if not the collapse itself, is essentially dependent in cases of cholera on the flux from the stomach and bowels; and Dr. Copland,¹ who agrees on this point with Sir Thomas Watson,² Dr. Wood,³ of Philadelphia, and other distinguished writers, may be said to represent very fairly the prevailing opinion when, in his latest publication on the subject, he states without reserve that "the ischuria (in cholera) is a consequence of the excrementitial fluid of the blood being all discharged by the digestive canal and skin, none being left that can be removed by the kidneys." In reply to this assertion it will be sufficient to mention that, not only is there ample evidence derived from direct observation to refute it, in addition to the evidence which has been adduced from analogy, but that there is, moreover, a self-destructive fallacy in thus supposing that the digestive canal could serve for the complete escape of excrementitial matter usually discharged by another outlet, whilst the elimination of excrementitial matter proper to the canal itself is altogether checked. For just in the same way that jaundice results from the increasing accumulation of the essential elements

¹ 'Dictionary of Practical Medicine,' vol. iii, part ii, p. 1006, 1858.

² 'Lectures on the Principles and Practice of Physic,' 4th edit., vol. ii, p. 642, 1857.

³ "In epidemic cholera, in which the urinary secretion is sometimes entirely arrested, the brain remains remarkably clear, in consequence, no doubt, of the copious discharges from the skin and alimentary mucous membrane."—'A Treatise on the Practice of Medicine,' 4th edit., vol. ii, p. 599, 1855.

of bile in the blood, and uræmic poisoning from the increasing accumulation in like manner of urea, so the absence of these two morbid conditions shows that during collapse there is no excess of excrementitious matter for either the kidneys or the liver to eliminate, and therefore no urine is conveyed to the bladder and no bile to the alimentary canal. It is, indeed, chiefly in consequence of this parallel arrest of the organic functions presided over by the abdominal sympathetic nervous system that the primary seat of the disease in cholera, as in analogous diseases, has been referred to the digestive canal, for no corresponding arrest of function usually occurs in those organs which are remote from this nervous influence; and the analogy which has been traced in the preceding groups of cases tends, without exception, to this conclusion. But before any just estimate can be formed of the value of analogy in cholera, it is necessary that preconceived opinions in favour of a lung theory of the disease should be given up, so as to allow the attention for a time to be transferred from the outworks to the centre of organic life, for otherwise it would be impossible to give any physiological explanation of the fact that lactation continues and the urine is suppressed, whilst the condition of the brain itself is undisturbed; and although analogy can only be referred to for the purpose of supplying indirect evidence, yet, on the present occasion, this is so strongly in favour of cholera being primarily due to an affection of the sympathetic nervous system, developed through the medium of the digestive canal, as scarcely to need any further evidence to support it. It may, however, before concluding, be useful to state that such experimental evidence as the subject admits of strengthens the argument from analogy; and although evidence of this kind, when based on a protracted and complicated operation, is usually very questionable, there is some which appears to be free from any such objection, as, for example, Dr. Davey's¹

¹ 'The Ganglionic Nervous System,' p. 196, 1858. The pressure of an aneurism, by interfering with the nervous supply to the small intestine, appears to have caused "excessive diarrhœa" in Dr. J. W. Ogle's case of aneurism of the superior mesenteric artery at St. George's Hospital. ('Path. Trans.,' vol. viii, pp. 168-170, 1857.)

important observation, that “the fatal depression in cholera, consisting in the complete annihilation of the action of all the vital organs, may be at any time simulated by pressing the solar ganglion on the fore part of the bodies of the vertebræ over which it lies.”

P.S.—Since the above was written some important evidence in support of the argument contained in this paper has been supplied by M. Moreau’s experiments on section of the abdominal nerves in relation to intestinal flux. (*Comptes Rendus des Séances de l’Académie des Sciences*, tom. lxvi, pp. 554-557, 1868; cited in *Medical Times and Gazette*, April 11, 1868, p. 397.)