Notes

ON THE

PATHOLOGY AND TREATMENT OF CHOLERA.

BY

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The Relationship between Choleraic Collapse and the Gastro-intestinal Symptoms.—Why is not Dyspnoea a more Common and Urgent Symptom during Collapse?—What is the Cause of the Peculiar Feebleness of the Voice during Collapse?—Why is Syncope so Rare an Occurrence in Cholera?

The Relationship between Choleraic Collapse and the Gastro-intestinal Symptoms. There are few subjects which have given rise to greater difference of opinion or to greater discrepancy of statement, than the question as to the relationship which exists between that condition which we recognise as choleraic collapse and the gastro-intestinal symptoms—the vomiting and purging. Those who adopt the theory that collapse is a result of the drain of fluid from the blood, have boldly asserted that there is a direct and constant relation between the degree of collapse and the drain of fluid from the blood. Others, with more candour and caution, admit that, while there is some general relationship between the degree of collapse and the amount of fluid which passes away by the stomach and bowels, there are yet very striking exceptions to this rule. Most of the best writers on cholera, both in India and in Europe, refer to cases in which, to use the words of Dr. Parkes, “there is absolutely no ratio between these two classes of symptoms” (i.e., the gastro-intestinal symptoms and collapse), “or they appear even to observe an inverse ratio to each other.”

It is to cases of this kind that Scot refers, when he says, “A frequent variety, the worst of all, is that which is noted for the very slight commotion in the system; in which there is no vomiting, hardly any purging, perhaps only one or two loose stools, no perceptible spasm, no pain of any kind; a mortal coldness, with arrest of the circulation, comes on from the beginning, and the patient dies without a struggle. This has frequently manifested itself as the prevailing type; and almost all die who are attacked by it.” (*Report on the Epidemic Cholera, Madras*, p. 21.)

We are now, I think, in a position to give a rational and intelligible explanation of the relationship which exists between the gastro-intestinal and the other symptoms of cholera. In giving what appears to be the true interpretation of these phenomena, I shall be enabled very much to condense what I have to say, if I assume that my readers are already familiar with the account which I have given of the pathology of collapse.

1. First, then, during an epidemic of cholera, there occur many cases of what are commonly called choleraic diarrhoea, characterised by the occurrence of vomiting, bilious purging, and cramps. These cases

are more or less severe, according to the dose or virulence of the poison or the peculiar susceptibility of the individual; but they do not pass into collapse. It is probable, however, that this disease is of essentially the same nature as cholera with collapse. The difference is one of degree. In these milder cases, the morbid condition of blood has not been sufficient to induce that arrest of the pulmonary circulation which is the immediate and essential cause of collapse. One of the most conclusive proofs that choleraic diarrhoea is essentially the same disease as cholera with collapse, is the undoubted fact that, when opium has been given in sufficient quantity to arrest suddenly and completely the bilious purging, the disease has often passed immediately into the stage of collapse. The explanation of this sudden transition is that, the escape of the poison and its products having been prevented by the opium, they have accumulated in the blood, the pulmonary circulation has become obstructed, and so the state of collapse has occurred.

2. In a second class of cases, an attack which commences with bilious vomiting and purging passes on, with more or less rapidity, into the stage of collapse, even though the course of the disease has not been interfered with by treatment. Coincidentally with collapse, there is suppression of bile and, in most cases, a marked diminution in the amount of intestinal excretion. In cases of recovery, however, the purging continues more or less during the stage of collapse, during reaction, and for some time after reaction has been fully established. In this class of cases, the morbid change in the blood has been sufficient for a time to obstruct the pulmonary circulation, and so to cause collapse; then the pulmonary obstruction has been gradually removed by the elimination of the poison through the gastro-intestinal canal.

3. In a third class of cases, the attack commences, as in the preceding class, with vomiting and purging; but extreme collapse supervenes with great rapidity. Soon there is an entire cessation of vomiting and purging; and the patient quickly dies. In these cases, the elimination of the morbid poison by the stomach and bowels is suspended in consequence of the high degree of obstruction to the pulmonary circulation. It is manifest that, for the continuance of the process of excretion from the mucous membrane of the stomach and bowels, there must be a certain blood supply to these organs. A ligature on the arteries which supply the stomach and bowels would obviously stop all secretion from the mucous membrane; and, in cases of extreme collapse, so nearly complete is the arrest in the lungs, that the supply of blood sent to the stomach and bowels is insufficient for the continuance of the secretory process. The elimination of the morbid poison is, therefore, more or less completely stopped; there is a “dead-lock”; and the patient's condition is henceforth one of hopeless collapse.

4. Lastly, there is a class of cases in which collapse comes on at the very commencement of the disease, robust sailors falling down on deck “as if they had drunk the concentrated poison of the upas tree.” (Sir Wm. Burnett's *Report on Cholera in the Black Sea Fleet*.) This is the class of cases referred to in the extract which I have before given from Scot; and his statement that there is “arrest of the circulation from the beginning” is the exact and literal truth. The poison is so virulent, or the patient so susceptible, that the pulmonary circulation is quickly arrested, and there is scarcely any attempt at elimination. It may be that after death the rice-water secretion is found in the small intestines, and healthy faeces in the colon; but the process of excretion has been speedily arrested by the fatal obstruction in the

lungs. In this class of cases the disease is more malignant, more unmanageable, and more rapidly fatal, than in any of the others.

We see, then, that when the disease stops short of collapse, the abundance of the gastro-intestinal excretion is a pretty accurate measure of the severity of the attack; just as, in the case of small-pox, the gravity of the disease is measured by the copiousness of the eruption. But when choleraic diarrhoea passes into the stage of collapse, the gravity of the disease often bears an inverse ratio to the vomiting and purging; and no cases are more hopeless than those in which not only is there a cessation of the vomiting and purging, but an almost complete arrest of the process of excretion from the gastro-intestinal canal. The cause of this suspended excretion is the extreme degree of obstruction to the pulmonary circulation; and there is no hope of relief except from the use of means which tend to increase the flow of blood through the lungs. I have before shown that the hot saline injections into the veins act in this way. The injections have, in most instances, been followed by an increase of the intestinal discharges; and it is likely that the number of recoveries after this operation would have been greater than it has actually been, were it not for the fact that the good effect of the injections in giving temporary freedom to the circulation has generally been counteracted by the simultaneous administration of opium and brandy.

Another remedy, which affords some hope of relief in these all but desperate cases, is *venesection*. I have before shown that the symptom which appears especially to call for venesection, and which has most commonly been relieved by it, is rapid breathing with an oppressive sense of suffocation. When, with these symptoms, there is a cessation of vomiting and purging, which is probably a result of the almost complete arrest of blood in the lungs, the patient will speedily die if he be not relieved; and venesection affords some hope of benefit. The only rational interpretation of the speedy relief which has often followed the operation is that, by lessening the over-distension of the right cavities of the heart, it increases the contractile power of their walls, and consequently more blood is propelled through the lungs. The following description of the effects of venesection is given by a medical man who was himself the patient. "There was a sensation which I am at a loss to describe, as if my heart was ceasing to beat, and a dread of suffocation; this sensation was instantly relieved by bleeding, and I recovered immediately." (*Reports on Asiatic Cholera on Regiments of the Madras Army*, by Samuel Rogers, p. 269.) Venesection in these cases will act as a purgative, by increasing the freedom of the pulmonary circulation, and thus sending a larger supply of blood to the intestines.

It would manifestly be useless, and worse than useless, to administer either emetic or purgative drugs to a patient in whom the process of intestinal excretion has been suspended in consequence of a nearly complete arrest of the circulation. The use of emetics and purgatives in cholera is to assist in the speedy expulsion of the morbid secretions which have been poured into the digestive canal. A careful examination of the abdomen will assist in determining the important practical question, whether the cessation of the purging be a result of arrested excretion, or whether it be due to an excessive accumulation of excreta in an over-distended and torpid bowel. In the one case there is suppression, in the other retention, of the excretions. In the latter case, a purgative, by stimulating the bowel to unload itself, may be the means of saving life.

Before concluding this communication, I will reply to some questions which have been put to me from time to time.

Why is it that, with so great an impediment to the pulmonary circulation, Dyspnoea is not more common and more urgent during Collapse? The absence of urgent dyspnoea in most cases of collapse affords conclusive evidence that the obstruction does not exist in the capillaries of the lung. With the capillary engorgement which often occurs after reaction is established, there is always hurried and rapid breathing. During collapse, the obstruction occurs in the minute arteries, so that the balance between the stream of blood through the capillaries and the supply of air in the cells is maintained; and there is usually no urgent dyspnoea until the obstruction has reached an extreme degree and death is imminent.

What is the cause of the peculiar Feebleness of the Voice during Collapse? Is it a result of muscular weakness? Certainly not; for, if so, it would continue more or less during the stage of reaction from collapse, and the voice would not be immediately restored to its full power by the hot injections into the veins. The feebleness of voice is one of the phenomena which are always exactly coincident with collapse, and it is a result of the small volume of tidal air. During collapse, the volume of air which is breathed is greatly reduced. This is proved by Twining's observations before referred to (*BRITISH MEDICAL JOURNAL*, Jan. 27th, p. 87). It is confirmed, too, by the incompleteness of the respiratory movements during collapse, the imperfect expansion of the chest, and the feebleness and even sometimes the complete absence of the vesicular respiratory murmur. The explanation of the diminished current of tidal air during collapse is to be found in the fact that, owing to the arrest of blood in the pulmonary artery, and the reduced volume of blood which in consequence passes through the capillaries of the lungs, there is less demand for air. There appears to be a mutual attraction between the blood in the pulmonary capillaries and the air in the cells; so that, when the access of one is prevented or limited, the supply of the other is lessened in a corresponding degree. With the first rush of air into the lungs at the moment of birth, the blood is drawn into the lungs through the pulmonary artery, and ceases to flow through the ductus arteriosus. During a paroxysm of spasmodic asthma, defective respiration is associated with extreme feebleness of the voice and smallness of the pulse in proportion to the intensity of the dyspnoea. The explanation of the small and feeble pulse in these cases I give in the words of Dr. Salter (*On Asthma*, p. 71). "The imperfect supply of air produces capillary arrest—partial stasis—of the pulmonary circulation; only a small quantity of blood is, therefore, allowed to pass on to the left side of the heart.....That the small pulse is due to pulmonary capillary arrest, itself due to shutting off of air from the lungs, is proved by the fact that, immediately the paroxysm yields, the pulse resumes its normal volume." In the case of spasmodic asthma, the flow of blood through the lungs is diminished in consequence of a limited supply of air. On the other hand, when, during the collapse of cholera, the blood is largely arrested before it reaches the pulmonary capillaries, the respiratory current of air is lessened in the same degree, and the voice is consequently enfeebled. And, again, when the free movement of blood through the lungs has been restored by injecting a hot saline solution into the veins, the respiratory movements simultaneously become free, the full volume of air is breathed, and the voice recovers its original tone and strength. Dr. Watson refers to one patient in collapse on whom the opera-

tion of injecting the veins was performed. The pulse had almost if not quite disappeared from the wrist, and "the voice was faint and husky". Immediately after the injection, the pulse became distinct and full, and he "spoke in a strong voice." (*Lectures on the Principles and Practice of Physic*, 4th ed., vol. ii, p. 528.)

Here we find that circulation, respiration, and voice, are restored simultaneously by the same means. If we now compare and contrast the phenomena of spasmodic asthma with those of spasmodic cholera, we see that, while in the case of asthma-spasm of the bronchial tubes causes a limited supply of air, and in consequence an impeded flow of blood through the lungs, in the case of choleraic collapse, spasm of the minute arteries first lessens the blood-stream through the lungs, and then, in a corresponding degree, the volume of respired air.

In both diseases, spasm is the immediate cause of the morbid phenomena. In the one, the spasm is bronchial; in the other, it is arterial. In both diseases, there are defective respiration and impeded circulation: in one, the defective respiration is primary, and the impeded circulation is a secondary result of this; in the other, the phenomena occur in the reverse order. In both diseases, there is evidence of the close and intimate relationship which exists between the function of respiration and the circulation through the lungs. In both diseases, there is feebleness of voice, and in both this is mainly due to the small volume and force of the respired current of air; but, in the case of asthma, the difficulty of speaking is still further increased by the inordinate action of the respiratory muscles.

Why is it that Syncope is so rare an Occurrence in Cholera? Why is it that a cold and pulseless Patient is often able to stand, and even to walk about? These phenomena prove that the state of collapse is essentially different from that of mere exhaustion. The heart appears not to be materially weakened by the disease, so that the left ventricle sends on to the brain and other parts the small supply of blood which it receives, as regularly when the patient is in the erect as when he is in the recumbent posture. This is probably the main cause of the absence of syncope. There is another circumstance which may, perhaps, have some influence. During collapse, in consequence of the arrest in the lungs, there is a great accumulation of blood, not only in the pulmonary artery and in the right cavities of the heart, but also in the systemic veins; and it seems probable that this venous turbulence, by checking the return of blood from the brain, may tend to prevent syncope, as the recumbent posture with the head low prevents or removes syncope by allowing the blood to gravitate towards the brain.

CATTLE-PLAGUE SPREAD BY MANURES. The *Farmer* of 17th January last noticed that great alarm had been created in the north of Scotland by the landing of cargoes of bones at Invergordon and Findhorn, the bones being the remains of animals which had died of Rinderpest, or been carried from districts where the cattle-plague prevailed. Since that time, the attention of the authorities at various other ports has been called to the subject of the importance of manures generally, and in many cases their absolute prohibition has been enforced, guano (as in the case of the Isle of Man) being exempted. In the west of Scotland, the prohibition extends to all kinds of manures, the notice issued by the justices of Kintyre being as follows: "That no blood manure, bones, or manufactured manures of any description, be imported." (*The Farmer*.)

Illustrations

OF

HOSPITAL PRACTICE:

METROPOLITAN AND PROVINCIAL.

THE LONDON HOSPITAL.

POPLITEAL ANEURISM: DISTAL OCCLUSION: LIGATURE OF THE FEMORAL ARTERY: DEATH FROM DISEASE OF THE HEART.

Under the care of Mr. HUTCHINSON.

[Reported by Mr. WARREN TAY.]

JAMES DRISCOLL, an Irish labourer, aged 20, was transferred from a physician's ward on Friday, June 16th. He had been admitted on account of rheumatism; but was found to have also an aneurism in the right popliteal space. The latter was of the size of an orange, pulsating very freely, and at some parts very close to the surface. He was a thin cachectic man, and nervous in the highest degree. He had a jerking irritable pulse; and there was a rough murmur heard over the base of the heart in connection with the aortic valves.

Mr. Hutchinson found, on examination, that the arteries below the aneurism appeared to be occluded; no pulsation could be detected in either anterior or posterior tibial. The man stated that he had only known of the beating behind his knee for about a week; but, in all probability, the aneurism had existed much longer. He gave the history that one night, about three weeks before admission, he awoke suddenly, and found his leg numbed, cold, and cramped, which occurrence possibly marked the date of the occlusion.

With regard to treatment, Mr. Hutchinson remarked that the aneurism was too large and its coats too thin to permit of the trial of Mr. Hart's flexion plan; whilst the man's extreme irritability of constitution made him an unfavourable subject for compression treatment. The occlusion of the vessels below the sac favoured the latter plan; since, by ponding a considerable quantity of blood in the sac, there was better chance of the formation of coagulum. Several surgeons had recently recommended in compression treatment that the pressure should first be made below the sac, so as to keep the latter full of blood.

Compression treatment was commenced on June 17th, by means of two clamp tourniquets applied to the upper third of the femoral artery and used alternately. The man was allowed a meat diet, with as small a quantity of fluid as possible.

The man could not be persuaded to bear the compression at all well. He undid the instruments, and was miserably restless and desponding; constantly shedding tears like a child. This peculiar state was probably induced to some extent by the disease of the heart which was subsequently discovered. It soon became clear that there was no hope of success from compression.

On the 23rd, the tumour was found increased in size, and its walls so thin that there was great danger of its becoming diffused at any time. The pulse for several days had been 120. Mr. Hutchinson determined at once to ligature the femoral artery. The operation was done under chloroform.

After the operation, all went on well for some days. The tumour contracted, and its contents became