ON THE CONDITION OF THE HEART IN CHOLERA COLLAPSE.

By Surgeon-Major Augustus R. Hall, A.M.D.

In a person suffering from an attack of cholera, the vomiting and purging are so severe, that the chief effort has generally been to subdue these distressing symptoms. Unfortunately, they have usually attracted the whole of the medical attendant's endeavors to give relief, to the exclusion of the study of pathological conditions which are really of more importance. Hence, in most works on the treatment of cholera, remedies calculated to stop the evacuations have been recommended. and often given to the patient in large quantities, without doing any permanent benefit.

The late Professor Parkes, in his book published in 1847, entitled *Researches into the Pathology and Treatment of the Asiatic or Algide Cholera,* was the first who directed particular attention to the state of the lungs and heart in this fatal disease. And Professor George Johnson, in 1866, in his "*Notes on Cholera,*" brought forward arguments which convinced a great many that the real danger in cholera did *not* depend on the copious diarrhœa, as had been so generally supposed.

Both these eminent writers point out that the defective aeration of the blood, inducing *asphyxia,* is the chief source of peril; and Dr. George Johnson attributes entirely to the contracted pulmonary arterioles the principal cause of the mischief. But Dr. Parkes has described signs, indicated by the heart sounds, which may be of great value, if paid attention to, in determining the class of therapeutic agents from which most benefit may be reasonably expected.

Dr. Lauder Brunton, in a pamphlet published in 1873—"*On the employment of Nitrite of Amyl in the Collapse of Cholera*"—writing about the heart and pulse, in a footnote, p. 8, states—"Magendie attributes the emptiness of the arteries, and Griesinger the slow passage of blood through the lungs, to weakness of the heart; but it seems much more probable that they are due to obstruction of the pulmonary circulation, as Parkes has shown that the heart sometimes continues to beat with considerable vigour during collapse, and the *second* sound of the heart becomes inaudible, while the first can still be heard. Now the first sound is caused almost entirely by the contraction of the muscular walls of the heart, and it disappears *first* in cases of weakness of the organ, as in fever; but the second sound is caused by the closure of the sigmoid valves."

In a paper which I wrote in 1869, which appeared in *The Indian Annals of Medical Science,* No. 26, March 1870, I expressed an opinion that the muscular walls of the heart were in a state of spasmodic contraction, and that it could not *dilate* properly. And I am inclined to believe that this opinion is borne out by the heart sounds, which any medical man may observe for himself in a severe case of cholera.

The following may be an approximate notion of the state of matters against which we have to contend:—

There is no doubt that, ordinarily, the blood has lost a very large quantity of serum. It is, therefore, very much thicker than normal, having been described as approaching to the consistence of tar.

The blood vessels contain a much smaller quantity of this blood, so altered in quality, than what they do of ordinary blood, in health. This thickened fluid, getting with difficulty through the contracted pulmonary arterioles, reaches the left ventricle Its walls are contracting, perhaps *strongly, or in those cases where even the first sound is inaudible,* it may be contracted like that of an animal poisoned by Digitalis. The walls of the ventricle cannot therefore dilate thoroughly, and this, together with the thickened blood, prevents the sigmoid valves from closing sharply with that *click which is the second sound of the heart.* In these cases, also, percussion proves that the *area of cardiac dulness is much decreased,* indicating that the whole organ occupies a smaller space than it does normally.

A small quantity of this blood is, however, pumped at each beat of the heart into the contracted systemic arteries—not sufficient, perhaps, to cause the pulse to be felt even in the brachial artery. It comes back slowly through the veins till it reaches the right heart, which is also more or less contracted, *but which the gorged state of the systemic veins may force to dilate,* and is sent on to the lungs, where it cannot get properly oxygenated owing to the contracted state of the pulmonary arterioles, and *asphyxia* is shown by the *blue* lips and skin of the patient, and cold surface. But, of course, we may get cold extremities and pulselessness in true *syncope,* which is well known to depend on want of power in the heart to propel the blood which it receives. In this case the heart gets a supply of good red blood, but the patient is *very pale* from weakness of that organ to pump it to the surface. Then, as quoted above, the *first* sound is *indistinct,* while the *second* is quite *clear.* But, in *severe* cases of cholera, the *second* sound is lost, while the *first* is heard; but *even that may become inaudible* when the heart is in a state of *cramp-like spasm*—the *blue* colour of the skin showing deficient oxydation.

Then the character of the pulse, when reaction is established, may be noticed as a sign. It will be found generally *full* and *hard;* and at the very *commencement* of an attack, when there is the so-called *premonitory diarrhœa,* if it be then tested, it will, as a rule, present the same feelings to the touch.

There is, in fact, increased arterial tension at the beginning; if collapse supervene, tonic spasmodic contraction of the whole arterial system; then, should the spasm subside gradually, *hardness* and *fullness* of the pulse, before it returns to its normal condition.

If then we have actually a state of contraction of the whole involuntary muscular system to contend against, the calibre of the arteries reduced, and the heart in *persistent systole,* more or less, surely the class of remedies indicated are the vascular depressants, whose action is to subdue this state of affairs. In works on Materia Medica published latterly, the physiological action of drugs has been much more fully described, as proved by recent experiments, than was formerly possible. The books by Garrod and Sidney Ringer contain very full

information on the therapeutic effects of remedies; and "*A Treatise on Therapeutics*" by Dr. H. C. Wood, of Philadelphia, is a very valuable one for reference and guidance.

The employment of Chloral Hydrate has been advocated by me, and I have recently, in the pages of the *Indian Medical Gazette*, indicated the method of using it which may be found of benefit. Dr. Lauder Brunton has tried the inhalation of Nitrite of Amyl, from its well known power of producing dilatation of the capillaries, but did not find it answer, chiefly on account of the feeling of difficult respiration and increased thirst which it occasioned. Dr. Brunton recommends that it should be given by subcutaneous injection. Under the head of Depresso-motors, Dr. Wood describes fully the action of this drug, and mentions Dr. Brunton's and his own observations. He comes to the conclusion that the cause of the dilatation of capillaries is peripheric, "due to a direct paralyzing action of the drug upon the coats of the arterioles." This remedy may therefore not be able to strike at the root of the evil, if the state of the heart and pulmonary arterioles is caused by irritated nerve centres. But Chloral Hydrate induces relaxation of arterioles, and tends to arrest the heart in diastole; and, according to Dr. Wood, it is "most probable that the chloral influences the heart through the centres at the base of the brain."

Bromide of Potassium is another Depresso-motor which, given in the same manner and quantities as Chloral, may be even superior to it. Then others, as Aconite, Calabar bean, Conia, Atropine, Hyoscyamine, &c., might also be tried. It would occupy too much space to make extracts from the work quoted on the action of these different drugs, but those who have not read it, will find Dr. Wood's work well worthy of very attentive study.

In conclusion, I venture to insert here some of my "notions" on the subject of cholera. It is pretty generally conceded that we know really nothing of the true cause, or causes, of that disease. But, the *morbid influence*, whatever it may be, being at work within the body, what are the effects produced by it? If we are inclined to believe that the real danger does not lie in the excessive purging, we need not pay particular attention to that, but direct our endeavours to ameliorate the condition of those important organs,—the heart and lungs.

With regard to these, recent experiments in physiological laboratories go to prove that the state of spasmodic contraction in which their non-striated muscular fibres are presumed to be, may be the result of irritation, or over-stimulation, of certain nerve centres. An attempt has been made here to validate the theory that the stethoscopic examination of the heart points out that that organ is not in state of weakness, but rather in a tonic spasm. And if this truly be the case, and death commences at the heart and lungs, the indication will be to obviate that tendency by agents that control that spasm. Fortunately, it may be said that whatever causes cholera, although acting with fearful violence for a period, ceases to operate strenuously within a comparatively short time. Were it not so, it may be doubted whether any *true* case of cholera would ever recover. If therefore, *until it ceases to act* (for we do not know what it is, and cannot neutralize it,) we can, by remedies, antagonize the morbid condition that it is producing, we may keep the patient alive, and tide him, or her, over the attack. And, presuming that this morbid condition is one of *asphyxia*, due to spasmodic contraction of the pulmonary arterioles and heart, and systemic arteries, if we can control this spasm, we shall do the best thing for the patient. This, with sufficient dilution of the blood with water, seem to be the chief indications. My own limited experience tends to show, in my opinion, that, if a powerful vascular depressant be absorbed into the blood, and that blood be sufficiently diluted to carry it to the nerve-centres, the patient will probably recover. As the *sedative* acts on the nerve centres the cramps and vomiting will cease, and so will the purging after a time. Therefore, the plan recommended by me is the subcutaneous injection of Chloral, supplemented by injections of warm water into the *rectum*, and *bladder*, as recently detailed by me in the *Indian Medical Gazette*. With regard to injecting water into the bladder, of course we all know that, *in health*, very little fluid will be absorbed by its mucous membrane. It is not intended that it should be. But in cholera, where the specific gravity of the blood is so much higher than normal, and the surrounding tissues are comparatively *dry*, then the laws of exosmosis and endosmosis will probably come strongly into force, and water will transude through the walls of the bladder when it otherwise would not do so.

If then we confine ourselves strictly to this *principle* of treatment—to allay the presumed irritation of the nerve centres; to dilute the blood sufficiently by enemata and injections into the bladder, and giving the patient as much cold water to drink as he can swallow, quite irrespective of the vomiting; particularly to *avoid* all stimulants, alcohol, and opium, and should reaction take place, to feed him on nothing but milk, soups, and other bland fluid nourishment till convalescence is thoroughly established—then it *may* be proved, after a time, (for it will take a *great* many cases to establish the truth of this proposition, if it ever should be corroborated) that the line of treatment here recommended is founded on a good physiological basis, and the mortality at present caused by malignant cholera may be materially decreased.

A MIRROR OF HOSPITAL PRACTICE.

LIGHTNING ACCIDENT.

By SURGEON A. BARCLAY,
Bengal Medical Service.

Authentic cases of lightning stroke are so comparatively rarely seen and treated by medical officers, and the particular circumstances attending the following cases are so interesting, that I have thought them worth recording. Before, however, describing the cases individually, it may be well to give a short general account of the accident.

During a violent thunderstorm, accompanied by heavy rain, on the 8th August, two men, about 300 paces apart