Pathological Explanation

OF THE

DIMINISHED ABSORPTION OCCURRING DURING THE STAGE OF CHOLERAIC COLLAPSE.

BY

GEORGE JOHNSON, M.D., F.R.C.P.,

PHYSICIAN TO KING'S COLLEGE HOSPITAL; PROFESSOR OF MEDICINE IN KING'S COLLEGE; ETC.

THE more closely the facts of cholera are examined by any competent observer who has freed himself from the blinding influence of erroneous theories, the more simple and intelligible appear all the most striking phenomena of the disease—the more completely do they come within the grasp of the understanding. How few and simple are the facts—how plain and obvious are the inferences—which suffice to explain the chief symptoms of choleraic collapse. There is, first, the fact demonstrable after death, that, during the stage of collapse, there is an arrest of blood in the minute branches of the pulmonary artery. Then there are the phenomena observable during life, which correspond with this fact, and which receive their explanation from it—the extreme smallness and feebleness, or even the complete absence, of the pulse; the very scanty supply of blood to the arteries, as shown by the fact that, the temporal artery and other arteries of considerable size having been opened, the blood has escaped only in a small and languid stream. Again, there are the striking chemical phenomena which result from the greatly reduced stream of blood which passes through the lungs during the stage of collapse. This small stream of necessity involves a correspondingly limited supply of oxygen; and hence results a fall of temperature, and a very scanty formation of carbonic acid and of biliary and urinary constituents; the blood at the same time becoming black and thick and dense, mainly in consequence of a deficiency of oxygen and an accumulation of unoxidised materials within it.

There is one phenomenon which has not hitherto received the attention which it deserves. I allude to the extreme impairment of the *function of absorption* during the stage of collapse. It has often been stated that absorption is absolutely suspended during collapse; but this is not so. Magendie has shown that absorption, although much slower and less active during collapse, is not absolutely suspended. He proved this by injecting camphor and ether into the rectum, and then ascertaining that the odour of these drugs might be detected in the breath in about five minutes; whereas, in health, he found that they might be so detected in one minute after their injection into the bowel. (*Leçons sur le Cholera Morbus*, p. 97.) It would appear, therefore, that absorption is reduced to about one-fifth of its normal activity during the stage of collapse.

What is the cause of this remarkable phenomenon?

Some pathologists endeavour to explain it on the principle *obscurum per obscurius*, by attributing it to “paralysis of the ganglionic nervous system”, and appear to consider this a full and complete account of the whole matter. That the diminution of absorption during the stage of collapse is not a result of the active and copious excretion from the intestinal vessels, is shown by the fact that, whereas the function of absorption is much impaired only during the stage of collapse, the intestinal excretion is commonly more active before collapse than during that stage, and often continues with more or less activity for a considerable period after collapse has passed off, and when the function of absorption has recovered its wonted activity. This impairment of absorption is indisputably a phenomenon belonging exclusively to the stage of collapse. And here it may be well to explain, that we are now considering only that part of the function of absorption which is performed by the *blood-vessels*. During the collapse stage of cholera, there is little work for the *lacteals* to perform; and in all circumstances the blood-vessels are the channels by which, chiefly ordinary liquids and the various saline and odorous matters are taken up into the circulation. What we have to explain, therefore, is the diminished activity of vascular absorption during the stage of collapse.

Physiologists have shown that absorption in living animals is in great part a purely physical process. The process implies imbibition or endosmose of a fluid through the walls of the vessels, and the subsequent transmission of the imbibed fluid by the vascular channels to distant parts. Various circumstances influence the rate of absorption; more especially, first, the physical and chemical characters of the fluid to be taken up; and, second, the state of the blood-vessels as to repletion or the opposite condition. The greater the degree of vascular fullness and distension, the less actively is absorption carried on; and *vice versa*. But there is another condition which has a more direct bearing upon our present inquiry, and that is the *rapidity of the blood-current through the vessels*. All other conditions remaining the same, absorption is rapid and active in proportion to the velocity of the stream of blood. Retard and lessen the stream of blood, and the rate of absorption is checked. Arrest the stream, and absorption ceases. Let the blood within the vessels so accumulate as to exert great pressure on their walls, and a process the reverse of absorption takes place; namely, an exudation from the vessels into the surrounding tissues. I am referring now to well established and familiar physiological facts. (See the chapter on Absorption, in Todd and Bowman's *Physiological Anatomy and Physiology of Man*, vol. ii, p. 269; and Dr. Carpenter's *Human Physiology*, 6th ed., p. 109 *et seq.*; also a lecture by the author, on the Pathology of Dropsy, *Lancet*, Jan. 16th, 1864, p. 59.)

The relation of these facts and principles to our present inquiry, appears to be sufficiently obvious. We have to bear in mind the peculiar condition of the whole circulation during the stage of collapse. The main bulk of the blood is arrested before it has reached the capillaries of the lungs; so that only a small fraction of the ordinary supply is received by the left ventricle, and sent on in a languid stream through the imperfectly filled arteries. If we puncture an artery of considerable size, so little blood does it contain, that little or none will escape; “the artery merely emptying itself in a languid stream, not in a jet, and then collapsing.” Again, if we open a vein, although the vessel may be full of blood, yet so nearly is this blood stagnant, that only very slowly and with great difficulty can the blood be made to flow.

Here, then, as it appears to us, in this scanty and slowly moving stream of blood, we have a sufficient explanation of the diminished absorption which accompanies the collapse stage of cholera. This phenomenon of lessened power of absorption is exactly coincident with the stage of collapse. It comes on with the other symptoms of collapse, and it passes off with them. It is one of the obvious and necessary results of that remarkable impediment to the pulmonary circulation, which I have shown, in a previous communication (*BRITISH MEDICAL JOURNAL*, Nov. 18th, 1865), to be the one great central fact in the pathology of choleraic collapse.

Knowing what we do of the process of absorption by the blood-vessels, and of the various circumstances which tend to quicken and to retard it, we might have predicted, as a necessary consequence of that peculiar state of the circulation which has been proved to exist during the stage of collapse, just such a diminution of the function of absorption as is known to occur. As Magendie ascertained by experiment that the function of absorption from the lower bowel is reduced to about one-fifth of its ordinary activity during the stage of collapse, so it is probable that the blood-stream is lessened in the same proportion. The one phenomenon will serve as an index and a measure of the other.

It is probable that, during any future epidemic of cholera, attempts will be made to treat the disease by the method of hypodermic injection. I see that some practitioners have publicly announced their intention to introduce morphia in this way. It makes one shudder to contemplate the consequences of this practice. An opiate introduced by the stomach has some chance of being rejected by vomiting or passed away by stool; but injected beneath the skin, it must enter the circulation and produce its deadly narcotising effects. Two results, therefore, must inevitably attend this method of treating cholera. 1. The death of the patient, whose nervous system will be overwhelmed by the drug; and 2. The discredit of the practitioner who, refusing both to learn and unlearn, persists in a method of treatment condemned equally by therapeutical experience and by pathological science.

CATARACT GLASSES. In the October number of the *Ophthalmic Review*, Dr. Mackenzie of Glasgow gives some very excellent "Hints on Cataract Glasses." He tells us how to adapt proper glasses in individual cases; and winds up with directions to be given to the patient. "Having seen our patient provided with proper glasses, he should be warned against scratching them, which, on account of the prominence of their surfaces, is very apt to happen. Dismissed from an hospital, cataract patients are supplied with two pairs of glasses of the usual foci; but the cases with which they are furnished for holding the spectacles are generally so coarse and rough inside that in a few months the centres of the spectacles are marked with scratches, and thus rendered of almost no further service. Rather than commit the spectacles to such usage, it were better to advise the patients to have a soft pouch of cloth (of velvet, if they can get it), made expressly for holding their spectacles, so as to avoid scratching them. Cases for cataract-glasses, furnished by the optician, should be constructed so as never to open at one end, but should have a lid extending the whole length of the case, and hinged like that of a snuff-box; so that the glasses are laid flat into the case, and not put in at one end and thrust along into their place—a plan which, unless the case is lined throughout with velvet, is sure to injure the glasses by rubbing against their surfaces."

Original Communications.

THE CATTLE-PLAGUE AN ERUPTIVE FEVER.

By ROBERT CEELY, Esq., Aylesbury.

[Continued from p. 18.]

NOTWITHSTANDING that there are found some modifications both of the external and internal pathology of the Cattle-Plague when it attacks the sheep, yet it still is seen to preserve its eruptive character.

So also in the goat. Professor Varnell very lately informed me that he had met with a fatal case of the disease in the goat, in which the cutaneous eruption was well developed.

I have been favoured with the following description of the order of development of the cutaneous eruptions, by a careful observer, who had excellent opportunities (T. W. Mayor, Esq., V.S.R.E.).

"The earliest symptoms of cattle-plague are indicated by an increase of the heart's action; the pulse varying from 86 to 120, and generally wiry. The respirations 30 and upwards. The countenance, when not excited, appears anxious; the ears are thrown back; *alæ nasi* swollen, so as, in some instances, almost to close the aperture; Schneiderian membrane inflamed; slight watery discharge from the nostrils; vagina inflamed in streaks.

"In the second stage, which commences about the fourth, fifth, or sixth day from the preceding, the swelling of the *alæ nasi* diminishes; the pulse varies from 80 to 90; the respirations from 24 to 30 and upwards, with crepitation on one or both lungs. There now appears, on the nose, along its margin, close to the hair and occasionally along the back, vulva, udder, etc., a papular or vesicular eruption of a dark copper or bronze colour. When that is peeled off, a red spot is visible, slightly depressed in its centre; but, on the nose, rapidly becoming dry and pitted.

"The 'cauliflower' eruptions or incrustation, I have seen only in the last stage of the disease, and they only appear pustular.

"In the only cases of recovery I have seen here (Norfolk), the vesicular eruption began about the fourth day, and commenced to disappear about the twelfth day."

The character and course of the eruption are best observed on the udder, particularly when devoid of hair. Here, both during life as well as after death, may be seen patches of roseola, minute papule, small flat vesicles, and circular dirty brown crusts. Mr. Lepper of Aylesbury, not long since furnished me with the skin of the udder of a milch cow which had recently died of a severe attack of the disease. And, still later, Professor Varnell forwarded to me for inspection a portion of the skin of the udder of a heifer similarly affected, which was seen also by Dr. Quain. In both these specimens, the above co-existent phenomena were remarkably well displayed.

Reverting to the writers before mentioned, who either recorded the popular belief in the resemblance of the cattle-plague to small-pox, or expressed their own impressions on the subject, one cannot help remarking that no records are to be found, as far as my information extends, of the communication to man of the malignant cattle-distemper of their times, either by casual or artificial inoculation.

In regard to the present disease, reports have reached me of its casual communication to persons occupied in attendance on diseased cattle or engaged in autopsies. Few of these can be relied upon, the