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OBSERVATIONS,

PATHOLOGICAL AND THERAPEUTIC,

ON THE

EPIDEMIC CHOLERA,

AS IT HAS PREVAILED IN EDINBURGH AND ITS VICINITY.

By DAVID CRAIGIE, M.D.

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS, EDINBURGH, ONE OF THE ORDINARY PHYSICIANS TO THE ROYAL INFIRMARY OF THAT CITY, INSPECTOR OF ANATOMY FOR THE CITY AND COUNTY, AND PHYSICIAN TO THE TEMPORARY CASTLE-HILL CHOLERA HOSPITAL.

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THE Epidemic malady, which, it is to be hoped, is now almost at its close, has continued in Edinburgh and its vicinity very nearly 9 months, never affecting a very large proportion of the community, but displaying such a degree of virulence, as to destroy in a very short space of time the majority of those attacked by it. During the course of this time, I have had occa-

sion to see and to treat a considerable number of cases, both in private houses and publicly; and though I have no reason to congratulate myself on the success of my measures, I have had occasion to make several observations on the pathology and treatment of the disease, which I have reason to believe may deserve to be made known. It is not my intention, however, to write a formal description either of the semiographic or pathological characters of cholera, but simply to direct the attention of my readers to a few important practical points.

I. Nothing is more variable than the manner in which malignant cholera makes its invasion. In one individual it appears in the form of diarrhœa, that is, frequent, liquid, but feculent stools, enduring for twenty-four, thirty-six, or forty-eight hours, then followed by sickness and vomiting, and the usual profuse sero-albuminous discharges from the intestinal tube, proceeding rapidly afterwards to collapse. In another class of cases, it commences at once with sickness and vomiting, followed by frequent loose stools, and then proceeding, unless arrested by art, with equal rapidity to collapse. In a third class of cases, the first appearance of the disease consists in a sudden copious gush of gruel-like or whey-like fluid from the intestines, without manifest sickness, and followed only after six, seven, or eight hours, with sickness, vomiting, and cramps.

In all the cases which I have seen, in which the disease commenced suddenly with vomiting and frequent loose stools, the patient complained of an oppressive sense of constriction and weight at the epigastric region, preventing the complete filling of the lungs, and causing at the same time a distressing sensation of anxiety. When the disease appeared in the form of diarrhœa only, it was very generally accompanied with a sense of weight and distension between the epigastric and umbilical regions; and the moment the patient became sick and vomited, he began to complain of the painful constriction across the lower part of the chest. These symptoms it was of the utmost importance to watch carefully; for until they were entirely and permanently removed, the peculiar morbid action of cholera could not be considered as arrested.

As the vomiting and purging continued, this symptom became more severe and distressing, and was gradually but rapidly converted into a sense of burning heat at the pit of the stomach, accompanied with unquenchable thirst, and a sense of internal anguish, which the patient could not describe otherwise than by complaining of the sensation of oppressive weight and constriction.

In many of the cases, the vomiting was accompanied with

the constant formation of wind in the stomach, producing great distension of that organ, and rendering the process of vomiting greatly more difficult. As the disease proceeded, however, this symptom did not increase, but rather abated; and though occasionally the patient complained of it, it did not appear to be always very permanent or general.

The matter vomited consisted in general of the fluids drank, with more or less mucus. Several attempts were made to ascertain its acid or alkaline qualities; but these were in general attended with fallacy, in consequence of the most of the fluids drank having either free nitric acid, or free tartaric acid, or, on the contrary, subcarbonate of soda in some proportion.

The matters discharged from the intestines were much more various, and may, I think, be distinguished in the following manner.

When the disease commenced by diarrhœa, or frequent loose stools, lasting for hours or days, these stools were always more or less bilious and feculent, but contained an unusually large proportion of watery fluid, and a gelatinous semi-fluid matter. After these had been discharged for some hours, or even for two days, it might be, varying according to treatment and the diet of the patient, on his exposure to, or shelter from, weather,—the first symptom of deterioration was a sudden gush of frothy or yeasty fluid, something not unlike oat-meal and water stirred together, and occasionally like dirty soap-water, which had been already used for washing. This was succeeded by similar discharges at intervals, varying from half an hour to two hours and a-half, but in each case the discharge becoming thinner and more watery, until the oat-meal or soap-washing water was superseded by a small quantity of semitransparent, opaline, seroalbuminous fluid.

This, which may be regarded as the second variety of choleric discharge, when attentively examined, was found to consist of a serous or watery fluid, with a thicker granular matter suspended in it in the shape of albuminous *flocculi*, various in size and shape, but always so much denser than the thinner liquid, as invariably, after a very short time, to fall to the bottom of the vessel. This fluid, which is the *rice-water* evacuation of the East India practitioners, was void of all smell of feculent matter; and it generally emitted a faint mawkish odour, if such a mode of expression can be permitted,—not unlike that of water in which animal matter has been macerated for some time without becoming putrid.

In both of these two forms of choleric discharge, the disease proceeded very rapidly to collapse, and very frequently to the fatal termination. In several fatal cases which have fallen un-

der my observation, the first symptom of the disease was a copious and profuse gush from the intestines of the soap-washing frothy fluid, taking place at intervals, first of two hours, then of one, then more frequently, and at length terminating in the scanty sero-albuminous or rice-water discharge. In one remarkable case, after diarrhœa had continued at a variable rate for nearly three days, and had temporarily subsided on the fourth, early on the morning of the fifth the patient was awakened by a profuse gush of the frothy soap-water discharge, which was speedily followed by vomiting, and continued till seven in the morning, when the pulse was gone. In another case, equally remarkable, after slight bowel complaint had continued all Friday, the 17th September, the patient was awakened on Saturday morning at five by a call to stool, when a profuse gush of the frothy soap-water fluid, rather thicker, however, as if a little oat-meal had been stirred in it, took place, and was repeated at seven, and afterwards several times during the day. Collapse was perfect at nine that evening; and, notwithstanding the use of all remedies during the night, death took place the following morning at nine.

I must nevertheless observe, that many cases in which rice-water or sero-albuminous fluid was discharged in small quantity recovered, either immediately before passing into perfect collapse, or after being some hours in it; but these were either young persons of unimpaired constitution, or adults, who had sufficient energy, dynamic and organic, to resist the pernicious tendency of the malady. I shall afterwards attempt to explain in more specific language what is understood by this energy or vital power.

A third species of choleric intestinal discharge which I have witnessed, consists of watery fluid slightly darkened in colour, and containing a multitude of gelatinous grains of a dark colour, and giving the idea of half-boiled sago, or rather of the sago grains slightly softened and diffused in water. This, I have reason to believe, is one of the most favourable varieties of the intestinal choleric discharge. I have seen it, I think, exclusively in young, healthy, vigorous, adults; and, whether it be owing to these circumstances, or the fact that in such cases the disease admitted of being treated by blood-letting, I have seen no instance of a patient dying who had this variety of discharge. I have not been able to ascertain whether this sago-like discharge succeeded to the oat-meal-water or soap-washing discharge, or whether it came on instantaneously, or succeeded bilious evacuations.

A fourth variety of the choleric intestinal discharge is the wine-lee evacuation;—a dark-coloured muddy fluid, very similar

in appearance and colour to the lees of port-wine or claret, but exhaling in general a faint disagreeable animal odour, like the water in which meat has been washed, only more marked and impressive. This is manifestly a sero-sanguine exhalation from the mucous membrane of the ileum and colon. Of this variety of discharge six examples occurred in the Castle-Hill hospital; and in four of these which were inspected, the mucous membrane of the colon was of a purple-red colour and thickened, the submucous tissue was traversed by numerous vessels containing dark-coloured blood, and actually elevating the mucous membrane, and patches of dark-red extravasation were observed scattered over the submucous tissue. In one case, with these appearances were conjoined red injection of the ileal mucous membrane, considerable enlargement of the solitary glands, which were as conspicuous as millet seeds, and numerous large vessels distributed through the submucous tissue. The mucous membrane itself was uniformly covered by a tenacious adherent mucus, of a dark-brown colour, similar to soft viscid currant-jelly, and which could not be removed without repeated washing and macerating in water.

This wine-lee species of intestinal discharge is by far the most fatal form of the disease; and not one of the patients, in whom it took place, recovered. I may add, that it was apparently associated with a peculiarly diseased state of the ileal or colic mucous membrane; since the vessels of this bowel appeared to be enlarged and varicose, and the bowel itself was irregular and preternaturally villous on the free surface.

I have in my account of the epidemic of Newburn remarked, that in collapse the countenance was not always blue, as several descriptions would lead us to suppose, but rather of a dull leaden or dingy colour. This was still the most frequent tint of the face, neck, and extremities, in Edinburgh; but I saw a few instances which exemplified the deep blue tint; and I think the explanation is to be found in the difference of the natural complexion. In persons in whom the complexion is naturally florid, and rather what is termed high-coloured, when collapse comes on, the countenance becomes of a deep-blue; and when this state is completely established, it acquires with the neck, breast, and extremities, a tint not less intense than that of the bilberry. This change I witnessed with particular attention in one very rapid and strongly-marked case, in which the individual had a good deal of colour naturally.

II. Cholera in the different countries of Europe has been distinguished by a third stage, or that of reaction, which has been represented by several observers to resemble the usual

characters of typhous fever. I have on a former occasion mentioned, that my observation of the first cases of choleric reaction which I witnessed led me to doubt the accuracy of this view; and my subsequent experience has only tended to confirm this opinion, and to enable me to recognize a wide difference between the state of the system in typhous fever and during the reaction from the collapse of an attack of cholera.

Choleric reaction consists in a congestive state of all the larger vessels of the head, chest, and belly;—the vessels of the brain and its membranes; those of the lungs and the heart; those of the spleen, stomach, and intestines; and those of the liver and kidneys especially. This congestion is not confined to the brain alone, or to the lungs alone, but extends to every part of the sanguiferous system. It approaches in general by slight redness of the cheeks and a little warmth of the face, while the eyes continued still sunk in the orbits, and surrounded by a leaden-coloured *areola*. At the same time the breathing, which had before been slow and languid, becomes slightly freer, but is performed by an extremely labouring and heaving motion of the chest, without, however, seeming to fill the lungs perfectly. At this period there is often hiccup, or even occasional retching or vomiting; and the congestion of the kidneys is indicated by no urine being as yet secreted. In the course of eighteen or twenty hours, if this state did not ameliorate, a degree of drowsy lethargy and sleep came on, from which the patient could be raised, speaking not always very coherently, and often showing hallucinations and other errors of sense; the respiration either became more frequent, with short and incomplete inspirations, or, remaining the same in point of frequency, was slow, languid, and feeble; mucous rattling was heard in the bronchial tubes; the pulse continued heavy and oppressed; and the beat of the ventricles was dull and labouring; the surface at the same time exhaled a urinous odour, and no urine was voided. At the end of twelve or twenty hours more, this state was followed either by complete lethargy and coma, or violent and uncontrollable delirium; the respiration became slow and feeble, or rapid, and with incessant tracheo-bronchial rattling; the surface became cold; the action of the heart still more labouring and oppressed, and without any urine being discharged, yet bilious and feculent stools escaping either involuntarily, or by the use of medicines; the patient, after gasping long in a half-dying state, breathed his last.

Nothing can be more anomalous than the whole of this state of reaction, which embraces, as it were, the symptoms of several different diseases at once; and which, though possessing several common characters, was scarcely in any two patients in all respects the same. These variations occurred not merely

in the degree of the affection of each organ, but in the combination of the affection of the different organs.

The symptoms of affection of the head constitute the only features of resemblance between typhous fever and the reaction of *cholera*. But these symptoms, I shall show, indicate an affection entirely different. These symptoms consist in a species of cerebro-meningeal congestion, in which it is very difficult, if not impossible, to draw the load of blood from the internal vessels, and restore the natural and healthy secretions. In children this affection bore a very close resemblance to the meningeal inflammation which constitutes *hydrencephalus*, or terminates in water of the brain. In adults it occasionally resembled the *delirium* of *delirium tremens;* but more frequently it was rather a profound lethargic stupor; and in a few cases it assumed the characters of incessant sleeplessness and unmanageable delirium, with constant speaking and muttering.

The affection of the thoracic organs was not less characteristic. An extreme sense of weight in the chest, incapacity to inspire fully, and frequent sighing or moaning to relieve the anxiety thus occasioned, were the leading features of the disorder.

In general, the respiratory murmur was impaired in intensity, and in some instances it was extinct, or at least could not be heard at the middle of the *demithorax;* while there was more or less mucous rattle in the windpipe and bronchial tubes. The action of the heart was in general very much disordered. While it generally was so forcible as to shake the whole chest, and make the patient sensible of its impulse, it was very oppressed and jarring, as if the ventricles contracted with a vibrating thrill; and the sound was invariably dull.

In most of the cases, when the cerebro-meningeal congestion was not so considerable as to extinguish organic sensibility, the patients complained much of unquenchable thirst, and a sense of gnawing burning heat at the region of the stomach, which was incessant, and often accompanied with the distension of air, which could not be expelled. This sensation, I think, manifestly depended on the congested state of vessels of the stomach and *duodenum*, and the incapacity to propel the blood freely through their communicating capillaries. In some instances, it was accompanied with incessant hiccup; in others with hiccup and retching without vomiting; and in a few with mere distension and pain in the hypochondriac or iliac regions.

In two cases, (Butler and Coventry Thomson,) during this stage, bile, very pure in the former case, was brought up from the stomach by vomiting.

The inert state of the kidneys was always a leading, and in this state a very bad, symptom. In mild cases of the disease,

the urine began to flow spontaneously as soon as the stools became bilious, and even before that phenomenon in some instances. But when the patient had been in distinct collapse for many hours, the urine rarely flowed so easily; and it was generally twenty-four or thirty-six hours after reaction commenced that this secretion began to appear in a scanty form. In other instances, however, it did not return at all; and in those in which the cerebro-meningeal symptoms, and the pneumo-bronchial and cardiac oppression continued or increased, the patient struggled in a protracted agony for several days, and died without secreting a drop of urine. This suppression of a secretion so important and necessary to the well-being of the circulating function, might seem to depend on the affection of the brain, and thereby to resemble the suspension of secretion, distinguished by the nosological name of *ischuria renalis*. At first this opinion appeared to me to be well-founded, and perhaps may still be applicable to a variety of cases of secretion, at least in part. But circumstances took place in the course of observing the cause of the disease, and inspecting the bodies cut off in this state, which induced me to modify considerably, if not to change entirely, this opinion. The suppression of the urinary secretion appeared to be part of that general state of congestion of the vascular system, which interrupted the whole process of circulation, and its dependent one of secretion; and it appeared to be very closely connected with, if it did not entirely depend on, the local congestion of the renal vessels and capillary system. This, however, will appear more clearly afterwards.

In order, however, to comprehend thoroughly the nature of this condition, and that of all the others of the system, during the stage of reaction, it is requisite to take a view of the appearances found in the dead subject.

III. In the Castle-Hill hospital I inspected with some care the bodies of 26 patients; and the appearances which were observed were of two kinds;—1*st*, morbid changes common to choleric subjects and others; and 2*d*, morbid changes proper to choleric subjects. These morbid changes were further observed to vary according as the patient was cut off in the stage of collapse, or during the period of *anastasis* or reaction.

I shall, therefore, take a short view of the morbid changes proper to choleric subjects in the two periods of collapse and reaction, and then enumerate the morbid changes found in the bodies of choleric subjects, but which have no immediate connection with that disease or its effects.

1. In patients cut off during the former stage, the following appearances were very generally observed.

The stomach was contracted, and contained some semi-fluid matter, the last taken during life; and its mucous membrane was very uniformly covered by a quantity of viscid tenacious mucus, which adhered very closely. The mucous membrane corresponding to the cardiac region, and to the large arch before and behind, was puckered into large prominent *rugæ* or wrinkled folds, the *apices* of which were ordinarily very much injected with dotted and arborescent vascularity, while the intermediate furrows and spaces were at least of a general rose-red colour, and occasionally injected. This could not be the effect of cadaveric exudation; for it was not removed by washing, and though it acquired a brown tint, it was not discharged by immersion in spirits.

The *rugæ* now noticed are described by most anatomists as parts of the natural structure; and unquestionably they are found in the most healthy subjects after death. But they are always most distinct when the stomach is constricted by the energetic contraction of the orbicular muscular fibres; and in the majority of subjects inspected after death we never observe them. In the bodies of those cut off by *cholera*, their presence and strongly developed form depends, I conceive, on the very forcible contraction of these fibres during the stage of vomiting and collapse.

The gastric mucous membrane was also considerably thicker than it is observed in subjects cut off by other diseases; but this is to be ascribed also chiefly to the contraction of the muscular coat over it; and perhaps in a more trivial degree, to the greater quantity of fluid in its capillaries. It was not, however, softened, unless in one case, in which the whole of the posterior half between the great and small arches was reduced to pulp, and was hanging in loose shreds and patches of various size. In this case also a distinct sharp line of demarcation was observed between the sound and the softened part of the gastric mucous membrane, the former being uniform in surface, and of its usual light rose-coloured gray,—the latter all at once soft, loose, prominent, and easily detached, and of a peculiar dirty ashen or wood-brown colour. The individual, (Thomas Phillips, *æt.* 47,) in whom this irreparable lesion was observed, died in a state of profound and irrecoverable collapse, during which he took several doses of the saline powder recommended by Dr Stevens, and had two ipecacuanha emetics of thirty grains each.

The peritoneal coat of the stomach was almost invariably marked by a slight blush of faint red; and its surface, like that of the intestinal peritoneum, was generally covered with a peculiar glutinous exudation.

This redness of the serous and mucous surfaces of th e sto-

mach could almost uniformly be traced to injection or congestion of the vessels distributed in the substance of the gastric filamentous tissue, through which they could be seen, very much filled with blood to their minutest ramifications.

The *pylorus* was always thick and prominent, and its aperture much closed. The mucous membrane of the *duodenum* was in general covered with the same tenacious adherent mucus observed in the stomach, only more tinged with bile; and when this was removed, it was found sometimes of its usual gray colour, at other times slightly reddened. The upper part, for two or three inches, was in general uniform in surface; the inferior always folded into numerous folds, *(plicæ)* or *valvulæ conniventes.*

The intestinal canal was always unusually contracted both in the small and large intestines; and I have several times seen the transverse arch of the colon shrunk as small as a portion of *ileum.* With this contracted condition was usually combined a marbled appearance of the *ileum* especially, the streaks of which were generally in the circular direction of the intestine, and depended on the *plicæ* or *valvulæ conniventes.*

The contracted condition above noticed was occasioned by the forcible constriction of the intestinal muscular fibres; and the marbled or mottled appearance was produced partly by this, but chiefly by the congestion of the vessels of the intestinal filamentous tissue. In several instances, the contraction was so considerable, and accompanied with wrinkles so firm, as to resemble the cadaverous rigidity, and must have been the result either of that or of the spasmodic contractions which constitute so striking a feature of the disease.

The peritoneum, both muscular and intestinal, was covered by a glutinous exudation, which could be drawn out in ropy threads. The intestinal peritoneum presented in general a reddish tint, or a colour between red and pale pink; but when this was closely examined, it was found to depend chiefly, if not solely, on the vessels distributed through the intestinal or subserous tissue.

The intestinal mucous membrane was always covered with a thick layer of viscid adherent mucus, generally tinged with bile at the upper part of the tube, but often colourless below. When this was removed by repeated washing and immersion in water, the intestinal mucous membrane appeared with the *valvulæ* very distinctly marked, the membrane generally slightly reddened, and occasionally thickened, but not softened. This rubescent tint, as it may be named, was very indistinct at the upper or duodenal extremity of the *ileum.* At the distance,

however, of four, five, or six feet from its lower or colic extremity, it became very conspicuous, and was occasionally very distinctly marked.

Along with the rubescence, which was generally slight, the agminated glands of Peyer were in almost every case more conspicuous than natural, and so prominent as to present a distinct elevated line enclosing a patch of the usual elliptical shape, palpable by the finger, and visible to the eye.

It is almost unnecessary to remind the reader, that these agminated glands, which were discovered in 1677 by John Conrad Peyer of Schaffhausen, and represented by him in his *Parerga Anatomica* in 1681, consist of orbicular follicles or minute glands, mutually aggregated and arranged in the form of oblong elliptical or oval patches on the anti-mesenteric surface of the intestine. Each minute follicle consists of a simple sac with a minute aperture, lined by delicate mucous membrane, in which numerous minute arteries, believed to terminate in exhalents, are distributed. These glands in the healthy state secrete much of the mucous fluid with which this part of the intestine is supplied; from these proceed many of the fluids discharged from the intestinal tube; and in all the morbid states of the alimentary canal they perform an important part.

Besides the agminated glands of Peyer, the intestinal mucous membrane presents, especially towards the last three or four feet of the *ileum*, numerous minute bodies, not larger than pin heads or minute millet seeds, isolated and detached, and distributed without any arrangement over the intestine, and from that circumstance denominated *glandulæ solitariæ*, or isolated glands. In the healthy state these are scarcely visible, and can be seen only in a particular oblique light. But when the ileal mucous membrane is by any cause irritated or excited, they are then enlarged, and become conspicuous to observation.

The point at which the patches of agminated glands became distinct, varied in different individuals from three feet to six from the cœcal or inferior end of the *ileum*. In most adults they began to be visible at the distance of five feet; in some, small patches were seen so high as seven feet or eight feet; and in the bodies of two children, they were recognized at a much higher situation.

In most of the bodies of the persons cut off by cholera, one or the other or both of these orders of glands were unusually prominent and well-marked. In the bodies of children, the agminated glands were invariably much more prominent than in adults, and were generally so rough as to induce superficial observers to regard them as ulceration. When, however,

they were closely and carefully inspected, they proved to be merely the individual component follicles of the cluster, very much enlarged and swelled. In the bodies of children, the isolated glands were, on the contrary, not nearly so well marked, and were often totally imperceptible.

Conversely, in adults the solitary glands were always very much developed, and acquired in some instances the size of millet seeds, so as to be distinctly seen to render the ileal mucous surface rough and irregular. In one case (Thomas Philips,) in which there had been wine-lee stools with reddish granular bodies discharged *per anum*, similar to gooseberry seeds, not only were the isolated ileal glands enlarged, and prominent, and reddened, but the whole ileal membrane was of a pale or light red colour from vascular injection.

In the majority of adult subjects, however, the agminated glands were developed, in the strict sense of the word, that is to say, they were rendered more distinctly visible, and they were not only more enlarged than natural, but they were redder, and, when held between the eye and the light, the patches which they formed were more opaque than the rest of the membrane.

To give some idea of the prevalence of these appearances in the bodies of those cut off by cholera, I must mention, that, among the 26 cases inspected, 22 presented enlargement and irregularity of the agminated glands; and 21 more or less distinct developement of the isolated glands.

Though I have stated these among the appearances proper to cholera, yet I am not prepared to assert that enlargement of the intestinal glands is not found in other diseases. We know, indeed, that the agminated glands are occasionally enlarged in continued fever, and frequently in diarrhœa and dysentery, and almost invariably in the diarrhœa of infants and children, constituting the disease distinguished by the name of *dothinenteritis*. The isolated glands also are liable to become prominent and swelled, in various intestinal disorders; and only on the 6th November, I inspected in the Royal Infirmary the body of a man cut off by meningeal apoplexy, in which the isolated glands of the lower extremity of the *ileum* were so enlarged, reddened, and prominent, that they looked not unlike small-pox pustules scattered over the ileal mucous membrane.

While, therefore, it must be admitted that this enlarged and developed condition of the intestinal glands is the most frequent and uniform morbid appearance of the intestinal mucous membrane in cholera, it would perhaps be too precipitate to infer that it is either the cause of the profuse discharges, or the effect of the choleric action, whatever that may be. These glands ap-

pear to have been in most instances in a morbid state previous to the choleric attack; and as this morbid state appears to consist in an unusual accumulation of blood in the vessels, indicated by the enlarged appearance, and perhaps in some increased degree of excitement, it is not improbable that it may have acted as a predisposing circumstance.

It is remarkable that the follicles of the colic mucous membrane were by no means very commonly or frequently enlarged; and, excepting in four or five cases, though diligently looked for, they were not recognized otherwise than in very minute orbicular *areolæ* or *disci*, not elevated above the surrounding membrane, and chiefly cognizable by the minute central aperture or excretory pore. I have indeed seen these follicles more distinctly in dropsical subjects than I have done in those cut off by cholera.

The other morbid appearances proper to cholera, and observed chiefly in the stage of collapse, though occurring in a great variety of organs, were all nevertheless confined to the vascular system of these organs. I shall therefore begin first with the vascular system itself.

The heart generally presented round its base at the junction of the auricles and ventricles, and along the acute or right margin, a train of dark-coloured ecchymotic spots, irregular in shape, and varying in size from the area of a small vetch to that of a split pea, or even larger. These spots were in the subserous tissue beneath the cardiac pericardium, and were in some instances largest and most numerous along the course of the vessels. Connected with this the surface of the aorta and pulmonary artery, but especially the former, was traversed by numerous minute communicating vessels, very much injected, and forming a complete vascular net-work, encompassing the proper tunics of the vessels. In one or two subjects, but especially in the body of the woman M'Gurke, inspected on the 23d October in the presence of Dr Henderson of Aberdeen, there were distinct ecchymotic patches in the filamentous tissue above the proper coat of the aorta, and which could not be removed by mere immersion in water.

The right auricle and ventricle invariably contained a large mass of semi-coagulated dark-coloured grumous blood, implicated more or less firmly with the *musculi pectinati* and walls of the former, and the *columneæ carneæ* and walls of the latter; and from these a large coagulum, generally fibrinous, extended into the pulmonary artery. The left auricle contained a small quantity of semi-coagulated dark-coloured gore; and a small quantity of the same was very generally found in the left ventricle, the walls of which were always firm and hard, and the capacity very small, as if it had been much and forcibly contracted.

The trunks of the pulmonary arteries and the corresponding veins contained much semifluid uncoagulated blood, in both of an equally dark colour,—at least so nearly of a shade that it was impossible to draw any distinction.

The injection of the vessels of the filamentous tissue outside the aorta, and of the *vasa vasorum*, was continued from the arch of that vessel upwards along the *innominata*, or right subclavio-carotid trunk, and the carotid and subclavian of the left side, as far as these vessels were traced in the neck; and over the arch, and down the thoracic and abdominal *aorta* on the trunk; and occasionally the general sheath of the former vessels and the neurilematic covering of the pneumogastric nerve, were much injected by numerous minute vessels.

The tracheal and bronchial membranes were injected and embrowned, and the mucus which the bronchial tubes contained was tinged with blood.

The proper substance of the lungs was always loaded and almost stuffed with dark-coloured blood, so as to communicate to it a deep brown colour, and impair, if not destroy, its susceptibility of inflation. The substance of these organs was also inelastic, and much more compact than usual, giving a doughy and inelastic sensation to the finger.

Exactly the same appearances were observed in the vascular system of the head and spine and their contents. Thus the scalp was no sooner divided than a quantity of semifluid blood, more or less copious, escaped from the incisions; and even the bone itself was bluer than usual with the blood accumulated in its substance. The different sinuses of the *dura mater*, in like manner, generally contained much fluid or semifluid dark-coloured blood, which continued to flow very freely for some time.

When death took place after some hours of duration in collapse, a considerable quantity of serous fluid was infiltrated into the sub-arachnoid filamentous tissue; and though in early cases this was more scanty, in none was it entirely wanting.

The vessels of the *pia mater*, which were invariably extremely numerous, were, with equal regularity, very much injected, the large ones with dark-coloured blood, the small ones with red; and it was interesting to remark the transition from the former to the latter order of vessels. In some subjects the *pia mater* presented even along its frontal and parietal regions, and at the base of the brain, continuous dark-red patches, as if blood had been extravasated; but this on more minute inspection was found to be blood in the capillary vessels of the arachnoid surface of the *pia mater*. The *pia mater* covering the inferior surface of the annular protuberance and spinal bulb, was also

very generally much injected, so as to give that body a very vascular appearance.

The vertebrals, basilar, and carotids and their branches always contained a quantity of dark-coloured blood, which was in no instance coagulated, but was in general semifluid, ropy, and consistent.

The substance of the brain was natural in consistence and colour, unless in a few instances to be specified. But when divided it presented numerous circular apertures of considerable size and transverse fissures, which freely effused blood, in general dark-coloured. The part most conspicuous for these sanguiferous apertures and fissures was, as in other cases, the *corpus striatum* and the anterior part of the *optic thalamus* in each hemisphere.

The substance of the annular protuberance was invariably more or less traversed by large vessels, and exhibited apertures and fissures effusing fluid blood. In one or two instances its grey matter was of a faint rose-red tint. The substance of the cerebellum was in like manner injected, and traversed by numerous blood-vessels, especially in its external or foliated structure. But the part almost invariably most affected in this manner was the gray crust of the *corpus rhomboideum*, in the denticulations of which many minute apertures effusing blood were observed.

The vessels of the central surface of the brain and its membranes were similarly affected. Thus the choroid plexus was always much darker than usual, by reason of the blood in its vessels; and the *velum interpositum* was of a deep-red colour, and traversed by numerous large vessels, containing dark blood. The superior surface of the *corpus striatum* in each ventricle, and each side of the *fornix*, to its posterior extremity, was traversed by several large vessels containing dark-coloured blood. A little serous fluid was occasionally found in the ventricle; but this appearance did not belong so much to the stage of collapse, as to that of sinking after long collapse or partial reaction.

The muscles of the spine were always loaded with a great quantity of dark-coloured blood, which was here more perfectly fluid, than in any other part of the body. The substance of the spinous plates also, and of the bodies of the *vertebræ*, were of a dull blue colour, and effused more or less dark-coloured blood; while the rachidial veins were generally very much filled, and discharged blood freely, and the filamentous tissue of the sheath was perfectly black with blood. It was remarkable, nevertheless, that this blood when collected in pools always presented a sort of oily scum or coating on its surface, and never underwent complete separation into clot and *serum*.

In several instances, perhaps seven or eight, there was at the

upper extremity of the spinal chord, in the angle between the bulb and the chord, a considerable quantity of serum infiltrated into the subarachnoid tissue, and elevating the arachnoid from the *pia mater* of the chord. A more uniform appearance was a slight general effusion between the arachnoid and *pia mater* of the whole chord, both before and behind, but perhaps most in the latter situation.

The *pia mater* of the chord was always more or less traversed behind by large well-injected vessels, which, though numerous, were not much less so before. These vessels were in general most abundant and largest in the cervical and lumbar regions; and the individual chords of the brush-like expansion, named the *cauda equina*, were always most completely covered by minute vessels.

The substance of the chord, though firm in most cases, was in one or two a little softer than natural. In other respects, it was sound; and in four only, of nineteen cases examined, did the central gray matter present any unwonted degree of vascularity.

The liver was in general natural in its proper substance; but its vessels were always much lined with dark-coloured semifluid blood, and the *pori* contained dark-green bile. The gall-bladder was invariably full of bile, generally dark-green in colour, and viscid in consistence; and the ducts were pervious.

The spleen was always natural, and the colour of its internal substance was of the usual dark-red or purple tint.

The *pancreas* was unchanged in appearance and structure.

Next to the brain and lungs, the kidneys partook most of the general distension of the vascular system. The external cortical or granular substance was always much darker than natural, and, not only when divided, effused blood from circular apertures and linear fissures, proceeding from the outer to the inner margin, but at the latter, where it unites with the tubular part, presented numerous large vessels emitting dark-coloured semifluid blood. The tubular or internal cones were also much darker in colour than natural; and only when well-washed or macerated acquired their usual tint and appearance. The *papillae* when pressed, emitted always a small quantity of a milky, dirty-looking, opaque, fluid, which appeared to be albuminous urine. This fluid, however, I have also expressed from the renal *papillae* of persons dead of other diseases.

The bladder was in all instances shrunk and contracted to such a degree as to resemble a large fig, or a small apple within the *pelvis*.

2. In the bodies of patients cut off during the stage of *anastasis*, or reaction, the appearances now enumerated underwent in the different organs some modification.

In the first place, the serous membranes, but especially the *peritoneum*, were uniformly covered by a gelatinous viscid exudation, which rendered them very slippery, and might be drawn out in thin ropy threads. This I have already noticed in a slight degree, and in smaller quantity, in the stage of collapse. In that of reaction, in which it was more fully formed and more abundant, it must be regarded as an exudation from the vessels, relieving themselves of the preternatural load by which they were oppressed.

The colour of these membranes was that of the subjacent organs. Thus the *pleura* was of a dark-livid or brown-marbled colour, from that of the lungs; and the *peritoneum* was of some shade of grayish-pink, or faint-red, from vascular injection of the subserous and submucous tissue of the intestinal canal.

The stomach was not by any means so much contracted, nor were the *rugæ* of its villous membrane so well marked; indeed, in most instances they were indistinct or entirely wanting. The cavity of the organ in general contained fluid or semifluid matter, often mixed with a considerable quantity of bile. But the most usual appearance in this stage was an abundant quantity of viscid, ropy, mucus, very adherent, and more resembling the mucous jelly adhering to the stomach of some fishes, than the ordinary appearance of that of the human stomach. When this was removed by washing, the mucous membrane came into view itself thickened, and in some parts rather softer than natural, but not capable of being detached without force. Indeed, this was more a doughy œdematous softening, apparently from interstitial serous effusion, than destruction of the membrane. Reddish patches also occasionally faintly injected were seen towards the cardiac portion and the large arch; and between the eye and the light much vascular ramification and minute injection could be recognized.

The pyloric ring was less prominent, and the pyloric aperture less contracted and wider, than in the bodies of those cut off in the stage of collapse.

The *duodenum* always contained semifluid pulpy matter, much mingled with bile; and the mucous membrane was covered with viscid mucus deeply tinged by this fluid. When this was removed, it was in general possible to recognize the duodenal mucous membrane of a faint rose-red colour, chiefly from minute vascular injection of the sub-mucous tissue.

The *ileum* was much less contracted than in the state of collapse; and in some instances, this and the colon were considerably distended by air. In some parts of the canal, especially toward the lower extremity of the *ileum*, the intestine was generally reddened or coloured of brownish red from vascular injection of its filamentous tissue.

The *ileum* contained more or less pulpy mucous matter tinged with bile, and towards the lower extremity sometimes mere semifluid gruelly matter, without bile, but always with dingy dark bluish-coloured portions, apparently from calomel or blue pill. More frequently, however, especially if life had been continued in imperfect or complete reaction for some days, the contents of the intestinal tube were coloured with dark green undecomposed bile above, and a more perfectly decomposed bile below. The mucous membrane of the *ileum* was immediately covered by a thick layer of viscid adherent *mucus* thoroughly tinged with bile, so as at first sight to look like that fluid. When this was removed by washing and affusion of water, the mucous membrane appeared in general a little thicker than natural, but certainly not softened. The *villi*, however, were more distinctly developed than during the stage of collapse, and also than in ordinary subjects. The *valvulæ conniventes* were always well-marked above, but began to become less numerous, less regular, and smaller towards the lower extremity of the intestine.

The agminated glands were always rather distinct, sometimes elevated and injected or reddened, and the isolated glands were also perceptible in the shape of miliary granules of the size of pin-heads. The intermediate mucous membrane was also reddened, though not remarkably, but never abraded or eroded.

The *pericardium* always contained more or less serous fluid; and the membranes, as well as the mediastinum and the adjoining parts of the *pleura*, were much injected.

The origin and arch of the aorta were strongly injected, and reddened with minute blood-vessels; and this vascular injection, which was in the filamentous tissue of the sheath, and in the *vasa vasorum*, was continued up the *innominata* and its branches, and the left subclavian and carotid into the neck on each side. In those subjects who lingered long in the stage of reaction, this injection was browner and more deep than in those cut off early or during collapse. It was occasionally, but more rarely, accompanied with ecchymotic spots,—a circumstance from which I infer that these ecchymotic spots are the accompaniments of a more violent and irrecoverable form of the disease. This is also corroborated by the fact, that rarely were these spots seen on the right margin of the heart in those cut off during reaction.

The right auricle and ventricle were invariably very much distended; and when laid open, were found to contain large *coagula*, bloody and albuminous, which were closely implicated with the *musculi pectinati* of the former, and the *columnæ carneæ* of the latter, and always sending a large fibrinous *coagulum* on the left side of the tricuspid valve into the pulmonary artery. These *coagula*, which were firmer and more consistent

than those found during the stage of collapse, I was disposed, like most pathologists, to regard as formed either after death, or in the last efforts of the heart's action during the dying agonies. When, however, I found them in eight or nine instances adhering most closely by a blood-shot or vascular membrane to the *parietes* of the auricle generally, and especially to the *musculi pectinati*, and also to the base of the ventricle and parts of its *parietes*, and when detached, which always required considerable force, exhibiting a rupture of parts and effusion of blood, I was then disposed to regard them as formed during life, in the stage of collapse probably, and in that of reaction becoming partially organized and attached in this manner to the nearest parts.

Of the extreme difficulty of adducing positive proof of the truth of this view, I am well aware. But I must observe, that, in addition to this anatomical fact after death, I found that in these patients, during life, the action of the heart was heavy and labouring, and its beat dull, as if it contracted not on a fluid which it could expel from its chambers, but on a solid body which was not to be moved, and accompanied with peculiar anxiety and precordial distress. If not one of the causes of death, it was at least one of those which diminished the chance of recovery.

It is important on this point also to remark the different degrees of adhesion of the *coagulum* in the different chambers in which it was found. The part attached to the *musculi pectinati* was invariably most firm and consistent, presented the most evident traces of organized membrane, and adhered so intimately, that it could not be detached without laceration. The portion adhering to the *sinus venosus* was also very firmly attached, and in several cases, perhaps four or five, could not be detached without rupture. The portions attached to the auriculo-ventricular margin and the base of the ventricle were still firm but less adherent than those in the auricle. Those within the ventricle were attached chiefly by their implication with the *columnæ carneæ* and *chordæ tendineæ*, but also in some degree to the *apices* of the tricuspid valve. And, lastly, that in the pulmonary artery, which was always more fibrinous than the other, and less blood-shot, adhered either loosely, or not at all, and was a mere mould of the vessel.

The left auricle, which was small, contained generally an imperfect small *coagulum*, more gory than coagulated; and the ventricle generally contained a similar very small *coagulum*, loose and grumous, and rarely filling the cavity, which, however, was small. The *parietes* of this ventricle were rarely so firm, hard, and constricted as in the bodies of those who expired

in pure collapse; and the whole substance of the organ was softer and more flaccid.

The *pleuræ*, both pulmonary and costal, were much and minutely injected; and a little serous fluid, tinged slightly red, was generally found in the cavity.

The tracheal membrane was of a red-brown colour, and traversed by numerous minute vessels. The *trachea* and *bronchial* tubes contained much reddish brown viscid mucus, which was also found in, and expressed from, the minute divisions of the bronchial tubes, though in a more fluid and less viscid form, in the shape of frothy reddish mucus. The pulmonic tissue, or proper substance of the lungs, was of a deep reddish brown, more compact than natural, doughy and inelastic, and in some parts approaching to the aspect and consistence of liver.

These appearances must be regarded as the effect either of the continuance of the state of collapse, or of the succession of reaction to that state; for in all the cases in which I observed it after death, I had ascertained during life the presence of a congestive degree of peripneumony and *bronchitis*, by the presence of laborious and inefficient respiration, incapacity to fill the lungs, violent and oppressive mucous rattle, and impairment or absence of the respiratory murmur in the centre of the demithoracic region. This condition, I conceive, is one of the results of the long-continued accumulation and stagnation, perhaps, of the blood, deprived of much of its serum in the branches of the pulmonary artery and veins; since we can scarcely suppose the substance of the lungs to become so much reddened and embrowned in twelve or eighteen hours after death, without the previous congestive state of the pulmonary vessels during life. Several patients appeared to die with rapid and oppressed, or languid and inefficient respiration, more from this asphyxiated state of the lungs than any other; and in this manner George Cruickshanks, (*æt.* 33,) whom I watched for several days in the stage of reaction, expired. In other instances it was combined with the symptoms of affection of the head; but in all cases it proved one of the most formidable disorders to combat and remove, and contributed most materially to the fatal termination. With such a state of the lungs there could be no respiration; and during the latter state of reaction this function was extremely interrupted and impaired.

In the head the chief changes in this state were a more advanced stage, and a more extensive degree, of the appearances remarked in the bodies of those cut off during the stage of collapse.

Thus the subarachnoid infiltration was more abundant and more opaque, and formed conspicuous whitish gray ridges over the *sulci* at the upper part of the hemispheres, and whitish

patches over the commissures of the optic nerves, the pisiform bodies, the intercrural *fossa*, and in the angle between the *cerebellum* and spinal bulb.

No great difference could be recognized, however, in the degree of injection and vascularity of the *pia mater*, unless that it was, if possible, more minute, and communicated a more general redness to that membrane and to the convoluted surface of the organ.

The substance of the brain was also more vascular, and presented a still greater number of apertures and fissures emitting blood. The convolutions were in some cases tinged of a faint rose-red, and points of them seemed rather softer than natural. But the part that was most coloured was invariably the annular protuberance and *crura cerebri*, which in this stage showed a faint rose-red coloration, as if from the sojourn of the colouring matter of the blood in its vessels. The capsules also of the *corpora rhomboidea* of the *cerebellum* were always much redder than the surrounding parts, and than they are naturally.

Lastly, the ventricles were invariably distended or dilated with from four or five to six drachms, or even an ounce or an ounce and a half, of serous fluid. In one case, this effusion had elevated the *fornix*, and expanded and extenuated, but not broken, the *septum lucidum*,—an accident which, I have elsewhere remarked, is always the result of great accumulation of fluid in the ventricles.

Much fluid was in like manner found in the *theca* of the spinal chord and beneath its arachnoid membrane, especially at the atlantal and lumbar regions. In two instances slight softening had taken place in the spinal chord. Its chief morbid appearance, however, was augmented vascularity and rubescence of its gray central pillar.

The vascularity and congestion of the liver and spleen were always considerable; but the substance of the liver was in several instances dry and doughy; and it was the blood-vessels of that organ only which were congested.

The exterior surfaces of the kidneys were very much marbled, and their granular matter was always redder and more injected than natural, and presented numerous vascular pores at the union of the granular with the tubular part. The tubular part was always very much congested and dark-coloured.

3. I now proceed to enumerate those lesions and morbid changes found in the bodies of those cut off by cholera, which must have preceded the appearance of the disease, and which, existing, as they did, in very different organs, had no connection with the choleric symptoms, but nevertheless rendered the chance of recovery much less likely.

It was, in the *first* place, very common to find the heart and vascular system and the lungs more or less diseased. The left ventricle was very frequently affected with thickening and contraction of its chamber, the *concentric hypertrophy* of M. Bertin; that is, the deposition of new matter had taken place chiefly in the internal and central direction. This we observed in at least eighteen cases of adults. In two cases, and, I think, only two, did I find the left ventricle dilated and hypertrophied, or presenting the excentric or aneurismal hypertrophy of M. Bertin. The substance of the heart in the former cases was firm; but in the latter flaccid.

In a very great number of cases the aortic semilunar valves were indurated and thickened; and there was not a single case of an adult in which the proper aortic membrane was not affected by steatomatous, atheromatous, or osseous deposition, commencing generally at the beginning of the aorta, and appearing in opaque irregular patches at the origins of all the arteries, the coronaries, *innominata*, carotid, and subclavian arteries, and rendering the inner membrane, which was elevated and irregular, lacerable and liable to be ruptured by the mere impulse of the blood. In two instances the aortic arch was dilated and enlarged. In one case (Knowles) the coronary arteries were ossified throughout their whole course; and one of them I dissected out and removed. In all the cases of adults, also, the arteries of the brain had begun to become opaque by the steatomatous deposition in patches or points. This was most frequent in the internal carotids at their emergence from the carotic canals, in the vertebrals, and in the basilary artery. Patches also were seen in several cases in the arterial canals of the circle of Willis.

It is well known that this steatomatous or tyromatous deposition is observed principally in those who have been addicted to the use of spirituous liquors, if young or middle-aged, and is very frequent in advanced life, even in those who have not indulged very freely in these fluids. It is often found also associated with apoplexy, palsy, pulmonary hæmorrhage, and all those disorders in which the vascular system is liable to preternatural injection, congestion, or effusion of blood. The existence, therefore, of this degeneration in the bodies of those cut off by cholera merely adds another to the many confirmations of the principle, that cholera selects its victims among those chiefly whose organs are already diseased.

In the pulmonary organs various morbid changes were recognized. In one case, (Elizabeth Abernethy, æt. 50,) the *pleura* investing the *apex* of both lungs was thickened and converted into smooth cartilage, or a polished substance as fine as

bone. In the body of William Falkner, (*æt.* 50,) the *pleura* investing the *apex* of the right lung was in like manner indurated, thickened, and almost ossified; and in that of Thomas Phillips, (*æt.* 47,) the *pleura* covering the same part was also in a state of cartilaginous induration. In another case it was extensively asperated by numerous miliary tubercles. Adhesions of old date, and of greater or less extent, were very common, and were observed at least in twenty or twenty-two of the cases;—in one instance, Jean Randall, most extensive, firm, and thickened. In two cases, one (William Younger, *æt.* 21,) reported a habitual drunkard, and the other (Margaret Paterson, *æt.* 40,) numerous minute red spots like petechiæ appeared in the *pleuræ* at its attached surface.

In six or seven of the cases there were calcareous concretions in the lungs; and I think I generally traced them to branches of veins—a fact which, if verified by others, generalizes our knowledge of these bodies, by referring them to the general head of *phlebolites* or vein-stones. In the body of William Falkner, (*æt.* 50,) there were in the pulmonic tissue, immediately subjacent to the *pleura*, and disseminated through the lung, several minute bodies, very hard, and requiring to be forcibly divided by strong scissors, and of a deep black colour. The superior part of the right lung of George Cruickshank, also, was much occupied by minute bodies like millet-seeds, dark-coloured, but semitransparent, and similar to the miliary tubercles described by Bayle. In both lungs of Mrs Adie, (æt. 47.) were disseminated many dark-coloured hard bodies, irregular in size and shape. Ordinary tubercular induration was found in six or seven cases at the superior part of the lungs.

I feel some difficulty as to the head to which I should refer the compact doughy state of the centre of the lungs, so often found in the bodies of those cut off by cholera. This lesion I have already mentioned as one which, with the bronchial induration, in my opinion, explains the difficult and oppressed respiration which precedes the fatal event. In several instances, nevertheless, the lung was so compact, solidified, and dark-brown, with bloody engorgement of its proper tissue, that I am inclined to think some considerable lesion of the tissue of these organs must have existed previous to the choleric attack. This was the case with the right lung of George Cruickshank, *æt.* 33; the right lung of William Younger, in which there were masses compact, doughy, and slightly indurated, but not circumscribed or defined induration, with the left lung of the same subject, in the inferior lobe of which were several masses of distinct induration; the right lung of Thomas Phillips, in which the compact doughy portion emitted, when divided, a great

quantity of dark, inky, dirty fluid; the inferior part of the right lung of Elizabeth Abernethy; and in several others. It is by no means unlikely that these patients previously laboured under a degree of peripneumony or congestive disease of the lungs.

In two cases, that of Jean Macdonald *(æt.* 46,*)* and Coventry Thomson *(æt.* 50,*)* the upper surface of the liver was attached by old extensive false membrane to the diaphragm, indicating previous hepato-peritoneal inflammation. In another, E. Abernethy, there was a peculiar notch or fissure in the substance of the liver corresponding to the gall-bladder, so that the two portions of the liver were here conjoined by thickened or duplicated *peritoneum* only. The substance of the liver was rarely in a state of perfect integrity. However much its vessels were loaded, its proper glandular substance was dry, doughy, and altered in colour. Incipient *cirrosis* or yellow degeneration was a very common appearance. In a boy of 10, James Barr, who died in the stage of reaction with severe and uncontrollable affection of the head, this organ presented more extensive and marked disease than I ever witnessed in any person so young. The gland was indurated generally in its whole substance, and presented various minute circumscribed portions of a light or fawn-coloured matter extremely firm and solid. The left lobe was so hard as to grate under the knife; and its interior substance consisted of irregular-shaped globular masses of a pale red or orange colour, in some instances gray, in which no trace of the original structure of the organ was recognized. In Jean Macdonald, already mentioned, in the inferior surface of the gland, about *one* inch on the right of the cystic *fossa*, there were two depressions occupying the anterio-posterior diameter, as if the result of previous fissure and inflammation. In Jane Paterson, *æt.* 39, there were several globular vesicular cysts containing clear water, and resembling hydatids.

The spleen presented in several cases induration of its outer tunic, and in three or four cases minute concretions in its substance, most probably belonging to the veins of the organ.

The pancreas presented nothing very unusual. In several cases, at least eight or nine of the adults, the pyloric extremity of the *duodenum* was irregular and indurated slightly, apparently from chronic irritation of its glandular apparatus. In one case, that of Mary M'Gurk, a woman of 45, the pyloric ring was indurated and the aperture contracted.

In six cases the mucous membrane of the colon was very much diseased. In two of these it was thickened, extremely dark-coloured with the blood in its vessels, which passing through the submucous tissue were large, numerous, and distended; and though, after immersion in water, a large proportion of this co-

loration was destroyed, when the membrane was brought into view, it presented numerous elliptical and circular breaches of surface, varying in size from a pin head to a garden pea, or even the area of the section of a small bean. In two others there were large oblong breaches of the mucous membrane, irregular in shape, but affecting chiefly the oblong elliptical, one inch broad, and sometimes two and a-half or three inches long. In one of them, now before me, though there is a complete destruction of the mucous membrane in several large patches, its place is partly supplied by an irregular tubercular sort of growth of a wood-brown colour, and which could be removed by the forceps, and then bore the appearance of a false membrane or new growth. Of one of these patches I have given a representation in Figure 3d.

The organs most frequently and remarkably diseased in both sexes and at all ages were the kidneys. In these we witnessed every gradation and variety almost of the morbid changes delineated by Dr Bright. In every case almost the exterior surface of these glands was more or less deeply fissured and lobulated—approaching in this respect the original type of the fœtal structure. Not a single case occurred in which this surface was not more or less marbled, mottled, and congested with blood. In at least nineteen cases the external granular matter was unusually marbled and variegated with whitish patches, and harder than natural; and in several the granular matter encroached on the tubular to a degree that indicated absorption or destruction of the latter. In five instances the granular matter conversely was unusually thin.

The yellow degeneration of the granular part of the organ, or what is probably *cirrosis* of that organ, was observed in a most perfect form and exquisite degree, affecting the granular tissue in Jean Macdonald, aged 46, a woman who had rallied from the state of collapse after saline injection into the veins, but who afterwards sunk under an uncontrollable affection of the head and the constitutional shock of inflamed vein. In Mary Turnbull, aged 23, both kidneys were irregular and tuberculated on the surface, and rather paler or more fawn-coloured than usual; and the granular matter, which was also fawn-coloured, showed, perhaps, an early stage of *cirrosis.* The tubular part, however, was natural. I should be chargeable, however, with unprofitable tediousness, were I to enumerate all the shades and varieties of this morbid change in the kidneys of those attacked and cut off by cholera; and I must satisfy myself with the following remarks.

That these changes do not depend altogether on age, or the long continuance of dissipated habits, must be inferred from the appearances exhibited by the kidneys of a girl of 18, whose body

was inspected on the 25th October. The surface of both glands was fissured and lobulated, and much variegated with deep reddish-brown lines of vascularity. The granular matter of the right kidney was paler, and more fawn-coloured than natural; and a grayish homogeneous mass had usurped the place of the granular tissue, and encroached much on the tubular part of the middle of the gland, so as to extend irregularly from the convex surface to the sinus of the organ. The surface of the left kidney was very much mottled, and irregularly variegated with brownish patches. The granular portion was in like manner paler than usual, and much attenuated; and a mass of gray matter, with red margins of irregular shape, and without distinct organization, occupied in the centre of the kidney the place of the tubular portion. The *papillæ* in both kidneys effused, when pressed, a quantity of opaque semifluid reddish matter, something like milk tinged with blood.

The tubular part of the organ was generally itself much redder and more injected than in healthy subjects. In two cases in which it was much indurated and preternaturally firm, the granular was soft, flaccid, marbled, and attenuated.

I have still to mention two remarkable examples of disease of the kidney, of a different kind entirely, In preparing to remove the right kidney of Jane Reid, I was struck with the feeling of a hard globular resisting body; and as I felt that it adhered to the transverse arch of the colon very firmly, I cut open that bowel, and found corresponding to the point of adhesion a puckered depressed space, with a distinct aperture in its centre. This had a urinous smell; and a probe inserted into it grated against a very hard body. I was now satisfied of two things;—*first*, that a urinary concretion was contained in the *pelvis* of the kidney; and *secondly*, that a fistulous opening had been formed by adhesive and ulcerative inflammation between the kidney and the colon. Accordingly, by making an incision in the upper part of the kidney, I exposed a *calculus* as large as a good sized walnut, with a brown-coloured irregular surface, and I found that the probe passed freely up from the colon into the cavity in which the concretion was lodged.

I have already mentioned the case of a woman, Jane Paterson, aged 39, in whose liver several globular vesicular cysts were found. The kidneys of the same individual presented the most remarkable assemblage of serous cysts I have ever witnessed. Not only was the surface of each kidney thickly studded with these cysts, which were various in size, from that of a garden pea to the magnitude of a grape, or even a large gooseberry; but the interior substance was occupied through its whole extent, so that a section of it rather resembled a piece of *breccia* or plumb-pudding-stone than a kidney. The figure of these

cysts was spherical or oblong-spheroidal; and they consisted of a thin semitransparent membrane, sometimes traversed by blood-vessels, occasionally not, containing a limpid fluid, or a fluid tinged slightly yellow or bluish-red. Though similar to what are named hydatids, they presented none of the characters of these parasitical animals.

The womb and ovaries were always more or less diseased in the females cut off by cholera. In the body of Jean Macdonald, attached to the *uterus* was a large globular very firm tumour, with membranous *septa*, and even osseous nodules in it. The neck and orifice of the uterus was in several cases indurated to an extreme degree. The ovaries were not in a single case, either young or old, free from morbid change. Vesicular serous cysts of various sizes, bloody cysts, tubercles, or indurated masses, were found in every one of the cases inspected. In the whole of the cases, also, the peritoneal tissue of these bodies was rough on its surface, and thickened and indurated in its substance, indicating the previous existence of inflammatory action at a remote period.

The lesions now enumerated it is important to distinguish, not as illustrating the morbid anatomy of cholera, with which they are in no immediate way connected,—but because they show that in all the cases in which that disease is fatal, some great and signal change exists in the texture of some important organ, and consequently, that in these cases the system possesses in itself those essential morbific principles which determine the developement of disease, dynamic or organic, in one or more of its constituent organs. They show that the individuals cut off by cholera must at no remote period have fallen beneath the slow and insidious but sure influence of organic disease; and that cholera had merely anticipated by a year or two, probably much shorter time, the extinction which must have resulted from the continuance of an affection of the heart or lungs, or disorder of the intestinal tube, or an incurable lesion of the kidneys or *uterus*.

In drawing this conclusion, I of course proceed on the principle, that one or more of the lesions which we found in all the cases inspected must have existed in those not inspected, at least to an equal, probably to a greater, extent. Particular circumstances occasionally prevented us from inspecting several of the cases. Wherever the friends opposed inspection, prudence prevented us from attempting it clandestinely; and to insure the confidence both of patients and their friends,—an object which we found of consequence even in conducting the treatment,—we made a rule never to inspect any subject, in which it was to be apprehended that such a proceeding would have

led to any excitement of the feelings of the friends, and thereby to popular commotion and outrage. The necessity of this conduct was indispensable, both for the security of the hospital and the tranquillity of the minds of those for whose benefit it was intended; and such at length was the effect produced, that in one instance, in which a patient had died in the High Street, his friends applied to the house-surgeon and myself to inspect the body; and in other two instances, in which patients died in the hospital, the relatives solicited us to inspect the bodies of both. Though on these accounts our inspections did not embrace the whole of the deaths, I think they embraced a sufficient number to justify the conclusion now specified, that they afford a fair view of the average result of what may be expected in the corpses of cholera subjects.

If the views above specified be well founded, they lead to another inference, which I confess has thrust itself on my mind repeatedly and forcibly during this epidemic. All of us know the frightful and unequalled mortality which it has caused; and though some persons pretended at its first appearance, to assert that the average annual mortality was not, and would not, be increased, no one who had been for a very short time attending to its progress could deny that the mortality between October 1831 and October 1832 is much greater, by many thousands, than the mortality for 1830-31, or 1829-30.

This fact, however, being admitted, it may be, with a considerable degree of confidence, anticipated, that the average annual mortality for the years 1832-1833, and the subsequent years, will undergo some diminution, and that, if the whole mortality for the ensuing ten years, after the disappearance of cholera as an epidemic, be compared with that for the preceding ten years, including of course the epidemic year, or eighteen months, it will be found that the annual averages will be rather less, and certainly will not be more.

The reasons on which I found this inference are the following. The majority, if not the whole, of the persons who have fallen victims to cholera, must at no long period have become the prey of disease of the heart, lungs, or kidneys, in the form of apoplexy, or dropsy, or consumption; or of the intestinal tube, in the shape of chronic diarrhœa; or must have slowly sunk under uterine or ovarian disease. Or, even if they resisted the slow and certain operation of these maladies, they might have become the victims of fever, catarrh, or an acute attack of inflammation in any one of the organs already disordered. It must, indeed, be manifest to every one, that the same order of individuals who are annually cut off by fever, local inflammation, dropsy, and chronic diarrhœa, or dysentery, afford the

most numerous supply of subjects to cholera. It cannot, therefore, be denied, that those individuals who are destroyed by cholera, will no longer remain to become the victims of fever, of apoplexy, of lethargy, of dropsy, or consumption, and that, consequently, the list of deaths under each of these heads must be diminished by the entire number of those who have fallen victims to the choleric epidemic.

To render this reasoning obvious to the general reader, I shall represent it in the form of algebraic notation. Let the general mortality from all diseases, for one year, be represented by the letter Θ, and, of course, the individual or integral parts of this be represented by the initials of the respective diseases; viz. π, fever; $\varkappa$, heart disease; π', lung disease; α, apoplexy and palsy; and $\dot{\upsilon}$, dropsy from renal disease; then,

$\pi + \alpha + \varkappa + \pi' + \dot{\upsilon}, \varkappa, \tau, \lambda = \Theta$; and the mortality for ten years is, $10\,\pi + 10\,\alpha + 10\,\varkappa + 10\,\pi' + 10\,\dot{\upsilon}\,\varkappa\,\tau\,\lambda = 10\,\Theta$.

But during 1831-32,—for twelve or fifteen months, or even eighteen,—many of the subjects of the first series of terms must have been cut off by χ, or cholera; and though it is observation alone that can tell us the exact proportion of each of these items that must fall victims to cholera, the mortality for 1831-1832, therefore,—a few months more or less,—is represented by the following symbols:

$$\frac{10\,\Theta + \chi}{11} = \Theta, \text{ annual mortality.}$$

And on this principle the mortality of cholera is distributed over ten previous years. But this mortality must, according to correct views, be distributed not only over ten previous years, but with much greater justice over ten subsequent years; since, as I have already shown, cholera has anticipated the deaths that must have been occasioned by five or six other maladies; and it may be inferred with pathological certainty, that no patient with any of the lesions which I have enumerated could have survived for ten years, or even the half of that space of time. For the subsequent period of ten years, therefore, we have the following expression for the annual mortality:

$$\frac{10\,\Theta - \chi}{10} = \Theta$$

$$\frac{10\,\Theta}{10} - \frac{\chi}{10} = \Theta, \text{ the annual average.}$$

But $10\,\Theta = 10\,\pi + 10\,\alpha + 10\,\varkappa + 10\,\pi' + 10\,\dot{\upsilon} + \chi$, at least for the ten years from 1831 to 1841. And pathological inspection, it may be allowed, has proved that χ and π, α, $\varkappa$, π' and $\dot{\upsilon}$ run on the same line, as it were, or destroy nearly the same class of individuals. Whatever is consumed, therefore, during

the epidemic year by χ, will not be left to be destroyed by the other diseases represented by the symbols, π, α, &c. and consequently, as χ is augmented, these other quantities must of necessity be diminished. Hence, the deaths by each of these diseases, diminished by a tenth part of the mortality produced by cholera, will represent the average mortality for each year till 1841 or 1842.

These conclusions also proceed on the principle, that cholera, as an epidemic, will not continue to prevail in the places where its ravages have of late been so conspicuous. I am aware that any very positive conjecture on this point must at the present time be presumptuous, if not rash and precipitate. It is believed by many, on the evidence chiefly of the Indian history of the disease, that, once introduced into the cities and towns of Europe, it will continue its stay, and become eventually naturalized. At present, I may remark, we have no means either of proving or confuting this conjecture. But it seems inconsistent with the history and characters of a disease, which in general appears so suddenly in a community, affects such numbers, and disappears in so short a period, to imagine that it can continue to recur annually in an epidemic form, or even after a series of five or ten years. It is doubtless the fact, that the disease recurred twice in Astrachan within a period of three years; but it may be replied that this was more likely to take place in such a locality within that short space than after the lapse of 10 or 15 years. If, therefore, we can expect with any shadow of reason, that cholera is not to recur for a series of years in an epidemic form, then we may predict with some confidence the abatement of mortality from other diseases now specified by the distribution of the choleric mortality over a considerable cycle of years. A few sporadic cases may occasionally occur; but even these would not materially affect the great general results. Of course several corrections must be made on this estimate by ascertaining the numerical mortality. My present purpose is merely to explain the general principle.

The results of the inspections are useful in another point of view. They contribute to explain, if they do not completely account for, the difficulty of curing the disease, and the general inefficiency of remedies. Cholera is a disease of that kind that appears, as it were, to smite with a violent stunning blow all the organs of the living frame, and to rob them for the moment of a large proportion of their vital powers. Physiologically speaking, the lungs, and the greater part of the circulating system of a patient smitten with the collapse of cholera, are for the time inert, powerless, and dead. A mass of semifluid inspissated blood stagnates in the former organs; and atmospheric air, though admitted through the windpipe, has no effect on it, because,

instead of being propelled freely to the communicating extremities of the pulmonary artery and veins, it either moves sluggishly along, or remains motionless in the large trunks and their immediate small ramifications, without percolating the capillary net-work. This state, which commences on the right side of the heart and in the lungs, is continued to the left chambers of the organ and the circulating system at large; and the arterial blood, which should be running freely in the different organs, is accumulated in thick semifluid masses in the larger vessels.

Were all the organs of a subject thus attacked anatomically sound, we can imagine a temporary suspension of function of this kind, from which recovery might take place; because, if the capillaries of an organ are pervious, and in other respects natural, they might, before their natural sensibility and erethism are completely extinct, begin to act on their contents, and resume their proper functions. With such lungs, however, and such kidneys as most of the subjects presented, restoration of this nature was out of the question. The natural powers of the capillaries, impaired and enfeebled by previous disease, possessed too little energy to withstand the deleterious influence of so violent a shock. They had no longer sufficient sensibility and irritability to contract on their contents, and seemed to yield passively and like inert tubes to the irresistible force of a gradually augmenting local congestion. Hence, when a slight rally from the state of collapse did take place, one or other of the organs essential to life seemed still to be oppressed by a load, of which all our methods were inadequate to relieve them.

IV. In conducting the treatment of cholera, our therapeutic measures were varied according to the stage of the disease, and the general character of the symptoms. In the first cases which I witnessed on Saturday 21st January at Musselburgh, the leading symptoms consisted, besides vomiting and purging, of a sense of fulness, weight and distension at the epigastric or umbilical region, or both, with quick, throbbing pulse, heat of the surface, and much thirst. In these circumstances, blood-letting, followed by opiates, with castor oil or the colocynth pill, was employed by Dr Stephen and Mr Veitch, who had the management of the cases in Newbigging,—a particular district of Musselburgh,—and with great advantage and success. The first effect of the blood-letting was to aggravate the cramps, if present, and to induce them, if not. But it was quickly followed by relaxation of the system; diminution, and the total removal of the epigastric-umbilical weight and distension; cessation of the vomiting and purging, and rapid and sure convalescence. This mode of treatment required, indeed, two conditions,—one, the early and preliminary stage of the disease, before the approach of collapse,

—the other, that of the patient having otherwise a good and comparatively sound state of the different organs. In several instances, in which there was less of the epigastric weight, and chiefly frequent profuse alvine evacuations, the exhibition of castor-oil, the colocynth pill, and calomel, alternated with opiates, was adequate to remove the disease.

In the Castle-Hill Hospital, when I entered on duty in the beginning of July, I found the employment of blood-letting in treating cases of cholera, with the conditions specified, in general use, having been practised much in the same way, in cases in which it was admissible, by my able predecessors, Mr G. Hamilton Bell and Dr Begbie. The blood-letting was generally followed by large doses of calomel and opium, repeated according to circumstances.

The method which I generally followed in cases with choleric vomiting, purging, and great epigastric weight, was to detract twelve, fifteen, or twenty ounces, as the strength of the patient allowed; to give after this ten grains of calomel, and half a grain of opium; and to repeat this dose at the end of two or three hours, according to circumstances; and in general, in cases of this kind, little more was required, except to continue the employment of colocynth pill, with or without the blue pill or calomel, until the alvine discharges became less frequent and more natural. The great object at this stage of the disease is to stop the vomiting and purging, and prevent by all means the approach of collapse. To illustrate this mode of treatment, I shall mention the particulars of three cases, in two of which most assuredly, if the means now specified had not been employed, the patients would certainly have proceeded to collapse.

1. Mrs Weir, æt. 24, residing in Allan's Close, Grassmarket, whose husband died two days before of cholera, was attacked at three in the morning of the 9th July, with purging of dark-coloured watery matter, to which vomiting was superadded about nine. When admitted at 11 A. M. the vomiting was frequent of whatever she drank, with much epigastric weight and some constriction; thirst was great; she had frequent profuse discharges of sago-like watery stools from the bowels; the pulse was 112, rather creeping; the head was confused, with some giddiness; the countenance had still some remains of its natural colour; but the eyes were already perceptibly sunk, and surrounded by a bluish *areola*, and the voice was slightly affected; the extremities, however, were warm. Blood-letting to twelve ounces was ordered; but after seven were drawn, she became faint, and the pulse began to give way. As she had much flatulence, fifteen grains of the compound rhubarb powder were immediately given, and ordered to be repeated after two hours. At two o'clock, when she was seen again, she had vomited the powder, and, with much sickness and some purging, she had suffered several

attacks of cramps in the lower extremities. The pulse, however, was 96, and she had less confusion of head. The blood-letting was now directed to be repeated to the extent of ten ounces; but after eight had been drawn, faintness and failure of the pulse again came on. Five grains of calomel and half a grain of opium were given by the mouth; four ounces of port-wine were injected into the intestines; and, to allay the thirst, coffee *ad libitum* was ordered.

At nine in the evening, though the pulse was at 100, of good strength, and the vomiting had ceased, she had had several discharges of watery fluid, with brownish *flocculi* like dissolved sago; cramps had occurred slightly; the tongue was moist, slightly furred, and cold; her thirst was intense; she had made no urine; and the extremities were rather colder than was desirable. An enema, consisting of six ounces of port-wine, six ounces of very warm water, and half a drachm of sedative liquor, was ordered to be administered; sinapisms were applied to the epigastrium and legs; and gruel was ordered for drink.

There was no recurrence of vomiting or purging after eleven that evening; and after some sleep, she awoke next morning with the pulse at 88, firm, and becoming full, with less epigastric weight; the tongue was dry and somewhat brown; and she had voided some urine. The only unfavourable symptoms were the persistence of the depression of the eyes, and occasional hiccup, with slight sensation of epigastric load. She was now ordered five grains of calomel, with ten of rhubarb, and five drops of clove-oil in the form of bolus, and to continue the use of the gruel. In the evening she continued to improve; but the countenance had become flushed, the pulse was 100, and full, and she seemed threatened with serious head symptoms. The hair was therefore removed, and cold cloths were applied; and she was ordered an ounce of castor-oil the following morning, that sleep might not be disturbed by its nocturnal operation.

One dark-coloured feculent stool, the first voided, had taken place during the night; urine had been voided several times; the pulse was again down to 90; the respiration was natural; and the tongue was covered only with a slight white fur. The castor oil, however, had been rejected, and much vomiting and some purging followed. Another dose of calomel and rhubarb, with six drops of clove oil, was now given and retained; and in the evening, when the vomiting had subsided, the pulse was 78, the epigastric weight entirely gone, and the respiration natural; the tongue was clean, and, the appetite returning, she had no complaint. Two ounces of port wine with hot water, and some dry toast, were allowed as supper and anodyne; and next day she was free from complaint, and the countenance was becoming natural.

On the 18th, she had some swelling of the belly and lower extremities, with scanty high-coloured urine. Three compound colocynth pills in the evening, and a drachm of the compound jalap powder in the morning, removed these symptoms entirely.

2. On the 3d October, at 12 noon, I was requested by Mr Moir, to

see Mr H. a man aged about 35, who had been attacked in the night with frequent vomiting and purging, followed by cramps in the legs and arms in the morning. When I saw him, his pulse was 140, and very small, the breathing was anxious and labouring, with great weight and oppression at the *sternum* and *epigastrium*, preventing full inspiration, and thus apparently rendering the respiration labouring and rapid. He was sick, very thirsty, vomiting frequently, and had repeated discharges from the intestines of dark-coloured watery fluid, like macerated sago. A vein was immediately opened, but when twelve ounces were drawn, his pulse began to flag, and he felt faint. A thebaic pill, and six grains of calomel, were administered.

At 4 P. M. he still continued to vomit, and to discharge the macerated sago stools; he had the same oppressive weight at the epigastric region, the same thirst, and no urine had been voided since last night. The pulse was still about 140, and the respiration labouring. Ten ounces more blood were drawn, six grains more of calomel were given, and the colocynth pill was ordered every hour.

At 7 P. M. the epigastric oppression was decidedly diminished, but not gone; he was vomiting occasionally whatever he drank; the stomach was distended with air, and some more macerated sago-fluid was discharged. No urine was voided, and the pulse was 130, very small. Fifteen ounces more blood were drawn, with the effect of relieving the oppression and allowing inspiration to be deeper; and he was ordered every half hour a powder, consisting of one scruple of carbonate of soda, two grains of nitrate of potass, and three grains of ginger; and to have one thebaic pill at nine, and one blue pill, with one colocynth, every hour, till four of each were taken. He was ordered oat-cake toast-water for drink.

The following morning, though only two pills of each kind were taken, he had slept at intervals; the epigastric oppression was much and sensibly relieved; the vomiting was less frequent; the skin was warmer and moister; the cramps were gone; and he felt more comfortable. The purging of sago-like matter, however, continued; he was very thirsty; the pulse was 110; and no urine had been voided. He was ordered to take the other two blue pills, and to continue the soda powder: and if the stomach continued or became less irritable, to take one ounce of castor oil in the afternoon, to have weak chicken-soup, and oat-cake toast water. At 4 P. M. though the characteristic purging continued, the vomiting had not returned, the epigastric oppression was gone, and the pulse was 100, and fallen. An enema was ordered to be administered, and was followed after an hour, or a little more, by some scanty feculent bilious discharge. The colocynth pills were directed to be continued; and with the chicken-soup, he was to have a little dry toast.

On the morning of the 5th, some scanty bilious feculent discharge had taken place; and, if this was not augmented within an hour, an *enema* was ordered to be administered; pulse 92, full and firm. At 9 P. M. very copious feculent discharges had taken place; the pulse was reduced to 80, full and firm; the breathing natural; and urine had been voided several times. On the following day,

when an immense quantity of feculent matter had been evacuated, he was free from complaint.

3. In a third case of the same kind, a gentleman, after exposure to wet, on the 7th and 8th of October, was attacked during the night of the latter with profuse purging of bilious, serous, and then sero gelatinous matter, which on the morning of the 9th had a dark-green tinge, as if from undecomposed bile, and contained a multitude of minute jelly-like grains, similar to macerated sago. On the morning of the 9th also, he felt sick, and vomited what he took to breakfast; he had several cramps of the legs, and coldness and moisture of the feet. He had taken three pills, containing each three grains of calomel and one of opium.

When I saw him at eleven on the morning of the 9th, the pulse was 96, small; the sense of uneasiness at the epigastric region was felt, but not oppressively; and the chief complaint was much thirst, squeamishness, and some stupor from the quantity of opium taken.

Eighteen ounces of blood were instantly detracted, with the effect of rendering the pulse softer and freer, the skin and extremities warm, and removing the tendency to cramps. Ten grains of calomel without opium were given; and in the evening five grains more with half a grain of the drug. At this time, though the profuse watery discharges without smell and containing partly undecomposed bile, in ropy threads, partly the gelatinous grains, continued, and no urine had been made since early in the morning, or rather late last night, the thirst was abated, the vomiting had not returned, the pulse was fuller and softer, and the skin generally warm. There was considerable feeling of rumbling and uncomfortable movement in the bowels; and, with the view of allaying this, and checking the action from which it arose, two blue pills were ordered during the night, and the soda and ginger powders to be taken every hour. Chicken soup was allowed.

The night was spent without uneasiness, further than from the watery purging, which recurred three times, with the macerated sago appearance, and in the morning with the characters of boiled spinage but extremely thin, indicating bile more copiously, though little decomposed. Some urine also had been voided; the sensation of flatulent movement and distension were abated; and the pulse was 86, full. Ten grains of calomel were administered immediately, and the colocynth pill ordered every hour during the day till six were taken.

Next day, the 11th, feculent stools had distinctly taken place; and he felt no uneasiness save from soreness and tenderness of the gums, in consequence apparently of taking so much opium and so little calomel at the commencement. This, however, was speedily removed by two doses of castor oil in two successive days, and by keeping out of bed.

These cases I have detailed minutely, because the two first were exactly on the verge of collapse; and perhaps the space of three or four hours at most would have made all the difference between tractability and intractability, in the symptoms. Both of

them were too far gone to bleed in the large and liberal manner which we were in the habit of doing, when the disease was taken at an earlier stage; and both, nevertheless, must have gone on to collapse without the blood-letting. In the employment of this remedy, I attach great importance to its regulation in such a manner as to relieve and abate the epigastric load; and as I was prevented from effecting this by detracting twenty ounces at once, I had no alternative but to remove it in separate quantities as the strength admitted, and as the symptoms guided me. In open distinct cases, where the vomiting and purging and cramps are violent or frequent, but not of long duration there is no difficulty; for a blood-letting of twenty or twenty-four ounces, followed by ten grains of calomel and half a grain of opium, repeated after six or eight hours, will infallibly remove the disease, if any thing will. So uniform was the success of this method, that both the district surgeons, when called in sufficient time, and the house surgeon, when a case was admitted in the proper stage, invariably employed this remedy; and no case in which it was admissible was lost.

Next to the blood-letting, and the use of calomel and opium, with castor-oil, may be ranked the employment of sinapisms and blisters as means of allaying vomiting, and relieving the internal oppression. For these, however, we had rarely or never occasion in cases which were received sufficiently early to admit of the blood-letting being carried to the requisite extent. After the use of this remedy, the necessary revulsion seemed to be completely effected; and the only use of sinapisms and blisters in cases of this class, was to combat particular symptoms, such as hiccup, or a casual return of vomiting, with irritability of the stomach.

In milder cases, the usual practice which, after many trials, was found to be most successful, was to exhibit, either at once 20 grains of calomel, and one grain of opium, or 10 grains of calomel, and half a grain of the drug, at the interval of one, or two, or three hours, according to the state of the stomach. The general effect of this remedy was, first, to allay the irritability of the stomach, and put a stop to the watery vomiting; and afterwards to suppress the sero-albuminous discharges from the intestinal tube.

In some other cases, where the disease appeared chiefly in the form of frequent profuse watery stools, with weight in the umbilical region, a single blood-letting of 18 or 20 ounces, followed by the thebaic pill, or 30 drops of the sedative liquor, and afterwards an ounce of castor-oil, had the effect of completely removing the disease.

In some cases, whether requiring blood-letting or not, I found the blue pill alone, or combined with the compound colocynth pill, of

the utmost utility. The indications for its use are vomiting or hiccup, indicating irritability of the stomach, and the consequent rejection of all other medicines. Its first effect was almost invariably to allay this irritability, and check the vomiting, after which the compound colocynth pill was used. In this way I employed blue pills, not only in the preliminary and vomiting stages of cholera, but in that of reaction, when the intestines were sluggish, and when the great object was to keep up the hepatic action, to allow the vessels of the intestines to recover their lost tone, and to remove morbid secretions.

In two or three cases I tried the effect of a dose of 30 grains of ipecacuan, so as to produce full vomiting, repeated if requisite; and in one case I think with the effect of giving a temporary check to the symptoms; that is, the vomiting and purging ceased for 24 or 36 hours But the pulse still was not satisfactory; there were epigastric weight, heat of skin, and thirst; and two days after violent symptoms of collapse came on suddenly. This case, however, merits attention on another account. I was, in general, however, averse to the experimental employment of agents, the efficacy of which was doubtful, when I possessed for the stage of irritability, in blood-letting and the other adjuvants, remedies so certain in their operation.

In the stage of collapse it is of very little moment what is done; and I have seen reason to conclude, that the less that is done beyond merely applying heat, and keeping the patient warm and quiet, and perhaps attempting revulsion by the counter-irritant powers of the sinapism, the more likely will proper reaction take place. In short, I have come to the conclusion, that in several individuals the system may possess sufficient energy to rally of itself without the interposition of art; and that hence it is extremely difficult, if not almost impossible, to estimate the true efficacy of any given remedy, or any class of remedies. At this conclusion I have not arrived without a considerable number of trials, and without much disappointment and mortification. I had early occasion to recognize the inutility of brandy, whisky, and opium, and indeed all forms of ardent spirits, and what are named the diffusible, as well as the permanent, stimuli. Without seeming to produce any alleviation of vomiting, or abatement of the sero-albuminous purging, these substances only aggravated thirst to an incredible degree, increased the burning sensation at the stomach, augmented headach, and seemed often to induce delirium and maniacal raving. In short, they evidently, when given to the extent in which they were used, augmented the vascular congestion of the different organs, exactly as these liquors do in the healthy subject. The spirituous injections, which at first I thought were beneficial, evidently increased, instead of abating

the flocculent discharges. On these accounts, I early abandoned the general use of spirituous *stimuli* in the treatment of choleric cases, in collapse, or proceeding to it; and I trusted either to the frequent exhibition of small quantities of port wine and water in some cases, or to the use of weak chicken soup, as recommended by Sydenham, and to the liberal use of tea, coffee, toast-water, and gruel. I cannot say that I witnessed a single instance of recovery in which spirituous liquors were given to any extent; and, on the contrary, I saw several instances of complete and steady reaction where they were not exhibited. The following case, in which nothing but some port wine diluted with water was given, is one of the most satisfactory I know.

4. On the evening of Saturday the 16th June, Dr Stephen of Portobello requested me to visit a young man, named Marshall, who had been attacked the day before with the usual symptoms of cholera. He was then in a state of complete collapse, the face dingy-coloured, and shrunk; the eyes sunk in the orbits, and almost glazed; the pulse imperceptible at the wrist; the skin of the extremities cold and clammy; intense thirst; and occasionally retching, with scanty discharges of sero-albuminous fluid from the intestines. He had been bled when first seen at seven, and had since that some paregoric, and some calomel and opium. From the miserable nature of the abode of the patient, however, it was deemed expedient to send him to the temporary hospital, which was still understood to be open.

This was a house situate close on the beach; and, as the cholera patients were not allowed to be carried by the public roads, this young man was put in a cart and driven down to the beach, and along this to the hospital, about eight in the evening, when the atmosphere was chilled by an easterly breeze, loaded with the humid particles of the Firth at that season. When the father of the patient arrived at the hospital, he found that establishment shut; and he had no alternative but to drive the young man home again by the same route.

On his return from the hospital, I was requested by Dr Stephen to visit him, to say whether injection by the venous system was expedient. To this proposal, after examining the young man, I was averse; and as I thought he appeared to be rather benefited than injured by his drive, otherwise unavailing, I recommended the use of warm liquors internally; warmth to the surface: that calomel and colocynth should be continued occasionally; and, above all, that small quantities of warm wine and water should be injected, with sulphate of quinine, into the intestines. I thought at this time I could perceive a slight thread of pulse.

Next morning, at seven, when he was seen by Dr Stephen, after frequent vomiting and purging of the usual matters, and cramps during the night, he was so much enfeebled, and seemed still in so hopeless a state, that Dr Stephen soon after wrote me, requesting me

to come as soon as possible, and assist him in injecting a saline solution into the veins, which then appeared to be the only chance of recovery. This note did not reach me till twelve; and, in the meantime, Dr Stephen had given the patient wine and water frequently, in small quantities, so that at one, when I saw him, he had taken a pint of port wine, and was so decidedly better, that Dr Stephen agreed with me in thinking that injection was superfluous. The vomiting and the purging were greatly less frequent; the sense of epigastric weight was still present, but palpably abated; and a slight thread of pulse was perceptible at the wrist. The countenance, however, was still dingy and constricted; the eyes were sunk in the orbits; the voice was whispering; and no urine had been voided.

The first thing done was to inject into the intestinal tube six ounces of wine, with an equal quantity of water, and ten grains of sulphate of quinine, and to cause the attendants to apply hot bottles diligently to the back, feet, and between the legs. The vinous and quinine enema was retained an hour and a half, and the patient felt much more strength and comfort than he had done for some time. Exactly two hours after this the enema was repeated, and with the same good effects. He was now decidedly improved; for the vomiting was altogether gone,—the pulse was distinct; the countenance was slightly improved; and even the voice was less suspirious. The eyes were still hollow, and there was no return of urinary secretion. The injection was directed to be repeated next morning, the 18th; and the patient was allowed tea and other warm liquors.

At one on the 18th, I was informed that he was decidedly continuing to improve; that the surface was generally warm; the pulse distinct and good, about 96–100; no headach or giddiness; but that no urine had been passed, and that he had suffered much from hiccup. I recommended the immediate use of carbonate of soda, and, if this did not relieve the hiccup, a blister to the epigastric region; and the use of the turpentine *enema*, with perseverance in the other remedies. On Tuesday the 19th, however, I learned that the hiccup had subsided spontaneously, and that urine was voided in the afternoon of the 18th, and copiously before the morning of the 19th; and from this time convalescence proceeded without interruption.

This case induced me to attach at the time great importance to the vinous and quinine *enemata*; and perhaps they may prove in several instances very beneficial remedies. I have since, however, had occasion to employ them in several cases of collapse without obtaining more from them than temporary suspension of the symptoms. The case of Marshall, indeed, I am more disposed to regard as one of spontaneous recovery; and I believe it is very much to be ascribed to the youth and vigour of the patient.

The collapse of cholera, however, presents several states and symptoms which it is incumbent on the practitioner to combat

and alleviate. The epigastric weight and internal heat are best opposed by the sinapism applied to the belly, and repeated according to circumstances; and the same application I found always relieved vomiting and hiccup for a time.

To check the purging, I employed various means; but the one which I found, after many trials, to be best and most effectual, was a small *enema* of four or six ounces of dissolved starch, containing a drachm of sedative liquor or paregoric, repeated every hour, according to its effects. In the administration of *enemata*, I have had occasion to lay down particular rules as to their volume. In all cases where it is the intention to cause the *enema* to be retained, it ought to be as small as possible, four, six, or eight ounces at most, and injected as far up the intestine as possible. If it is larger than the latter quantity, it is so much more likely to be expelled, and will most certainly be returned if it consists, as is too often the case, of one or two pounds of fluid. On this account I often employed mere suppositories.

The pain and frequent recurrence of the cramps were most readily alleviated by injecting into the intestines ten, twelve, or sixteen ounces of warm water, either alone, or with a little sedative liquor or paregoric.

To allay thirst, I began with using water or ptisan acidulated with nitrous acid; but of this the patients soon tired. I then found, after many trials, that the liquors which most perfectly quenched the thirst and quieted the irritation of the stomach were coffee, tea, and weak chicken-soup. For patients who required a stimulus, as well as mere drinks, I found port wine diluted with two parts of water the best. Brandy I never gave, unless in very minute quantities, from my own hands, or those of the house surgeon. The method of giving large and unlimited draughts of cold water, as practised by Dr Shute, I had opportunities of trying in several cases in which the patients were importunate for drink; but it never was attended with the effect of restoration; and I infer, that, where such quantities of fluid are required, it indicates a very severe and unmanageable form of the disease. I must, nevertheless, add, that I never saw any advantage from forbidding patients to quench their thirst freely; and I think the practice of refusing them drink where thirst is so urgent, is only adding most unnecessarily to their sufferings.

5. In several cases I subjected to fair and extensive trial the saline powder recommended by Dr Stevens, but in one only with much and unequivocal advantage. This was the case of Adam Edgar, a man of 40, of alleged intemperate habits, but robust in appearance, who was admitted on the 27th September, with pulse gone at the wrist, frequent vomiting, purging, and cramps, and

the face and extremities cold, clammy, and shrunk. He had a scruple of calomel before admission, with a warm *enema* containing a drachm of sedative liquor. He was ordered a scruple of carbonate of soda every half hour. Next day, he was free from vomiting, and the purging, which had subsided, but again returned, was again checked by an opiate suppository. On the 29th, reaction was complete, with full and natural warmth of surface; but the head exhibited very slight stupor. He refused to allow it to be shaved, as ordered; and the result was, that next day, with a full, strong, and tense pulse at 140, he had complete lethargic oppression of the brain; and, notwithstanding the use of general blood-letting, which he bore well, leeches, cold applications, *enemata* and purgatives, and sinapisms to the legs, he breathed his last in a state of coma on the night of the 1st October. Inspection was not permitted.

I cannot say, however, that this remedy was equally successful in restoring reaction in other cases; and, indeed, it seemed in this stage very much like other agents. If the patient recovered, it was impossible to deny that it was instrumental. But perhaps the same result might have taken place without it, or under any other substance. I shall afterwards advert to the use which I made of one of the ingredients of the saline powder.

The stage of reaction was distinguished by a general congestive state of the vascular system, in which that of the head was generally the first and most prominent object. To counteract this it was a uniform rule to shave the head and apply cold, or to employ leeches or blisters, according as the symptoms seemed to indicate. In several instances I employed general blood-letting; and I have reason to think with good effect. But to this mode of detracting blood, it was a considerable objection, that, though by its means the large and superficial vessels were immediately emptied, it did not follow that we could be quite certain of drawing the blood into these from the deep-seated vessels. Indeed, though the general blood-letting diminished the fulness and tension of the large vessels, it was by no means equally effectual in removing the congestion of the small ones. This remedy, therefore, I confined only to urgent cases; and trusted to leeches, blisters, the cold affusion, warmth to the feet, and the cautious use of several of the diffusible stimuli, to blue pill, and colocynth, or castor oil, as purgatives, and purgative *enemata* containing in general oil of turpentine.

Oppression of the brain and its membranes, however, was not the only congestive state against which we had to contend. An insidious, obstinate, and exceedingly unmanageable pneumo-bronchial congestion generally came on twenty-four or thirty-six hours after the cerebro-meningeal one; and by its constant interruption to the function of respiration, not only aggravated the whole disorder of the patient, and thereby gave all the other

organs a smaller chance of recovery, but, by conjunct *asphyxia* and congestion, gradually and certainly brought him to his final gasp. While inspection proved how little could too often be done for this deep and irreparable lesion, it also showed, that, if any reasonable hope of controlling it could be entertained, that must be in the early stage of its appearance.

When I first witnessed this painful oppression of the respiratory organs in George Cruickshank, my first thought was to attempt to relieve them by detracting blood. But the employment of this measure was contraindicated, it appeared to me, by the consideration, that, however I thus could empty the vascular system, I could not be equally sure of drawing from the lungs the load by which they were oppressed. I therefore limited my measures to the exhibition of antimonials and squill, the use of the diuretic stimulants, and the external application of blisters. Afterwards, however, it occurred to me that a full dose of ipecacuan, so as to induce complete vomiting, might, by its action on the tracheo-bronchial membranes, unload it of the viscid mucus by which it was oppressed. This method succeeded completely with the boy Lauchlan Ross, and partially with Charles Robertson, a boy of 5, in whom also I availed myself of the revulsive power of sinapisms between the shoulders and over the sternum with great temporary benefit.

The management of the alimentary canal during reaction was a task of great delicacy and difficulty. Prone to indulge in errors in diet, and clamorous for food, which they conceived would give them strength, the patients were often themselves the cause either of protracting their recovery, or inducing relapses or the return of disagreeable symptoms. Occasional vomiting, hiccup, pains of the hypochondriac and umbilical regions, distension of the belly, and incapacity to expel the wind from it, were a few of the leading symptoms which frequently, either conjointly or separately, occurred during reaction, and required particular modes of management For the vomiting and hiccup, I generally found a blister applied to the pit of the stomach, or repeated sinapisms, the most useful means. If there were fulness, or congestion, or tenderness in the epigastric region, the local detraction of blood by cupping or leeches was resorted to with benefit. The remedy, however, which I found most uniformly useful, with or without the sinapism, the blister or the local bleeding, according to circumstances, was a powder consisting of fifteen grains of bicarbonate of soda, two grains of nitrate of potass, and three grains of powder of ginger, given every hour, or four times or six times daily, according to its effects, and the abatement or persistence of the symptoms. This combination I was led to use, both in the vomiting stage and in that of reaction, from observing the immense quantity of

wind generated in the stomach, and the consequent distension. I had been for years in the habit of prescribing, for various stomach and intestinal complaints, powders consisting of 10, 15, or 20 grains of bicarbonate of soda, five grains of rhubarb, and two grains of ginger, with the effect of first producing temporary relief, and then permanent amelioration; and what was beneficial in one form of gastro-enteric affection, would, I argued, be useful in another, when slightly and suitably modified. With this view, I found, after trying this combination in choleric reaction, that the rhubarb might be advantageously withdrawn, and its place occupied by the nitrate of potass, which might then act on the kidneys; and the sequel will show that I was not altogether disappointed. This combination was employed with the greatest advantage in the cases of Daniel Manson, David Drummond, James Kennedy, Alexander Lake, Ann Hughes, and several others, in whom it not only rectified the action of the alimentary canal, but exerted some influence on the kidneys.

A symptom, or rather sensation, during reaction, which gave much uneasiness, and was truly an indication of *inertia* or *anaisthesia*, loss of power and sensation, in the several parts of the alimentary canal, was a sort of feeling that there was no immediate communication between the stomach and bowels, or that the gastro-duodenal division did not act in unison with the ileo-colic. This symptom, which I ascribed to diminution of the natural tone of the capillary vessels and muscular fibres of the intestinal tube,—the result of previous excessive excitement,—I found most easily removed by the frequent use of purgative injections, generally with from half an ounce to an ounce and a half, or even two ounces, of the volatile oil of turpentine. By the daily use of this measure, the lower part of the intestines was easily relieved of a load of mucofeculent matter, and the intestinal fibres and vessels were allowed gradually to recover their impaired tone. It was remarkable also, that, under the use of this remedy, the uneasy sensations referred to the stomach, as hiccup, distension, or even vomiting, gradually disappeared. The general mode in which I proceeded with this species of treatment, was to give a blue pill, with a colocynth pill, four times daily, and to cause a terebinthinate enema to be administered in the evening, and, if not very efficient, to be repeated on the morning of the ensuing day.

When I first began to treat cases of cholera, it was to me a great source of disappointment and perplexity to observe, that the vomiting and purging might cease permanently, the pulse return, and the skin become warm, but not a drop of urine be secreted; and the patient, whose person then invariably exhaled a urinous odour, might die with all the symptoms of renal *ischuria*. Proceeding in the usual mode of reasoning,

the readiest means which occurred to me to restore this important secretion was the employment of diuretics; and the spirit of nitrous ether, nitrate of potass, supertartrate of potass, acetate of potass, and acetate of ammonia, with the spirituous stimulants, were all more or less frequently and liberally used, sometimes with the result of the urine flowing, but much more frequently with no discharge at all, or a scanty temporary secretion. After some reflection on the source of this disappointment, and comparing well the appearance of the kidneys in the dead subject at different periods of the disease with the symptoms during life, and the analogous states of other organs, it appeared to me highly probable, if not quite certain, that the suspension of the urinary secretion was owing to the excessive congestion of the vessels of the kidneys. To remove this, it appeared that the local detraction of blood from a spot as near the situation of these glands as possible ought to be most likely sufficient. In the case of Daniel Manson accordingly, who had with great difficulty rallied from the immediate state of collapse, I first employed this mode of treatment.

6. This patient, whose habits were not very sober or regular, had been admitted on the 5th September. The symptoms of cholera had been completely checked by two doses of ipecacuan of half a drachm each; and under the subsequent use of carbonate of soda to remove flatulence, and blue pill or calomel, with colocynth and the thebaic pill, to restore and regulate the action of the bowels, he was comparatively well on the 9th, when the stools were feculent. On this day, however, another patient had a sudden relapse early in the morning, and died in the evening in a state of perfect collapse. The rapidity of this man's fate struck Manson so impressively, that he felt ill that evening. and next morning (8th,) about three, he was attacked with purging and vomiting; and at half-past nine, when I saw him, his face was marbled blue, his extremities cold and clammy, the voice gone, and his pulse gone at the wrist. By the immediate and assiduous use of opiates, small quantities of brandy, chicken-soup, and calomel, the vomiting was checked, and the pulse was distinct at the wrist in the evening at nine. Next day, though the stools were still flocculent, reaction was commenced, and vomiting had ceased. On the 10th he was, with the exception of a little vomiting, and stools still gelatinous, much better, but there was slight stupor, and heaviness of the head; the person exhaled a distinct urinous smell, and no urine had been voided since early in the morning of the 8th. In short, when, after making no urine for sixty-two hours, he was slipping by sure, but insensible steps, into that hopeless state in which so many of our cases of reaction had expired, I ordered ten leeches to be applied to the region of the kidneys, and a blister to be applied afterwards. This was on the evening of the 10th September; and the blister was applied on the morning of the 11th; and early in the course of that day he voided about eight ounces of urine. He was also getting blue pill and croton oil, varied with calomel and croton oil,

occasionally *enemata* of turpentine; and a mixture of nitrous ether was ordered on the morning of the 11th, which, however, could not, in the course of five or six hours, be expected to restore the action of the kidneys, after it had failed in so many other cases. More urine was voided during the day; and before the morning of the 13th, the secretion was fully, though sparingly, established. From this period Mr Manson improved progressively and steadily, though the inert state of his bowels required the frequent and careful use of the blue pill and colocynth pill, and the turpentine *enemata*.

7. and 8. I now thought I possessed, in the use of local blood-letting and counter-irritation, one means more promising than all the others of restoring the action of the kidneys; and I accordingly employed it in a considerable number of cases of reaction with suppression of the urinary secretion. In the case of the boy Lauchlan Ross, *æt.* 10, it was employed twice, with the effect of producing the discharge of two pounds of urine, after the secretion had been suspended for fifty-two hours at least. In the case of the child Cornelius O'Neil, (*æt.* 3,) who had voided no urine from the night of the 1st October till the afternoon of the 3d, leeches were applied to the region of the kidneys twice, before the secretion began to resume its course.

9. In the case of David Drummond, *æt.* 30, no urine had been voided from the 2d October till the evening of the 4th. The powder consisting of one scruple of carbonate of soda, three grains of nitrate of potass, and two grains of ginger, was freely tried beforehand, partly with the view of relieving the sensation of flatulence, partly with that of operating on the renal circulation. On the 4th, eight leeches were directed to be applied to the region of the kidneys; and in the evening, eight ounces of urine were voided, and about the same quantity on the morning of the 5th. The leeches were repeated: and next day about two pounds of urine were voided; and on the 7th, he was discharging at the rate of four pounds daily. This patient was also subjected about three times daily to the use of the cold affusion.

10. In the case of Kenneth Forbes, *æt.* 52, who was admitted in a pulseless state of collapse, on the 4th October, and had voided no urine since the attack, when some reaction appeared on the evening of the 5th, eight leeches were applied to the renal region; and on the 6th, as no urine had yet appeared, local bleeding was again ordered from the loins by ten leeches, with the administration of a turpentine *enema*. On the 7th, the urine was copious; but he complained of pain and weight in the epigastric region; and, with the view of removing these symptoms, ten ounces of blood were ordered to be drawn from the epigastric region by cupping. This was followed by much relief; and the colocynth pill, with a few ounces of wine, completed the cure.

11. The case of Alexander Lake or Leake, *æt.* 46, was a still more pointed illustration of the benefit of this remedy. This man was admitted on the 22d on the verge of collapse, and all the usual means to avert this state were put in active use without effect. On the 24th, when no urine had been voided since the morning of the

23d, according to his own statement, but more likely since that of the 22d, eight leeches were ordered to the loins, and a little urine was voided that evening, and some dark-coloured turbid urine next morning, At this time he was taking four blue pills, with an equal number of the compound colocynth, daily ; and for hiccup, which was distressing, a sinapism, and afterwards a blister, were applied to the epigastrium. The hiccup still continuing, with a recurrence of vomiting of bile, twelve leeches were ordered to the right hypochondriac region ; the cold affusion was ordered ; and a turpentine *enema* was directed to be administered. Hiccup was abated the following day ; and, by the continued use of the blue pill and turpentine *enemata* for a few days more, he was convalescent.

This case was probably one of the most severe, violent, and complicated that recovered from the stage of reaction,—the symptoms of which displayed their true congestive characters in different regions and organs of the frame, conjointly and successively.

My limits will not permit me to enumerate all the cases in which this mode of eliciting the urinary secretion was employed. I shall merely add the following in as little space as possible.

12. Margaret Beatoun, *æt.* 18, admitted September 26, treated by blood-letting and calomel,—did not proceed to complete collapse,—voided no urine since the attack,—was ordered on the 27th *twelve* leeches to the renal region, and during the following night voided urine several times.

13. Mrs Scott, *æt.* 33, attacked on the 30th September with the usual symptoms, admitted on the 1st, had a scruple of calomel and a grain of opium ; afterwards, carbonate of soda, nitrate of potass, and ginger,—had pain of the epigastric region, for which eighteen leeches were applied, and voided no urine since the attack. On the 3d, eight leeches were applied ; and a little urine followed in the course of five or six hours. On the 4th, they were repeated, and some more was voided ; and on the 5th, they were again applied, and the urine then flowed copiously, This woman had also the turpentine *enemata* administered in general once daily.

14. Anne M'Donald, *æt.* 36, after diarrhœa of several days' duration, was attacked on the 17th October with the usual symptoms of cholera, and was proceeding rapidly to collapse, when she was admitted, and treated in the usual mode. Collapse was averted ; but she had on the 18th and 19th, a stupid air, with heavy suffused eyes, a lethargic look, and some deafness. She had passed no urine since the 17th. She was ordered *ten* leeches to the loins, an ounce of castor oil, and the cold affusion on the head three times daily. About two hours after the leeches had bled freely the urine was voided copiously. The scalp, however, was still hot, the eyes suffused, and there was slight stupor. The colocynth pill was now ordered, four in the course of the day ; and the affusion was repeated as before. The heaviness and suffusion continuing, the head was shaved, a blister applied to the nape of the neck, and

she was ordered two ounces of spirits diluted with four times the quantity of water. Under this treatment she speedily convalesced.

15. A case greatly more tedious and severe was that of Mrs Hughes, æt. 36, who was admitted on the 10th October in a state of complete collapse, with cold surface, dingy constricted features, depressed eyes, surrounded by an areola, and very feeble voice and pulse, which, however, was perceptible, like a small thread, 100 in the minute. The following day, with great thirst, the vomiting and purging continued at intervals; but the skin was more dry and warmer. On the 12th, when the pulse was distinct and beating 100, she had voided no urine, so that for seventy-two hours this secretion had been completely suspended. Six ounces of blood were now directed to be drawn from the loins by cupping; and the powder of carbonate of soda, nitrate of potass, and ginger, was ordered in fifteen grain doses every hour. No urine followed, however; and two blue pills, with one thebaic, were ordered at bed-time; and next morning, two more blue pills, with two colocynth; eight leeches to be applied to the loins, and some green tea occasionally. At nine in the evening some urine had been voided. Next day, though vomiting still continued occasionally, the surface was cold and dry, and the pulse was very weak; urine continued to flow scantily. The blue pill was therefore continued, with the carbonate of soda and ginger; four ounces of wine daily were ordered, and the turpentine enema in the evening. On the 15th, when the pulse was 88, a pound of urine had been passed; and after this, by the occasional use of the cold affusion, she made an excellent recovery.

This case was so unpromising, that a physician who had much experience of cholera in India thought it impossible for the patient to survive; and in this opinion he was not solitary.

In some other cases, this mode of treatment was less successful; and though the detraction of blood from the region of the kidneys was followed by a discharge of urine, the patients did not eventually recover. This occurred in three cases. Helen Haigg, *æt.* 42, a very broken-down miserable subject; Alexander Gordon, a young man, who seemed to sink under the pneumonic or pneumo-bronchial affection; and Charles Robertson, a boy of five, who partially recovered from a bronchial affection, but sunk under the united action of that and the symptoms of cerebro-meningeal congestion. In a fourth case, William Denham, a boy of 8, who was admitted in deep and irrecoverable collapse, who only partially rallied, and who finally sunk under the obstinate form of cerebro-meningeal congestion, urine appeared to be voided once or twice; but the urinous smell of the surface continued to the last. In neither of these cases were we permitted to inspect; but it may be presumed from the result, that some irreparable lesion existed either in the brain or lungs, or both. The child Charles Robertson, was much relieved of the bronchial affection by ipecacuan and antimonials;

and the cold affusion evidently abated the symptoms of cerebro-meningeal affection. But the circumstance of other individuals of the same family having died of symptoms of *hydrencephalus*, showed that little could be expected from any remedies.

The result of these cases, nevertheless, shows that some means may, with reasonable hopes of success, be employed to oppose this formidable symptom. While I cannot hold it up as a remedy that will in all instances remove the renal congestion and restore the natural secretion, I think that in the majority of cases,—that is, ten out of twelve,—in which the system possesses sufficient energy to rally spontaneously, and yet not enough to resist alone the overwhelming congestion of the cerebro-meningeal and pneumo-bronchial vessels, this local depletion may always be used with the hope of restoring the urinary secretion. It was remarkable, indeed, that when it succeeded in this, the head was always less oppressed, and the respiration became more free; and, if the healthy action continued, or was not interrupted, the circulation soon resumed its natural course.

To the employment of this mode of attempting the re-establishment of the urinary secretion, I have already stated, I was led by reflecting on the appearance of the kidneys and their vessels in those who died during reaction, combined with the analogical condition of the vascular system in all the organs. I have also mentioned, that the *papillæ* of the tubular cones always emitted when pressed a thick, milky, opaque fluid, and in one case a bloody fluid. In illustration of the nature of this fluid, and of the pathological state of the urinary secretion, it is highly interesting to remark, that my friend Dr Christison had previously ascertained, that the urine first voided by patients in choleric reaction, is much less dense than natural, and always contains more or less albuminous matter, and that in some instances *urea* is found in the serum. On mentioning to him some time ago the effects of the local depletion and counter-irritation, he communicated to me the experiments by which he had determined this point; and, though these experiments are not so complete as I well know they would have been, had they not been interrupted by a severe and tedious fit of sickness, and afterwards by circumstances over which Dr Christison had no control, they are so precise and satisfactory, so far as they go, that a short abstract of their results cannot fail to be interesting.

Dr Christison examined the density of the serum of the blood in nine cases of patients, three of whom were bled before collapse, two in that state, (John M'Donald and William Melrose,) in one case (James Keir,) after reaction had commenced, and in three in which it is not specified. In all the cases in which blood was drawn during violent symptoms, the density of the serum varied from 1038, which is the lowest, to 1045.5,

which is the highest. One is at 1039, two at 1040, one at 1041, and one at 1043. In the man who was bled during reaction it was highest, being 1060.70.

In one case Dr Christison analyzed the blood drawn, and found it to contain less water than healthy blood, by 53 parts in the 1000, but more colouring matter by 29 parts; more albumen and salts by 24 parts; and only about .5, or half a part, in the 1000 more fibrin. The albumen of the serum in the only case examined was 132 in the 1000, or 45.2 more than in health; the saline 11.74.

In three cases in which the serum of the blood was examined after death, it was found to contain *urea* in appreciable quantity; and in the serum of the man bled during reaction, and who had passed only a very little urine from the date of his attack, a very unusual proportion of that principle was found. In three other cases in which blood was drawn, in the one at the commencement of collapse, (John M'Donald,) in another before it appears to have approached, (William Melrose,) and in a third when collapse was far advanced,—the serum, when treated with nitric acid, still afforded distinct crystals of nitrate of *urea.*

In eight cases in which Dr Christison examined the density of the urine, he found it to vary from 1013 or 1015 to 1025, which was the highest observed, and occurred in a patient named Crawfurd, after suppression for the space of two days. In the whole of these cases the urine contained more or less matter coagulable by heat. In all these cases, therefore, the density of the urine is much below the natural standard, which is between 1025 and 1030; and this diminution appears to depend either on the presence of *albumen* instead of *urea*, or on the quantity of the latter being diminished. In this respect, therefore, the state of the urine is very similar to that of persons labouring under renal disease, as orginally described by Dr Bright, and afterwards by Dr Christison and Dr J. Gregory.

This diminished density and albuminous impregnation of urine in choleric patients was established only with regard to the portions first voided after suppression, followed by restoration of the secreting functions of the kidneys. It becomes, therefore, a question, whether it belongs to the reaction of cholera, and the congestive state of the vascular system during that struggle, or belongs to a previously disordered state of the kidneys. The strong argument in favour of the latter idea is the circumstance of so many of the fatal cases presenting more or less disease of these glands. This subject, however, it is unnecessary to pursue further. It is sufficient that I indicate the state of the urine in this stage of the disease, as one which throws some light on the influence of local depletion in restor-

ing the natural action of the kidneys. It connects the treatment with the general fact already established of the efficacy of depletion, general and local, in augmenting the urinary secretion in disease of the kidneys, when that is the cause of dropsical effusion. It is also not unimportant to remark, that two of our convalescents, Mrs Weir and Betsy Taylor, had symptoms of anasarcous effusion, which required in the former case the repeated use of purgatives, and in the other of a large bloodletting, and purgatives, with diuretics, before the swellings gave way, and the urine became natural in quantity.

Notwithstanding the importance, however, which I attach to the employment of this remedy, it is not my intention to represent it as one which never fails. I had myself occasion to witness in three cases its inefficacy in permanently maintaining the renal action; and there is no doubt that it cannot be expected to succeed in every case. It is always indispensable, however, to have recourse to it if the urine continues suppressed for twelve or twenty hours, if there be any reaction whatever; for much of its efficacy depends on having recourse to it early. In its use, also, it is important to attend to the state of the gastro-enteric circulation, the state of the liver, that of the lungs, and that of the brain; and, by the use of remedies directed to each, or which are likely to operate on the circulation generally, to relieve the congestion of the internal vessels.

In the treatment of the stage of reaction, indeed, two objects very much of the same character were to be held in view;—one, to relieve internal congestion, the other to restore the action of the several glands, and that of the skin. For the former, I found local bleeding, sinapisms, and blisters, with the cautious use of such stimuli as diluted wine, diluted nitrous ether, tea, and coffee, most applicable. To fulfil the second indication, I employed the blue pill, and detraction of blood from the hypochondriac region, for restoring the action of the liver; detraction of blood from the loins, and the powder of carbonate of soda and nitrate of potass for that of the kidneys; and for the head and cutaneous circulation generally, the affusion of a stream of cold water on the head and person, alternated with warm fomentations to the feet.

Next to the local detraction of blood from the region of the kidneys, indeed, I think no remedy proved so beneficial as the cold affusion. It was indicated whenever there was heaviness of the head, suffusion of the eyes, much thirst, and a skin warm but rather dry and imperspirable. It always produced temporary clearness of the head, quenched thirst more effectually than any other means, and after two or three repetitions, rarely failed to render the skin moist and comfortably warm. So manifest, indeed, were its effects, that the patients themselves,

who resisted shaving of the head, and had a particular dislike to sinapisms and blisters, submitted to the cold affusion with the greatest readiness. One individual, indeed, David Drummond, *æt.* 20, after he was convalescent and walking about the ward, but who still felt an uneasy fulness and oppression about his head, was in the habit of having recourse to it several times a-day after he ceased to be the object of medical treatment; and he requested the nurse or any patient to pour the water on his head and person two or three times daily till he left the hospital.

Such is a view of the treatment pursued at the Castle-Hill Cholera Hospital in the cases under me during the period of my attendance there from the 5th July to the date of the reduction of the establishment. If I dwell on some parts of it, it is not by reason of any remarkable success which I can claim form the method of treatment; for the disease is of that nature, that, unless taken at the very first, and in subjects otherwise vigorous, it baffles the most rational practice and the most assiduous attention. This was particularly illustrated in the early history of the disease, when only the most wretched and enfeebled subjects were attacked, and when, from prejudice, it was impossible to get them to enter the hospital until all hope was over. Then they appear to have entered almost moribund.

From the first opening of the institution to its final close on the 20th November, the whole cases admitted were 318; the total deaths have been 187; and the total recoveries 131.

Previous to the 5th July, when I entered on duty, the total admissions were 119; the total deaths, 85; the total recoveries, 29. From the 5th July to the 20th November, the total cases were 199; total deaths, 97; total recoveries, 102; thus showing an increase of recoveries above the amount of deaths, which were about one-half of the admissions.

The principal reasons of this abated mortality appear to be the following. In the *first* place, the disease at its second outbreak in July attacked greater numbers of persons, and, consequently, much better constitutions; and the same is true of its numerical augmentation in the end of September, and during the first week of October. *Secondly*, as the disease became more diffused, and continued longer among the populace, their prejudices against the hospitals, the Board, and the medical officers, subsided; and they applied earlier to the district surgeons, and came more readily to the hospitals when first attacked. In the *third* place, by the promptitude and energetic conduct of Mr Taylor and Dr Edgar, our two most assiduous district surgeons, the majority of the cases were sent at much earlier periods than at the carly stage of the epidemic. To the

exertions of these gentlemen, indeed, the Castle-Hill Hospital owes a large proportion of any utility which it has rendered to the inhabitants of that neighbourhood. And, *lastly*, I think it fair to conclude, that, under the use of local depletion from the region of the kidneys, and the other auxiliaries, during the stage of reaction, for instance, the frequent use of the turpentine *enema*, and the cold affusion, several cases have recovered from this stage, which must otherwise have sunk under it.

Explanation of the Figures.

Fig. 1. Appearance of the agminated glands of Peyer, and the isolated glands, in the adult dead of cholera.

Fig. 2. Appearance of the agminated glands of Peyer in children cut off by cholera.

Fig. 3. Appearance of the patches of the colon described in p. 43.

EDINBURGH:
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Fig. 1.
p. 29.

Fig. 1*

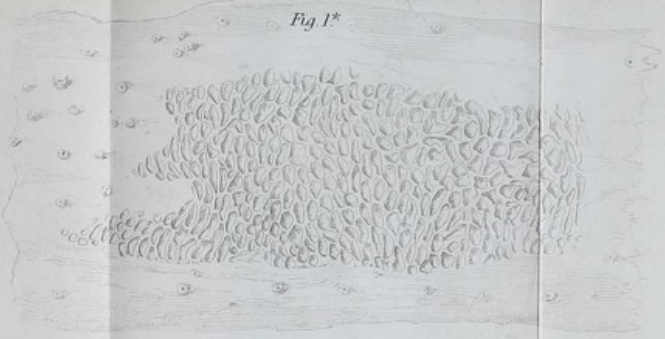

Fig. 3.
p. 43.

Fig. 2.