ORIGINAL COMMUNICATIONS.

CLINICAL NOTES ON CHOLERA.

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III. PATHOLOGY OF CHOLEBA (CONTINUED).

Abdomen. Intestinal canal. On opening the abdominal cavity, especially in deaths during collapse, I frequently found the peculiar cholera odour already alluded to under the head of the sweat and breath. The intestines were as frequently distended as collapsed: the distension was chiefly visible in the stomach and transverse colon. Contractions of various parts of the canal were also occasionally met with, chiefly in the colon. On palpation, the gut usually had a thickened doughy feeling, as if it contained a very viscid matter; and its external surface was more or less, in many cases, copiously lubricated by a glutinous mucus. There was also, in most cases, a rosy or arborescent hyperæmia of the exterior of the canal, sometimes of a bright red, at other times of a darker venous hue: it was best marked in the small intestines, and frequently existed in them while the surface of the stomach and large intestines was pale. This rosy hyperæmia has been considered by Pirogoff, Virchow, and others, as a characteristic pathological feature of cholera. It did not appear to me always proportional to the stage or intensity of the disease, though it was undoubtedly most common in the collapse stage. The tympanitic condition of the stomach and large intestines (for it was seldom or never met with in the small), the amount of thickening and gluey exudation, and the pallor or increased vascularity of surface, varied with the stage, intensity, and character of the disease, the pre- or co-existence of other morbid conditions, the state of the digestive organs, and of the digestive function, prior to the seizure, etc. There was, however, no fixed connexion between the vital and pathological phenomena in question. The increased vascularity varied also in degree: it was sometimes a mere blush, confined to the finest capillaries, and, according as it extended to the larger capillaries and smaller veins, it became finely or coarsely arborescent, and the hue ranged from vivid red to dark bluish purple. Though usually generally and equably distributed, it sometimes occurred in patches, particularly in the large intestines. In scarcely a single case were the intestines covered by the omentum, which was either very delicate, atrophied, or collected in a mass below the stomach.

The *œsophagus* seldom exhibited any lesion, with the exception of hyperæmia of its gastric extremity, and copious lubrication of its interior with mucus. The mucus membrane here was occasionally white and opaque; if this were removed, the subjacent surface was found minutely injected. Sometimes the mucous surface was studded over with millet-seed-like white opaque spots. A few ecchymotic patches were occasionally noticed, extending upwards from the stomach. The upper part of the tube, along with the fauces, was comparatively healthy.

Stomach. This organ was sometimes more or less distended with gas or fluid contents; at other times contracted and empty. It was sometimes pale and anæmic; at others marked by capillary or venous hyperæmia, or by punctiform ecchymoses, sometimes also occurring in large patches, especially along the greater curvature. Its mucous membrane was frequently thickened, rough, granular, and as if sodden, apparently from oedematous infiltration. In this condition, it felt villous and velvety, and was copiously lubricated with viscid mucus. In some instances, it was irregularly thinned to various degrees, or altogether absent over small patches, exposing the subjacent muscular coat: it also presented all degrees of softening, from mere pulpiness to distinct exuviation in flocculi and shreds, sometimes of considerable size. These flocculi, especially when thrown off from the lower portions of the canal, closely resemble,

and have probably been mistaken for and described as dysenteric lymph. This softening and thinning has generally been best marked around the pylorus, and along the greater curvature. The mucous membrane was frequently discoloured, the tint being generally some shade or combination of green or brown. Sometimes the interior of the stomach presented a series of patches of green and brown, alternating with ecchymotic masses of a dark purple. This discoloration was probably due to chemical changes in the contents or secretion of the viscus. In a few cases, portions of its interior were lined with bloody mucus; these, along with the discoloured patches just noticed, were chiefly along the greater curvature, and about the pyloric extremity. In no case were the gastric glands at all enlarged or prominent. In a few cases, the rugæ were very thick and prominent, giving the interior a mammillated appearance. They were frequently congested or ecchymosed, and their interspaces copiously filled with variously coloured or bloody mucus. On removing the mucous coat, the subjacent surface was generally much injected; the veins, in particular, were frequently gorged. In the mucus scraped from the stomach, the microscope frequently detected, besides food *débris*, the same "annular bodies" which occurred in the stools and vomit, but in very small quantity, and bearing no relation either to the stage or intensity of the disease, or the proportion of the same bodies existing in the matters evacuated during life. The contents of the stomach were frequently of a greenish, brownish, or chocolate colour, and more or less viscid from mucous admixture. Their reaction with heat, nitric acid, and test papers, their coagulability, density, and general chemical and microscopical characters, varied nearly as much as, though similar to, the characters of the matters vomited during life. In no instance were the contents *ricey*, though they often consisted chiefly of mucus.

Small intestines. In the duodenum and jejunum, the rosy hyperæmia generally commenced, and the gut often felt thicker, more doughy and oedematous, and was more copiously lined with mucus, than any other part of the canal. In the interior, Brunner's glands were sometimes enlarged from the size of a pin's head to that of a pea. Peyer's patches also began to exhibit enlargement and thickening, the maximum of which was generally attained towards the lower part of the ileum. The valvulæ conniventes were seldom abnormally prominent or thickened, but were frequently deeply stained orange-yellow with bile. This staining chiefly occurred in deaths during the typhoid stage; but it did not always coexist with biliary colouring of the fæces. Between the valvulæ, in one or two cases, I found what appeared to be a lymph-like false membrane, spread over, and closely adhering to, the surface of the mucous membrane: it usually had a deep greenish yellow colour, from biliary staining. Under the microscope, it consisted almost entirely of delicate fibrillated bands and cylindrical epithelium, as isolated cells, or as groups of cells united at their apices by a common connecting membrane. When freed from colouring matter, and artificially disintegrated or torn up, it formed flocculi closely resembling those of the rice-water stool. Towards the lower parts of the duodenum and jejunum, these membraniform patches became smaller, until they entirely disappeared as a coating of the interior of the canal. The ileum usually presented, in a marked degree, arborescent vascularity of the external surface, a thickened doughy feeling of the coats of the gut, and a velvety sodden condition of the mucous membrane, depending on oedema. Ecchymoses were chiefly confined to the interior, and occurred both as minute dark points and as purple patches of various sizes. They were generally readily removed by maceration in water. To see them distinctly, it was sometimes necessary to remove the thick layer of viscid mucus, which lined the canal, especially if this was tinged by blood or fæculent matter. Extensive ecchymoses sometimes coexisted with a lining of bloody mucus, general, or confined to particular parts of the canal: these, however, were more common in the lower part of the large intestines. Not unfrequently

the ecchymotic patches were variously discoloured, exhibiting, as in the mucous membrane of the stomach, various shades of brown and green. This was undoubtedly due to the chemical decomposition of the contents or secretion of the gut, and the action of the sulphuretted hydrogen and other gases thus evolved on the extravasated blood. Neither the hyperæmia nor ecchymosis could be considered characteristic of, or confined to, any particular stage of the disease; for I found them equally in the collapse and advanced typhoid stage, and, in some cases, they were nearly or altogether absent. The increased vascularity and ecchymosis frequently centred round Peyer's patches, giving them a red or purple margin, and rendering them very distinct among the surrounding pale mucus. The bases of these compound glands were also sometimes studded over with punctuate ecchymoses; and, in some cases, a similar condition existed throughout a great part of the ileum, all the solitary glands and glandular follicles having apparently become the seats of hæmorrhagic extravasation. From the thickened velvety condition of the mucous membrane, Peyer's patches sometimes appeared as if scooped out of the surface of the gut, or as having thick raised margins, which were sometimes congested and ecchymosed. At other times, it was scarcely possible to distinguish them amid the mucous lining of the canal, which required to be washed completely off before they were exposed to view. Enlargement (œdematous thickening) of Peyer's patches appeared to bear no relation to the enlargement of the solitary glands, which were sometimes comparatively prominent, at other times not discoverable. I seldom noticed them without removing the mucous lining; they were better seen in the large intestine: even here, and in the lower part of the ileum, they were seldom so distinct as to constitute the *psorenterie* of the French. I never noticed any approach to ulceration of the Peyerian or other intestinal glands. It is generally stated that the enlargement of the various glands in collapse is due to œdematous infiltration, and disappears in the typhoid stage; this I cannot corroborate from personal observation. Some authors have described the existence, during collapse, of flattened elevations of various sizes, resembling, in general appearance, those met with in the first stage of dothin-enterite, which also seem to depend on submucous exudation or effusion. On section and pressure, they are said to yield an abundant creamy juice, which, under the microscope, shows numbers of the same granular nucleus-looking corpuscles already described as occurring in the mucous flocculi of the collapse stools. Circumscribed elevations corresponding to this description I have not personally met with. The contents of the small intestines (and this also so far applies to those of the large intestines) were seldom icky, like the collapse stools, being usually thicker in consistence, and variously coloured by blood or fæculent matter. In one case only was there no trace of either of these substances, the whole canal being copiously lined with pure viscid mucus. This mucus, scraped or washed from the surface of the gut, agitated with water, and allowed to stand an hour or two, gave to the fluid exactly the appearance of the "rice water" stools. When the intestinal contents chiefly or entirely consisted of mucus, they had similar characters to the "rice water" stools passed during life, with the exception that the microscope generally detected abundance of perfect or disintegrated cylindrical epithelium, and perhaps a few blood-corpuscles. The fluid was also much more albuminous; and this, though sometimes, was not always dependent on, or proportionate to, the amount of intermixed blood. In the typhoid stage, the contents were usually of a brownish or greenish colour, and varied in consistence: sometimes they resembled pea-soup, at other times chopped spinach; occasionally they consisted of a thin brownish yellow fluid, intermixed with portions of fæculent matter; they were usually very fœtid, alkaline, and albuminous. In microscopical, chemical, and general characters, they resembled the stools passed during life in the same stage, except that cylindrical epithelium was always present. The contents, when devoid of ordinary fecal matter, frequently

possessed the peculiar odour already so often referred to; it was also sometimes noticed on the surface of the intestines, and in the general cavity of the abdomen. Mucus scraped from the surface of the gut usually consisted, under the microscope, of hyaline bands; of the mucus and other granular corpuscles already mentioned under the head of the collapse stools; of cylindrical epithelium, isolated and in patches, connected apically by a common membrane, entire or altered in various ways; of portions of villi removed by the knife, which were always nude (*i. e.*, uncovered by epithelium); with sometimes a few blood-corpuscles, "annular bodies", phosphates, and some food *débris*. The corpuscles entangled among the mucous bands were usually much larger and more granular than those in the flocculi of the "rice water" stools. I have not noticed the cylindrical epithelium preserving the form of the villi; but this may have been due to agitation in water, or pressure between the microscope glasses. With reference to the theory advocated by Boehm and others, that cholera consists essentially in a desquamation of the intestinal epithelium, it is important here to notice, as has been pointed out by Dr. Gairdner of Edinburgh*—

I. That artificial maceration of the healthy intestinal mucous membrane will be found to produce a similar separation of the epithelium.

II. That the epithelium found in different parts of the canal belongs to, or has been macerated off, the parts near which it is found; and

III. That the stools passed during life *never* contain the slightest traces of cylindrical epithelium.

The conclusion deducible from these data is, that the phenomenon in question has no claim to be considered *vital*, or as standing in any essential relation to the disease, but is probably purely *mechanical*, *viz.*, the result of *post mortem* maceration of the mucous membrane. The contents were pale, fluid, and mucoid only in the collapse stage, when the disease had been very rapidly fatal, and where there had been little or no alvine evacuation during life, in consequence apparently of the intensity and instantaneity of the shock. This was seldom seen in the human subject; but in two dogs, which, as I have already mentioned, died of cholera artificially communicated, where the death had been sudden and the intestinal discharge during life small and fæculent, I found the canal more or less loaded with flocculent mucus, which, when agitated with water, gave the fluid all the appearance of the "rice water" stools. The contents here also were variously intermixed with, and coloured by, fæculent and other matters, in some parts of the canal. In this case, the gut appears to have been so suddenly and completely paralysed as to have been rendered quite inadequate to perform its ordinary excretory duties. On removing portions of the mucous membrane, or on examining portions of the canal naturally denuded of this coat, the surface usually appeared finely injected or ornamented by an arborescence of dark gorged veins. This hyperæmia was greatest at the free (or anti-mesenteric) edge of the intestine.

Large intestines. These were sometimes distended with gases, at other times contracted in various situations and to various extents. Diminished calibre was chiefly noticed in the transverse colon, sigmoid flexure, and rectum. I never found any *intussusception*. Like the small, they were the seat frequently of hyperæmia or ecchymosis. The mucous membrane was sometimes thickened, rough, and sodden, but in a less marked degree than in the small; and the solitary glands were sometimes enlarged and prominent. The latter occurred as pin head or millet-seed-like opacities, chiefly in the sigmoid flexure and rectum; they were much more distinct than in the small, but frequently required the surface of the gut to be denuded of its covering of dark or bloody mucus before they became visible. I never saw these glands so prominent in man as in the two dogs already alluded to as having been poisoned

* On the Pathology of Cholera, in the Edinburgh Monthly Medical Journal, 1848-49.

by the cholera miasm; in the lower part of the ileum, and throughout the large intestines in these animals, they appeared like mango-grains studding the mucous surface; they were peculiarly distinct on washing and macerating the gut so as completely to remove its mucus and blood.* The rugæ were sometimes thickened and prominent, congested or ecchymosed, resembling those of the stomach. The mucous membrane frequently presented a slaty discoloration, or various shades of brown or green; ecchymotic patches were also similarly discoloured. When discoloured patches existed at short intervals throughout the canal, it frequently happened that their colour in the stomach was a rich chocolate tint, which gradually passed, on descending the canal, into a dirty green; the latter tint usually reached its maximum in the transverse or descending colon. This discoloration often coexisted with some degree of tympanitic distension of the gut; both phenomena being obviously due to the same cause, viz., the conversion into gases, by chemical decomposition, of the contents of the intestine. In many cases, the interior of the gut was covered by dark blood or bloody mucus, which was distributed either generally or in patches. The appearance of the mucous membrane in such a case resembled that sometimes found in advanced dysentery. This condition explains the bloody stools which have been described in some cases of cholera, but which it has not occurred to me to see. The mucous membrane of the rectum was sometimes white, opaque, and studded with small lymph-like mucous flocculi: this milky opacity had probably been produced by turpentine and other stimulant enemata injected towards the fatal termination of the collapse. In the large intestines, exuviation of the mucous membrane was sometimes carried to a large extent. In one case, only a narrow ribbon-shaped band of normal mucous membrane appeared to remain in the rectum; this was in a case fatal in the typhoid stage. When the mucous membrane was beginning to become exuviated, I generally noticed a discoloured and thickened patch, having a brownish green tinge, like a gangrenous slough; and could but faintly trace a line of demarcation between the healthy and diseased tissue. Gradually this patch became slightly elevated above the surrounding surface, the line of demarcation was more distinct, and the patch was circumscribed. The edge became thickened and raised, and, in the advanced stage, it was inverted, and the patch appeared to separate itself by a process of involution of its margin. The outline of these patches was generally irregular, though their form was more or less oval or round. They varied in size from that of a shilling to that of a crown-piece; sometimes they were two or three inches broad, and completely encircled the gut; they ran sometimes in the longitudinal, at other times in the transverse, axis of the canal. In general appearance, they resembled sloughing ulcers; but they were not surrounded by any congestion or ecchymosis, though their bases were sometimes the seat of both. They have probably been described as dysenteric ulcers; but, under the microscope, they consisted almost wholly of cylindrical epithelium, with nude villi, mucus, and mucus-corpuscles. Their microscopic characters, therefore, appear to indicate that they consisted of mucous membrane. This subject, however, has only been very crudely examined by me, and requires, and will repay elaborate histological investigation. The presence of flocculi of mucus and mucous membrane, and of softened patches of the latter in the interior of the intestines, in some cases of cholera, is probably the chief ground of the view of its pathology upheld by the Berlin observers, viz., that it is essentially a destructive *diphtheritic inflammation* of the intestines. The contents of the large intestines were generally similar to those of the small, with the exception of a darker colour, which depended either on admixture of a larger quantity of blood or of feculent *débris*. In some cases, the fluid portion, when filtered, was less albuminous, and there was less cylindrical epithelium in the sediment

than in the small. The microscopic and chemical characters were otherwise alike.

The following cases will illustrate the pathological appearances in various periods of the collapse and subsequent typhoid stage, viz.:-

CASE I. H. H., a woman aged 44, died in collapse, nine hours after admission. A *post mortem* inspection was made on the day following death. Among the appearances noted were:*

The *lungs* weighed sixteen and fifteen ounces respectively; their anterior margins were emphysematous, and overlapping the pericardium. The pulmonary tissue was crepitant throughout. There was general pleural adhesion on both sides by delicate, lax, areolar tissue. Hyperæmia was present posteriorly and inferiorly.

The *pericardium* contained a drachm of serum.

The *heart* weighed ten ounces; it was normal in its size, cavities, and valves; the muscular substance was flabby, dry, dull, dark; the anterior surface exhibited several milky opacities; the right side was full of blood, which was loosely coagulated and partly decolorised; the left ventricle contained a very small quantity of semifluid blood.

The *liver* weighed two pounds thirteen ounces; it was large, pale, flaccid; the epithelium was fatty. The *gall-bladder* was distended with apparently normal bile.

The *kidneys* weighed four ounces each; they were small and flaccid, but normal in structure.

The *spleen* weighed four ounces; it was pale, flaccid, and the capsule exhibited several milky opacities.

Intestines. Their surface was dry, and covered by a viscid, gluey exudation. The small intestines exhibited rosy hyperæmia; they felt thickened and doughy; the interior was normal, with the exception of *psorenterie* of the lower part of the ileum. The large intestines showed no increased vascularity, either externally or internally, and appeared normal. The *stomach* was much distended; the mucous membrane was thinned and softened at some points, thickened and pulpy at others, along the greater curvature.

Uterus. Hyperæmia was present externally. The os was nearly occluded and round. The cervix was thickened and indurated; its cavity was occupied by yellowish mucus, intermixed with a little blood. There was a cystic condition of the extremities of both Fallopian tubes, one cyst being as large as a walnut, having a thin diaphanous membranous wall, and containing a claret coloured fluid; the smaller one contained gelatiniform mucus. In the left ovary was a hæmorrhagic clot, which was undergoing central softening. The mucous membrane of the vagina was lined with a white, curdy, opaque matter. The urinary bladder was contracted and empty.

This case illustrates the presence of the rosy hyperæmia of the intestines, which is said by some to be pathognomonic of Asiatic cholera; the comparatively rare anæmic condition of many of the viscera in deaths during collapse; and the absence of positive or characteristic lesions in any part of the body.

CASE II. I. M., a woman aged 55, died in the consecutive fever, three days after seizure. An examination was made two days after death.

The *lungs* were much congested behind, where they exuded, on section and pressure, a copious juice, consisting of mucus, pus, and a frothy sero-sanguinolent fluid. There were lax pleural adhesions on both sides. They weighed two pounds two ounces.

Heart. A few punctiform ecchymoses were found over the origin of the aorta posteriorly. The left ventricle was firmly contracted, and devoid of blood; the right was dilated, flaccid, and full of blood; it contained a large decolorised clot, which extended some distance up the pulmonary artery. There was contraction of the mitral orifice; thickening of the tricuspid valve; thickening and calcareous degeneration of the aortic valves; and atheroma of the aorta.

* Edinburgh Medical and Surgical Journal, April 1854, p. 295.

* I merely give a few selected illustrative extracts from copious notes taken at the time.

The *liver* was abnormally adherent to the diaphragm, and slightly fatty.

The *kidneys* were small; they exhibited the first stage of Bright's disease; ecchymosis of the cellular tissue was present below the right kidney.

The *spleen* was large, and somewhat anæmic.

Stomach. This shewed several patches of ecchymosis along the greater curvature, alternating or intermixed with portions of discoloured mucous membrane.

The *bladder* contained a drachm of turbid urine, abounding in epithelium.

Uterus. The cavity was very small, full of bloody mucus. The ovaries were ecchymosed.

This case illustrates the co-existence of chronic disease—cardiac, renal and pulmonary; and the presence, in various parts of the body, of ecchymoses, which are usually supposed characteristic of, or confined to, the collapse stage; but which I have not found sufficiently frequently or regularly in that stage to justify such a conclusion.

CASE III. J. McG., a man aged 45, died in collapse, nine hours after admission. A *post mortem* inspection was made on the day following death.

Rigor mortis was very strong; there was dingy livor of the legs, penis, and scrotum; the extremities of the fingers were corrugated and sodden; the lips were pale and exsanguine; there was livid mottling of the arms; two large gangrenous vesications were seen on the back; the muscles and viscera were dry, the latter were also collapsed.

The *pericardium* was dry.

The *heart* showed few ecchymotic patches posteriorly; a firm decolourised clot intertwined among the columnæ carnææ of the right ventricle.

Lungs. There was bullose emphysema at the left apex; the costal and pulmonary pleura were closely adherent on on both sides; ecchymotic patches were present on the pulmonary pleura.

Liver. This, and all the abdominal viscera, were more or less gorged with venous blood; it was slightly fatty. The bile gave healthy reaction with nitric acid.

The *stomach* was contracted; the mucous membrane was soft, pulpy, discoloured; the mucous membrane of the gastric end of the œsophagus was milky and opaque.

Small intestines. These showed venous arborescent vascularity of surface; Peyer's patches were very distinct, from being surrounded by a circle of congestion. The contents were icky, but of a brownish colour, foetid, and alkaline. When they were filtered, the fluid portion had a pinkish colour, and was of specific gravity 1010; the reaction with heat and nitric acid was greenish-yellow; on standing, a phosphatic scum collected; the fluid was densely albuminous. The sediment contained cylindrical epithelium, and the ordinary constituents of the flocculi of the "rice water" stools.

Large intestines. Ecchymotic patches were present in the colon, and the contents were chocolate coloured, foetid, alkaline, and deeply tinged with blood. When filtered, the fluid portion was less albuminous than that in the small intestines; it was of specific gravity 1010; the reaction with heat and acid was brownish-red. On standing, a copious scum of phosphates collected. The sediment contained little cylindrical epithelium, but a considerable amount of food *débris*.

The *bladder* was contracted, corrugated, and empty.

This case illustrates an approach to a cyanotic condition of body, in the dryness of the muscles and viscera, from draining away of the serum of the blood; ecchymosis; visceral congestion; and the fact that the contents of the intestines resembled, in microscopical and chemical characters (with certain exceptions), the stools passed during life, at corresponding stages of the disease.

CASE IV. J. B., a woman aged 53, died in deep collapse, three and a half hours after admission. A *post mortem* inspection was made the day following death.

Brain. There was venous hyperæmia of the posterior portion of the cranium and scalp; engorgement of the dura

matral sinuses; irregularity of the cerebral convolutions; a considerable amount of subarachnoid effusion, particularly at the base of the brain; and milky opacities of the arachnoid. The cerebral substance was normal; the puncta vasculosa were dark and distinct. The ventricles contained a drachm of muddy serum. The cerebellum and ganglia were healthy.

The *lungs* shewed hyperæmia, emphysema and collapse, and injection of the bronchi to a slight extent.

Stomach. The contents were brownish-yellow, muddy, acid, albuminous; they gave no reaction with heat and acid; they had a strong odour of whiskey. The mucous membrane was velvety and sodden.

The *small intestines* were in a state of arborescent hyperæmia; their contents were icky, but tinged slightly with blood; the valvule of the duodenum and jejunum were stained with bile.

The *large intestines* were pale; the rugæ were prominent; they showed only a few patches of increased vascularity. The caput cæcum and colon were distended with gas. The contents were foetid, alkaline, deeply tinged with blood, albuminous. The reaction with heat and acid was greenish-yellow.

The *liver* was very fatty.

The *kidneys* were healthy.

The *uterus* was retroverted to a slight degree. The ovaries were atrophied, contracted, and hard. There were two mucous polypi of the cervix uteri.

The *bladder* contained half a drachm of muddy urine.

This case illustrates congestion of the membranes of the brain without alteration of its substance, co-existent chronic lesions of uterus and liver, and the chemical characters of the intestinal contents.

CASE V. A. F., a man aged 48, died in consecutive fever, seven days after admission. A *post mortem* inspection was made on the day following death.

Lungs. There were evidences of old bronchitis. The greater part of the left lung was the seat of pneumonic hepatisation of a peculiar kind, being condensed, friable, non-crepitant, and of a dirty reddish-grey colour; it sank in water, and was readily penetrated by the finger. On pressure, a copious opaque juice exuded, consisting chiefly of bloody pus; a few gritty concretions and superficial puckerings were present at the apex. The right lung was crepitant throughout; it was œdematous behind, where it yielded a copious sero-sanguinolent juice.

The *kidneys* showed incipient Bright's disease.

The *intestines* exhibited general hyperæmia of the surface. The contents were of a greenish colour; the reaction with heat and acid was reddish-orange. Under the microscope, the sediment contained food *débris*, mucus, and disintegrated mucous membrane.

Stomach. The contents were of a dark brownish-green; viscid, from mucous admixture; acid; and had an intense cholera odour. The reaction with heat and acid was a fine chocolate colour, which passed, on agitation, into a greenish-yellow.

The *urine*, removed by the catheter, was turbid, amber coloured, of specific gravity 1014, acid, and albuminous. The reaction with nitric acid was faint pink; it contained shreds of mucus.

This case illustrates the co-existence or sequence of sub-acute lesion of the lungs, the presence of chronic lesion of the kidney, the remains of former pulmonary disease; and the fact that the contents of the stomach, intestines, and urinary bladder, resembled, histologically, chemically, and generally, the vomit, stools, and urine passed or ejected during life.

From what has been above stated, it will be evident that a great—an almost insuperable—difficulty exists in allocating particular morbid phenomena or appearances to particular stages of cholera, or to cholera at all. In the present state of our knowledge, it is only safe or prudent to regard the following conditions as peculiar to cholera, and as giving it "an individuality, which forbids our merging

it, for the present, in any general category".* They are characteristic of collapse, which I believe to be the typical or essential stage or form of the disease, viz.: Depression of capillary power, as evidenced by the pallor of the surface, engorgement of the larger veins of the viscera, stagnation of blood in the lungs, etc.; extreme exhaustion of the great ganglionic nervous centres in the abdomen; and reversal of the normal function of the intestinal mucous membrane, which, instead of consisting of endosmotic absorption or imbibition, is a process of exosmosis so rapid and intense, as to drain the system in a very short period of much of its moisture, and its most nutritive elements. A very general opinion, and one that is daily gaining ground at present, is that the gastro-intestinal mucous membrane, with its sympathetic nerve-system, is the *focus mali* of cholera. The hyperæmia and ecchymosis, the œdema of the mucous membrane, the amount and character of the fluid thereby effused, and the other pathological conditions of the gut above detailed, certainly indicate an important lesion of the circulation in and about the intestinal walls. The prevalent view that the sympathetic nervous system is the seat of the functional changes, which result in the collapse of cholera, has caused its pathology in this disease to be carefully investigated of late years. But the only lesion hitherto discoverable has been ecchymosis of the covering of the ganglia or larger nerves, or of the cellular tissue in which they are imbedded. Ecchymosis has already been stated to be generally distributed throughout the body in some cases of cholera, and therefore cannot be held to indicate any special lesion of the nerves in question. It is noteworthy that there appears to be a deficiency of pathological evidence to prove that previous or co-existing disease, especially of an acute kind, predisposes to cholera; in some cases, we might almost arrive at an opposite conclusion, and believe that cholera, in the selection of its victims, prefers the healthy and robust. It is difficult to see why there should be any incompatibility of cholera with other diseases; but it certainly appears to exist, at least in the majority of cases. I will not here enter on any of the theories of cholera which have been based, wholly or partially, on its pathology, *e.g.* that it is a serous catarrh, or a serous hæmorrhage, or a destructive diphtheritic inflammation of the gastro-intestinal mucous membrane, as the discovery of amorphous granular fibrin thereon has suggested to the Berlin pathologists. The variability, and sometimes the absolute deficiency of morbid appearances will sufficiently indicate the extreme danger or inutility of founding theories on such an insecure basis as is our present knowledge of the pathology of cholera. I cannot help thinking that, at present, generalisations on this subject are premature. It is a natural tendency in the human mind constantly to overstep the regions of fact for the realms of fancy, and found, I might almost say, upon the foreshadows or delusive appearances of genuine data or facts, ingenious speculations, or make these facts succumb to the government of ordinary, known, material laws, whereby it may account for or classify given phenomena: yet this desire or tendency, in certain stages of human knowledge, is far from salutary to the interests of science, and throws a strong barrier in the way of advancement. The present duty of the profession, with reference to cholera, is undoubtedly to accumulate facts, and when these have been collected *en masse*, so far as human ingenuity and perseverance can bring them together, we will be in a condition so to collate and arrange them as to draw or deduce useful generalisations or conclusions. I conclude this part of my subject by giving a brief resumé of the facts above narrated.

I. The following pathological appearances or conditions were sometimes present, sometimes absent, in deaths during the collapse and subsequent stages of cholera, viz.

1. Capillary or venous hyperæmia of the surface and interior of the intestines.

2. Softening, thickening, and exudation of the mucous membrane of various parts of the canal.

3. Presence of a large excess of mucus lubricating the interior of the canal.

4. Discoloration of the intestinal mucous membrane.

5. Exudation of a viscid, gluey mucus on the peritoneal surface of the intestines.

6. Thickening and prominence of the rugæ of the stomach and larger intestines.

7. Pallor of the stomach and intestines.

8. Tympanitic distension of ditto.

9. Partial and irregular contractions of ditto.

10. Enlargement of the Peyerian, Brunnerian, and solitary glands.

11. Hæmorrhagic exudation on the mucous membrane of the large intestines.

12. Emission of the peculiar cholera odour by the abdominal cavity and viscera, etc.

13. Venous congestion of the parenchyma or coverings of the viscera of the abdomen, thorax, and head; causing an enlarged and plethoric condition of the viscera.

14. A flaccid, anæmic condition of these viscera.

15. Ecchymoses on the surface of the viscera, or the coverings of the great sympathetic ganglia or trunks, and on the cellular tissue, in various parts of the body.

16. A dry and collapsed condition of the muscles and intestines.

17. Dryness of various serous membranes.

18. Diminished or vitiated secretion of various glands.

19. General resemblance of the contents of the stomach, intestines, and bladder, in microscopical and chemical characters, to the vomit, stools, and urine, passed during life.

20. Biliary staining of portions of the intestines, especially the valvulæ of the duodenum and jejunum.

21. Comparatively healthy condition of the bile.

22. Blood dark, grumous, and showing no tendency to coagulation, or containing firm, decolorized clots; sometimes structurally altered.

23. Chronic lesions of various viscera, especially of the liver, kidneys, heart, lungs, and uterus.

24. The evidences of former disease, *e.g.*, obsolete or retrograde tubercle of the lungs.

25. The coexistence or sequence of subacute lesions, *e.g.*, typhoid pneumonia.

26. Œdema, emphysema, and collapse of portions of the lungs.

27. Capillary injection of the bronchi.

II. Other conditions, which have been noticed and described, were obviously unconnected with cholera.

III. Of the above lesions or conditions, perhaps the most frequent were—

1. Hyperæmia of the peritoneal surface of the small intestines.

2. A comparatively healthy condition of the bile and blood.

3. Visceral, venous congestion.

4. A sodden, œdematous condition of the intestinal mucous membrane, with excess of mucus in the canal.

5. Œdema and hyperæmia of the posterior portion of the lungs.

IV. Few of these conditions coexisted in the same case.

V. In many cases, none of them were present, the appearances being entirely negative.

VI. They were not proportionate, and did not stand in any fixed relation, to the fatal period, duration, or intensity of the disease.

VII. Many of them had no necessary connexion with cholera, but are much more frequently met with in other diseases.

VIII. Though some of them are seldom or never found in other diseases, at least grouped as they are in cholera; yet we cannot consider any of them as pathognomonic, or essential pathological features, of this disease or its individual stages.

[To be continued.]

Crichton Royal Institution, Dumfries, June 1854.

* Baly and Gull's Report on Cholera.