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ON

DISEASES OF THE STOMACH:

BEING THE

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ON

DISEASES OF THE STOMACH,

&c. &c.

LECTURE I.

Mr. President,—I have chosen diseases of the stomach as the subject of the lectures which you have done me the honour to ask me to deliver to the College.

It would be difficult to find in the whole range of pathology a subject of more obvious importance. The stomach not only receives and contains the crude materials for the nourishment of the body, but, by the peculiar fluid which it secretes, it dissolves those materials and prepares them for conversion into the living blood. Any serious disorder of its functions must necessarily vitiate all the after-processes, and pollute, or divert, the life-stream at its source. To ensure, then, the proper nutrition of the body, and, consequently, the due maintenance of its manifold powers, the functions of the stomach need to be rightly performed. But in man they are liable to be disordered from various causes, and in various ways; so that probably no diseases, as a class, are more frequently brought under our notice than the diseases of this organ.

Notwithstanding their frequency, however, and their obvious importance, and the great attention which has in consequence been paid to them by physicians in all times, our knowledge of them, it must be confessed, is still very scanty and vague. The reason of this is, that the study of these diseases is extremely difficult. Considering such of them only as are dependent on some appreciable change of structure, we have great impediments to encounter.

Where the disease is not such as to cause a palpable tumor, we have no direct means of ascertaining the physical condition of the organ, while the sick man is living. The stomach is not visible, like parts on the surface; it cannot be explored by the sense of hearing, like the organs within the chest; its outline can seldom be distinctly felt, like that of the liver or the spleen; and its secretions are not poured out separately and unmixed for our inspection, like those of the kidney. We are obliged to infer the nature of its diseases almost wholly from the functional disturbance they occasion. But the functions of the stomach are more readily deranged than those of any other secreting organ, and by a greater variety of conditions. Irritation of the brain, the passing of a gall-stone, obstruction of the bowels, disease of the kidney or of the uterus, will cause vomiting as frequent and distressing as organic disease of the stomach itself. Any sudden emotion, a febrile condition however induced, various unhealthy conditions of the blood,—will suspend or derange the secretion of its solvent juice.

Again, the structural diseases of the stomach,—at least, of its mucous membrane,—have been less elucidated by morbid anatomy than those of most other organs. When inflammation, for example, occurs in solid organs, as the brain, the liver, or the kidney,—or in the closed sacs of the body, as the peritoneum, or the pleura,—where it does not immediately destroy life, it leaves, for the most part, some permanent traces. If the body be examined at any future time, these traces are seen, and understood. It is not so with mucous membranes. The effu-

sions to which inflammation gives rise are here poured out on an open surface, and discharged from the body; and often, even when the disease is of long continuance, no permanent changes of structure result,—at least, no changes which our senses can appreciate.

This remark applies, indeed, to the mucous membrane of the air-tubes, or of the bladder and urethra, as well as to that of the stomach. But when inflammation occurs in the air-tubes, or in the urethra, the matters effused are thrown off unmixed for our inspection, and from their varying characters the progress or decline of the malady may be traced. The secretions to which inflammation of the stomach gives rise are, on the contrary, mixed with various matters,—with whatever is taken as food, or drink, or physic; and with the different secretions which are poured into the stomach and intestines to work those important changes in the food in which digestion consists.

But, in the study of these diseases, there is yet another difficulty. The stomach presents various appearances, independent of disease,—according to the condition of the person when death occurred, and the time of year, and the mode of death, and the time after death at which the body is examined; and several of these appearances are very like the products of disease, and have, indeed, been generally confounded with them.

Before, then, we can discriminate the changes of structure which are due to disease, we must be able to recognise, and rightly to interpret, these other changes that occur without it. By far the most important of these is the change which the stomach undergoes after death from the solvent action of its own proper juice. This change exists in greater or less degree in a large proportion of the bodies we examine; and unless we are familiar with its characters, it is impossible that we can distinguish the effects of inflammation, and other changes of nutrition of the mucous membrane. A study of it is not only a necessary preliminary to the study of the diseases of the mucous membrane, but it also throws light on the circumstances which promote the secretion of the gastric juice, and on various functional disorders to which the stomach is liable.

It is to this change, therefore, that I shall first call your attention.

I need not remind you that it was John Hunter who first announced that the stomach may be dissolved or digested after death, by the fluid which itself secreted.

Earlier pathologists, from Morgagni downwards, had noticed extreme softening of the mucous membrane, — indeed, of all the tissues, in the splenic end of the stomach,—but they had all regarded this change as the result of disease. Hunter was led to the discovery of its real nature by finding it in an extreme degree in some persons killed by accident, in the midst of health; in whom, therefore, it could not be thus explained. He says: — "The first time that I had occasion to observe this appearance in such as died of violence and suddenly, and in whom, therefore, I could not easily suppose it to be the effect of disease, was in a man who had his skull fractured, and was killed outright, by one blow of a poker. Just before this accident he had been in perfect health, and had taken a hearty supper of cold meat, cheese, bread, and ale. Upon opening the abdomen, I found that the stomach, though it still contained a good deal, was dissolved at its great end, and a considerable part of its contents lay loose in the general cavity of the belly. This appearance puzzled me much.

"The second time was at St. George's Hospital, in a man who died a few hours after receiving a blow on his head which fractured his skull.

"From these two cases, among various conjectures about so strange an appearance, I began to suspect it might be peculiar to cases of fractured skull; and therefore, whenever I had an opportunity, I examined the stomach of every person who died from that accident; but I found many of them which had not this appearance.

"I afterwards met with the same appearance in a man who had been hanged."

In some of the cases that fell under the observation of Hunter, the digestive action had extended much further than through the stomach. After having dissolved the stomach at the usual place, it had partly dissolved the adjacent side of the spleen, and had dissolved the adjacent portion of the diaphragm quite through, so that the contents of the stomach were found in the cavity of the chest, and had even affected in a slight degree the surface of the lung at that part.

Hunter found softening of the stomach of the same kind in some of the animals that were the subjects of his experiments on digestion, when he did not open them immediately after death. These animals, after having been fed with various kinds of food, were all killed at different stages in the process of digestion.

He procured also the stomachs of a great variety of fish, which usually die from violence, in a state of perfect health, and with their stomachs full; and in many of these he found the digesting part of the stomach in the same dissolved state as the digested part of the food.

Hunter found that digestion of the stomach after death is most common, and takes

place in the highest degree, in persons who die violent deaths; but that it occurs very frequently, though then usually in less degree, where death arrives more slowly from disease. He says, indeed, "There are few dead bodies in which the stomach at its great end is not in some degree digested; and one who is acquainted with dissections can easily trace these gradations."

These observations of Hunter excited great interest at the time, not only from their novelty and startling character, but also from the new views they unfolded of the causes of digestion, which were then very imperfectly understood. They showed, indeed, conclusively, as the sagacious mind of Hunter at once perceived, that digestion depends essentially on something secreted by the coats of the stomach, and poured into its cavity; and that this solvent menstruum, this gastric juice, though indebted to the stomach for its secretion, is yet capable of acting independently of it.

The experiments of Hunter were repeated and varied, among others by Spallanzani, who, when Hunter's paper fell into his hands, was engaged with his experiments on digestion. Spallanzani's experiments, which were all made on the lower animals, and which were multiplied and varied with his characteristic patience, confirmed the main fact announced in Hunter's paper, that digestion goes on after death, and that the stomach itself may then be digested by its own proper juice. Spallanzani, probably from making his observations in winter, did not for some time, among a great number of stomachs which he examined, find a single one which had its great end perforated from digestion of its coats. He found, he tells us, the mucous membrane dissolved more or less, and especially in fish, but never observed that entire destruction of all the coats of the stomach which had been noticed by Hunter. His observations, however, taught him a fact of which Hunter was not aware,—the fact, namely, that a certain degree of *heat* is requisite to develope the solvent power of the gastric juice.

Soon after the publication of Hunter's paper, observations on softening of the stomach in man were published by several physicians. In these observations the appearances of the softened stomach were very faithfully described, but no one seems to have met with the change so frequently as Hunter. Most writers, from making their dissections chiefly in winter, or from only recognising the change when it existed in an extreme degree, inferred that digestion of the stomach after death occurs but seldom, and in cases that must be considered as exceptions to the general rule.

At length, the interest which the subject at first excited died away; few observations on this remarkable change were published, and when softening of the stomach was met with it was regarded by most physicians, as it had been before the time of Hunter, as the result of disease. In France, indeed, where morbid anatomy was most assiduously cultivated, but where the writings of Hunter were less generally read than in this country, many of the most enlightened pathologists seemed never to have even suspected that it could have any other origin; so that, in 1830, when Dr. Carswell again mooted the subject in Paris, and exhibited softened stomachs of rabbits that were killed soon after feeding, and opened some hours after death, almost as much interest—I may say, indeed, *surprise*—seems to have been excited, as was caused on the first publication of the observations of Hunter.

From this time the renewed interest had its former effect, and, for a few years, essays on the subject frequently appeared. Observations, indeed, of softening of the stomach, or of digestion of the stomach after death, have occasionally been published up to this time; some very admirable ones recently, by Mr. Wilkinson King, in one of the late numbers of Guy's Hospital Reports. But pathologists, in general, seem not to be aware how frequently the stomach undergoes this change. It has been supposed by many to occur only after violent deaths; and when occurring, as it often does, in other circumstances, it has been either overlooked or has been regarded as the effect of disease.

M. Louis, for instance, one of the most accurate observers of our times, has published a special essay on softening (with thinness) of the mucous membrane of the stomach; and in his elaborate work on Phthisis has given, in his usual statistical form, the exact proportions in which he found this change, after death by acute and by chronic diseases; but when these works were first published he seems not to have suspected that such a change could take place, except from disease. To any one, however, who is familiar with the appearances produced by the gastric juice in cases like those which first arrested the attention of Hunter, where death happens suddenly in the midst of health, it will be evident enough, from the mere perusal of Louis' descriptions, that in most of the instances to which he refers the softening of the stomach occurred subsequently to death, and was the mere effect of the solvent powers of the gastric juice.

The question then arises—how is it that, in this age of inquiry, when morbid anatomy has been studied with a zeal and success incomparably greater than in any former time, the truth set forth by Hunter has been so slow to make its way?

The reason, apparently, is, that the change in question varies in frequency and degree with many circumstances,—with the time of year, with the heat of the room in which the body is kept, with the circumstances of death, and with the previous state of health; —so that the observations of one man did not tally with those of another; what one found frequently, another, whose observations were made in different circumstances, found but rarely. The variable and disturbing circumstances were not considered, and each man naturally distrusted observations that appeared to be contradicted by his own.

No one seems to have observed this change so frequently as Hunter; but the truthfulness of Hunter's mind, and the simplicity and candour even of his statements, prevent us from supposing that in this respect he was guilty of any exaggeration. The fact is, that the solvent powers of the gastric juice require a certain temperature, and increase as the temperature increases from the lowest point at which they act at all to the temperature of the blood,—the temperature at which they act in the living body. Hunter's observations were probably made during a hot summer, when, by reason of the high temperature, softening or digestion of the stomach after death was unusually frequent. During the past summer, which was a very hot one, my attention was casually drawn to this subject, and from the middle of May to the middle of August I carefully examined the stomach in all the bodies that were opened in the King's College Hospital. In several instances the mucous membrane in the great end of the stomach was completely destroyed, and in a very large proportion it had been clearly acted on, more or less, by the gastric juice. I renewed my observations in October, but the change, at least in a striking degree, was then much less frequent.

Digestion of the stomach by the gastric juice is generally observed, as I have already intimated, in the great end of the stomach; where any liquid that may be in the stomach collects after death, and where the mucous membrane is thinner, and less firm, and usually less protected by mucus, than in other portions.

The first effect of the gastric juice is to render the mucous membrane thinner and softer, so that it may be readily removed by the pressure of the fingers; and at the same time to blacken the blood contained in its vessels. If the capillaries of the mucous membrane were full of blood when the action of the juice commenced, the softened membrane gets a greyish or brownish cast, and is paste-like and opaque. If, on the contrary, the capillaries of the mucous membrane were empty, the softened tissue is rendered somewhat gelatinous and transparent, and should the larger branching vessels in the submucous areolar tissue be full, these are blackened, and thus rendered conspicuous, and, in consequence, are plainly seen (as they are represented in this diagram) through the thin and softened and gelatinised membrane.

Precisely similar changes take place in albuminous tissues out of the stomach, when they are submitted to the action of the gastric juice at the temperature required for digestion. If the substance, like white of egg, or lean boiled meat, contains little blood or fat, it is rendered more or less transparent or gelatinous, as it softens; if, on the contrary, it contains much blood and fat, like raw or roasted flesh, it is transformed into a brownish paste.

In a still higher degree of this post-mortem digestion of the stomach, the mucous membrane most acted upon has the form and appearance of a thin layer of mucus or paste. The underlying tissues are next dissolved and removed, until, as in the instances which first attracted the attention of Hunter, all the coats are eaten through, and the contents of the stomach escape into the general cavity of the peritoneum. The edges of the opening thus made, to borrow the description of Hunter, "appear to be half dissolved, very much like that kind of dissolution which fleshy parts undergo when half-digested in a living stomach, or when dissolved by a caustic alkali, viz. pulpy, tender, and ragged."

In some instances, the portion of the diaphragm which lies in contact with the dissolved end of the stomach gets dissolved in its turn, and the contents of the stomach pass into the cavity of the chest. The spleen, the lungs, and other organs with which the solvent juice is thus brought into contact, are in such cases more or less corroded by it.

Digestion of the stomach occurs, as I have before remarked, in the highest degree in its great end; and it is only in this part, where the liquid contained in the stomach chiefly collects after death, and where the mucous membrane is thin, that *perforation* from this cause ever takes place: but when this end of the stomach is perforated, or its mucous membrane much softened, other portions of the organ exhibit in less degree the action of the same agent. The edges of the folds, which the organ, when contracted, always exhibits in its pyloric portion, are the parts that here become softened the first. If the mucous membrane was empty of blood, these folds appear as whitish, semitransparent lines, or rather narrow bands, in which the mucous membrane is palpably thinner and softer than in their intervals, where it is more protected,

partly perhaps by the mucus which lodges in the furrows, from the action of the dissolving agent. If, on the contrary, the mucous membrane was congested, the softened bands have a brownish tint, which contrasts still more strongly with the pink uninjured membrane around them.

It sometimes happens, as was shown by Mr. King, in a paper published in the 7th volume of Guy's Hospital Reports, that, after death, some of the liquid in the stomach regurgitates through the cardiac orifice (mainly, perhaps, through the contraction of the abdominal muscles in the *rigor mortis*), and lodges in, and dissolves, the lower end of the œsophagus. Here, as towards the pyloric end of the stomach, the projecting edges of the folds are acted upon first. The coats of the œsophagus may be completely dissolved, one after another, like those of the stomach, and in this way, also, some of the contents of the stomach may pass into the cavity of the pleura. A case of this kind occurred to Sir A. Cooper, who related the particulars of it to Mr. King. "The œsophagus," he said, "was dissolved, and the bread and cheese was found extravasated in the chest."

The under or back part of the œsophagus, on which the solvent fluid rests, is the part that is most acted on in such cases; and from the lower end of the œsophagus lying to the left of the vertebral column, it follows that where perforation takes place the opening leads into the *left* pleural sac.

When the œsophagus is thus dissolved, or corroded, by the gastric juice, the great end of the stomach is always dissolved, or corroded, also.

As digestion of the stomach after death does not occur in all cases, and as, when it does take place, it occurs in very different degrees in different cases, the question arises—On what conditions does this digestion depend?

Two conditions obviously necessary are, 1st, that the stomach, at the time of death, should contain a certain quantity of active gastric juice, or, at least, of its acid; and 2dly, that it should be kept for some hours afterwards at the temperature required for artificial digestion.

The first condition is very generally fulfilled in persons who are killed by accident, in the midst of health, and soon after a meal. The instances, before related, which so strongly arrested the attention of Hunter, were of this kind.

It was early remarked by Hunter, that softening of the stomach does not occur in all cases of violent death; and it was inferred from his observations, and the inference was confirmed by the experiments of Dr. W. Philip and Dr. Carswell, that it only takes place when death happens soon after a meal; that is, while the process of digestion in the stomach is actively going on.

It is, indeed, only at such times that the stomach, under ordinary circumstances, contains any gastric juice. While the stomach is empty of food, the fluid which moistens its surface is not acid, and has no peculiar solvent power. This point was conclusively established by the observations of Dr. Beaumont on the stomach of St. Martin, which could be seen and examined through a large fistulous opening in the wall of the belly; and one of the most interesting circumstances witnessed by Dr. Beaumont, in his long-continued observations, was the out-pouring of the gastric juice on mechanical irritation of the inner surface of the stomach, and especially on the introduction of food. The following is the account he gives of one of his experiments. (Exp. 63).

"Jan. 19th—At 9 o'clock A.M., coats of stomach perfectly healthy and clean. No appearance of morbid action; tongue clean, and every appearance of perfect health. There was no free fluid in the gastric cavity until after the elastic tube was introduced, when it began slowly to distil from the end of the tube, drop by drop, perfectly transparent and distinctly acid. I obtained about one drachm of this kind, and then gave him a mouthful of bread to eat. No sooner had he swallowed it than the fluid commenced flowing more freely from the tube, and I obtained two drachms, less pure, however, with saliva and mucus mixed with it, and slightly tinged with yellow bile. The surface of the protruded portion of the villous coat at this time became covered with a limpid fluid, uniformly spread over its whole surface, distilling from myriads of very fine papillary points, and trickling down the sides. After letting him rise and walk about two or three minutes, I again introduced the tube, and obtained about two drachms more of very pure gastric juice, making in the whole five drachms."

Dr. Beaumont states, that in more than two hundred observations he never found any gastric juice in the empty stomach; and he considered mechanical irritation of the mucous membrane, or the more natural and more efficient irritation by food, to be necessary for the secretion of it.

The secretion of the gastric juice is, to use a word much in vogue, a *reflex* function, whose ordinary excitant is the impression of food on the mucous membrane of the stomach. The nervous influence, so excited, causes the sudden and rapid outpouring of the gastric juice, just as the nervous influence, called into action by mechanical irritation of the conjunctiva, causes a flow of tears. Now the flow of tears may be excited, not only by mechanical irritation of the conjunctiva, but by mechanical irritation of the

mucous membrane of the nostril, or of the mouth; and by certain medicines, like iodide of potassium, which are excreted at those surfaces: and by mental emotion. The flow of urine, again,—an instance in some degree analogous—may be increased by emotion, as well as by direct irritation of the kidney itself.

The question then arises—may not the same thing happen for the gastric juice? May not the outpouring of this be occasionally determined by other influences than the presence of food in the stomach; or, at least, by nervous impressions on other parts? Many considerations lead me to think that it may.

Spallanzani obtained some gastric juice from his own stomach by tickling the fauces, and thus exciting vomiting, in the morning before breakfast, when the stomach, we may presume, was empty of food. By exciting vomiting twice in succession, he obtained in this way juice enough to undertake some experiments of which he has given an account. That the fluid was actually the peculiar solvent juice of the stomach was shown by its dissolving, and preventing the putrefaction of, meat.

A case having great interest as regards this question, was brought under my notice last summer.

A gentleman, 40 years of age, while riding in the Park at 6 o'clock in the afternoon of the 21st of May, was thrown from his horse, and, by the fall, fractured his skull. He was taken to his house, where he lay motionless and insensible till half-past 1 P.M. on the following day, when he died.

On examination of the body, which was made eighteen hours after death, by my colleague, Mr. Fergusson, the great end of the stomach was found to be completely dissolved, and other portions of the organ exhibited in less degree the usual appearances caused by the solvent action of the gastric juice. The portion of the diaphragm in contact with the great end of the stomach was likewise dissolved quite through, so that there was a large opening from the stomach into the cavity of the left pleura. This cavity contained about a pint and a half of dark grumous fluid, not unlike coffee-grounds, consisting chiefly, I presume, of partially digested or altered blood.

Now the accident happened, as far as I could learn, and I made many inquiries on this point, before dinner, when the stomach was probably quite empty; and, according to the statement of Mr. Fergusson and others attendant upon the patient, it completely destroyed the power of swallowing, so that nothing whatever was taken into the stomach from the time of the accident to his death.

Here, then, was digestion of the stomach in the highest degree, after a violent death, which did not occur, however, suddenly and soon after a meal, as in the instances of similar destruction of the stomach recorded by Hunter and others, but, on the contrary, at the end of nearly twenty hours passed in a state of coma, and after an unusually prolonged fast.

The question, then, naturally arises, was the secretion of the large quantity of gastric juice which must have existed in the stomach at the time of death determined by the shock of the accident, or by the subsequent irritation of the brain which the accident occasioned? And is there not still some ground for the suspicion which Hunter early entertained and then abandoned, that digestion of the stomach is especially apt to occur after death from fracture of the skull? It is clear that if gastric juice should be secreted under such circumstances, and in an empty stomach, its action on the coats of the stomach after death would be unusually great, because it would not then be absorbed and neutralised by food, and would have nothing but the unprotected stomach to dissolve.

But, as I have already stated, it is not only after violent death in the midst of health that digestion of the stomach takes place: it occurs also, and not unfrequently, though then usually in much less degree, in persons who die of disease. The reasons of this difference of degree are obvious. In a state of health, the secretion of gastric juice is determined by the presence of food in the stomach; and the quantity of juice secreted varies with the quantity of food which it has to dissolve. At the end of two or three hours after a meal, the stomach is either empty, or the solvent power of its juice has been in a great measure expended in digesting the food. Hence it is that digestion of the stomach is usually found in the highest degree when death happens suddenly, soon after a full meal.

Now, in most diseases, the appetite is impaired, and much less food is usually taken than in health, more especially as their fatal termination approaches. In most diseases, too, the power of digestion suffers—the gastric juice secreted, after a given quantity of food, is less in quantity, and has less solvent power, than in health. On both accounts, the digestion of the stomach itself after death occurs less frequently, and usually in much less degree.

There are, however, some striking exceptions to this general rule. In persons who die of phthisis, and after death from some other diseases, the mucous membrane of the stomach, in its great end, is frequently found much softened by the gastric juice; and now and then all the coats of the stomach are destroyed at that part in almost as great

extent as when death happens suddenly, in the midst of health, soon after a meal.

A consideration of these cases raises some interesting questions, but I have not time to enter on it to-day. I shall, therefore, reserve what I have to say on this subject until I have the honour of addressing you again, and shall now proceed to speak of the other conditions necessary for post-mortem digestion of the stomach.

One requisite for this, as was clearly shewn by the experiments of Spallanzani, is a certain temperature. Spallanzani found that the gastric juice, which acts strongly at the temperature of the living body, loses its solvent powers, and is no longer antiseptic, when the temperature is reduced below a certain degree,—a conclusion which has since been fully confirmed by the experiments of Dr. Beaumont. Digestion is probably most rapid at the temperature of the living body, about 100° Fah.: it goes on briskly at the temperature of the atmosphere in summer; but at the temperature of 60° Fah. (to judge by an experiment of Spallanzani) it becomes very slow and feeble. This accounts for the circumstance that digestion of the stomach after death is most commonly met with in summer. Much, however, must depend on the temperature of the body at the time of death, and on the rapidity of cooling which takes place afterwards, which must of course vary, whatever be the season, with the place in which the body is kept, and with the nature of the material, whether woollen or otherwise, in which it is wrapped.

Another condition of artificial digestion, and which is therefore required for the digestion of the stomach after death, is that the digestive fluid should be acid. It was proved by Schwann, in his experiments on artificial digestion with *rennet*, that the digestive fluid is inert when neutralised by carbonate of potash, but recovers its solvent power on the addition of the proper quantity of hydrochloric acid.

The digestion of the stomach after death may be occasionally prevented by ammonia given just before death, to relieve the sense of sinking. If the juice be in small quantity, it may be neutralised, and thus rendered inert after death, by the transudation of the alkaline serum of the blood.

Alcohol, again, renders the digestive principle inert; and if this be given freely just before death, as it often is in this country, in the vain attempt to relieve the sense of sinking, it may not be absorbed before the circulation ceases, and may prevent the subsequent solution of the stomach, which the gastric juice would otherwise occasion. A great number of medicines also suspend or much diminish the solvent powers of the gastric juice, and, if given just before death, may prevent or retard the subsequent digestion of the stomach.

The influence of medicines in retarding digestion, which may now be clearly ascertained by artificial digestion with rennet, has not yet been sufficiently studied. The importance of knowledge on this point is very obvious, when we consider how frequently medicines of different kinds, many of which are slowly absorbed, are given when there is food in the stomach, and when digestion is still going on.

Digestion of the stomach after death is especially interesting, because it exhibits to us in a very striking manner the self-protective power possessed by living tissues. While the food we take into the stomach is rapidly dissolved by the mere chemical action of the fluid which is there secreted, the coats of the stomach itself, which in composition are nearly the same as the food which is thus dissolved, suffer no damage. The chemical action of the gastric juice, as regards the stomach itself, and no doubt the chemical action of various articles of food as well, is counteracted by the forces which the nutrition of the organ developes. We have, indeed, the protective influence of the forces thus developed always presented to us in the resistance which the tissues of living bodies offer to the chemical affinity of the matter by which they are surrounded. Even air and moisture, which are so necessary to the continuance of life, destroy by their chemical action, and resolve into simpler chemical combinations, all the tissues of both animals and plants when life is extinct. But the instance we have been considering is perhaps more likely to fix attention, from the circumstance that the destructive agent is formed by the very tissues which it subsequently serves to destroy. We see an analogous instance in plants. The leaves of a living plant, under the influence of light, are continually evolving oxygen; yet they yield readily to the chemical action of the oxygen of the air when the vital principle is extinct.

The protective influence of the forces developed in the processes of nutrition has not been sufficiently considered in pathology. It is through the resistance which they offer to destructive chemical changes, that the tissues of living bodies remain unhurt amidst the many causes of disturbance to which they are ever exposed. This vital resistance, if we may so term it, exists in different degrees in different persons. Men of feeble constitution have frequently recurring ailments, the effect of external agencies, which they have not strength enough to resist; others, by nature more robust, exposed to these same agencies, pass through life without ever suffering sickness.

The vital resistance varies in intensity at different periods of life, and becomes very

feeble in old age, when the tissues suffer damage, and when the current even of life may be stopped by slight disturbing influences. The way to prolong life in old age is carefully to protect the body from cold, and from all other avoidable causes of disturbance: above all things to abstain from lowering remedies in the treatment of the ailments that are incident to it.

But, at any period of life, the vital resistance varies in degree, according to the circumstances in which the person is placed. It requires for its support the proper nutrition of the tissues. Whatever promotes this—as pure air, good food, the natural stimulus of the nerves, the healthy play of the different organs—serves to maintain and increase it. Whatever lowers the nutrition of any part, renders that part more liable to disease from chemical disturbing influences from without. So it is with the whole body. Whatever exhausts the body—as insufficient food, prolonged cold, excessive bodily fatigue, the depressing passions—leaves it without its proper protection. Its tissues suffer damage from external agencies which in other conditions of the body would have been without injurious effect.

Disease always comes in the train of exhausting or depressing influences of whatever kind. Fever attacks the poor in preference to the rich,—the new comers to towns,—those of our medical students who are exhausted by work. Erysipelas infects those who are weakened by other diseases. Consumption is especially frequent among the inmates of prisons. Dysentery and other disorders produced by malaria are very common (as Dr. Baly as shewn in the admirable lectures which he has just delivered in this place) among the prisoners at Milbank, while they do not occur among the free population around. It has long been a popular notion, and is probably a true one, that the dread of cholera predisposes to it. After devastating wars, and in seasons of scarcity, when a whole population is depressed, pestilence invariably comes in the form of infectious fever, or malarious disease. This has long been known to the historian and the statesman, as the result of experience. The physician looks deeper, and sees in it the effect of the diminished vital resistance which all exhausting or depressing influences occasion.

LECTURE II.

THE last time I had the honour of addressing you, I called your attention to the softening of the coats of the stomach that takes place after death, when this happens suddenly, in the midst of health, and soon after a full meal; while digestion is actively going on. I shall now speak of softening of the stomach, having the same characters, that occurs under other and very different circumstances.

Cruveilhier has distinguished two kinds of softening, both occurring principally in the great end of the stomach, which he terms, respectively, the *pulpy* softening and the *gelatinous* softening, according to the appearance of the softened tissues. The pulpy softening he supposes to occur after death, from the action of the gastric juice; the gelatinous softening, during life, from a peculiar morbid process. Rokitanski distinguishes three varieties of softening in this portion of the stomach, according to the colour of the softened tissues; and two of these he supposes to occur during life as the effect of disease.

An attentive examination of these so-called varieties leaves no doubt in my mind that they are all produced after death, and by the same agent,—namely, the gastric juice; and that the differences of transparency and colour in the softened tissues, to which so much importance has been attached, result mainly from variations in the quantity of blood in these tissues at the time of death.

In illustration of this, I may call your attention to a stomach on the table, which I obtained, two days ago, from a man who died of phthisis in King's College Hospital. The stomach was much congested at the time of death, and towards its pyloric portion, the edges of the folds, which are the only parts where the mucous membrane is softened, appear as brown lines or bands. The change is exactly like that represented in this plate of Cruveilhier, which he gives as an illustration of the *gelatiniform* softening, except in the darker colour and in the want of transpareney of the softened tissues; which are perfectly explained by the greater quantity of blood which the tissues contained at the time of death.

The essential characters of the change are—

1st. A softening of the mucous membrane, usually over a considerable space in the great end of the stomach, and *along the edges of the folds*, extending from this towards the pyloric end; parts which, for reasons I have already assigned, are most exposed to the action of the dissolving agent.

2d. A blackening of the blood in the tissues so acted upon, giving various shades of brown to the softened tissues when much blood was contained in them at the time of death.

A third character of the change is, that the softened or digested tissues have an acid reaction; and that they putrify less readily than other parts, in consequence of the antiseptic properties of the gastric juice.

These characters will serve in most cases to distinguish the digestion of the stomach that occurs after death, even in its slighter degrees, from every other change. If the coats of the stomach at the time of death were empty of blood, they are rendered, in the process of softening, more or less transparent or *gelatiniform*, as all albuminous tissues are when acted upon by the gastric juice, or by acetic acid; if, on the contrary, the softened tissues contained much blood or fat, they became brown, and opaque, or paste-like.

As the digestion proceeds, the mucous membrane is rendered thinner and softer, until it resembles a thin layer of mucus or paste; the other coats of the stomach are next dissolved and removed, in succession, from within outwards, until a ragged aperture is made, through which the contents of the stomach escape into the peritoneal sac. The process of digestion may still go on, so that the side of the spleen contiguous to the stomach may be dissolved, or the diaphragm at that part may be dissolved quite through, and the contents of the stomach pass into the cavity of the chest.

It occasionally happens, as I have before remarked, that some liquid from the stomach regurgitates, after death, through the cardiac orifice, and causes similar changes in the lower end of the œsophagus. From the supine posture of the body after death, the back part of the œsophagus is the part most soaked in the liquid, and in which, consequently, the highest degree of softening usually exists.

The conditions necessary for this *post-mortem* digestion of the coats of the stomach are, 1st, that the stomach should contain some gastric juice at the time of death; and 2d, that it should be kept for some hours afterwards at the temperature required for artificial digestion

The first condition is very generally fulfilled in persons who are killed by accident, in the midst of health, and soon after a meal; and up to this time it has been commonly supposed that digestion of the sto-

mach after death occurs in a high degree only under such circumstances.

It has, indeed, been generally taught that gastric juice is only secreted while food is in the stomach, and that it only exists in the stomach for a few hours after a meal,—and this is, no doubt, true for persons in health. Dr. Beaumont, during the long time that he had St. Martin under his daily observation, never found any gastric juice in his stomach when it was empty of food; at such times the fluid which moistens the inner surface of the stomach is not acid, and has no peculiar solvent power.

But in certain diseases, gastric juice is secreted when the stomach is empty; or, at least, it exists in the stomach unmixed with food, and long after food has been taken; and in persons who die of such diseases, digestion of the stomach is often found in as high a degree as in persons killed by accident, in the midst of health, and soon after a meal; and in many of these cases the softening of the stomach may be predicted with tolerable certainty by a peculiar train of symptoms, which result, I imagine, from the presence of free gastric juice, or its acid, in the otherwise empty stomach.

This occasionally happens in cases of simple ulcer of the stomach. On the table are two preparations exhibiting this disease in conjunction with entire destruction of the mucous membrane in the great end of the stomach, doubtless produced by the gastric juice. One of these preparations has been long in the Museum of King's College; the other is that of a stomach which I obtained in the month of January, in very cold weather, from a man who died under my care in King's College Hospital, from perforation of the stomach caused by the ulcer.

In cases of simple ulcer, pain of the stomach is sometimes felt when the stomach is empty of food; and, with thirst and an impaired appetite, there are frequently sour eructations and occasional vomiting of a sour fluid. These symptoms seem to depend mainly on the presence of gastric juice, or its acid, in the otherwise empty stomach. It is easy to conceive that the flow of the juice may be excited in the empty stomach by the irritation of the ulcer, or its secretions, just as it was in the experiments of Spallanzani by the mechanical irritation of pebbles, or of bits of sponge or glass.

Digestion of the stomach in a high degree is found much more frequently in persons, and especially in women, who die of phthisis. Before you, lie two preparations in which this is well exhibited;—the mucous membrane in the great end of the stomach is completely destroyed, and the branching vessels in the submucous areolar tissue are exposed, and are very conspicuous from the blackening of the blood they contain. These stomachs were obtained from men who died of phthisis in King's College Hospital; one of them last summer, the other about two months ago. It now and then happens that in persons who die of this disease, the muscular and serous coats in the great end of the stomach are found dissolved, as well as the mucous coat; and the stomach, when removed, exhibits an aperture on its great end, with ragged flocculent edges, as when death happens suddenly after a full meal; and, as in these latter cases, the absence of any marks of inflammation of the peritoneum or of the coats of the stomach, as well as the peculiar characters of the change itself, shew clearly that the softening takes place, after death, from the action of the gastric juice.

This digestion of the stomach has been well described by Louis, who was not, however, aware of its real nature. In his elaborate work on phthisis, he states that he observed it in about one-fifth of the persons he examined who died of this disease.

The persons in whom it is found, have generally had, for some weeks, and often for several months before death, much disorder of the stomach; pain and tenderness at the epigastrium, loss of appetite, thirst, frequent vomiting, (the matters vomited being slightly acid,) or frequent nausea.

This gastric disorder, which is extremely common in the advanced stages of phthisis, exhausts the strength, and sometimes attracts more of the patient's attention than the primary disease of the lung. The frequent occurrence of the peculiar softening of the coats of the stomach, caused by the gastric juice, after death, in the persons in whom it has existed, shows that this disorder is associated with increased secretion of gastric juice, or with the presence of gastric juice, or its acid, in the otherwise empty stomach. It is not improbable that, in these cases, the flow of gastric juice in the empty stomach is excited by irritation of the lung, just as it was excited by Spallanzani, in his own person, by voluntary irritation of the fauces.

The most efficient remedy for this gastric disorder is Liquor Potassæ, or some other alkali, which neutralizes the gastric acid, and thus renders the fluid inert. Fifteen drops of Liquor Potassæ, or twenty grains of Bicarbonate of Potash, three times a day, hardly ever fail to stop the nausea, and to allay or much mitigate the pain. The vomiting and pain may likewise be stopped, in the great majority of cases, by vegetable astringents. The mildest and most efficient is an infusion of log-wood, which I have long been in the habit of using, in doses of ʒj. three times a day, to quiet this gastric disorder, as well as to arrest diarrhœa.

I learnt the efficacy of these medicines in

this disorder from experience, long before I had formed any supposition as to the nature of the disorder itself.

3d. Digestion of the stomach after death frequently takes place, also, in persons who die of inflammatory diseases of the brain. These diseases give rise to the same kind of secondary gastric disorder as tuberculous disease of the lung—viz. : frequent vomiting or nausea ; and, unless these symptoms are masked by delirium or blunted sensation, pain at the stomach, thirst, and loss of appetite. The frequent occurrence of softening of the stomach after death in these diseases shows, as in cases of phthisis, that this gastric disorder is associated with increased secretion of gastric juice, or with the presence of gastric juice, or its acid, in the otherwise empty stomach.

The cases are strictly analogous in this respect to the instance which I related in my last lecture, in which the highest degree of digestion of the stomach and diaphragm was found in a man who died from fracture of the skull after an unusually prolonged fast.

4th. Softening of the stomach of the same kind is also often met with in persons who die of typhoid fever, especially, I believe, where death has been preceded by delirium, or other serious disorder of the functions of the brain.

In some instances in which this happens there has been pain and soreness of the stomach, and vomiting, for some days before death ; but generally the gastric disorder is masked by the delirium or the blunted state of sensation which usually exists in severe forms of fever.

When softening of the stomach occurs in persons who have died of fever, the softened tissues have generally a rust-colour, or brownish tint, from the circumstance of the blood remaining fluid, and gravitating to the lowermost parts of the stomach, where the softening takes place.

5th. The same change is occasionally met with in persons who die of cancer of the uterus, or of peritonitis, or of other diseases of the abdominal viscera, which lead to secondary functional disorder of the stomach. Where it occurs in conjunction with chronic diseases, as phthisis or cancer of the uterus, which do not cause delirium or coma, it has generally been preceded for some time before death by the peculiar gastric disorder which I have described. When it occurs in conjunction with inflammatory disease of the brain, or fever, which destroy or pervert sensation, and which kill quickly, the symptoms of gastric disorder are, of course, less marked, and are often altogether absent.

In any case, the degree of the softening bears no necessary relation to the severity or duration of the gastric disorder. The gastric disorder may have existed for months, but the stomach may chance to be empty at the time of death, and no softening of its coats take place. And, on the other hand, where there has been no gastric disorder, or only a slight degree of it, a considerable quantity of gastric juice may be poured out just before death, and the highest degree of softening take place.

These facts have been noticed by Louis, Cruveilhier, and others, whose attention has been directed to this subject ; and, as they supposed the softening to be the result of disease, and to occur during life, they could only explain them by supposing that at times this disease runs a very rapid course, or that it is *latent:* in other words, that it gives rise to no appreciable symptoms.

All these difficulties are removed by the explanation which I have offered : namely, that the softening occurs, in all cases, after death ; and that the degree of it depends, if the conditions of temperature, &c. be alike, on the quantity of gastric juice in the stomach at the time of death, and not at all on the duration or extent of the gastric disorder.

The same kind of gastric disorder not unfrequently occurs, especially in nervous women, from disordered menstruation, the irritation of gall-stones, or some other cause of disturbance, and after continuing in a severe form for weeks, or even for months, subsides, on the removal of its exciting cause, or on improvement of the general health, and the power of the stomach is perfectly restored. No weakness of digestion or other symptom remains to show that the organ has been damaged in its structure.

But it is in infants who die from the age of three or four months to two years that softening of the stomach in a high degree occurs most frequently. In them, different portions of the intestines are frequently found softened as well as the stomach ; and the softened tissues, from the state of anæmia in which infants usually die, are generally semitransparent, or *gelatiniform.*

The change is found very commonly in infants who die from hydrocephalus or phthisis, and occasionally, unconnected with any structural disease, in infants who die of exhaustion consequent on the eruptive fevers, or on improper diet after weaning.

The children in whom it takes place have generally had for some time before death severe disorder of the stomach of the same kind as occurs in adults : frequent vomiting, loss of appetite, great thirst, and crying, as if from pain ; and with these symptoms there is often diarrhœa, the discharges from the bowels being *green*, like spinach, from the presence, I imagine, of bile acted on by acid, which has passed down from the stomach, and has not been neutralised.

In infants the softening of the stomach is

found unconnected with organic disease of other organs much more frequently than in adults, because in them the functional gastric disorder, which may be excited by teething, or other causes of disturbance, rapidly exhausts the strength, causing a state of collapse, and thus proving fatal of itself.

In infants the softening is usually more extensive than in adults, and in higher degree; more frequently leading to perforation of the stomach, and to softening or corrosion of contiguous organs. As in adults, however, the degree of softening bears no necessary relation to the severity or duration of the gastric symptoms; and this circumstance, together with the absence of any marks of inflammation in the peritoneum, even when the diaphragm, as well as the stomach, has been dissolved quite through, shows that the changes have taken place after death.

This softening of the stomach is usually found, then, in persons who die of disease of some other organ, and of those diseases especially which have long been known to lead to secondary functional disorder of the stomach. Now this peculiar softening of the coats of the stomach is, in any case, a clear proof that there was active gastric juice, or its acid, in the stomach at the time of death. Its frequent occurrence, therefore, in persons who die of the diseases I have mentioned, shows us that the functional disorder of the stomach so common in those diseases is associated with increased secretion of gastric juice, or its acid; or with secretion of gastric juice, or its acid, when there is no food in the stomach; or with undue retention of it in the stomach; so that at the time of death active gastric juice is contained in the stomach, which subsequently dissolves or digests its coats.

The question then arises—How is this functional disorder brought about in these several diseases, and what is its real nature?

When disease of any one organ causes secondary disease of another and distant organ, it must be either through the circulating fluids, or through the nervous system. It is only by the circulating fluids, or through the nerves, that disease of an organ can cause secondary disorder of a different organ remote from it.

But, in the cases in question, this secondary disorder of the stomach can hardly arise through the blood. Tubercular disease of the lung, continued fevers, inflammatory disegses of the brain, cancer of the uterus, and mere functional disorder of this organ, lead to no common change in the blood by which this peculiar functional disorder of the stomach can be explained.

We are driven, then, to the inference, that the secondary disorder of the stomach in these diseases is produced through the intervention of the nervous system. And this inference is confirmed by the fact, that in phthisis the softening of the coats of the stomach after death, like the functional disorder that usually precedes it, is more common in women than in men; and that when it results from inflammatory disease of the brain it is much more common in young children than in grown-up persons. For the same primary disease, whether it be of the brain or of the lung, the change is most common in those persons who, by their sex and age, are most liable to sympathetic disorders.

Considering, then, this functional disorder as a sympathetic disorder excited through the nervous system, the further question arises—What is its real nature? Does this sympathetic disorder affect the secreting apparatus of the stomach, or merely its muscular coat?

In my last lecture I mentioned the circumstances which led me to infer that the outpouring of the gastric juice, which has been supposed to result from direct irritation of the stomach alone, might also be excited, through reflex nervous influence, by irritation of other parts; that as the flow of urine may be increased by emotion as well as by direct irritation of the kidney through the blood; or as the secretion of tears may be excited by irritation of the nostril or the mouth, or by emotion, as well as by irritation of the surface of the eyeball: so might the outpouring of the gastric juice be excited by irritation of the fauces, and, therefore, probably of the lung, or by irritation of the brain, as well as by mechanical or other irritation of the inner surface of the stomach itself.

The circumstances which I have brought under your notice to-day confirm this inference, and afford additional grounds for supposing that in many of the cases we have been considering it is to the secretion of gastric juice excited in this way in an empty stomach that the symptoms referrible to the stomach, and the digestion of its coats after death, are mainly owing; that the secondary disorder of the stomach which occurs in inflammatory diseases of the brain, in phthisis, and in various diseases of the abdominal viscera, affects the secreting apparatus of the stomach, as well as its muscular coat.

In some of the cases to which I have alluded, the softening of the coats of the stomach may, however, be accounted for in another way; namely, by supposing that an impediment existed to the free action of the muscular fibres, so that the stomach could not be completely emptied, and that the acid thus remaining in the stomach after digestion was over dissolved its coats after death.

The softening of the stomach found in conjunction with simple ulcer may be satisfactorily accounted for in this way:—When

the ulcer is near the pylorus, or when it is of long standing, and has partially cicatrised, and thus altered the shape of the stomach, it must interfere with the action of the muscular fibres, and tend to prevent the stomach from being ever completely emptied through the pylorus.

The explanation applies also to those cases of phthisis in which the stomach is found much enlarged, as well as softened. It was particularly remarked by M. Louis, and has been long known, that the stomach often becomes much enlarged in the course of phthisis, being not unfrequently found after death three or four times its usual size. No satisfactory explanation of this enlargement of the stomach has, that I am aware of, been yet given. M. Louis ascribes it to the frequent cough; but, if it were so produced, it would be observed in conjunction with mere chronic catarrh as frequently as with phthisis. The real cause of it is, I believe, enlargement of the liver from fatty degeneration, which always exists in those cases of phthisis in which the stomach is found much enlarged after death. The large liver compresses the pyloric division of the stomach, and prevents the stomach from being emptied through the pylorus by the wasted and weakened muscular fibres. When this happens, some of the acid products of digestion must remain in the stomach, and may be the cause of the softening of its coats found after death.

In many cases of phthisis, and in most of the cases of other dieasess in which the stomach is found softened, the change cannot be thus explained, and the only way in which I can account for it is by the supposition I have before advanced.

I have hitherto described the most common form of softening by the gastric juice; namely, where the great end of the stomach and the lower and back part of the œsophagus —parts with which the gastric juice usually lodges after death—are the parts softened. But, occasionally, softening of the same kind occurs in other situations. Cruveilhier remarked that the *gelatiniform* softening is sometimes found on the anterior wall of the stomach, when the stomach is empty, and when there is no softening on the posterior wall or in the great end, where the softening or digestion after death usually takes place; and that in some instances the same kind of softening occurs also in the intestines; and he considers these facts conclusive evidence that the softening could not in such cases be the effect of the gastric juice, and that it must have resulted from disease, and during life. He says —"The gelatiniform softening is generally met with in the splenic end of the stomach; but it occurs also in its anterior wall, and in various parts of the small and of the large intestine, and in the lower end of the œsophagus. The softening always proceeds from within outwards, and in the intestines, as in the stomach, may lead to perforation. The parts thus transformed are colourless, transparent, completely deprived of vessels, and of a sour smell, without any marks of inflammation, and without the odour of gangrene. The softened parts, indeed, undergo putrefaction less readily than others." This kind of softening, he adds, occurs occasionally in adults, but it is much more common in infants.

Soon after the publication of Hunter's paper, by which the attention of the profession was first called to the digestion of the stomach after death, instances of this kind were noticed; and in the 6th vol. of the Edinburgh Medical and Surgical Journal there is a paper by Mr. Adam Burns, containing observations exactly like those of Cruveilhier. Burns met with three cases in which the fore part of the stomach was dissolved; and four cases, apparently including these three, in which every part of the alimentary canal, from the cardiac orifice of the stomach to the beginning of the rectum, was dissolved into a pulpy, glutinous mass, transparent, and bearing some resemblance to thick starch. Not a single point of either the stomach or intestinal tube but was so much acted upon that it tore whenever it was even gently touched. The other viscera presented no peculiar changes. The subjects were young children, fat, and free from putrefaction. In all of them the abdomen, when opened, emitted a sour smell. Burns did not know the history of these persons, and could tell nothing of their condition during life.

As in instances like those I have just cited, the softening occurs in parts with which the gastric juice does not generally come into contact, the question naturally arises—may not the softening in such instances have been brought about in some other way? It is important to bear in mind that ordinary putrefaction does not produce these effects. The changes which putrefaction causes in the firmness and texture of the mucous membrane of the stomach occur very slowly. For several days after death, when most of the viscera are softened by putrefaction, the mucous membrane of the stomach often retains almost the firmness which it had at the time of death. Gas forms in the submucous areolar tissue, causing an emphysematous condition of the coats of the stomach; the blood decomposes, and filters through the vessels, and stains its different coats; the stomach becomes further discoloured by the gases that permeate its tissues; but the mucous membrane retains its firmness, sometimes, as was observed by Andral, for eight or ten days after death. From this

the inference may be drawn that unnatural softness of the mucous membrane of the stomach cannot be ascribed to ordinary putrefaction unless many days have elapsed since death, or unless putrefaction has far advanced in other parts of the body.

But, setting putrefaction aside, might not the softening of the stomach and intestines have occurred during life, from defective nutrition, or some other morbid process? The stomach and intestines, it is expressly stated by both Cruveilhier and Burns, exhibited no traces of inflammation; and the same remark has been made by other pathologists who have described similar appearances in these organs; but we not unfrequently find softening of other tissues, occurring from some obscure fault of nutrition, without any process to which the term *inflammation* can be rightly applied. This sometimes happens, in organs that are much exercised, from mere defective nourishment. The more an organ is exercised, the greater is the waste of its constituents, and the sooner, therefore, it suffers, when, from defective supply of food, or from any fault in the assimilating processes, the repair of its waste is prevented.

The cornea, from being of delicate texture, and much exposed, suffers from defective nourishment, and becomes ulcerated, when firmer and more protected, and more vascular tissues, into the composition of which nearly the same elements enter, present no such marks of destruction. The muscles of the heart are in continual action, and in low fevers (in which the fibrine of the blood becomes much diminished, and the nutrition of the muscles is prevented) they undergo a softening that does not occur in the voluntary muscles, which, from the commencement of these fevers, are in comparative repose. But in the secreting glands, which have many points in common with the mucous membranes, as regards both structure and function, a similar softening is now and then met with, without any trace of inflammation, the result, seemingly, of some obscure defect of nutrition.

A change of this kind is occasionally met with in the liver, in those cases of jaundice that prove fatal speedily from disorder of the functions of the brain. All the tissues of the liver, in certain parts of the organ, are found softened, or disorganised; and in these parts, on microscopic examination, none of the hepatic cells, which serve to secrete the bile, can be seen.

A similar disorganisation of the kidney now and then occurs, but so seldom, that it has not, that I am aware, been noticed by pathologists. An instance of it fell under my observation in the autumn of 1844, in a gentleman who had been under the care of several of our eminent physicians, and who fell to my charge only a few days before his death. He had œdema of the legs, and distressing vomiting, and his urine (which was several times tested by heat and nitric acid) was found to be albuminous. From these symptoms, and from there being no signs of any other disease sufficient to account for them, he was supposed to have granular disease of the kidney. On examination of the body, I found the kidneys remarkably softened: the right, which was the smaller of the two, was so soft that it broke down under the slightest pressure of the finger, like a softened spleen, immediately recalling to my mind the softened and disorganised livers that I had previously seen. The body was examined forty-two hours after death, in hot weather, and exhibited marks of commencing putrefaction, but the liver and the spleen were firm.

The question, then, very naturally arises —Might not the softening of the stomach and intestines in the cases to which I have referred have resulted from some obscure fault of nutrition? A consideration of the particulars of these cases will, I think, shew conclusively that it did not so originate, but that, as in the ordinary cases of stomach digestion, the change occurred after death, and was the effect of the gastric juice.

Cruveilhier has given the particulars of a case in which he found the fore part of the stomach softened, and a drawing (from which this diagram is taken), representing the appearance of the stomach in question. The person in whom this occurred was a man-servant, 22 years of age, who died of fever, in the latter stages of which there was severe disorder of the brain. The stomach was found empty, and was only softened in this spot on its anterior surface. The mucous and muscular coats were here destroyed and removed, so that perforation was only prevented by the peritoneum, which was spread as a thin gauze over the part.

But there is another circumstance noticed by Cruveilhier, which to my mind is quite conclusive that the softening resulted from the gastric juice after death. In the lower and back part of the œsophagus there were two perforations leading into the left pleural sac, just as are found occasionally in conjunction with softening of the great end of the stomach in persons killed by accident, in the midst of health, and soon after a meal; and, as happens in these latter cases, the edges of the perforations were soft and ragged, and the blood-vessels surrounding them were of a jet black. Cruveilhier notices, moreover, that at a spot corresponding to these apertures, the pleura covering the lung had also undergone the gelatiniform softening, and that the tissue of the lung was laid bare; and with all this, he expressly states, there were no marks of

inflammation, either in the pleura or in the lung.

But if any doubt still remains of the nature of these changes, it will be removed by a case, which I will next cite, recorded by Adam Burns in the paper to which I have already referred.

The following are the particulars of the case, as given by Burns:—

"About ten months ago, I had occasion, two days after death, to open the body of a very emaciated and anasarcous young girl, who had died from scrofulous enlargement of the mesenteric glands. On raising the coverings of the abdomen, the stomach, which was empty, presented itself to view, with its front dissolved. The aperture was of an oblong shape, about two inches in its long diameter, and an inch in its short, with tender, flocculent, and pulpy edges. This I demonstrated to the pupils attending my class; and I especially called their attention to the fact, that the liver, which was in contact with the hole, had no impression made on it. Having proceeded thus far, I placed all the parts as they had been, stitched up the abdomen, and laid the body aside in a cold situation for two days. Then I opened it again, in presence of the same gentlemen, and we found that now the liver, where it lay over the dissolved part of the stomach, was pulpy; its peritoneal coat was completely dissolved, and its substance was tender to a considerable depth. At this time the other parts of the liver were equally solid as before; and as yet every part of the subject was free from putrefaction. The posterior face of the stomach, opposite to the hole, was dissolved, all except the peritoneal coat; at least, the internal coats were rendered pulpy and glutinous." "The dissolved part," he goes on to observe, "was seated at the fore part of the stomach, about an inch distant from the pylorus, and midway between the smaller and greater curvatures of this viscus, at a part of the stomach with which the gastric juice could not have come into contact, as the body had constantly been in the supine posture."

Now, it will naturally be asked, If the softening of the stomach in these cases was the effect of the gastric juice acting after death, how did it happen that the fore part of the stomach was dissolved, while the hinder and lowermost parts, where fluids in the stomach tend to collect, were not dissolved?

The following is, I have little doubt, the right explanation of the fact. In the case related by Cruveilhier, the stomach is stated to have been empty; that is, its surface was moistened merely by the gastric juice. Now the man died of fever, and, as happens in the severe forms of this disease, the blood, we may infer, was unusually fluid after death, and gravitated to the lowermost parts of the stomach; and the transudation of the alkaline serum of the blood through the coats of the vessels in these parts neutralised the acid of the small quantity of gastric juice contained therein, and destroyed its solvent power.

In Burns's case, the fact, that the stomach was softened in its forepart only, may be explained in the same way. The stomach, here also, was empty, and the girl was dropsical. The alkaline dropsical fluid, transuding through the coats of the stomach at its hinder or lowermost part, neutralised the acid of the small quantity of gastric juice that moistened its coats, and prevented any digestive action from taking place there.

It may be predicted with tolerable safety that it will be only in such cases, and where the stomach is empty, that softening of the upper or forepart will occur, without there being at the same time softening of the lower and hinder parts.

If it be established by the circumstances I have mentioned, that the softening of the stomach in these cases was the effect of the gastric juice after death, the presumption is very strong that the so-called gelatiniform softening of the intestines, which is met with in the same class of cases as the softening of the stomach, and very generally (as seems to have happened in three of the cases related by Burns) in the same persons; — the presumption, I say, is very strong that the softening of the intestines is of the same nature, and produced by the same agent.

But, without reference to the stomach or to the circumstances in which the softening occurs, and considering merely the characters of the change in the intestines, we are led to the same conclusion.

The change, like that produced by the gastric juice, affects the different coats of the bowel in succession, from within outwards, leading at length to perforation.

The decomposition, like that in digestion, is unattended by evolution of gas.

The parts softened, when they did not contain much blood at the time of death, have a semi-transparency, or a gelatinous appearance, like albuminous tissues in process of softening by the gastric juice.

Again, from the observations of Burns, we may infer that the change in question, like digestion of the stomach after death, is most common in summer. Burns, indeed, tells us that he never met with it except in the summer months.

Digestion after death requires the presence of a free acid, and, as digestion goes on, the acidity of the gastric fluids increases. Now, both Cruveilhier and Burns particu-

larly remarked, and their observations appear to be quite independent, that the softened intestines in the cases in question had a sour smell.

Another very important property of the gastric juice is, that it prevents putrefaction. Now it is stated by Cruveilhier, and the same may be inferred from the remarks of Burns, that the softened parts had no odour of gangrene. Cruveilhier expressly says, indeed, that they undergo putrefaction less readily than others.

All the circumstances I have mentioned —the circumstances, namely, that the softening of the coats of the intestines occurs in the same class of cases, and sometimes in the same person, as softening of the stomach; that it occurs especially in summer; that it involves the different coats of the bowels in succession, from within outwards; that it is unattended by the evolution of gas; that the softened tissues have a semi-transparency, and a sour smell; and that they exhibit no marks of inflammation, and are free from any odour of gangrene:—all these circumstances leave, I think, no doubt that the change in question occurs after death, and that it is produced by the gastric juice. The mere presence of acid in the intestines is not sufficient to cause it, since the coats of the intestines, when acted upon by an acid, have no peculiar dissolving or digestive power, like those of the stomach.

The softening of the intestines is most commonly found in infants who have died of hydrocephalus, or of tuberculous disease of the lung, or with functional disorder of the brain; and in whom, together with the peculiar gastric disorder that so often exists in the cases in which softening of the stomach is found, there has been severe diarrhœa, with green, spinach-like, stools: the green colour being the effect of uncombined acid on the bile.

Softening of the intestines, like softening of the stomach, is also found occasionally in grown-up persons, who have died of phthisis, or of typhoid fever; especially where diarrhœa has existed, with the peculiar gastric symptoms to which I have so often referred.

There can be little doubt that, in the cases in which this happens, the gastric juice passes, in its active state, from the stomach into the intestines; and that not meeting there with alkali enough to neutralise its acid, and thus destroy its solvent powers, it dissolves or digests the coats of the intestine after death.

The result, then, at which I arrive is, that the softening, with thinness, of the coats of the alimentary canal, described by Louis,—the pasty or pulpy and the gelatiniform softening of Cruveilhier,—and the other varieties, described by other authors, distinguished by the colour of the softened tissues, are essentially the same change; and that this change, whether it exist in the lower end of the œsophagus, or in the great end of the stomach, or in the fore part of the stomach only, or in any part of the small or the large intestine, is produced after death by the gastric juice, like the softening of the great end of the stomach, remarked by Hunter, that occurs after sudden and violent death, in the midst of health, and soon after a meal.

I have occupied much of your time in considering the change, because I consider the subject as one of great importance. It is obviously important with reference to medico-legal inquiries; and it is important, also, with reference to the attainment of a right knowledge of the pathology of the digestive organs. Every one who has studied the diseases of these organs by means of morbid anatomy must have had his mind perplexed, as mine has often been, and his progress stayed, by the continually recurring question, What do these striking changes mean?

But the subject is important, too, with immediate reference to practice, because the study of it leads us to a more intimate knowledge of a peculiar form of indigestion, which is of frequent occurrence. In the class of cases, indeed, in which this form of softening of the stomach and intestines is found after death, there generally exists for some time previous to death a peculiar form of indigestion, attended with various distressing symptoms referrible to the stomach and bowels,—the result mainly of the presence of free, uncombined, gastric juice in them; and the efficacy of liquor potassæ and other alkalies in relieving this gastric disorder, and the like efficacy of chalk mixture (which furnishes an insoluble alkali, which is not absorbed in the stomach, but passes down into the intestines,) in relieving the diarrhœa and the griping pain that attends it;—the efficacy of these medicines results from their neutralising the acid of the free gastric juice, and thus preventing the juice, which loses its solvent power when thus neutralised, from exerting any chemical action on the tissues, or calling for the expenditure of their vital force of resistance.

LECTURE III.

The subject to which I shall call your attention to-day is a disease of the stomach which is very painful, and often lingering, and very fatal, and which, taking these circumstances into account, is sufficiently frequent to be of considerable practical importance; which leads, moreover, to unmistakeable changes of structure; but of which, notwithstanding, the clinical history has not yet been clearly traced. The disease I speak of, is that which has been termed *simple* ulcer, or *chronic* ulcer, or *perforating* ulcer, of the stomach. The series of preparations which I have placed on the table afford good illustrations of its various forms and results.

In most cases, the stomach presents no marks of disease, except a single deep ulcer on its inner surface. This ulcer is seldom larger than a shilling, but sometimes, especially when it is situated on the posterior wall of the stomach, grows to the size of a crown-piece, or even of the palm of the hand. It is generally circular or oval, and in all cases extends through the mucous membrane, the edges of which are clean-cut, as if a portion of the membrane had been punched out. Sometimes, the mucous membrane only is destroyed, and the ulcer has then an even base, formed of the submucous areolar tissue. In other cases, after a time, the process of ulceration eats through the other coats of the stomach in succession, until perforation takes place, and the contents of the stomach escape into the sac of the peritoneum.

The outer coats of the stomach are always destroyed in less extent than the mucous coat, so that, when perforation occurs, the aperture seen from without is much smaller than the original ulcer of the mucous membrane.

At first, and often for a long time after the formation of the ulcer, the coats of the stomach at its margin present no change of structure; but, in cases of long standing, the margin of the ulcer, like that of an old ulcer of the skin, is frequently indurated and thickened, from the contraction of lymph that has been effused into the submucous areolar tissue. This hardness and thickening seldom, however, extends more than a line or two from the edge of the ulcer.

It frequently happens, that, before all the coats of the stomach are eaten through, adhesive inflammation of the peritoneum over the ulcer is set up, and lymph is poured out which glues the portion of the stomach covering the ulcer to the pancreas, or to the left lobe of the liver, or to some other organ with which it happens to be in contact. The adhesions formed in this way often prolong the life of the patient, by closing the aperture made by the ulcer, and thus preventing extravasation of the contents of the stomach into the peritoneal sac.

When the ulcer extends deeper than the mucous membrane, it frequently opens a branch of one of the arteries with which the stomach is supplied, and thus causes sudden and profuse, and, it may be, fatal hemorrhage.

The ulcer is generally situated along the lesser curvature of the stomach, or near it; usually, nearer the pyloric orifice than the cardiac; and much more frequently on the posterior wall of the stomach than on the anterior. It is hardly ever found in the fundus, or great end, of the stomach, where the softening of the mucous membrane from the gastric juice, to which I called your attention in the preceding lectures, is usually met with in the highest degree. An ulcer is now and then met with in the first, or upper, part of the duodenum, having precisely the same characters as the simple ulcer of the stomach, and doubtless formed in the same way.

Rokitanski, who has studied the morbid anatomy of this disease with his accustomed patience, states that of 79 cases of which he has given an analysis, the ulcer was situated

In 15, on the lesser curvature.
20, on the posterior wall of the stomach.
5, on the anterior wall of the stomach.
16, at a small distance from the pylorus.
16, in different parts at once; especially simultaneously on the anterior and posterior surfaces.
1, at the fundus of the stomach.
6, in the duodenum.

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In most cases of simple ulcer of the stomach the ulcer is solitary, and, as I have before observed, the stomach presents no other marks of disease, except such as are clearly traceable to it. Now and then, however, more than one ulcer exists. In two instances which have fallen under my own observation, there were two such ulcers in the same stomach, as you see exhibited in three of the preparations before us; but in my own experience I never met with an instance in which there were more than two.* Of the 79 cases collected by Roki-

* Very minute and superficial ulcers, difficult

tanski, to which I have before referred, the ulcer was solitary in 62. Of the remaining 17 cases, there were 12 in which two ulcers existed; 4, in which there were 3 ulcers; and 1, in which there were five. Now and then an ulcer in the duodenum is found in conjunction with one in the stomach.

A simple ulcer of the stomach is sometimes found cicatrised. The ulcer heals just like an ulcer of the skin. The portion of the mucous membrane destroyed is replaced by a dense fibrous tissue, which contracts, and thus draws towards the centre of the ulcer, and consequently puckers, the mucous membrane around it. The newly formed fibrous tissue has a very different appearance from the mucous membrane of which it takes the place, and never fills up the cavity or depression formed by the ulcer,—so that the scar of the ulcer is readily discernible, by the deep permanent depression which is thus left, as well as by the puckering of the mucous membrane around it. If, however, the ulcer be small, its edges may be drawn together and unite, and a mere stellar cicatrix be left, without any permanent depression.

When the ulcer is large, and situated across the lesser curvature of the stomach, the process of healing, by the contraction that attends it, often permanently alters the shape of the stomach, diminishing its breadth at that part. This change of shape is very striking in these two preparations, in each of which the stomach is divided into two pouches, as if by a string passed transversely round it, looping up the greater curvature towards the lesser.

Such are the facts respecting the ulcer that have been learnt from dissection, and from some of these facts—from the circumstance, namely, that the ulcer always extends through the mucous membrane, and that, when first formed, it has always a definite circular, or slightly oval, shape, and clean-cut edges—there can be little doubt, that it is formed by sloughing of the mucous membrane, and not by a process of ulceration commencing at the surface.

The important question now naturally arises—Under what circumstances does the ulcer occur, and by what agency is it produced? On these points our knowledge is very defective.

The disease is met with in both sexes, but, as it appears, more frequently in women than in men. In the 79 cases before referred to, of which an analysis has been given by Rokitanski, 46 occurred in women, 33 in men. It seldom, if ever, occurs under the age of 16, but is found in persons of all ages from this to 60 and upwards. According to Rokitanski, it is met with more frequently in persons beyond 50, than in persons under 30.

It occurs in the different countries of Europe in which morbid anatomy is cultivated; in agricultural districts and in large cities; and, though not with equal frequency, in the various classes of society. It seems to be much more frequent, even considering their relative numbers, among the poor, than among the rich. In this country it is generally supposed to be most frequent in the class of maid-servants, between the age of 18 and that of 25. I am inclined to believe, however, that this conclusion has been hastily drawn, and from too small a number of facts. During the last three years five fatal cases have occurred in my own practice at King's College Hospital, and all were in middle-aged men.

Lastly, the disease has not been found in conjunction with, or in sequel to, any other disease, with such frequency as to lead us to conclude that it has any intimate connection with it.

It is clear that these facts have not yet given us the clue to the real cause of the disease. The circumstance, if it be true, that the disease is more frequent, relatively to their numbers, among the poor than among the rich, and that it is more frequent among unmarried maid-servants than in other classes, would favour the inference that a state of anæmia disposes to it. But it is almost idle to speculate further. We cannot explain how it is, that the ulcer does not occur under the age of 16; how or why it is, that the ulcer is always situated in what has been termed the pyloric division of the stomach, or in the first part of the duodenum; how it is, again, that the ulcer is generally single, and that it is so much more frequent along the lesser curvature of the stomach, or near it, than in any other part?

Some peculiarities in the structure of the stomach, hitherto undiscovered, or some physiological relations not yet even suspected, may, by and by, be brought in evidence, and may perhaps furnish satisfactory answers to these important questions. That there are such physiological relations as I have here supposed, is rendered extremely probable by the remarkable discovery made a few years ago by Mr. Curling, that severe burns are frequently followed, at least in young persons, by a sloughing ulcer of the middle portion of the duodenum, which, like the ulcer of the stomach we are considering, frequently destroys life by eating into an artery, and thus causing sudden and profuse hæmorrhage, or by leading to fatal perforation.

Waiving, then, any further speculation on

to be seen, are now and then found in great numbers in the stomach. Following the example of Cruveilheir and others, I do not class these with the round, deep, and usually solitary ulcers described above.

the cause of the ulcer, let us turn our attention to what mainly concerns us as practical physicians ;—its effects, namely, in the living body, and the circumstances which promote or hinder its healing.

An ulcer in the stomach, however produced, which has extended through the mucous membrane, is clearly very difficult to heal. The cases in which cicatrisation takes place are probably few in number compared with those in which the ulcer proves fatal by perforation, or by hæmorrhage ; and when cicatrisation does take place, the lost substance is very imperfectly restored, and, unless the ulcer be a very small one, a deep depression, or pit, is left.

The contrast which the stomach presents in this particular with the small and with the large intestine, is very striking. The ulcers which form in the small intestine in typhoid fever generally heal in a few weeks, when the force of the fever is past. The ulcers which form in the large intestine in dysentery often heal rapidly, if proper care in diet be taken ; and in those cases in which they remain open, or in which some of them remain open, for years, no perforation of the intestine takes place. Lymph is effused at the bottom of the ulcer, which becomes firm and hard, and effectually prevents perforation of the bowel.

Several circumstances conspire to prevent the same thing from happening in the stomach.

The first of these is the great change of volume to which the stomach is liable, two or three times a day. Directly after a meal, it is full and large ; and at the end of three or four hours it is again empty and contracted.

The healing of an ulcer must also be retarded by the constant churning motion that takes place during digestion.

Dr. Beaumont observed that in the stomach of St. Martin, as long as digestion was going on, the food was regularly carried round and round, in from one to three minutes, from left to right along the great curvature of the stomach, and from right to left along the lesser curvature.

The sagacity of Hunter had already led him to infer that regular movements take place in the stomach, from the circumstance that in the hair-balls found in the stomachs of cows and some other animals, the hairs have a regular direction.

In a state of health, we are, happily, unconscious of these movements of the stomach, as we are of the stronger contractions and movements of our hearts ; but when an ulcer exists in the stomach they must fret its surface, and be an obstacle to its healing.

The process of healing is doubtless hindered also by the mechanical and other irritation of the sore caused by the various substances which are taken as food.

The mucous membrane of the stomach is so organised, as to bear with impunity, when healthy, the contact of substances differing widely in their qualities. The stomach is intended to be the common receptacle of the various matters from which the nutriment of the body is derived ; and its mucous membrane, with which all these matters are brought into contact, is so organised as not to be injured or painfully affected by them. But when a portion of the mucous membrane is destroyed, the mildest articles of food cause pain—a change of temperature even, by the drinking of water too hot or too cold, causes pain—and the surface of the sore is constantly fretted, and its healing retarded, by the contact of those substances which are the natural and appropriate stimulus of the mucous membrane.

The healing of an ulcer in the stomach is probably retarded also by the action of the gastric juice. The solvent power of this juice has, indeed, no injurious effect on the living mucous membrane, but it very probably dissolves and removes the lymph which is poured out on the bottom of the ulcer ; and it is only by means of this plastic lymph that the lost substance can be repaired, and the ulcer heal.

All these circumstances explain how it is, that a small ulcer which causes no constitutional disturbance, which may not even much impair the nutrition of the body, and which, if situated in a lower portion of the same canal, might soon heal, becomes so serious a disease,—how it leads so frequently to long-continued suffering, and death.

It is now time that we should consider the symptoms of ulcer of the stomach, as these alone enable us to detect it in the living body.

We have already seen that the disease is one of great danger : that it may at any time destroy life, almost suddenly, by causing perforation of the stomach, or profuse hæmorrhage. We have seen, too, that it is a curable disease ; that the ulcer, even when of long standing, may heal, and the health of the patient be restored ; and there can be no doubt that the healing of the ulcer, and the recovery of the patient, may be brought about or promoted by judicious treatment. The health and life of the patient may depend, then, on our detecting the real nature of his disease. Unfortunately, in the early period of the disease, it is not easy to do this. We are not aided, as we are in the detection of many other diseases, by the knowledge of its causes, or of any peculiar circumstances under which it is apt to arise ; and at an early period the symptoms are of doubtful character, and often the sufferings of the patient, and the derangement of his health, are so slight as not to alarm either

himself or his friends. Sometimes he follows his usual occupations, and seeks no advice, till perforation of the stomach takes place. He does not even regard himself as an invalid, and is considered by his friends in good health, when he is *suddenly* seized with agonising pain at the epigastrium and with the other symptoms of peritonitis from perforation, falls rapidly into collapse, and dies within 24 or 36 hours.

In such cases, the character of the symptoms, especially the great suffering referred to the stomach, and the suddenness with which life is cut short in the midst of apparent health, often lead to a suspicion of poisoning. One instance of this kind, which gave rise to a coroner's inquest, has fallen under my own observation, and many others are related in the systematic works on forensic medicine. A perusal of these works might, indeed, lead to the belief that the symptoms which precede perforation are *generally* trivial; but such is by no means the case. In a great majority of instances the symptoms are distressing, and, when the disease has lasted some months, they are generally significant enough.

The most constant symptom is pain in the stomach, which is generally referred to a small spot, and is more severe after meals, when the stomach is distended, and when its churning movements are going on. The pain usually abates as the stomach gets empty, to be renewed again by the next meal. Now and then, however, pain is also felt when the stomach is empty. Together with this pain, there is some degree of tenderness or soreness at the epigastrium; but this is often slight, and, like the pain, is generally referred to a small spot. There is also occasional eructation of a sour fluid, and now and then, perhaps only once or twice in a month, the patient vomits his food. There is complete absence of fever and of thirst, the appetite is commonly but little impaired, and, unless the ulcer be large, the patient does not fall away perceptibly in flesh or in strength.

The pain at the stomach after meals, and the sour eructations, and, it may be, the occasional vomiting, are the only symptoms of disease. These symptoms persist, and the patient may go on for months, heeding them but little, and following his ordinary course of life. At times, however, the pain at the stomach gets more severe, and the vomiting more frequent, and the appetite fails. Now and then there is slight diarrhœa. These exacerbations render a restricted diet necessary; and, under the influence of this, the symptoms soon return to their former degree, and the patient goes on as before.

After a time, the ulcer may begin to heal, and the pain of the stomach to abate. The process of healing may go on uninterruptedly, and the health be permanently restored: but more generally the amendment is only temporary, and, after a period of comparative ease, the former pain and uneasiness of the stomach returns.

But, as dissection has already disclosed, the ill effects of ulcer of the stomach do not end here: the patient is liable to accidents which may at any moment place his life in jeopardy. The most common of these is profuse hæmorrhage, in consequence of the ulcer eating into one of the arteries in the submucous areolar tissue. The hæmorrhage is often preceded for a day or two by an increase of pain, which may, perhaps, be taken as evidence that the ulcer is spreading; but in other cases it occurs without any aggravation of the usual symptoms.

If the blood be poured out in small quantity, or slowly, it may pass off by the bowel, without causing vomiting. The patient grows rapidly weak and listless, has a slight diarrhœa, without tenderness of the belly or fever, and the discharges from the bowels are copious and black. More frequently the blood is poured out in large quantities at a time, and acts as an emetic. The patient has a feeling of faintness and nausea, soon succeeded by vomiting of a large quantity—from one to three pints—of black, clotted, blood. The vomiting is followed by a state of faintness, and the hæmorrhage ceases. Frequently, the vomiting recurs on the same or the following day, and a large quantity of blood is again brought up. Some blood also passes downwards, and the discharges from the bowels are copious and black.

At the end of a day or two, the hæmorrhage ceases entirely, and the patient is left blanched and weak. In addition to the sufferings which belong properly to the disease of the stomach, he has now those which result from the loss of blood. Slowly, and by degrees, the loss of blood is repaired, and the symptoms directly referable to the stomach alone remain.

In the majority of instances, after the lapse of some months, or, it may be, of two or three years, hæmorrhage comes on again. The patient, after a day or two's increase of pain, but sometimes without this, and quite suddenly and unexpectedly, is taken, as before, with faintness and nausea, which is soon followed by vomiting of black, clotted, blood. The circumstances of the former attack are repeated, and at the end of a day or two, at most, the hæmorrhage again ceases.

In cases which are very protracted (where the ulcer remains open, as it sometimes does, for many years), it happens not unfrequently that the patient has four or five attacks of hematemesis, such as I have described, occurring at unequal, and, it may

be, long intervals. Notwithstanding that the hæmorrhage is generally abundant, it seldom proves immediately fatal. Among a considerable number of cases of this kind that have fallen under my own observation, there is only one in which this happened. The subject of this case was a very respectable man, who kept the parish school of St. Clement's, and lived in the immediate vicinity of King's College Hospital. Symptoms of ulcer of the stomach first appeared in June 1842, when he was 48 years of age; and from this time till his death, which happened in December 1844, he was frequently under my care on account of it. He had an abundant hæmorrhage from the stomach in October 1843, which ceased at the end of two or three days, and did not recur till the 20th of December, 1844. On the evening of that day he grew faint, and vomited blood. The loss of blood was not, however, sufficient to prevent his attending to his school as usual. On the evening of the 23d he grew faint again, and felt sick, but did not vomit. He complained of griping pains in the belly, but was not purged. About an hour after, he fell down in a fainting fit, and expired.

The stomach, and the whole of the intestinal canal, down to the descending colon, were distended with dark, clotted blood. The ulcer from which the blood came was situated on the posterior wall of the stomach, about two inches to the right of the cardiac orifice, and was as large as a half-crown: it had destroyed all the coats of the stomach down to the pancreas, which was there adherent to it, and had eaten through a large artery, which I took to be the splenic, from which the hæmorrhage doubtless proceeded. Nearer the cardiac orifice was the depressed scar, about the breadth of a shilling, of another ulcer, which had healed.

On the table is a preparation, shewing an ulcer on the posterior wall of the stomach, which caused fatal hæmorrhage, by eating into the splenic artery; and another preparation, shewing an ulcer on the lesser curvature, which led to the same event, by laying open the gastric or coronary artery.

Simple ulcer of the stomach, as I have already remarked, seldom proves fatal by hæmorrhage. Cruveilhier states, that, of the cases which he had collected, the only ones that proved fatal in this way were those in which the ulcer had eaten (as in the preparations to which I have just pointed) into the gastric or the splenic artery. These ulcers form most commonly, as we have seen, along the lesser curvature of the stomach, or on its posterior wall; so that the gastric artery, which runs along the lesser curvature, and the splenic artery, which crosses the posterior surface, are liable to be involved in the ulcer.

But death results much more frequently from another accident to which persons with this kind of ulcer are liable—namely, perforation of the stomach, and the escape of its contents into the sac of the peritoneum. When this happens, the patient is seized *suddenly* with agonising pain at the epigastrium, soon followed by the other symptoms of peritonitis from perforation, and usually dies in from eighteen to thirty hours.

As I have already remarked, the occurrence of death in this sudden way, in a person who, up to the time of the perforation, had been following his usual course of life, and had seemed in good health, has often led to a suspicion of poisoning. All the concomitant circumstances have in consequence been often noticed and recorded with extreme care and minuteness. Mr. Alfred Taylor, who has published an excellent paper on this subject, in its medico-legal relations (in the 4th volume of Guy's Hospital Reports), states, that the perforation generally occurs soon after a meal. Its more frequent occurrence at that time is, no doubt, chiefly attributable to the distension of the stomach which then exists, and to the vermicular movements of its coats which are then taking place; but it may possibly also be owing in some degree to the solvent action of the gastric juice. When the ulcer has eaten down to the peritoneal coat, and has, perhaps, impaired the vitality even of this, the gastric juice may exert its solvent action upon it, and immediately cause the catastrophe.

In some cases the process of ulceration is rapid, and perforation occurs early—without having been preceded by any severe or alarming symptoms, and within a few weeks (it may be) of the formation of the ulcer. In other cases the ulcer remains open for many years, giving rise to its ordinary symptoms, and now and then to an alarming hæmorrhage, and, at last, leads to the fatal perforation. A remarkable instance of this kind fell under my care in King's College Hospital, in October, 1843. A house-carpenter, 63 years of age, who had had the usual symptoms of ulcer of the stomach for fifteen years, was brought into the hospital on the 3d of October, in a state of extreme exhaustion from vomiting of blood, which came on some days before. The hæmorrhage had then ceased, and did not again recur. Two days after his admission to the hospital, perforation of the stomach occurred, and he died in twenty hours. The ulcer, which was not larger than a shilling, was situated on the lesser curvature of the stomach, about half an inch from the pylorus, and had a hard and thickened edge. The rest of the stomach, and the intestines throughout, were perfectly sound.

Occasionally perforation takes place, but the contents of the stomach are not effused over the whole surface of the peritoneum, so as to excite general peritonitis. The diffusion of the contents of the stomach, and of the consequent inflammation, is prevented by adhesions which have already taken place; and the result is a circumscribed abscess in the sac of the peritoneum behind the ulcer. One instance of this has fallen under my own notice, and two others are recorded by Dr. Seymour, in a paper published in the MEDICAL GAZETTE for 1844. When this happens, and when the abscess is of considerable size, there is, of course, contant suffering, with loss of appetite and hectic fever, which soon wears out the strength of the patient.

Fatal perforation is, I believe, most common when the ulcer is situated on the anterior wall of the stomach, or along its lesser curvature. It would take place much oftener than it does, were it not for adhesions which are apt to form between the peritoneum covering the ulcer and some other organ which this part of the stomach may happen to touch. Before all the coats of the stomach are eaten through, adhesive inflammation is set up in the portion of peritoneum covering the ulcer, and coagulable lymph is poured out, which serves, in some degree of itself, as a safeguard against perforation, and which glues the stomach at this part to the organ with which it happens to be there in contact. By this means the aperture which the process of ulceration would otherwise cause is stopped. The pancreas is, from its situation, the organ by which fatal perforation is most commonly prevented. The symptoms which denote this partial adhesive inflammation of the peritoneum are an aggravation of pain and of tenderness, (which are still confined to the region of the stomach,) more frequent vomiting, and a certain degree of fever.

It happens now and then that without perforation taking place, or at least without extravasation of the contents of the stomach taking place, the adhesive inflammation of the peritoneum set up above the ulcer, instead of being confined to the immediate vicinity of the ulcer, and leading to the effusion of only a small quantity of lymph, is much more extensive: lymph is poured out in considerable quantity; the stomach becomes united to all the adjacent viscera, and some coils of intestine, it may be, become united to each other,—so that after the inflammation has subsided, besides the symptoms which properly belong to ulcer of the stomach, the patient is liable to obstruction of the bowels, and other evils, which result from the natural movements of these organs being restrained.

All this happened in a man, from whom the stomach forming this preparation was taken, who died under my care in March, 1845. The stomach was much altered in shape, being lengthened at the expense of its breadth, and was united to all the adjacent organs—the liver, the spleen, the pancreas, the colon—so firmly that it could only be separated from them by dissection: the coils of intestine in the upper half of the belly were glued together in the same way.

The ulcer, which was the source of all this mishief, was, at the time of death, of the size of a fourpenny-piece, nearly circular, and situated midway between the orifices, along the lesser curvature of the stomach. The edges of the ulcer are indurated, and the mucous membrane for some distance around is puckered, by the contraction which the ulcer has undergone.

In this instance death resulted from exhaustion, which was occasioned, not merely by the ulcer in the stomach, but as a consequence of the adhesions of the stomach and bowels which the ulcer had caused. These adhesions, by causing obstruction, led to frequent vomiting, and doubtless interfered in other ways with the functions of those organs.

It now and then happens, when the ulcer attains a large size, that death results from exhaustion, without any such extraneous mischief.

From the account I have given of the symptoms and course of ulcer of the stomach, it will be seen that this disease becomes more easy of detection the longer it has lasted.

In its early stages the symptoms are few and equivocal. Pain and soreness at the stomach felt after meals, occasional acid eructations, and occasional vomiting—which are often the only symptoms then present—may result from various other causes, and even from mere functional disorder.

After these symptoms have lasted some weeks, or months, their very continuance becomes significant; it leads us to conclude that they depend on organic disease, while the seat of the pain, and the circumstance that it is always increased by eating, and usually abates as the stomach gets empty, lead us to infer, in the absence of any direct evidence of disease of the liver or other adjacent organs, that this organic disease is in the stomach.

After a time, the symptoms I have mentioned are often succeeded by the sudden occurrence of vomiting of blood in large quantity. When this has happened, the detection of the disease becomes much easier.

Vomiting of blood may, indeed, result from various other causes, but these may generally be distinguished by the circumstances under which they occur.

1st. It may result from a general tendency

to hæmorrhage, in consequence of a faulty condition of the blood,—as in scurvy, or purpura; but in such cases the hæmorrhage is not confined to the stomach; blood issues from other mucous surfaces, and purpuric spots appear on the skin.

2. Again, vomiting of blood may result from mechanical congestion of the stomach, in consequence of some impediment to the free passage of the blood through the liver, or the chest. In such cases, the quantity of blood lost is small, and the cause of the hæmorrhage is generally obvious enough, from the co-existence of other symptoms, which reveal the primary disease, and which show that the passage of the blood through the liver, or the chest, is greatly impeded.

3. Vomiting of blood sometimes occurs, without any organic disease of the stomach itself, in persons who, in consequence of repeated attacks of ague, or other causes, have great enlargement of the spleen. Here, also, the previous history of the patient, his cachectic condition, and the palpable enlargement of the spleen, readily lead us to the original cause of the hæmorrhage.

4. Lastly, the hæmorrhage may be vicarious of the catamenia; and this is especially liable to happen in young unmarried women,—the class of persons supposed to be most subject to ulcer of the stomach. But, in such cases, the hæmorrhage usually occurs at the monthly period, and the natural discharge is suppressed, or has previously been irregular; and the vomiting of blood, although it may be attended with severe pain at the time, has not been preceded, and is not followed, by the long-continued pain and soreness produced by ulcer.

When vomiting of blood does not depend on any of the conditions which I have just mentioned, it results almost invariably (except in the case of malignant fevers) from organic disease of the stomach itself.

When, therefore, profuse vomiting of blood occurs in a person who exhibits no general tendency to hæmorrhage; who has no disease of the liver, or in the chest, which greatly impedes the passage of the blood; who has no great enlargement of the spleen; and in whom the hæmorrhage cannot, from the time of its occurrence and other circumstances, be referred to disorder of the menstrual function;—we are driven, in reasoning by the method of exclusion, to ascribe it to disease of the stomach itself. When such is the case, and when, moreover, the vomiting of blood has been preceded for some weeks or months by pain and soreness at the stomach, always brought on or increased by meals,—hardly a doubt can remain that it actually depends on organic disease of this organ. But in persons under the age of 30, the only organic disease of the stomach that gives rise to hæmorrhage, with very few exceptions, is ulcer.

It follows, therefore, that from the peculiar train of symptoms which I have mentioned; namely, pain and soreness of the stomach, always brought on or increased by meals, continuing for many weeks or months, with occasional sour emitations and occasional vomiting, but without much fever or constitutional disturbance; and succeeded at the end of that time by profuse vomiting of blood,—it follows that, from this peculiar train of symptoms, we may occasionally, in persons between 18 and 30, infer the existence of ulcer of the stomach with almost as much certainty as that of any inward disease.

In persons above the age of 30, vomiting of blood, preceded by disordered and painful digestion, may likewise occur from cancer of the stomach. For persons, therefore, who have reached this age, the question will arise,—Is the organic disease of the stomach, which we have inferred to exist, simple ulcer, or is it cancer? When the disease has already lasted some months, it will in most cases be easy enough to answer this question.

Cancer of the stomach in most cases originates at the pyloric or the cardiac orifice, and in some degree narrows or obstructs it. It also gives rise to a tumor, which, at the end of some months, is generally palpable enough; and it *always* interferes greatly with nutrition, causing progressive, and, after a time, extreme wasting.

Simple ulcer seldom produces any of these effects. When, therefore, from the train of symptoms I have mentioned, we have inferred that organic disease of the stomach exists, we may often proceed a step further, and conclude that this disease does not obstruct either the cardiac or the pyloric orifice; and, from the circumstance that the power of digestion remains, and that there is no great wasting, we may conclude, also, that the disease involves only a small portion of the stomach.

We are thus led to the conclusion, that there is organic disease of the stomach of such kind as to cause hæmorrhage,—that this disease involves only a small portion of the stomach,—that it does not obstruct the orifices,—and that it does not form a tumor large enough to be felt. The probability in such a case will be very great that the disease is simple ulcer, and not cancer. The probability is the greater, the longer the previous duration of the disease. A simple ulcer may continue almost stationary—at any rate, with little change in the symptoms—for twenty years. Cancerous disease, on the contrary, constantly and steadily progresses; the symptoms become, week after week, more marked; and the patient dies much emaciated within a year, or

within two years at the furthest. If, then, the disease has lasted this time, presenting the peculiar train of symptoms I have mentioned, and there is still no great wasting, and no evidence that the orifices of the stomach are obstructed, and no tumor to be felt, hardly a doubt can remain that the disease is simple ulcer of the stomach. The evidence is as complete and decisive as we can well have for any inward disease.

Although, then, it may be difficult, or even impossible, to distinguish ulcer of the stomach soon after its formation, from some other diseases, we may generally do this surely enough when the ulcer has already lasted many months.

Supposing, then, the existence of the ulcer to be thus made out, the question arises,—How can we best alleviate the sufferings to which it gives rise, and obviate its dangers, and promote its healing?

We have seen that there are several circumstances which impede the healing of the ulcer, and which cause the repair of the lost substance, when healing does take place, to be less perfect there than in lower portions of the alimentary canal. These circumstances are, the great and frequent changes of volume to which the stomach is subject,—the writhing movements that are constantly going on in its coats while digestion continues,—the mass of crude substances that are put into it, which, being constantly driven round and round, must continually irritate and fret the ulcer,—and, as regards the ulcer and the secretion from its surface, the irritating and solvent action of the gastric juice. It is by lessening as much as we can the unfavourable influence of these circumstances, that we best promote the recovery of the patient. Our chief means of effecting this is by proper regulation of the diet. The patient should prevent the ill effects of distension of the stomach, and, as much as possible, of change of volume of the stomach, by eating little at a time; and the food taken should be of the mildest kind. Whatever irritates an ulcer on the skin will irritate an ulcer in the stomach. Milk, or milk with bread, or with arrow-root, or other farinaceous food, which would make a soothing poultice for an ulcer on the skin, are the articles of food which are most soothing, or rather, which cause the least pain, in ulcer of the stomach. Occasionally, a little jelly, or beef-tea, may be allowed. Our choice between different articles of food will be best determined by the degree of pain which they severally occasion.

The good effects of this plan of treatment are in most cases soon apparent. After a few days the pain at the stomach has generally much abated, and the sickness, if any existed, has ceased. Sometimes the amendment is progressive, and, if the plan be persevered in for a few weeks, the ulcer heals, and the patient recovers. In other cases, on the contrary, the pain and soreness, though much lessened, continue to be felt; and if the ulcer heal at all, it is only after the lapse of many months. As a general rule, the ulcer will be slower to heal the longer it has lasted. Old ulcers are generally larger and deeper than recent ones; and they have often a raised and hard margin, which prevents, or very much retards, the process of healing.

In most cases, perhaps, the chief impediment to the cure of these ulcers, when they are not of long standing, arises from the difficulty of making the patient submit long enough at a time to the restricted diet that is necessary for it. The pain may not be sufficiently severe, or the general symptoms sufficiently alarming, to furnish an adequate motive for so much self-denial.

Medicines are of comparatively little efficacy. Where there are sour eructations, or where, in case of vomiting, the matters vomited are sour,—that is, where the stomach does not completely empty itself, or where the irritation of the ulcer causes a secretion of gastric juice in the empty stomach,—15 grains of Bicarb. of Potash, and 3 or 4 grains of Nitre, two or three times a day, lessen the pain at the stomach, and are therefore, it is fair to presume, productive of benefit. In other cases, on the contrary, they increase the pain, and probably do harm. The best evidence we can have of the good or ill effects of medicines, as of particular articles of food, is from their assauging, or increasing, the pain.

When there has been vomiting of blood, and the patient is much blanched, a few grains of citrate of iron may often be given with advantage, as soon as, under the influence of strict diet, the symptoms have so far abated that a little solid food can be borne without pain.

I have often made trial of opium and hydrocyanic acid, and nitrate of silver, with the object of lessening the pain, or of healing the ulcer, but never could persuade myself that either of these medicines did any substantial good.

When the bowels are much confined, an aloetic, or a compound colocynth pill, should be given. These medicines irritate the stomach much less than castor oil, rhubarb, or the saline purgatives. They exert their chief action on the large intestine, and may generally be given in the disease we are considering without bringing on or increasing the pain. When ulcers exist in the in-

testines, on the contrary, and a purgative is necessary, — as sometimes happens during convalescence from typhoid fever, and in dysentery,—the purgative that is safest and best is castor oil; and of this small doses are always sufficient. A drachm, or two drachms, will act as surely as two or three times the quantity, and with much less offence to the stomach, and much less irritation to the bowels.

In these diseases, as in ulcer of the stomach, the patient should be kept on the mildest diet, until there is reason to believe that the ulcers have healed. Many a case of typhoid fever has terminated fatally from perforation of the bowel, during seeming convalescence, and many a case of dysentery has become chronic, from want of attention to this point. The appetite has been indulged without stint, and the raw surface of the ulcers continually fretted.

If vomiting of blood should come on from ulcer of the stomach, the means most likely to restrain it are, ice, swallowed in small quantity, or applied to the epigastrum; rest; *prolonged fasting;* alum, and other astringents.

We have seen that perforation and hæmorrhage are often preceded for a day or two by increased pain and soreness at the stomach. Aggravation of the pain betokens a spreading of the ulcer, and should always be promptly opposed by restricted diet. *Prolonged fasting* is doubtless the most efficient remedy for any aggravation of the symptoms, and the surest means of obviating the danger which such aggravation threatens.

An ulcer in the *duodenum* causes less severe and less significant symptoms than an ulcer in the stomach. The duodenum is not liable to the same changes of volume as the stomach, and its contents do not undergo the same *churning* from the movement of its coats, and the surface of a sore in it is not fretted in the same degree by the crude substances taken as food.

The chief symptom of ulcer in the duodenum is pain in the situation of the ulcer, which is seldom constant, and which, in most cases, is felt only two or three hours after a meal, when the food is passing from the stomach into the duodenum. After this has continued for some time, the ulcer may heal; but, occasionally, the ulcer burrows deeper than the mucous membrane, eats into an artery in the sub-mucous areolar tissue, as it does in the stomach, and causes sudden and profuse hæmorrhage, or leads to perforation of the bowel, and the sudden occurrence of peritonitis that proves rapidly fatal.

From the symptoms being usually much less severe than those of ulcer in the stomach, the fatal perforation occurs with less warning, and is more unexpected. Some striking instances of this have been published during the last two or three years in the weekly medical journals.

A gentleman, who had previously enjoyed excellent and uninterrupted health, had for three days slight uneasiness in the stomach and bowels, which induced him to take a dose of castor oil, but did not prevent his entering fully into his occupations and amusements. On Friday, the 29th of May of last year, he had spent several hours on horseback on the downs of Epsom, and was returning home, when he was seized, at a short distance from Epsom, at 6 o'clock in the evening, with violent pain in the stomach and bowels, which obliged him to alight and seek a place to lie down. He entered a farm-house, and threw himself on his belly, apparently in great agony, and seeking relief from pressure. Half an hour afterwards he was found by Mr. Stilwell, the surgeon who was called to him, lying on his back on a sofa, in a state of collapse, and complaining of severe pain in the region of the stomach. He was placed in bed, and died there, in the farm-house, the next day, about eighteen hours from the time of his unexpected and terrible seizure. Other very interesting particulars of the case, which I have no time to mention, have been published by Mr. Stilwell, in the Lancet, for the 18th of July, 1846. The perforating ulcer was on the anterior surface of the duodenum, near the pylorus.

A case still more impressive, with the details of which many of you are doubtless familiar, occurred in the summer of 1845, and is related by Dr. Little in the Lancet. I allude to the case of Mr. Somes, the great shipowner, and the late M.P. for Dartmouth, in whom perforation of the duodenum occurred, while he was engaged in the House of Commons.

He was a man of firm and vigorous constitution, 57 years of years, and, although he seems to have suffered for some time occasional pain at the epigastrium, considered himself in good health. The perforation occurred at a quarter past one, P.M. on the 24th of June, causing great agony and speedy collapse, which ended in his death shortly after 1 P.M. on the following day, just 24 hours from the time of his unexpected seizure.

The ulcer, as in the former case, was near the pylorus.

I have now, sir, occupied the three hours allotted to these Croonian lectures, and, in conclusion, beg to offer my best thanks to yourself, and the gentlemen who have done me the honour to be present, for the

patience with which you have heard me. The shortness of the time has only permitted me to bring under your notice a small portion of the diseases and disorders of the stomach. Others, quite as interesting and important, remain, to which, if an opportunity is afforded me, I shall beg to call your attention at some future season.

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