ON
MORBID CHANGES IN THE STOMACH
AND
INTESTINAL VILLI PRESENT IN PERSONS WHO
HAVE DIED OF CANCER.

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Received May 4th.—Read June 27, 1865.

THE difficulty of accounting for the origin of cancer and the want of success in all our efforts to arrest its progress or effect its cure, render investigations upon it of general interest. Of late years inquiries have been chiefly directed to obtaining clearer views as regards the development and anatomical structure of the tumour itself. As far as I am aware, no attempts have been made to ascertain whether the progress of the disease is accompanied by changes in other important parts; and yet an accurate knowledge of the condition of the various organs connected with the formation of the blood must be necessary to enable us to determine whether a malady having chiefly a local manifestation originates in an error of local or of general nutrition. Until, therefore, we have carefully scrutinised all the glandular structures, we

cannot be certain that the predisposing causes of the so-called malignant action may not lurk in imperfect or perverted actions of some of these organs.

The microscope has shown us no local changes which *precede* the formation of cancer; consequently we are unable to foresee and powerless to prevent its invasion. If we could discover that anatomical or functional alterations take place in tissues other than those obviously affected, a careful observation of their conditions might warn us of the approach of the disease and we might be enabled to avoid any circumstances likely to excite its development.

In many cases of cancer we can scarcely account for the death of the patient. There is no secondary formation in any important organ, and the failure in strength has been out of proportion to the amount of local mischief, so that we are forced to admit either that the blood has been infected, or that some fatal change of a non-cancerous nature has occurred in the viscera.

But if all the laborious investigations into the nature of cancerous tumours have left us still ignorant of their causes, and of any structural changes preceding their formation, and if in many cases the cause of death is not apparent, is it not probable that the medical practitioner will derive more advantage from a knowledge of the changes which may be found to take place in the *vital organs* than from further inquiries directed exclusively to the locally diseased tissues?

I have, in the following paper, stated the results obtained from the microscopic examination of the stomach in fifty-seven, and of the intestines in twenty-three, cases of cancer.

In addition to the ordinary difficulties attending anatomical investigations, the liability of the stomach to peculiar post-mortem change has tended to produce differences of opinion amongst pathologists respecting the explanation of the morbid appearances that are to be found in this organ. Thus, Dr. Handfield Jones,¹ in an important paper in which he first drew attention to the pathological anatomy of the

¹ 'Medico-Chirurgical Transactions,' Vol. XXXVII.

stomach, describes *destruction of the secreting tubes* as of frequent occurrence. He attributes it to the pressure of "nuclear masses" (which he believes to originate in degenerative changes) situated below and between the tubes.

Dr. Fox,¹ on the other hand, in an interesting communication to this Society, whilst admitting the frequency with which the stomach is affected in various diseases, attributes the morbid changes *entirely* to inflammation, and states that he only met with one case in which nuclei were present below the tubes. I have constantly found the "nuclear masses" mentioned by Dr. Jones,² and I feel quite sure they were not the result either of accident or decomposition, since in every case the mucous membrane was previously hardened either by spirits or chromic acid, and in many instances the post-mortem examinations were made in the coldest months of the year, and in an unusually short time after death. I have not, however, found the gastric tubes destroyed in the splenic or middle regions of the stomach in non-cancerous diseases so frequently as Dr. Jones; but I have usually observed, in addition to the "nuclear masses," the appearances of chronic catarrh as described by Dr. Fox.

I have to regret that in the following cases I am unable to give the history of each patient and a description of the peculiarities of the local disease, or to report the manner in which digestion was performed during life. My opportunities make it necessary that I should limit myself to detailing the changes I have observed in the mucous membrane of the stomach and intestines.

Cancer of the Breast.

OBSERVATION 1.—A woman, æt. 62, died of cancer of the breast in the Middlesex Hospital,³ February 7th, 1865. The mucous membrane of the stomach was everywhere thin, es-

¹ 'Medico-Chirurgical Transactions,' Vol. XLI.

² In accordance with his views, I have described them as enlarged solitary glands.

³ To avoid repetition, it may be stated that all the observations mentioned in this paper were made upon patients who died in the cancer wards of the Middlesex Hospital.

pecially along the smaller curvature ; it was smooth, but much injected in patches. Along the greater curvature it was rather thicker, adherent firmly to the subjacent coat and mammillated. In this part the tubes were united together, and the spaces between and below them were loaded with nuclei and cells, nuclei also being everywhere visible in the muscular coat. The solitary glands were greatly enlarged, and mostly empty at the centre, but at their edges they presented thick layers of cells and nuclei. In the more wasted parts of the mucous membrane the remains of the tubes appeared as bulbs, or as irregularly shaped masses of fat and broken-up gastric cells, or as lines of fatty matter so small as to resemble blood-vessels, whilst their interspaces were occupied by fatty and granular matters. In some places no remains of the solitary glands could be perceived ; in others elongated cavities surrounded by thin layers of nuclei and cells marked their former position. The muscular coat seemed to consist of little else than fibres. The duodenum was large, but to the naked eye showed no appearance of disease. Examined microscopically, Brunner's glands were seen to be enlarged and loaded with nuclei and fatty cells. The intestinal villi were normal.

OBSERVATION II.—A woman, æt. 37, died June, 1863. The mucous membrane of the stomach was very thin, and much congested in parts. At the cardiac end it was everywhere sprinkled over with small white spots about the size of a pin's head, that looked, but did not feel, as if raised above the surface. In this portion of the organ the membrane was converted into fibrous tissue, fat, and granular matters, whilst the tubes had disappeared or their remains only could be recognised as faint lines of fatty matter. The muscular tissue was thickened and fibrous, and the blood-vessels seemed very large and in many cases thickened and opaque. In a small portion of the organ the tubes could be distinguished, but they were firmly adherent to each other, and were filled with granular matter and a few large gastric cells.

OBSERVATION III.—A woman, æt. 43, died in July, 1863. In one part of the middle region of the stomach, the mucous membrane seemed hard and fibrous. The solitary glands were in some parts enlarged and the tubes distorted or withered, as in Observation i, but in other parts, although the solitary glands were not apparent, the tubes were firmly adherent to each other, their basement membrane was thickened, and the connective tissue between them and the muscular coat increased. The openings of the tubes on the free surface were larger than usual.

OBSERVATION IV.—A woman died August, 1863; no post-mortem digestion had taken place. In the cardiac region the tubes were greatly wasted, and for the most part their closed ends only remained. They were firmly united in every other part of the stomach, their interspaces being occupied by nuclei, as in Observation i. The gradual conversion of tubes into bundles of fibre was observable at many points.

OBSERVATION V.—A woman died August, 1863. In the smaller curvature of the stomach, no indication of tubes existed, excepting here and there a bulb surrounded by thick fibres; the whole of the structure being composed of cells, nuclei, and fibres. In the cardiac region the tubes were in a similar condition. The solitary glands were in many places very large, and loaded with cells and nuclei.

OBSERVATION VI.—A woman, æt. 63, died December, 1863. The stomach contained torulæ in large quantities. The mucous membrane was remarkably thin, but much congested; along the lesser curvature were patches of a white opaque appearance. The tubes could be easily recognised, but contained only small cells; between and below the tubes the spaces were loaded with nuclei.

OBSERVATION VII.—A woman, æt. 63, died December, 1863. The stomach was extremely thin everywhere, but

especially so in the cardiac region, which was not digested. A broad band of dense white tissue ran along the smaller curvature for two thirds of its length; excepting this the middle and pyloric regions were of a dark gray colour. The tubes could be distinguished in some parts of the cardiac region, but were united together, whilst in other places they were converted into bundles of fibres. In the white band no remains of tubes were visible, the whole tissue appearing to consist of fibres and granular and fatty matters. In the gray parts the tubes were firmly adherent, and intermixed with cells and nuclei. The solitary glands were much enlarged and filled with cells and nuclei.

OBSERVATION VIII.—A woman, æt. 60, died January, 1864. The mucous membrane of the stomach was exceedingly thin and pale, but not digested. Towards the cardiac end the remains of the tubes appeared only as confused masses of fat and granular matter, and the membrane itself seemed opaque and granular. In other parts the tubes were firmly connected together, and their basement membrane thickened, whilst within and around them were cells and nuclei from $\frac{1}{3000}$ to $\frac{1}{4000}$ of an inch in diameter. Few normal gastric cells could be seen, but the solitary glands were greatly enlarged and filled with the same cells and nuclei.

OBSERVATION IX.—A woman, æt. 75, died July, 1865. The mucous membrane of the stomach was not atrophied; the tubes were adherent to each other, their interspaces being occupied by nuclei and cells. The tubes contained gastric cells, generally of a small size.

In all the above cases the appearances were similar. In all except one the mucous membrane was much wasted, chiefly at the smaller curvature and splenic regions; in one instance, in which I weighed the mucous membrane, it only amounted to 360 grains; it was usually congested in irregularly shaped patches, and the veins were generally of large size. When examined by the microscope they all pre-

sented evidences of disease, which were most perceptible where the membrane was thinnest. In the earliest stage of the disease the solitary glands were enlarged and filled with cells and nuclei; the gastric tubes and sometimes the muscular fibres were displaced by these bodies, which were also scattered everywhere through the membrane; the tubes adhered firmly to each other, but still contained normal gastric cells. Later, the solitary glands appeared empty in the centre, but surrounded by thick layers of nuclei; the tubes could no longer be traced in their whole extent, but could be recognised only as bulbs filled with fatty cells, or as lines of cells, whilst the whole tissue was obscured by fatty and granular matter. In the last stage the solitary glands had disappeared, and the tubes were replaced by fibres, the replacement of glandular structure by fibre being the ultimate metamorphosis.

These anatomical changes seemed to have produced a concomitant decrease of functional power. Post-mortem digestion seldom occurred even in the summer, and in one case, in which I digested ten grains of albumen for eleven hours in an acidulated infusion of the mucous membrane, only six tenths of a grain were dissolved.

In the next cases, although no nuclear deposits were present, the structure of the stomach was seriously injured by an increased formation of fibrous tissue.

OBSERVATION X.—A woman, æt. 56, died in August, 1864. The mucous membrane of the stomach was exceedingly thin. At the greater curvature was an irregularly shaped puckered patch of thin membrane, about three inches long by one in width, and from this projected fibrous bands in different directions, but not so well marked as is usual in a cicatrized ulcer: there was no change in the shape of the stomach. At the puckered part the membrane was pale, but on every side it was greatly congested. Where most contracted the mucous membrane seemed to be converted into a very thin layer of fibres, intermixed with a few cells; in other places the tubes appeared to be drawn in a

longitudinal direction, and were in process of conversion into fibres, the cells being absorbed and the thickened basement membrane constituting the fibrous bundles. Along the smaller curvature the tubes were easily distinguished, filled with gastric cells, but adherent to each other, their basement membrane being much thickened and the connective tissue below and between them greatly increased.

It might appear doubtful whether the appearances in the above case were not caused by the cicatrix of an ulcer, but the great extent of the contraction without alteration in the shape of the stomach itself seems to forbid the supposition. Degeneration was in progress in all parts of the organ, and in cases of simple ulcer of the mucous membrane I have not usually found much structural alteration at a distance from the sore.

OBSERVATION XI.—A woman, æt. 55, died January, 1865. The mucous membrane of the stomach was very thin, but not digested. In the middle and splenic regions the tubes could be distinguished, but were firmly adherent to each other; their basement membrane was much thickened, and they contained large fatty gastric cells; the solitary glands were not enlarged. The connective tissue below them was greatly increased, and the muscular coat seemed fibrous.

Although I did not detect any enlarged solitary glands in the two foregoing cases, nuclei were everywhere dispersed in Case x, whilst in Case xi there were scattered nuclei in the cardiac and middle regions.

In both of these cases the mucous membrane was very thin; in Case xi twenty grains of it carefully dried were digested in ether, and lost 32·8 per cent. in weight. But, as the average amount removed by ether in five cases dying of other diseases was only 12·6 per cent., it is evident that in the cases just narrated considerable amount of fatty degeneration must have taken place.

Eleven grains of solid albumen were digested in an acidulated infusion of the mucous membrane of Case xi for twelve hours, and, although the albumen became translucent at the edges and

softened, it gained one grain in weight. As the average solution of albumen in similar experiments in cases dying of other diseases amounts to four grains, it is plain that the functional activity of the stomach in Case xi had been greatly diminished.

In the next four cases no serious disease of the gastric tubes could be observed by the microscope.

OBSERVATION XII.—A woman, æt. 60, died in November, 1864. The mucous membrane of the stomach was remarkably thin. The tubes were distinct and readily separated, but were loaded with granules and fatty epithelium.

OBSERVATION XIII.—A woman, æt. 50, died January, 186-. The mucous membrane was very thin, weighing only three and a half drachms. *Torulæ* existed in great numbers in the contents of the stomach. The tubes could be easily separated, but were chiefly filled with granular matter.

OBSERVATION XIV.—A woman, æt. 49, died July, 1863. The stomach was quite undigested, although that of another person who died the same day of another complaint was extensively acted upon by the gastric fluid. The mucous membrane was everywhere very thin, and the blood-vessels were greatly enlarged. The tubes seemed healthy, and contained cells. The duodenum was very granular, and Brunner's glands were much enlarged.

OBSERVATION XV.—A woman, æt. 59, died January, 1865. The stomach was deeply congested, and the veins were very large. The tubes could be easily separated, but the gastric cells were large and fatty, breaking down with the least pressure.

In none of these four cases was there any evidence of structural disease in the stomach, excepting in the softness of the gastric cells, and the unusual amount of granular matter; but in Case xiv the duodenum was very granular, and its vessels large and injected. Although three of them presented the usual thinness of the mucous membrane, in one this membrane weighed nearly the average, viz., 720 grains.

In one case ether removed 19·1 per cent. of weight, showing that some amount of fatty degeneration had taken place. In two cases, in which artificial digestion was tried, there was a mean loss of 4·8 grains of albumen; so that, as far as pepsine was concerned, there had been no deficiency.

It will be remarked that the state of the pyloric region has not been mentioned in the foregoing cases. All reference to it has been omitted on account of the frequency with which this part of the stomach presents morbid changes, especially at and after middle life.

But, it may be asked, if disease of this part so constantly exists, apparently without any constitutional affection arising therefrom, are we justified in supposing that a similar condition of the splenic and middle regions is likely to produce more serious results? I think a consideration of the comparative extent and activity of these different regions will enable us to decide the question. In nineteen cases of death from other diseases than cancer I found the average weight of the mucous membrane of the middle and splenic regions to be thirteen drachms, whilst that of the pyloric only amounted to two drachms. In seventeen instances artificial digestion was tried with mucous membrane taken from each region, and the average amount of albumen dissolved by two drachms of the pyloric was only 1·4 grain, whilst by two drachms of the middle and splenic it was 3·1 grains. In bulk, therefore, the pyloric did not constitute one seventh of the whole membrane, and the material of which it was composed had little more than one third of the digestive power of the more active portions of the organ.

The proportion of these parts also varies according to the age of the individual; thus, of five cases who had died under twenty-five years of age the pyloric formed only 11·9 per cent. of the whole mucous membrane, whilst of fourteen above that time of life it amounted to 16·4 per cent. We may, therefore, conclude that when the growth of the body is fully completed the pyloric region normally undergoes some alteration of structure, and thus the anatomical changes so frequently found in it may not effect nutrition.

But is the amount of disease as just described in the splenic and middle regions of the stomach greater than is usual in other complaints? Out of one hundred cases, exclusive of cancer, I found seventeen in which the gastric tubes in these regions had undergone considerable morbid changes, and Dr. H. Jones relates that in fourteen (of which two were persons who had died of cancer) the tubes in these situations were implicated to a great extent. As will be afterwards seen, the diseases in which this most frequently occurs are phthisis and certain heart and liver affections. Of the first of these, according to my own observations, 33 per cent., of the second 50 per cent., and of the last 50 per cent., presented appearances of chronic catarrh in the splenic and middle regions. But as in 75 per cent. of the cases of cancer of the breast the gastric tubes in the middle and splenic regions were extensively diseased, it is evident that this cannot have been a mere accidental complication.¹ In no disease have I seen the secreting tubes so greatly destroyed as in cancer of the breast; in other diseases the changes are usually limited to thickening of the basement membrane, increase of the connective tissue, enlargement of the solitary glands, and alterations in the epithelium; whilst in many of the foregoing cases of cancer all trace of the tubular structure had disappeared from a large extent of surface, or only masses of fatty cells remained to point out its former situation. Again, in cancer of the breast, the mucous membrane is usually atrophied and fatty; but in cases of diseased heart and liver it is thickened, and the epithelial cells are increased in size and number. These morbid changes have, doubtless, resulted from different causes, as will appear more clearly on examining the following table, which contains the causes of death of those persons in whom the tubes were seriously affected in the splenic and middle regions of the stomach, according to the observations of Dr. Jones and myself. I have also added the observations of Dr. Fox, although he includes all cases of chronic catarrh, whether limited to the pyloric region or not:

¹ I have since examined two other cases, in both of which the mucous membrane of the stomach was extensively diseased.

TABLE.

	Dr. Handfield Jones.	Dr. Fox.	Dr. Fenwick.
Tubercle of lungs.....	2	9	4
Other diseases of lungs	...	3	...
Diseased heart	4	7	8
Diseased heart and phthisis	...	5	...
Diseased liver	2	1	3
Diseased kidney	4	4	...
Drunkenness.....	...	2	...
Fever	...	2	2
Other diseases	...	3	...
	12	36	17

It is evident from this table that the diseased state of the stomach is usually the result of an obstruction to the circulation of the blood, for in Dr. Jones's cases 66 per cent. in which this condition exists, consisted of diseased lungs, heart and liver; whilst in Dr. Fox's 60 per cent., and in my own 88 per cent., are to be referred to the same cause. But in cancer of the breast there is no mechanical obstacle to the flow of blood through the mucous membrane, and the frequency with which it is diseased must therefore arise from some other circumstance than that usually producing gastritis.

The bulk of the whole mucous membrane of the stomach varies according to the sex; thus, in six females who had died of other causes than cancer, the weight, on the average, was 730 grains; but in twelve males it was 1027 grains. Again, it varies according to age; thus in four males from twenty to twenty-five years of age the average weight was 1130 grains, in eight above that period of life it was only 1008 grains.¹

As cancer is most frequent in the female, and the liability to it increases with age, it would be interesting if we could ascertain whether the mere loss of bulk observed in

¹ In these cases the mucous membrane was in a moist condition.

three of the cases in which there was no structural disease of the mucous membrane had been sufficient to produce any effect on the general health.

Cancer of the Uterus.

In only three out of twenty-four cases was there any serious change in the mucous membrane of the stomach similar to that described as so often occurring where the disease had affected the breast.

OBSERVATION XVI.—A woman died in August, 1863. One part of the mucous membrane of the middle region showed no remains of gastric tubes, the whole tissue was white, opaque, and loaded with nuclei. In another part the tubes could be distinguished, but were firmly united together, their basement membrane being much thickened and the spaces between and below them loaded with nuclei.

OBSERVATION XVII.—A woman, æt. 30, died February, 1865. A large hard ulceration, but which showed no appearance of cancer, was found in the middle region near the pylorus. In the splenic region the mucous membrane contained only a few bulbs as the remains of gastric tubes; the solitary glands were enlarged, and the whole tissue was loaded with cells and nuclei.

In another case there was a large hard patch of thickened tissue, like the cicatrix of an old ulcer, and the secreting tubes in every part of the organ were much diseased.

In five other cases the anatomical condition was of a different character; the tubes were easily distinguished, but were very soft; they adhered to each other and to the muscular layer by very fine fibres, and they usually contained transparent cells. The blood-vessels were generally congested, and the surface of the membrane was covered by a considerable quantity of mucus. From the fact that inflammation between the gastric tubes usually terminates in other cases in

their adhesion to each other, and from the congestion of the blood-vessels, I suspect the above cases to be of the same nature as those next to be described, excepting that chronic inflammation had taken place.

In sixteen cases the anatomical characters were as follows :—The tubes could be readily separated from each other, but the basement membrane was exceedingly thin; the tubes contained gastric cells, more transparent than usual, breaking down into granular matter with very slight pressure. The mucous membrane was but little diminished in bulk, the average of three cases being 660 grains; it was very pale, but this, I think, is not entirely to be attributed to the discharges produced by the local disease, for in cases in which the connective tissue was increased it did not exist to the same extent. In some instances the tubes seemed bathed in an albuminous fluid; in others the membrane cut as if gelatinous, and in but few instances did spirit or chromic acid harden the membrane as is the case in its normal condition. The chemical composition likewise varied; in one case the softness seemed to be connected with an increased deposition of fat to the extent of 33·5 per cent. of the entire substance; in another there was nearly 50 per cent. of albumen, whilst in a third with a small proportion of fat and albumen there was a large excess of gelatine. It is difficult to estimate the effect these changes had produced upon the function of the organ. As a general rule, post-mortem solution was not common, but I have met with it in a few cases, and chiefly, I think, in those in which the change in the membrane was of a fatty character. In nine cases artificial digestion was tried, and in one 3·7 grains of albumen were dissolved; in the remaining eight, although the albumen was softened, no loss of weight had taken place.

Whether, therefore, we choose to refer the loss of pepsin¹ to an alteration of structure or to the anæmia consequent on

¹ Some of these specimens had been kept for some weeks in spirit, but artificial digestion was readily effected by the mucous membrane of stomachs of other cases than cancer which had been similarly preserved for the same length of time.

the cancer, there can be little doubt that during life digestion must have been imperfectly performed.

As 75 per cent. of the cases of cancer in the breast and only 12 per cent. of the cases of cancer in the uterus presented morbid changes in the mucous membrane of the stomach, it is probable that the nature of the cancer affecting these organs respectively is different. This opinion is strengthened by the fact that I cannot call to mind a single case in which both the breast and the womb were simultaneously diseased.

The remaining cases in which the condition of the stomach was carefully examined are grouped in the following table according to the site of the cancer :

Cancer of other parts than the Breast or Uterus.

	Sex.	Age.	Condition of stomach.
Cancer of tongue	Male	50	Enlarged solitary glands; tubes united, and in places atrophied.
	Male	...	Enlarged solitary glands; tubes united; large perforating ulcer.
	Male	...	Tubes normal.
Cancer of stomach	...	...	Tubes in some places united.
	...	...	Tubes extensively diseased.
Cancer of rectum	Female	54	Tubes united by fine membrane.
	Male	26	Enlarged solitary glands; tubes diseased.
Cancer of groin, penis, and bladder	Male	...	Great thickening of connective tissue, with adhesion of tubes.
	Male	72	Tubes normal.
	Male	50	Tubes normal.
Cancer of glands, bones, skin, and lungs	Male	71	Tubes normal.
	Female	59	Tubes normal.
	Female	...	Tubes normal.
	Male	82	Tubes normal.
	Male	...	Tubes normal; connective tissue increased.
	Female	45	Enlarged solitary glands; adhesion of tubes.
	Male	29	Tubes normal.
	Male	43	Tubes normal.

I have mentioned a case (Observ. xvii) in which a large ulceration had formed in the stomach in a person suffering from cancer of the uterus, and it will be observed that a similar lesion occurred in a patient affected with cancer of the tongue. In both, the connective tissue below the muscular coat was greatly thickened, and this condition was also present in another case of cancer of the bladder, in which although no ulceration had taken place, pus cells were found in and the mucous membrane.

The class in which disease of the stomach has been most rare is that composed of cancerous affections of the skin, bones, and glands.

As the changes in the stomach are most frequent in cancer of the breast, the organ in which scirrhus is most common, and least frequent in cancer of those organs which are especially liable to the attacks of the softer varieties of the disease, it is, I think, probable that the alterations in the gastric tubes will be found to coexist only with the harder forms of malignant growth.

From the similarity of the intestine in structure to the stomach, we might expect to find anatomical changes in it also. In the earlier examinations I unfortunately neglected to investigate the condition of the intestine, but in the last twenty-three subjects, in which I have minutely examined it, I have usually found it diseased.

An increase in the quantity of nuclei in the intestinal villi was observed in Cases x, xi, and xiv. When this form of disease was present the mucous membrane was usually more firm than in its normal condition. The nuclei were very prominent and distinct, there was generally a deficiency of granular matter, and the basement membrane was often thickened. Brunner's glands and the intestinal tubes often presented similar changes, their cells being intermixed with nuclei. In Cases i and ix, and in a case of cancer of the uterus, the villi were exceedingly fibrous, and looked wasted. The fibres were disposed in a direction parallel to the long axis of the villi, and between them were lines of

prominent nuclei. In some instances the ducts of Brunner's glands were greatly thickened and enlarged.

In Case xv, and in two cases of diseased uterus, fatty degeneration of the mucous membrane was present. The appearance of fat was not the result of digestion, for Brunner's glands presented a similar condition. The villi were very thin and transparent, and so soft as to be crushed with the least pressure. Small globules of oil were diffused everywhere, and in many parts the intestinal tubes were either absent or the remains only of their closed ends were visible.

The most common morbid appearance was a dark condition of the villi; indeed in only three cases out of seventeen where no disease of the stomach existed was this change wanting, but where the stomach and villi were loaded with nuclei it did not present itself excepting to a small extent in one case; in two out of the three exceptions the mucous membrane was in a soft fatty condition. To the naked eye the mucous membrane appeared in many cases of a uniform dark hue, whilst in others the colour was more intense, and the villi could be readily distinguished as minute black spots. When examined by the microscope the villi were seen to be loaded with dark cells and nuclei, which were in greatest numbers at the free ends, but often extended the whole length. In some instances the villi were universally coloured by dark spots of an irregular form; occasionally they were loaded with a fine, dark, granular matter, and, in two or three instances, I think, I detected minute crystals in their interior.

I need not say that the dark appearance of the villi is not peculiar to cancer; it has been described by other observers than myself. I have met with it chiefly in fever, but as I have never found it in men who have been killed by accident, and once only in upwards of 100 dissections of wild animals, we may assume that it indicates an important alteration in the intestine.

The similarity in the appearances presented by the villi in typhus and cancer is of great interest, tending, as it does, to support the opinion of Rokitansky on the analogy between

typhous deposits and carcinoma. Thus, in his conclusions respecting typhus, he states, "The product of typhus presents in its first, but still more in its later stages of metamorphosis, the greatest analogy with cancerous growths, and more particularly with medullary cancer."

I have often seen oil-globules in villi thus affected, so that, as far as the mere absorption of fat is concerned, their functions are not destroyed. We know, however, that the albumen of the chyle undergoes changes in its passage through the lacteal system; and as many of the softer forms of cancer seem to consist chiefly of this substance, it is, I think, probable that a morbid condition of the villi is connected with functional changes of an important character.

It will be observed that out of fifty-seven cases of cancer the stomach was seriously diseased in twenty-one, or in 37 per cent.; and that in nineteen cases in which the intestines were examined, and in which the gastric tubes were normal, morbid changes were detected in eighteen, so that we have reason to suppose that few cases of cancer die in which serious anatomical change of a non-malignant nature is not present in some part of the digestive canal.

But the important question arises, what relation have these conditions of the mucous membrane to cancer? Are they produced by it? Are both the results of a common cause, or does cancer originate from the disease in the digestive organs? Although I think the information we possess is insufficient to answer these inquiries, a few observations upon them may, perhaps, be useful.

With regard to the first question, it may be remarked that the changes in the stomach are most striking in cases of cancer of the breast, the form of cancer in which operation is most frequently resorted to, and in which, consequently, the local disease has a shorter time to infect the system. In many of the foregoing cases the alterations in the gastric tubes were most advanced when the amount of cancerous disease was small, and confined to the neighbourhood of the breast. When we couple with these considerations the fact that the alterations in the digestive canal are not peculiar to

malignant disease, we can, I think, only conclude that they are not produced by the action of the tumour.

The degeneration of the arteries that so frequently accompanies cancer would seem to show that a common cause is likely to have produced the degeneration, as well as the changes in the digestive tube and the cancer itself. When the nuclei and fibres are developed in the stomach even the smaller arteries of other parts are often found hard and rigid, whilst in cancer of the uterus atheromatous deposits in the aorta are frequently met with; but, on the other hand, fibrous and fatty degeneration of the liver and other organs are of everyday occurrence without the development of cancer, and there seems no reason if the disease in the arteries, stomach, and breast originate from a common cause, why other organs should not be, at the same time, implicated.

In favour of the theory that the changes in the digestive canal act as *predisposing* causes of cancer is the circumstance that the cancerous material appears to consist of an altered form of albumen, and we might, therefore, reasonably suppose that disease in the organs whose office it is to prepare this material would have a tendency to produce an alteration in its qualities. In addition to this is the fact that different parts of the digestive canal seem to be affected in various degrees, according to the organ in which the cancer exists.

But, at whatever conclusion we may arrive, a knowledge of the frequency with which diseases of the digestive organs present themselves in cancer cannot fail to prove useful to the practitioner. He will see in these alterations in the blood-making organs an explanation of the anæmia that so often ushers in and accompanies malignant disease, and he will be encouraged to hope that means may be discovered to arrest the progress of these alterations or obviate their effects upon the system. If further inquiry should teach us that certain varieties of gastric and intestinal disease always co-exist with particular forms of cancer, the state of the digestive organs will have to be considered in determining the advisability of operation, as success must depend upon the condition of the internal organs.

In conclusion, I beg to thank the surgeons of the Middlesex Hospital, Messrs. Shaw, De Morgan, Moore, and Nunn, for their liberality in granting me the opportunity of examining the foregoing cases of cancer. I have also to thank Dr. Cayley, Pathologist to the Hospital; and I am especially indebted to Mr. Nunn for the assistance and advice he has afforded me in the course of my inquiries.

DESCRIPTION OF PLATES V AND VI.

PLATE V.

- FIG. 1.—*a.* Enlarged solitary glands.
b. Altered mucous membrane.
c. Muscular layer.
d. Remains of an altered gastric tube.
- FIG. 2.—Gastric tubes in process of being transformed into fibres.
a. Gastric tubes drawn from their natural perpendicular position.
b. Tubes in state of transformation into fibres.

PLATE VI.

- FIG. 1.—Gastric mucous membrane changed into fibres.
a. A few scattered cells.
b. Remains of muscular layer.
c. Elastic fibres.
- FIG. 2.—Intestinal villi in cancer.
a. Thickened basement membrane.
b. Nuclei.
- FIG. 3.—Ditto. Villus in a state of fatty degeneration.
- FIG. 4.—Ditto. Villus loaded with pigment.
a. Pigment.
b. Oil-globules.

Fig. 2, 3 & 4, x 250 Diameters.