

**Contributions to the pathology of the glandular structures of the stomach /  
by William Fox, M.D. ; communicated by A. B. Garrod.**

**Contributors**

Fox, Wilson, 1831-1887.

Garrod, Alfred Baring, 1819-1907.

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CONTRIBUTIONS 22  
TO THE  
PATHOLOGY  
OF  
THE GLANDULAR STRUCTURES  
OF THE  
STOMACH.

BY  
WILSON FOX, M.D., B.A. LOND.,  
OF NEWCASTLE-UNDER-LYME,  
PHYSICIAN TO THE NORTH STAFFORDSHIRE INFIRMARY.

COMMUNICATED BY  
A. B. GARROD, M.D.

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1858.

# THE CLARENCE

BY  
J. H. CLARENCE

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*Communicated by* DR. GARROD.

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THE great frequency of derangements in the functions of the stomach, apparently unassociated with those corresponding changes in organic form which microscopic investigation has aided so largely in revealing to the pathologist, has long been a stumbling block to those whose attention has been occupied with the disorders of the digestive process; and it has become an urgent desideratum, for the progress of our knowledge of these complaints, that the symptoms which they exhibit should be connected as far as possible with anatomical conditions, an acquaintance with which—serving as they do, in the state of health, as a foundation for the laws of physiology—must also, in disease, be recognised as the basis and stepping-stone to the pathology of the changes induced by morbid action.

The medical profession is greatly indebted to Dr. Hanfield Jones, for having been the first to offer an elucidation of this problem ; since, with the exception of a paper by Dr. F. Schäpfer, published in vol. vii of Virchow's 'Archivs' there is little to be found in the numerous treatises on disorders of digestion relative to the actual anatomical state present. Dr. Habershon, in his recent admirable work on the alimentary canal, appears to have partially adopted Dr. H. Jones's views, and I am indebted to him for a hint as to the mode of making preparations of the mucous membrane for the microscope, which (with a slight modification) I have found of great service, and have invariably adopted.

While at Berlin during the past winter, I resolved to avail myself of the unusually great opportunities for a research of this nature afforded in the Pathological Institute attached to the Charité Hospital, under the direction of Professor Virchow, to whom I shall ever feel myself gratefully indebted, not only for the liberality with which he placed the requisite materials at my disposal, but also for the invaluable advice and assistance with which he has aided me in the prosecution of this inquiry. The statements which I have here to bring forward are based upon the notes of observations made upon 100 stomachs, taken indiscriminately from the bodies of patients brought for post-mortem examination. I have examined many more, but rejected all those made at an earlier period, before I had fully satisfied myself of the exact anatomical structure, and, (what is of equal importance in structures which suffer so rapidly from cadaveric change), of the nature of the alterations induced by decomposition. To these I shall have occasion hereafter to refer, and I will here only premise, that it is only in rare instances that conclusions can be drawn with certainty from the condition of the fundus of the stomach after death, which, in a very large proportion of cases, is more or less acted on by the contents of the organ, and in which decomposition sets in at a very early period.

It has been a cause of regret to me, that the nature of my engagements prevented me from instituting any accurate

comparison between the post-mortem appearances here recorded and the symptoms of the patients during life; this was, however, impossible, and I can only hope that I may be found to have contributed, in some degree, in aiding to lay a foundation for further clinical and pathological inquiry. The mode of making preparations for the microscope which I have followed, has consisted in stretching the stomach over a large cork by means of pins, and then making sections in any part which I wished to examine by means of a Valentin's knife. These can then be removed by means of a fine forceps and scissors, and spread out under water (pressure with the covering-glass being carefully avoided). I have found this plan, proposed by Dr. Habershon, preferable to that adopted by Dr. H. Jones from the fact that it gives a thin and uniform section, and is also much less liable to crush and injure the natural arrangements of the parts.

The morbid condition to which I would first direct attention, as affecting the glandular structures of the stomach, is that known under the name of recent or acute catarrh. The alterations which the glands undergo in this state have been but little noticed by writers on this disease, who have principally studied the nature of the altered secretion and the appearances which the membrane presents to the naked eye.

The characters of the mucous secretion found post mortem on the surface on the stomach are very variable, and depend, I believe, in many cases—(1) on the physiological rather than on the pathological state preceding death; and (2) on chemical changes taking place in the contents, either as the result of spontaneous decomposition, or from this cause combined with the action on it of other decomposing substances which may be accidentally present.

During the act of digestion the whole surface of the stomach is covered with a tenacious "mucus," containing both spheroidal and columnar epithelium, free nuclei, and molecular matter, held together by a tough translucent substance, which becomes opaque on the addition of most acids, the histological elements forming, however, a large proportion of the whole. It is very frequently found in large quantities

where the stomach is almost empty, and has in these cases an alkaline, neutral, or faintly acid reaction to test paper, and is often unaccompanied by any morbid change in the finer structures. In other cases, where decomposing food is present, we have also a mucus which has still a high degree of tenacity, but much more fluid, and sharing with the other substances present in a highly acid reaction, while the histological elements are much less distinct. An alkaline or neutral mucus has been found by Donders in a considerable number of stomachs of animals killed while fasting.

I am inclined to the opinion that no important conclusion can be drawn, as to the pathological condition of the membrane, from the simple presence of this mucus. In some cases, where the microscopic appearances have convinced me that catarrh was present, this mucous layer was of a pale colour, though I believe such cases to be exceptional; and where a recent catarrh of any intensity affects the membrane the secretion is generally found post mortem tinged of a reddish hue, owing to the escape of hæmatin from the overloaded vessels. The mucus, even when pale, has, however, in these instances a peculiar "glassy" translucent character. I am not prepared to say that I consider this as diagnostic of the condition in question, but it certainly has in many cases a look differing from the ordinary layer found on the surface of healthy stomachs.

The naked-eye appearances of recent catarrh have been so fully described by numerous observers, that I need not dwell upon them here. Injection, as shown by redness of the surface and fulness of the veins in the submucous tissue, indicating a state of hyperæmia, thickening of the membrane, and unusual prominence of the orifices of the glands—all contributing to produce a swollen appearance—are its most marked characteristics; but the latter alone is by no means distinctive, nor is the condition first observed and described by Louis (the *état mamelonné*) specially limited to this affection, but is met with in a great number of cases where no changes can be found in the glands. Dr. H. Jones be-

believes that it is occasionally caused by a series of atrophied spots, produced by a condition which he describes as nuclear degeneration, occurring in limited patches of tubes, and giving an appearance of undue prominence to other parts, and he draws an analogy between this state and the granular kidney, where the irregularity of surface arises, not from hypertrophy of some convolutions, but from atrophy of others. I have made sections in various directions through stomachs found in this state, and have rarely seen either marked swellings, and increase of the size or amount of contents of some tubes, or atrophy of others; but in some cases (though I have only observed this in the slighter forms of the appearance in question) it does at times appear to be associated with some increase in the connective tissue intervening between the glandular structures. This latter state I shall hereafter discuss more fully; but I may mention here, that in some of the cases where it has been most fully developed, it has been unattended with the mamillated condition. With regard to the microscopic appearances in acute catarrh, they are of a well-marked kind, and the results of my observations have corresponded very closely with the description given of them by Dr. F. Schäpfer, in the seventh volume of Virchow's 'Archiv.'

Viewed with a low power, the hyperæmic condition of the finer vessels is well seen; the smallest capillaries being often found filled with blood, which in a vertical section occupy nearly the whole of the interspaces between the tubes, or regarded from the surface show the openings of the canals surrounded by a zone of vessels. The glands are enlarged, and have an unusually dark and granular look by transmitted, and a whiter appearance than normal by reflected, light, both of which are removed by the addition of caustic alkalies. Irregular swellings are also noticed in various parts of their course. When more highly magnified, they are found filled with granular matter and epithelium; the cells of the latter being much enlarged, and much more granular in appearance than normal. The nucleus also often undergoes a considerable increase in size, and is in some cases

darkly granular. The glands lie closely packed together, and often appear to be only separated by the swollen capillaries which fill the inter-tubular spaces. The irregularities and swellings in their course are caused by groups of enlarged cells, or by accumulations of smaller ones mingled with granular matter at the dilated parts.

Dr. Schöpfer remarks, that he has not been able in these cases to find entire cells, but only molecular *débris* in the tube. In some of the cases which I have observed, and of the appearances in which I have made drawings, (Pl. I, fig. 1), the cells were remarkably distinct; in other instances they were filled chiefly with the molecular matter described by Dr. Schöpfer. Of two cases dying in the typhoid stage of cholera—a mother and a child—in the former the epithelium had in a great measure broken down, and the *membrana limitans* of the glands had disappeared in many parts, while in the latter the cells were preserved, and on being pressed out from the tubes many assumed an elongated form. The cells in some of these cases were increased from one third more to twice their normal size, and their appearance when pressed out from the glands was very peculiar and characteristic.

Many of the cells which were still entire contained numerous fat-granules, and where they were broken down fat-drops in considerable numbers mingled themselves with the granular *débris*. The cells, when present, were acted on by reagents with much greater facility than usual, but I have not found this peculiarity so marked in the other specimens of the disease which have come under my notice.

Glands in this condition have, as I have before observed, an unusually white appearance by reflected light, and present a remarkable similarity to the microscopic appearances observed in the kidney in the first stage of Bright's disease. This character is always present in some degree in the glands of the stomach, and disappears on the addition of caustic alkalies, but in the condition which I am at present describing it occurs to an unusual extent, and is very characteristic of the affection.

The varying conditions in which the cells are found are probably to be accounted for by the different stages of the disease at which they come under observation, and this may, I think, suffice to explain the difference between Dr. Schäpfer's description and my own.

The rapidity of the post-mortem changes may also be concerned in these differences. The cases of typhoid cholera to which I have alluded were probably in a more advanced stage than the others recorded, an opinion supported by the great amount of fat accumulated in the tubes, which would indicate a further degenerative change in the secreting structure.

Slighter degrees of this affection are not very unfrequently met with; the appearances to the naked eye being such, to a greater or less degree, as I have described, and a microscopical examination revealing similar alterations, but in a less marked form. The glands look more dark and granular by transmitted, more white by reflected, light, than is consistent with their normal appearances; but the epithelial cells, though granular to a degree greater than is usually observed, even in the physiological states where this is most marked, exhibit but little increase in size. Many contain double nuclei. This is sometimes, though not very frequently, observed in the human stomach, when it appears otherwise healthy, and appears to have been occasionally met with in the stomachs of animals; but I have certainly seen it most frequently associated with some of the other characters of the catarrhal condition, and it may, I think, be regarded as a sign of increased nutritive activity excited by the inflammatory stimulus.

With regard to the classes of glands affected, I have not been able to detect any marked difference in the changes of those containing a cylindrical and those whose epithelium is of a spheroidal character. Both appear to be equally implicated, though the pyloric portion of the stomach certainly suffers with greater frequency than the other regions. The cylinder epithelium appears to break down with greater facility than the spheroidal, and it is especially

in the pyloric portion that we meet with glands filled with granular débris and fat-drops. I have hitherto met with only one case corresponding to the acute gastritis of authors. It was associated with scirrhus cancer of the muscular coat, which had in some places extended through the mucous membrane. The whole surface of the stomach was intensely injected, and stained with blood. Sections were peculiarly opaque; and the glands, when persistent, were filled almost entirely with a granular débris, a series of appearances which have some similarity to those described by Dr. H. Jones in the stomachs of animals poisoned by arsenic.

With regard to the terminations of recent catarrh, the possibility of a "restitutio ad integrum" must, of course, be admitted; but a series of conditions is not unfrequently met with which I am inclined to classify under the head of "chronic catarrh," as alterations in structure which, in the present state of pathological knowledge, must, I think, be still considered as of inflammatory origin, though many modern pathologists, especially in England, are inclined to remove them from this category, and to regard them simply as the effects of degenerative changes resulting from impaired nutrition. It would be inconsistent with the object of this communication to discuss this question in its full extent, and to enumerate the reasons which still induce me to regard the alterations in question as the results of inflammation. I will, therefore, limit myself to the statement of opinion, that not only in the stomach, but in other organs, most of these changes appear to be consequences or secondary effects of the same exciting causes which in the earlier stages produce appearances to which the term "inflammatory" can be indubitably applied.

The characters observable by the naked eye are, thickening of the membrane, often irregularly, giving rise to a considerable unevenness of surface (but not in all cases identical with the mamillated condition), which appears due at times to prominence of the gastric follicles, at others to increase of the intervening connective tissue. The état mamelonné is described by numerous authors as occurring

in its most marked form in this affection ; but I have not seen it constantly present nor occurring in a greater degree than in other stomachs apparently perfectly healthy. Congestion and fine injection of the mucous and submucous tissues may or may not be present. They are not unfrequent, but cases are occasionally met with in which there is no appearance of hyperæmia. A tenacious and, with rare exceptions, an alkaline mucus, is usually found adhering to the surface. There are alterations in colour at various parts, consisting generally (and this is, I believe, the best test of a long-continued subacute, or of previously existing acute inflammatory action) of a slaty-gray discoloration of the surface, extending in patches of variable extent from one to three or four inches in diameter. The surface of the membrane has often, in many parts, a somewhat translucent appearance, and in addition, either in the prominences above alluded to, or in portions not elevated above the level of the rest of the membrane, are seen opaque, dull white spots, varying in size from that of a pin's head to a millet seed, or even attaining a greater diameter. These changes, like those before described, are found with the greatest frequency in the neighbourhood of the pylorus, and assume there the most developed form ; but they occur with considerable frequency in the cardiac portion, especially around and to the right of the œsophageal opening, where also I have found the microscopic appearances, which I shall proceed to describe, very well marked. These deviations from the normal structure appear to me to be principally of six kinds :

1. Increase in amount of the connective tissue between the glands and of the submucous tissue, with occasional fatty degeneration of the latter.

2. Thickening of the membrana limitans of the glands.

3. Fatty degeneration, or atrophy and loss of the glandular epithelium.

4. Pigmentary deposit in the tissues.

5. Cystic degenerations in the glands.

6. Occasional fatty degeneration of the vessels.

(1.) *Increase in the elements of the connective tissue.*—Dr. Schäpfer attributes to this cause the irregularities which are seen on the surface of the mucous membrane, and this has appeared to me to be occasionally the case, though it seems to be more frequently due to a condition which he has also described, viz., the prominences caused by distension of the glands themselves with the product of secretion.

With regard to the increase of the connective tissue, I may be allowed to say a few words on the fallacies to which the observer is liable in judging of its amount; and they are of several kinds. In the first place, as pointed out by Dr. Habershon, the direction of the section influences greatly the appearance presented by the object under the microscope, for if not carried in a direction perfectly vertical with the line of glands, we obtain an object in which an excessive amount of fibrous tissue appears to be present. There is also in different regions of the stomach a considerable variation in the closeness of approximation of the glands. In the immediate neighbourhood of the cardia, and also sometimes in the fundus, they are much less closely packed than in the more central parts; and near the pylorus they are aggregated into groups, separated by wider interspaces than occur between the individual glands. Frerichs mentions that this latter arrangement may occur in other regions of the organ, and I have myself observed it independently of other morbid alterations in the cardiac portion. The *membrana limitans* of the glands (as pointed out by Dr. Habershon, whose observations I have repeatedly found confirmed) breaks down with great facility, and numerous nuclei and much granular matter are thus set free in the tissue, in which, by a slight alteration in the focal distance, a deeper layer of connective tissue can be brought into sight, and the observer be led to the fallacious opinion that this is generally increased in amount. Dr. Handfield Jones describes a condition to which he has applied the term “nuclear degeneration,” as occurring with great frequency. I have met with nothing corresponding to his descriptions and figures (with the exception of one case), but such appearances

as I have above described, and which I am disposed to consider as the effect of cadaveric change. In many cases he speaks of large portions of the glandular tissue being replaced by free nuclei, imbedded in a fibrous stroma; but in the drawings which he has given of these appearances, the nuclei there represented have much more the characters of those of the glandular epithelium than of the connective tissue. I am disposed to doubt whether an independent development of free nuclei can occur under any circumstances, so as to constitute a special form of degeneration; for careful observation has shown that, in most, if not in all, the cases where such a condition has been described—as in tubercle of the lungs or other organs, the enlargement of the patches of Peyer and of the lymphatic system in typhoid fever, and in some forms of sarcoma and cancer—this appearance has been due simply to the early breaking down of the cells which contained the nuclei, by which means they have been set free, and *appear*, on examination, to form the sole constituent elements of the tissue. Such formations, with the exception of the cells of the glands of Peyer and of the lymphatic system, belong mostly to the class of heterologous products; but in the tissue intervening between the glands of the stomach we have no cause to suppose, in most of these cases, that any *new* tissue has been developed, and, if we have only to do with a simple increase of a tissue of the same type as that previously existing, that newly formed must, according to the general laws of hypertrophy, present the same characters as the old. At the same time, I must confess that I have seen one case in which the appearances bore some resemblance to the descriptions given by Dr. H. Jones. There was a great number of nuclei free in the tissue, and in one or two places collected in considerable numbers below the line of glands. These were perfect in some parts, but in others in the immediate neighbourhood they had entirely disappeared. The nuclei had a look different from those of the epithelium; they were apparently smaller and clearer, and refracted light more strongly. But the stomach was

much softened, and the breaking down of the glands, in some parts at least, left it open to the suspicion that their appearance in the fibrous stroma was due to this source. If they had any other origin, I am at a loss to explain their presence. The patient had died of extensive tuberculous disease of the lungs and intestines, and the appearance in one or two spots in the submucous tissue of the stomach resembled, under the microscope, to some degree, that afforded by miliary tubercles of the pleura in its earlier stages; but nothing of the kind could be detected by the naked eye. There was in this case a real increase of the inter-glandular fibrous tissue, and other signs of chronic catarrh. I have endeavoured to give a representation of this object in the accompanying drawing (*vide* Plate II, fig. 7). That a positive increase of the fibrous tissue between the glands does take place there can, I think, be no doubt. It then appears thickened, the glands lie further apart, and, on the addition of acetic acid, a crowd of nuclei are seen, usually appearing elongated and in much greater numbers than are ordinarily seen in these situations, where in the healthy condition little is brought into view by this reagent except the nuclei of the capillaries and a few contractile elements mingled with some elastic fibres. They correspond very closely with the elements of the submucous cellular tissue, though from the direction of the fibres stellate cells cannot be discovered. (Plate I, fig. 4.) The glands are more widely separated, but are not necessarily diminished in diameter, as there is no check to the enlargement by thickening of the membrane, and compression is not, therefore, a necessary consequence. In fact, in some cases, where this increase in the fibrous structures is met with, there seems to be a simultaneous enlargement of the glands, and I have only once been able to observe a positive diminution in the diameter of a gland in chronic catarrh, except in the instances to which I shall hereafter allude under the head of "cystic degeneration," and in the case in which it occurred there were other *enlarged* ones in the immediate neighbourhood. Whether this condition, if

carried to a higher point, would result in any extensive atrophy of the gland-tissue, I have not been able positively to determine, though, judging from the analogy of other organs in which similar changes occur, such a possibility can hardly be denied; but, except in the instance alluded to, I have neither been able to trace the loss in question, nor any intermediate stages showing a progressive diminution in the size of the glands.

(2.) *Thickening of the membrana limitans* of the glands forms a second of the series of changes induced by chronic catarrh. I do not find this condition described by any of the pathologists who have devoted their attention to these structures, though my observations leave no doubt on my own mind that such a change really exists with considerable frequency, and often accompanied with other signs of morbid change in the membrane, and more especially with pigmentary deposit and fatty degeneration of the epithelium.

There is a source of fallacy to be avoided in observations on this point, in the fact that the membrana limitans of the glands of the stomach does, like that of those in the mouth and pharynx, as pointed out by Kölliker, swell up on the addition both of acetic acid and the solutions of caustic alkalies. This reaction is not constant; but I am unable to offer any explanation of the reason why it takes place in some cases and not in others. The thickening in question may often be seen without the addition of any reagents, though it is considerably increased by them. The membrana limitans is seen under ordinary circumstances as a fine clear line around the gland, perfectly structureless, and not possessing any appreciable thickness; but, in some cases of chronic catarrh, it presents a clear double-defined outline, of a breadth easily recognisable, around the circumference of the follicle, the thickening being generally most marked at the lower end, but often traceable into the upper two thirds of the tube. The glands in which this condition occurs have often an irregular outline, presenting narrowings and contractions in their course. This thickened membrane

appears as a rule perfectly homogeneous, without a trace of structure, though I have once or twice observed a faint appearance of striation in it. The change occurs with greatest frequency in the pyloric region, and affects equally the glands lined with a cylindrical epithelium, and those containing spheroidal cells. It is met with also in the neighbourhood of the cardia, and in the glands of the small curvature. I have not found it in the fundus, nor in the left half of the great curvature. (*Vide* Plate I, figs. 4, 5, and 8.)

(3.) The state in which the epithelium of the glands is found is a variable one. It may be apparently normal, though this is extremely rare; or it may present but little alteration in appearance, except that the cells are smaller and in diminished numbers, or, may be fattily degenerated to a greater or less degree; or, finally, it may be almost entirely absent, its place being occupied by molecular débris and fat-drops. I have not seen it (except when recent catarrh has coexisted) increased in size, nor presenting the granular look, disappearing with Liq. Sodæ, which is observed in the acute affection. In the more advanced stages, complete fatty degeneration seems to be the natural course of the disease, and the state of the glands is thus illustrated by the accompanying drawing (Plate I, fig. 4), exhibiting the appearances presented by a vertical section made in the pyloric region of the stomach of a man dying of phthisis, and who for some time before his death laboured under an almost total anorexia. I am decidedly of opinion, from the progressive series of changes which I have been able to trace, that this accumulation of fat is due to a degeneration of the epithelium. In some cases, where this is most marked, the lower extremities of the glands filled out with fat-drops can alone be seen under the microscope; but I should hesitate to ascribe the disappearance of the upper portion to pathological changes. It is very seldom that the glands can be traced to the surface in a vertical section; they generally appear to terminate in a mass of cells, nuclei,

and molecular débris, at a distance of two or three lines from this,—a disintegration which I believe to result from mechanical injury, in the preparation of the object, to the already softened upper layers of the membrane; and it is very possible, when the stomach is already affected by disease, that a more rapid post-mortem disorganization may facilitate this artificial breaking down of the structure. I have not seen any considerable accumulation of fat in the interior and swelling of the epithelium, so as to give rise to any of the forms of granule-cells. They appear either to be set free or to break down before this stage is reached, and the nucleus shares early in the disintegration; at least, it is rare for free nuclei to be found in the granular and fatty débris which occupy the interior of the glands in the more advanced stages of the condition in question.

(4.) *Pigmentary deposit* is another of the appearances observed in this affection of which mention must be made, though I have but little to add to Dr. H. Jones's observations on this subject. The mucous membrane exhibits in spots of variable size, from one or two to four or five inches in diameter, a dark slaty-gray appearance. It is most marked in general at, or near, the pylorus, but occurs also in other parts, as in the small curvature, or in the central parts of the great curvature. That, in common with other forms of pigmentation, its production is due to changes in the hæmatin of the blood, little doubt can, I think, exist; and in the cases where it occurs the cause is to be found in long continued hyperæmia and congestion, attended by escape of blood from the finer capillaries, of which we have such frequent examples in the stomachs of patients suffering from obstructions to the portal or general circulation. It is not uncommonly met with coincidently with similar alterations in the intestinal tract. Its seat seems to be either superficial, or extending through the whole thickness of the mucous membrane. I have seen it, as Dr. H. Jones has described, within the epithelium of the glands, as well as in the inter-cellular tissues, and I have figured one case, where

it could be seen in the cells of the connective tissue, near the surface of the imperfectly formed villi in the neighbourhood of the pylorus. (*Vide* Pl. I, fig. 6.)

(5.) *Cystic degeneration of the glands* appears to be a secondary result of one or more of the series of changes which I have endeavoured here to describe. This alteration has been but little noticed, but the number of stomachs in which I have met with it induces me to believe that the appearances produced by this change have been mistaken for solitary glands, similar to those of the intestine; the frequency of which, as occurring in the stomach, has, I think, been greatly exaggerated. I am somewhat at a loss to understand the description which Dr. H. Jones has given of some bodies which he has figured, and whose origin he seems inclined to ascribe to changes in the solitary glands—a class of structures with which these cysts have nothing in common; and this is the more incomprehensible to me, since Dr. H. Jones also recognises degeneration of the glands as a frequent cause of these cystic formations; though I must demur from accepting his further statement, that they originated as “*vesicles*,” which subsequently enlarge, especially since he gives no further information as to the locality or mode of origin of the vesicles in question. The solitary glands when they do occur in the stomach, have their seat below the layer of the tubular secreting structures, and are sometimes even deeply imbedded in the submucous tissue. I have only met with two indubitable instances of their presence in the stomach; but one is figured by Frerichs in Wagner’s ‘*Handwörterbuch der Physiologie*,’ art. “*Verdauung*,” and another by Ecker in the ‘*Icones Physiologicae*.’ I must also object to the term “*nuclear masses*,” which Dr. H. Jones has applied to these bodies, as inadequately describing their structure, and further tending to induce a confusion with the appearances which he describes as nuclear degeneration, though I have endeavoured to show reasons for questioning the propriety of applying even the latter term to morbid conditions of the stomach. The

glands in question, as met with in the intestine, when from their number they can be easily examined, and with which, I believe, those occasionally found in the stomach entirely correspond, are closed follicles, having a distinct capsule; and, I am inclined to believe, a membrana limitans; but their essential feature, distinguishing them from all the proper secreting structures of the intestinal tract, is the nature of their contents. These are *cells*, not nuclei (at least when fresh); but the cells are of the same character as those met with in the closed follicles of other organs, and their counterparts are to be found in the cells of Peyer's glands, in the lymphatic system, and in some of the cells of the Malpighian bodies of the spleen; in all which situations, also, the nuclei mostly exceed the cells in number, unless the part be examined perfectly fresh, as the cell-walls rupture and set free their contents with great facility.

The contents of the structures which I am about to describe are of a totally different character, being both columnar and spheroidal epithelium, corresponding with that lining the glands; and, having been able to follow sometimes in the same stomach a progressive series of changes, from the simple gland to the fully developed cyst, I feel no doubt remaining in my own mind as to their real nature. They may, after they have obtained any size, be distinguished by the naked eye as small round bodies, having a peculiar pellucid appearance, situated apparently on or near the surface of the mucous membrane, and differing also in this respect from the solitary glands, which, as before remarked, are more deeply seated. They are best seen in a bright light, falling at an angle of  $40^{\circ}$ , but are easily overlooked when the light is not good, or the search for them is not very carefully made. Their number varies greatly; sometimes only one or two can be found in the whole mucous membrane, at other times hundreds may be counted. I have hitherto met with them with a relatively much greater frequency in the neighbourhood of the pylorus, and at a distance of from one to three inches from it; but they also occur scattered, and, occasionally, in considerable numbers

in the middle third of the great curvature, extending both to the anterior and posterior surfaces. They are seen, though more rarely, in the neighbourhood of the cardia.

When examined under the microscope, they are seen, when fully formed, to be round or ovoid bodies of variable size, sometimes measuring from 0.42 millimetre to 0.5 millimetre in breadth, and when ovoid having a long diameter averaging 0.52 millimetre. They are generally enclosed in a capsule of fibrous tissue, which may obtain a thickness of 0.006 millimetre. I have only once been able to observe in a fully formed cyst any trace of a thickened *membrana limitans*; and it is only in some cases that any remains of this structure can be seen. The contents are, as before stated, of an epithelial character, either columnar or spheroidal, according to the part of the stomach in which the cyst is formed, and sometimes both kinds are met with in the same cyst, an appearance due to the constriction leading to the formation of the cyst taking place at the upper part of the follicle, which is always lined towards its orifice with cylindrical epithelium. When once thus encapsuled, the epithelial structures seem to be tolerably persistent. I have repeatedly found them perfectly preserved when the epithelium in the surrounding glands was almost entirely fatty; occasionally a few cells in a state of fatty degeneration may be seen within the cyst; but after some time the cells undergo a species of atrophy; they become very clear and transparent; the cell-wall grows thinner, until it disappears; the nucleus grows indistinct, and finally the cyst becomes filled with a clear mucus-like substance, having some resemblance to "colloid" matter, in which granular *débris* and a few entire cells still float. A slight pressure generally suffices to burst these bodies, and to set free their contents in the field of the microscope, when their nature can be further ascertained. Such is the cyst when perfectly formed; and in many cases it is almost impossible to trace its direct connexion with any remains of glandular structure; occasionally, however, the gland-tubes can be traced in continuity with them, either at the upper or lower

end ; sometimes presenting an appearance nearly normal, at others wasted to a fine thread ; occasionally a second constriction may be observed in the cyst, or in the gland at a short distance above or below it, giving rise to a second formation of the same character. (Fig. 7, Pl. I, represents these appearances.) I have, however, met with even more direct evidence of their mode of origin in an object of which I have given an illustration in fig. 8, Pl. I, being a gland undergoing a double constriction in its course. It occurred in a stomach where numerous other cysts of varying sizes were present. The gland was lined throughout by a cylindrical epithelium, though only faint traces of this were observable above the upper narrowed part, and in the lower end some fat was seen. The *membrana limitans* was thickened as far as the upper constriction, and presented a homogeneous, transparent, highly refracting, double outline. There was considerable thickening of the fibrous tissues around this gland, and also in other parts of the stomach ; and this had taken place to a most marked extent around the constricted parts. At both of these, but especially at the upper, where the lumen of the tube was almost obliterated, there was a marked striation, looking as if the *membrana limitans* were thrown into folds, or as if the growth of fibrous tissue were encroaching on this structure ; an idea supported by a somewhat indistinct appearance of elongated nuclei at this part.

In all the cases which have yet come under my notice this change was always associated with one or more of the alterations previously described, though they are not equally present at all times. There may be considerable slaty discoloration of the membrane, with but little thickening of the intervening fibrous tissue. The most constant attendant change is that of fatty degeneration of the glandular epithelium ; this may occur to a slight extent, both in the neighbourhood of the pylorus and cardia, without any other apparent morbid changes in the structure, and can scarcely be regarded, in such cases, as of special pathological importance ; but when met with to any marked extent, either

in these situations or in other parts, so as to replace the normal epithelial cells, it must be considered as morbid.

Professor Simpson, in his collected works, has described, under the title of "pellicular inflammation," a condition of the gastro-intestinal mucous membrane, attended with disturbances of the digestive functions, and consisting of a vesicular eruption, which appears to bear some resemblance to the conditions of the stomach of which I have given an account. My friend, Dr. A. R. Simpson, who first pointed out to me this paper in his uncle's writings, also drew my attention, during a post-mortem examination which he was performing, to the simultaneous occurrence of cystic formations in the stomach, rectum, and posterior part of the fauces, and more especially in the glands of the uvula. I have since met with two similar cases, and have no doubt of the true cystic character of the formations in the rectum, which I have represented in fig. 1, Pl. II. It may, perhaps, still require further observation to determine whether the changes in the upper part of the pharynx are true cysts, or simply glands distended with the products of secretion. I am inclined to the belief that the former will be found to be the case, and have, in fig. 2, Pl. II, represented one burst at the upper end; but I have not been able to trace any intermediate stages in the process of their formation. I have not been able to find anything similar in other parts of the intestinal tract, though it seems extremely probable that the glands and other structures of the mucous membrane of the intestine may be liable to the same processes of morbid change as that of the stomach. Dr. H. Jones has found the glands of the duodenum enlarged, and I have also observed the same appearance coincident with other alterations of the stomach. Professor Simpson remarks, that the patients suffering under the condition which he describes often pass masses of a white substance by stool; and in the intestine of the first-mentioned case—a patient who died of caries of the bones of the pelvis, complicated with a hydrocephalis of the left side, caused by the impaction of a calculus in the ureter—there were seen numerous white

masses mingled with the fæces, which appeared to consist chiefly of epithelium, but no other morbid alteration could be detected here.

(6.) *Fatty degeneration of the connective tissue* is not very unfrequently found associated with these alterations. Dr. Jones has described and figured these appearances, and I have met with it three or four times in the course of my observations, though not in the position in which he has seen it, viz., between the glands, but in the elastic tissues below them. The cells in this part become filled with fine granules of fat, and are at the same time somewhat enlarged, and have a very granular look, which does not disappear either with acids or alkalies. In one or two cases I have also seen associated with it a fatty degeneration of the coats of the vessels, both in the finer capillaries which pass between the glands, and also in those of the sub-mucous tissue. As far as I have yet seen, this has been associated with disease of the heart, or similar changes in the larger arteries.

Often coincident with these changes, but at other times occurring apparently independently of them, are other forms of fatty degeneration, of which some have been already noticed by writers on diseases of the stomach, though others have hitherto excited but little attention.

The most frequent of these are found as small, white, highly refracting spots, frequently of about the size of a millet-seed, scattered over the surface of the mucous membrane; they occur most frequently in the pyloric portion, but are often met with in the neighbourhood of the cardia; and, on examination by the microscope, are found to depend on a fatty degeneration of the epithelium of groups of glands, which are entirely filled with fat-drops.

Another form, noticed by Dr. H. Jones, in the fifth volume of the 'Transactions of the Pathological Society,' consists in dull, opaque, white spots, generally of about the size of a split pea, apparently quite superficial, but not

elevated above the line of the surrounding membrane ; and which, on microscopic examination, are found to depend on deposits of fat in the upper layers of the membrane, which are rendered perfectly opaque by their presence, so that their real nature can only be ascertained at the edges, where fat-drops may be seen in all parts of the tissue. In one case I was able to trace the apparent primary seat of this affection. The patient was a man who had been for some time under Professor Bichow's observation. He had first suffered from pneumonia, had subsequently an attack of parotitis and suppuration of the cervical glands, and finally died with symptoms of albuminuria. On examination post mortem, tubercle was found in the lungs ; the liver was fatty ; the kidneys presented thickening of inter-tubular substance and fatty degeneration of the epithelium ; the other viscera were healthy. The mucous membrane of the stomach was injected throughout, but more especially so in the fundus and small curvature ; the injection extended also through the left two thirds of the great curvature. The surface was covered with a tough, gelatinous-looking mucus, which was found to consist, in large proportion, of enlarged spheroidal and columnar epithelium and free nuclei. The membrane had a thickened and swollen appearance. In the middle third of the small curvature, and extending over its anterior surface into the great curvature, was a number of small hæmorrhagic spots, varying in size from a pin's point to a pin's head, and of a deep reddish-brown colour. The left half of the stomach presented all the appearances which I have before described under the head of recent or acute catarrh, viz., enlargement of the epithelium, and an abnormally granular character of their contents, irregular enlargements of the glands in their course, and fatty accumulations in scattered points. Some of the hæmorrhagic spots had the appearance of being surrounded by a whitish zone, which again passed into a more pellucid tissue. On a section being made through such a point, it was found, that while the glands at the spot where the extravasation had taken place were almost broken down, the tissue was filled with

granular débris, blood-discs, hematin-crystals, and pigment, and was stained throughout of a red colour; the glands in the whole circumference of such a spot, extending through a series of five or six outwards, were almost filled with epithelium undergoing a fatty degeneration, while external to these the tissue presented the characters before described.

In the pyloric portion the process seemed to be of older date, as shown by an extensive fatty degeneration of the epithelium of the glands, accompanied by thickening of the membrana limitans, and some, though but slight, increase of the connective tissue between them. Near the pyloric ring there was a white spot, similar to those before described, and which could be seen by the naked eye to be in the superficial strata of a thin section made with a Valentin's knife. The central parts of this spot were almost perfectly opaque, but a thin line, representing the membrana limitans, could be traced along the upper border. It was only at the sides and lower edge that the true fatty nature of the change could be recognised; and here fat-granules, some of them of a peculiar brownish colour (the origin and nature of which are questionable), were found to penetrate all parts of the tissue, and the normal elements were with difficulty, and in some cases not at all, discernible. At the lower edge a very interesting series of changes could be perceived in the cells of the connective tissue. They were seen to be enlarged and filled with fat, giving to this part the peculiar appearance of strings and stellate groups of fat-granules, crossing and interlacing with one another, while around some of them the outline of the cell-wall was still discernible. At some points there were appearances as if the coats of the arteries were also undergoing this change. Very little of the glandular structures could be seen at this spot, but their lower ends could be still detected here and there resting on the thickened corium, the cells of which also appear enlarged, and in some places fatty. The glands around were in a highly fatty condition. (*Vide* fig. 5, Pl. II.) These changes appear to me to represent a fatty

degeneration of the elements of the tissue, but commencing in what may appear an unusual manner, and specially affecting the cells of the connective tissue. It appears to lead to occasional loss of substance, which I have been able, in one or two instances, distinctly to trace to this cause, and one of which corresponded so closely with a description given of a superficial erosion by Dr. H. Jones, that I will quote his words: "The mucous surface of the stomach was thickly studded with depressions of a circular or irregular form, and varying in size from the diameter of a silver penny to one fourth of that magnitude. They were rather paler than the surrounding membrane, but many of them were dotted with black points. They existed all over the stomach, except for an inch or two near the pylorus. Their margins were not sharp cut, but evenly rounded ones. The depressions were much more translucent than the surrounding tissue, and it appeared clear that a loss of substance had taken place. In vertical sections, under the microscope, the mucous membrane in the vicinity was found to be quite healthy, the tubes perfectly natural; but in the depressed part the tubes were reduced to a mere granular débris. The basement-line of the surface was lost. There was a great deal of oily matter in the disintegrating tissue, and just beneath it. There was no particular change in the submucous tissue. The surrounding tissue passed rather abruptly into the disintegrating, and there was no deposit or morbid formation of any kind in the parts affected. No injected vessels were seen by the microscope, nor any pigimentary deposit. The change in this case seems to have been more akin to sloughing than ulceration."

In the case which I observed, the patient was a woman dying of puerperal fever. The stomach was pale; no injection could be seen anywhere. The mucous membrane was throughout rather soft; that in the fundus was already considerably disintegrated. In the central part of the posterior surface of the small curvature, extending into the great curvature, were six spots, nearly circular, varying in diameter from one eighth to three quarters of an inch, where there

was evident loss of substance on the surface of the membrane. The surface in the depressed part looked smooth to the naked eye, and the edges were evenly rounded off. There was no redness of the membrane, no injection of the blood-vessels at or around these parts. A vertical section carried through several of these showed the same appearances in all. In the central depressed part the upper part of the tubes could be traced, though faintly, through the midst of a granular *débris*; what remained of them was granular and fatty to a high degree. They retained the same character towards the edges, and scarcely a trace of epithelium could be seen in their whole course. This fatty degeneration passed gradually into the usual healthy structure, within a few lines of the edge of the depression. The other parts of the stomach were healthy.

In another case, there were somewhat similar changes, but presenting a rather different appearance to the naked eye. The patient was a man, *æt.* 26, who died of the rupture of a strangulated inguinal hernia. The other organs were healthy. The stomach was stained throughout with bile; the mucous membrane soft, but nowhere injected; its appearance to the naked eye was, on the whole, healthy, with the exception of two white spots in the central part of the great curvature, which were rather elevated at the edges above the surrounding membrane, and one of which had a cup-like depression in the centre. A third similar one was found in the small curvature near the pylorus. The appearances of these are represented in fig. 3, Pl. II. In fig. 4 the same superficial deposit of fat is seen as I have before described. The change occurred in the pyloric region, and the basement-line of the rudimentary villi is still perfect. In fig. 3, where depression existed in the centre, we find a more advanced stage of the same. The whole thickness of the mucous membrane had apparently undergone a fatty degeneration, being filled with fat-drops, which had broken down the *membrana limitans*. Among the *débris* thus produced, faint traces of the glands could be still perceived. The dark granular appearance thus produced ceased rather

abruptly on each side, but the glands for a short distance showed a fatty degeneration of their epithelium. These cases are not without interest in relation to some forms of erosion or ulceration of the stomach, which still remain involved in considerable obscurity. The principal seat of the change being in the cells of the connective tissue, suggests an analogy with some forms of atheroma—to which attention was drawn by Mr. Gulliver, in the 'Medico-Chirurgical Transactions' of 1843—in the arteries, and especially that described by Professor Virchow, under the name of "fettige usur" (and of which an account has recently been given in the 'British and Foreign Medico-Chirurgical Review'),<sup>1</sup> where the accumulation of fat in the cells of the middle coat leads to their disintegration, and finally to a loss of substance at the parts. The comparative frequency with which the condition in question is met with in cases of chronic catarrh would point to an inflammatory origin, of which this process represents the last stages, though the limited form in which it appears to occur may, perhaps, cause some doubt still to exist on this point, and render it desirable that its mode of production should be made a subject of further inquiry.

With regard to the forms of catarrhal inflammation, which I have here attempted to describe, I would venture to call attention to an interesting analogy which appears to me to be traceable between them and the acute and chronic inflammatory affections of the kidneys. The difference in structure of the two organs must, of course, give rise to some difference in the appearances presented; for the most complicated vascular system of the kidney, its more compact structure, and the long course and convoluted character of the secreting tubes, which do not so easily allow of the escape of the altered epithelium, nor of swelling taking place without producing pressure on the blood-vessels, and the various phenomena which are the secondary effects of this disturbed circulation, give rise to numerous pathological

<sup>1</sup> 'Gesammelte Abhandlungen von Rudolph Virchow,' pp. 504 et seq.

appearances in this organ which are not met with in the stomach, where the structures are simple in their arrangement, and the laxity of the tissue allows either swelling or contraction to occur, without necessarily producing such important secondary changes. In the essential characters of the affection of the glandular system, there is, however, a striking similarity. In the first stages we find increased vascularity and swelling of the tissue, which, in the kidney, produces the swollen and cloudy look by which this change is recognisable by the naked eye, and in which, under the microscope, the glands are seen to present an unusually white appearance by reflected, and a darkly granular look by transmitted, light, disappearing on the addition of alkalies, and which are found to depend on an increase of the protein contents of the secreting cells. Precisely the same change is seen in the epithelial cells of the stomach, both in the glands and in those found in the thick tenacious mucus which covers the surface. Slight amounts of fatty change are also seen in the epithelium of the glands of the stomach as in that of the kidney, even in the acute stage; but in neither does it attain a very marked character at this period. In the later stages we have a different series of alterations presenting very similar characters in both organs, viz., those affecting the epithelium and those affecting the connective tissue. The epithelium does not appear to suffer so extensively in the chronic affections of the stomach as in those of the kidney. This may be due in part to the greater facility with which it is set free, and replaced by new cells; but in both we find an alteration of the same nature, viz., fatty degeneration. That this reaches a higher point in the kidney may also, perhaps, be referable to the fact, that its nutrition is more impaired by the increased production of interstitial tissue, affecting more especially the glomeruli, and by the contraction to which this condition gives rise causing shrinking and an anæmic condition of the tissue, to which it is evident that the stomach is much less liable; but the essential character of the process in causing the development of an increased amount of the connective

tissues, is in both cases the same; it occurs in both in the membrana limitans, which thickens; in occurs in the interstitial tissue, the effect of which, in the stomach, is chiefly marked by widening of the spaces between the glands; and it is found in the tissues upon which they rest. In some cases the increased nutritive activity extends also to the muscular coat, but of this I have not met with any very striking examples in the course of my investigations, where the thickening of the coats of the organ has generally appeared to be rather due to a change affecting the corium than to a hypertrophy of the deeper structures. The cystic degenerations to which I have drawn attention complete this parallel, which, if borne out by subsequent inquiry, tend, I think, to supply another link in the history of the laws of the affection of glandular structures by the inflammatory process.

In the course of these investigations I have met with a striking instance of a peculiar affection of the mucous membrane, associated with similar changes in other organs, and produced by a form of degeneration of the tissues, which has of late attracted considerable attention, under the names of "lardaceous," "bacony," or "albuminoid," change; and in which the interest of the profession has been still further excited by the discovery of Professor Virchow that the parts so affected give a peculiar blue tinge with iodine, a reaction which has induced him to employ the term "amyloid degeneration" in describing this state.

The patient in whom the appearance which I am about to describe occurred was a woman, æt. 34, who died in an excessive state of marasmus. The liver was enormously enlarged, and showed the characteristic appearances of this disease, giving also the above-mentioned reaction with iodine; this was further found to exist in the kidneys, in the whole of the intestinal tract, in the tissue of the lungs (while the mucous membrane of the bronchi appeared free), and in the rete Malpighii of the skin. The muscles were unaffected. The stomach was everywhere pale, the mucous membrane was thin, and had a peculiar glistening appearance.

Sections made in all parts refracted light to a remarkable degree; but the change was most marked in the superficial strata, though it could not be specially traced in the coats of the vessels, where it often appears to have its chief seat, and where it was found in the *intestines* in the case in question. The whole glandular structure was, however, affected. There was hardly a trace of normal epithelium to be seen, but the interior of the glands was filled with a homogeneous mass, strongly refracting light and giving the characteristic reaction with iodine. Large masses, retaining the form of the glands, and having similar properties, could be separated on tearing the tissue with needles. The reaction with iodine was most marked towards the upper surface, but it extended also into the deeper parts. The vessels in the submucous tissue did not appear to be much affected. On the addition of Liq. Sodæ, numerous fat-drops were to be seen in the lower part of the tubes. This was most particularly the case in the cardiac and pyloric portions, but their connexion with the epithelium could not be distinctly traced. The squamous epithelium in the lower part of the œsophagus was similarly affected, but the change did not extend into the submucous tissue, and the muscular coat, both here and in the stomach, was entirely unaffected.

Had no other cause existed, the amount of marasmus in this case could be accounted for by the impairment which the digestive functions alone must have undergone, for scarcely a trace of the essential elements of glandular action, viz., the epithelium, could be found in the stomach; and from the condition of the villi in the intestine, it was reasonable to infer that the process of absorption must have suffered in an almost equal degree.

This may, perhaps, be the fittest place to mention another species of morbid alteration, of which, however, I have only observed one instance, and as to the nature and mode of production of which I must confess myself to be in some doubt; though I hope that if the attention of other observers is attracted to it, other cases may be met with tending better to its elucidation. The stomach was taken

from the body of a male patient, of about the middle age, whose history could be only imperfectly ascertained, though it appeared that he had had a large quantity of blood abstracted without apparent cause, and had taken a considerable amount of mercury for supposed syphilis.

The blood, during life, contained a great excess of white corpuscles, and the same condition was found post mortem, but no other disease could be detected. The lungs and heart were healthy; the liver was of normal size, and presented no unusual appearances; and the other viscera were healthy.

The stomach was pale; a few cysts, of the character before described, could be found in the mucous membrane. This had throughout a peculiar shining, and at the same time a translucent, appearance, which was exaggerated in limited spots, of about two lines in diameter, giving it a mottled look; while here and there were small patches of the dead opaque white colour which attends extensive fatty degeneration of groups of glands.

The translucent parts were found to exhibit, under the microscope, the appearances which I have attempted to delineate in fig. 6, Pl. II; though this was presented, to a greater or less degree, by sections made in all parts. There were seen scattered through the tissue, large, round, or oblong bodies, varying in size from the dimensions of twice or three times that of the spheroidal gland-cells to smaller bodies of about half that size. They were specially aggregated in the upper layers of the mucous membrane, and here also they were found larger than in other parts, and encroached upon and greatly obscured the upper parts of the glands. In the deeper layers they could be especially traced, but greatly diminished in size, in the tissue intervening between the glands, which were much further apart than normal. Near the pylorus, where the change was most marked, they entirely filled and replaced the structure of the rudimentary villi of this part. They refracted light very strongly, and I at first thought them to be large fat-drops, or some inorganic salts, but they disappeared en-

tirely, both on the addition of liq. sodæ and acetic acid. They did not give any reaction with iodine alone, nor with iodine and sulphuric acid. In some parts, they appeared to be especially accumulated around the capillaries passing up between the glands; but the connexion between them and the vascular system could not be very distinctly traced. Nothing of this kind could be found in the submucous elastic layer, nor in any other of the coats. Their reaction would lead to the belief, that their constitution was that of a protein substance, and the situation in which they are found would justify the supposition that their origin must be sought in some degeneration or other change of the connective tissue; for though, when attaining a large size, and accumulated in great numbers, they encroached on the glandular structures, yet even between and below such points the epithelium was preserved more or less perfectly, though in many places it had undergone a fatty degeneration. Professor Virchow, to whom I showed some preparations of these appearances, informed me that he has seen similar ones in the ovula Nabothii, and in cysts of the ovaries, but was in doubt as to their nature and origin.

I have collected in the following table the cases in which disease was found in my examinations of a series of 100 stomachs, taken indifferently. They give a sum total of fifty-seven cases, in which either recent or chronic catarrh existed, viz., recent catarrh alone in twenty-one cases; chronic catarrh alone in nineteen cases; recent and chronic catarrh combined in seventeen cases. There is a considerable difference between the proportions thus expressed and those given by Dr. Handfield Jones, who for 100 cases, returns only twenty-three cases of catarrh; but this is in part explicable by the difference of meaning attached to the term. I apply it to all cases where I find a catarrhal condition of the glandular epithelium, while of the twenty-three cases recorded by Dr. H. Jones, the glands in twenty are spoken of as being but little affected.

In seven of the twenty-one cases of uncomplicated recent

catarrh, I found but little injection, though often considerable thickening of the membrane; and I then founded my opinion of the state present entirely on the condition of the epithelium, which was precisely similar to that of numerous other cases presenting the usual character of catarrh, as recognisable by the naked eye.

Acute Catarrh of Stomach.	No. of Cases.	Chronic Catarrh.	No. of Cases.	Acute and Chronic Catarrh combined.	No. of Cases.
Pneumonia, Acute ...	2	Tubercle of Lungs (uncomplicated) .....	4	Tubercle of Lungs (un- complicated) .....	2
"    Chronic...	1	Tubercle of Lungs, Tu- bercular Peritonitis...	1	Tubercle of Lungs, Tu- bercular Pericarditis,	1
Variola .....	2	Tubercle of Lung and Intestine, Bronchi-ec- tasis, Morbus Cordis,	1	Old Valvular Disease of Heart, Liver fatty,	1
Puerperal Peritonitis, with recent Bright's disease .....	2	Cysts in Rectum and Soft Palate .....	1	Kidneys granular ...	1
Perimetritis Puerpera, with recent Bright's disease .....	1	Tubercle of Lungs and Intestine, Liver fatty	1	Tubercle of Lung, re- cent Bright's disease	1
Phlebitis from various causes, associated with first stage of Bright's disease .....	2	Tubercle of Lungs, Kidneys granular, Morbus Cordis .....	1	Morbus Cordis .....	2
Endo-Pericarditis, first stage of Bright's disease .....	1	Tubercle of Lungs, Morbus Cordis .....	1	Morbus Cordis, Cir- rhosis of Liver, recent	1
Suppurative Parotitis..	1	Capillary Bronchitis, Morbus Cordis .....	1	Pneumonia (uncompli- cated) .....	1
Cholera; kidneys in first stage of Bright's disease .....	2	Chronic Bright's dis- ease, Fatty Liver ...	2	Pneumonia, Phlebitis..	1
Typhoid Fever.....	1	Gangrena Pulmonum, Morbus Cordis .....	1	Morbus Cordis, Gan- grene of Lung.....	1
Morbus Cordis, Capil- lary Bronchitis .....	1	Morbus Cordis, Caries of Pelvic Bones .....	1	Pneumonia, recent	1
Morbus Cordis.....	1	Melanosis of Lung, Pleurisy .....	1	Bright's disease .....	1
Tubercle of Lungs.....	1	Cystic Disease of Ova- ries, Peritonitis .....	1	Puerperal Fever .....	1
Tubercle of Lungs and Tubercular Perito- nitis.....	1	Abscess in Œsophagus	1	Typhoid Fever .....	1
Diabetes .....	1	Hernia .....	1	Delirium Tremens ...	1
Carcinoma Ventriculi .	1	Drunkard, other patho- logical conditions no noted .....	1	Cirrhosis of Liver.....	1
Total.....	21	Total .....	19	Suppurative Parotitis, Kidneys fatty .....	1
				Total.....	17

I have given in this table a short summary of the principal attendant pathological conditions, which, though less complete than I could have wished to make them, still, I think, present some points of interest with regard to the etiology of the disease.

One remarkable fact which appears from this table, especially in the contrast of recent and chronic catarrh, is the greater proportionate frequency with which the former is associated with acute, and the latter with chronic, affections of other organs. Recent catarrh of the stomach was met with in two cases of variola; in two of typhoid fever (four cases of this were examined); in two of cholera; in four cases of simple acute pneumonia; and in two others, in one of which the pneumonia was accompanied by heart-disease, and in the other with phlebitis; and in one of chronic pneumonia; in four out of nine cases examined of various puerperal inflammations; in three cases of phlebitis from various causes; and two of suppurative parotitis. The frequency with which it appears to occur as a complication of acute diseases, which are associated with the swollen and cloudy appearance which marks the first stage of Bright's disease of the kidneys, struck me as very remarkable. I have before alluded to the analogy which I believe to exist between the affections of the glandular structures involved in the inflammatory process, and it would seem as if the same exciting cause sometimes sufficed to produce similar changes in the cellular structure of both organs; but in one case I examined, in which death took place from acute idiopathic Bright's disease, I found the stomach perfectly healthy. Septic and acute febrile disease seem especially to possess this tendency, and it was especially in these cases that the coincidence was observed. That it is not an invariable law, is shown by the fact that these associated changes were only met with in four out of nine cases of puerperal fever.

The tendency of diseases obstructing the venous circulation to induce a catarrhal condition of the stomach, which has been pointed out by Dr. H. Jones and other observers, meets with additional confirmation from this table, where it is seen that catarrh may arise as a complication in cases where either the heart, the lungs, or the liver, offer obstructions to the free passage of the blood; but the disease which appears to lead to its evolution with peculiar

frequency, and to present it in the most advanced and persistent forms, is tuberculosis. Of the total number of cases of catarrh here recorded, whether acute or chronic, tubercle is seen to be present in sixteen out of fifty-seven, or in 28 per cent. (The total number of tubercular patients examined amounted to thirty-one.) This is perhaps not more than might have been expected, when we recollect the frequency of dyspepsia as a symptom of phthisis, the occurrence of which it has been often difficult to explain; especially since tubercular formations in the gastric mucous membrane are of extreme rarity, not one case being recorded in the work of Louis on this disease. I have looked for them in vain in the stomachs which I have examined, though I have alluded to one case in which there was a suspicion of a formation of this kind in the cellular tissue below the glands.

Of cases in which the patients had been acknowledged drinkers of spirits, I have met with alterations of structure in three. They partook of the characters of both recent and chronic catarrh, but in one only could I trace any history of previous gastric disturbance.

## DESCRIPTION OF ENGRAVINGS.

## PLATE I.

Fig.

1. Recent catarrh of stomach, showing the irregular outline and granular appearance of the glands, 90 diam. Without reagents.
2. The same magnified 340 diam., showing the glands filled with enlarged and swollen epithelial cells. Without reagents.
3. Cells extruded from the glands in a state of acute catarrh, 400 diam.
  - a. b. c.* Enlarged and granular spheroidal epithelium.
  - d.* The same treated with strong acetic acid.
  - e.* Swollen columnar epithelium.
  - f.* Free nuclei.
  - g.* Enlarged cells, containing double nuclei.
4. Chronic catarrh, 290 diam. The upper part of the glands not seen, the breaking down being probably due to post-mortem change.
  - a.* A mass of pigment in upper layers of membrane.
  - b, b, b.* Free fat-drops.
  - c.* Thickened membrana limitans.
  - d, d, d.* Entire fatty degeneration of the epithelium.
5. Chronic catarrh. The preparation, treated with acetic acid, shows the increase of connective tissue (the nuclei of which are thus brought into view) between the glands; thickening of the membrana limitans of the glands. The cloudy appearance of the epithelium is here due to the action of the acid. 340 diam.
6. Pigmentary deposits in the villi of the pyloric region, in a case of chronic catarrh. The pigment is seen at (*a*), within the cells of the connective tissue; at (*c*) it is free among the elements of the tissue. 340 diam. Treated with acetic acid.
7. Cystic degeneration of a gland in the pyloric portion. The gland-tube is seen continuous with the lower part of the cyst; glands around, with epithelium in state of partial fatty degeneration; 100 diam. Without reagents.

Fig.

8. A gland-tube which has undergone a double constriction in its course; probably an earlier stage of the foregoing; 340 diam. Without reagents.
  - a.* Thickening of membrana limitans.
  - b, c.* Points of constriction where the connective tissue is greatly thickened.
  - d.* Fatty degeneration of epithelium.
9. A cyst from the pyloric portion of the stomach, magnified 340 diam.; without reagents; showing the contents to be cylindrical epithelium; at (*a*) is seen the capsule of fibrous tissue surrounding it; (*b, b*) glands in a state of chronic catarrh.

## PLATE II.

1. Cystic degeneration of the glands of the rectum; 340 diam.
2. Cystic change (?) in the glands of the uvula.
3. Fatty changes in upper layers of mucous membrane, leading to erosion of the surface; 100 diam.
4. A similar change in the pyloric portion; membrana limitans of the membrane preserved; 100 diam.
5. A change somewhat similar to the above, in which the cells of the connective tissue (*a, a, a*) are seen in a state of fatty degeneration of their contents. (*b*) Fatty degeneration of the cells of the corium.
6. Appearances described at page 390 of accompanying paper, showing large round and oval bodies accumulated above and between the glands. They disappeared entirely on addition both of Liq. Sodæ and acetic acid.
7. Appearances resembling (?) the "nuclear degeneration" described by Dr. Handfield Jones, showing great numbers of nuclei scattered through the fibrous tissue, and especially accumulated at the base of the glands. (Qy. Cadaveric change?)

Fig. 1.



Fig. 2.

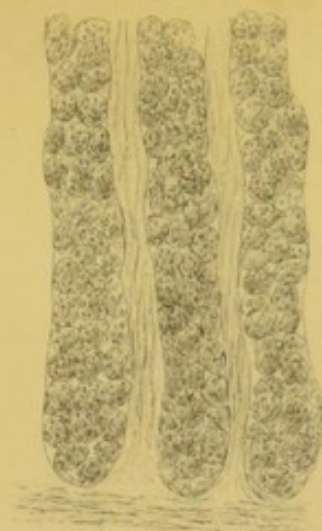


Fig. 3.

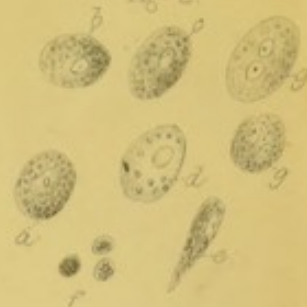


Fig. 4.

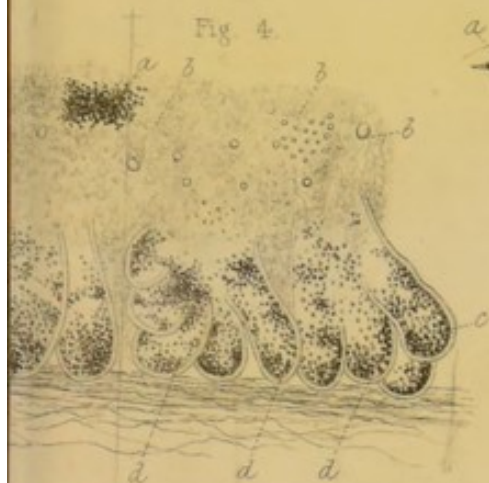


Fig. 6.



Fig. 5.

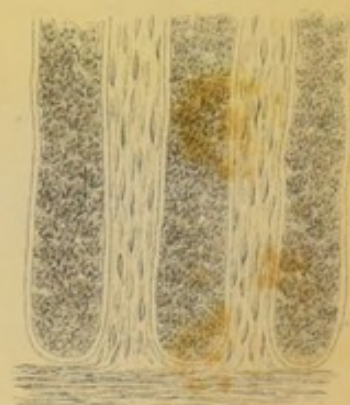


Fig. 8.



Fig. 9.

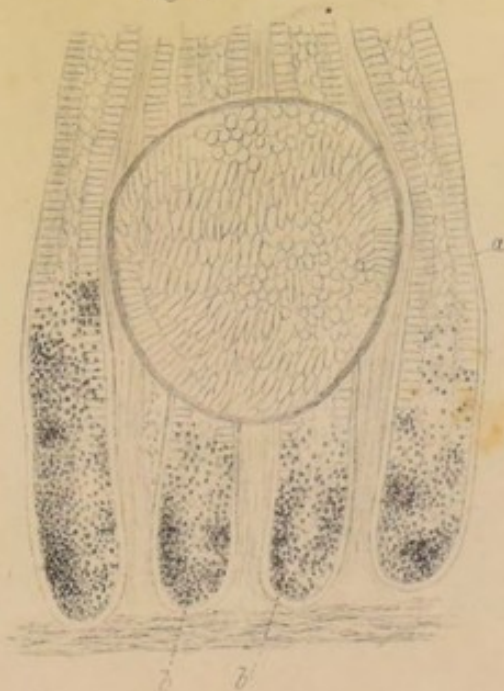


Fig. 7.



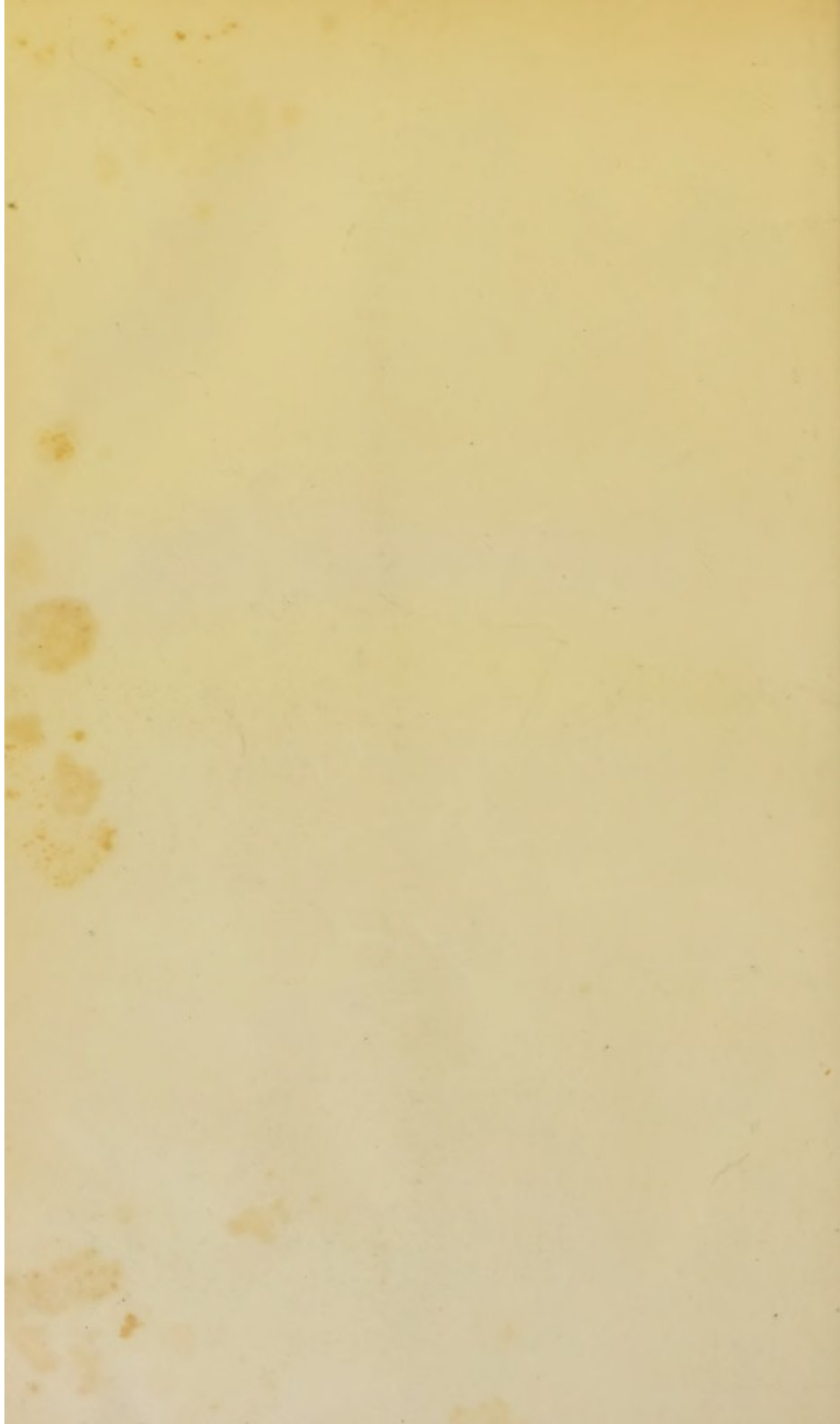




Fig. 2.

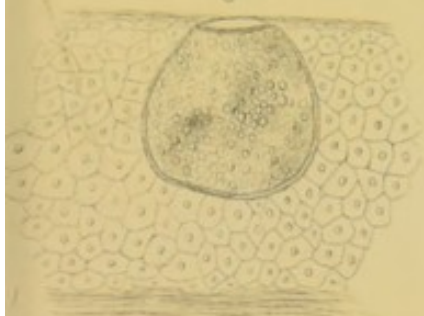


Fig. 3.

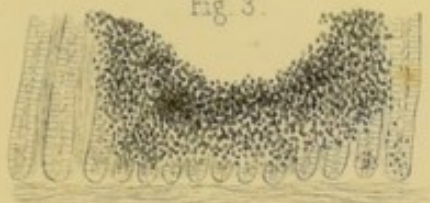


Fig. 4.



Fig. 5.

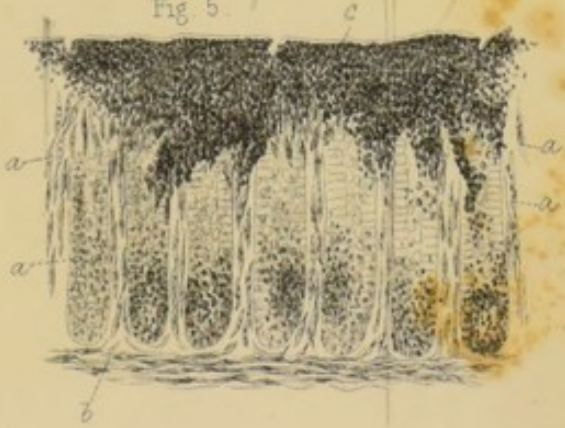


Fig. 7.

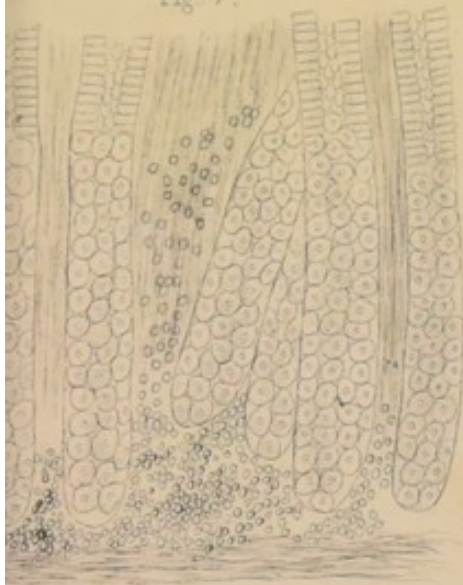


Fig. 6.

