

OBSERVATIONS ON CHRONIC PEPTIC ULCER  
AND ITS MEDICAL TREATMENT.

- BY -

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## INTRODUCTION.

The end and purpose of Medicine is to alleviate pain, prolong life, restore to health, and promote good health in the individual and the community. The science of medicine is being rapidly advanced by those who work in the laboratories of physiology and pathology, and its art yearly becomes more intricate, as the advance of knowledge adds to the burden of physicians who practise it. Medical research, the instrument of progressive medicine has made great advances in the present century. But whilst realising that the practice of medicine is changing, we must also take into account the change which the human race is undergoing. In the evolution of species, especially in human beings, the reactions to environment undergo constant modifications, and certain diseases disappear in whole or in part, and other new diseases just as certainly make their appearance. No other facts in the history of medicine are more soundly established than the results of the laws of evolution of the diseases which inflict mankind. This has been accepted with respect to the plagues of the human race, and the cyclic character of epidemics, but the same study has not been given to the systemic diseases of/

of the body. We rather fail to realise that any particular organ and its environment is constantly and permanently changing, and the disease which to-day follows a definite course may in the passage of future generations become hardly comparable with the disease which takes its place. A pathologist, re-incarnated a hundred years from now would probably find many pathological conditions which he had never seen before, and the microscopic appearances of the various organs under varying pathological reactions would be largely new ground for his once experienced eyes. It is not only new knowledge attained by new methods which changes our conceptions of disease processes; the diseases themselves are changing, and in the course of time it becomes necessary to correlate the facts concerning them in order to establish and to be able to appreciate the extent of this change. There can be little doubt but that the incidence of peptic ulcer of the stomach and duodenum, in the present harassed state of the world and mankind shows a distinct rise in the last quarter of a century and the factors which tend to this and the treatment of the disease as advocated by various authorities I shall endeavour to bring forward clearly in this Thesis.

Since graduating, and for the purpose of this Thesis/



Thesis, I have endeavoured to specially interest myself in this disease - chronic peptic ulcer.

As Resident Medical Officer, for a year, at St. Andrew's Hospital, Dollis Hill, London, - a general Hospital of fifty-five beds, specially for the professional and middle classes who could not afford high Nursing Home fees, I had ample opportunity to observe a number of these cases, and at the Marylebone Infirmary, London, where I was House Physician, I had similar opportunities. Thereafter, in my own practice and in the Outpatient Department of the Royal Sussex County Hospital, Brighton, I have tried to further my knowledge. In one section, to follow, will be found an analysis of 293 cases of peptic ulcer admitted to the wards of the Royal Sussex County Hospital during the years 1930 and 1931. I have no solution to put forward for this great medical problem of Peptic ulcer, but have endeavoured to express my ideas, especially as regards treatment, from the point of view of the general practitioner.

The aetiology of this disease is a subject of mystery and immense interest, for, in the light of our present knowledge, we can really point to no specific factor and can only surmise. But great strides are being made of late years by physicians, though it is rather sad to relate, as Hurst states, that/

that we owe the enormous progress in our knowledge of gastric and duodenal ulcer during the first twenty years of the present century almost entirely to surgeons; during the last ten years the bio-chemist and radiologist have added their quota. If the general practitioner and physician are prepared to seize the opportunity, the prevention, early recognition and successful treatment of peptic ulcer should in the future be in their hands. Hurst, rather cynically states, when considering operations in general, in this disease, and gastro-enterostomy in particular, that in his experience gastro-enterostomy is the commonest gastric disorder to-day, and undoing gastro-enterostomy is the gastric <sup>operation</sup> we now frequently recommend. Medicine, however, cannot be an exact science because of the ever present and variable factor in our problems, of the human or temperamental element.

No amount of chemical, X-ray, or other investigations can compensate for the absence of a clinical insight, which is at first innate in varying degree, and later developed by careful observation, clear thinking, and the use of experience.

"Suaviter in modo, fortiter in re."

HISTORICAL NOTES.

According to Leube, Galen mentions ulcer of the stomach and Celcus lays down laws for its treatment. Adams, in his translation of the works of Paulus Aegineta, states that Rhases and Avicenna describe ulceration of the stomach very accurately.

As post mortem examinations became more common practise this condition became frequently noted as the cause of death, and Grassius, in the year 1695, gives an account of a perforated gastric ulcer.

I have in my possession a book called "A General Practise of Physic," imprinted at London by Edmund Bollifante, in the year 1598.

Apart from the leather binding it is in very good condition and from the notes made throughout, it has been much referred to by physicians of long ago. The title page states that "wherein are contained all inward and outward parts of the body, with all the accidents and infirmities that are incident unto them, even from the crown of the head to the sole of the foot. Also by what means (with the help of God) they may be remedied; very meet and profitable not only for all physicians, surgeons and apothecaries and midwives, but for all other estates whatsoever. The like whereof as yet in English hath not been published.  
Compiled/

Compiled and written by the most famous and learned Doctor Christopher Wirtzung in the German tongue, and now translated into English, and in divers places corrected and with many additions illustrated and augmented by Jacob Mosan Germane, Doctor of the same faculty." It is obvious that the writer was conversant with diseases of the stomach, including ulceration of the stomach, though of course ignorant of their pathology, (Pages 316 - 384) he fully describes pain in the stomach through a hot 'Impostume.' "These Impostumes which the Latins call an abscess are like a separation from that which is whole and firm in a man's body. It is separated into two parts and doth make an ulceration, which comes to an issue and breaketh out and healeth speedily. The difference between an Impostume and an ulceration is that the Impostume breaketh out and healeth more speedily, but an ulcer endureth long and corrodeth like as the same may also happen in the stomach."

"As much as concerneth the ulceration they grow otherwhiles from the Impostume and chiefly if they be hot. The same may sometimes be caused by cholicks and sharp rheumes which fall out of the head into the stomach and there then through their sharpness ulcerate the stomach. Like as the same happeneth oft times to the lights (lungs). Also these ulcerations/



tions may be caused by some sharp and choroding meats; belching with breath of the mouth and thirst which proceedeth out of the stomach is a token of an ulceration. If the patient doth take any sour meats or drink, then doth the pain increase, which would not have happened if he had fed on milk, butter or other sweetmeats."

Much space is given to the potions and remedies which include astrology. Unnatural hunger and symptoms are described at length and the pains differentiated according to the position of the ulcer, whether at the neck, the mouth, or bottom of the stomach. Cirrhosis of the stomach is also described as hardening without ulceration and this may outwardly be discerned. The chief causes are cold, wind and melancholy. Many observations in diseases of the stomach which coincide with our present day knowledge are to be found in this wonderful old book.

Duodenal ulcers also received casual mention by De Muralto, who in 1688, described two perforations in the duodenum of a soldier. In the year 1704 Littre found the source of a severe fatal gastrointestinal haemorrhage in an "ulcus-rotundum" five lines broad and half a line deep, situated an inch and a half from the pylorus. The stomach and intestines contained a large quantity of partly co-agulated blood/

blood, which had come from several open blood vessels in the ulcer. In 1793 Penada of Padua wrote what is believed to be the earliest description of a perforated duodenal ulcer.

It was completely overlooked by later writers until Malluch republished it in 1919. Morgagni, in 1729, described in some detail cases showing gastric ulcers and even perforation by them, but barely mentions erosions of the duodenum. In 1722 Sir George Baker, in a footnote in his classical paper on lead colic, gave particulars of haematemesis and duodenal ulcer found post mortem. About this time little recognition was given to duodenal conditions as compared with other lesions including ulcers of the stomach. Matthew Baillie in 1799, then a Physician to St. George's Hospital, published a report of a series of pathological specimens, including one showing four small ulcers of the stomach, and a larger one of the duodenum.

In 1802 Neumann described a perforation of the duodenum in a man with strangulated hernia.

A second case is reported by Gerard in 1804; this ulcer was four lines below the pylorus and resulted in a fatal peritonitis. Two instances of perforated ulcer of the duodenum were published by Benjamin Travers in 1817. In 1825 Broussais whom Maret says was/  
was/



was the first to mention peptic ulcers, gave details of a further case and others were added by Rayer in 1826, Robert in 1828, Lenepveu in 1839, Holscher and Bainbridge in 1842. In spite of these cases Cruveilhier, who gave the first clear-cut anatomic differentiation of cancer and ulcer of the stomach, does not mention duodenal ulcer.

In 1828 John Abercrombie of Edinburgh gave an excellent account of the symptoms of gastric ulcer in his "Pathological and Practical Researches on diseases of the stomach and intestinal canal, the Liver and other Viscera of the abdomen." He later mentions a case as seen in the Museum of the Royal Colleges of Surgeons of Edinburgh, of perforated ulcer of the duodenum.

He makes the sagacious observation that "the leading peculiarity of disease of the duodenum so far as we are at present acquainted with it, seems to be that the food is taken with relish and the first stage of digestion is not impeded, but the pain begins about the time when the food is passing out of the stomach or from two to four hours after a meal."

The obvious importance of this remark appears to have been passed over unnoticed for many years, until brought to light again within recent date. Dr. Abercrombie also made the following recommendation with/

with regard to treatment, and he may be said to have laid the foundation of present day therapy. "The food must be in small quantity and of the mildest quality, consisting chiefly or entirely of farinaceous articles and milk; it would appear to be of much consequence to guard against any degree of distension of the stomach, that can possibly be avoided even by the mildest articles. The patient should abstain in great measure from bodily exertion. In the early stages little probably is gained by medicine given internally, beyond what is required of the regulation of the bowels. In the more advanced stages benefit may be obtained by some internal remedy such as oxide of bismuth, limewater and nitric acid." It was not until 1839, however, that we find any statistics with reference to either duodenal or gastric ulcers. Rokitanski in that year reported observations on a collection of seventy-nine cases of peptic ulcer, six of which were in the first part of the duodenum.

In 1842 Curling reported in some detail twelve cases in which duodenal ulcers or inflammation had followed severe burns. This relation of ulcers to burns had first been noted by Dupuytren, and was confirmed by numerous later writers, among others Long and Hewitt and Cuthbertson.

In/

In 1833, Beaumont wrote a remarkable book on experiments and observations on the Gastric Juice and the Physiology of digestion. Beaumont's servant and patient, Alexis St. Martin, following an accident had a permanent external opening into his stomach, and through this Beaumont had the advantage of direct vision of the gastric mucous membrane and its contents. For Beaumont digestion in the stomach consisted essentially of chymification of the food "effected by the solvent action of the gastric juice, aided by the motions of the stomach and the natural warmth of the system." Fear and anger check its secretion, and also the latter causes an influx of bile into the stomach, which impairs its solvent properties and cause material alterations in its appearance.

Mayer, in 1844, was the first to publish a monograph on the duodenum, more clinical than anatomical; his discussion includes ulcers both perforating and healing. He emphasizes burns as an etiological factor. No comparison with gastric ulcer is given, although he regards the duodenum as a second stomach. Cancer and tuberculosis have etiological significance, but he concluded that "Nothing is as yet known with respect to the diagnosis of duodenal lesions."

Bardeleven/

Bardeleben, in 1853, in reporting a case of perforated duodenum said "of all parts of the intestinal canal the duodenum shows ulcers least often; they resemble ulcers found in the pylorus of the stomach."

It is interesting to note that Brinton, who, in 1856 wrote a very comprehensive account of ulcers of the stomach and collected considerable literature, reviewed the results of 7,226 post mortem examinations and concluded that gastric ulcers occur in an average of 5% of all persons. What might be reckoned the modern study of this subject dates from the time of Krauss' work in 1865. During the interval, 1863 - 1882, several theses for the degree appeared but contained no material addition to our knowledge. Morot, in his thesis, gave details of 22 cases, 18 in men and 4 in women. He quotes Brinton as authority for the statement that duodenal ulcer is five times more common in men than in women. Teillais, in 1869, found 16 cases and discussed various theories as to the origin of ulcers of the stomach. Several German students presented theses at this time, giving details of cases. Among them was Schulze, who, in 1837, in his thesis, and in a case report, endeavoured to show the embolic origin of duodenal ulcers.

To/

To come back to England, we find that in 1855 Budd, Professor of Medicine at King's College, London, described the chief symptom of ulcer of the duodenum as "pain in the situation of the ulcer which is seldom constant and which in most cases is felt only two to three hours after a meal." He says that some cases heal but others may cause haemorrhage which can prove fatal, or they may perforate and lead to death from general peritonitis. About this time, single cases, sparsely scattered in the literature, were reported. Amongst the authors were Haldane of Edinburgh, 1862. Barclay, in 1870, and Andrew Clark, in 1867. Wadham in 1871. All the above cases were of perforating duodenal ulcer. Moore, in 1883, reported two cases at the Pathological Society of London, and asserted that from 1867 to 1882 only three cases of duodenal ulcer were recorded on the post mortem record of Saint Bartholomew's Hospital, London. In 1881 Nidergang produced the most complete review since Krauss. He directed attention to the greater frequency of the ulcer in men than in women, the reverse being true of gastric ulcers. Distension or bulging of the duodenal wall was emphasized by Turner in 1884.

In 1889 Mikulicz presented before the German Congress of Surgery a notable contribution on the surgical/



surgical treatment of peritonitis from perforation.

Bucquoy, in 1887, published for the first time on record personal diagnosis of five cases solely from the symptoms, one being verified by subsequent autopsy. He was the first physician since Abercrombie to suggest that the symptoms observed in cases of duodenal ulcer were sufficiently precise and characteristic to enable a diagnosis to be made during the life of the patient. Oppenheimer in 1891, made a thorough and valuable review of the subject, and remarked that recurrences are very frequent and not rarely are fresh ulcers found adjacent to old scars.

Perry and Shaw, in 1893, investigated the report of 17,652 post mortems in Guy's Hospital records, going back to 1826 in Dr. Hodgkin's "Green Inspection Books", and ending in 1892. They found that in 70 cases (0.4%) there were duodenal ulcers open or healed. In cases of burns there were ulcers of the duodenum in 33%, and excluding these, the ulcers were found in 48 males and only 16 females. They quote Brinton in affirming that gastric ulcer is twice as common in women as in men.

Dickinson, in 1895, says that according to the records of the duodenal ulcers in St. George's Hospital, London, 14 were in men and 3 in women, and of gastric ulcers 42 were in women and only 12 in men.  
It/



It is remarkable that the work of both Abercrombie and Bucquoy on duodenal ulcer should have been almost totally forgotten. It appeared to be universally taught in the early days of the twentieth century that duodenal ulcer was a rare condition and the diagnosis difficult before haemorrhage or perforation had lead to a fatal issue and up to this period the attention of the surgeon had not been drawn to the subject to any extent.

In 1894 Mr. H. P. Dean performed the first successful operation recorded on perforated duodenal ulcer (British Medical Journal.)

Another successful case was recorded by Mr. L. A. Dunn in 1896. A stimulus was now given to the surgical aspect of the question, and these cases were quickly followed by other successful ones. Weir's address, as President of the American Surgical Association at this time, contains a full summary of early cases with a criticism in particular on perforating ulcer of the duodenum. Moynihan of Leeds, in January 1900, operated on his first case, and the surgical aspects of the disease were thoroughly discussed by him. On this occasion he gave, for the first time, a complete account of the symptoms now known to be characteristic of duodenal ulcer. Other valuable papers, about this time, were contributed by W. J. Mayo/

W. J. Mayo and Codman in American Journals.

Hurst states in his recent book "Gastric and Duodenal Ulcers" (Hurst and Stewart) that "a clinical lecture I delivered at Guy's Hospital in 1909, after a visit to Moynihan of Leeds, was the first publication of a physician, and recognised the new era in our knowledge which had opened with recent advances in abdominal surgery." I find, however, in the very excellent "Clinical Studies," by Byron Bramwell, Volume IV, published in 1906, full history, discussion and treatment of four cases of duodenal ulcer. These were all seen within two months at his clinic. In three patients two died from haemorrhage and one from perforation, and in the fourth case gastro-enterostomy was done with a successful result. Byron Bramwell states that this lamentable experience made a profound impression on his mind. He gives details for diagnosis and medical treatment and suggests that after one haemorrhage operation is advisable in case of copious recurrence. Frequent attacks of bleeding appeared to be more common in those days than we find now.

In 1909 Dowden of Edinburgh performed a successful operation for duodenal ulcer by excision of the ulcer.

In France and Germany at this time duodenal ulcer was/

was still regarded as a very rare condition, or at least a disease almost peculiar to Britain and America, if not in fact, due to the too vivid imagination of surgeons in these countries. Gastric ulcer was freely diagnosed as from early days by the presence of pain, vomiting and haemorrhage, the latter symptom being regarded almost necessary for diagnosis. Along with chlorosis it was supposed to be particularly common in anaemic young women; but in 1898 an important contribution was made by Dieulafoy, who differentiated between acute and chronic gastric ulcers. The former he considered as toxi-infective in origin, and assumed it was the precursor of the latter. Hale-White, in 1906, pointed out that the common cause of haematemesis in young women was not due to a chronic ulcer, but an acute one, and that the prognosis was favourable.

Brinton, in 1862, said that many cases get well with diet alone, and most physicians will agree with him, though the judicious use of drugs does hasten recovery and are indispensable in the severer cases.

The medical treatment of peptic ulcer by the older method is associated with the name of Leube (quoted by Lambert. Amer. Journal Med. Sci. 1908 CXXV 18). This consisted in attempting to rest the stomach by withholding all food and endeavouring to supply/

supply nutriment in the form of rectal injections. Only small quantities being allowed by the month. The objections are the hunger and thirst which the patient suffers. The enemata are not in reality nutrient and the patient becomes very weak and anaemic, has little chance of resisting infection and reforming haemoglobin. Also the gastric secretions are not neutralised.

The Lenhartz treatment was introduced in 1904 with the idea of rapidly giving the patient a diet of adequate caloric value, which will enable him the better to combat the anaemia debility consequent upon a haemorrhage. The diet is rich in protein which should combine with the hydrochloric acid of the gastric secretion. Small feeds were given of iced foods; the caloric value rising from 300 to 3000 at the end of a fortnight.

Sippy of Chicago introduced his treatment in 1915. Its object is to protect the ulcer from hydrochloric acid. This is accomplished by giving large doses of alkalies after, and of belladonna before the feeds, and by using as the basis of the diet, milk and cream.

Sippy advised that 3 ounces of a mixture of milk and cream should be given every hour from 7 a.m. to 7 p.m; eggs and cooked cereals can be gradually added. Half an hour after each feed a powder containing/



containing sod. bicarb. gr. x and magnes. pond. gr.  $\frac{x}{2}$   
is given alternately with a powder of Bism. carb.  
gr.  $\frac{x}{2}$  sod. bicarb. gr.  $\frac{x}{2}$  -  $\frac{xx}{2}$ .

The Sippy treatment was warmly advocated in this country and has been modified and used with very good results. Modification was found to be necessary because the method was often resented by the patient and the Nursing Staff, for there was hardly a minute during the day and half the night, in which the patient was not taking feeds or powders.

Bolton's objections to this form of treatment were that the gastric juice is put out of action and digestion stopped. That this amount of neutralisation is unnecessary, and toxic symptoms may be caused by the large doses of alkalis. Sippy was aware that toxic symptoms occasionally developed in the course of intensive alkaline treatment he used for patients suffering from ulcer. These symptoms are found chiefly in patients suffering from duodenal ulcer, and generally appear about the seventh or tenth day of treatment.

Since these days diagnosis of peptic ulcer, with the help of biochemist and radiologist, has become increasingly more exact, and it would seem to be indicated clearly both in literature and investigation of actual cases that the incidence of gastric and duodenal/

duodenal ulcer, specially the latter, has been gradually but steadily increasing. In duodenal ulcer this incidence has been absolute and also relative compared with the incidence of gastric ulcer. There is a remarkable preponderance of duodenal ulcer in men and the preponderance of gastric ulcer in men is increasing.



ANATOMY AND PHYSIOLOGY.

The first portion of the small intestine received its name "duodenum" meaning twelve, from the fact that it is about equal in length to the breadth of twelve fingers. It is the shortest, the widest, and most fixed part of the small intestine, and is arranged in the form of a loop with a forward convexity, which loop might be considered as a ring suspended at an upper and a lower point. The duodenum is usually divided into four parts. The first portion is of the most importance in relation to ulcer and is the free and moveable portion immediately below the pylorus. The three lower segments are retroperitoneal and their curve usually corresponds to one of three types "U", "V" or "C". The circuitous course described by this portion of intestine presents an S-trap arrangement, the mechanics of which allows the food and secretions from the stomach as well as the secretions from the liver and pancreas to accumulate, and also prevents the passage of gases from the intestine into the stomach. The pyloric part of the stomach consists of the pyloric vestibule and pyloric canal, the termination of which is the pylorus. The pyloric canal is about  $\frac{3}{4}$  inch in length and its termination projects into the duodenum, producing a striking resemblance to the vaginal/

vaginal portion of the cervix uteri. The circular muscle coat of the stomach is thicker round the pylorus than elsewhere and forms a definite sphincter which attains its greatest development at the pylorus. Our knowledge of the anatomy and physiology of the stomach and duodenum has been greatly advanced since the advent of X-ray examination some twenty years ago. The X-rays stand supreme as a means of investigation in chronic ulcers of the stomach and duodenum and recent advances in technique have made it possible to recognize their presence with almost complete certainty in a very large percentage of cases. They further give valuable information as to the nature and extent of the disturbances in the motor functions of the stomach and duodenum, which result from the presence of ulcer. Much valuable information is afforded by noting the type of stomach, whether short, normal or long, existence of spasm, changes in the motor functions, which result from reflex disturbances in the activity of the pyloric sphincter or from pyloric gastritis. The first part of the duodenum immediately adjoining the stomach differs more from the rest of the duodenum than it does from the stomach. To this part the designation duodenal "bulb" or "cap" has been given. It is pyramidal in shape with its concave base formed by the end/

end of the pyloric canal and the surrounding sphincter which projects into it. The mucous membrane of the duodenal bulb is thin and smooth in contrast with that of the rest of the duodenum, which is thicker and thrown into transverse rugae. The muscular coat is also less developed than in other parts of the small intestine. Both Wilkie and Reeves have thoroughly worked out the blood supply of this region and have shown that the critical area is supplied by a variable branch, which is given off from the gastro-duodenal or hepatic arteries, and has been described by Wilkie as the supra-duodenal artery. It is of the end-artery type with a paucity of anastomosis. The posterior wall is chiefly supplied by branches of the gastro duodenal artery as it passes behind the bowel. The submucous plexus formed by these vessels is not nearly so well developed as that of the remainder of the duodenum. This scarcity of vessels explains the anaemic area which may be produced by traction and which was described by W. J. Mayo. The branches given off from this plexus to the mucosa have a similar arrangement to the vessels of the lesser curvature of the stomach. Reeves has shown that they are small and more tortuous than in the other portions of the stomach and duodenum, and thus are more likely to thrombose, as they have no collateral/

collateral circulation, such thromboses is more prone to be followed by ulceration. This may account for the greater frequency of ulceration in these areas. The blood returns by corresponding veins, the superior of which enters the right gastro-epiploic and so to the superior mesenteric vein. The inferior branch passes in company with the artery and enters directly into the superior mesenteric vein. The angle which the duodenal bulb forms with the stomach depends on the type with which it is allocated. With a short stomach it is more horizontal and with a long stomach more perpendicular than in the average normal stomach. The X-rays show that the duodenal bulb is more or less filled throughout the period of gastric digestion, whereas the rest of the duodenum is never full, but is rapidly traversed by the chyme on its way from the bulb to the more distal parts of the intestines. The duodenal bulb is really an annexe of the stomach and has similar functions and like it is subject to peptic ulceration. The rest of the duodenum may be considered simply as the proximal segment of the small intestine into which the pancreatic juice and bile are poured, and like the rest of the small intestine is not subject to peptic ulceration. Hurst states that acute ulcers may be found in the second and third parts of the duodenum, but/



but never chronic ulcers. The movements of the stomach and duodenum have been studied by X-ray and the former also by introducing into that organ balloons connected by means of tubes to recording tambours. We may consider that functionally the stomach is divided into two parts. The proximal end is composed anatomically of the fundus and half of the body and this forms the gastric reservoir where under a small amount of pressure the food is stored. The stomach walls adapt themselves to the contents, whatever the amount, and fresh food is admitted into the centre of the food mass, because of the anatomical position of the cardiac opening, which relaxes reflectly on stimulation of the pharynx by food. In the distal half of the stomach, beyond the incisura angularis, the food is churned up with pepsin and hydrochloric acid and rendered sufficiently fluid to pass through the pylorus. Some peristaltic waves begin at the fundus, but the majority sweep forward towards the pylorus from the middle of the stomach. These waves slowly carry the food forward, but as they travel more quickly than the food they over-ride it and churn it up. Where there is no condition such as ulcer causing spasm of the pyloric sphincter, these peristaltic waves are continued and pass the pylorus into the duodenum. Even although there is an artificial/

artificial opening elsewhere in the stomach, if the pylorus is patent, food will tend to pass through it by virtue of the muscular arrangement. Different foods are retained for varying periods in the stomach; for example carbohydrates alone leave it quickly, whilst proteins and especially fats are retained for much longer periods. Carbohydrates undergo a certain amount of digestion, whilst in the gastric reservoir or cardiac end of the stomach. As digestion proceeds in the stomach and its acidity is over 0.2%, reverse peristalsis and regurgitation of duodenal contents, according to Bolton, take place to prevent excessive acidity. On the other hand Hugh Maclean and his co-workers (B. W. Journal of Physiology, 1928) state that results prove conclusively that duodenal regurgitation of alkaline fluid is in no way connected with the reduction of hydrochloric acid. The function of the stomach then is to triturate the food, reducing it to a chyme of uniform consistency for passage into the intestine, and to act on it chemically so as to forward the digestion and solution of the food. Early last century it was recognized that the acidity of the gastric juice was due, not to any organic acid, but to hydrochloric acid, and of all the secretions poured into the alimentary canal, that of the stomach alone is acid.

Figures/



Figures varying from 0.05 to 0.57% are found in the literature, representing the analysis of human stomach contents of varying degrees of purity, since the hydrochloric acid may be taken up in part by the proteins of food and by mucous from the stomach wall, or partly neutralised by swallowed saliva, or by pancreatic juice and bile regurgitated from the duodenum. For many years it was hoped that the test meal would provide a specific chemical diagnosis for various affections of the stomach, but it is difficult to see how reliance can be placed on the forms of curves of acidity in various types of gastric disease or attempting exact mathematical deductions from the analysis of a mixture of food, itself of complex chemical character, saliva, regurgitated contents and secretions of mouth, throat and naso-pharynx.

Investigation has proved that the stomach is very responsive to internal and external stimuli. The flow of gastric juice is excited or inhibited by many causes, some of them physical, others mental, and even the level of the gastric curvature may vary at the call of the emotions, probably accounting for the well-known "sinking feeling". Whilst a patient was being screened, having just swallowed a barium meal, the stomach was noted to descend about four inches, on the banging of a door which startled the patient./

patient. A small proportion of healthy and otherwise normal people have no free hydrochloric acid in their gastric secretion, but whether this renders them more liable to develop diseases associated with low gastric acidity, such as pernicious anaemia or gastric cancer is not known. We do know that they have a normal appetite and good digestion in spite of this apparent anomaly. It is very doubtful whether variations in gastric secretion give rise to symptoms and to distinguish between physiological variations and pathological variations requires other means of investigation, among which the X-ray barium meal examination and the chemical examination of stools have chief place. According to recent experiments by the balloon method of Boldyreff, whereby the patient swallowed a sausage shaped balloon about six inches long and two inches in diameter, when this was inflated, and attached by a rubber tube so that continuous records could be made of stomach movements; the normal stomach when empty or nearly empty was found to have alternating periods of vigorous contractions and almost absolute rest, whilst the stomach containing food gave a curve showing a condition of weaker contractions of constant slow rhythm.

In patients with ulcer and suffering from "hunger pain" there was found to be a distinct connection between/

between the pain and the hunger contraction periods of the stomach. No pain was present when the stomach was at absolute rest, nor when food was taken, thus inducing slow, gentle contractions. One wonders what effect on the motor conditions and secretory activity of the stomach a balloon of this size had. Totally different conclusions are reached by Christensen and Palmer, who both used the balloon method. Their findings are given later when pain as a symptom is discussed.

ETIOLOGY AND PATHOLOGY OF PEPTIC ULCER.

The word peptic is derived from the Greek, "peptiros" to digest; and the term "peptic ulcer" is used to indicate these ulcerations in which digestive processes form an etiological factor. We also mean any ulcer in the formation or continuation of which, the gastric juice plays a part. Under certain conditions gastric juice may cause an ulcer, and may also prevent its healing. In any case it is significant that such ulcers are only found in those parts of the digestive tract which come in contact with acid gastric juice.

Thus we find ulcers in the stomach, duodenum, and rarely in the lower end of the oesophagus. Also, they may occur in the jejunum after a gastro-enterostomy; and ulcer may be found in the duodenum and jejunum when the pancreatic and bile ducts have been transplanted to a lower portion of the ileum, thus depriving the upper portion of the small intestines of the alkaline secretions of the liver and pancreas. The etiology of peptic ulcer of the oesophagus is in every respect similar to that of the stomach and duodenum.

One visualizes the peptic ulcer commencing as a simple erosion on loss of living substance in the wall of/

of the viscus, only the mucosa and superficial layers of the submucosa being involved. But the causes which give rise to an erosion need not be the same as those which transform it into a peptic ulcer.

Bolton divides ulcers into acute, transitional and chronic, each variety corresponding to a stage in the development of peptic ulcer from a simple erosion. This classification is disputed now-a-days, and I am inclined to think that the acute ulcer may be aetiologically independent of the chronic callous ulcer. From a pathological point of view we find that acute ulcer is frequently multiple, small, with clean cut edges, smooth floor, and the peritoneal surface is not thickened. The mucosa shows intense round cell infiltration.

The chronic ulcer is invariably single: is much larger with thickened margins frequently rounded, overhanging, and the border is sinuous. The floor involves the mucosa, usually also, the muscular layer, and the stomach or duodenum may be adherent to neighbouring structures. Inflammatory changes extend around the ulcer. Its base may be soft and cellular, or it may consist of fibrous tissue, this depending on its chronicity.

Then, to touch here on symptoms: we usually find in acute ulceration a patient, who may or may not have suffered/



suffered for a short period from indigestion. Without warning he suddenly becomes very ill from a profuse haematemesis if perforation has not occurred. The pulse rate is increased and the temperature raised, he is prostrated, and as a rule there is no pain or epigastric tenderness.

The patient recovers and these ulcers do not tend to recur if care is taken with regard to diet, alcohol and tobacco, and above all the removal of toxic foci.

How different is the chronic ulcer with its syndrome of hunger pain, tenderness, periodicity of recurrence, hyperchlorhydria, pylorospasm and gastritis. Of course haemorrhage or perforation may occur in the chronic ulcer, but the above syndrome of symptoms are present usually over a considerable period.

I consider that the chronic peptic ulcer starts as an erosion which may be produced by mechanical, chemical or physical causes, circulatory and nervous disturbances, infection and allergic phenomena. The erosion goes through many stages before it develops into a peptic ulcer, as we find it in man.

The cause of the erosion is obscure, but we may take it that any single factor or any combination of factors that will produce erosions in the skin or in any other organ, may produce erosions in the stomach or/

or duodenum. Before considering these factors at length, the constitutional and hereditary tendency of the patient himself must be discussed.

Hurst states that there is strong evidence of a type of stomach and duodenum, and an inborn hypersthenic diathesis, and a constitutional tendency to hyperchlorhydria; and that a short, high, rapidly emptying stomach with hyperchlorhydria is generally present in duodenitis, which may give rise to precisely similar symptoms to those of duodenal ulcer, though no deformity is seen with X-rays, and inflammation without ulceration is found if an operation is performed. This may also be found in patients who have recovered from an ulcer as a result of medical or surgical treatment. Hurst is emphatic that this hypersthenic stomach is an essential or almost essential, predisposing cause of duodenal ulcer, and that this "type" of stomach tends to run in families. He further states that no definite conclusion can be drawn from investigating the type of stomach which is present, when its secretory and motor functions have been profoundly modified as a result of associated gastritis, and of disturbance in the activity of the pyloric sphincter, which results from the presence of an ulcer in its immediate neighbourhood.

The/

The curve of acidity obtained with a fractional test meal may rise after successful medical treatment of a gastric or duodenal ulcer, owing, presumably, to the gastritis with which ulcers are always associated.

Delayed evacuation of the stomach caused by oedema and congestion round the ulcer, and spasm or achalasia of the pyloric sphincter, may produce the long, low, hyposthenic type of stomach, with a low acidity, and there is reason to believe that, following treatment and cure, the stomach resumes its original high, short form, with a higher acidity.

The idea that nutritional factors are a potent cause of the original ulceration seems now, largely to be discounted. Spira recently presented a new theory to the effect that a food factor is responsible for chronic peptic ulcers of stomach and duodenum. Fat in excess is the offending article of diet, and when introduced into the stomach regularly, a regurgitation of duodenal contents, including bile, takes place, and the bile salts, when mixed with the acid gastric contents, form an irritant, which damages the mucous membrane of the stomach and duodenum. Later, in the 'treatment' section I shall discuss results of treatment on these lines. Chlorotic and anaemic states do not seem to invite specially/

specially rapid spread of ulceration, but secondary anaemia may predispose to formation of ulcer, and prevent its healing. Trauma and excessively hot or cold food can undoubtedly produce ulceration, but undue importance has probably been allotted to such direct causes.

Griffiths reported on gastric ulcer caused by blows on the stomach, and faulty posture, by compressing the stomach and interfering with its blood supply, may explain its frequency among tailors, shoemakers, jewellers, and so forth.

Schwarz considered that the pressure exerted by the abdominal muscles on the stomach, forcing it against the spine, results in erosions. He observes that in gastroptosis, where the pressure is on the lesser curvature, he found the ulcer on the lesser curvature, while in the high, toxic stomach, where pressure is exerted on the pylorus and first portion of the duodenum, the ulcers were found on the pylorus or on the duodenum. That chemicals, such as strong acids and alkalies, result in erosions of the stomach and duodenum is a matter of common observation, as is the duodenal ulceration following severe body burns.

Heiser states that in 108 cases of peptic ulcer that came to operation, practically all gave a history of having habitually eaten very hot food.

Aschoff/

Aschoff (Lectures on Pathology, N. York, 1924. 279.) supports the mechanical factor, and the "Magenstrasse" of Waldeyer. This is the "gastric path" where daily the meals pass along the lesser curvature into the duodenum. Chronic ulcers are found with very few exceptions in this gastric avenue, while acute lesions can appear anywhere in the gastric mucosa and heal rapidly. The frequency of peptic ulcer in the first part of duodenum may be partly explained by the close anatomical relationship between the "Magenstrasse" and the duodenum. The powerful longitudinal fibres of the gastric pathway, which prevent the healing of erosions by spreading their edges apart, are directly continuous with the longitudinal fibres of the duodenum. This view of the Magenstrasse is not accepted by all investigators.

Klatsch and von Fredrick conducted a series of experiments to determine whether fluids run along the lesser curvature, and were unable to substantiate this view. On the contrary, they found that fluids mix fairly well with the rest of the stomach contents, and they found nothing in the structure of the magenstrasse to explain the frequency with which ulcers are found there.

#### CIRCULATORY.

The possible influence of vascular stasis in the production/



production of peptic ulcer may, as Hurst points out, be illustrated by the undoubted influence of sudden changes of temperature in causing relapses of gastric and especially duodenal ulcer, and the frequent association of a poor peripheral circulation with these lesions. The spasm of the stomach itself, accompanying the ulceration may also exert in this respect a vicious influence upon the lesions.

Virchow thought that gastric ulcer is preceded by circulatory disturbance in its mucous membrane, which deprived the area involved of alkaline blood, thus exposing the area to attack by the acid gastric juice. It was thought that the funnel shape of a gastric ulcer could be explained by the formation of an infarct in the wall of the stomach, produced by obstruction to the flow of blood in one of its vessels, and this might be due to an embolus, thrombus or arterio-sclerosis. Aschoff found, however, that when the blood vessels in the region of the ulcer were examined, that the course of the branches did not at all coincide with the location and shape of the ulcer. Further, arterio-sclerosis is uncommon in young people and not infrequently peptic ulcer is quite common amongst them. Also the fact that ulcers bleed so frequently is another argument against it, since occluded vessels do not bleed.

There/

There is reason to believe that the presence of clot in vessels at the base of an ulcer is a secondary condition.

The old question why the gastric juice does not digest the stomach continues to give rise to controversy, and this interesting phase of the ulcer problem is still unsettled.

John Hunter, in 1772, advanced the theory that a vital principle present in all living tissue prevents its digestion; but Claude Bernard, in his classical experiment, has shown that the leg of a living frog is digested in the stomach of an animal, thus disproving Hunter's theory. He assumed the existence of an antiferment in the gastric mucous membrane, which prevents it digesting itself.

Katzenstein found that a loop of small intestine with its blood supply intact, when transplanted to the stomach, is quickly digested, but when the first portion of the duodenum on a flap of the stomach, is inserted into the stomach, no digestion takes place. This may prove the presence of an anti-pepsin only in the walls of the stomach and the first portion of the duodenum.

By decreasing the quantity of anti-pepsin in the mucous membrane of the stomach, he produced typical callous ulcers.

Kawamura/

Kawamura repeated all the above experiments and found no digestion in stomach of living tissue, with no circulation disturbances present. Peptic ulcer would thus be due to interference with the circulation at the affected area, which prevents anti-pepsin from reaching it.

Kohler compared the anti-peptic activity of the blood of ulcer patients with the peptic activity of their own gastric juice, and found that the second by far exceeded the first; whilst in those free of ulcer the first exceeded the second. Making use of this method he arrived at a correct diagnosis in almost 100% of his cases.

Orator, using this method was unable to verify his findings. Lieblein found that the quantity of anti-pepsin in the blood of normal cases is constant, while in those with ulcer, it is either very high or very low.

Gunzberg found an increase of pepsin in the stomach of ulcer patients, while in those free of ulcer he found it to be normal. This interesting phase of the ulcer problem is still unsettled, though it has occupied the attention of medical minds for over a century. However, from these experiments we may assume that anti-pepsin is present in the stomach, and that this prevents the stomach from digesting itself, /

itself, or the healthy lining of the stomach has some special resistant powers during life, probably because it is bathed by alkaline blood - circulating in the mucous membrane.

Cruveilhier compared gastric ulcers to typhoid ulcers in the intestines. Since the latter begin as an inflammation of the lymph follicles, he assumed that the first also originated in this way.

It has also been observed that gastritis frequently accompanies gastric ulcer, and the question arises as to whether there is a casual relation between the two, and if so which is cause and which is effect. Aschoff is of the opinion that gastritis is secondary to ulcer, because living tissue is not digested by the gastric juice, and because it is frequently present in carcinoma of the stomach.

Bolton, however, in his experiments, came to the conclusion that gastritis may give rise to ulcer, although frequently it is caused by ulcer. He constricted the duodenum in animals, producing gastric retention, and then fed them with hydrochloric acid (0.4 - 0.7%). In a large number of them gastritis developed, in many of which this condition led to ulcer formation. In human beings, spasm of the pylorus or the duodenum, giving rise to gastric retention, is frequently accompanied by hypersecretion.

We have, then, naturally the same causes of gastritis as those artificially produced by Bolton in his experimental animals. It is, therefore, very probable that in some cases at least, gastric ulcer may be due to gastritis.

Since spasm and hypersecretion may cause gastritis, and since they are frequently a result of gastric ulcer, it follows that gastritis may be caused by ulcer. The two conditions may also co-exist independently, both being produced by the same cause. Experimental evidence by numerous workers confirms the clinical evidence that the presence of acid in the gastric contents is an essential factor in the formation of gastric and duodenal ulcers. It may lead to their extension when once formed, though it is not the only factor, for there are many more acute ulcers than become chronic. Claims have been made that peptic ulcer is always secondary to some other abdominal disease, such as appendicitis or cholecystitis, and that spastic deformity of the first portion of the duodenum is due to reflex disturbances from "the primary disease."

Of great significance are the bacteriological experiments, and findings of recent years, and modern experiment seems to show that bacterial infection and intoxication is the most important influence in man, both/



in the acute and chronic peptic ulcer. There is, undoubtedly, some connection between localised infections, dental or tonsillar, or residing in the appendix or gall bladder, and the production of acute ulcer or at least of acute exacerbations of a chronic ulcer.

The process would appear to consist of localised infection, possibly via the blood stream, and secondary digestion of the mucosa. The usual positions of the ulceration implies, of course, that besides infection, the action of the gastric juice must be essential to the process.

Cohn, in 1860, produced stomach erosions by the injection of bacteria into the blood vessels of animals.

In 1888 Widal produced the same results by the same means.

Bottcher, in 1874, was the first to isolate bacteria from the margins of the ulcer base.

In 1907 **Rosenau** and **Anderson** produced erosions by injecting diphtheria toxin into the blood, proving that the production of ulcers by bacteria need not be due to bacterial emboli lodging in the vessels.

Bolton upheld the infection theory, pointing out that an unsuspected local infection of some organ might cause erosion and haemorrhage in the acute ulcer/

ulcer, and induce the chronic peptic ulcer.

The classical work of Rosenow upon elective streptococci, found in the ulcer walls, and capable of reproducing ulceration in animals, is outstanding. In 1913, he injected intravenously into animals, a streptococcus of sufficiently low virulence, not to cause a general infection, and he found that in a number of these animals, erosions of the stomach and duodenum were produced.

He then proceeded to make a culture from these erosions, and got a strain of streptococci, which, when re-injected into animals, reproduced the same lesions, thus proving the "elective localisation" of these bacteria.

Patients have complained to me of a return of symptoms after a cold, and of a slight exacerbation of their old symptoms of indigestion, after weekly prophylactic doses of an anti-cold or anti-influenza vaccine. Further, with regard to Rosenow, he found that bacteria isolated from the duodenum tended to localise in the duodenum, and those isolated from the stomach tended to localise in the stomach.

The ulceration was the result of a localised infection with secondary digestion. In infection of the gastric mucous membrane, according to Rosenow, there is a disturbance in the mechanism of gastric secretion. Normally, Hydrochloric acid is produced on/

on the surface of the stomach, but when the stomach is infected it is produced in its wall, thereby causing its digestion. He isolated streptococci from gastric and duodenal ulcers in man, or from foci of infection, - teeth, tonsils, - in ulcer patients, and after injecting them into animals he produced typical callous ulcers. Streptococci obtained from these ulcers, when re-injected, again produced such ulcers.

Ivy produced erosions in the stomach of animals by pinching the gastric mucous membrane, and then feeding them with bacteria. He found that peptic ulcers only developed in those in poor general condition. These had but little free hydrochloric acid, which condition, he thought, gave the bacteria a chance to infect the stomach wall, and consequently produce ulcers. The injection of streptococci (viridans and haemolytic) into the gastro-epiploic arteries did not produce ulcers. Recent experiments corroborate convincingly the findings of Rosenow.

In a recent lecture, Bramwell, (British Medical Journal, 1932), points out the importance of the part played by the emotions and by anxiety in causing disturbance of the autonomic nervous system, and the large number of diseases and disorders attributed to this disturbance.

He shows that individuals vary in their sym-  
ptom: /

thetic-parasympathetic "make-up", and that there is reason to believe that manifestations of a general or local autonomic reaction, may, by repetition, become habitual. Then, he asks, may not these autonomic reactions lead to structural changes in the tissues? Do emotional reactions determine physical changes, and is the individual who presents sympatheticotonic characteristics, shorter lived than his phlegmatic vagotonic brother? And is peptic ulcer more common in persons of the sympatheticotonic type?

As Bramwell says, there would appear to be a fruitful field for investigation on these lines.

Gunsberg, in 1852, said that hypersecretion of hydrochloric acid, produced by nervous influences, is the direct cause of gastric ulcer.

Von Bergmann considers disturbed innervation as the cause of hypersecretion and hyperperistalsis, so frequently encountered in peptic ulcer. It is probably true that emotional disturbances cause a state of spasm in the stomach and duodenum, and interference with, and blanching of the blood vessels.

It is easy to infer that if one of these spasms last long enough, an area of ischaemic necrosis will ensue. We, then, have an erosion which may develop into a peptic ulcer, and continued spasm would delay healing/



healing because it diminishes the supply of blood to the ulcer.

Many experiments have been performed on animals by injuring both Vagi and both sympathetic nerves.

In 1828 Cammeren did this, and produced ulcers.

Durante claimed similar results by ligating the splanchnic nerves.

On the other hand, Ivy did similar experiments and got no ulcers. He accounts for his negative results by the fact that he fed his animals carefully, and considered that not the injury to these nerves, but poor feeding, followed by a lowered general resistance and bactericidal power of gastric juice, set up an inflammation, resulting in ulcers.

In an highly interesting paper, recently published by Draper and Touraine, Draper gives an analysis of the family histories of 32 cases of gastric and duodenal ulcer, and a similar number of gall bladder diseased. He urges that observations must be made on the four panels of the personality, - morphological, physiological, immunological and psychological, - and the view of the processes at work is incomplete without such a picture. The detailed family histories which have specially dealt with physical type and actual symptoms in the more immediate relations, have shown that the families of the ulcer patients contained more males than females,



and that the reverse holds with respect to gall bladder families. In the ulcer patients the build approximated to the asthenic type and the short, stocky type, prevailed in the gall bladder patients. The physical features specially noted in the ulcer families have been general alertness of the facies, sometimes bordering on defiance, low arterio-posterior diameter of the chest, narrow sub costal angle, and short extremities, with long digits.

Alterations in the jaw measurements and constant variations in the placing of the teeth were also marked in the families of ulcer patients.

Detailed psychological investigation of the patients and a picture of the families' general reactions were noted. It was found in the peptic ulcer cases under review that an emotional reaction of fear had been present, and that this had affected the individual in two ways.

First a long continued and unconscious strain had been borne, and the authors picture this as leading to slow ulcer formation. They suggest that this arises in the "peptic ulcer male" on account of his failure to acquire full masculine reactions, and the "ulcer female" is one whose urge towards executive ability has been hampered by her feminine build, which masks a masculine outlook. This conception of masculine/

masculine and feminine components in every individual is not new, but the idea of how this may alter the reactions of the autonomic nervous system, and actually originate organic changes, is highly suggestive.

The second factor is an immediately precipitatory emotional crisis, followed by increase in symptoms, possibly by haemorrhage. H. Cushing is convinced that the incidence of gastric and duodenal ulcer has greatly increased during the past 15 years.

He suggests that its present prevalence may legitimately be associated with the strain and stress of modern life. Three points are cited in support of this hypothesis, and details of, and comments on, eleven cases are also given. The attempt to explain the acute perforative lesions affecting the alimentary tract, which in three instances caused early death after operations for cerebral tumour, led Cushing to review the literature on the neurogenic aspects of ulcer pathogenesis, and to undertake experimental investigations, which strongly suggest the presence in the diencephalon of a parasympathetic centre. From this point fibres pass back to relay with the cranial-autonomic stations of mid-brain and medulla, of which the vagal nucleus is the most important. Experimental lesions in the intracranial course of these fibre tracts from hypothalamus to vagal centre, are/

are prone to cause gastric lesions. Intracranial injuries and diseases affecting these regions are known to be accompanied by ulcerative lesions of the upper alimentary tract. Probably, therefore, the perforations following the cerebellar operations in the present case were similarly produced by irritation either of the fibre tracts or vagal centres. The parasympathetic apparatus is strongly affected by cortical or psychic influences and direct stimulation of the tuber on its descending fibre tracts leads to hypersecretion, hyperchlorhydria, hypermobility and hypertonicity, especially in the pyloric segment. By spasmodic contractions of the musculature with local spasms of the terminal blood vessels, small areas of ischaemia or haemorrhagic infarction are produced, leaving the over-lying mucosa exposed to the action of the hyperacid juices.

Thus the neurogenic theory of Rokitansky, and Virchow's theory of a primary local cause are reconcilable. Cushing believes that this conception of the actiology of ulcer reasonably explains most cases and accords with the personal experience of most patients with chronic recurring ulcer. Mainly owing to the work of Wilkie, in recent years, the condition of chronic duodenal ileus has had attention drawn to it. The actiology of the condition has been the subject of some discussion. Both Wilkie and Coffey believe/

believe that the dilatation of the duodenum ceases at the site of the crossing of the superior mesenteric vessels, and that if the root of the mesentary be raised, the duodenum easily empties. They thus support Albrecht's view of the nature of acute dilatation of the stomach, of which duodenal ulcers may be regarded as a chronic variety. The lesion is usually found in adult females and the symptoms date back frequently, for many years. There is at first flatulence and discomfort, which passes on to severe pain in the epigastrium, most marked 1 - 2 hours after food. Exacerbations often associated with vomiting may persist for a few days. The patients present the general characters of virginal ptosis, and Wilkie shows that duodenal ileus is not uncommonly associated with true lesions of other viscera. X-ray examination shows a dilated duodenum, and may show hyperperistalsis, while the stomach is dilated and atonic, with much delay in emptying. A certain amount of dilatation of the duodenum may occur, in association with other lesions, such as duodenal ulcer, chronic gastric ulcer, gall stones and appendicitis, acute dilatation of the stomach, while any form of acute or chronic obstruction, especially in the upper part of the small intestine, may be followed by distension of this viscus.

Chronic/



Chronic duodenal ulcers, active or healed, bring about distortion of the duodenum, resulting in shortening, pouching, displacement and immobility. These factors may cause duodenal stasis, and a resulting intoxication.

The possibility of carcinomatous changes arising in the site of a chronic ulcer was first discussed by Cruveilhier in 1839, and by Rokitansky a year later.

A few years ago it was suggested that the majority of carcinomata had such an origin. To-day there is a tendency to belittle the relationship. It is difficult to arrive at actual figures, but whatever they are there can be no doubt of the possibility of such a complication. Duodenal ulcers very rarely become carcinomatous, though a few cases have been reported of late.

Hurst states that owing to the absence of segmentation and the nature of the peristalsis in the duodenal bulb, its contents are never rubbed against the mucous membrane, and the complete absence of mechanical irritation is in striking contrast with what occurs in the pyloric vestibule, and perhaps explains, in part, why primary cancer of the duodenal bulb is so rare, and why duodenal ulcers differ from gastric ulcers in never becoming malignant.

Hurst has taught for many years that a "pre-duodenal/





duodenal ulcer" condition exists, which is associated with the hypersthenic gastric diathesis, and generally with active duodenitis, and if left untreated it is likely to develop into actual ulceration. Many patients have been operated on for duodenal ulcer, and only a congested duodenal bulb found.

Nagel has described twenty-six cases of this condition, observed at the Mayo Clinic, fourteen being in women and twelve in men. The symptoms were typical of duodenal ulcer, and haemorrhage had occurred in six. The X-rays had shown spasm in the duodenal bulb in all but two of the cases, but on examination of the duodenum at operation no abnormality was seen. The excised bulb, however, showed well marked inflammation of the mucous membrane, together with minute abrasions in some cases, but neither an active ulcer nor the scar of a healed ulcer. This condition is extremely resistant to treatment.

Walton remarks that characteristic symptoms of duodenitis are seen in young men subjected to long continued mental work and lack of exercise, and are not uncommon in those working hard for an examination. The symptoms are relieved by taking food or alkalies and the attacks last only for a day or two, but recur at a relatively short interval, the pain tending to become/

become more severe. If, however, the mental strain be prolonged over a long period, as in the case of professional men, the symptoms gradually pass into those of the later stages, until a definite diagnosis of a chronic duodenal ulcer may be made.

I would suggest that hyperchlorhydria may cause symptoms very similar to gastric or duodenal ulcer, but probably the border line between the hyperacidity and peptic ulcer is a narrow one, and, of course, the former may be secondary to disease elsewhere, such as chronic appendicitis.

#### ALLERGIC CAUSES.

With regard to allergic causes, many experiments have been done by Bolton, who used a gastrototoxic serum, which he injected into the gastric mucous membrane of various animals, and produced gastric ulceration.

These experiments are certainly very interesting from a purely scientific point of view, but it is difficult to see how they apply to man. But of greater significance in this respect are the experiments conducted by Ivy, and Shapiro. They sensitized an animal to a foreign protein - egg albumen, oat protein, and so forth, and then injected that protein locally into the gastric mucous membrane. In this way/

way they produced acute ulcers which healed within two or three weeks. Such procedure would destroy tissue in any organ, but we know that certain diseases, such as gastro-intestinal disturbances, mucous colitis and infantile convulsions, may be due, in certain cases, to protein sensitization. The gastro-intestinal mucosa may become hypersensitive to an article of food, with the result that the patient experiences severe abdominal pain, often associated with nausea and vomiting, whenever he eats the food to which he is sensitized.

Individuals sensitive to the commoner articles of food, such as milk or eggs, have more frequent attacks of pain, and are often subject to chronic indigestion as well.

Of great importance is the question of lead poisoning as a cause of peptic ulcer. Plumbism is chiefly of importance as an occupational disease.

Last year there was considerable correspondence in the British Medical Journal on the subject as related to spelter workers. As we know, the pathology of peptic ulcer is not clearly understood, but toxæmia may play a potent part in its production. Lead is a very toxic element, and as it is eliminated by the liver via the alimentary canal, the duodenum is more exposed to its effects than the rest of the intestine./

intestine.

Many continental authors have drawn attention to the frequency of peptic ulcers in lead poisoning.

Glaser of Berlin has found ulcers in the stomach and duodenum and in a large proportion of his plumbic cases, and he maintains that such ulcers are not the result of a special disposition, but are caused by toxic vagatonia.

At the Swansea Vale Spelter Works, recently, one hundred men, who in the course of their work, were exposed to lead fumes and dust, were examined. The urine of thirty men of the selected hundred was examined, and lead in varying quantities was found in every case.

Lead was found in many men who did not show the slightest evidence of lead absorption, and who were apparently fit. One man, aged forty-five years, who had worked for five years in the Spelter works, and had in the urine as much as 1.89 parts of lead per million, stated that he felt very well. He left this occupation. Two years later he died of a perforated peptic ulcer. Of the hundred cases examined, twelve, whose ages ranged from thirty to sixty years, were found to be suffering from gastric ulcer, which was verified by X-ray examination. Lead was found in the urine of each ulcer case. Five of the twelve perforated, one recovered and is now well.

Necropsy/



Necropsy was performed on three cases and lead was found in the liver, brain and kidney, in each case. Some workmen showed signs of grave toxæmia without the classical signs of colic or wristdrop. Early signs of lead absorption are loss of weight, vague abdominal pains, loss of appetite, and discomfort on taking food. There would appear to be idiosyncrasy with regard to plumbism as in other things. In connection with lead absorption and poisoning, I would like to draw attention to what I consider may be a fertile source of plumbism. I refer to the unrestricted sale of metallic "hair restorers" by commercial firms. These are advertised in the more high-class weekly journals under attractive labels, and the price is in keeping with the cost of advertising; distinctive literature, and bottles, not forgetting the scent which is added to the watery solution. This was brought to my notice in a man who suffered from recurrent, typical symptoms of duodenal ulcer. There were also neuralgic pains and extreme general debility; in fact a neurasthenic state. X-ray showed a quickly emptying stomach and duodenal cap distortion. Having about this time to examine a case of dye dermatitis for an Insurance Company, I read some literature on the subject, and incidentally came/



came across information on the use of lead acetate in commercial preparations for the hair. Many preparations on sale to-day consist of a solution of lead acetate and free sulphur, and when applied to the hair a dark film of lead sulphide is deposited.

On the hands of the patient under discussion I observed a yellowish deposit, and found he had been applying his "hair restorer" and had not washed his hands. I shook up the bottle, because of a solid deposit at the bottom, and took away a sample for analysis. There was a high percentage of lead. The patient was quite innocent of the contents of his "restorer". It had been recommended to him by a hairdresser several years previously. His hands were practically always in contact with lead, from the preparation itself, his hair, hats, hair brushes, pillows, etc., and a considerable amount must have been ingested from his hands when eating. From abrasions on the skin there would be a danger of absorption of the acetate, and probably a certain amount of absorption through the scalp. This patient was all in favour of his hair "tonic," because he had had no irritation or dandruff since using it, which would, of course, be explained by its astringent properties. I stopped the use of the restorer/

restorer at once, and a gradual improvement took place in patient's health. The peptic ulcer symptoms were inclined to recur, but much less severely. There was no blue line on the gums, or wristdrop, as seen in severe lead poisoning; but I am certain that in this man's case there was lead absorption, and in view of the considerable sale of these lead preparations, one would hazard the guess that much ill-health results from their use by susceptible persons, and their sale should be prohibited.

SYMPTOMATOLOGY.

It is unfortunate in the extreme that so far it has been impossible to formulate a syndrome indicating the early or formative stage of peptic ulcer.

There must first be a chemical change followed by structural pathology, the latter showing at first microscopic and later macroscopic changes. The great problem is to find methods of subjective and objective worth which will lead us to suspect, and later to establish, the presence of peptic ulcer.

When the early chemical changes occur - due to implantation of bacteria and impregnation of part with toxins, there is not enough functional disturbance to call the attention of the patient to the fact.

Probably in time to come the biochemist will be able to detect serum or fluid changes in the blood and secretions. When the patient explains his symptoms

it is most important that a detailed history be

competently taken and thoroughly studied. And the

patient must be studied too - the stalwart, well-developed man with the duodenal diathesis - in whom

hypermotility and hypersecretion are the rule, and

the symptoms of gastric ulcer in the hyposthenic

type with a narrow chest, poor physique, and a

tendency to visceroptosis, in whom gastric secretion

and/

and motility are both on a lower plane. Invariably the condition of which the patient complains has been present for months or years. At first he observed an irregular and indefinite dyspepsia, in the form of abdominal discomfort and distress; fullness and pressure, general or localized, usually accompanied by eructation and some relief. There may or may not be, at this stage relation to food intake as regards these sensations, but gradually this relationship, especially in duodenal ulcer, dawns on the patient. In the majority of gastric cases, such symptoms as nausea and vomiting are active at this stage. Sooner or later there appears by imperceptible degrees a pain of such varying character as dull, boring, burning, twisting, - the pain cannot always be intelligently described by the patient, and minute questioning is necessary.

It is now noted that in from fifteen minutes to one or more hours after the heavy meal of the day, there is discomfort by pain of varying intensity and duration. Later the pain appears with almost clock-like regularity, according to the time of food intake. Accompanying these symptoms there are various dyspeptic complaints, such as flatulence, eructation, nausea/

nausea and anorexia, and constipation. Great care should be exercised in determining that the symptom presented is pain and not merely discomfort, for many patients who, at first, state they have pain, upon close questioning retract this statement and confess to discomfort only. I do not consider the location of the epigastric pain to right or left of the midline is of significance as to whether the ulcer is gastric or duodenal. Complications may greatly change the anatomical location of peptic ulcer pain, e.g. adhesions from the gall bladder or liver to the pylorus, perforating ulcers from stomach and duodenum to the pancreas, liver and surrounding structures. In the majority of ulcers the pain is localised and does not radiate. In a small percentage of cases, especially in posterior duodenal ulcer, there may be a localised spot of pain in the back, about the level of tenth rib, and pain may radiate through to the back, indicating posterior adhesions, or accompanying hepatobiliary complications. The character of the pain is extremely variable, and differs with the individual's reaction, and one of the most important characteristics of uncomplicated peptic ulcer is the relationship to food-intake. Moynihan's formula as to the two rhythms is as follows: /



follows: "Gastric ulcer; food, comfort, pain, comfort." "Duodenal Ulcer: food, comfort, pain." There are many exceptions, however, to these rhythms. A marked indication of peptic ulcer is nocturnal pain, indeed in duodenal ulcer this may be the patient's chief complaint. As a rule, in duodenal ulcer patients the so-called hunger pain is prominent; whenever the stomach becomes empty or just before each meal time, and during the night, pain occurs, accompanied by intense epigastric gnawing, and a feeling of weakness and exhaustion. Upon the intake of food and drink the symptoms, in many instances, disappear as if by magic. It is in these cases where the patient eats six to eight times during the twenty-four hours that the appetite is good, and the weight normal or excessive. Early in the study of the potential ulcer patient, the effect on pain of the character of food should be studied. In this condition, as in every other, there are exceptions to all rules, but in the majority of cases heavy foods prove to be the most deleterious articles of diet. After a heavy meal of meat and vegetables relief is at once obtained, but when the pain later appears it is much more intense than after the consumption of smooth digestible foods. In some cases if fluid alone is taken, the pain appears more rapidly and/

and persists for a greater length of time than after solid foods. I am certain that the drinking of large quantities of milk, between and with meals, is bad treatment in many cases. Violent exertion may bring on the pain, and this is rather difficult to explain, but it is probably due to increased muscular activity in the abdomen, as well as in the stomach itself, or it may be a reflex occurrence.

If adhesions are present, it is easier to comprehend the effect of muscular exertion upon pain intensification. Cold weather and exposure to a strong wind may bring on an attack of pain, and patients note exacerbations when attacked by coryza, influenza, and other acute infections.

A peculiarity of peptic ulcer not yet explained is the occurrence of marked periods of intermittency. Splendid results may follow treatment, and the patient is allowed to go about, following the schedule prepared, when suddenly there is an inexplicable return of symptoms, or even such a catastrophe as haemorrhage or perforation.

Again, a patient may become discouraged and rebellious, throws all caution to the winds, and eats and drinks at will, his symptoms cease, at any rate for a time, and his physician's advice is ridiculed. To this criticism there is but one answer: that for some/

some reason unexplained there occur irregular periods of latency, inactivity, and lack of symptomatology, in an unhealed ulcer. The syndrome of peptic ulcer may become completely changed following various complications as partial or complete pyloric or cardiac obstruction, hour-glass stomach, peri-gastric adhesions or abscess and adhesions between stomach, pancreas and liver.

It is then that a fully taken and well studied history is appreciated. Often it is discovered that chronicity, intermittency, relation of pain to food-intake, and food-ease were almost classic in the early stages, but that this relationship has been lost. Intermittency has gone, and the complaint is constant. Such a syndrome should at once suggest complications. Again vomiting must be considered when this symptom is on the increase, the hunger-pain decreased and irregular, as to whether organic pyloric stenosis is present.

Irregular attacks of vomiting may occur, especially in gastric ulcer after a severe attack of pain.

A certain number of ulcer cases give a history of vomiting dating from the onset of symptoms, usually in neurotic women, with marked nervous irritability of the stomach. With regard to reflex disturbances, the/

the stomach may give manifestations of gastric disturbances which are reflexly produced by diseases elsewhere in the body. Hence the significance of a detailed history, a thorough physical examination, and various laboratory investigations, in order that sufficient evidence may be adduced to implicate some other organ or organs, as the gall-bladder, liver or appendix, which being diseased, may excite a hyperperistalsis in the stomach, causing pain or discomfort. It is interesting to note that appendicitis will more readily excite symptoms of duodenal ulcer in persons of duodenal diathesis. We must try to distinguish between actual and referred symptoms, and everything depends on a correct answer.

The pain of gastric ulcer comes on within half an hour to one hour after the ingestion of food, but if the ulcer be close to the pylorus, the pain may not occur for two or three hours.

The pain increases in intensity as digestion progresses: sometimes taking more food relieves the pain, but this is not the case so often as in duodenal ulcer. The pain may continue in gastric ulcer so long as there is food in the stomach. Relief may be obtained by vomiting, whether spontaneous or artificially produced. Almost all sufferers from gastric ulcer are troubled with flatulent distension of/  
of/



of the stomach, and vomiting is much more frequent than in duodenal ulcer.

As already stated the pain in duodenal ulcer, unless complicated by pyloric stenosis, comes on from two to three hours after food, and remains until the next meal. As pain is the symptom from which above all others, the patient seeks relief, and which drives him to his doctor, let us consider the theories as to the mechanism of the pain in gastric ulcer, and the "hunger" pains in pyloric and duodenal ulcer.

According to one theory the pain is primarily a result of increased acidity of the stomach contents at the height of or at the end of gastric digestion. The acid may have an irritating effect on the pain-producing mechanism, or irritate the mucous lining of the stomach, which by reflex action, gives rise to spasm, and in this way to pain.

But the concensus of opinion, nowadays, is that there is very slight relation, if any, between the subjective sensations of the patient, and the acid values in the gastric contents. In the other theory the pains are chiefly due to abnormal motility - spasm and increased peristalsis, in fact disordered muscular action, and really an exaggeration of normal sensations, such as hunger, which are associated with hypermotility. In the early days, before X-ray demonstration/



demonstration to the contrary, it was believed that the presence of an ulcer in the duodenum produced a protective reflex, which delayed the evacuation of the stomach, and the pain began when the contents of the stomach first gained access to the ulcer. Were the painful sensations in the ulcer itself one would expect a continuous pain instead of periods of quiescence following food-intake. The mechanism of pain in gastric and duodenal ulcer was the subject of a paper by Palmer in 1927. In his experiments he uses the balloon method devised by Boldyreff in 1914, and by Carlson in 1917, but in addition to swallowing a rubber balloon, the patient has duodenal tubes passed. Kymographic studies that he has made with this technique are very well done and illustrate very beautifully the reason for his conclusions. He finds that the pain producing mechanism is intimately associated with the ulcer, but is not dependent upon gastric motility - nor upon pylorospasm. At times gastric peristalsis may cause stimulation to the pain producing mechanism, but probably more important than peristalsis is the direct sensitizing effect of hydrochloric acid, as shown by producing pain when injected into the stomach previously free of gastric contents, and when it is drawn through the duodenal tube relieving pain.

More/

More recent experiments by Christensen, in 1931, also by the balloon method, showed that there was no relation between the hunger pains and the hunger contraction-periods of the stomach, and also there was no relation found between the induced or spontaneous variations in the acidity of the stomach contents, and the appearance or intensity of the pain. These findings do not at all coincide with those of Palmers. In Christensen's view the hunger pains are a symptom of pyloric gastritis, and greater or lesser degrees of tenderness in the inflamed wall, due to circulatory disturbances, may be related to variations in the occurrence of the pains, and that the seasonal occurrence of the pains may be associated with exacerbation and improvement of the gastritis.

This hardly explains the relief from pain in pyloric and duodenal ulcer, on food-intake. I am inclined towards the muscular spasm theory, especially pyloric spasm, with an associated gastritis or duodenitis, the spasm being associated with diminished vascularity. Any circumstance which determines an increase of the blood supply to the part, can arrest the spasm and relieve the pain associated therewith. This would explain why the taking of food temporarily relieves the pain of pyloric or duodenal ulcer. The same/

same explanation serves for the relief of pain stated to occur, following a course of protein injections, for these eventually produce an intense vascularization of the abdominal organs, and a visible lengthening of the musculature of the stomach, a relaxation of the stomach wall, and a cessation of the painful spasms.

In the later stages of gastric ulcer alkalias have little effect, and only vomiting gives relief from pain. Usually the irritating food is returned with much mucus, an evidence of chronic gastritis. Where there is vomiting of large quantities of sour fluid with partially digested food, hour-glass stomach or pyloric stenosis is indicated. One can visualize an atonic stomach with impaired motility, an inflamed hypersensitive mucous membrane, and vomiting, as nature's effort to get rid of the irritating stomach contents.

DIAGNOSIS.

In the diagnosis between gastric and duodenal ulcer the X-ray will invariably settle the question, especially should the ulcer be in the stomach. The method is not so satisfactory in duodenal ulcer as regards the actual finding of an ulcer crater. Usually the report states - indefinite - or deformity of the duodenal cap, which may mean an old scar from previous ulceration, irregular spasm of the cap or actual ulcer. Valuable information is, of course, obtained from the emptying time and type of stomach; usually in duodenal trouble one finds a high position of the stomach and rapid evacuation, unless some organic narrowing follows the healing of the ulcer, or an oedematous condition of the pyloric antrum. Further regarding duodenal symptoms, if they have been present only a short time an actual ulcer may not be present, but a pre-ulcerative duodenitis, which is likely to go on to ulcer if not adequately treated. Over-fatigue, emotional strain, and toxic conditions, may give rise to almost identical symptoms in individuals with the hypersthenic gastric diathesis. No deformity of the duodenal cap would show in X-rays, and/

and occult blood would be absent from the stools.

Hyperchlorhydria is generally shown to be present by test meal, though a low curve might result by fractional test meal if there is considerable gastritis. The diagnosis from gastric ulcer depends chiefly upon the later onset of pain, greater relief on taking food, rarity of vomiting, and more frequent periods of complete freedom from symptoms. Pain and tenderness may be to the right of the middle line, "guarding" and the abdominal reflex accentuated over the lesion.

The symptoms may closely resemble those of cholecystitis, but in this condition the pain is much more irregular in its onset, and is not influenced by food or alkalies to the same extent. Also the tenderness is over the gall-bladder region, and frequently there is pain referred to the right shoulder.

Haematemesis is more commonly a complication of gastric ulcer, and this, with occult blood in the stools, excludes all other gastric disorders, except cancer. Cirrhosis of the liver and splenic anaemia must be kept in mind in a case of haematemesis. In cancer, occult blood is always present in the stools in spite of diet and rest, and free hydrochloric acid is absent in 60% of cases. Anorexia and wasting out of proportion to the diminished intake of food are also/



also likely to be present.

The pain and tenderness in nervous dyspepsia are irregular in position, time of onset, and relation to quantity of food and alkalies have less effect. In chronic gastritis the patient complains more of discomfort than pain, and it usually begins directly after meals, and there is no localised tenderness.

In this generation much progress has been made in elaborating diagnostic methods. Radiology has especially increased the knowledge of the viscera but only a few organs can be brought under direct vision, e.g. the larynx, bladder and rectum. In the case of the stomach the gastroscope is an instrument that requires special care, and its field of vision is limited. Photography of the stomach wall by the "gastrophoton" offers a useful addition to our diagnostic methods. In his manual on gastrophotography Dr. Becart describes his methods of using, and the results obtained with an instrument for taking direct photographs of the lining membrane of the stomach. A double camera is mounted at the end of an oesophageal tube for introduction into the stomach. One exposure enables eight stereoscopic pictures to be obtained of the whole circumference of the stomach. The minute pictures of the interior thus obtained are developed and enlarged before examination.

GASTRIC EFFICIENCY.

There are two methods of investigating gastric efficiency:- examination by X-ray after a barium meal. Investigation of the response to test meals, - the one-hour method of Ewald, and the fractional method of Rehfuß.

The latter is the more satisfactory. The patient receives, the night before the examination, a glass of milk and a charcoal biscuit. The latter is to supply something which will be easily recognizable in the stomach contents. On the following morning the patient swallows a thin stomach tube, and the resting juice is removed. A test meal is then either taken orally or given via the tube: a pint of thin oatmeal gruel being quite suitable.

Every quarter of an hour, for two and a half hours, specimens of 15 ccs. are withdrawn. In the resting juice examination valuable information may be obtained. The quantity returned gives an indication of the ability of the stomach to deal with ingested material. There would be an increase from normal in the hypotonic stomach and where there is pyloric stenosis.

In a normal stomach, charcoal should not be present after twelve hours, if present, an atonic or obstructive/

obstructive condition would be indicated. The odour should be noted, in carcinoma the resting juice is foul. Mucous is found in excessive amounts in the atonic stomach and in chronic gastritis. Blood will be found in cases of carcinoma, and in many cases of ulceration.

Acidity is due to a mixture of hydrochloric acid and certain organic acid, such as lactic and butyric, and since gastric juice contains protein matter, some adsorption of the acid takes place with a consequent lowering of the hydrogen ion concentration. The following conditions may be found in the gastric contents:

- (1) Free Hydrochloric acid.
- (2) Adsorbed or protein hydrochloric acid.
- (3) Organic acids.
- (4) Neutral mineral bodies.

We find a wide variation in the occurrence of free hydrochloric acid, in normal individuals, but it is important to note that the amount after fasting is low, and after a meal it gradually increases up to a point, and then diminishes. The fractional test meal is most likely to be of value in the diagnosis of gastric ulcer, duodenal ulcer, gastric carcinoma, pernicious anaemia, and sub-acute degeneration of the spinal cord. Hydrochloric acid may be increased in gastric/

and duodenal ulcer; the gastric crisis of tabes; as a reflex in appendicitis and in cholecystitis.

Hydrochloric acid may be diminished in gastric carcinoma, pernicious anaemia, sub-acute degeneration of the spinal cord, severe secondary anaemias, atonic dyspepsia, certain chronic infections.

Rapid emptying of the stomach and a swiftly rising curve of acidity is found, usually in duodenal or juxtapyloric ulcer. A "climbing curve" with no drop in the acid in the later stages, suggests some impediment in the pyloric outlet, possibly due to an ulcer. The "plateau" type of chart is characteristic of pyloric obstruction. Complete achlorhydria of the "benign" type is found with rapid emptying. It occurs in about 5% of normal healthy men, in cases of pernicious anaemia, and occasionally, though rarely, in cases of cancer of the stomach. The picture is not constant in the latter, but varies according to the nature and exact position of the neoplasm. The presence of free hydrochloric acid does not exclude the diagnosis of cancer, nor does the presence of lactic acid confirm it. For many years it was hoped that clinical methods of gastric analysis would provide diagnostic information of value in differentiating various disorders of the stomach. At first the results/

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results seemed very encouraging, and various syndromes based on studies of test meal findings were soon described. However, as time has gone by, it has become evident that such supposed diseases as hyperacidity or hypoacidity have no very uniform pathological basis, and that great variations in gastric activity may occur in apparently normal people. Most physicians at the present time hesitate to make an exact diagnosis from the results of gastric analysis alone. One is struck by the tremendous amount of work done and being done in this subject, and the volume of statistics recorded in the literature. Much of the time and energy expended would have been better devoted to methods of treatment of the disordered or diseased stomach. It has also been found that great variations in motility of the stomach exists. There is no distinct relation between emptying time and any particular disease, although it may be noted that the stomach as a rule empties more quickly in the duodenal ulcer than in the gastric ulcer cases. The part played by the gastric hydrochloric acid in the bodily economy is still in some respects unexplained. The secretion has a definitely bactericidal action which may be of importance. Many people go through life without producing hydrochloric acid, and apparently suffer/



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suffer no dyspeptic or general symptoms. It is, however, a fact that there are certain abnormal bodily states in which pathological alterations of the stomach may be encountered, and it has been suggested that a deficiency of the secretory function of the stomach might bear a relationship to the associated manifestations of disease. Perhaps the most important condition in which the etiological significance of a defect of a chemical function of the stomach has been raised is in pernicious anaemia. In nearly all cases of this disease a practically complete and constant absence of hydrochloric acid and of pepsin is found. In daily practice one prescribes hydrochloric acid dilute, in some cases of diarrhoea and in suspected intestinal toxæmia on the assumption that an absence of hydrochloric acid in the stomach may allow the passage of living organisms into the intestine. The theory of "acid control" of the pyloric sphincter is no longer held, as there is no doubt that it is not the reaction alone, on either side of the pylorus which governs the opening or closing of this sphincter, and the presence of normal hydrochloric acid is not necessary for normal gastric evacuation. Since neither the function of the gastric acid as a bactericide or as a regulator of pyloric activity appears to be essential it has been suggested that its primary/

primary "purpose" may be to maintain the acid-base equilibrium of the body; that is to say, it is held that the stomach may behave somewhat like the kidneys and lungs, and excrete acid when the hydrogen ion concentration of the tissues tend to shift to the acid side. From this point of view the hydrochloric acid of the stomach would be an excretion - much as carbon dioxide in the lungs or acid phosphate in the urine are excretions - and its output would vary according to the condition of the body as a whole, rather than according to any conditions within the stomach itself. Apperley and Crabtree have lately recorded some experiments which suggest that the condition of the blood largely determines the secretion of the hydrochloric acid and the emptying time of the stomach.

They have studied gastric activity by means of fractional gruel test-meals under varying conditions of plasma bicarbonate and blood reaction, i.e. in experimental conditions of alkalosis and acidosis, similar to those occurring, for example, at high altitudes or in diabetes. From their results in a number of ingenious experiments they conclude that the bicarbonate content of the blood plasma determines the concentration of the gastric hydrochloric acid during a fractional test-meal, and that the emptying time/

time of the stomach is determined by the hydrogenion concentration of the blood.

Such conclusions support the suggestion that the gastric mucous membrane may be an important regulator of the body's neutrality mechanism, and that gastric acidity is partly an expression of the reaction of the body as a whole. Broadly speaking, it may be that the more acid the body tends to become, the more hydrochloric acid will the stomach excrete, and the more alkaline the body, the less acid will the stomach put out, thereby maintaining the normal reaction of the tissues. Hyperacidity would then become a question of an acid constitution rather than an over-acid stomach, and there would appear to be some justification in the self-diagnosis of so many patients, who, in beginning to describe their symptoms state: "I am full of acid, Doctor !" Balint's treatment of gastric ulcer by intravenous injections of sodium bicarbonate instead of by the mouth would appear to meet Apperly and Crabtree's theory.

OCCULT BLOOD.

When blood is swallowed, or derived from a gastric or duodenal ulcer or neoplasm in the stomach, it is discovered in the stools as haematoporphyrin or acid haematin, or both. In ulcerative colitis, acid haematin, but no haematoporphyrin, is present, as the blood does not remain sufficiently long in the bowel for the transformation of the former into the latter.

Boas, in 1901, first directed attention to the value of examining the stools by chemical tests for the presence of "occult blood." In later years the test has become of great value, as the technique is now reliable. Experience has shown that the guaiac test is the most satisfactory chemical method, and spectroscopic examination is also employed. The patient is put on a strictly milk diet, and a charcoal biscuit is given with the first meal, and first and subsequent stools passed when the faeces are no longer blackened by the charcoal are examined.

Attention must be paid to the gums when brushing the teeth, and if bleeding occurs the mouth must be well washed out so that none is swallowed. The patient should be questioned as to bleeding from nose or pharynx. No iron or iodides are given, and chlorophyl - /

chlorophyl - containing aperients such as senna, -  
must be avoided during the tests.



INCIDENCE AND STATISTICS.

According to Wilkie, in the year 1906, in the Royal Infirmary, Edinburgh, twenty-four cases of duodenal ulcer were treated. 18 of these cases were treated medically and the 6 remaining, surgically. 22 cases of perforated duodenal ulcer were dealt with. Twenty years later, that is in 1926, 236 cases of duodenal ulcer were treated, 73 medically and 163 surgically.

Does the difference mean an active increase in the incidence of duodenal ulcer or merely indicate that diagnosis has improved? But in 1926 there were 102 cases of perforated duodenal ulcer, that is more than four times that of 20 years ago, and many cases must have been treated as urgent in the small provincial hospitals within the area served by the Edinburgh Royal Infirmary.

Wilkie further states that in his experience, duodenal ulcer is much more common than gastric ulcer in both sexes, and indeed in the female the condition is not infrequently missed in diagnosis because the typical history is much less frequently given, and hunger pain is absent. The reason being that the house-wife has food available at home and indulges in frequent/

small meals. The clinical picture points more often to a cholecystitis. Wilkie recognizes a cholecysto-duodenal syndrome in these women - flatulence, irregular pain, and yellowish tint in the skin. He has the gall-bladder X-rayed after an intravenous injection of sodium tetra-iodo-phenolphthalein, and a barium meal given, and the stomach and duodenum screened and X-rayed at the same time.

Below I give particulars of all cases of peptic ulcer admitted to the Royal Sussex County Hospital, Brighton, during the years 1930 and 1931, which may be of some interest. These statistics appear to tally, more or less, with those noted in the literature as regards increase in incidence of the disease.

Firstly, I append a statement showing incidence covering a period of 20 years, at the R. S. C. Hospital.

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Year.	Gastric ulcers.	Duodenal Ulcers.	Beds.	No of Inpatients treated.
1911.	56.	12.	195.	2,690.
1931.	72.	80.	246.	3,913.

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The great increase in incidence of duodenal ulcer will be noted, and a similar increase is reported in the literature of all countries.

Until/

Until recent years, text books stated that gastric ulcers outnumbered duodenal ones, but now almost all statistics quoted indicate the reverse condition, and explain the error of former compilations as due to faulty clinical diagnosis, and to a failure of pathologists to examine carefully the duodenum for ulcers and scars.

Duodenal ulcer, it is generally agreed, occurs about four times as often in males as in females. Further referring to peptic ulcer cases in Wards of the Royal Sussex County Hospital (293 cases). Fractional test meals were done in the majority of the following cases. The duodenal cases had a greater acidity, which is the usual experience, and in diagnosis between ulcer of the stomach or duodenum, low acidity would point to the site being in the stomach.

		<u>Cases.</u>	<u>Male.</u>	<u>Female.</u>
<u>1930.</u>	<u>Gastric.</u>	73.	48.	25.
	<u>Duodenal.</u>	68.	58.	10.

DURATION OF SYMPTOMS:

<u>Gastric.</u>	One year and under - 13 cases.
	Over one year - - 60 cases.
<u>Duodenal.</u>	One year and under - 22 cases.
	Over one year - - 46 cases.

Among the gastric cases there were three cases of perforation, and 21 cases of haematemesis, and in the duodenal series there were 21 cases of perforation and/

and urgent operation. 8 of these cases had sudden perforation, and had very short or no previous history of dyspepsia.

PREVIOUS OPERATIONS:

<u>Gastric.</u>	5 cases	had	previous	operation, -
	1 case	"	"	Gastroenterostomy.
	8 cases	"	"	operation, -
	1 case	"	"	partial Gastrectomy.
				operation, -
				appendicectomy.
				operation, -
				for perforated ulcer.
<u>Duodenal.</u>	3 cases	"	"	operation, -
	2	"	"	Gastroenterostomy.
	2	"	"	operation, -
				for perforated ulcer.
				operation, -
				appendicectomy.

Previous operations had been, in some cases, done at other hospitals.

One duodenal case, male, aged 66 years, had gastro-jejunosomy done four years previously, and developed an ulcer at the gastro-jejunal junction, which perforated. One case had an ulcer in the lesser curvature of the stomach, and another ulcer in first part of the duodenum. There were 2 cases of gastro-jejunal ulcer in this series.

AGE INCIDENCE:

Gastric. Oldest - 76 years.  
Youngest - 20 years. Average age - 47 years.

Duodenal. Oldest - 76 years.  
Youngest, 24 years. Average age - 46.6 "

X-RAY/

X-RAY EXAMINATION:

Gastric Ulcer. Ulcer crater - 27 cases.  
 Indefinite - 20 "  
 Not done - 24 " (perforation and haematemesis.)  
 Residue after 6 hours - 3 cases.

Duodenal Ulcer. Ulcer crater - 3 cases.  
 Deformed duodenal cap - 17 cases.  
 Others indefinite or Not done.  
 Residue after 6 hours - 2 cases.

TREATMENT.

	<u>Medical.</u>	<u>Operation.</u>
<u>Gastric.</u>	48.	23.
<u>Duodenal.</u>	34.	34.

The number of cases sent for operation includes the perforation cases.

1931.

	<u>Cases.</u>	<u>Male.</u>	<u>Female.</u>
<u>Gastric.</u>	72.	52.	20.
<u>Duodenal.</u>	80.	68.	12.

DURATION OF SYMPTOMS:

Gastric. One year and under - 19.  
 Over one year - 53.

Duodenal. One year and under - 32.  
 Over one year - 48.

Among the gastric cases there were five cases of perforation, and twenty-three cases of haematemesis. In the duodenal cases there were seventeen cases of perforation.

PREVIOUS OPERATIONS: /



PREVIOUS OPERATIONS:

<u>Duodenal.</u>	3	cases	had	previous	operation, -
					Gastroenterostomy.
	4	"	"	"	operation, -
					for perforated ulcer.
	7	"	"	"	operation, -
					appendicectomy.

4 cases had been previously treated medically.

One case had a gastro-jejunal ulcer, and in the case of the youngest patient in this series, aged 22 years, by trade a butcher, there was a history of indigestion for 8 years. X-ray showed a deformed duodenal cap, and ulcer and scarring was found at operation.

AGE INCIDENCE:

<u>Gastric.</u>	Oldest - -	72.	
	Youngest -	28.	Average age - 48.1 years.

<u>Duodenal.</u>	Oldest - -	73.	
	Youngest -	22.	Average age - 45.5 years.

X-RAY EXAMINATION:

<u>Duodenal ulcer.</u>	<u>Ulcer crater.</u>	4 cases.
	Deformed duodenal cap -	24 cases.
	Remainder, indefinite,	
	and not done.	
	Residue after 6 hours.	5 cases.

TREATMENT:

	<u>Medical.</u>	<u>Operation.</u>
<u>Gastric.</u>	44.	28.
<u>Duodenal.</u>	24.	56.

Of the duodenal cases sent for operation 17 were perforations.

SYMPTOMS/

SYMPTOMS:

With the exception of a few patients who complained chiefly of flatulent discomfort, the outstanding and almost universal symptom in this series was upper abdominal pain. "Gnawing" was the adjective applied most frequently in the duodenal group, and a "burning" pain was usually described in the gastric ulcer cases. Vomiting was much more frequent in the gastric ulcer cases as was haematemesis. The state of the teeth appeared to be much better in the duodenal than in the gastric cases. The majority of these patients had attended the Out-Patients Department before admission to the Ward, and had been overhauled as regards teeth and other infective foci. An extraordinary number of patients had "dentures."

In the above statistics of cases of peptic ulcer treated in the wards of the Royal Sussex County Hospital during the years 1930 and 1931, comment might be made on the high average age incidence, 46 years. Probably one factor is the comparatively large number of elderly people who, on retirement, settle in the health resorts of Brighton and Hove, but on the other hand the Hospital serves a large country area of the County, from which patients of all ages are drawn. Goodall of Edinburgh, in his series of 200 cases, gives/

gives the average age as 37 years. Peptic ulcer commonly becomes a clinical problem in the latter decades of life, though its onset may be traced, in probably the majority of patients, to their 'teens' or 'twenties.'

Blackford and Dwyer found the average age at time of diagnosis to be 41 years for duodenal ulcer, and 48 years for gastric ulcer; they found 66% of the former group seeking relief before 45 years of age, and only 33% of the latter.

#### OCCUPATION.

In the series of 293 cases quoted, every conceivable occupation was represented, from chalk-cutter to political propagandist ! And no special occupational liability could be noted, except that in the series, there were 7 chauffeurs or motor drivers, and 4 gardeners. In Goodall's series of 200 cases, including 167 males, no less than 27 were miners.

The Royal Infirmary, Edinburgh, serves a large mining area. An occupation which necessitates a great deal of stooping, as in gardening and mining, and in many "heavy" trades, may be a factor, as may be the "carried meals" of many workers, mentioned by Goodall. As previously stated in "Etiology," in shoemakers and jewellers, and such trades where a crouching/

attitude is adopted, and probably pressure on the epigastrium, from working against this part, may tend to the disease.

I have always considered that the Australian sheep-shearer had an occupation which would surely develop peptic ulcer if the predisposition was there. I have seen these men at work in a shearing shed, temperature 100° in the shade, stooping over prostrate sheep, which they held down on the ground and sheared, using an electrically driven clipper. One man would shear anything over 100 sheep per day. One of their number was appointed cook, and his effort at bread-making was of the crudest. This bread with mutton (an ancient sheep being usually killed) and strong tea, minus milk, or with tinned milk - there being few cows in the sheep districts, - was their every day diet. And it was fashionable to have tea at least six times a day and take it very hot. The water supply being unreliable, tea was at least a safe drink. The majority of shearers looked like chronic dyspeptics, and did suffer in that way.

Hurst states that the New Lodge Clinic statistics, seem to point to a special liability among the members of the fighting services, and to a less extent among members of the medical profession.

David/

David Forsyth, who, as Chief Medical Officer of a British Assurance Company, which makes a speciality of life and health insurance for physicians, has published some figures which, while few in number, are of unusual interest and value, because the subjects were almost all physicians, because half were operated on, and half not, and because with sickness-indemnity provision in the policies the Company was able to keep a record of recurrences, and of the amount of disability suffered.

Unfortunately, the insured were observed for periods of only from one to twelve years. Of the 59 in the series, 22 or 37% relapsed from one to seven times. 56% were operated on, apparently most of them during the period of observation.

The number reporting recurrences was practically the same in the two groups, but the number of relapses for each person was a little larger in the group treated medically. One such relapse took place as late as ten years after the apparent cure of the disease. Four of the thirty-three treated surgically had to have secondary operations; one of them after sixteen years. Two of those operated on died in the hospital, and one more died later. Forsyth concludes from this that persons with duodenal ulcer may be given life/



life insurance, but they certainly should not be given sickness insurance. Incidentally John Ryle personally communicated to the writer that at least 27% of his patients were doctors.

TREATMENT.

The question of medical or surgical treatment of peptic ulcer has been discussed a great deal in recent years. The indications for medical and surgical treatment of peptic ulcer are apt to vary considerably when stated either by the physician or by the surgeon. There is no such thing as exclusive medical treatment, and likewise an ulcer is not always, by any means, a surgical disease. The recommendation in a given case depends upon the history, symptoms, size, type and site of the ulcer. Most surgeons agree that acute, uncomplicated ulcers are best treated medically, though a number advocate operation and suture in cases of haematemesis. This may be necessary in a limited number of cases where there is arterio-sclerosis, and bleeding persists. It is only in the long-standing chronic ulcer, where there are complications, especially structural deformity, that surgical intervention is necessary, and one would hope that in the near future, as medical treatment is developed, and the disease recognized in its earliest stages, that the need for surgery will become less and less. Most medical men agree that surgery may be resorted to in peptic ulcer that has failed to heal upon a thoroughly applied course of medical treatment given for a sufficiently long time, and that it is imperative in perforation, and /

and in gastric ulceration where there is suspicion of malignancy. Pyloric obstruction, not due to an oedematous condition of the pylorus, hour glass contractions of the stomach, and disabling perigastric adhesions, which interfere with proper drainage of the stomach, should be treated surgically. Cases with coincident lesions in the gall bladder, appendix, pancreas or pelvic organs, are best treated by the surgeon. In cases of long standing gastric ulcer, which, fortunately, is less common than duodenal ulcer, we are less inclined to carry out prolonged medical treatment because of its tendency to undergo malignant change. There is undoubtedly a tendency to overestimate the danger of malignancy, and the 20% of carcinomata said to arise in a simple ulcer are probably growths simulating ulcer. This condition does not apply to duodenal ulcer, though in recent years cases of duodenal cancer have been reported.

Meyer and Rosenberg describe four cases in their practice. The symptoms are like those of cancer of the stomach or pylorus with jaundice. According to J. E. Schofield of Swindon, the location of the growth in reported cases has been: above the ampulla 30, ampullary 104, below the ampulla 19. In a few cases the growth has been successfully removed, but as a rule all that can be done is cholecystgastrostomy, with/

with or without gastrojejunostomy.

I consider that treatment of duodenal ulcer is essentially medical, for it is a terminal manifestation, the duodenal localization of a general disease, that is, a general metabolic disturbance of the body. Because of this the physician must realize that there is a stiff proposition in front of both he and the patient when the cure of chronic peptic ulcer is undertaken. There are many factors to be considered, such as the internal or constitutional factors of predisposition, principally the degree of dysfunction of the parasympathetic, the dietetic conditions including vitamin deficiency diet; psychical conditions, emotive traumata and psychical conflicts; also the general external etiological factors, such as focal infection, tobacco intoxication, and the factors which determine the localization on the first part of the duodenum, such as pyloro-duodenitis, mechanical displacements of the duodenum, and constitutional organ inferiority of the duodenum. The man himself, as well as the disease, has to be taken into consideration, and thoroughly understood; and patience is necessary.

It was Moynihan who stated that it was a reproach to medicine that surgeons should be compelled to operate/

operate so frequently on gastric and duodenal ulcer when such an ulcer should be cured far more often than it is by medical treatment. Physicians who acquaint themselves with the living pathology of peptic ulceration realize how protracted the medical treatment of these complicated lesions must necessarily be. To be really satisfactory the treatment must be strict and must be lengthy. This is admittedly difficult, for the patient, probably long before healing has occurred, has lost all pain, has experienced a return of appetite, and is very apt to take liberties with his diet and general routine. The doctor becomes discouraged and on recurrence the **patient** is handed over to the surgeon. On the other hand there is the type of patient who has developed, to use a much hackneyed phrase, an "inferiority complex" with regard to his digestive apparatus, and is in a chronic state of starvation. This condition of mind must be explained away, and the patient, in the later stages of treatment encouraged to extend his dietary, omitting only articles of food which from experience cause discomfort.

With regard to surgical treatment of gastric and duodenal ulcer, a huge body of figures has been analysed by A. Rendle-Short, who gives the various statistics/



statistics from British, American and Continental Clinics. Briefly, he states, "that until about ten years ago, the diagnosis of gastric and duodenal ulcer, unless verified by perforation, operation or necropsy, was so precarious that the older statistics of medical treatment are untrustworthy. The medical treatment of gastroduodenal ulcer, in the best clinics gives good immediate results. At least 75% become symptom free. Only 40% remain so. from 15% - 20% of patients will die within ten years. If the duration of symptoms was under a year, more than half the patients remain well; over a year, far fewer. Obviously, therefore, efficient medical treatment should have a good trial. Mechanical obstruction, or a large deep ulcer that may be malignant, demands early operation. The mortality and end-results of gastrojejunostomy are set forth fairly in an adequate number of cases treated by rank and file surgeons, followed up for at least four years, in the B. M. A. collective Report. The operation mortality for duodenal, pyloric, and gastric ulcer was 5, 2.6, and 9 per cent. The follow-up, for both gastric and duodenal ulcer, showed 90% of successes (75% perfect), and about 4% of failures. Secondary gastro-jejunal ulcers followed in 2.8% of the duodenal and 0.8% of the gastric cases. Subsequent cancer was rarely, if ever, /

ever, reported. Individual English surgeons report a lower mortality, - 1% - 2% in duodenal and 3% - 4% in gastric cases. Continental and American results for gastro-jejunostomy are, for some reason, not well understood, far less satisfactory. The mortality is about the same as in the Collective Report, but only 50% - 70% are cured, and 20% - 30% do badly.

Pyloroplasty gives results very similar to those of gastro-jejunostomy. Partial gastrectomy is advocated to avoid gastro-jejunal ulcer or cancer, and to obtain a larger percentage of cures. Gastro-jejunal ulcer, in England, follows 0.4% to 3.4% of the patients operated on. Cancer follows in about 2% of the cases. Anaemia may result from an extensive gastrectomy, - mild in nearly half; serious in perhaps 10%; in a few cases quite severe.

The operative mortality of partial gastrectomy for gastric ulcer is from 4% - 10%. Excellent results are obtained in about 80%, - poor results in 5%.

Except in cases of large, deep, adherent gastric ulcer, which call for a resection, the results of partial gastrectomy for gastric ulcer are no better than those of simple gastro-enterostomy, in spite of a doubled operation mortality. They are not so good as those of gastro-enterostomy with wedge excision of the ulcer./

ulcer. This apparently does not hold good on the Continent or in America, owing to the poor results following gastro-jejunostomy in those countries. The end results of this operation on one hundred doctors at the Mayo Clinic, however, compare well with the figures obtained by British surgeons. In cases of duodenal ulcer, partial gastrectomy or duodenectomy give results no better than those of the B. M. A. Report on gastrojejunostomy, and the mortality is higher. Local excision of the ulcer, by itself, gives fair results, - 55% cured, 19% no better. Local excision with partial resection of the pyloric sphincter is better, but not as good as gastro-jejunostomy.

R. Wanke of Kiel points out that patients under twenty years with gastric ulcer ought only to be operated on for perforation or stenosis. Patients whose ulcer cannot be demonstrated by X-rays should not be subjected to surgical treatment.

V. Pauchet and P. l'Helias extol the advantages of opening the mucosa with a diathermy knife, after inserting one row of sero-muscular sutures to approximate the stomach and jejunum, Pannett advocates resection of the pylorus and duodenum for duodenal ulcer. He has operated in this manner on 85 cases; 2 died. Of 38 cases, followed up, 81.5% are absolutely/

absolutely well. He has been much less successful with gastro jejunostomy, 8.5% deaths and only 61.5% good results.

Lord Moynihan wrote at once to dissent. He has had the marvellous result of 1,000 gastrojejunostomies with only one death, and for duodenal ulcer, over 90% good results.

Berg, of New York, is an ardent advocate of resection for gastric ulcer, following a technique of the Polya type. Absence of hydrochloric acid in the stomach is by no means always secured by this operation: it can, however, be obtained, if at the same time the left Vagus Nerve is cut on the front of the oesophagus at the cardia. Berg has done this in 16 cases where the acidity was known to be high, with no increase in the risks of the operation. If the patient is anaemic before the operation, it may take the blood a year to recover, but he has never seen pernicious anaemia follow.

Hertel, writing on the causes of failure after resection of the stomach for gastroduodenal ulcer, points out that gastrojejunal ulcer is an infrequent source of trouble; chronic gastritis is more often responsible. The part played by adhesions is doubtful; they are only absent in 13% of the cases. Chronic pancreatitis has to be considered, and spastic states of/

contraction. The less found at the operation, the more likely it is that symptoms will persist. G. W. Saunders of New York found the same streptococcus in 19 resected ulcers of the stomach and duodenum; these were not identical with germs found in appendicitis or cholecystitis, but identical with strains producing ulcers of mucous membrane and skin. Patients with gastric ulcer, in his experience all have this organism's specific agglutinins in their blood. It will not grow in bile, which is theoretical-ly in favour of those operations which admit bile to the stomach. The operation of cholecysto-gastrostomy is sometimes practised in cases of large gastric ulcers, in the hope that the bile will neutralise the gastric juice and promote healing. It will be observed that a vast field was opened to the surgeon in the treatment of peptic ulcer since the year 1909, when Dowden of Edinburgh, first introduced the radical operation and excised a duodenal ulcer in the longitudinal axis, and sutured the opening thus formed in transverse axis.

There is a serious aspect of the question of a big resection of the acid-bearing area of the stomach to be considered, and that is the induction of an artificial achlorhydria, which occasionally induces a grave anaemia. In my own practice I have a patient who/



who suffers in this way, following a partial gastrectomy by Walton of London, who, however, deserves all credit for saving the life of this patient, as he was practically moribund.

What are the results of medical treatment for gastric and duodenal ulcer? The literature is full of statistics, giving cures, estimated at from 60% to 90%, by medical means, but there are remarkably few articles from which accurate conclusions, ascertained by follow-up study after years, can be obtained. So many writers, too, seem to be chiefly concerned with disputing other workers' results. Even by Sippy, who did such noteworthy work in treatment, no follow-up study has been made by he or his co-workers. Nor, as far as I can learn, has there been any results of ambulatory treatment published.

In early uncomplicated cases of duodenal ulcer, and in a few cases of gastric ulcer, very good results can be obtained by ambulatory treatment, depending, I admit, on the intelligence of the patient, and form of work which he follows. I fully realise that, in most cases, general physical rest in a warm room is the most important factor in treatment of peptic ulcer. I further believe that in cure by surgical treatment the enforced rest plays a considerable part. That cases of peptic ulcer, even when deeply adherent, can and do heal, either spontaneously or with medical treatment/

treatment is certain, partly on clinical, partly on post mortem evidence, the scars being found at necropsy. Simple pyloric stenosis nearly always indicates the presence of an ancient healed duodenal ulcer, just as hour-glass stomach means an ancient healed gastric ulcer.

It is also certain that chronic gastric and duodenal ulcer, untreated or treated, may lead to fatal haemorrhage or perforation, and that these catastrophes are not infrequent. This happens rarely in the acute ulcer. With regard to recent statistical evidence relating to the results of medical treatment for peptic ulcer, a recent article by Goodall of Edinburgh, giving a study of 200 cases is one of the best, being concise, and an excellent exposition of treatment. Goodall had 6 re-admissions from the 200 cases, and in the "follow-up," replies were had from 98 patients, all of whom had been discharged from the Royal Infirmary, symptom free. Of these 13 had undergone operation, 15% were completely cured, 47% greatly improved; 31% improved; 7% unable for work because of constant indigestion. As the author points out these results compare unfavourably with results in private practice, because the hospital class of patient return to the conditions which originated their illness.

David/

David Smith gives the immediate results in 214 cases treated between 1913 and 1922. 67% of the males cured, 2% dead. 76% of the females cured, 5% dead. In cases observed five to fifteen years later, 29% of the males were cured, 19% were dead; while the corresponding figures for females were 40% and 15%. The percentages were calculated on the original number of cases.

Franklin White, in a series of 206 private cases, followed up from 3 to 5 years, reported that 30% of the gastric cases were well, and 24% better, while 57% of the duodenal ulcer patients were well and 21% better. Of the gastric cases 42% of the patients came to operation, and 4 died under medical treatment: of the duodenal cases 4% of the patients were no better, and 18% came to operation, and at Hurst's New Lodge Clinic, where diagnosis is most accurately carried out, in 160 cases treated since 1921, 39% of of the gastric cases were quite satisfactory, 13% fairly good, and one-third had relapsed. Of about 130 duodenal ulcer cases, 41% were very satisfactory, 28% fairly good, and there were recurrences in 24%, about half of these being ultimately operated upon. Robert Hutchinson, commenting on these cases, states that considering that these results were obtained in private patients treated under the best conditions, they/

they must be regarded as disappointing.

Einhoun and Crohn, in 1926, presented the result of a careful follow-up of 100 cases. One year after treatment 67.5% were cured, and 22% were better: 4 years after treatment 27% were cured, and 23% were better. Their statistics show very little difference between gastric and duodenal ulcers. The principal factor determining the probability of cure in any particular patient is the duration of symptoms. It will be seen that the percentage results claimed in surgery are better than those in medical treatment, and as a rule the medical cases cannot be considered to parallel in severity the surgical cases. The surgically treated ulcer cases include the bad medical results, the complications, and the very severe cases.

It is equally true that in the past surgeons have dealt with a large number of uncomplicated cases of peptic ulcer which should have had medical treatment. Patients have been sent by their doctors to the surgical, instead of to the medical, outpatient department. However, the pendulum is swinging back, definitely in favour of medical treatment, and a new enthusiasm is spreading amongst clinicians who are anxious to combat this increasing disease.

John Ryle states that the aims of the medical treatment of early cases of duodenal ulcer do not differ/



differ from those of surgery. They are: (1) To secure the optimum rest for the stomach as a whole and for the pyloric sphincter and ulcer-bearing area in particular. (2) The inhibition or neutralization of excessive acid secretion, with a view to minimising the "acid control" of the pylorus, and giving "chemical rest" to the ulcer. (3) As a preliminary to these, the eradication of focal sepsis.

This regime applies also to gastric ulcer. In some cases of gastric ulcer, - usually very chronic cases, - the test meals disclose hypochlorhydria and even achlorhydria, but these conditions are due to associated chronic gastritis, and after the ulcer has healed and the gastritis disappears, an increase in acidity and often hyperchlorhydria is the rule.

One would expect these cases to do well on doses of hydrochloric acid, but the reverse is the case, and they do best on alkalies. Incidentally, I have prescribed a hydrochloric acid mixture when the "hunger pain" symptom in duodenal ulcer came on, and for the time being the patient got relief. By decreasing the hyper-motility of the stomach, one supposes, just as does a drink of water. Spria considers that the "hunger-pain" is due to a retro-peristalsis, caused by gastritis and pyloritis, and on the taking of food a normal peristaltic action returns. Clinically, peptic/



peptic ulcer of the chronic type is characterised by periods of activity and periods of quiescence. In gastric ulcer there is not as a rule the frequent periods of complete freedom from symptoms. The periods of activity show in general two phases, - the phase of intense symptoms, and the phase of decreasing symptoms.

Treatment, therefore, will be considered separately for these phases, and it is the treatment of the private practice patient I have in mind.

Apart from the treatment of patients in the outpatient department of the Royal Sussex County Hospital, I have had no opportunity for work amongst the "working-class" patient in their homes. Amongst this class are the severer cases, as evidenced by the preponderance of fatal haemorrhage and perforation, in comparison with the well-to-do patient, who invariably has a comfortable home, suitable diet, and the opportunity to reform his mode of life, as indicated by his tendency to this ulcerous disease.

The eradication of "focal sepsis" must first be considered, and a careful examination made by experts of the teeth, tonsils, nasal sinuses. The appendix and gall bladder must be taken into account as foci of infection, though in diagnosis, these conditions would/

would be considered and the symptoms differentiated. A chronic appendix may cause spasm and simulate peptic ulcer, and cholecystitis and peptic ulcer may both be present. In theory, sepsis should be radically dealt with before intensive treatment is begun, but the patient must first be got as fit as possible, and free from pain. To send a patient for tonsillectomy when in the throes of "hunger-pain" would indeed be cruelty.

There is no doubt in my mind as to the importance of complete rest, indeed for at least a month, in the treatment of chronic gastric and duodenal ulcer. In fact I consider that rest is the chief factor in the cure of this disease.

There are certain cases, the type of which will be dealt with later, who do well on ambulatory treatment, but for the patient who is in misery with pain and other symptoms, and trying to keep going despite them, rest in bed, in a warm room and with warm clothing is the first essential. With lowered activity on the part of the whole body food requirements are diminished, and the peristaltic and tonic activity of the stomach, subjectively expressed by hunger and appetite, are simultaneously decreased. In a similar way warmth also discourages excessive motility. Only visits to bath and lavatory should be allowed. Goodall of Edinburgh admits his patients to the Ward in batches/

batches, and from a psychological point of view this is excellent, quite apart from the economic aspect of the case. The hospital patient has an advantage over the private patient in a Nursing Home, in this respect. In the latter I have never observed the "alkaline smile" recorded by Goodall, but perhaps the Sassenach is more sensitive to the monotony of confinement on alkalies and milk diet. I am convinced that massive doses of alkalies have, in the majority of patients a depressing effect, and definite alkalosis is of comparatively frequent occurrence, especially when belladonna is also prescribed.

I find that patients, even in the most severe cases, lose their pain after a few days in bed. For the first week I give eight feeds daily at two-hourly intervals, from 8 a.m. to 10 p.m., and a feed during the night, if awake, which may be kept warm in a thermos flask.

Many patients have a strong distaste for milk, citrated or otherwise, and I replace it as far as possible with Benger's food, Allenbury's diet, ground rice, semolina, corn flour, arrowroot, gruel, - made with plasman oats, cocoa, - made with milk. Sodium citrate and sodium bicarbonate destroy Vitamin C in milk, and it has been shown that a pint of milk is capable of producing definitely higher curves both of free and total acidity, and a more prolonged gastric phase/

phase, as determined by fractional analysis, than a pint of standard gruel. No feed exceeds half a pint in bulk. If the patient tolerates alkalies well, I give Emulsion of Magnesia, one dessertspoonful in water one half hour before each alternate feed, and if there is a rapidly emptying stomach, from X-ray observation, I add Tr. belladonna m  $\ddot{V}$ . to each dose. This is cut down if dryness of the mouth on visual disturbance becomes troublesome. Alternating with these drugs and again before feeds I give either a tablespoonful of olive oil, or cream. The majority of patients much prefer the latter. Liquid paraffin is given if constipation is present. Orange juice is given during the morning, and the mouth washed out after each feed.

During the last two years I have instituted the use of one of colloidal hydroxide of aluminium preparations of which alocol and neutralon are perhaps the best known.

I am convinced that these drugs are much superior to the more powerful alkalies, and I have noted no symptoms, even when given in large doses, indicative of absorption. When the colloidal hydroxide of aluminium comes in contact with the gastric juice a jelly is formed, which acts by coating the gastric and duodenal mucosa, and by forming with the gastric contents a gelatinous/



gelatinous or colloidal solution, which absorbs the excess of hydrochloric acid.

This jelly passes with the stomach contents into the intestine, and can be seen in the stool. These preparations are, at first, inclined to be constipating, and liquid paraffin may be necessary. Alocol powder gr.  $\frac{\cdot\cdot}{xv}$ , is given in water, or two tablets chewed up and swallowed half an hour before and after each alternate feed. When a patient is irritable and sleeping badly I try the following powder, which I have found very useful, one half hour after each alternate feed.

Sod. bromide	gr	$\dot{v}$
Calcium carb.	gr	$\dot{viii}$
Mag. carb. (pond).	gr	$\dot{x}$

After the first weeks the individual reaction of the patient to food must be carefully considered, and a more and more liberal dietary followed, avoiding, of course, cooked fats, coarse and spicy articles of diet, and the foods which the patient finds indigestible in the ordinary course. The best way is to have a printed and very complete list of food-stuffs from which the foods not allowed are struck off. If a list of forbidden foods only is given, the patient is sure to remark that "nothing remains for me to eat."

No alcohol is allowed during the first six weeks, but after that I allow older patients, who have been accustomed to stimulants a little whiskey and water with/



with their evening meal. Few take advantage of this, and I do not encourage them to do so. Smoking should be prohibited. I think too much importance has been ascribed to diet in the later stages of treatment. As soon as possible the patient should be got on to ordinary diet, minus, of course, articles of food which are prohibited. And the meals should be frequent and nourishing. It is necessary to order that cocoa or even weak tea and biscuits should be taken between meals, and at bedtime. To instruct a hard-working man to take only white foods, such as boiled or steamed fish, and one or two eggs with milk, as his staple diet, not forgetting his doses of alkalies, is in my opinion, wrong, and he must be put on a diet which provides the necessary amount of calories, - according to his age and occupation. Many excellent recipes for varied diets and instructions for cooking thereof may be found in Chalmers Watson's books. These I have found extremely helpful.

In the early duodenal cases we, as a rule, have to deal with a rapidly emptying stomach, and a high acidity, surely a combination fit to deal with something more substantial than milk and milk foods.

In the matter of diet, I got rather a shock recently when in conversation with an intelligent and level-headed London doctor, who assured me that  
for/

for a few years his treatment was to almost entirely stop alkalies, but entirely stop milk and fatty foods, excepting a little butter for its vitamin content. His patients had from a few to several days in bed, fed on jellies, souffle of fish and chicken, etc., quickly passing on to lean steak, chops, and such meat as agreed with them. If they wished they could drink lager beer with their meals, but no spirits, and take weak tea between the chief meals, if desired. His patients had all been on the milk and alkalies regime, and he was insistent that they became better at once, put on weight, and felt that life was worth living once more. I do not know how long they continued in this happy state. His were genuine peptic ulcer cases, he assured me. X-ray and the usual tests being carried out. I tried this treatment on two cases. One case was that of a man, a busy dentist, aged about thirty-five years, with a long history of hunger-pain, two to three hours after food, and especially severe during the night. He had the usual periods of complete freedom from symptoms, but of late his attacks had numbered several a year, and had lasted two to three weeks. During the attacks he became thin and depressed, and was continuously taking alkalies. He existed chiefly on milk and light/

light diet.

He stated he had never been X-rayed, nor had undergone proper treatment with rest, as he could not afford the time off. He was definitely tender in the epigastrium, and there was "guarding." I do not think that there was much doubt but that he had a duodenal ulcer. I stopped his milk diet and alkalies, and put him on an ordinary diet of meat, fish, eggs, potatoes, vegetables etc. For breakfast he took porridge and cream, an egg or bacon, or fish and juice of an orange. During the day he never went more than three hours without food. Before and after each principal meal he at first took two alocal tablets. This patient is immensely improved. His attacks are few and far between, and last a day or two instead of weeks. Further it is usually some indiscretion of diet which brings on the pain !

Of course, I am not certain that this man had a duodenal ulcer, though clinically all his symptoms and history of several years pointed to it. The second case was that of a middle-aged patient who had a gastric ulcer demonstrated by X-ray. She had undergone medical treatment following haematemesis a few years previously, and was much better, but still had frequent attacks of pain, and did not consider herself/

self cured. She was anxious to try a change of diet, and although I considered she was probably a case for surgery, I put her on a carefully regulated ordinary diet. This she could not tolerate, and had to return to milk foods.

In spite of this patient's return to milk diet, I am of the opinion that milk and milk foods are not well tolerated by many peptic ulcer cases, and they will do much better by omitting these from their dietary. I have switched ambulatory patients from milky foods, steamed fish, etc., on to an ordinary but non-irritating diet, allowing freshly cooked meat once or twice daily, during their attacks, and the reply to my question as to their well-being has always been the same, that their pain was no worse, often better, and they felt much stronger and fitter for work, and I do not believe that there is added risk of haemorrhage or perforation. The patient should be allowed to organise his diet as he desires, provided he avoids certain food stuffs, and it should be impressed upon him that food must be properly cooked: that he must sit down to meals in as tranquil a frame of mind as possible, and that on no account should he take a full meal when worried or tired. Instead he should take Benger's food or cocoa, or something of that description until he has recovered his poise.

There/



There is no doubt but that all classes of the community are much more enlightened about proper cooking and balanced diet than in the past, and moderation in eating and drinking is the rule now-a-days. And despite this there is a great increase in the incidence of the disease. My opinion is that each patient is a law unto himself as regards individual taste and diet, and that milk foods are not suitable articles of diet in many cases, and should not be prescribed by rule of thumb. It is, of course, necessary to keep a patient on milk diet whilst testing for occult blood in the stools. When I say milk foods I refer to the large quantities of plain milk and its mixtures which most patients consume. There is not the same objection to foods cooked with milk. It would be interesting to put a number of cases in a Hospital Ward on the usual milk regime, and an equal number of patients on an ordinary non-irritating diet, omitting milky foods except butter, and noting the result as regards subjective and objective signs and symptoms. I shall certainly do this when opportunity presents, believing, as I do, that diet is of less importance than complete rest in bed in the beginning of treatment, combined with an effort to find out and remove the conflicts which harrass the patient, and point out a better mode of life.

This/



admittedly is difficult in Hospital work, but an intelligent House Physician, under instructions from his chief, could devote an hour now and again with the patient, and give advice about diet in ordinary life, in view of the patient's predisposition to the disease, e.g. never to become really hungry; that he has a good stomach and can digest most things if he will stop worrying and get plenty of sleep, and so on. Later the patient's own doctor could carry on the good work. As previously stated, there is an intimate connection between the cerebral cortex and the stomach and duodenum, through the autonomic nervous system. Much work has been done of late on this subject, and enough is now known to provide a scientific basis for psychotherapeutical measures. The physician must go deeply into the psychical life of his patient and try to determine the mechanism of abnormal cortico-visceral impulses, find out his immediate conflicts, and try to remove them by a method of suggestion and optimistic re-assurance. Fear is the strongest of primitive emotions, and anxiety neuroses, since they hold the fear element, are the most apt to produce clearly defined disorders. Fear and hence anxiety has a notable influence on heart rate and vascular tone, and also upon the several factors of digestion. To a less degree, but quite definitely, other emotions may/

may have the same result in predisposed individuals. Profound disorder of digestion is comprehensible in the light of physiological experiments, that emotional states can inhibit secretion and influence peristalsis. The patient must have fears and phobias explained away as far as possible, and be given confidence in himself. This may not cause an ulcer to heal, but will materially help the cure. That is all one claims for psychotherapy.. To place a patient, suffering from peptic ulcer, in a Nursing Home, instruct the Matron on diet and drugs, as is so often done, and visit him now and again, is a hopeless procedure. The patient must be seen daily, and we should proceed to suggestion treatment to the utmost, and try to turn that suggestion and auto-suggestion treatment into faith, by a constructive process of re-education. The doctor of the future will be trained in psychology just as he is now trained in physiology.

In general practice, ambulatory methods of treatment are most frequently employed in cases of uncomplicated duodenal ulcer, and in a very few cases of gastric ulcer. This treatment will bring temporary relief, and in many cases so much relief that patients have considered themselves entirely relieved. Where there is little or no improvement, and in severe cases, /

cases, and in most gastric ulcer cases, a period of rest in bed is the first essential. But in these days of competition and unemployment this is not always possible, and ambulatory treatment is instituted. Where the patient is doing heavy manual work it is advisable to get light work, or give up work altogether, and undergo the complete rest treatment. In the case of the sedentary workers a short holiday is a great help. During the first week the patient may take a bread and milk diet, if he is partial to this sort of food. The doctor must judge. Personally, I find that patients do best on an ordinary smooth diet, avoiding high seasoned foods, fried foods, and notably indigestible foods. The great secret is simple food and frequent feedings. The following mixture may be prescribed:

Bismuth Carb. gr.  $\dot{\bar{x}}$ .

Mag. Carb. gr.  $\dot{\bar{xv}}$ . To be taken in water half

Calcium Carb. gr.  $\dot{\bar{xv}}$ . an hour before food, four

Emuls. Chlorof. m  $\dot{\bar{x}}$ . times daily, and during

Mucil. tragacarth. q.s.night, if required.

Aq. chlorof. ad.  $\dot{\bar{i}}$ . oz.

As before stated many more patients do better on Alocol, which also has the advantage of being in tablet form, and can be carried in the pocket.

The/

The diet is gradually increased week by week, and the patient is usually on normal diet in a month's time. As the patient improves attention must be given to the eradication of sepsis. The alkalies must be cut down to a minimum, and usually patients discontinue such medication of their own accord, to resume later if there is any suggestion of trouble. It is very important that the alkaline mixture is kept in a state of suspension by mucilage tragacanth. The object of keeping the insoluble salts in suspension is to bring them in contact with the ulcer, even whilst standing in the erect position. The various carbonates settle out on the surface of the ulcer and exert their neutralising and protective qualities.

Where no mucilaginous agent is used the heavy salts tend to fall quickly, by gravity to the greater curvature of the stomach, thus missing ulcers which may be present high up or midway on the lesser curvature. This phenomenon is well known to all radiologists and mucilage tragacanth or gum arabic is employed in the preparation of barium meals for X-ray examination with the object of facilitating the deposition of barium sulphate on all parts, including the cardiac end of the stomach. A talk, or rather frequent talks must be given on the importance of proper/



proper living, on the avoidance of mental stress and worry, and on the evils of tobacco and alcohol for the peptic ulcer patient. The patient soon recognizes that frequent feeds is a more valuable feature of the treatment than the kind of food or drug he takes. The majority of peptic ulcer patients suffer from constipation, and to try to remedy this take daily doses of aperients and purgatives. This habit, most emphatically, must be stopped. I am convinced that drug-taking, for constipation in peptic ulcer patients, is a serious menace to the bowels in general, and stomach and duodenum in particular. During treatment, in the early stages, either in bed or ambulatory, it may be necessary to give magnesia on Liquid Paraffin, but when the patient is back to normal health he must give up aperients entirely. Until he has faith in himself a little liquid paraffin may be given nightly at bedtime. My system is to teach the patient how to take an enema, agreeing as I do with Alvarez, that twenty-four feet of intestine should not be upset with a purgative when the material to be removed is in the rectum or sigmoid, within easy reach of a little water. From the small quantity of water necessary, the danger of the induction of retro-peristalsis is nil. Every second/



second morning or night, an enema is taken, using a Higginson's syringe. An enamelled two pint measure is filled with warm water to which a dessertspoonful of common salt is added. I have never had a failure in any patient using this rational method; indeed it is extraordinary how soon the enema may be discontinued, a normal action of the bowels taking place without drugs and the patient feels more comfortable in every way. At first a glycerine suppository may be used between enemas, until the patient has developed faith in the method. A high enema is unnecessary, - a short rectal nozzle only is used. When the patient is back to ordinary smooth diet, cream and butter should be taken in goodly quantities, and likewise orange and prune juice at breakfast time.

The proprietary drugs "alocol" (aluminium hydroxide) and "neutralon" (aluminium silicate) do not apparently meet with the approval of Hurst because of their feeble reduction of "acidity," the final pH. in ten minutes being 2.4 and 3.7 respectively. They have thus less effect than Bismuth Oxycarbonate which only reduces acidity to pH. 4.0, the solution never becoming neutral. Sodium and potassium citrates and tribasic calcium and magnesium phosphates attain neutrality (pH. 7.0) within one minute.

Magnesium/

Magnesium oxide and peroxide and sodium bicarbonate produce alkaline solutions, which reach a maximum and constant degree of alkalinity within one minute. (Magnesium Oxide pH. 10.0 and sodium bicarbonate pH. 8.0). Magnesium carbonate attains neutrality in less than a minute and then proportionately more alkaline upto a maximum (pH. 8.5) in ten minutes. However, I have got much better results in the relief of symptoms from the aluminium preparations, due no doubt, to their adsorptive and protective functions.

Einsel and Rowland (Ohio State Medical Journal, March 1932) record clinical and laboratory investigations which indicate that aluminium hydroxide is useful in the treatment of peptic ulcer, while being free from the disadvantages attendant upon the administration of absorbable alkalies, and from the danger of inducing alkalosis. They state that in powder this base is chemically neutral, and has but little neutralizing action on the gastric secretion; a gelatinous aluminium hydroxide cream will, however, neutralise ten times its volume of decinormal hydrochloric acid, and reduce the gastric acid better than free alkali. Relief of symptoms was prompt and persistent in 92% of thirty-eight cases, with radiographical evidence of duodenal ulcer. This cream is described as being an amphoteric substance, with a slightly/

slightly astringent, but not unpleasant, taste. Although neutral to titration with neutral red as indicator, it fixed free hydrochloric acid without delay. The authors give details of cases which, although previously unbenefited by the usual alkaline therapy, improved as soon as they were treated by aluminium hydroxide. The diet was of the convalescent Sippy type, with six feeds per day, the cream being given in 4 c. cm. doses in one ounce of water, half an hour after each meal. Blood analysis showed hardly any absorption of aluminium hydroxide in a daily dosage of thirty-two grams, and no alteration of the acid-base balance. No evidence was obtained of any toxic action on the kidneys or other organ. Personally, I prescribe, in my practice, an Emulsion, made by local chemists, containing: Pulv. alocol gr.  $\dot{xv}$ ; H.C.N. m  $\dot{ii}$ ; which may be taken several times daily when pain is troublesome.

Duodenal feedings, using a duodenal tube, was introduced by Max Einborn, and the method was popular in America for a time. Dr. Young (Lancet, 1927. October 8th. P. 778 and B. M. J. February 25th, 1933) considers it superior to any other form of treatment. A small rubber tube with perforated metal tip is passed into the stomach, whence peristalsis gradually/

gradually forces the tip of the tube through the pylorus into the duodenum. In duodenal ulcer the tube is allowed to pass some thirty inches from the teeth which is some seven inches from the pylorus, and well beyond the usual site of a duodenal ulcer. The proximal end of the tube is seventeen inches outside the mouth, and when not in use is closed with a bone plug. The patient receives through the tube, eight liquid feeds each day at two hourly intervals, for the whole period of active treatment, i.e. eighteen days. Feeding is accomplished by means of a small irrigator, fitted with a nozzle, which is connected to the proximal end of the tube when required. By this method the stomach and first part of the duodenum are out of action and no food or acid secretion passes over the ulcer, which is kept free from irritation and given a chance of healing. After the eighteenth day light, solid food is commenced.

The short period required for active treatment is a factor to be considered in this method. The patient is confined to bed for only eighteen days, and may be up and about on light diet within three weeks. I have had no experience of this method, which would appear to be an uncomfortable one for the patient, and a troublesome one for the Nurses, but Sir William

Wilcox/



Wilcox and other London physicians endorse this method of treatment.

In recent years the treatment of peptic ulcer has been attempted by protein therapy, and pepsin therapy, and good results have been obtained, and this would appear to open new horizons in the fight against this disease. In any case we must consider it as an adjunct to the usual methods. The treatment of peptic ulcer by injection is carried out by Dr. Martin of Freiburg, Germany, and it is stated that the "rich duodenals" in England flock to his clinic, where I understand, the routine is thorough examination and a series of injections daily, and psychotherapeutic treatment, for three weeks. This is repeated in six months whether the patient has been free from symptoms during this period, or not.

With regard to protein therapy I gather that the injected foreign protein, or non-foreign protein shock substance, or the products which originate locally at the site of the injection, or, when this foreign protein is injected intravenously, the modification of the colloidal equilibrium of the blood acts as a stimulant of the autonomic nervous system, and through that stimulation the general metabolic processes of the body, disorder of which constitutes the basis of ulcer, are regularized. Two methods may be used, a



very mild and progressive shock or a more intense shock. Mild shock may be obtained by the administration of Vaccineurin (an autolysate of *B. Prodigiosus* and *Staphylococcus Albus*) given intramuscularly or Novotropine (a plant protein preparation) intravenously. Intense shock treatment is given by the administration of intravenous vaccineurin injections, and of intravenous special T. A. B. vaccine injections in small doses.

Meyer and Kartoon investigated the effects of intravenous injections of foreign protein upon peptic ulcer in eleven patients, in whom clinical diagnosis was arrived at from an analysis of the history, symptoms, and such physical signs as localised tenderness, positive radiograms, and analysis of the gastric contents and stools. Except for meat, the patients were on general hard diet, and were allowed to be up. In addition to a routine Ewald test meal, a control fractional gastric analysis was made in the case of each patient, and on the following day an intravenous foreign protein injection of from 500 to 800 million gonococcus or typhoid vaccine was given. Five or six injections of the same doses were given at intervals of from five to seven days if the initial reaction was severe, but, if mild, the doses were increased to 1,000 million, 1,500 million, and up to 2,400 million. From/

From twenty-four to forty-eight hours after each injection fractional gastric analysis and X-ray examinations were made before the first and after the last injections, with analysis of the stools throughout the whole observations. The gastric acidity was decreased in five patients, unchanged in four, and increased in one. The relief from pain accompanying treatment appeared to be independent of changes in acidity. The authors believe this to be due to the diminution in gastric tonus and contractions which followed the injections, and they think that the increased vascularity in the stomach and capillary bed near the ulcer is the important factor in such relief.

They consider that the rhythmic pain in ulcer is due to rhythmic variations in the vascular bed, in and around the ulcer, associated with digestive peristaltic activity. They add that from a treatment point of view, this may be useful, combined with other modes of treatment.

Loepens, Debray, Michaux and Sainton have treated a series of twenty cases of gastric and duodenal ulceration by the hypodermic injection of pepsin. In a preliminary series a 10% solution of pure sterilized pepsin was given in 1c. cm. doses, but owing to rather troublesome general reactions, a 10% solution of pepsin was/

was made up with the addition of sodium benzoate, which eliminated the unpleasant reactions without lessening the efficacy. A standard course of treatment consisted of a first injection of 1 c. cm. into the muscles of the buttock: this acted as a test of tolerance. The following injections were of 2 c. cm., and were repeated three times a week for fifteen doses.

Three weeks' rest was then allowed, with a simple but generous diet, after which, if the pains returned, a second similar course was given. The authors were guided by the tolerance displayed by the patient and by X-ray examination, as to the frequency and desirability of further courses of injections. The treatment was well borne and the results were very gratifying in nineteen patients, most of whom had had previous unsuccessful treatment of different kinds. A detailed table is given of the results of treatment. In it are included two cases of carcinoma, which showed little change except disappearance of pain. Among the cases treated by pepsin were two ulcers of the lesser curvature, seven pyloro-duodenal, and seven duodenal. No other medication was employed simultaneously, and the authors claim that the injections of pepsin must have caused the almost uniform and dramatic amelioration in all the cases except one. They discuss its method of action, and conclude/

conclude by stating their belief that cases of hyperchlorhydria and ulceration are hypersensitive to pepsin, and that the good effects produced by its injection can be better explained by the hypothesis of hypersensitivity than on any other lines.

Professor Glaessner of Vienna, has treated, during the last five years, more than six hundred cases in hospital or ambulatory by subcutaneous pepsin therapy. Gastric and duodenal ulcers represented the chief material, strictly surgical cases being omitted. Oesophageal and jejunal ulcers were also treated.

In cases of haemorrhage, injections of pepsin were begun after a rest of three weeks.

Professor Glaessner and the French authors previously quoted, worked quite independently, and apparently both groups of investigators got equally satisfactory results. The pepsin employed is not sterilized, but is filtered through porcelain under pressure, to rid it of albumen. Diluted carbolic acid is added as an antiseptic, and a 1% solution is finally obtained. Each patient is given thirty injections, at two day intervals, twice yearly. Glaessner claims very good results in fully two-thirds of the one hundred and thirty cases which were thoroughly controlled. Objective and subjective cure were brought



about in these. On the 600 cases only 6% required surgical interference. A mixed diet is recommended, the customary milk and fasting cures in particular being avoided. Six meals per day is suggested, and the patient should always feel satisfied. Olive oil and a bismuth preparation are advised.

It may, of course, be argued that the pepsin therapy played a secondary part to diet and alkalis in the treatment. Glaessner believes that there is evidence of a biological difference between the gastric juice of normal persons and those suffering from peptic ulcer.

On injecting gastric juice from the latter beneath the skin of a guinea-pig or painting the same substance on the cornea of the animal, he finds that the erosion caused by the juice from an ulcer patient is far more extensive, and far slower in healing. He also produced artificial ulcers of the skin and mucous membranes of rats, guinea-pigs and rabbits, by the intracutaneous or intramuscular injection of gastric hydrochloric acid, and he has found that the subcutaneous injection of pepsin will notably accelerate healing in such cases. He passed on to the treatment of ulcer in human beings by similar injections.

The Austria Pharmacy in Vienna has, for the last few years, put on the market ampoules of neutral pepsin ready/



ready for use, and I procured a series for trial on two cases of duodenal ulcer. The first, a man forty years of age, who had suffered from attacks of hunger-pain for many years, and whose lesion had been confirmed by X-ray examination and occult blood in the stools. He had been on ambulatory treatment, taking a non-irritant diet, and alkalies when he felt doubtful of his condition. I began the injections on his next attack, and in a few days his symptoms had cleared up, and for a few months now he has been perfectly well. I realise that this is no test whatever, but I was chiefly anxious to note his reactions to the pepsin for future guidance.

The ampoules of pepsin increase in strength, reaching a maximum about the middle of the course, and then decreasing in strength.

The local reaction was nil, only a slight reddening of the skin, but on reaching the heavier doses, the patient felt very tired and had an attack of migraine. I considered these symptoms as anaphylactic, and, according to instructions, used half doses until the smaller doses were reached, towards the end of the series. This patient was hard at work, and I believe that these symptoms would not be so evident were the patient in bed, and in that case I should be inclined to go through with the full dosage.

Second/

SECOND CASE.

Female - aged 37 years.

JANUARY, 1932.

History and symptoms, typical of duodenal ulcer. No X-ray examination made then. Treatment. Diet with usual alkaline powders. Kept at work. Patient improved under treatment for three months.

JULY, 1932.

Symptoms reappeared. X-ray examination afforded no definite evidence of ulcer, but spasm of stomach. Occult blood positive. Patient again given alkaline treatment, diet and rest.

AUGUST, 1932.

Began injections of neutral pepsin. (Glaessner, Vienna) Series No 1 commenced, given every third day, later every second day; alkaline treatment discontinued.

SEPTEMBER, 1932.

Patient returned to work. Pepsin injections, - series No. 2; continued every second day. Occult blood examination, - negative. Normal diet then reverted to. No symptoms of ulcer. No reaction noted from injections.

OCTOBER/

OCTOBER, 1932. Injections, - series No. 3., given every second or third day. No occult blood in stools. No symptoms of ulcer.

NOVEMBER, 1932. Injections, - series No. 2, decreasing in strength. No symptoms of ulcer. Normal diet.

DECEMBER, 1932. Injections down to Series No. 1. No symptoms of ulcer.

JANUARY, 1933. General condition of patient very good. No symptoms whatever. Patient on normal diet. Injections discontinued.

FEBRUARY, 1933. In excellent health. Gain in weight.

It is early days to make any comment on this case, except that this woman has had for her, a longer spell of freedom from symptoms, than usual in her case.

There were no untoward reactions from the injections.

Recently, gastric ulcer has been treated in France by Posterior Pituitary Extract. I can find no trace of the method having been used in this country, and makers of Endocrine preparations, to whom I have written, have no data on the use of this extract for peptic ulcer.

DISCUSSION AND SUMMARY.

At the present time there are many medical problems in a state of flux, and one of the most important is chronic peptic ulcer of the stomach and duodenum. Probably there is no subject engaging the attention of the physician and surgeon in which is displayed such divergent views as in the treatment of peptic ulcer. Until comparatively recently there were two distinct camps - the one advocating medical treatment, and the other surgical intervention, without reference to the individual case. It must be admitted that surgical interference becomes necessary in complicated cases, with structural deformity, and in advanced gastric cases, based on the possibility of malignant transformation. It has often been stated that although a patient may be absolutely quiescent, following medical treatment, a sudden fatal haemorrhage or perforation may occur, and to avoid this catastrophe only surgical treatment should be considered. If the medical treatment has been conscientiously carried out, and the cure based not only on the subjective symptoms, but on the objective clinical and radiological examinations, no such complications should happen. There are records of patients who have been treated/

treated surgically and, misled into thinking themselves completely cured, have thrown discretion, in matters of diet and mode of life, to the winds, and succumbed to these fatal accidents. The surgeon may remove the ulcer but not the "ulcerous disease," nor does it solve the origin of the disease, and medical treatment must be continued after operation.

I would suggest that Medical students be taught to regard peptic ulcer in the first place as a disease to be treated medically - in the majority of cases, and however thrilling a posterior gastroenterostomy or partial gastrectomy may be to watch, the student must relegate surgery to its proper place, and get down to facts, which are that peptic ulcer is a general, systemic disease, with a localised lesion in the stomach or duodenum, or possibly in both. Also that their duty to their future patients is to consider what can be done, not only by diet and alkalies, but also by consideration of the external toxic factors, the psychical conflicts, the focal infections, the influence of rest and a proper mode of life, taking care at the same time, not to fall into the common error of attributing a preponderant rôle to a factor which may be, in a given case, of secondary importance. Admittedly this is very difficult, especially in the working class practice where conditions are against patient/



patient and doctor, but the problem must be faced. The student should also be taught that the study of disease in the advanced stages and after death is of less importance than the detection of disease in its early stages when there is hope of cure. And that the subjective sensations heard in the Out-patients' Department are not to be lightly dismissed, even in absence of physical signs.

We found that the etiology of peptic ulcer is an unsolved problem, and that not one but a combination of factors are involved. Why are some persons so highly predisposed to peptic ulcer that if one lesion is cut out, another takes its place? Amongst other and more important factors there is acidity of the stomach concerned in its production. But there are countless people with marked hyperacidity who do not develop peptic ulcers, and there are those with comparatively low acidity who have one after another. Any theory of ulcer causation must account for a host of facts and must explain not only the formation of duodenal ulcer, but also of gastric and gastrojejunal ulcers. There may be different types of ulcers at different ages and in different situations.

Despite all these years spent in the study of gastric secretion, our knowledge remains elementary. We know a little about the concentration of hydrochloric acid/

acid in health and disease, but we cannot satisfactorily control it. About the concentration of pepsin in disease we know almost nothing. Nor do we know exactly why the normal stomach does not digest itself, and why the diseased one sometimes does. Besides the study of gastric acidity, investigators might now turn their attention to pepsin, and gastric lipase, for there is a theory that the protection of the living cells lies in the fact that the lining membrane is made up of lipoids, which are not digestible by pepsin. The value of gastric analysis in determining the condition of the ulcer has been greatly over-emphasized. One doubts sometimes, if there is truly an ulcer curve in gastric secretion. Possibly the presence or absence of occult blood in the stools is the only laboratory method of great consequence in determining healing. More light is required to be thrown on the mode of production of "hunger-pain" and on the ways in which emotion can affect the various secretions of the stomach, duodenum, pancreas and liver. Patients tell of nervous strain and a sudden "flare-up" of their ulcer symptoms and on the other hand we hear of the sudden cessation of symptoms, without apparent reason. Why this sudden access to well-being? The patient feels he may resume ordinary diet, - with reservations, if he is wise, - enjoys a remission of symptoms for a time/

time, but gradually works up to another attack. In peptic ulcer, it is a fact that the feeling of toxicity, lack of energy, hunger pain, in ambulant cases, may disappear in a night, and the next day the patient is a different person, physically and mentally. The patient will naturally put it down to the particular drug he is taking at the time, but we know that that may be a coincidence.

One visualises, in a fresh attack, that an ulcer may have healed completely and fresh ulceration occurred at some other point in the stomach or duodenum, or an old scar may have broken down, but probably in most cases where proper attempt at cure has not taken place, an indolent condition of the ulcer is present during the quiescent periods, and the attack is due to a recrudescence of inflammatory activity in the ulcer or its neighbourhood.

Undoubtedly a febrile, toxic condition as in tonsillitis, or coryza, may induce an attack, but many attacks come on when there is no obvious factor to account for them. Probably a combination of processes including metabolic disturbance is a possible explanation of certain cases of recurrent ulceration. In many types of people and in some forms of disorders, e.g. migraine, there appears to be certain rhythmic cycles of metabolic ups and downs, and/

and their mode of production will help to explain the alternating cycles of well-being and of depression experienced. The theory recently advanced by Spira in his book that a food factor - fat - was responsible for peptic ulcer, from the regurgitation of an excess of bile into the stomach to deal with the fat, and subsequent irritation to the mucosa from the mixture of bile salts and hydrochloric acid, does not seem to have been taken up with any great enthusiasm by the profession. I find that the irritant properties of the mixture had been discussed previously (1913) though no reference was made then to a fatty diet as the cause of the trouble.

One is impressed with the theory of a psychic reaction resulting in nervous spasm of blood vessels, in stomach and duodenum - comparable to that which is seen in the hands and feet in Raynaud's disease - which might keep the gastric or duodenal mucosa anaemia long enough to induce auto-digestion and formation of ulcers. While it is important to know more about the secretory functions of the digestive tract, it is probable that symptoms of indigestion are produced mainly by disturbances in the motor functions.

A large number of elderly people live more or less comfortably with no free acid in the gastric juice, but should there be a breakdown in motor transport through/



through pylorus or intestine, trouble immediately arises. What is necessary now, is that more research work be done in medical treatment so that there should be fewer gibes like that of Lord Moynihan's (Lloyd Roberts' Lecture) "that present methods of medical treatment are proved by experience to be of little value and highly dangerous." Admittedly these words were spoken four years ago but there has been little attempt at change in our methods of treatment in this Country since then. However successful this is compared with the older methods it is not nearly successful enough.

In going through the vast literature on this disease one is forced to conclude that too little attention has been devoted to medical treatment, from an experimental point of view.

The general practitioner has few opportunities, and only in Clinics and Hospitals can this properly be carried out, and however empirical a foreign treatment may seem, it should be given a fair trial. Many of the leaders of the profession in this particular disease, seem to me to have gained prominence by the publication of masses of complicated statistics on such subjects as gastric analysis, methods of operative procedure, which, while not gainsaying their great value, help the general practitioner little, and the/



the patient less. In too many cases the treatment laid down and adopted in practice consists of 6 weeks more or less in bed, or at rest, milk and milk foods and alkalies. A leaflet on diet and general hygiene is sometimes presented when goodbyes are said. This will never conquer the disease: it is not so simple as that, indeed, it is somewhat mysterious.

Rest, of course, is invaluable, and I believe is the chief factor in the treatment now in vogue, but as regards milk, "one man's meat is another man's poison," and in some cases, massive alkali dosage, engenders a condition which brings another old adage to mind, that "the cure is worse than the disease." What do I suggest then as treatment? In the first place the patient must be made thoroughly conversant with the risks he runs from complications, and even if he loses all symptoms, he must realise that he has a physical handicap which cannot be treated specifically, and that to maintain compensation, which means to him, absence of symptoms, and to the physician abolition of such physical signs as tenderness and more nearly normal motor activity of stomach and laboratory findings, he must adhere to certain rules of living.

And now what are the principles of treatment by which we hope to allow the patient to become and remain adequately compensated with respect to his digestive/

digestive tract lesion ?

As the etiology of peptic ulcer is a doubtful one a specific mode of therapy is impossible. From the very chronicity of the lesion in itself, it is suggested that systemic, as well as local, factors may be influential. It appears then, that at present one must assemble whatever experimental data seem relevant and empirical measures which have helped clinically, and treat the patient as a whole, as well as his gastric or duodenal ulcer. Our knowledge of the pathogenesis of ulcer is so limited that for practical purposes, both for patient and physician, the recognition of a constitutional ulcer diathesis is best. It eliminates over-enthusiasms on the part of the patient or physician, and precludes careless indulgence, which may precipitate loss of compensation built up during cure, either through lighting up an old ulcer or a recurrence elsewhere.

In all patients suffering from peptic ulcer whom I have seen in recent years I have endeavoured to trace early symptoms in the history given by the patient. This is most important from the point of view of prophylaxis in early cases, especially where there is familial incidence. Most patients are amazingly vague as to their symptoms unless seen during an attack. The gastric ulcer cases are usually much undernourished/

undernourished and state that they have had "a weak stomach all their lives," and invariably they are obsessed with the idea that their symptoms are due to the food they eat. I find in the energetic, duodenal type of patient that they frequently, even in early childhood, became very "empty" especially during the forenoon; not a pain, but hungry and faint, unless they at once took food.

In families with a duodenal ulcer history, it would be interesting to watch the children with regard to this symptom. Notwithstanding a hearty breakfast this "hunger-sensation" made its appearance one to three hours later, indicating that the stomach had emptied much more rapidly than normal. Advice as to their probable diathesis, diet, and mode of life, should be given to these children and to their parents.

#### PROTEIN AND PEPSIN THERAPY.

In the treatment section, I gave particulars of protein and pepsin therapy, and an account of two cases of my own. This method I consider eminently worthy of extended trial as there are practically no disturbing symptoms of reaction following the injections, and results, so far, justify its use as a means of help towards cure of the disease.

#### APERIENTS.

As already stated I am convinced that aperients and purgatives/

purgatives are injurious to peptic ulcer patients. Constipation is the rule, in the disease, but it can be overcome if the patient takes plenty of fluids, the juice of one or two oranges daily, a liberal supply of fresh butter and cream, if possible, and foods of a bulky nature, such as well-cooked cereals for breakfast. The patient must refrain from irritating his intestinal tract with aperients.

A small enema of warm salt solution is all that is required to relieve the usual dyschezia. Incidentally, I am of the opinion that the taking of purgatives at bedtime, for their effect next morning, is, in many cases, detrimental to tranquil sleep which these patients require.

#### INFECTED FOCI.

The removal of infected foci improves the general health of the individual, and thus favourably influences healing. In the causation of both acute and chronic peptic ulcers, bacterial infection may be a big factor.

#### PSYCHOTHERAPY.

This has been emphasized, and satisfactory adjustment of emotional difficulties cannot be ignored when one realizes their influence on the motor and secretory activity of the alimentary tract. A careful social/



social adjustment which may involve change in occupation and general habits of life may be necessary in some cases. Every disease must have a functional aspect, and in the early stages of disturbance of digestion, mental means will bring benefit, perhaps recovery.

#### PLUMBISM.

In the section on etiology reference was made to lead poisoning, and I drew attention, giving particulars of a peptic ulcer case of my own, to the unrestricted sale, in this country, of "hair-restorers" containing lead acetate. Several preparations, I find, are advertised and sold extensively. The buyers are ignorant of the fact that their "hair-restorers" contain lead, and also of the necessity of keeping the hands free from the solution. Lead is therefore ingested with the food, apart from absorption from skin abrasions, and possibly through the scalp, during long-continued use. The sale of these lead solutions should be prohibited by law.

#### STATISTICS.

Most of our data on the efficacy of any form of treatment is based on immediate results rather than the ultimate efficacy. What really matters in statistics/



statistics is the "follow-up" of all cases over several years at least. I regret that I have not been able to do this, except inadequately, in the cases admitted to the Wards of the Royal Sussex County Hospital in 1930 and 1931. However, the statistics given may be of some interest. Certainly, I found statistics a fascinating study, once a beginning had been made in the investigation. All investigators agree as to the considerable increase in the incidence of peptic ulcer; to the preponderance of male over female incidence in duodenal ulcer, and a similar tendency in gastric ulcer.

#### DRUGS.

In the "treatment" section, I have indicated my preference for the aluminium preparations instead of the stronger alkalis. These preparations, I find, more effectively relieve pain, and being non-absorbable they do not give rise to alkalosis or other systemic effects. Nausea and loss of appetite are common symptoms when patients are given large doses of the time-honoured alkalis, but I have never found this to be so when the aluminium preparations are taken. I am insistent on this, because I have experimented on various patients with antacid medication for several years/

years, and although I sometimes prescribe such antacids as magnesium, calcium and bismuth salts - always with mucilage tragacanth - I favour an emulsion of colloidal hydroxide of aluminium, with or without dilute hydrocyanic acid. In ambulatory cases, tablets of "alocol" may be carried, and used when required. The anastomotic ulcer is very resistant to treatment, and frequently the gastro-jejunosotomy must be undone, and a long period of medical treatment undergone.

#### DIET.

Before touching on diet I should like to point out how important it is, in my opinion, that patients should be encouraged to attain adequate body weight, for malnutrition doubtless influences metabolism and the healing process in the ulcer. Further, I find that the undernourished patient does not sleep well, as a rule, and we might, I think, bear that in mind when treating insomnia.

Even in Shakespeare's time this seemed to be appreciated, for in "Julius Caesar" he voices his preference for "men about him that are fat and sleek headed, such as sleep o' nights." !

I have already stated my opinions on diet. It is/

is essential that it should contain nothing which can irritate chemically or mechanically the ulcerated mucous membrane, but I do not agree that milk should form the basis of diet, except during the first weeks in bed, certainly not in ambulatory cases, unless they can tolerate large quantities of milk and milk foods, which few in my experience can do. I reckon that about half of my patients tell me that "they cannot take milk, never could." Ambulatory patients I advise about diet and encourage them to get back to well-cooked ordinary diet, including meat as soon as possible. The patient ought to know from experience what food best agrees with him. It is extraordinary the number of fish, meat and vegetable dishes which can be devised from books mentioned, without recourse to milk, and sufficient calories thus taken. Many patients do not digest milk well; examination of the stools discloses this, and loss of weight and energy results.

But when all is said and done it is comparatively easy, even in the light of our present knowledge to get the well-to-do patient back to health and to maintain that condition, provided he co-operates, in the routine. A much more serious problem is that of the very poor hospital-class patient, whose home conditions and work (or lack of it) nullifies after a time, any treatment/

treatment instituted, whether medical or surgical. Especially disturbing is the knowledge that some sections of the community are not getting enough food. There exists a great need for dietetic information for use by medical and social workers, whereby they could give advice on good, inexpensive diet, comprising an adequate supply of calories, adequate first class protein, adequate minerals and vitamins.

It must be kept in mind that in detecting disease in the early stage, laboratory methods are, meantime, of little use. X-rays and the microscope may reveal disease when it has destroyed or altered structures, but it is impossible to obtain in this way information from the great and important field of subjective impressions.

I realise fully that the bulk of patients are seen by the general practitioner in the early stages of disease. Neither the hospital physician nor laboratory worker has the same opportunity of observing the patient when only subjective sensations are present. The family physician has an unique opportunity, in that he becomes acquainted with the lives of a number of people, knowing them in health, and when disease attacks them, watching its development. Therefore, a large responsibility rests upon him, for/

for progress demands that the predisposing and early stages should be investigated with the utmost earnestness. He can do an immense amount of investigation in the disease which forms the subject of this Thesis, but he must train his senses and develop his clinical instinct so that the patient's earliest symptoms, his family history, his mode of life, his diet, his worries, his type and temperament, may all be quickly taken into account, and their bearing considered with regard to the patient's future health. Perfection cannot be attained in this world, but in attempting to attain it we are bound to add to our knowledge, and this notwithstanding the extraordinary complexity of Humanity and of Medicine.



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