An Address

ON

RECENT ADVANCES IN THE TREATMENT OF GASTRIC DISEASES.*

BY

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IN May of this year I came of age as a member of the staff at Guy's Hospital. When I recall our knowledge of disorders of the stomach twenty-one years ago and compare it with that of to-day, it is at once apparent that most recent advances in treatment are the result of advances in diagnosis. Radiology was in its infancy in 1907, and only the grossest anatomical and functional abnormalities of the stomach could be recognized with its aid. To-day I am unwilling to diagnose a gastric or duodenal ulcer without direct x-ray evidence of its presence, and I do not think that my colleague Dr. P. J. Briggs has failed during the last five years to discover some abnormality in the outline or movements of the stomach in any case of carcinoma. Test meals were rarely given in 1907, and the significance of the results obtained was little understood. The modern fractional test meal not only shows how much acid is secreted, but it gives an accurate measure of the motor efficiency of the stomach, and affords the only means of recognizing gastritis—a common disorder, formerly diagnosed on insufficient evidence and to-day diagnosed with insufficient confidence. The significance of the presence of occult blood in the stools was unknown twenty-one years ago, and it is only in the past seven years that Dr. J. H. Ryffel at Guy's Hospital, and Dr. J. F. Venables and Dr. T. W. Turner at New Lodge Clinic, have so improved the methods of testing for it that it now ranks with the x rays in value as a means of recognizing the organic diseases of the stomach. It is almost always found with active ulcers, and its gradual disappearance is an excellent measure of the success of treatment, whilst its constant presence in every stool in every case of cancer is of the utmost importance in diagnosis.

During this same period surgery has taught us that duodenal ulcer is a common disease with characteristic symptoms instead of an undiagnosable rarity. It has taught us how frequently gastric symptoms are the reflex results of disease in the gall-bladder and appendix. Finally, and most important, it has shown us how often it fails to cure the diseases it has taught us to recognize, and how often it gives rise to new and artificial diseases formerly unknown. It has thus stimulated us so to improve our methods of medical treatment that we may look forward to the day when all the unsuccessful gastro-jejunosomies have been undone, and the only gastric operation the surgeon is called upon to perform is gastrectomy for early carcinoma.

THE TREATMENT OF ULCER.

In the past the medical treatment of ulcer was frequently unsuccessful because it was not founded upon an adequate knowledge of its pathogenesis and was consequently not sufficiently thorough, because it was rarely continued until healing was complete, and because it was not realized that when the ulcer had healed the ulcer diathesis remained, so that unless the essential exciting causes were eradicated and the accessory exciting causes were avoided a recurrence was very likely. I shall briefly consider the principles of treatment, the evidence of healing upon which the duration of treatment should depend, and the instruc-

tions which should be given to the patient so as to make it possible for him to lead an active life without running danger of developing a new ulcer.

A. PRINCIPLES OF TREATMENT.

1. *The Acid Factor.*—The presence of free hydrochloric acid is required for the development of an ulcer. A diet must therefore be chosen which produces as little secretion of acid as possible, and atropine and olive oil should be given to inhibit the secretion of acid, and alkalis to neutralize the acid when it has been secreted both during the day and, what is almost invariably neglected, during the night. I shall presently refer to some recent work on the relative value of the different alkalis and the danger of alkalosis, and how the latter can be avoided. The diet must also be one which contains nothing to irritate the ulcerated mucous membrane chemically or mechanically, and it must be adequate in quantity and quality to maintain the patient's nutrition.

Diet.

In nearly all the well-known systems of dieting patients with ulcer tables are given in which changes are made at definite intervals, until, at the end of a varying period, a full or almost full diet is allowed. Such systems are most illogical, as a small superficial ulcer calls for a very much shorter period of treatment than that required for a large penetrating ulcer. Moreover, it is not obvious why any change in the treatment should be made until the ulcer has healed. Such schemes as those associated with the names of Leube, Lenhart, and Sippey, in which the diet is changed daily or every few days for two, three, or four weeks, have thus no rational basis. If a certain diet is suitable for a certain day, it is absurd to assume that every ulcer, whatever its size or position, and whatever the general condition of the patient may be, will have improved in twenty-four hours to just the degree which justifies the addition of an egg or a *zweiback* to the diet.

When the diet has once been modified so as to suit the special requirements of the individual, no further change should be made until all the available evidence shows that the ulcer has completely healed. I doubt whether it is really necessary to have any intermediate diet before the patient changes from the strict diet to the almost full diet of the "post-ulcer regime," which he must keep to for the rest of his life. As, however, it is impossible to be quite certain that an ulcer has healed, I give a diet intermediate between the strict diet and the post-ulcer diet for the patient to take for a week or two whilst he is beginning to resume his usual activities.

In various papers published between 1829 and 1835 Cruveilhier recommended an exclusively milk diet for the treatment of gastric ulcer, and soon afterwards Brinton introduced it into England. Since their day milk has, and I think rightly, formed the foundation of nearly every plan of treatment. Pavlov showed thirty years ago that its fat inhibits the secretion of gastric juice, and that its protein combines with some of the free acid. Freezer, Gibson, and Matthews (1928) have now demonstrated that milk neutralizes approximately its own volume of 0.3 per cent. hydrochloric acid.* If, therefore, 1,500 c.cm. (2½ pints) could be administered in such a way as to coincide with the varying rates and periods of acid secretion, the milk would by itself be sufficient to keep the gastric contents neutral throughout the day, if not more than 1,500 c.cm. of juice containing 0.3 per cent. hydrochloric acid were secreted. P. M. F. Bishop, D. Ellis, Evan Jones, G. W. Rake, and B. T. Squires have investigated the effect of different diets and different alkalis in the actual treatment of ulcer patients under my care by removing fractions from their stomach every fifteen minutes for several consecutive hours. It has been found that purely carbohydrate feeds have none of the neutralizing action of milk, and that the latter acts more satisfactorily in small quantities given hourly than in larger doses given two-hourly or still larger every four hours. The administration of milk every hour leads to complete achlorhydria for a considerable part of the day, but free acid appears from

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time to time a quarter of an hour before the next feed is due, especially in the afternoon and evening (Chart 1). It is then that the addition of alkalis is required in order to obtain continuous complete neutralization.

CHART 1.—(a) Ordinary fractional test meal (10 oz. gruel) keeps gastric contents neutral for only a quarter of an hour. (b) Milky feeds of 10 oz. keep contents neutral for half to three-quarters of an hour (Evan Jones).

2. *The Infective Factor.*—The essential exciting cause of gastric and duodenal ulcer is infection. It is therefore necessary to eradicate completely any infective foci which may be found. Pyorrhoea alveolaris requires treatment not only by the dental surgeon but by the patient, whose personal attention to oral hygiene can often bring about the cure of mild forms of the condition. All dead teeth should be x-rayed, and any showing apical infection should be extracted. Areas of rarefying osteitis should be looked for even in edentulous patients, as a residual streptococcal infection may persist for many years after infected teeth have been extracted, as Eyre was the first to show, and as Spencer-Payne has demonstrated in many of my patients. Infected tonsils should be enucleated and the nasal sinuses examined for obvious or latent infection, which should be treated by appropriate measures.

3. *Accessory Factors.*—Tobacco is a very important factor in the pathogenesis of ulcer, largely on account of the increased secretion of acid to which it gives rise; the patient, therefore, should not be allowed to smoke during the period of strict treatment. As fatigue and exposure to cold often play a part in the development of an ulcer, it is best for the treatment to be carried out in bed.

B. DURATION OF TREATMENT.

Strict treatment must be continued until the ulcer has completely healed. The spontaneous pain often disappears within twenty-four hours, and it rarely lasts for more than a week. Deep tenderness and rigidity may be found considerably longer, but generally disappear long before healing is complete. The stools should be examined twice a week for occult blood; until three consecutive ones have given a completely negative guaiac reaction and have shown no spectrum of haematoporphyrin. The more active inflammatory phase of ulceration may then be regarded as past, but the ulcer is not necessarily healed. In the rare cases in which occult blood remains constantly present, even in specimens obtained through a sigmoidoscope, so as to avoid possible contamination from piles, and in spite of the disappearance of all other symptoms and signs, early malignant degeneration should be suspected, and the necessity for exploratory operation requires consideration. An x-ray examination must be made every week until the crater has completely disappeared. This is a most valuable sign of healing in gastric ulcer, but it is often difficult to recognize the crater in the irregular outline of the bulb in duodenal ulcer, as some permanent deformity almost always persists after the ulcer has completely healed. Only when spontaneous pain, tenderness, and rigidity, occult blood in the stools, and direct radiological evidence of ulceration have all completely disappeared for a week should the strict treatment be discontinued, and then only if the total duration of treatment amounts at least to four weeks, as, from what is known of their pathology, it is difficult to believe that even the smallest chronic ulcer will heal soundly in much under a month. Large ulcers require six or eight weeks, and very large and chronic ones, which

have penetrated the pancreas or liver, may require as long as three months.

C. AFTER-TREATMENT.

Investigations on the ulcer diathesis carried out at Guy's Hospital and New Lodge Clinic, and in New York by Draper, together with our observations and those of Ryle and Huddy on the familial occurrence of ulcer, have clearly shown that the tendency to recurrence after medical treatment, and of the equal tendency to the development of new ulcers in the stomach, duodenum, or jejunum after surgical treatment, are primarily the result of constitutional peculiarities of the individual. If he returns to the conditions which were present before his ulcer developed, it is only to be expected that a new one will form. This can only be prevented if, in addition to the removal of all foci of infection during the strict treatment, he is given instructions as to his diet and habits, which he must obey for the rest of his life.

If food is properly masticated, by the time it is swallowed it should be so well broken up, softened, and diluted by the saliva that it can no longer exert any mechanical, chemical, or thermal injury on the healthy gastric mucous membrane. Nothing which cannot be reduced to a fluid condition by chewing must be eaten; no pips or skins of fruit, whether raw or cooked, or in jam, marmalade, or cake, and no raw vegetables, no pickles, and no cooked vegetables except in the form of purées, are allowed. Everything which does not lose its chemically irritating properties by dilution with saliva must also be prohibited; this prohibition includes all forms of alcohol, strong coffee and tea, unripe fruit, and the majority of drugs. Smoking must be confined to a limited number of cigarettes provided with a mouthpiece containing a plug of cotton-wool, because of the chemical irritation caused by swallowing small quantities of tobacco juice and the increased secretion of gastric juice which follows the inhalation of nicotine.

ALKALIS.

Until recently it had always been thought that the equivalent dose of various alkalis could be calculated from their chemical formulae. As, however, the theoretical conclusions did not agree with clinical experience, I asked Professor C. S. Gibson of Guy's Hospital to investigate the question by modern physico-chemical methods. This he has now done, with Mr. C. R. E. Freezer and Mr. E. Matthews. Their results are of great interest and of much practical value. In their first series of experiments an excess of the "alkali" was added to a constant amount of 0.3 per cent. hydrochloric acid, and the hydrogen-ion concentrations (pH values) of the resulting solutions were determined. It was found that the "alkalis" could be classified as follows.

(a) Magnesium oxide and peroxide and sodium bicarbonate produce an alkaline solution which reaches a maximum and constant degree of alkalinity within a minute. This is higher for magnesium oxide (pH 10.0) than for sodium bicarbonate (pH 8.0). Magnesium carbonate attains neutrality in less than a minute and then becomes alkaline, reaching a maximum (pH 8.5) in two minutes.

(b) Sodium and potassium citrates and tribasic calcium and magnesium phosphates attain neutrality (pH 7.0) within a minute, and calcium carbonate attains neutrality in two and a half minutes, but none of the solutions ever become alkaline.

(c) Bismuth oxycarbonate only reduces the acidity to pH 4.0, the solution never becoming neutral. The proprietary drugs "alocol" (aluminium silicate) and "neutralon" (aluminium hydroxide), which have been much used for the relief of so-called "acidity," have even less effect, the final pH being 2.4 and 3.7 respectively.

In a second series of experiments it was found that the calculated chemical equivalent dose of the alkali required to produce neutralization always failed to do so, owing to the reversed action of water with the salt formed by the combination of the acid with the alkali. Instead of neutrality (pH 7) being attained, most of the alkalis had very little effect, the greatest reduction in acidity being produced by sodium bicarbonate (pH 4.1), and the next by sodium and potassium citrates (pH 2.3).

In a third series of experiments the quantity of 0.3 per cent. hydrochloric acid neutralized by 2 grams (30 grains) of the alkali was determined. It was found that, weight for weight, magnesium oxide is the most efficient alkali and that bismuth oxycarbonate is the least. Calcium carbonate, sodium and potassium citrates, and tribasic calcium and magnesium phosphates have less than one-fifth the neutralizing power of the same weight of magnesium oxide, sodium bicarbonate having rather more than a quarter.

The investigations of Crohn with fractional test meals showed that sodium bicarbonate and magnesium oxide, after neutralizing the acid present in the stomach, stimulated the secretion of more acid; they are, in fact, the most powerful stimulants of gastric secretion known, with the exception of histamine. As Freezer, Gibson, and Matthews found that these alkalis produce an alkaline solution when given in excess, in contrast with most alkalis, such as calcium carbonate, sodium and potassium citrate, and tribasic calcium and magnesium phosphates, which produce a neutral solution, it appears probable that it is the alkaline reaction of the gastric contents rather than any specific property of sodium bicarbonate or magnesium oxide which stimulates the secretion of acid. Consequently, if the latter are given in doses insufficient to produce complete neutralization, no secondary stimulation of secretion is likely to occur.

It does not seem to have been realized in the past what efficient alkalis sodium and potassium citrates are. When the former is added to milk in order to combine with its calcium and so prevent the rennin of the gastric juice from clotting it directly it is swallowed, it loses none of its neutralizing power. Freezer, Gibson, and Matthews found that milk neutralizes an equal volume of 0.3 per cent. hydrochloric acid, so that citrated milk contains the properties of two efficient alkalis—milk and sodium citrate—as well as being an unirritating and valuable food (Chart 2).

On the other hand, it is customary to regard bismuth oxycarbonate as an alkali, although it is interesting to recall the fact that the first bismuth salt employed in the treatment of gastric disorders was the subnitrate, which was never supposed to exert any neutralizing action on the gastric juice. As so many patients believe they gain relief from the use of bismuth salts—the oxychloride and subnitrate being apparently as effective as the oxycarbonate—their physical rather than their chemical properties may perhaps endow them with some soothing action, the nature of which is quite unknown. It has been suggested that they form a protective coating to ulcers, but Briggs has shown by radiological observations that even half an ounce of bismuth oxycarbonate taken in suspension on an empty stomach does not as a rule adhere to the surface of even a large ulcer crater.

Sodium bicarbonate gives immediate relief to the pain in most cases of ulcer. This is due in part to the almost instantaneous neutralization of the acid present, and in part to the effect of distension of the stomach with gas on the mechanism of the pyloric sphincter. It is, however, an undesirable alkali in the treatment of ulcer, in spite of its popularity with patients and many physicians, because, as I have already pointed out, the neutralization of acid is followed by a great increase in secretion. Moreover, the distension of the stomach with gas may be dangerous if an ulcer is near perforation, and its stimulating action on peristalsis is an additional disadvantage.

Magnesium oxide has nearly four times the neutralizing power of an equal weight of sodium bicarbonate, and no carbon dioxide is evolved, so that no gaseous distension of the stomach is produced. It has a mild aperient action,

and produces a smaller secondary increase in secretion after the initial neutralization than sodium bicarbonate.

Calcium carbonate has two-thirds of the neutralizing power of sodium bicarbonate, but it does not give rise to any secondary hypersecretion. It has been suggested that the calcium chloride which it forms in the stomach may have some influence in increasing the coagulability of the blood, and it has therefore been recommended when haemorrhage has recently occurred, but there is no deficiency in the blood calcium in such cases, and calcium salts given by the mouth have no effect on the coagulability of the blood.

Tribasic phosphates of calcium and magnesium act, according to Greenwald (1923), as antacids in the stomach, but not as systemic alkalis. We have now had a considerable experience of their use in the treatment of ulcer. They appear to be just as efficacious as the usual alkalis, but I am not yet convinced that they may not also give rise to alkalosis even in the absence of pyloric obstruction and renal disorder. As the magnesium salt is slightly laxative and the calcium salt slightly constipating, the dose of the former can be increased when the patient is constipated and that of the latter reduced. In the uncommon cases in which there is a tendency to looseness of the bowels some of the magnesium salt should be replaced by the same dose of the calcium salt.

Greenwald stated that tertiary calcium phosphate had

only one-fourth of the neutralizing power of the magnesium salt, which was equivalent to the same weight of sodium bicarbonate. But, using more accurate physico-chemical methods, Freezer, Gibson, and Matthews have shown that tribasic calcium phosphate is actually a slightly stronger alkali than the magnesium salt, but for practical purposes they can both be taken to

neutralize about the same quantity of acid gastric juice as half of their weight of sodium bicarbonate.

ALKALOSIS.

Sippy did not refer in any of his publications on the treatment of ulcer with large doses of alkalis to the toxic symptoms which occasionally develop. In 1923 Hardt and Rivers first drew attention to the subject, and in 1925 Venables described seven cases of the kind observed at New Lodge Clinic. Curiously enough, no similar cases have been observed among my patients at Guy's Hospital, though an equal number have been treated in precisely the same manner.

According to Venables, toxic symptoms develop only in cases of duodenal ulcer, as there was no case of gastric ulcer in our series. Hardt and Rivers stated that they occurred especially in patients with partial pyloric obstruction, who have in consequence continuous hypersecretion, considerable quantities of acid being often lost by vomiting. But only in one of Venables's cases was there any evidence of pyloric obstruction, and this patient was the only one who vomited severely.

In some of Hardt and Rivers's cases there was evidence of kidney disease before the symptoms developed, and in their two fatal cases an acute exacerbation of a chronic nephritis was found after death. On the other hand, only one of Venables's patients (a case of chronic pyelitis and cystitis) had a definite history of urinary disease; two others in Venables's series had a slight excess of blood urea before treatment was begun, the figure rising still higher at the end of a week's treatment. In the others no previous estimation of urea had been made, but in two the fall after the treatment had been discontinued was incomplete, so that perhaps some renal insufficiency had previously been present. In every case the blood urea was abnormally

CHART 2.—Effect of sodium citrate and tribasic phosphates.—(a) Carbohydrate feeds given at the hours; specimens taken immediately before the feeds and also at half-hours. (b) The same as (a), but 15 grains of sodium citrate taken with each feed. (c) The same as (a), but 1 drachm of tribasic calcium phosphate given alternately at the half-hours from 1.30 p.m. Specimens taken immediately before the feeds and alkalis.

high when estimated after the development of symptoms. The urine was only abnormal in the patient with old-standing cystitis and pyelitis, but in several cases reported by Hardt and Rivers albumin and casts appeared in the urine.

The symptoms generally appear within seven and almost always within fourteen days of commencing the alkaline treatment. Anorexia and depression are always present from the first, the patient being unduly introspective and nervous. He complains of difficulty in taking his milk, and after a time headache, nausea, and vomiting occur. He is irritable, and may complain of pruritus and dryness of the skin. Only in very exceptional cases do more severe symptoms develop. The patient then becomes apathetic and drowsy, and may finally become comatose. In two cases under Hardt and Rivers and in one of Venables's cases death ensued, but as a rule the symptoms never become very severe, and they rapidly disappear on discontinuing the alkali.

THE STOMACH TUBE.

The stomach tube is useful in the treatment of two definite conditions—gastritis and pyloric obstruction. It should rarely, if ever, be employed unless one or other of these organic diseases has been definitely proved to be present.

(a) PYLORIC OBSTRUCTION.

Increasing experience has shown how frequently the pyloric obstruction caused by an ulcer is due to oedema

CHART 3.—Man, aged 66, with only six months' history; twelve-hour gastric stasis (starch in resting juice) with hyperchlorhydria and hypersecretion—Chart (a)—secondary to duodenal ulcer. After fifteen days' treatment with diet, atropine, and evacuation by tube every evening the symptoms had gone and stasis and hypersecretion disappeared—Chart (b).

and congestion in its neighbourhood and reflex interference with the normal relaxation of the pyloric sphincter (achalasia) or pylorospasm. Consequently, when the ulcer heals the obstruction often disappears. If it persists, it is clear that it was from the first mainly due to cicatricial contraction, as a fibrous stricture is generally the result of many years of alternating activity and partial healing, so that its actual development during a course of medical treatment is very rarely observed. I have myself only seen this occur on a single occasion.

It has often been stated that when pyloric obstruction is sufficient to produce a six-hour residue after an opaque meal a gastro-jejunostomy should be performed without further delay. Our experience shows, however, that medical treatment may lead to the healing of an ulcer and disappearance of obstruction even if there is a twelve-hour residue, and even in exceptional cases a twenty-four-hour residue with peristalsis visible through the abdominal wall.

To obtain the most satisfactory results it is essential that the dietetic and medical treatment should be combined with evacuation of the stomach late in the evening, in order to prevent the accumulation of very acid gastric juice, with or without food residue, which would otherwise occur during the night. Accordingly, in every case in which delayed evacuation has been shown to be present with the *x* rays and fractional test meals we use Senoran's

evacuator just before the patient settles for the night. It is only necessary to empty the stomach; no lavage is required. This can be done most satisfactorily if the last feed is taken three or four hours before the tube is passed. There is no reason why the patient should not have a small feed with a dose of atropine and alkali immediately afterwards, as a tube passed the following morning shows that food taken under these conditions is not retained abnormally long in the stomach. Evacuation is practised every night until not more than three ounces of food and gastric juice are present. When the ulcer has finally healed, the *x* rays and test meal show that evacuation takes place at the normal rate or with only slightly less rapidity than normal (Chart 3).

(b) GASTRITIS.

Chronic gastritis is a not uncommon condition. It may be a sequel of acute gastritis caused by food poisoning or an acute infection. It may result from the constant irritation produced by excessive consumption of alcohol and to a less extent of indigestible and insufficiently chewed food, or from the swallowing of infective material from the mouth or nasopharynx. It can only be diagnosed by means of a fractional test meal, which shows excess of mucus in most or all of the fractions as well as in the resting juice. The thick tenacious mucus sticks to the surface of the mucous membrane and blocks the mouths of the gastric glands; so that only a small part of their secretion can gain access to the lumen of the stomach. At the same time the mucus acts as an alkali and combines with some or all of any free acid which reaches the food. Consequently, achlorhydria is often present, and in every case the quantity of free acid in the stomach is less than

CHART 4.—Woman, aged 53, with achlorhydria caused by chronic gastritis, cured by lavage. (a) January 3rd, 1925: Achlorhydria. (b) January 5th: After preliminary lavage. (c) March 10th: After treatment with lavage, but no lavage before test meal.

the normal for the individual. Hydrochloric acid is often given to patients with achlorhydria caused by gastritis, but it is generally not really required. If a second test meal is given after preliminary lavage, a normal curve of acidity is often obtained; when the achlorhydria persists it is due to true achylia, which is either constitutional, the gastritis being secondary, or the result of complete atrophy of the oxyntic cells following severe inflammation.

The main object of lavage in the treatment of gastritis is to remove the mucus sticking to the surface of the gastric mucous membrane. This can be done most efficiently in the early morning when the stomach contains no food. We have found that it is impossible to dislodge the mucus by ordinary water or by the sodium bicarbonate solution often employed. The only way in which the stomach can be washed completely free from mucus is by means of hydrogen peroxide; the bubbles of oxygen given off when it comes in contact with the mucus quickly dislodge it. It is necessary to begin with a weak solution— $\frac{1}{2}$ drachm to 1 pint—as otherwise the froth blocks the tube. A Senoran's evacuator is used, and lavage is continued until no more mucus appears; the stomach is then finally washed with water. The quantity of mucus is found to diminish very rapidly, and after a few days the strength of the hydrogen peroxide can be increased, as much less froth is produced. A strength of $\frac{1}{2}$ oz. to 1 pint is finally used. When mucus is no longer present in the first washing the lavage is discontinued. A test meal given at this stage, which is

often reached ten or fourteen days and rarely more than a month after the beginning of treatment, shows that mucus is now absent from every fraction, and in most cases an average normal or even a high curve of acidity is obtained (Chart 4). If at the same time a diet similar to that I have already described as suitable for individuals with the ulcer diathesis but no active ulceration is given, and infective foci in the mouth and nasopharynx are treated, there is not likely to be any recurrence of the gastritis.

HYDROCHLORIC ACID.

Achlorhydria, or complete absence of free hydrochloric acid from the gastric contents, is a very common condition; it was present in no less than 15 per cent. of 762 consecutive cases of abdominal disorder examined at New Lodge Clinic. It is important to decide whether it is due to inability of the gastric mucous membrane to secrete acid—true achylia gastrica—or to mechanical interference with the secretion and neutralization after secretion by excess of mucus in chronic gastritis. Whereas the former condition, which is much the less common, should be treated by the administration of hydrochloric acid, the latter, as I have already pointed out, should be treated by lavage, which results in the gradual return of a normal gastric secretion.

Achylia gastrica is generally a familial and constitutional condition, but it may also result from a single severe attack of acute gastritis or severe and prolonged chronic gastritis. In the former case it cannot be regarded as a disease, and, though it is present throughout life, it may never give rise to symptoms. In many cases, however, gastric symptoms develop sooner or later owing to the secondary gastritis which is likely to result from the loss of the diluting, softening, and antiseptic action of the gastric juice. Just as the food is prepared in the mouth for its reception in the stomach, so normally it is prepared in the stomach for its reception in the intestines. In achylia gastrica the food leaves the stomach in the same chemical and physical condition as that in which it enters; this often results in irritation of the intestinal mucous membrane, with the result that chronic or recurrent diarrhoea occurs. The absence of the antiseptic barrier offered by the normal gastric juice to swallowed bacteria and the abnormal alkalinity of the intestinal contents may result, as Knott has so clearly demonstrated, in intestinal infection. This is a factor of more or less importance in a large number of diseases, such as appendicitis, cholecystitis, and rheumatoid arthritis; it is probably the one essential predisposing cause of Addison's anaemia and subacute combined degeneration of the spinal cord.

It is clear, therefore, that the treatment of achylia gastrica is not only important for its direct effect on any gastric or intestinal symptoms to which it has given rise, but also in the prophylaxis and treatment of the various conditions I have just mentioned.

The treatment of achylia gastrica is a form of substitution therapy analogous to the treatment of myxoedema by thyroid gland and diabetes by insulin. It is, however, impossible in practice to provide anything approaching the quantity of acid secreted by a normal stomach. The dose often given is totally inadequate, but, if properly administered, it is easy to give as much as 2 drachms of dilute hydrochloric acid (B.P.) three times a day; when mixed with half a pint of water this dose provides a solution of approximately the same strength as normal gastric juice. If symptoms such as diarrhoea have developed as a result of hypochlorhydria, they often disappear at once with only a drachm or half a drachm of the dilute acid.

Though I fear I have been unable to record any recent advance in the treatment of gastric diseases of an epoch-making character, I think that some real progress has been made during the last few years in the treatment of functional gastric disorders and of two out of the three common organic diseases of the stomach—namely, gastritis and ulcer. There is no medical treatment of carcinoma, but the medical treatment of chronic gastritis and of chronic gastric ulcer may be regarded as a real prophylactic measure in preventing its development.

APPENDIX I.

Ulcer Diet.

1. Every alternate hour from 8 a.m. to 10 p.m. 5 oz. of milk. This can be warm or cold, and may be flavoured with tea.
 2. Every other hour, alternating with 1, from 9 a.m. to 9 p.m. a 5 oz. feed, which may be made of any of the following: (a) arrowroot, cream of wheat, Benger's food, junket, custard; to any of these red currant, apple, or other fruit jelly can be added, and the junket can be flavoured with chocolate. (b) at least two should consist of a thick white soup or semi-solid purée of potato, artichoke, cauliflower, or parsnip.
 3. A rusk with butter should be eaten with three feeds.
 4. 1 oz. of cream should be added to the 11 a.m., 1 p.m., and 5 p.m. feeds, and $\frac{1}{2}$ oz. of olive oil should be taken before the 9 a.m., 2 p.m., and 7 p.m. feeds.
 5. 1 drachm of Mixture 1 with 1 drachm or more of emulsio magnesiae, according to the state of the bowels, should be added to each milk feed.
 6. 1 drachm of Mixture 2 should be taken before the 8 a.m. and 3 p.m. feeds, and 2 drachms before the 10 p.m. feed. The dose should be increased if no dryness of the mouth occurs.
 7. 1 drachm of tribasic magnesium or calcium phosphate should be taken after the 3, 7, and 10 p.m. feeds with a little water. An extra powder can be taken after any other feed during the day or night if any indigestion or heartburn occurs.
 8. Wash the mouth out after each feed and thoroughly clean the tongue by scraping with a spatula morning and evening.
 9. No smoking allowed during the strict treatment.
- Note.*—During the night the patient should have a feed with Mixture 1 by his bedside, so that whenever he wakes, whether in pain or not, he can take a feed. This can be repeated as often as he is awake during the night.

Mixture 1.

R Sodium citrate	...	...	...	...	15 grains
Water	...	...	...	...	to 1 drachm

Mixture 2.

R Atropine sulphate	...	...	...	...	1/200 grain
Water	...	...	...	...	to 1 drachm

APPENDIX II.

Post-Ulcer Regime. (To be followed permanently.)

Avoid alcohol, except, if desired later on, a small quantity of light wine or diluted whisky at meals; avoid effervescing drinks; avoid coffee.

Avoid all pips and skins of fruit (whether raw or cooked, or in jam, and currants, raisins, and lemon-peel in cake or puddings), nuts, and all unripe fruit. For example, an orange may be sucked but not eaten. Currants, raisins, and figs are particularly undesirable.

Avoid all raw vegetables, whether taken alone (celery, watercress) or in pickles or salad; green vegetables must be passed through a sieve and mixed with butter in the form of a purée. Porridge is only allowed if made with the finest oatmeal.

Avoid vinegar, lemon juice, sour fruit; spinach; pepper, mustard, curry, chutney, excess of salt; new bread; tough meat; salted fish or meat, pork, made-up dishes, high game; clear or thick meat soup.

Take plenty of butter and cream, and a tablespoonful of olive oil before each meal.

Eat slowly and chew very thoroughly.

Do not smoke excessively. No smoking at all if any indigestion present.

A meal or feed should be taken at intervals of not more than two and a half hours from waking till retiring, and again if awake during the night. The feeds should, at first, consist of a glass of the following mixture, which should be prepared each morning: a quart of milk, 5 to 10 ounces of cream, and 120 grains of sodium citrate in 1 ounce (more or less according to the state of the bowels) of emulsio magnesiae.

Have your teeth attended to by your dentist regularly every six months.

Take no drugs in tablet form.

If you have the slightest return of symptoms, go to bed for a few days on a strict diet, and do not wait for the symptoms to get serious.