Chronic Gastric Dyspepsia

with special reference to the removal and examination of a portion of the contents of the stomach during digestion as an aid in the diagnosis and treatment of the disease.

Within the last few years our means of studying chronic diseases of the stomach, characterised by abnormalities in the digestive processes, have been much advanced by the introduction of the method of removing, for purposes of examination, a portion of the contents of the organ at varying intervals of time after the taking of food. By this method not only has our knowledge of the abnormal digestion been much increased, but many new facts in connection with normal digestion have been brought to light.

Although it is no doubt perfectly true that the procedure has not fulfilled all the expectations that its introduction promised, I think most observers agree that it is a valuable aid in the diagnosis and treatment of the different forms of chronic gastric dyspepsia. The object of the method is to compare the changes which the food undergoes in healthy digestion with the products of disordered digestion with a view to determine the causes of, to explain the symptoms of, and to devise means of preventing, these disordered digestive processes.

The changes that the food materials undergo in the stomach depend to a large extent on the characters of the gastric juice & this is equally true both in healthy & unhealthy digestion.
Where the digestion is natural we have to deal with a stomach secreting normal gastric juice, but in many forms of dyspepsia we have to deal with a stomach secreting a gastric juice differing from the healthy standard either in quantity or composition or in both.

There are, however, many difficulties in the way of obtaining pure gastric juice in sufficient quantities for purposes of examination & so this method of study is not commonly adopted. The plan of obtaining a portion of the contents of the stomach some time after a meal is far more easy of accomplishment, and after all it is sufficient to the mixed contents of the organ, not the pure gastric juice, that the symptoms of dyspepsia are due. Besides as above stated the characters of the "Stomach Fluid" as distinguished from pure gastric juice, depend mainly on the characters of the gastric juice, and therefore a comparison of the "Stomach Fluid" in healthy and disordered digestion enables us to compare to a large extent the gastric juice in the two cases.

I shall now briefly discuss the method of obtaining the material for examination which for convenience I have called the Stomach Fluid.
Method of Obtaining the Stomach Contents

The best and simplest way is by the use of an indiarubber stomach tube which is passed into the stomach sometime after food has been taken. The best tube for the purpose is the soft red rubber tube known as "Jacques' Tube". A stiffer red tube made of gum elastic is used by some; though perhaps easier to pass at times is more disagreeable to the patient. The soft red rubber tube is open at the end and has one or more 'eyes' at the side near the extremity of the tube. When the tube is in the stomach if the patient be instructed to try to cough or vomit some of the contents of the organ will press up the tube and can be received in a suitable vessel. Pressure with the hands either of the patient or the physician over the abdomen will aid in this, if necessary, but often the mere presence of the tube is enough to excite sufficiently strong involuntary contractions of the stomach and abdominal walls to bring about the required result. As a general rule the tube should not be passed till 1 or 1½ hours after a meal, otherwise pieces of undigested matters are not unlikely to choke it up.

To simplify as to get uniformity in the process its results, it is convenient to use certain "test-meals" of these the one recommended by Ewald is probably the best. This consists of weak tea without sugar or cream, and a piece of bread without butter - one dry roll is about three quarters of a pint of the tea are sufficient for general purposes.
Some use milk instead of tea & it answers well enough for rough purposes but as hydrochloric acid forms a compound with milk tea is better. The material thus obtained from the stomach should be filtered. Then the matter on the filter paper may be subjected to macroscopic examination & the filtrate to chemical examination. Von Gerach points out that filtering alters the acidity slightly so that for minute analyses it should not be done, but ordinarily this does not matter.

Before discussing the examination of the stomach contents in detail I should like to say a few words on the objections which many raise to the procedure. They urge that it is very repugnant to the patient and even may do injury to the stomach. I consider that the supposed evils are very much exaggerated. I have passed the stomach tube several hundred times in nearly a hundred different patients both in hospital and private practice & I have found that there is very little difficulty in getting any patient to submit to the procedure & that after it has been done two or three times most of the repugnance vanishes. I have passed the tube in students & others who have voluntarily submitted to the experiment after seeing it done on patients, and it is far more easy to persuade real sufferers from gastric troubles to undergo the process.
As to the possibility of doing injury to the stomach, I can say is that I never saw or heard, where any bad effect could be put down to the use of the stomach tube. I have myself used it in cases of gastric ulcer and gastric carcinoma. So that altogether I have no hesitation in saying from my own experience that the objections to the use of the tube are nearly sentimental and aesthetic. In fact I am inclined to think that some of those who object to the use of the tube do not regard from the patient's point of view, but from their own desire to avoid what certainly is a somewhat troublesome and objectionable task. There are others again who say that no good is got from the examination of the stomach contents but this is not the case. I have no hesitation in strongly recommending the procedure as a valuable aid in diagnosis, so there is no doubt that its use has increased our knowledge both of normal and abnormal digestive processes.

The chemical examination of vomited matters is of little or no use because when vomiting is about to occur there is a diminution in the secretion of acid and an excessive secretion of alkaline mucus in the stomach, as has been directly observed in cases of gastric fistulae. Again, the acidity of vomited matters is reduced by admixture with an excessive amount of saliva.
Again for purposes of study we may require to examine the contents of the stomach at varying intervals of time after food has been taken. Of course, the chemical and microscopic characters of undigested matters are often a useful aid in diagnosis and should not be neglected.

In using the stomach tube some point the back of the throat with cocaine and mount the tube with glycerine but for my own part I have not found the use of cocaine of any service & prefer to moisten the tube with plain water. Whilst the use of the tube is a means of obtaining some of the contents of the stomach for examination is very useful especially in diagnosis yet in my opinion the use of the tube to wash out the stomach is equally valuable as a means of treatment especially in certain forms of dyspepsia as will be discussed later. And before remonstrating give the "test meal" one ought to previously wash out the stomach as to obtain pure chyme only. The washing out may be done with plain water boiling hot with dilute bodily fluid or with or of these. I prefer bodily fluid with warm water. The colour thus imparted to the water readily enables one to tell when the stomach has been properly cleaned out. The amount of water put in at one time should as a rule be about one pint, it is simply syphoned off again by lowering the end of the tube over a sink.
Having now considered the method of obtaining the contents of the stomach I now propose to discuss the

**Examination of the Stomach Fluid**

Naturally its *naked* eye characteristics should be first noted, then its microscopical appearances and lastly it should be subjected to chemical analysis.

The *Naked-eye* Character - *in health* - this is not special. Of course it depends mainly on the food taken.

Generally speaking it is a turbid fluid containing shelly fragments & pieces of food more or less broken down & digested according to the length of time that has elapsed since the last meal. When filtered of course the solid particles remain on the filter & a slightly turbid fluid passes through. The *Smell* & *the Taste* are not special & in fact as above stated *in health* the *naked-eye* appearances are not remarkable. However in certain forms of deep-seated chronic stomach diseases much information can be got by *naked eye* inspection - thus the presence of *blood* *in an almost pure* a very much altered condition may be recognised - or the *stomach fluid* may be tinged with *Bile* - may be very *frothy* & have a *smell* which may suggest the presence of *Bacillus* *digesti* & again *Putrid* acid may be recognised by its characteristic smell. Again the more *foul* of the fluid which flows
up the tube may be alone sufficient to indicate the presence of a dilated stomach. These special naked eye appearances we will be referred to again when considering the special forms of stomach diseases in which they are met with.

**Microscopically - in Health** - the presence of more or less digested muscle fibres - walled fat cells - starch in the media can readily be made out. In Disease - the presence of Sarcina, yeast cells - putrolytic bacteria - blood in the media - fatty acid crystals etc. are sometimes very characteristic.

To see the various matters that may be met with more clearly various staining reagents may be used - the use of a solution of black - the emetine dye will show the bacteria. Staining of Konich diluted used as a stain makes a very pretty microscopic appearance - when Sarcina and starch in the media are present. The starch cells of corn are stained blue whilst the packets of Sarcina are stained brownish-yellow whilst fat cells are unstained. The presence of muscle fibres practically unchanged after digestion has been going on for some hours may serve to indicate delayed or inefficient digestive powers on the part of the stomach. In matters of microscopic examination the residue left on the filter paper is best.
The Chemical Examination of the Stomach Fluid

For this purpose we use the filtrate.

The Stomach Fluid is always acid in health, this acidity as we shall see is one of its most important characters. The degree of acidity varies even in health; it always also varies with the interval of time which has elapsed since the last meal. Since of course the secretion of the gastric juice takes some time to reach its maximum, the kind of diet also affects the acidity.

The Acidity of the Stomach Fluid is not a simple but a very complex acidity; the factors on which it depends are many. The acid of the gastric juice of course is one of its main factors. Besides this we may have acids or acid salts taken in with the food or produced from the food; we may have fermentations leading to the formation of various organic acids. Not only have we free acids but we have acids in combination. According to Matthew and Raymond we may group the various factors which together make up the total acidity as follows:

Free Hydrochloric Acid - Hydrochloric Acid in organic combination -

Free Organic Acids - Combined Organic Acids -

Acid Substances of an acid nature or origin -

I shall take up the study of the Total Acidity first and then discuss each of the above factors in detail later on.

(In discussing the Acidity and factors I refer to the effects of the last meal only.)
The Total Acidity of the Stomach Fluid

The method of estimating the acidity commonly adopted is easily done & sufficiently accurate for general purposes. The method is as follows - take a definite quantity e.g. 5 cubic centimeters of the stomach fluid & place it in a porcelain capsule & to it add a few drops of a solution of phenolphthalein which serves as an "indicator". The capsule is put under a burette containing a decinormal solution of ammonia of which 1 cubic centimeter will neutralize 0.36 grammes of HCl or 0.03 grammes of oxalic acid. The ammonia solution is gradually dropped into the stomach fluid to neutralize it - each drop tells it from the presence of the phenolphthalein in the capsule. If the stomach fluid is stained with a glass rod the print disappears, & it is only when the acidity has all disappeared & the fluid has just become slightly alkaline that a permanent pink tint remains & then it is time to stop.

Then we need off how much decinormal solution of ammonia we have used & so we can easily calculate the acidity of the stomach fluid in terms of hydrochloric or oxalic acid. This method of estimation not only tells us the amount of free acid in the stomach fluid but it also indicates when the acids are combined with substances of a weak alkalinity, weak acids, or amides which when not free are not strong.
enough to affect the Phenolphthalein. There were organic
bases do affect the substance Tournierol which may be
used as an indicator and the acidity shown by Tournierol
is less than that shown by Phenolphthalein. By comparing
the results obtained by using Tournierol and Phenolphthalein
respectively Mathieu & Raymond tried to estimate
the amount of albuminoids dissolved but the results
were not satisfactory.

According to the majority of observers the total
acidity varies from 1 to 2 parts per 1000. I have
found that this is usually the case also. The
acidity however depends not only on the solute liquids
taken in the food but with a uniform diet
the results depend also on the interval that has
elapsed after a meal. With the test meal Mathieu
states that the acidity at different times is as follows—
after 30 minutes 0.9, after 60 minutes 1.4, and after 90 minutes
the maximum average 1 to 2 parts per 1000 is reached.

This method of estimating the total acidity is
very useful for general purposes. It gives no idea however
to what extent the different factors are concerned
in producing it but this requires special processes which
would be difficult to mention under the different factors
which I am going to take up now.
In considering the different factors which together make up the total acidity of the stomach fluid I shall make free use of the articles by Matthew Raymond* and Weyman Winter† especially as regards the more purely chemical rather than clinical aspects. The first most important factor in the acidity is

Free Hydrochloric Acid

It has long been known that the gastric juice contained a free acid but there has been much dispute as to the nature of this acid—various acids have been suggested as lactic hydrochloric, acetic even luffamic acid. As early as 1824 Priest said it was hydrochloric acid—and there is no doubt whatever that the only free acid met with in the pure gastric juice is hydrochloric acid, but it is otherwise as we shall see when we are dealing with stomach contents after a meal for then in diseased conditions often acids may be present and even in health lactic acid is always present in the early stages of digestion.

In 1853 Meidner and Schmidt* indirectly proved the existence of free HCl by estimating the total amount of chlorine in the gastric juice and then estimating the bases and comparing the two when it was evident that there was more chlorine than was necessary to satisfy all the bases therefore some of the chlorine must have existed as free HCl.
In 1878 Richet proved the same thing in another way by estimating what is known as the "coefficient of constancy" of the gastric juice - when ether is shaken up with acid fluids it assumes an acridity which is different for each acid, if but constant for the same acid, and which is more marked in the case of solutions of mineral than organic acids. The comparison between the original acridity of the acid solution and the acridity which the ether assumes gives result is known as the coefficient of constancy of that acid solution. Richet found with gastric juice that ether acquired an acridity which was greater than that which could be due to any organic acridity. According to Ewald this method is unsuitable to the examination of stomach fluid.

The presence of hydrochloric acid in the stomach fluid can be readily shown by means of various "colour tests" which have been devised by Malpighi and others. Of these the best is that of Gimbel in which respect consists of an alcoholic solution of Phlobaphenium and Vanillin.

(Phlobaphenium 2 grammes, Vanillin 1 gramme, absolute alcohol 30 grammes.)

To perform the test a few drops of the stomach fluid are to be put in a porcelain capsule and then a few drops of the reagent added - if now the mixture be slowly heated over a spirit lamp, as it evaporates a red stain is left on the capsule if the latter be present. The heating should not be too rapid.
This test of course is only a qualitative test and gives no real idea of the quantity of free HCl present—though roughly speaking the degree of intensity of the red stain is an indication of the amount of the acid. According to Gynghör the test is not interfered with by the presence of proteins, albumins or acid salts and its only fallacy of importance is the fact that occasionally there might be enough lactate or acetate of soda in the stomach fluid to cause confusion.

There are several other Colour Tests for indicating the presence of free hydrochloric acid. Amongst the reagents used for this purpose are Crozat's, Triposolin, Benzopurpurin, Methyl violet but none of them are so satisfactory as Gynghör's Reagent. Triposolin in alcoholic or watery solution gives with free HCl a dark brown colour but with acid salts an orange yellow colour.

Ewald and Boas have shown that in the early stages of digestion there is no free hydrochloric acid to be found in the stomach fluid, but that another free acid is present and this is Lactic Acid. This Lactic Acid they proved was not secreted from the mucous membrane of the stomach, but was derived from the food materials. It is from the Carbohydrates of the Food that Lactic Acid is derived, or it is taken in as such with the food and increased in the stomach. Free Hydrochloric Acid according to these observers is never found in the Stomach until from 15 to 30 minutes after food has been taken and as the free HCl. appears and begins to increase in amount the Lactic Acid gradually disappears.
I have repeatedly convinced myself of the truth of this statement by experiments on several patients. The further consideration of this question will be found under the heading Lactic Acid later on.

As above stated, a considerable part of the hydrochloric acid secreted in the gastric juice enters into organic combination with part of the food materials, it is only when all the basic compounds are neutralized that any free acid can exist in the stomach fluid. So that to estimate the total quantity of HCl secreted we must measure both the free and the combined acid.

There are several methods of doing this, and I shall briefly describe two of them— that of Sjögren recommended by Själland and that of Hayem's Winter recommended by Matthiasson.

Sjögren's Method—consists in estimating the amount of chlorine in the stomach fluid by neutralizing a definite quantity (100 c.c.) with barium carbonate and then reducing it to ash. By these means all the organic compounds of HCl are converted into barium chloride and this may be estimated by solution of potassium bichromate.

Hayem & Winter's Method—These observers showed that free HCl was present in the gastric juice and also showed that, in normal conditions, after a meal when there was deficiency of HCl, as shown by the absence of the colour reactions, yet there was always a quantity of HCl in organic combination with the digested products resulting from the food.
Their method consists in first estimating the amount of chlorine in a certain quantity of gastric fluid. Then the amount remaining after evaporation - & lastly the amount persisting after both evaporation & chlorination - an equal amount of stomach fluid be used each time. The difference between the first result & the second gives the amount of HCl, evaporated which is almost equivalent to the amount of free HCl - & the difference between the second result & the third gives the amount of HCl, in organic combination - whilst these two amounts thus obtained when added together give the total quantity of HCl secreted.

According to Baudelot others the average amount of free HCl in the stomach fluid is from 1 to 2 parts per 1000 after a test meal & so in pure gastric juice the quantity is somewhat greater.

There may be an entire absence of free Hydrochloric Acid in the stomach fluid without there being any symptoms of dyspepsia & it is the fact of such cases being known that made many (as Matthew) regard the amount of HCl in combination as being more important than the amount free.

I shall now make a few remarks on the Hydrochloric acid which exist in organic combination in the stomach fluid.
Hydrochloric Acid in Organic Combination.

As alone stated cases are met with where the colour tests give no reaction, as there is absence of free HCl, yet these patients may exhibit no symptoms of dyspepsia. In these cases there is always present a considerable amount of HCl in combination. This combined HCl may often somewhat nears the colour tests for free HCl. That the organic combination of the HCl does not correspond to peptonisation of food but is merely a chemical combination with the albumenoids has been shown experimentally by Vernet and Eyre who put HCl and dry albumenoids together in a dish or evaporator - by so doing the HCl is driven off, but a fixed amount remain which is not driven off by evaporation or it is in chemical combination but is driven off by calcination. The quantity of HCl that is driven off by evaporation alone remains the same however long the HCl and albumenoids remain in contact and this shows that it is not a matter of digestion or peptonisation requiring time but it is a matter of instant chemical combination. The same thing applies in the stomach. Thus the estimation of the organically combined HCl by the methods given above gives no indication whatever of the peptonisation that occurs - but the amount of free combined HCl together indicates the total amount present by the gastric mucus, as every this is a guide to the physiological value of the juices.
We have still to consider the sources of the use of the hydrochloric acid before considering the other factors which go to produce the total acidity of the Stomach Fluid.

The Source of the Hydrochloric Acid:

The HCl. of the Stomach Fluid is derived entirely from the HCl. which is contained in the gastric juice & this is derived from the chloride in the Blood & secreted by the gastric mucous membrane. This has been proved experimentally by Voit & later by Calve who showed that if all chlorides were kept out of the Blood, HCl. was no secretion of HCl. The acid is derived from the splitting up of the various chlorides in the Blood especially the sodium chloride, and the alkali remains in the Blood, the more acid therefore secreted the more alkaline does the Blood become. This question will again be referred to under the study of Hypoacidity of the Stomach Fluid when we shall see the effect on the reaction of the urine & saliva.

Since the secretion of acid by the stomach leaves the Blood more alkaline we should expect this to be the case when the secretion is actively going on during digestion & this is the case. Conversely during the secretion of the alkaline pancreatic juice the Blood becomes less alkaline of these two effects cause produce the "acid & alkaline tide" of the urine whose reaction is affected by the stages of digestion.
According to Sticker, the secretion of the acid gastric juice has another effect on the composition of the urine as the amount of chlorides in it are increased after food from the fact that some of the HCl secreted is reabsorbed into the blood in the form of chlorides various loose compounds with peptones. If also, according to the same observer, salts such as magnesium calcium carbonate be given, this increase of chlorides in the urine after food does not occur owing to the formation of insoluble chloride of magnesium calcium.

The secretion of a free mineral acid (HCl) from the alkaline blood at first sight seems somewhat remarkable and many explanations have been put forward. Maly has thrown light on the matter by his experiments on the dialysis of different salts. Alkaline fluids may contain acid salts or even free acids. Thus Maly showed that the blood contained acid phosphate of soda as free Uric and alluric acids. These acid salts have a much greater difffusion power than the neutral salts. In a dialyser an alkaline solution containing neutral and acid phosphate of soda will give up the acid salt to the distilled water around. Maly says that in the same way the renal cells act as a dialyser, pass out the acid salts of free acids of the blood. Further Maly showed that if we mixed together neutral phosphate of soda with calcium chloride we get calcium tripiphosphate, sodium chloride and free hydrochloric acid.
The above reaction may be represented as follows:

$$2 \text{Na}_2\text{HPO}_4 + 3 \text{CaCl}_2 \rightarrow \text{Ca}_3(\text{PO}_4)_2 \cdot \text{NaCl} + 2 \text{HCl}.$$ 

Now according to Brehm and Hecker hemin is present in the blood therefore allowing the opportunity of the formation of free hydrochloric acid. This acid according to Lysholm possesses a very high diffusible power and when once formed in the blood passes into the gastric juice.

These observations certainly show the possibility of alkaline blood secreting the source of acid gastric juices and wine. But there is no proof that the renal and gastric juices act a dialyoysis with explanation why the one secretes hydrochloric acid and the other secretes phosphate of soda.

Heidenhain endeavours to show that the gastric glands make HCl from sodium chloride by means of the lactic and organic acid and Landwehr says the same and denies the necessity of lactic acid from the stomach musus. However Brough has shown that if there albumen only is put in the stomach only HCl and lactic acid is secreted. There is however a weak acid C O₂ in the blood and this may be strong enough to form NaCl and H₂O, which suggests also that the same might partly be due to formation of some H₂SO₄ from the proteids in the food. A weak acid can certainly displace some of a stronger acid by the "influence of mass".
Bunge and Maly showed that in a solution of lactic acid and sodium chloride in a vessel the copper began to contain some free hydrochloric acid.

The use of the hydrochloric acid of the gastric juice will be considered later.

I will now take up another factor in the production of the acidity of stomach fluid—this is the organic acids.

The Organic Acids

In healthy digestion, the only organic acid met with in the stomach fluid often is lactic acid. In various hypophyses, lactic and other organic acids as butyric and acetic may be met with.

Lactic Acid—Ehrhardt and Bums were the first to show that in the early stages of digestion there was free lactic acid but no free hydrochloric acid in the stomach fluid. They showed that the lactic acid was not a secretion of the gastric mucosa membrane but was derived from the food or introduced along with the food: for if pure albumen be given no lactic but only hydrochloric acid is formed. These observers also pointed out that there is a kind of antagonism between the free and the lactic acid; that as the former appears the latter gradually disappears in healthy digestive processes. The lactic acid is derived from the carbohydrates of the food by fermentation.
Some say the fermentativeness due to an unorganized ferment contained in the stomach muscles or others to organized ferments. When there is deficient secretion of HCl, there is usually excess of lactic acid which may persist throughout digestion as we shall see later when discussing defective acidity.

Butyric acid - Known not with in healthy digestion but in diseased conditions it may be found in large quantities in the stomach fluid and results from secondary fermentative processes in the food materials as is especially met with in dilated stomachs. Its presence can usually be readily recognized white by the sense of smell. This acid is said to be one of the most important factors in the production of heartburn as it is volatile and acid fumes irritate the cardiac orifice of the stomach.

Lactic Acid - Like butyric acid this acid is found with in diseased conditions. It is a product of fermentative processes being partially derived from alcohol. This in turn from the carbohydrates of the food. It is not very commonly met with in the stomach fluid except alone. There seem a few cases where it's presence was evident if pain was marked features in the symptoms.
Other organic acids & salts may be introduced with the food materials but they are unimportant. The presence of Lactic Butyric & Acetic Acid in stomach fluid may be shown by means of Weilman's Reagent. This consists of a 2 per cent solution of carbolic acid to which a few drops of Liquor ferri phenolici have been added. To perform the test, take some of the above reagent dilute it 203 times with distilled water when we shall get a solution of an emulsified blue colour. If now some of the stomach fluid be slowly added to this the presence of the organic acids is shown as follows - If lactic acid imparts a canary yellow colour to the solution, butyric acid causes a greyish-white precipitate to be formed whilst acetic acid gives a reddish coloration to the solution. If only hydrochloric acid be present in the stomach fluid the blue colour of the reagent is simply discharged. Occasionally it may be necessary to use an ethereal extract of the stomach fluid to get the reactions of the organic acids. Successive extractions with ether & estimation of the coefficient of percentage have been tried as a means of quantitative analysis of the organic acids but are not satisfactory in the case of a complex fluid like the stomach fluid.
Organic Acids also like the hydrochloric acid may exist in organic combination with the albuminoids found in the stomach fluid and these must be saturated before any free acids can be found.

The influence which the organic acids exert on the digestive processes is unknown.

In a case of excessive acidity it is important to be able to recognize whether this acidity be one of secretion or fermentation and this as a rule can readily be made out. The smell alone is often a good guide as the stomach fluid whose acidity largely depends on fermentation carries has a sharp or rancid smell (acetic or butyric acid). If the total acidity be raised a luminous test shows that there is no free HCl. It is almost certain that the acidity is due to the presence of organic acid which should then be tested for by Wollmann's reagent.

Acid Substances of an Altered nature or origin

These may slightly affect the total acidity. Thus according to Villemin, Heliotone prepared according to Metani's method is always slightly acid having an acidity equal to about 1/23 that of Hel. Again according to Metani, Raymond, Tenu mi is acid and it along with Tenu mi is sometimes to be met with in the stomach fluid being derived from the intestines.

This completes the account of the different factors in the total acidity of the stomach fluid.
I have dealt thus fully with the Acidity of the Stomach Fluid because I consider it is the important factor as a rule. When we have Gastric Juice secreted at all there is always enough of the special Pepini-ferment (Mathieu) to make cases of ordinary dyspepsia depend upon the want of this ferment alone. In febrile and other conditions where little or no Gastric Juice is secreted then we have inability to digest food materials consequent gastric symptoms but here these depend on both the deficiency of the acid & the Pepini-ferment. So that in the ordinary case of dyspepsia of a more or less direct gastric origin the symptoms are not due to want of Pepini-ferment but to anomalies in the acidity. I shall attempt to show that a classification of the various forms of chronic gastric dyspepsia may be based upon the question of the acidity of the stomach fluid as revealed by direct examination of the contents of the stomach removed in the manner described above.

Meanwhile I wish to make some remarks on the Physiological action of the Gastric Juice on the food materials as evidenced by the examination of the products of the digestive processes.
The conversion of albumin & gelatin into peptones is commonly regarded as the main result of gastric digestion. The degree to which this really occurs and the steps in the process are by no means determined yet. Again it is usually stated that the object of the change is the production of a readily diffusible form of albumin; but it is denied by some that peptones are much more diffusible. In any case it is probable that the quantity of peptones formed in the stomach is only small compared with the quantity of the intermediate products such as pre-peptones. According to Budd, pre-peptone is not a constant but only a frequent product of the action of hydrochloric acid & pepsin on albumin & bases has shown that it is not a result in the digestion of meat but only is formed in the digestion of the albumin of plants or eggs. Both pre-peptone & peptone give the "peptonic reaction" so the presence of one or other can be readily recognised in the filtered stomach fluid. There is however no sure easy method of estimating the amount of peptone or the other intermediate products formed. The most important effect of peptic digestion is the solution of solid albumin attempts have been made to determine the value of the digestive power of stomach fluid by comparing the speed at which pieces of coagulated albumin were dissolved in test-tubes containing stomach fluid. These experiments have a doubtful value as the changes in the test tubes are not accomplished under like conditions to what they
in the stomach, where we have absorption of some of the products, a passage of others into the intestine, by which means the organ keeps its contents at a more or less uniform degree of concentration. According to Kendall in the human stomach, the amount of peptones formed is but small; the maximum is rapidly reached though why the production should stop is not exactly known.

The effect of heat on the filtered stomach fluid will enable us to tell whether albumin’s system is still present; for if coagulation occurs on boiling one or both of these must be present whereas if no coagulation occurs neither albumin’s system are present but either pro-peptone or peptone.

The chemical reaction which occurs when albumin is converted into peptone is not definitely known, but the process is probably one of hydration. This theory is borne out by the fact that Manniger has succeeded in re-converting peptone into protein by dehydrating with acetic anhydride.

It is probable that most of the pro-peptone or peptone formed in the stomach pass into the intestine with the chyme, but possibly a small quantity is absorbed from the stomach itself.
Experimentally it has been shown that peptones when injected directly into the blood produce a depressing effect on the nervous system as even death may result. The drowsiness which many experience to a greater or lesser degree, after a full meal may be thus possibly due to the absorption of a small quantity of peptone from the stomach. This was suggested by Ewald who pointed out also that all solutions of peptones are bitter and that probably the bitterness of undigested material commonly attributed to the presence of bile is in reality due to the peptones.

I shall now make a few brief remarks on the changes induced in the other forms of food materials in the stomach.

The coagulation of milk is due to the action of rennet ferment which is secreted in another form by the gastric mucus membrane and changed by the action of free acids especially bile into the ferment proper. The coagula of milk consists of the casein and the fat and casein is most fetturised. In disturbed digestion however lumps of coagula may be passed unchanged. The effect of "stomach fluid" on the digestion of milk can readily be tried experimentally, if it is not necessary that the stomach should contain any free acid to bring about the required result. Milk contains lactic acid from this some lactic acid may be formed in the stomach.
Fats—Lysestrine juice has little action on fats, but Agate* has shown that there is always a small percentage of neutral fat decomposed into glycerin and fatty acids even in the healthy stomach. Most of the fat however passes with the enzyme unchanged into the intestine. In some forms of dyspepsia the decomposition of fats in the stomach takes place to a larger degree. Fatty acid crystals are sometimes to be found in the microscope.

Starch—Is not acted on by lysestrine juice. The action of the by-products of the fat is continued for a time in the stomach and some sugar and the intermediate products between starch and sugar are present in the stomach. When the acidity of the stomach fluid reaches a certain height the action of the fat is checked. The amount of sugar formed in the stomach is very small. In health it is rapidly absorbed, but according to Bovard in a dilated stomach the absorption of sugar is deficient.

The chyme is acid and emits of food and matter both changed and unchanged by the fat and lysestrine juice. In microscopic examination we often find that the fibres of meat are but little changed, this is because of the protection which the envelope of connective tissue affords. The appearance of the muscle fibres depend on the duration of the food in the stomach, both in healthy and abnormal digestive processes.
The Duration of the Food in the Stomach varies very much. Probably the food does not pass through the Pylorus all at once but some of it escapes from time to time. The cause of the relaxation of the Pyloric Sphincter is disputed. No doubt the presence of the contents of the stomach forces up against the Pylorus by the movements of the stomach will have something to do with the relaxation of the Sphincter. The Acidity of the Stomach Fluid no doubt has something to do with the length of time food stays in the stomach.

The Motor Power of the Stomach. The peristaltic movement of the Stomach play plays an important part in the digestive process as it lead to an intimate admixture of the pepsin juice with the stomach contents. The motor power of the Stomach has another important effect on digestion as it is largely concerned in producing the passage of the food from the soft stomach into the intestine & when the chemicall power of the stomach is deficient the deficiency is to a large extent often compensated only by the passage of the food into the intestine at the proper time & the preventing thereby of the tendency to fermentative changes. There is necessity means of testing the motor activity of the Stomach. Suerol's Sable Test is unsatisfactory in its original form at any rate. The modification used by WEBER who pointed out that the length of time at which the presence of salicylic acid could be shown after solub had been given
by the mouth, was an evidence of the motor activity of the stomach as in health. The salivary acid was absent from the urine in 2 hours but when the motor power of the stomach was weak, this substance could often be detected in the urine 24 to 48 hours afterwards.

The exact part played by the hydrochloric acid in the digestive processes is still very undecided. At present this acid has one important effect that is its antiseptic effect. Putrefactive changes in the stomach contents occur then in a normal and excessive amount of free HCl.

Burge believes the antiseptic action of HCl to be manifest mainly if not the only one in digestion. Putrefactive changes in the food lower its nutritive value and lead to symptoms dependent on the absorption of the products of fermentative changes. Burge also points out that amount of HCl present in the stomach fluid is just what has been shown experimentally to be requisite to prevent fermentative changes. He also draws attention to the fact that in a whole series of lower animals the commencement of the elementary tract secretes a fluid very rich in free acid but having no action on food, as was first noticed by Trechsel. The gastric juice is not a powerful antiseptic and has no action on tubercle bacilli or their spores. It prevents the development of bacillus anthracis but does not destroy its spores. The bacteria which cause lactic and other fermentations are not affected by HCl. It probably is always to be met with in the stomach fluid though it is not certain whether these fermentations when they occur in the stomach are a result due to these bacteria but probably they are.
I have pointed out that the Acidity of Stomach fluid is one of its most important characteristics and taking this as a basis I shall now endeavour to show how it is possible to make a

Chemical Classification of the various forms of chronic dyspepsia. For this purpose we may divide dyspepsia into three great types according as we find, by examination of the Stomach fluid, whether the normal acid (HCL) be in excessive or diminished quantity or whether on the other hand the acidity may not be due chiefly to organic acids resulting from secondary fermentations. Thus I shall describe the 3 types as

Hyperacidity - Hypoacidity - Fermentative Acidity

The terms hyper, hypo, acidity must be understood to refer exclusively to the acidity dependent on hydrochloric acid.

Of course this classification is made on artificial one rather than a natural one but then most if not all classifications are very artificial. However I believe it is a careful classification in studying the dyspepsia by examination of the contents of the Stomach so I think it is possible to put all the commonly described forms of chronic gastric dyspepsia into one or other of these three classes.
Of course all forms of chronic gastric dyspepsia are not purely chemical in their nature or origin but they may also be dependent on defective motor activity of the stomach and secondary to other general conditions. So that this method of classification does not pretend to be a truly clinical one as under each type may be found perhaps more than one defined clinical type of disease. But as in the chemical examination of the stomach fluid I have considered the acidity as one of the main characteristics so also in the study of dyspepsia by that method it is convenient to have some generalized grouping as to the one I have indicated.

I shall first of all take up the consideration of stomach fluid which shows an excess of acidity which occurs mainly due to excess of hydrochloric acid. Under this class of hyperacidity I include two subdivisions - the first is true hyperhydrochloric acidity - and secondly what is commonly spoken of acid dyspepsia.

Hyperacidity - Class I.
(a) True Hyperhydrochloric Acidity - This both chemically and clinically is a definite characteristic type of dyspepsia. It is a form of dyspepsia truly chemical in its nature and as such presents a very definite series of symptoms and it must a secret diagnostic test is founded on chemical examination of the stomach fluid.
The condition was first specially pointed out by Reichmann, and since then other observers notably Mettheun have published a series of cases. I myself have seen several cases in Dr. MacAndrew's wards in the Edinburgh Infirmary, and found their main features to correspond with the cases quoted by the authors mentioned above.

I now propose to very briefly describe the symptoms, diagnosis, prognosis, and treatment of this particular form of chronic gastric dyspepsia.

Symptoms - Pain is always a prominent symptom - the pain is severe but comes on only from 1-2 after food has been taken and persists often increasing in severity until the next meal be taken - then there is ease for a time and then it begins an hour or so after. So that as one might expect, see if the pain is worst within some time after food has been taken, nocturnal pain is often very well marked - the presence of this alone should be enough to make one suspicious of the real nature of the case. As above mentioned the taking of food relieves the pain - that relief is usually quite complete - the same alleviation is brought about by the very taking of diluent drinks of any fluid such as milk, water, tea, etc. After the pain has endured for a longer or shorter time relief is often brought about by vomiting of the contents of the stomach, the patient usually says the vomited matters are very acid and sour.
The relief that follows natural vomiting is usually as well marked that it is very common to find that the patients are in the habit of inducing vomiting purposely by putting their fingers into their pharynx. Alkalies also bring about speedy relief for a time and often this too has been found out by the patient, who consequently frequently takes a pinch of soda. On questioning the physician will readily find that a diet in which meat takes a considerable part is much better borne than a diet composed largely of carbohydrates or milk. The effect of an ordinary dinner on these troubles is often remarkable so that after the meal it is not uncommon to find that these patients experience a distinct sense of bien-être. In making inquiries one will also find that although there may be loss of flesh yet the appetite is well preserved.

The seat of the pain is somewhat variable usually it is most intense in the epigastric region but it may radiate out to other parts.

Matthew draws attention to the fact that in these cases not only is there hydrochloric acidity but that there is also excessive secretion, hypersecretion - i.e., in old-standing cases there may be some dilatation of the stomach as well.
The evidence of the occurrence of hyperacration of an hyperacid fluid consists in washing out the stomach at night and finding on the introduction of the stomach tube in the morning, before any food has been taken, the presence of a considerable quantity of acid fluid in the stomach; also the same is shown by the fact that after the usual test meal one gets back from the stomach more fluid than one should do. In health, there should be little or no fluid pan obtained from the stomach in the early morning; if any be got it should never contain any food. In cases of hyperacridity, hyperacration often there is considerable quantity of fluid to be got, this fluid contains pilet. The cases of hyperacidity which I have seen have not all shown the presence of hyperacration also; probably this is to be explained partly on the fact that the hyperacration results only after some considerable time being due to the irritation by continued of the hyperacid fluid on the gastric mucous membrane.

In cases of true hyperhydrochloric acidity there is never any evidence subjective or chemical of the occurrence of secondary fermentation; this is due to the antiseptic action of the fluid. This is not so in some of the cases commonly described as "acid dyspepsia," as we shall see later.
The fact that hyperhydrotic acidity may be followed by some dilatation of the stomach is said to be due to the excess of acid causing contraction of the pyloric sphincter.

In the examination of a series of cases of true hyperacidity in which the symptoms began at different periods one is driven to the conclusion that hyperacidity may be followed by a disturbance of the stomach, which may be some dilatation of the stomach, or both the case may end in exhibiting the feature of hypoaclidity, the gastric mucous membrane having become so irritated by the acid secretion that it has undergone such extensive changes that it no longer secretes an excess of acid but rather a deficiency so that at first sight it would come into the third class of hypoaclidity rather than hyperacidity, but the history of the case should guide one to its real nature.

Among the minor symptoms occurring in cases of hyperhydrotic acidity may be mentioned diarrhea early in the morning. This is probably due to the passage of the hyperacid fluid into the intestine from the stomach—so it is well known that you can cause diarrhea by giving an excess dose of Aed. The physical signs of dilated stomach if present in
Hyperacidity are of course the same as would be present in any dilute stomach - but the objective phenomena are not the same as in the former case there are no secondary fermentations in the stomach fluid whilst in ordinary dilute stomachs due to organic obstruction at the pylorus the secondary fermentations play a marked part in the production of the symptoms.

I wish to draw attention to the fact that in hyperacidity there is usually increased secretion of saliva of an increased alkalinity. I had observed that fact for myself some time ago and only recently have I seen it mentioned in any book (Sir William Roberts passed it over). This increased secretion of saliva is useful as it is swallowed frequently and helps to neutralize the overacid fluid in the stomach. This frequent swallowing of saliva however has its disadvantages as the air swallowed along with it distends the stomach produces an uncomfortable feeling.

Another very important feature of hyperhydrobic acidity is the diminished acidity near the alkalinity of the urine secreted. The higher the acidity the lower is acidity of the urine as I have repeatedly seen in examining stomach fluids from these cases. Where the urine
is alkaline it is necessary to remember that the administration of alkalies to relieve the gastric symptoms may produce vesical irritation.

The diagnosis of true hyperhydrochloric acidity is best established by the chemical examination of the stomach fluid in the manner described above. If there be an increased total acidity without the presence of any excess of organic acids, this increased acidity must be due to hydrochloric acid. The stomach tube should be passed in the early morning, after a washout late at night, to see if hypersecretion has been established also. It is possible in many cases to arrive at an accurate diagnosis of these cases without the stomach tube by investigating the symptoms, the effect of diluent drinks, alkalies and a restricted diet etc. but the chemical test is the best and safest and is easy to do and ought to be done.

In those cases which have continued for many years the gastric mucous membrane may have become so affected that there is a deficiency rather than an excess of acid but these cases are very rare. A history of the cause of the disease should enable us to recognize what it true nature originally was.

Prognosis — from the cases I have seen I believe the prognosis is by no means very unfavourable. I have seen cases leave hospital free from all symptoms & remain so for a considerable time at any rate, though I do not wonder at subsequent history. If the case be one of these mentioned
where excessive acidity has been followed by diminished acidity and some dilatation of the stomach, the prognosis is not so good.

Before discussing the treatment I should like to make a few remarks on the etiology. The condition is more met with in the very young & never begins in the old though it may persist to old age, but it is especially met with in otherwise robust men in the prime of life. I have not seen any cases in women. Usually the male subjects are of a somewhat neurotic type. Mathew lays stress on the occurrence of mental strains as a distinct factor in the etiology of the disease in predisposed subjects.

As a secondary cause he mentions bad teeth consequent insufficient mastication of food.

Treatment - I have no hesitation in saying that in the treatment of this affection the washing out of the stomach at night is one of the very best means at our command. It usually ensures a fair night's rest & the daily removal of the irritating contents of the stomach gives a rest to the mucous membrane of the stomach & prevents the further development of hyperacidity. No one who has used this method of treatment in these cases can fail to have
been struck by the marked palliative effects, I have a firm conviction that it alone has a distinct curative effect. All the patients I have seen have been much impressed with its value and both to give up the use of the tube rather than anxious to avoid it. Indeed several of the cases I saw were so pleased with the effect of the tube that on leaving the hospital they purchased one for themselves so as to be ready if their troubles should return.

The treatment of the neurotic element by the use of hydrotherapeutic remedies & the removal of mental anxieties as far as possible is also very useful.

The proper dieting of the patient is also essential—a meat rather than a famineous diet should be given & he should drink on hours so as to be not at meals.

Alkalies are of course very useful also, but their excessive indiscriminate use in these cases must to be deprecated. Probably one of the best means of giving them is in the form of equal parts of soda bicarbonate and prepared chalk, & they must be intimately mixed to prevent the possibility of the formation of intestinal concretions. If these be constipation magnesia should be substituted for the chalk. As a general rule
about 15 years of each such be taken & they should be taken only when the pain commences from 1 to 2 hours after meals, & then may be repeated in one hour if necessary. Too much alcohol affects the urine & also causes distension of the stomach from the formation of CO₂. If the hyperesthesia of the gastric mucous membrane be very marked, sedative such as belladonna may be used — a local nerve sedative, such as opium, calomel or Belladonna's India, which last is much recommended by Ramanulée.
In the first of the three divisions into which I have divided the different forms of dyspepsia—the hyperacid division—in addition to true hypochlorhydric acidity just described, another form of disorder of digestion must be included. This is the condition commonly spoken of as "Acid Dyspepsia" which I shall now discuss.

Acid Dyspepsia—

Here also we have to deal with the presence of a hyperacid fluid in the stomach during digestion, but the condition is quite distinct both clinically and chemically from true hypochlorhydric acidity. Acid Dyspepsia is met with in adults usually every often is associated with a gouty or rheumatic diathesis or is met with in patients whose diet is injudicious, who indulge in what is called "high living".

The sufferers from this form of dyspepsia complain of an uneasy feeling in the stomach from half to one hour after meals. This is accompanied or followed by sour flatulence, often heartburn. Or, they express it "their food turns sour." Vomiting is the exception rather than the rule.

In this condition the examination of the stomach fluid may reveal the existence of a little excess of acid, but the excessive total acidity which is present is largely due to the presence of organic acids especially lactic and butyric.
The Organic Acids in these cases are not produced so much as the result of secondary fermentative changes in the food, but are derived more directly from their salts in the food. The excess of \( \text{HCl} \), often present, the fact that the stay of the food in the stomach is not lengthened, prevent any secondary fermentations. The \( \text{HCl} \) of the gastric juice however sets free the acids from the lactates, butyrates etc. present in the food.

Acid dyspepsia, a common symptom, is the regurgitation of sour fluid into the mouth. The taste of this fluid is often simply sour, but if butyric acid be present in amount the taste may be quite acid. The existence of an excess of butyric acid is said to be the main agent in the causation of heartburn, as the acid is very volatile and its acid fumes rise up to irritate the cardiac orifice. Butyrates are present in milk, cheese, butter especially if the butter be at all rancid. The other organic acids are not able to decompose butyrates, but \( \text{HCl} \) is.

The Flatulences, which is usually a prominent symptom, is probably largely due to swallowed air or in this form of dyspepsia also there is usually an increased secretion of saliva. The swallowed saliva takes down a considerable quantity of air into the stomach. The acids in the stomach probably liberat...
some carbonic acid gas from the alkali contained in the saliva & possibly there is also some degeneration of CO₂ from the duodenum when the acid chyme meets the alkaline pancreatic juice there.

According to Roberts, the digestive cramps that often occur in this condition are abortive attempts at vomiting & they are often accompanied by a very excessive discharge of saliva into the mouth which is often spoken of as Pyrosis though it is really pure salivary not any fluid from the stomach.

The Diagnosis of Acid Dyspepsia — as a rule is fairly easy especially if the predisposing causes such as gout, high living or the present. The effect of a dose of an antacid may be an aid to diagnosis also as a somewhat similar set of symptoms is met with in certain neurotic persons where “neurotic centre” is in their stomachs & whose gastric mucous membrane is hyperaesthetic.

The chemical examination of the stomach fluid in acid dyspepsia is often very useful. As a rule one finds there is increased acidity with plenty perhaps slight excess, of free HCl but also above all the presence of lactic butyric acid & both in quantity is easily to be made out by the use of Wollfman’s reagent. Sometimes the organic acid is lactic mainly but this is not so common.
Acid Dyspepsia is not accompanied by dyspepsion; it is as if the stomach be washed out at night. We do not get acid fluid from the stomach in the early morning as if we do get any it does not have an acid reaction & contains no bile. Again the semi-acid Dyspepsia is not so intense as a rule but partakes more of a feeling of fullness and discomfort - the pain also is not relieved by food, nor are the effects of a bland diet so beneficial as in true hyperchlorhydric acidity. In Acid Dyspepsia also there is no loss of flesh as a rule.

Treatment of Acid Dyspepsia - As regards the treatment, the presence of pre-disposing causes such as gruit, rheumatic distemper, indigestion, diet, if so must be modified as far as possible. The mode of life should be regular, the diet plain minus concomitants being avoided. Attention to the matters of the use of antacid remedies will often effect a very marked improvement. These cases do very well at certain baths where alkaline waters are drunk - though probably the mode of life and diet plays the same or much if not more to do with the result than the use of the waters. If chlorides are used they should be given in moderate quantity only, often an hour before meal or the last meal.
Roberts recommends that the alkaline be given in the form of lozenges as the chew of these has a salutary action which is very beneficial. Simple gum lozenges or jujubes without alkalies also have a salutary effect.

The trouble in giving alkalines in these cases of Acid Dyspepsia is that the free acid of the gastric juice is neutralized by so it's restraining effect on the production of the free acid is thereby lost. As its effect in preventing any tendency to true fermentative changes which may occur when the fluid in the stomach has become neutralized or made alkaline.
I shall now commence the consideration of the Second Chemical Class of Dyspepsia, namely that in which we have to do with a Stomach Fluid containing a deficiency of Acid, especially of free Hydrochloric Acid. The defects in acidity I have included under the term Hypoacidity.

**Hypoacidity — (Class II)**

A simple deficiency of acid dependent on diminished secretion of acid by the gastric mucous membrane is occasionally met with in persons who present no symptoms of gastric troubles whatever. Ewald and others have quoted such cases but they are not common. The occurrence of a diminished secretion of Hydrochloric Acid is by no means necessarily accompanied by the diminished secretion of the Peptic ferment as the two secretions are quite independent of each other.

Hypoacidity is sometimes dependent on purely local gastric conditions but more often perhaps is dependent on or associated with other general conditions. Amongst the local conditions where there is a deficiency or even absence of Acid may be mentioned Ceruminous of the Stomach — and certain forms of
of what is commonly 1st spoken of Chronic Gastric Ulcer where we have atrophic or atrophic change in the mucous membrane of the stomach.

The absence of free HCl in the stomach fluid of patients suffering from Cancer of the Stomach when first brought to notice was said to be pathognomonic of this condition - but whilst this is not the case it is distinctly a valuable confirming test in a case whose general symptoms would lead us to suspect the possibility of cancer being present. This absence of free HCl is sometimes seen in cases of atrophic change in the mucous membrane in some of the cases of "Atonic Dyspepsia" (though this term includes also dyspepsia due to defective muscular activity of the stomach wall) and in some cases of chronic alcoholic dyspepsia.

In Atonic Dyspepsia, we have a condition of weakly delayed digestion rather than symptoms due to any irritation of the stomach. There are a variety of conditions not well understood included under this term. Amongst the special features are palpably hot tongue, often indurated at the edge, an absence of thirst. Often too there is impaired general vitality. In some cases the condition is said to be due to diminished secretion of gastric juice from atrophic change in the mucous membrane.
Other cases are largely said to be dependent on the deficient muscular activity of the stomach. It is certainly quite true that cases are met with where there is both well marked deficiency of gastric juice (both Hel & jeepus) & yet no dyspeptic symptoms & probably this is because the motor activity of the stomach is normal & as the food passes into the intestine at the proper time & then is digested. If on the contrary the motor activity of the stomach be deficient the food remains too long in the stomach & is not churned up as it should be.

These conditions of so called atomic dyspepsia are often not very distinct & many cases put in this class I believe are better included in what I shall call Neurotic Dyspepsia or dyspepsias where the condition of hyperasthenia is present.

In the Dyspepsia due to intoxication alcoholic liquors are usually also have a deficiency of hydrochloric acid in the stomach fluid but have the general evidences of alcoholism i.e. the fact that these patients often vomit mucus in the early morning make the diagnosis clear.

In the forms of Hypoacidity just mentioned we have more or less local causes changes intimately associated with the causation of the condition but there are a number of cases
of acidity dependent rather on general than local conditions & at any rate always associated
with certain general disturbances of health & the
gastro-intestinal symptoms resulting are digestive manifestations of
general conditions such as Chlorosis - Fever - Neuregasthenia
& Hypertonia - & they are also met with in chronic
Bright's disease & chronic heart disease.

In Chlorosis - one usually find marked diminution
of HCl in the stomach fluid & it is has even been
urged that it the diminution of the HCl is the primary
condition & that the Chlorosis is secondary to this & due
to the consequent deficient absorption of iron from the
food. This theory is very doubtful & it is probable
that the Chlorosis is primary. However it is a fact
that you can often markedly improve a case of
Chlorosis by the administration of HCl without giving
any iron at all. Oppen the administration of large
doses of iron especially of the ferric salts rather aggravates
the dyspeptic symptoms in Chlorosis.

The occurrence of dyspeptic symptoms in Chronic Heart
& kidney diseases is due to the venous distension of
the capillaries in the stomach & is associated with a
deficiency in the HCl from impaired blood supply of the
gastric mucous membrane.
Felrible Conditions — in the acute febrile condition, it is not unfrequently the case that little or no gastric juice is absorbed so consequently there is no digestion in the stomach. In chronic febrile conditions such as not with malaria, the examination of the stomach fluid often reveals a deficiency in the amount of hydrochloric acid — probably this largely accounts for the good effect of dilute mineral acid given as “febrifuge” but which rather act by improving the digestion.

There are a great number of cases where we find gastric symptoms associated with general nervous derangement of a functional character. These dyspepsias come under the class of Hypoacidity or Atrophia is usually a deficiency of hydrochloric acid, I shall briefly describe these conditions under the term “Neuropathic Dyspepsia”.

“Neuropathic Dyspepsia”

This include a variety of conditions commonly seen in hospital practice especially in the female wards. These are disturbances of digestion accompanied by an infinite variety of nervous phenomena of a sensory or psychical nature. It is usually met with in young females — the people who say they have a weak stomach and vomit everything they take. Breathing difficulties, the excess complaints of neuromuscular pains in the ribs, in the epigastrium, and weakness in the back, headache, etc.
It is remarkable however apparently misgivings on their
troubles yet in reality the health of the patient
is not proportionally affected. There is little or no
loss of flesh though there is often anemia.

"Pressure" of the spine of the vertebrae will usually
dictate sensation over some of them especially over
the lower dorsal. "Pressure" over the points where
the cutaneous branches of the intercostal nerves
emerge from the deeper parts is also painful. There
is no tendency on pressure over the stomach itself.

On examination of the stomach fluid it is found
that there is deficiency in the secretion of acid, that
there is consequently excess of resistance of the
organic acids especially of the lactic acid.

The diagnosis of neurasthenia is easy as a rule
"depends on the evidence of functional derangement
of the nervous system mainly -

"As to the etiology - it is doubtful whether the
dyspepsia is due to the nervous or the nervous to the
dyspepsia. But I think the nervous is the primary
condition. These cases of "Neurasthenia" maybe said to
have their "neurasthenic center" in their stomachs.

The treatment of Neurasthenic Dyspepsia is not by light
diet & stomach sedatives but rather should be directed
to the toning up of the nervous system.
For this purpose hydrotherapeutic processes & the administration of iron, arsenic & strychnia are very useful. In hospital practice I have found also two very valuable aids in the case of the Paracelsian century over theleys & other tender points at the base of the Stomach Tube. These two remedial agents act probably by a moral influence rather than any true therapeutic value in these cases. But of their use there can be no doubt in the mind of anyone who has tried them on these otherwise troublesome cases in hospital at any rate.

In the cases of Hypocricidity I have spoken of under the terms Chronic Gastric Catarrh & Otone Dyspepsia the administration of a dilute mineral acid preferably hydrochloric after meals is often very valuable. It should be given half to 1 hour after meals in doses of from 10 to 30 minims. Oswald recommends that the acid should be repeated several times if necessary.

As mentioned before it is rare that there is any deficiency in the amount of Pepsin secreted but this is sometimes insufficiently pepsin may be given along with the acid. Oswald recommends that it be limited to cases of advanced mucous catarrh & atrophy of the gastric mucous membrane. It should be given in doses of ½ to 15 grains dissolved in ½d. of water & given Immediately after food.
Fermentative Acidity (Class III)

I shall now take up the third and last chemical class of dyspepsias - this includes the cases when an examination of the stomach fluid reveals the presence of a considerable quantity of organic acids derived from fermentative changes in the food - as in three cases the total acidity is mainly dependent on the fermentation acids the class may properly be denominated Fermentative Acidity.

Fermentative decomposition of the food materials is met with when there is a deficiency of the natural antiseptic of the stomach (Hcl) or when the food remains for a lengthened period of time in the stomach. Often these two facts are associated together in the production of the condition. As a result of the fermentative changes excessive quantities of lactic, butyric or acetic acid may be present and may give rise to special symptoms. It is especially the cases where food remains for a much longer period than normal in the stomach that these fermentative changes occur - so it is especially in Dilated Stomachs that they are met with. Where there is also usually deficiency in the secretion of Hcl by the gastric mucous membrane, in every case of Dilated Stomach there need not be fermentative changes, as also we
my first cases of undilated stomachs where little or no free acid is present without the presence of any symptom pointed to fermentative changes. These cases however are exceptional.

The cause of the fermentative processes are organisms introduced with the food - many different forms of organisms maybe met with - yeast fungi, aspergillus, oidium, bacillus, bacteria etc. but their pathogenetic action is not definitely known.

The carbohydrates in the food are one of the main factors which undergo decomposition - the form of decomposition which occurs may vary - alcohol or acetic acid maybe produced or lactic butyric acids. These fermentations are often accompanied by the production of various gases as hydrogen, carbonic acid gas, marsh gas etc. Several cases have been quoted where the gas produced could be lighted.

Not only may the carbohydrates of the food be decomposed but the proteins also may undergo satisfactory changes due to the action of bacteria. As a result ammonia, fatty acids, phomol alcohol etc. are produced as well as the special products called poisons & toxins. From the absorption of them products various symptoms & general phenomena may follow.
The decomposition of Proteids only occurs when the stomach contents are alkaline or it is a true putrefaction.

The decomposition of the Carbohydrates depend on changes in the sugar - lactic acid fermentation occurring in which the sugar is split up into lactic acid and afterwards into butyric acid, carbonic acid and hydrogen - or the process may result in the formation of alcohol, aldehydes or acetic acid. If much gas be present it results from a decomposition of the cellular ather in the stomach or intestine.

The existence of the fermentation acids in the stomach fluid is readily shown by means of Ufflemann's reagent described above.

The presence in addition of a dilated stomach is often evident at once from the enormous amount of the stomach contents which passes in the tube. I have seen cases where several pints were readily obtainable. The smell of stomach fluid is distinctive.

The exact size of the stomach can often be made out readily by pouring in a large quantity of water through the tube and then observing the very emaciated individuals. The size of the stomach when thus distended can often be seen.
The percussion of the stomach thus filled with water resembles as will great care a rule to make out the lower border; without this means it is very rare to find this will anything like accuracy; many beginners find it quite impossible. Pumplin also will do instead of filling with water; it is better than giving bicarbonate of soda & then an acid to distend the stomach with CO₂.

To prevent fermentation changes in the stomach many drugs are given. Before speaking of these I wish to point out the same value of washing out the stomach in these cases. It is especially valuable if the stomach be dilated & then it should be done daily & probably best late at night or early in the morning. Its effects are marvelous sometimes & in all cases distinctly beneficial.

With regard to the use of drugs to prevent decomposition I have seen not good from the use of碳酸 acid & creosote. If there be deficiency of the alimentation of the stomach, acid also a good effect often. Carbonic acid may be given in small dose of ½ to 1 grain & may be with advantage combined with other antimonials such as the green oxide of mercury.
The fermentative processes, especially when occurring in a distended stomach, may be largely controlled by the use of a proper diet. For this purpose the diet should be as dry as possible, the bulk of the solids as small as possible, and the use of milk, tea, coffee, should be forbidden. Various hypertonic preparations, meat powders and condensed skimmed milk must be used. The only starchy matter allowed should be a small amount of bread and sugar; small forms must be minimized as far as possible. Fat should also be avoided.

The remedy for fermentative processes is shown in the use of the stomach tube to wash out the stomach daily. The washing out may with great advantage be followed combined with an injection of the stomach with antiseptic solutions of which Saunders recommends salicylic acid in solution of a strength of 1 in 200 or 300.

A free action of the bowels daily is also necessary, for this purpose various cathartics may be used. The use of the stomach tube is also advisable, as it exercises a tendency to prevent constipation.

As a means of resort, treatment of the distension of the stomach itself electricity is often strongly recommended.
The paralyzation of the abdominal wall over the region of the stomach is said to also affect the wall of the stomach but I myself am very sceptical about this at any rate in the way in which the attempt is generally made. The plan of passing one electrode into the stomach itself & the other into the rectum seems to be far more likely to produce the required effect. I have tried this method & believe that it is feasible of some service but it is not very agreeable to the patient.

Massage of the stomach by pressing the contents into the duodenum will tend to dilate the pyloric orifice a stenosis of some kind here is often the cause of the dilatation of the organ, massage in these cases may be of service. It is well known that the removal of the cause of the dilatation at the pylorus which has given rise to a dilated stomach may lead to marked diminution in the size of the organ.
In this paper I have endeavoured to show how the diagnosis and treatment of chronic stomach diseases, characterized by abnormalities in the digestive processes and largely dependent on chemical defects, may be rendered more easy and more certain by the method of removing and examining the contents of the stomach. I am firmly convinced in my own mind and from my own experience that this is a method which should on no account be neglected. Of course, it should be combined with a study of all the subjective and objective symptoms of which the patient presents.

I have also laid special stress on the value of washing out of the stomach as a means of treatment of gastric affections. I am sure no one who has given this method a proper trial can doubt for a moment its extreme utility. In nearly all cases it is a good palliative remedy and often it also exercises a marked curative effect. To a general practitioner a stomach tube is a far more useful weapon than a clysmer or a syphonoscope as the use of it requires no special skill in the testing of stomach fluid nor requires no special knowledge but any one with the most elementary acquaintance with chemical manipulations can do all that is necessary to be done.
In conclusion I should like to state that I have not attempted to deal fully with the various forms of chronic gastric dyspepsia but have rather confined myself to the evidence of the disease as shown by the examination of the Stomach Fluids by the symptoms & features as I have seen them in hospital practice especially. I have endeavoured as far as possible to give references to various observers & I should like to express my indebtedness to the encouragement & opportunities I received both as a student & house-physician in Dr. Claud McNeish’s Wards in the Edinburgh Royal Infirmary.

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