

Staff Meeting Bulletin
Hospitals of the . . .
University of Minnesota

Treatment of
Peptic Ulcer

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HOSPITALS OF THE . . .
UNIVERSITY OF MINNESOTA

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William A. O'Brien, M.D.

I. LAST WEEK

Date: October 22, 1936
Place: Recreation Room
Nurses' Hall
Time: 12:15 to 1:18
Program: Movie: Silence after
Trumpets
Abstract: Amputations

Present: 122

Discussion: M. H. Manson
C. Dennis
E. T. Evans
R. W. Koucky
L. G. Rigler

Gertrude Gunn,
Record Librarian

- - - - -

II. MOVIE

Title: Volcanoes in Action
Released by: Erpi. Film Corporation

- - - - -

III. ABSTRACT

THE TREATMENT OF GASTRIC AND
DUODENAL ULCER

John A. Layne, and
Edward J. Semansky

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A. Introduction

Gastric and duodenal ulcers are commonly grouped together under the term "peptic ulcer", indicating that they are found only on the gastrointestinal mucosa bathed in gastric juice. They are not formed below the papilla of Vater, except at times in a Meckel's diverticulum. Although their points of similarity are more numerous than their points of differences, sharp differences do exist between gastric and duodenal ulcers from a surgical standpoint. The difference in potentiality of the two processes to undergo malignant change is most striking. Consequently, we will present the treatment of these two conditions separately.

It has been stated that about 10% of all individuals suffer at some time in their lives from a chronic gastric or duodenal ulcer. Of 4,000 consecutive postmortem examinations at the Leed's General Hospital, Steward, in 1923, reported an incidence of 4.58% of chronic or healed gastric ulcer, and 6.81% of duodenal ulcer, with a slightly greater frequency of active than healed ulcer.

B. Physiology of Stomach and Duodenum

It is important to remember that the stomach consists of two organs with a common cavity. The upper part corresponds to the crop or glandular stomach of birds, holding the food practically motionless while a certain amount of starch is digested. It is lined by a mucous membrane which supplies hydrochloric acid and several ferments. The lower portion of the stomach corresponds to a gizzard, serving to grind and mix

the food with the digestive juices.

It is well known that in some of the lower animals, particularly in the ruminants, a contraction of a special band of muscle fiber causes the lesser curvature to be formed into a tube, through which fluids pass from the cardia to the pylorus, and which is termed the "magenstrasse." It has been inferred from this that hot or otherwise irritating substances may follow a similar "magenstrasse" in man, and offer an explanation for the frequency with which ulcers and cancers form in this region. However, many studies in man have shown quite conclusively that liquids introduced into the human stomach do not predominantly follow the lesser curvature. Furthermore, if trauma to the mucous membrane were the main cause of ulcer, one would expect to find most of the lesions in the distal end of the pars pylorica (i.e. the grinding end), whereas actually, most of them are found up around the incisura.

Much has been written concerning the hydrochloric acid regulating mechanism. The pylorus is no longer considered to be the sole factor involved. The relative intragastric and intraduodenal pressures have assumed importance. Alvarez and Gienturco have shown that no material will pass through the pylorus when the pressure in the duodenum is equal to or higher than that in the stomach. They were able to demonstrate in motion pictures that whenever the duodenal muscle was contracted the stomach did not empty, even when the pylorus was open. Similarly, one would expect that whenever the pressure becomes higher in the duodenum than in the stomach, the contents of the duodenum will be regurgitated into the stomach. Such regurgitation is particularly likely to take place after the eating of fat, perhaps because fat relaxes and quiets the stomach, and at the same time stimulates the duodenum.

Pavlov showed that the composition and amount of gastric juice varied with the nature of the stimulus. The juice varies in acidity, in digestive power, and in the rate of secretion. In Pavlov's experiments, the acidity was usual-

ly greatest with a meat diet and lowest with bread. With equivalent weights of food, meat required the most and milk the least amount of gastric juice. With equivalent amounts of nitrogen, however, bread was found to require the most and meat the least juice. Bread needed the longest time for digestion and as a result, the flow of juice was prolonged. This juice contained four times as much pepsin as was found in the juice that poured out for the digestion of milk. Fish, and especially salted fish and fish soups, are more powerful excitants of gastric secretion than is meat. Coffee and alcohol are also strong stimulants to the parietal cells. The "bitter tonics," however, do not stimulate gastric secretions.

Marked daily variations in the concentration of acid and pepsin in the gastric juice do take place. Consequently, one, or even three or four gastric analyses made on successive days may give a decidedly misleading idea of the usual ability of that particular stomach to secrete acid and pepsin. The greatest degrees of variability are to be found in nervous, impressionable and temperamental persons who react too much to their environment. To go further, it is conceivable that the large daily changes in the digestive power of the gastric juice which take place in nervous individuals can, at times, have deleterious effects on the mucous membranes of the stomach and duodenum. Similarly, measurements of the concentration of pepsin in the gastric juice have no prognostic or diagnostic value, as the individual variation in pepsin output is so large and the overlapping of distribution is so great.

The early literature is replete with unsuccessful attempts to produce a chronic progressive lesion in the gastric or duodenal mucosa of dogs. Exalto (1911) and Mann with his associates (1923) must be credited with being the first to develop methods which regularly lead to the production of chronic ulcers without the use of external destructive agents, and largely as a result of these experiments, the theory that ulcer is due primarily to the corrosive and digestive action of the pepsin and hydrochloric

acid of the gastric juice has received such emphasis. Perhaps, the most striking evidence to be obtained from human pathology in support of the view that the chemical action of gastric juice may produce a chronic ulcer is the occurrence of such a lesion in the mucosa of the ileum adjacent to the entrance of a Meckel's diverticulum. It has been pointed out that in those cases in which ulcer has been present in a Meckel's diverticulum, islands of heterotropic gastric mucosa, histologically similar to that in the fundus of the stomach, have been almost invariably found.

As a direct result of experimental procedures, Dragstedt has been able to produce peptic ulcer in lower animals, and to duplicate in almost every particular, the lesion encountered in man. He found that if pure gastric juice is caused to flow into the empty jejunum or ileum, the mucosa is injured and an ulcer formed. Furthermore, if he isolated the stomach from the gastro-intestinal tract in such a way that its blood supply and vagal innervation are but little interfered with, and so that the gastric juice secreted is not promptly drained away, but remains in contact with the gastric wall for a time, the gastric mucosa becomes digested away and chronic progressive perforating ulcers develop that anatomically are not distinguishable from the clinical lesion.

Dragstedt found that preventing the regurgitation of the alkaline duodenal juices into the stomach of normal dogs, by means of a valve in the pylorus, raised both the free and total acidity of the gastric contents after a standard test meal, and delayed the neutralization of .5% hydrochloric acid placed in the stomach. It delayed the healing of acute ulcers in the gastric mucosa produced by the injection of silver nitrate, and also caused the appearance of spontaneous ulcers in transplants of intestinal mucosa sutured into defects in the stomach wall.

From these considerations it would appear that the most important single factor in the etiology of peptic ulcer

is an abnormally high free hydrochloric acid. In terms of physical chemistry a high free acid means a low pH (i.e. sharply shifted to the acid side) and indicates the absence of the proper amount of buffer substances.

Theoretically, control of this low buffer content can be maintained thru three channels: by means of the food intake, by oral administration of buffering substances and by medicinal or surgical treatment to the pylorus or gastric wall.

The action of oral administrations and of treatment to the pylorus will be discussed later. The physiological effect of diet has been extensively debated.

Most proteins are capable of combining with or buffering hydrochloric acid, and the products of pepsin, -hydrochloric acid digestion exert an inhibitory effect on the enzyme itself. It is quite probable that a part of the favorable result of the regimen of frequent feeding in the medical management of ulcer is due to this factor. The literature contains many suggestions that ulcer patients should be treated by duodenal tube feedings or by the administration of food by means of a jejunostomy. The idea that such a method puts the stomach at rest is false since it has been repeatedly demonstrated that the introduction of food into the duodenum or jejunum produces a copious secretion of gastric juice. Consequently, duodenal tube feeding can be expected to permit the accumulation in the stomach of a gastric content of much higher free acidity than would occur when food is given by mouth, and such a method should be more apt to produce rather than cure an ulcer in the stomach.

C. Medical Treatment of Duodenal Ulcer

Because 80 to 90% of all primary ulcers are duodenal and because the medical treatment of both gastric and duodenal ulcer is markedly similar, we will first present in detail its application to duodenal ulcer and later take up the special measures relating to gastric lesions.

When properly carried out, the medical treatment of uncomplicated duodenal ulcer insures a large measure of success. The capacity of many of these ulcers to heal permanently is inherently great, and in such cases, adequate medical treatment is always justifiable, logical, and effective. All too often, however, the patient hesitates consulting his physician during the earlier phases of the disease when the symptoms are mild and when medical treatment would prove most effective.

(a) Indications

As a rule, all patients who have uncomplicated duodenal ulcers, especially if the symptoms are of short duration, and all younger individuals should have the benefit of adequate medical treatment. Medical treatment is also indicated in the more chronic uncomplicated lesions of older patients, if the symptoms are mild and infrequent, not progressive in severity, and do not interfere with the efficiency of the individual. Likewise, medical treatment is usually indicated for such lesions in the aged, in those who have serious advanced organic disease, such as:

1. Active pulmonary tuberculosis
2. Coronary disease
3. Diabetes mellitus
4. Chronic nephritis
5. Marked obesity
6. Decompensated cardiac lesions

The treatment in pregnancy should be medical, also in the highly neurotic individual, in hyper-irritable patients whose stomachs empty rapidly, as well as a preliminary to operation, in order to minimize surgical risk and postoperative morbidity.

(b) Contraindications

Likewise, there are certain contraindications to medical treatment, and which in a general sense may be considered as indications for the surgical treatment, namely:

1. Failure of an ulcer to heal under adequate medical management.

2. Acute or chronic perforation.
3. Pyloric obstruction which fails to respond to medical treatment.
4. Very large ulcers, especially if they are adherent to a neighboring viscus.
5. Repeated massive hemorrhage.
6. Reasonable suspicion of the development of a carcinoma at the site of the ulcer.
7. Hour-glass deformity of the stomach.
8. Chronic nephritis with serious impairment of renal function is likely to prove a definite handicap to the prolonged administration of alkalis in the medical treatment of ulcer, and, therefore, constitute a relative indication for surgery.

Moynihan stated, in 1932, that the failure of medical treatment of ulcer was attributable to its insufficiency, and that very few patients received any treatment which offered a reasonable prospect of healing the ulcer. Regardless of whether or not this is true today, it must be recognized that once the lesion becomes chronic, the patient must be given the same consideration, and the same thorough, supervised medical treatment that is given to the diabetic, tuberculous or nephritic patient, even when surgery is considered to be necessary.

(c) General Considerations

In principle, the best ultimate results are achieved by carrying out the treatment in a hospital for a period of 3 to 4 weeks and following this by treatment with the ambulatory patient under careful supervision for 6 months or more. This type of regime obviously is impractical for the larger percentage of ulcer patients, who must be treated ambulatory. In the latter case, however, the patient should be under constant observation while he is undergoing treatment, so that the physician may obtain a fairly adequate conception of the response the patient is making, both subjectively and objectively. Every effort possible should be made to individualize the treatment.

1. Sippy Regime

a. The Regime Itself

Sippy has written of this as follows: "The principle involved consists essentially in efficiently shielding the ulcer from the corrosive effect of the gastric juice. This is accomplished by maintaining accurate neutralization of all free hydrochloric acid, thus rendering the digestive action of the gastric juice inert from 7 A.M. until about 10:30 P.M., or during the entire time that food and the accompanying secretions are present in the stomach." Although this does not agree entirely with our present day conception of the physiology of the stomach, the results of the Sippy regime of treatment cannot be denied.

If the patient is hospitalized for the treatment, 3 oz. of a mixture of equal parts of milk and cream are given hourly from 7 A.M. to 7 P.M., and an alkaline powder is administered midway between each two feedings, and after the last feeding for one-half hour intervals until four doses of powder have been given. This procedure is later modified as the individual circumstances permit. Sippy used two powders, alternating them throughout the day. It has been our policy at this Hospital to give the #1 powder the more constantly, and supplementing this by the #2 powder when the condition of the bowel indicates this; the #2 powder acting as a laxative. The prescription for the #1 and #2 powders used in this Hospital are as follows:

#1 Powder:		
Sodium bicarbonate	200	
Calcium carbonate	100	
Oil of peppermint		.2
#2 Powder		
Sodium bicarbonate	100	
Magnesium oxide		
(ponderosum)	100	
Oil of peppermint		.15

Because the patients are frequently constipated and this is aggravated by the constipating effect of the calcium

calt of the #1 powder, it is exceptional for a patient to dispense entirely with the use of the #2 powder containing magnesium oxide. Sodium bicarbonate tends to relieve the gastric distress and the unpleasant sense of fullness, and as the maximum daily intake when given as prescribed above does not exceed 4 grams, the various unfavorable reactions attributed to it rarely occur. Other therapeutic agents with the claim that they do not so readily disturb the acid base balance as do the above powders, have been made available in recent years. Among these are aluminum hydroxide, kaolin suspended in alumina gel and the tribasic phosphates of calcium and magnesium. Although these preparations are more pleasant tasting, they are also more expensive, and so far, have not succeeded in replacing the above powders.

Wosika has recently reported the control of gastric acidity in peptic ulcer by the taking of alkalinized powdered whole milk tablets, consisting of powdered whole milk (12.5 grams), sodium bicarbonate (.6 grams), and calcium carbonate (2 grams). These are claimed to be slightly more effective in the routine Sippy procedure in the neutralization of the gastric acidity, and alkalosis is said not to occur with their use. As many as 4 of these tablets may be taken every hour with safety thereby reducing the usual number of feedings.

In addition to alkalis, the use of sedatives and tincture of belladonna or atropine, are often efficacious. Atropine is preferably given until the physiologic effect is evident. Usually after about 4 or 5 days, supplementary feedings, consisting of 6 oz. of cream, vegetable soup, thin toasted bread, junket, soft custard or a well cooked cereal, are added to or may replace one of the feedings of milk and cream. By the second or third week, the patient may partake of substantial food about every 3 hours, in addition to the feedings of milk and cream. Usually by the end of the 4th week, the patient's diet is of adequate caloric value, and is sufficiently varied so it is not monotonous. Orange or grape juice, brewer's yeast, and wheat germ oil should be added to insure the inclusion of the essential vitamins usually deficient in a

diet for ulcer. Later, such additions as creamed cheese, tender cooked (preferably pureed) vegetables, as well as a wide variety of simple desserts and cooked fruits are permissible.

Again, it must be emphasized that the treatment of every ulcer patient should be individualized, and the adoption of any rigid form of treatment for all cases is unwise. Foods which might cause any irritation of the stomach; chemically, mechanically or otherwise, should be rigidly excluded. The patient should not lose weight under this regime; rather he should gain.

Favorable response to this type of treatment is manifested by the gradual or prompt disappearance of the tenderness in the epigastric region, of the characteristic pain or discomfort, of the blood in the stool, and by an improvement in the radiological picture. Further treatment will, of course, depend upon the individualities in each case.

If the patient is ambulatory from the onset of treatment, the principles of therapy are the same as when the patient is hospitalized, but, since the patient is up and about all the time, supplementary feedings must be given from the beginning so that the caloric requirement is provided.

(b) Duodenal Ulcer with Pyloric Obstruction

Pyloric obstruction caused by spasm, inflammatory reaction and edema can often be corrected after 2 to 3 weeks of intensive treatment. In some cases however, sufficient cicatricial stenosis may occur so that operation is necessary. Successful medical treatment in the presence of obstruction is usually much more difficult and the danger of alkalosis is far greater. If, however, it is feared that operation may prove too hazardous, or if the patient refuses, nonsurgical treatment, similar to that outlined above, may be instituted. In addition, however, gastric lavage should be employed to remove the abnormally retained food and gastric

secretion. This is done preferably about 9 P.M. The chief stimulus to an excessive nocturnal secretion thereby is removed. The ease with which the patients accustom themselves to the use of a stomach tube and their willingness to carry out nightly aspiration for indefinite periods of time is indeed remarkable. Hot packs applied to the abdomen have been known to be very useful in helping to relieve a pyloric obstruction.

When an active ulcer associated with evidence of pyloric obstruction is first seen, it is difficult to determine immediately to what extent the obstruction can be relieved by medical treatment. It has been demonstrated, however, that many cases of duodenal (and gastric ulcer as well) with pyloric obstruction may be converted in 2 to 3 weeks time into simple, uncomplicated ulcers emptying in normal time by medical treatment. Lahey has stated that less than one-third of the ulcer patients entering his surgical clinic with pyloric obstruction have required operation. Surgery is advised only after a preliminary course of medical treatment has demonstrated the presence of operative indications.

(c) Alkalosis

Uncompensated alkalosis may occur in the course of alkaline therapy for ulcer. It is well known that impairment of renal function is an etiologic factor in alkalosis, and this possibility is to be investigated before the treatment of ulcers with alkalis is considered. The symptoms of alkalosis usually appear after about a week of intensive therapy. The patient frequently complains first that the milk tastes sour; then headache, weakness and nervous irritability follow together with vertigo, nausea, vomiting and a generalized aching. In severe cases, there occurs a slowing of respiration, mental apathy and confusion, drowsiness, profuse perspiration, tetany and even convulsions. The treatment consists of the prompt discontinuance of all alkalis. The feedings of milk and cream are continued, preferably reduced to intervals of two hours. Fruit juices should be given freely. When all evidence of the toxemia has subsided, alkalis in the form of tribasic phosphate may be

administered, or one of the following substitutes may be employed: mucin, kaolin, alumina, cream or colloidal kaolin.

(d) Duration of Treatment

The length of time required for the treatment of peptic ulcer depends upon its size, depth, the amount of induration in its walls and base, the extent of injury to the local blood supply and the completeness with which the various factors involved in the pathogenesis are removed or rendered innocuous. An ulcer heals by granulation tissue formation and cicatrization. The frequency with which the scars of healed ulcers are found in the stomach and duodenum at autopsy bear witness to the strongly inherent tendency of ulcer to heal, even without treatment. The usual time required for an ulcer to disappear is 6 to 8 weeks. However, duodenal ulcer management should be continued for 6 to 9 months, and in certain old chronic lesions, especially when associated with hemorrhage or pyloric obstruction, for a year. The chief cause of a failure to obtain satisfactory results by medical measures is the tendency to modify too soon the strict regime employed in the early weeks of treatment, i.e. lengthening the period of time between feedings and decreasing the number of alkaline powders to be taken. The lack of individualization of the treatment, inadequate explanation and lack of instruction to the patient are other outstanding reasons for the many "medical failures." Intelligently informed regarding the rationale involved in the treatment of his ulcer, as well as the need for adequate rest and recreation, and care as to food and drink, the average ulcer bearing individual is as willing to assume responsibility for his future comfort and well-being as is the sufferer from diabetes.

(e) Results of Treatment

Brown (1930) reported cures in 44.5% and satisfactory improvements in 16.7% (additional) (total of 66.2%) of peptic ulcers using medical treatment. His series included cases of

gastric ulcer. In 1932, Jordan and Kiefer reported that in 54% of their cases of duodenal ulcer, the patients were entirely free of all symptoms 5 years afterward. Friedenwold and Morrison (1932) reported cures in 70% of their cases of gastric and duodenal ulcer in which patients were treated in the hospital. With respect to results following the treatment of ambulatory patients, Friedenwold noted cures in 45% of the cases. Therefore, we may conclude that under favorable circumstances and adequately sustained treatment, there is a possibility of a 5 year cure for duodenal ulcer in at least 50% of cases.

Other Methods of Medical Treatment

It is to be expected that there will be no universal agreement in regard to the treatment of chronic peptic ulcers, since the knowledge of its fundamentals being more or less incomplete, and since new measures are being constantly tried out. We have only sufficient space here to discuss the more important of these.

2. Histidine Monohydrochloride

Many workers have reported during the past 2 years the relief of pain in peptic ulcer by means of daily injections of histidine monohydrochloride. They claim that the pain usually disappears while the patient remains ambulatory and eats a normal diet. But, because of the psychic factors in ulcer, as well as the tendency to spontaneous remissions of this disease, it is necessary to have a control series in which some inert substance, as normal saline, is used. Such an experiment was performed by Flood and Mullins, who followed a series of 12 patients receiving daily injections of 5 c.c. of normal saline, and 6 patients receiving daily injections of 5 c.c. of 4% solution of histidine monohydrochloride ("harostidin"). Both groups of patients were assured at the onset that relief of symptoms was to be expected. In each group, two-thirds of the patients who received the injections received relief from pain - in other words, 8 of the 12 patients who received daily injections of normal saline received relief, and 4 of the 6 patients receiving harostidin received relief. This study emphasized two important considerations in

regard to the therapy of the patient with gastric or duodenal ulcer. First, that the evaluation of any therapy for the relief of pain in gastric or duodenal ulcer should be controlled by comparison with the effect of inert substances administered in the same way; and secondly, that many patients who are not improving with one form of treatment respond promptly to a change in therapy regardless of what that change may be.

3. Gastric Mucin

Since Fogelson reported the successful treatment of peptic ulcer with gastric mucin in 1931, this subject has received considerable attention. Brown, Cramer, Jenkinson and Gilbert, in the following year, reported that 36 out of 37 patients who had partial to complete disability on previous strict ulcer management had been relieved objectively and subjectively by means of mucin. The value of mucin may be due to its viscosity and demulcent properties which enable it to protect the ulcer from chemical and mechanical irritations. In addition, it may influence the synthesis of mucous from the mucous membrane because it contains the necessary building stones of mucin, chiefly glycuronic acid. With this in mind, Jones, Ivy and Atkinson produced a substance they named as "okrin," from the pods of the okra plant (*abelmoschu esculentus*) which they gave to 3 patients with very good clinical results.

Alvarez, however, is less hopeful of the efficacy of this method because, as he points out, mucin given by mouth can hardly be expected to adhere to the mucous membrane and to protect it as does the mucus which is formed in situ. However, gastroenterologists are now employing mucin as an adjunct when the response of the patient to the usual methods of treatment is not satisfactory. Usually, it is given in 2 oz. doses, three times daily, at 10 A.M., 3 P.M., and 8 P.M., being first dissolved in warm water and added to a chocolate malted milk mixture, and the whole stirred well with an egg beater.

4. Duodenal Extract

Rivers has prepared a powdered extract of animal duodenal mucosa and submucosa, chiefly with a view of increasing the tissue defense mechanism of the stomach. To date, the preparation has been employed in conjunction with the usual diet for ulcers, including alkalies which are given in small amounts. Although all types of ulcers have been treated with encouraging results so far, it is too early to allow any definite conclusions to be drawn as to the real therapeutic value of the substance.

5. Enterogastrone

Enterogastrone, a hormone which inhibits the motility of the stomach, has been developed by Ivy and his associates. Its possibilities lie in the fact that it affords rest and a state of decreased acidity to the stomach without diminishing the protective secretions of the stomach. In this case, also, it is too early to draw any conclusion regarding its use.

6. Meulengracht Regime

It has been recently suggested that the ulcer bearing patient be given from the onset a bland diet from which all irritating factors have been removed, in frequent feeding (5 to 6 daily). This type of regime was first used by Meulengracht in the treatment of hematemesis, and his use and results are discussed in detail under that heading. The clinical trial of this method has been inadequate so far to determine if this same type of regime can be satisfactorily used without the addition of alkalies.

7. Aluminum hydroxide drip

Woldman and Rowland have recently advanced a new technique for the continuous control of acidity in peptic ulcer by the aluminum hydroxide drip. They claim that by the continuous night and day installation of an absorbent substance, aluminum hydroxide, with the indwelling nasal tube, a constant control of the

gastric acidity may be attained. Aluminum hydroxide is an amphoteric absorbent substance which is not absorbed from the gastro-intestinal tract in any appreciable amount. This method is said to be free of the dangers of alkalosis and of secondary acid secretion. They have reported very good results in a small series of 8 cases. Again, it must be pointed out that the natural tendency of peptic ulcer is to heal, and that too much reliance must not be placed upon the early results of a small series.

8. Duodenal and jejunal feeding

Although good results have been reported following treatment of ulcer by these methods, there exists the danger of reactivation when the treatment is discontinued. Intelligent and reliable patients, however, can usually learn to feed themselves by these methods. Some observers have reported that they have obtained excellent results with this method of treatment and have also recommended it for jejunal ulcer and for severe chronic gastritis.

9. Other forms of parenteral therapy

Other substances which have been given by parenteral methods include:

1. Proteins of specific and non-specific bacterial origin.
2. Proteins of vegetable origin (novoprotein).
3. Proteins of animal origin.
 - a. Aolan
 - b. Purified milk protein
4. Lipoprotein combined with emetin (synodal).
5. Weak solutions of pepsin.
6. Insulin or a combination of insulin and pepsin.
7. Sterile solutions of sodium citrate and sodium chloride, buffered to a certain pH.

Undoubtedly, most types of nonspecific protein act in the similar manner as do the injections of histadine monohydrochloride, and they do afford systematic relief to a number of patients bearing ulcers.

D. Treatment of Hemorrhage from the Stomach and Duodenum

Hemorrhage is recognized as a not infrequent and often serious complication of gastric or duodenal ulcer. Fortunately the rapid fatality that occurs within a few hours from erosion of the wall of a large artery is relatively rare. Death may occur some days after the initial

hemorrhage as a result of the extreme anemia following repeated copious hemorrhages, less frequently from exsanguination due to continuous repeated oozing. Opinion is now nearly unanimous that the danger of death from hemorrhage in gastric and duodenal ulcer is much less than the danger of surgical operation performed either during or immediately after a life threatening hemorrhage, except when the wall of an artery has been eroded, and that therefore the treatment of hematemesis is medical.

If the blood loss has been great, and if there is reason to believe that the bleeding is continuing, the most effective way to stop the hemorrhage is to lavage the stomach with ice cold water, employing an Ewald tube and aspirating bulb. As the stomach may be filled with clotted blood which has the same stimulating effect upon gastric secretion as any other albuminous substance, the lavage should be continued until the water returns relatively clear. After emptying the stomach and prior to the withdrawal of the tube, 30 cc. of adrenalin solution (1 to 1000) may be introduced into the stomach through the tube to secure a local styptic effect. Not only is the influence of the cold manifested in the immediate cessation of the hemorrhage, but there is likely to be a marked improvement in the character of the radial pulse due to the coincident contraction of the large veins of the upper abdomen. Adrenalin may be given with perfect safety in this manner, as it is not absorbed when given by mouth, and therefore has no effect in raising the blood pressure. Since absolute rest of the patient is advised, and the mental anxiety of the patient regarding his condition allayed, morphine should be used. Blood transfusion is of paramount importance, and should be resorted to whenever necessary. On about the second day, following the hemorrhage, the routine Sippy

regime is instituted as described elsewhere.

The above treatment of hemorrhage has been challenged in recent years by Meulengracht. Immediately upon admission to the hospital, regardless of the stage of the bleeding and as soon as the original nausea has subsided, he prescribes for the patient a diet of five meals daily, which contains most types of foods save the obviously irritating substances, and an alkaline powder mixture which also contains iron and some hyoscyamus which is given 3 to 4 times a day. He has reported a series of 250 patients having hematemesis or melena who were treated with this type of regime, and sustained only a 1% mortality as compared with a series having an 8% mortality reported by another investigator in Denmark who used the classical regime of treatment. He does employ transfusion where it is indicated. As advantages of this type of regime, he points out that:

1. Food taken into the stomach is the best substance available for the neutralization of the gastric contents.
2. The patient's nutrition and caloric requirements are maintained from the beginning.
3. The patients like the diet much better than the milk and cream diet.
4. Blood disappears earlier from the stool than when the other method of treatment is used.

A modification of this type of regime has been used for the past several months in this Hospital and Out-patient Department in the treatment of uncomplicated gastric and duodenal ulcer. Sufficient time has not elapsed, however, to allow any conclusions to be drawn at this time.

E. Surgical Treatment of Duodenal Ulcers

A review of the literature on gastroduodenal ulceration shows that there is still a marked difference of

opinion, not only as regards surgical indications but also as regards the type of surgical procedure. Many internists believe that surgical treatment is indicated only in absolute medical failure. However, differences of opinion as to what constitutes a medical failure makes it extremely difficult to know just when surgical treatment is advisable. Many surgeons are confident that most surgical failures are secondary to medical procrastination which permits the development of such extensive pathological changes that surgery must of necessity be palliative rather than corrective.

If it were possible to remove every chronic peptic ulcer by excision with the same facility as the diseased gall-bladder or appendix and obtain as correspondingly good results as has been attained in those diseases, then surgery would also be the ideal method of treatment of chronic peptic ulcer. But as will be pointed out below, the symptoms of chronic ulcer are more often the symptoms of diseased functions than of the lesion itself, so it cannot be expected that excision of the lesion will remedy the symptoms.

The purposes of any operation for duodenal ulcer are:

1. Relief of symptoms.
2. Protection against complications.
3. Protection against recurrences.
4. Increase in life expectancy.

No one procedure will cure all patients suffering from chronic gastric or duodenal ulcers. Therefore, it is not surprising that a number of operations have been devised.

Before the controversial surgical aspects of ulcer treatment are considered, Brown's studies should be considered. Brown's criteria for surgical intervention are as follows:

1. Pyloric obstruction.
2. Repeated hemorrhage.
3. Gastric ulcer which fails to heal or recur after adequate medical management.

Of 1,130 medically treated cases of peptic ulcer observed for periods varying from $2\frac{1}{2}$ to 18 years, cure resulted in 49%, marked improvement in 16%, moderate improvement in 10% and failure in approximately 20%. These statistics suggest that two-thirds of all patients with ulcer are sufficiently relieved of their symptoms by medical treatment, and that only 33% require surgical intervention. According to the surgical results of Balfour, Judd, Bloodgood and Walton, approximately 80% of the patients not benefited by medical treatment are completely relieved of their symptoms by conservative surgical treatment. This leaves but a small percentage who are not rendered symptom-free by conservative combined medical and surgical treatment. However, the problem is not as simple as these statistics might suggest. There are many able clinicians who question medical cure and there is a large school of surgeons who have not been able to duplicate these results of conservative surgery. It is this difference in end-results that have led to controversy on the subject of ulcer treatment. Maes believes that although the medical treatment of peptic ulcers has a definite field its results are not permanent in a majority of cases. He is very skeptical about medical cures. He attributes the failure of gastroenterostomy to such causes as:

1. Performance of the operation on the suspicion of ulceration rather than its actual presence.
2. Technical errors.
3. Inadequate preoperative preparations.
4. Failure to eliminate foci of infection and causative foci.
5. Inadequate postoperative care.
6. Postoperative indiscretion.

Gastroenterostomy may fail because the patient's susceptibility to ulcers and constitutional inferiority have not been given adequate consideration. Woden believes that medical measures consistently retard the progress of gastroduodenal ulceration but rarely eliminate the disease. The great majority of ulcer cases are chronic with definite

pathological characteristics which tend toward the development of obstruction in 34% of the cases and toward the occurrence of hemorrhage in 40%.

Surgeons of the Radical School of Surgery presented by Finsterer and Von Haberer and Berg have been unable to duplicate the reported results of conservative therapy. They report failures in 30 to 50% of cases treated by gastroenterostomy and give an incidence of jejunal ulcers from 6 to 25%. The results obtained from gastroenterostomy by some of the continental surgeons have been so disastrous that the operation itself has been reported and referred to by some as a disease entity. The basis for more radical surgery in ulcer is based on certain pathological and histological interpretations of ulcer lesions and its associated pathology. Konjetzny studied freshly resected specimens of stomach and duodenum obtained from patients with gastric and duodenal ulcers. Gastro-duodenal inflammation was present irrespective whether the ulcer was gastric or duodenal. It was most marked in the region of the pyloric antrum. Konjetzny believed that ulcers are probably secondary to gastroduodenitis because the mucosa affected by acute or subacute gastritis nearly always shows superficial inflammatory defects which are undeniably secondary to the inflammation of the mucosa. He believes that the chief essential in the treatment of peptic ulcer is not reduction of acidity but relief from the inflammatory changes of the mucosa and of the muscular obstruction resulting therefrom. He believes, therefore, that the treatment of an ulcer is the treatment of gastritis, especially in the early stages of the disease. In chronic phases of the disease, the cure by medical measures is practically impossible, he states.

It will not be possible to discuss every phase of this subject in the desired detail. It will be necessary to limit our presentation which is to follow largely to the different types of operative procedures, their indications and their contraindications:

(a) Posterior gastroenterostomy

Because impairment of motor

function is the most frequent and most definite indication for operation, this is the most commonly performed operation.

Indications

1. A lesion of the contracting type, or in which edema has brought about marked obstruction.
2. When the physical condition of the patient does not indicate a more involved operation.
3. Age: The older the patient, the more is gastroenterostomy likely to be successful because:
 - (a) Gastric motor functions have often become permanently disabled due to impaired muscular tonus.
 - (b) Gastric secretory function is naturally lowered with increasing age.
4. Sex: Experience has shown that women very rarely have recurrent ulcer after this procedure; why this is true, is not clear.

Contraindications

Ryle states these quite concisely when he said: "No attempt should be made to circumvent mechanically a lesion which is producing no considerable disturbance of function." It is particularly important to avoid this operation if the patient is young, the stomach small, the lesion not extensive, or the acidity of the gastric contents high.

(b) Anterior Gastroenterostomy

Indications:

1. Technical difficulties encountered in doing a posterior gastroenterostomy.
2. Patients in poor state of health.
3. Short mesocolon.

The chief objection in anterior gastroenterostomy is the possibility of imperfect drainage of the proximal loop. This disadvantage is serious enough so that an entero-enterostomy is usually made. This, however, interferes with the reduction of acidity and greater liability of jejunal ulcers.

(c) Gastroduodenostomy

Of the direct procedures for cure of duodenal ulcers, gastroduodenostomy is an operation limited from its application since the circumstances under which it should be employed are rarely encountered. The operation is indicated:

1. If the lesion in the duodenum cannot be removed because of marked obstruction or because the pylorus is fixed to the liver or pancreas, or because of a mass of adhesions.

2. Gastroenterostomy is not advisable for one or more of the reasons already enumerated, or because of failure of previous gastroenterostomy.

3. The duodenum distal to the lesion must be sufficiently mobile so that anastomosis can be made with the stomach.

This operation avoids anastomosis between the stomach and the jejunum and has the primary advantage of obviating the possibility of a jejunal ulcer. The operation is also physiological, and under favorable circumstances it is easier and should be done in less time than gastroenterostomy.

(d) Excision Alone

Removal of the duodenal ulcer alone cannot be expected to relieve a patient of symptoms attributable to such a lesion since the symptoms are more often the result of disturbed function rather than the direct result of the lesion itself. Under exceptional circumstances, however, excision alone of a duodenal ulcer is said to be justified, e.g.: In cases in which the patient is being operated on for some other disease, particularly of the biliary tract and exploration of the duodenum reveals a definite but minute scar on the anterior

wall at some distance from the pylorus. Excision can be done readily and simply by cautery, and the small opening closed.

(e) Excision and Gastroenterostomy

This operation is particularly useful in those cases in which severe hemorrhages have been a major feature in the course of the lesion, and in which it is consequently desirable to remove the lesion, but on exploration the lesions were found to be awkwardly placed, and when excision has been done technical difficulties prevent satisfactory reconstruction of the pyloric outlet. When gastroenterostomy accompanies such a procedure, there is no necessity of restoring the duodenal lumen or pyloric outlet to its normal size. Closure of the defect from the excision followed by gastroenterostomy will afford the necessary drainage and provide a combination of procedures which cannot be excelled in principle or in practice. This type of procedure usually is contraindicated for very extensive lesions with massive posterior perforations.

(f) Pyloric occlusion and gastroenterostomy

Because the complete blockage of the pylorus resulted in all the gastric secretions being suddenly diverted into the jejunum, and causing a high incidence of jejunal ulcer, this type of procedure has been practically discontinued.

(g) Excision of lesion, combined with reconstruction of the pyloric outlet

Indications

Balfour has stated that the chief indication for direct operation for duodenal ulcer is that it can be safely and satisfactorily done. Its advantages consist in that:

- a. The mortality is low.
- b. The lesion is removed.
- c. It permits the inspection

- of the posterior wall.
- d. In the event of recurrence of ulceration, further surgical treatment is not difficult.

The type of case in which direct operation is most commonly employed is that in which the patient is young, has a nonobstructing ulcer or inflammatory process of the anterior wall, with marked hyperacidity and a small, high-lying hyper-tonic stomach. This type of procedure is also indicated when severe hemorrhages are an associated symptom. The contraindications are:

- a. Multiple lesions, so situated that they can be removed only with great technical difficulty.
- b. When a lesion of the posterior wall is large and has perforated deeply into the head of the pancreas.
- c. When great narrowing of the duodenum exists.
- d. When diffuse scarring has narrowed and shortened the first part of the duodenum.
- e. When extensive involvement of periduodenal tissue, gallbladder or liver has occurred, or when marked obstruction has occurred.

(h) Gastric resection

The purpose of this procedure is to remove the gastritis and to control acidity. Although popular in Europe, this operation has not gained favor in this country. In the first place, it has been shown that conservative procedure will sufficiently control gastric acidity in the great majority of cases to permit healing to take place, and to prevent recurrence of ulceration. Nor does subtotal gastric resection produce the achlorhydria that was first claimed for it. On a clinical basis, the chief reason advanced for employing gastric resection for duodenal ulcer is the disappointing results which may follow conservative surgical procedures, particular-

ly gastroenterostomy.

The indications for this type of procedure fall into two groups:

- a. Those in which there have been severe and repeated hemorrhages.
- b. Those in which a previous conservative operation has been followed by the recurrence of the ulcer.

Contraindications

- a. It is to be questioned whether an operation of such extent can be justified unless the disease is so advanced, or associated with such great suffering, that it cannot be controlled by any other procedure.
- b. When there are extensive perforations deeply placed.
- c. In obese or in elderly patients or any whose general condition is not good.

(i) Antral exclusion

This procedure was proposed by DeVine of Australia. It is based on the fact that the most certain indirect means of obtaining cure for duodenal ulcer is by excluding it from all contacts with food and gastric secretions. The procedure provides for exclusion of the duodenum by dividing the stomach wall about the incisura, closing the end of the lower segment and restoring gastro-intestinal continuity by an end to side gastrojejunostomy. In this way, the acid forming mechanism is more or less inhibited as it is in gastric resection. The efficacy of this method in selected cases is obvious. It has the advantage of much less risk than partial gastrectomy and if the stomach is divided at a high enough level, reduction in gastric acidity is as positive as in the more radical operation.

(j) Pyloroplasty

This operation consists of division of the pyloric canal and sphincter plus excision of any ulcer which might be present in the first part of the duodenum. Twenty-five per cent of 78 patients (Horsley) were relieved of symptoms and greatly benefited; 12% were slightly benefitted; 36% obtained no relief whatever; 4% could not be traced; 4% died. These cases were followed over a ten-year period. Horsley believes that his physiological pyloroplasty is indicated first in cases of single small well-defined ulcers without adhesions in the first part of the duodenum in which there has been no medical response, and secondly, cases in which it is desired to obtain an easier outlet for the stomach after excision or cauterization of a gastric ulcer.

(k) Resection of anterior half of pyloric sphincter.

Deaver favored the extensive use of this procedure without opening into the lumen of the stomach or duodenum. He believes this operation should be performed in

- (1) cases of peptic ulcer with organic pyloric obstruction
- (2) cases of pylorospasm associated with other abdominal lesions, and
- (3) cases of hyperchlorhydria without an organic basis.

Uncontrolled gastric acidity is assumed to be one of the chief factors of peptic ulcer. Deaver expressed the belief that the control mechanism of duodenal regurgitation can be restored to normal by removal of the anterior half of the pyloric sphincter. With this type of procedure, gastrojejunal ulcers are impossible. The removal of the anterior half of the pyloric sphincter is much simpler than gastroenterostomy or resection of the stomach. Moreover, it gives equally good results and is followed by much less hazardous complications and late sequelae.

(l) Fundusectomy.(m) Cholecystogastrostomy.(n) Resection of vagus nerve.(o) Jejunostomy.(p) Denervation of the suprarenals.(q) Deep X-ray therapy.

These procedures are so infrequently used that no detailed discussion is required.

Results of Surgical Management of Duodenal Ulcer

The normal mortality of the various operations for duodenal ulcer will vary according to the judgment with which these procedures are applied. Chiefly because the lesion is not malignant, operation for chronic duodenal ulcer should be associated with insignificant risks.

The following table shows the results of various observers using different types of operative procedures:

<u>Observer</u>	<u>Type of Operation</u>	<u>No. of Cases</u>	<u>Cures or</u>	
			<u>Good Relief</u>	<u>Failure</u>
Judd & Hazeltine	Excision & Reconstruction of Pyloric Outlet	369	90%	10%
Balfour	Gastroenterostomy	500	87	13
Judd	" "	1,363	90	10
Horsley	Physiol. Pyloroplasty	78	25	36
Horsley	Gastroenterostomy	57	67	23
Wolden	Local resection with gastroenterostomy	224	88	12
Finney		330	83.9	16.1
vonHaberer	Resection	2,000	95	5
Balfour	Posterior gastroenterostomy	100	87	13

F. Medical Treatment of Gastric Ulcer

The methods of the medical treatment of gastric ulcer are essentially the same as those for duodenal ulcer, but in view of the menace from carcinoma, the greater liability to perforation and the direct irritation of the lesion by substances introduced into the stomach, it is necessary to stress certain precautionary measures. These consist chiefly in impressing upon the patient the necessity of keeping under the personal supervision of the physician after completion of the treatment, and of the avoidance of incomplete methods of treatment.

Approximately two-thirds of all gastric ulcers are without obvious complications at the time they are first diagnosed. Medical treatment should be recommended to all patients less than 40 years of age and to those who have small uncomplicated lesions of short duration. Since the gastric ulcer is usually situated at some distance from the pylorus, and healing usually results in restoration of a normal luminal outline, a deformity of any consequence rarely persists, and the gastric function is restored to its previously normal state. The criterion of healing is the disappearance of pain and tenderness in the epigastrium, and of gross and occult bleeding if present.

If, however, permanent healing does not occur under adequate medical treatment, surgical treatment is indicated and offers the best prospect for cure. Ohnell has pointed out that an average of 40 days is required for an ulcer to heal and the niche to completely disappear. Jordan has pointed out that failure of the niche to disappear or even to grow larger while the patient is undergoing treatment is not necessarily evidence that the ulcer is carcinomatous; on the contrary, it may be benign but not amenable to cure by nonsurgical methods of treatment. An ulcer which is situated high in the stomach doubly recommends itself to medical treatment because it may prove itself inaccessible to the surgeon.

One must always be on the watch for

the carcinomatous ulcer. A crater larger than 2.5 cm. is of real significance, as the majority of such lesions are carcinomatous. Almost pathognomonic of carcinoma is the combination of achlorhydria with pyloric obstruction in the absence of an antral or pyloric defect.

Results of Medical Treatment

These are much the same as for duodenal ulcer, although several factors contributed to the difficulties encountered in analyzing these. In the first place, many investigators group the two types of ulcers together in their reports. Secondly, many gastric ulcers give rise to such mild symptoms that the patient is not aware of them, and fails to consult a physician in regard to them. In the third place, some clinics select for medical treatment chiefly those patients whom they expect to make a favorable response, advising operation in all others. At the Mayo Clinic, 3 to 5 year cures were observed in 75% of the cases.

G. Surgical Treatment of Gastric Ulcer

The ideal which is to be obtained in this condition is the complete removal of the lesion, with provision for good drainage by the safest operation which will permanently change the motor and secretory functions of the stomach. The following operations do not necessarily compete in merit but their use depends upon the individual differences of the ulcer.

1. Excision alone

This operation has been abandoned because other methods of surgical treatment have proved to be more effective. In about 50% of the cases, recurrences of the symptoms or the ulceration occurred.

2. Gastroenterostomy alone

This is not the operation of choice for gastric ulcer, and should be carried out only on special indications, such as a debilitated patient or

a large perforation, and acutely inflamed lesion.

3. Excision and gastroenterostomy

Excision, whether by knife or cautery, combined with gastroenterostomy for gastric ulcer, is based upon sound principles since it includes both the removal of the lesion and the modification of the secretory and motor functions. Symptomatic and physiologic results are completely satisfactory in a high percentage of cases. In general, the smaller the lesion and the more distant it is from the pylorus, the more likely is it that excision and gastroenterostomy will be the operation of choice.

The specific indications for local excision are:

- (1) The lesion must be sufficiently small.
- (2) The removal must be technically feasible. Removable lesions which involve the antrum and encroach upon the pylorus are better dealt with by partial gastrectomy than by excision.

When combined with gastroenterostomy, the advantages of excision may be summarized as follows:

- (1) It efficiently destroys the focus of infection.
- (2) It may be easily applied to a large percentage of gastric ulcers.
- (3) It is simple, speedy and safe.
- (4) Its use does not interfere with the motility and function of the stomach.
- (5) It may be used in cases in which no other means of direct attack on the ulcer are possible.

If the crater is not more than 1 cm. in diameter, the cautery can be most satisfactorily used because there is no active hemorrhage.

4. Wedge Excision and Gastroenterostomy

The use of this operation is restricted to relatively small lesions which are easily accessible and may be readily mobilized. It has the disadvantage that the defect created is out of proportion to the size of the lesion.

5. Excision combined with Reconstruction of the Pyloric Outlet

In general, excision plus plastic operations on the pylorus do not give as good results as gastric resection or excision with gastroenterostomy. Under the following circumstances, however, this type of procedure may be the operation of choice.

- (1) When the lesion of the anterior wall of the stomach is near the pylorus or involves the pylorus from the gastric side.
- (2) When there is a large duodenum.
- (3) When satisfactory mobilization of the lesion and of the outlet of the stomach may be attained.
- (4) When the patient because of obesity or constitutional disease is a poor risk.
- (5) The lesion must be single and the inflamed portion about it insignificant.

6. High Segmental Resection

In man, neither satisfactory gastric function nor permanent relief of symptoms, nor protection against subsequent ulcer have been brought about by this operation.

7. Partial Gastric Exclusion

This operation with the Billroth II type of anastomosis or one of its modifications may have a definite place in the management of gastric ulcer.

It is the most positive of all procedures to give rest to the lesion. However, it is most often used as a preliminary step in a two stage resection.

8. Partial gastrectomy

The primary purpose of this operation is to accomplish the most thorough removal of the lesion and at the same time to modify gastric functions so that ulceration does not recur. In these respects, the operation is the most efficient of any known procedure, especially when the ulcer is in the distal part of the stomach. Balfour states that partial gastrectomy is the operation of choice, but he admits that in practice it frequently can not be done because of conditions adding to the risk of the operation. One of the most important problems in this connection is the amount of stomach to be removed. Recurrence of both symptoms (or of ulcer) may take place when resection has been so extensive that little or no acid can be recovered in the gastric juice. Removal of the entire stomach is not compatible with good nutrition or health, secondary anemia is a possible sequel, and pernicious anemia has been reported to occur after extensive resection.

(a) Billroth I procedure

Indications for this type of procedure depend to a considerable extent upon the skill and experience of the operator. It presents more technical difficulties than the Billroth II. Its use should be limited to those cases in which there is some contra-indication to the Billroth II.

(b) Billroth II procedure

This is the operation of choice in gastric resection, combined with a gastroenterostomy.

9. Jejunostomy

To date, its use has been confined largely to those cases in which

any other surgical procedure has appeared unadvisable and is therefore rarely indicated.

The Results of Surgical Treatment of Gastric Ulcers

Success or failure of the surgical treatment of gastric ulcer is based upon the following factors:

- (1) Selection of the patient for operation.
- (2) Selection of the operation.
- (3) Technique of the operation.
- (4) Obstacles to the operation of choice.
- (5) Unexpected complications

The following table gives the results of operations for gastric ulcer from 1917 to 1926, at the Mayo Clinic, as reported by Balfour:

<u>Operation</u>	<u>No.</u>	<u>Cure or</u>	<u>No Re-</u>
		<u>of</u>	<u>lief %</u>
		<u>Much Im-</u>	
		<u>provement</u>	
		<u>%</u>	
<u>Partial gastrectomy</u>			
Anterior end to side	74	85.1	14.8
Posterior end to side	79	92.4	8.1
Billroth II type	19	84.2	15.7
Billroth I type	29	89.6	10.3
Segmental resection	52	85.5	13.4
<u>Partial gastric exclusion</u>	6	100.0	----
<u>Cautery or knife excision only</u>	33	80.8	19.1
<u>Cautery or knife excision, with gastroenterostomy or reconstruction of pylorus</u>	574	82.7	16.5
<u>Gastroenterostomy only</u>	118	82.2	16.9
<u>Miscellaneous</u>	12	41.6	58.3
TOTAL	1,010		

An additional important factor in estimating end-results is the protection

which surgical treatment gives against the development of gastric cancer.

H. Impressions

1. It has been estimated that about 10% of all individuals suffer at some time in their lives from a chronic gastric or duodenal ulcer.

2. Liquids introduced into the human stomach do not follow predominately the lesser curvature and there is no evidence to conclude that a "magenstrasse" similar to that of the ruminants exists in man.

3. If trauma to the mucous membrane was the main cause of ulcer, one would expect to find most of the lesions in the distal end of the pars pylorica, whereas most of them are actually found up around the incisura.

4. The passage of material through the pylorus is largely dependent upon the pressure in the duodenum; if this is greater than that in the stomach, no material will pass through the pylorus, even when the pylorus is open.

5. Marked variations in the concentration of acid or pepsin in the gastric juices occurs with the result that too much importance cannot be attached to a single determination of these.

6. Chronic ulceration in dogs may be produced if unneutralized gastric juice is allowed to remain in contact with the gastric or intestinal mucosa for abnormal periods of time.

7. The occurrence of a chronic ulcer in the mucosa of the ileum, adjacent to the entrance of a Meckel's diverticulum, in which islands of heterotropic gastric mucosa have been found, and near a gastroenterostomy stoma, is supporting evidence that ulcer is due primarily to the corrosive and digestive action of the pepsin and hydrochloric acid of the gastric juice.

8. When properly carried out, the medical treatment of uncomplicated duodenal ulcer insures a large percentage of success. The capacity of many of

these ulcers to heal permanently is inherently great, and in such cases, adequate medical treatment is always justified, logical and effective.

9. The indications for medical treatment of duodenal ulcer are:

- (a) All patients having no complications, especially if they are young, and the symptoms are of short duration.
- (b) In older patients, if the symptoms are mild and infrequent and not progressive in severity, and do not interfere with the efficiency of the individual.
- (c) In old people with serious organic disease.
- (d) In pregnancy.
- (e) In highly neurotic individuals.
- (f) As a preliminary to operation.

10. Contraindications to the medical treatment of duodenal ulcer:

- (a) Failure to heal under adequate medical management.
- (b) Acute or chronic perforation.
- (c) Pyloric obstruction which fails to respond to medical treatment.
- (d) Very large ulcers, especially if adherent to neighboring structure.
- (e) Repeated massive hemorrhages.
- (f) Reasonable suspicion of the development of a carcinoma at the site of the lesion.
- (g) Hour-glass stomach.
- (h) Chronic nephritis with impairment of renal function.

11. Every effort must be made to individualize the treatment of peptic ulcer. The ratio of the personality of the physician to the personality of the patient is a very important factor in the treatment of this disease, and which has received too little emphasis.

12. Rest is of primary importance in the medical treatment of ulcer. The best ultimate results are achieved by carrying out the treatment in a hospital for a period of 3 to 4 weeks. However, this cannot be achieved in the majority of cases but a realignment of the patient's activities can be made to give

him additional rest.

13. The Sippy regime of treatment is outlined. Sedatives and atropine in physiological doses are useful adjuncts. Care must be exercised to include a sufficiency of vitamins in the ulcer diet.

14. Pyloric obstruction due to spasm or edema usually responds well to medical management.

15. Uncompensated alkalosis may occur in the course of alkaline therapy for ulcer. It requires a week of intensive therapy for its development. Its symptoms and signs are: headache, weakness, vertigo, nausea, vomiting, mental apathy, confusion, profuse perspiration, tetany and even convulsions. Its treatment consists in the discontinuance of alkalis, giving of orange juice and supplying sufficient fluids.

16. The usual time for an ulcer to disappear is 6 to 8 weeks. The ulcer management should always be continued for at least 6 to 9 months.

17. One of the chief causes for failure to obtain satisfactory results by medical measures is the tendency to modify too soon the strict regime employed in the early weeks of treatment.

18. A five-year cure for duodenal ulcer occurs in from 45 to 70% of the patients.

19. Well-controlled studies have shown that symptomatic improvement may be obtained by the daily injection of sterile solutions of physiological saline similar to that obtained by the daily injection of histidine monohydrochloride. This emphasizes the fact that many patients who are not improving with one form of treatment respond promptly to a change in therapy.

20. Gastric mucin has been employed as an adjunct in the treatment of ulcer. Although the efficacy of its action is disputed on physiological grounds, its use does afford subjective improvement.

21. It is too early to draw conclu-

sions regarding the use of duodenal extract and of enterogastrone at this time.

22. A number of substances have been given parenterally for peptic ulcer. Most types of nonspecific protein therapy probably act in a similar manner to the injection of histidine monohydrochloride.

23. Hemorrhage is a frequent and often serious complication of gastric or duodenal ulcer. Death from hemorrhage itself, however, is less than for operations undertaken during or immediately after the hemorrhage.

24. Meulengracht now advocates the patients with gastric hemorrhage be fed frequent small feedings, starting as soon as the original nausea has subsided. In his experience, this type of treatment has been very successful.

25. A marked difference of opinion still exists, not only as regards the surgical indication, but also the type of surgical intervention for the treatment of duodenal ulcer.

26. The indications for surgical treatment of ulcer are:

- (1) Pyloric obstruction.
- (2) Repeated hemorrhage.
- (3) Ulcer which fails to heal or recurs after adequate medical treatment.
- (4) Reasonable suspicion or positive evidence of the development of a carcinoma at the site of the lesion.

27. In Europe, considerable emphasis has been placed upon the theory of Konjetzny that ulcers are probably secondary to gastroduodenitis. This view, however, has not been generally accepted in this country.

28. Posterior gastroenterostomy is the most commonly performed operation and is indicated in those cases where the motor function is severely disturbed, or when the physical condition of the patient does not warrant a more involved operation.

29. Anterior gastroenterostomy is indicated when technical difficulties, such as a short mesocolon or a high lying stomach prevents the use of a posterior gastroenterostomy.

30. Gastroduodenostomy is indicated in situations where the lesion in the duodenum cannot readily be removed or when gastroenterostomy is not advisable.

31. Removal of the duodenal ulcer alone cannot be expected to relieve a patient of symptoms attributable to such a lesion since the symptoms are more often the result of disturbed function rather than the direct result of the lesion itself.

32. Excision of the lesion plus gastroenterostomy is particularly useful in those cases in which severe hemorrhages have been a major feature in the course of the disease, and in which it is consequently desirable to remove the lesion but technical difficulties require that a gastroenterostomy be performed rather than reconstruction of the pyloric outlet.

33. Pyloric occlusion plus gastroenterostomy has been practically discontinued because the complete blockage of the pylorus resulted in all the gastric secretions being suddenly diverted into the jejunum thereby causing a high incidence of jejunal ulcer.

34. Excision of the lesion combined with construction of the pyloric outlet is an operation which is commonly employed when the patient is young, has a non-obstructing ulcer or inflammatory process on the anterior wall, with marked hyperacidity and a small, high lying hypertonic stomach. This type of procedure is also indicated when severe hemorrhages are an associated symptom. The contraindications are chiefly technical.

35. The purpose of gastric resection and duodenal ulcer is to remove the gastritis and to control the acidity. Although popular in Europe, this operation has not gained favor in this country. Its indications are: (1) those in which there have been severe and repeated hemorrhages; (2) those in which a previous

conservative operation has been followed by the recurrence of the ulcer.

36. Antral exclusion is based upon the theory that the most certain indirect means of obtaining cure for duodenal ulcer is by excluding it from all contacts with food and gastric secretions. In selected cases, this method has the advantage of much less risk than partial gastrectomy, and if the stomach is divided at a high enough level reduction of gastric acidity is as positive as in the more radical types of operation.

37. Pyloroplasty consists of division of the pyloric canal and sphincter, plus excision of any ulcer which might be present in the first part of the duodenum. The results of this type of procedure, however, are not impressive.

38. Deaver states that the control mechanism of duodenal regurgitation can be restored to normal by removal of the anterior one-half of the pyloric sphincter. With this type of procedure, gastrojejunal ulcers are said to be impossible. It is said to have equally good results and is followed by much less hazardous complications and late sequelae than resection of the stomach.

39. The following types of operation, namely: fundusectomy, cholecystogastrostomy, resection of the vagus nerve and jejunostomy and denervation of the suprarenals have all been tried in the treatment of peptic ulcer. The results in none of these procedures have been good.

40. The normal mortality of the various operations for duodenal ulcer will vary according to the judgment with which these procedures are applied. Chiefly because the lesion is not malignant, operation for chronic duodenal ulcer should be associated with insignificant risks. Various observers reported cures in from 67 to 95% of their cases, using the various types of operation.

41. The methods of the medical treatment of gastric ulcer are essentially the same as those for duodenal ulcer, but in view of the menace from carcinoma, the greater liability to perforation and

the direct irritation of the lesion, it is necessary to keep the patient under the personal supervision of the physician for a longer period after completion of the treatment.

42. It is necessary to be on the watch constantly for the carcinomatous gastric ulcer. A crater larger than 2.5 cm. is of real significance, as the majority of such lesions are carcinomatous. Almost pathognomonic of carcinoma is the combination of achlorhydria with pyloric obstruction in the absence of an antral or pyloric defect.

43. The results of the medical treatment of gastric ulcer are much the same as those for duodenal ulcer.

44. In the surgical treatment of gastric ulcer, the ideal condition is obtained by the complete removal of the lesion, and provision for good drainage by the safest operation.

45. The operation of excision alone for gastric ulcer has been abandoned because other methods of surgical treatment have proved to be more effective.

46. Gastroenterostomy alone is not the operation of choice for gastric ulcer, and should be carried out only on special indications, such as the debilitated patient with a large perforating lesion or one which is acutely inflamed.

47. Excision of the lesion, plus gastroenterostomy, give symptomatic and physiologic results which are completely satisfactory in a high percentage of cases. Its advantages are: (1) it efficiently destroys the focus; (2) it may be easily applied to a large percentage of gastric ulcers; (3) it is simple, speedy and safe; (4) its use does not interfere with the motility and function of the stomach; (5) it may be used in cases in which no other means of direct attack on the ulcer are possible.

48. Wedge excision, plus gastroenterostomy, is restricted to the relatively small lesions which are easily accessible and may be readily mobilized. It has the disadvantage that the defect created is out of all proportion to the

size of the lesion.

49. In general, excision plus plastic operations of the pylorus do not give as good results as do gastric resection or excision with gastroenterostomy.

50. Neither satisfactory gastric function nor permanent relief of symptoms nor protection against subsequent ulcers have been obtained by the high segmental resection.

51. Partial gastric exclusion is the most positive of all procedures which gives rest to the lesion, and is the most often used as a preliminary step to a two stage resection.

52. The primary purpose of partial gastrectomy in the treatment of gastric ulcer is to accomplish the most thorough removal of the lesion and at the same time to modify gastric functions so that ulceration does not recur. In these respects, the operation is the most efficient of any known procedure, especially when the ulcer is in the distal portion of the stomach. Either the Billroth I or the Billroth II procedure may be used with this procedure.

53. Reports of the surgical treatment of gastric ulcer vary greatly depending upon the types of operation and the operator. However, the majority of observers report cures of marked improvement in from 80 to 90% of their patients, when using one of the above well-established types of operative procedures.

54. In conclusion, it can only be said that no complete agreement can be expected in regard to the treatment of gastric or duodenal ulcer, either from a medical or from a surgical standpoint or from both, until more definite information can be obtained regarding the etiology of gastric or duodenal ulcer.

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- IV. DEATHS
- As it must to all men, death
came last week to:
- Frederick A. Erb, Minneapolis,
1873-1936.
- Louis D. Hughes, Minneapolis,
1888-1936.

Antoine A. Laurent, Minneapolis,
1882-1936.

Eugene G. McKeown, Pipestone,
1881-1936.

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V. ANNOUNCEMENT

PHLEBITIS

Will you please report any cases of Phlebitis to the surgical office as Mr. O. H. Wangenstein is anxious to see them.

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VI. OUR CO-AUTHORS TODAY

John Anthony Layne, 6 feet, 2 inches tall, 26 year old product of Lanesboro, Minnesota (where he was born) and Fessenden, North Dakota (where he was raised), has been a Fellow in Medicine since July 1, 1935. After graduation from high school in North Dakota, where he specialized in oratory and scribbling (he was editor of his high school paper), he entered the University of Minnesota, receiving the degrees of Bachelor of Science, Bachelor of Medicine and Doctor of Medicine. He took his internship at the Cincinnati General Hospital. Although he is of Irish-English descent, many of his sentences today had to be revised because he persisted in making long, direct translations from the German literature. While an undergraduate of Minnesota, he made an excellent scholastic record (A.O.A.), and dabbled in fraternity politics (Phi Chi and Grey Friars). His present interests include bacteriology, medicine and a desire to remain single long enough to complete his graduate work. His associates like him very much. He is such an all-around good fellow as he goes about his work in a self-effacing, conscientious way that his rating among his associates grows the longer they know him.

. . . . Edward John Semansky was born in Shenandoah, Pennsylvania, where he attended grade and high school. He

entered Georgetown University, Washington D.C., in 1924, and by 1932 had earned the degrees of Bachelor of Science (4 years), and Doctor of Medicine (4 more). He took his internship at Geisinger Memorial Hospital, Danville, Pennsylvania, during 1932 and 1933. He came to the University of Minnesota, July 1, 1933, as a surgical Fellow. In 1935-36, he took a year's work in Pathology. He is now Assistant in Anatomy and volunteer Assistant in Pathology. While in school, he was a star in athletics, specializing in track events. Eastern sports writers know him best as a quarter miler, 100 and 220-yard dash man, and member of Georgetown's famous relay team which participated in the Knights of Columbus and New York Athletic Club games. He is 29, also single, speaks Lithuanian fluently, and chews gum violently. A tireless worker, a loyal associate, he is rated high amongst his associates as an A #1 man with patience and a fine technician. He is a difficult dictator, as he speaks with a clipped, slightly Eastern accent, but he makes his peace with the stenographers by liberally supplying them with gum. In this, he is an able disciple of former Pathological Fellow Alex Blumstein, who kept a bag of hard candy on hand to offer to anyone as soon as they came into the laboratory in case they had something to complain about. A man with his mouth full of candy is at a distinct disadvantage in trying to blow-off. Although Dr. Semansky was born and raised 80 miles from Pottstown, Pennsylvania, the home of famed Olympic Track Man Gene Venzske, he never met him in competition.

Both Drs. Layne and Semansky are to be congratulated for their contribution today. It represents a great deal of literary research in which they have liberally sprinkled ideas as resulting from their personal experience.