pigs, born after the mothers had one hour of chloroform-oxygen anesthesia, had very fatty livers. Oxygen may lessen the danger of chloroform to the mothers, since the respiration is always much slower and more shallow than when ether or nitrous oxid-oxygen is administered.

Ether and nitrous oxid-oxygen never produce tissue changes such as we have shown in chloroform poisoning. They do interfere with cell metabolism, and when given over long periods produce changes which are of the type found after simple asphyxiation. Dr. Graham has given us a very clear and logical explanation for this difference in toxicity of the various anesthetics.

CHRONIC DIARRHEAS DUE TO ENTERO-COLONIC CONDITIONS *

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It is a rather difficult task to arrange a satisfactory classification of the different varieties of chronic diarrheas due to enterocolonic conditions. This is largely due to the fact that with improved methods of investigation the etiology of hitherto undetermined forms is gradually being made clear, necessitating frequent changes in classification. Since the term "diarrhea" is used only for a symptom denoting the passage of liquid feces, it not only embodies those forms due to disease of the gastro-intestinal tract, but it is also indicative of those varieties due to conditions arising outside of this tract, such as one commonly observes in toxic states, as is seen, for instance, in nephritis or in the disturbances of internal secretion.

I have followed the accompanying classification in the study of my cases, although I recognize fully its incompleteness:

1. Simple catarrhal enterocolitis.
2. Ulcerative colitis:
 - (a) Amebic.
 - (b) Bacillary.
 - (c) Tuberculous.
 - (d) Syphilitic.
 - (e) Carcinomatous.
3. Mucous colitis.
4. Simple colonic infections.
5. Intestinal stasis.
6. Chronic appendicitis.
7. Disturbances of the glands of internal secretion:
 - (a) Pancreas.
 - (b) Suprarenal.
 - (c) Thyroid.
8. Diarrheas of toxic and undetermined origin.

It is sometimes important to differentiate a diarrhea originating from disease of the large bowel from that of the small bowel. This is especially important when surgical interference is contemplated.

In catarrh of the small bowel, the diarrhea is less intense and the pains are colicky in character. The feces are more acid, and contain unchanged bile and undigested food particles.

Mucus is frequently absent, or is present in small amount, and then admixed with the stool. In those instances in which the diarrhea originates in the large bowel, the pain is usually associated with marked tenesmus, and is less frequent than in catarrh of the

small bowel. The tenderness on pressure is usually felt along the course of the colon, and not in the umbilical region. Gastric disturbances are usually absent in this affection, and the stools rarely contain undigested food. They are ordinarily alkaline and contain mucus and altered bile.

In this study of my cases of chronic diarrheas I have selected 100 cases, and these have been most carefully investigated. Thirteen cases represent those forms due to achylia gastrica, which cannot be considered here, while thirty-one represent the variety known as catarrhal colitis.

SIMPLE CATARRHAL ENTEROCOLITIS

In all of these cases there was a persistent diarrhea extending over several years, with frequent acute attacks associated with pain and tenderness over the colon; in every instance there was considerable mucus in the stools, together with blood at times. I am firmly of the opinion that the presence of mucus alone in the stools is not sufficient to warrant a diagnosis of catarrhal enterocolitis without the presence of the other symptoms already mentioned. In this disorder the characteristic appearance is usually presented by proctoscopic examination.

It was interesting to note the nature of the gastric secretion in these cases of chronic catarrhal colitis. In eighteen, the gastric secretion was quite normal; there was a hyperacidity in six, and seven presented an achylia gastrica. It is important in all cases of diarrhea associated with an achylia gastrica to determine whether or not the bowel is likewise affected, since in these instances treatment of the gastric disease alone is not sufficient to effect a cure. In the study of our cases of catarrhal colitis, the Schmidt test diet has been of considerable value. On this diet the stool is observed to be liquid or semisolid; rather large, and somewhat brown or light in color, containing more or less mucus in large or small flakes. It has a very fermented odor and contains many gas bubbles. To the naked eye there are no undigested meat fibers, and no excess of fat is present. Microscopically nothing of consequence is noted. The specimen is usually alkaline, and the sublimate test presents a normal coloration. When the stool is placed in the incubator, more or less gas is generated, indicating slight decomposition or putrefaction. Examination for dissolved protein is lightly or markedly positive.

The treatment of the various forms of catarrhal colitis is usually satisfactory. Diet plays an important rôle in this direction. In addition, most of these patients do best when treated with irrigations. Of these, solutions of potassium permanganate, boric acid, gelatin or instillations of protargol are most valuable. The internal administration of large doses of tannigen or bismuth subcarbonate is helpful.

AMEBIC DYSENTERY

Of the ulcerative forms of colitis, the amebic occurred in eight cases in this series. Since this is not an infrequent form of dysentery, the ameba should be looked for in all cases of chronic dysentery. These organisms are best observed in the scrapings obtained from the ulcerations through the proctoscope. The treatment with quinin irrigations and the administration of emetin need scarcely be mentioned here.

According to Nixon, the use of chaparro amargosa is valuable as a substitute for emetin in this disease. Cases that have resisted the emetin treatment have

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been controlled, according to him, by means of this drug. The plant is a small thorny bush indigenous to Texas and in Mexico. Nixon employs the drug as an infusion in doses of from 6 to 8 ounces.

BACILLARY DYSENTERY

There was present in our series but one case of bacillary dysentery. The diagnosis of this condition is usually difficult. The *Bacillus dysenteriae* may occasionally be found in the stools, and when obtained will agglutinate with the blood serum. Whenever amebas cannot be discovered in the stools, this condition must be suspected, and attempts should be made to isolate the organism. According to Shiga this disorder is only a subsequent disease in which it is impossible often to isolate the dysenteric bacillus. In this condition the feces are found mixed with mucus and the debris from the ulcerated areas. Most frequently, however, the mucus is simply hanging to the feces, not being intimately mixed with it. The result of treatment of these cases is not always gratifying. In addition to diet and rest, the best results are obtained by means of irrigations. Of the remedies to be utilized for this purpose, silver nitrate solution (1:500 or 1:1,000), potassium permanganate and tannin are probably the best. Internal medication is usually of little value. Of the remedies that may be employed, bismuth is of some value. In many of these cases, occasional mild purges are sometimes helpful. Of these, castor oil or liquid petrolatum oil is the best.

TUBERCULOUS ULCERATIONS

Tuberculous ulcerations occurred in four instances in our series. These are exceedingly frequent complications of chronic pulmonary tuberculosis and especially frequent as a late manifestation of this disease. This condition is not always associated with a persistent diarrhea, and alternating constipation and diarrhea is not infrequent. Diarrhea is more pronounced when the lesions are in the lower bowel. Pain is the most frequent symptom, occurring usually in the lower abdomen, and it is often most severe before the passage of a stool or after taking food. The stools may be very frequent, and at times may contain small quantities of blood. It is unusual, however, to note the passage of large quantities of blood. Mucus in variable quantities is often admixed with the feces. The finding of tubercle bacilli in the stools is of little diagnostic value, for these organisms are frequently present in patients affected with pulmonary tuberculosis having these organisms in the sputum. Of great interest are those cases of localized tuberculosis occurring about the ileocecal region.

In this condition a definite mass is found frequently resembling a malignant growth. In these cases, in addition to the paroxysmal pains, diarrhea alternating with constipation is observed. In two cases of this variety an operation was performed by Dr. Finney for me with most gratifying results. The treatment of the diarrhea observed in intestinal tuberculosis is exceedingly difficult. Diet and rest play a most important rôle in this direction. Physiologic sodium chlorid irrigations may at times be beneficial, but sooner or later it becomes necessary to administer opium by mouth or by bowel.

SYPHILITIC ULCERATIONS

Syphilitic ulcerations of the small intestines are rarely observed. The most common lesion of this dis-

ease is in the rectum. This occurred in two of the cases in my series. When the affection involves the small intestine, the symptoms are those of an ordinary intestinal ulceration, that is, persistent and painful diarrhea remaining unrelieved by the ordinary treatment. When involving the rectum, the picture is so characteristic as to render the diagnosis exceedingly simple. The indurated edges of the elevated ulcer with the smooth base, together with gradually increasing stenosis, is ordinarily sufficiently characteristic to permit of a definite diagnosis.

CARCINOMATOUS ULCERATIONS

This condition occurred in two cases of my series. Carcinoma of the intestine more frequently occurs in the colon and in the rectum, though the disease may occur in the duodenum, jejunum and ileum. Symptoms of obstruction are among the early signs of this affection. These are manifested by attacks of colic associated with constipation. As the disease advances, the contracted area sometimes ulcerates, and constipation may give rise to a marked diarrhea with mucus and blood in the stools. Of interest in this connection is carcinoma of the pancreas, which is frequently accompanied by a special train of symptoms pointing directly to the affection. In the earlier stages of this disease, the symptoms referable to disorder of the gastro-intestinal tract are manifested. These are especially loss of appetite, nausea and vomiting. There is usually constipation, which is rapidly transformed into diarrhea. The diarrhea becomes more and more intense, and at times fatty stools are observed. After a longer or shorter period of time jaundice appears, which gradually becomes more and more pronounced. The urine at times contains sugar; the liver enlarges and becomes nodulated, and further evidences of malignancy are noted by the cachexia. This affection is of such frequent occurrence that whenever a persistent diarrhea is observed in persons over 40 years of age which cannot be accounted for by the usual causes, carcinoma of the pancreas should be borne in mind.

MUCOUS COLITIS

Mucous colitis is such a well known affection that but little new can be said concerning it. There are three theories regarding the etiology of this affection: first, that it is entirely a nervous affection and that the mucus formed is purely a nervous hypersecretion; second, that it is due to a catarrh of the bowel, and thus has invariably an anatomic basis, and third, that the disease is due both to a nervous irritation and to a catarrhal condition.

Mucous colitis is always associated with evidences of disturbance of the autonomic nervous system, and there are present the signs of a vagotonia. While constipation is usually a prominent symptom, diarrhea is occasionally observed in this disease. This affection occurred in nine cases of our series. In addition to the usual treatment of this disorder, I should like to direct attention to the use of autogenous vaccines, which may be of great benefit in some instances.

COLONIC INFECTION

Among the infections of the bowel that may give rise to persistent diarrhea (not including the amebic and bacillary forms already referred to) there are various other micro-organisms and parasites that may play an important rôle in this connection. Of these may be mentioned certain intestinal worms, including

tapeworms, whipworms, flukeworms, strongyloides and various flagellate parasites. The diagnosis of any of these conditions can be readily made by a careful examination of the stools. These infections occurred in six cases of my series.

INTESTINAL STASIS

There are three well marked varieties of intestinal stasis that may give rise to persistent diarrhea. In the first form, the stasis is due to a dilated cecum in connection often with a dilated colon, which is frequently prolapsed and which retains its contents for an unusually long period of time. On account of the retention, fermentation is produced, which is followed by diarrhea. In the second form, on account of the prolonged retention, the fecal masses are channeled, through which the stools pass in a diarrheal form. In the third form, the diarrhea is due to a spastic condition of the bowel giving rise to a frequent expulsion of small round scybala.

The lower bowel is constantly filled with these masses, which produce an irritability of the bowel and frequent desire for defecation. In all of these forms, roentgen-ray and proctoscopic examinations will quickly clear up the diagnosis. Intestinal stasis as a cause of diarrhea occurred in eight cases of my series.

CHRONIC APPENDICITIS

Although diarrhea is rarely observed as a symptom of chronic appendicitis, I am convinced that appendicitis occasionally gives rise to this symptom notwithstanding the fact that these forms of diarrheas are usually attributed to other disturbances, such as colitis or disease of the cecum. This condition occurs most frequently when the inflamed appendix is plastered against the bowel. In one of my cases the nature of the trouble was revealed by the roentgen ray. There were no symptoms definitely relating to the appendicitis, except the diarrhea. In the other case, the patient developed an acute attack of appendicitis. The appendix was removed, and there were no further symptoms. There were three cases of this affection in my series.

DISTURBANCES OF THE GLANDS OF INTERNAL SECRETION

The diarrhea accompanying the disorders of internal secretion need be considered here only so far as these may provoke changes in the intestinal mucosa, on account of which fermentation and diarrhea may be produced.

In the thyroid forms it is probable that an increased peristalsis is at hand in most instances. It is also very likely that many cases of so-called nervous diarrheas on careful examination will be found to belong to this class. In the pancreatic forms, large fatty stools, usually soft but occasionally diarrheal, aid us in reaching a correct diagnosis. In the suprarenal forms, the diarrhea is due to a disturbance of the internal secretion of this gland producing a hyperperistalsis. The intestinal secretions are not ordinarily disturbed in this affection. Five cases of diarrhea due to disturbances of the internal secretions were noted in my series.

DIARRHEAS OF TOXIC AND UNDETERMINED ORIGIN

There still remains a class of diarrheas, the origin of which has not yet been fully determined in all instances. In this class are included those forms in which the irritation is transmitted through the circu-

lation. I refer especially to the diarrheas of nephritis, gout, cirrhosis of the liver, and to the various circulatory disorders, as well as to certain other diseases, such as spew and pellagra. In some of these instances a catarrhal condition is present, while in others no special lesion is produced and the changes that are observed in the intestinal canal are purely secondary lesions. Diarrhea of nephritic origin is probably due, in the larger proportion of cases, to the excretion into the bowel of irritating toxins, as is shown by the fact that the severity of the diarrhea varies with the exacerbations of the nephritic disease. In patients affected with chronic nephritis extending over a long period of time, uremic ulcers have been observed in both the small and the large bowel. In this series there were eight cases of diarrhea of toxic origin.

I have attempted briefly to describe some of the most important forms of diarrhea due to enterocolonic conditions. The diagnosis of some of these forms is exceedingly simple, while in the larger proportion of cases it is most difficult. It is highly important in all instances to make a thorough study of all features, utilizing all diagnostic measures to ascertain the underlying cause. Only in this way can therapeutic measures be instituted which may prove of the greatest avail.

RECTAL AND SIGMOID CONDITIONS IN CHRONIC DIARRHEA *

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The conditions found in the rectum and sigmoid flexure in cases of chronic diarrhea differ very markedly, and they may be due to numerous causative factors.

1. They may be caused by a primary infectious agent, which may be an amebic, a bacillary or a flagellate infection, or some other infectious element which may persist over a long period of time.

2. The conditions may be due to the primary and some secondary etiologic factors, as when during the course of a proctocolitis, the primary cause of which was a bacillary or flagellate infection, the patient becomes infected with the pathogenic ameba. The case may be one primarily of amebic infection, which, though it has continued over weeks or months, or even years, may not have produced alarming symptoms, until some secondary infection ensues, which may convert a seemingly indifferent situation into one of alarm, with possibly fatal results.

3. They may be due to the primary pathology, which was produced by the primary etiologic element or infection, though the latter may have been controlled, or may have disappeared entirely; hence, we have observed very extensive rectocolonic ulcerations due primarily to the ameba infection and secondarily to a streptococcic invasion, and though we had controlled the ameba infection, as we believed, the mucous membrane slough has been so extensive that the ulceration persisted for a long time, and the natural result was that the diarrheal symptoms also persisted.

4. A chronic diarrhea has oftentimes been observed to persist after all primary etiologic factors and all

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