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WILLIAM SEAMAN BAINBRIDGE, Sc.D., M.D.,

NEW YORK.

Professor of Surgery, New York Polyclinic Medical School and Hospital, Etc.

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Introductory Remarks.—The hard-and-fast division of diseases into functional and organic, and into metabolic and microbial, no longer holds. "Idiopathic," a term formerly used with such impunity, and now generally accepted as signifying ignorance of the etiology of a given malady, is fast becoming obsolete. The trend of modern medicine is to consider so-called functional affections as way-stages to organic disease, and to trace the given conditions back, through the factors which initiated the functional derangement, to the underlying cause or causes of the actual organic disease. We hear much more, today, of toxins—poisons produced by germs—than of the germs themselves; more of bacterins—substances introduced into the organism for the purpose of producing immunity—than of a mysterious, inherent capacity to resist disease.

Happily, we are, as a profession, gradually getting back to causal factors. The fallacy of regarding one effect as the cause of another is slowly but surely disappearing. Constipation, for example, is no longer regarded as a disease, but as an indication of an underlying pathological condition. Indeed, in no department of medicine and surgery is this "back to the cause" movement more noticeable than is that which deals directly with the gastrointestinal tract.

The pioneer in this hitherto largely neglected field is unquestionably W. Arbuthnot Lane, of London. In the face of skepticism, even of ridicule, he has pressed forward in the work of discovering first causes. He has demonstrated clearly that in health-maintenance the question of prime importance is body-drainage—the non-absorption of poisons, and the elimination of whatever poisonous matter may be produced within the alimentary canal, before there has been inaugurated a vicious cycle of events which may be the forerunner of disastrous end-results. Lane and his followers have thus focused attention more directly upon the previously obscure phenomena of intestinal stasis, and have offered a plausible explanation of the underlying causes which have led to the evolution of what have been called "the protean symptoms in a large group of patients who have received much treatment and little benefit from the medical profession and who have been exploited by the dietetic faddist and the charlatan."[1]

During the past six years it has been my good fortune to come into personal touch with Mr. Lane, to examine many of his cases before operation, to see him operate upon them, and to watch the after-course of the condition. While we may not accept all his views with reference to the relationship between intestinal stasis and tuberculosis, cancer, rheumatism, and other diseases, his contentions concerning the actual mechanical conditions existing in the abdominal cavity, as indicated by clinical symptoms, demonstrated by *x*-ray findings, and established by laparotomy, are being verified over and over by those of us who are following his lead in this field of surgical diagnosis and treatment.

Intestinal Obstruction.—When Mr. Lane first set forth his views concerning intestinal stasis, and attributed this slowing of the drainage current to the abnormal fixation of certain portions of the canal, with ptosis on either side of the fixed point, many

were inclined to pass over his contentions as being merely reiterations of well-known and long-established manifestations of chronic intestinal obstruction. Indeed, many distinguished surgeons in Europe and America still disavow belief in the existence of any of the types of Lane's kinks, acknowledging inability to recognize them if they have been present in any of their subjects.

The symptomatology, diagnosis, and treatment of the various types of acute intestinal obstruction may be said to have long been matters of general knowledge. The existence of chronic intestinal obstruction has also long been accepted as a possible contingency. It was left, however, to Mr. Lane to establish the fact that many of the factors concerned in the production of the various types of chronic intestinal obstruction are associated with, or perhaps are dependent upon, an already existent chronic intestinal stasis, and that they are, in reality, *end-results* of such a condition.

A notable example of what Mr. Lane has designated as the end-result, and which is catalogued by others as a causative factor in the production of chronic intestinal stasis, is cancer—cancer of the stomach, intestine, biliary ducts, or pancreas. This gives an excellent illustration of the sequence of events as Mr. Lane understands the matter. As pointed out in a previous communication,[2] the correctness of this theory of the cause of visceral cancer cannot be proved or disproved at this stage of our knowledge of malignant disease. The theory is worthy of further consideration, however, and, pending proof or disproof, it should be borne in mind in all cases of chronic constipation, autointoxication, and other obscure conditions seemingly having their origin in defective function of some portion of the gastrointestinal tract. It should be borne in mind particularly, in all cases of "visceroptosis," of "floating kidney," of "gallstones," of "duodenal ulcer," of "mucous colitis," of "perico-

litis," of "chronic appendicitis," etc. It should not be forgotten in the group of conditions to which the term "protein diseases" has been applied,—a term used, as Vaughan[8] has pointed out, "to cover the majority of bacterial and protozoal diseases, and many of those hitherto regarded as autogenous."

Mechanical Basis of Intestinal Stasis.—It is not the purpose of this paper to deal with the general subject of ptosis of the abdominal viscera, its en-

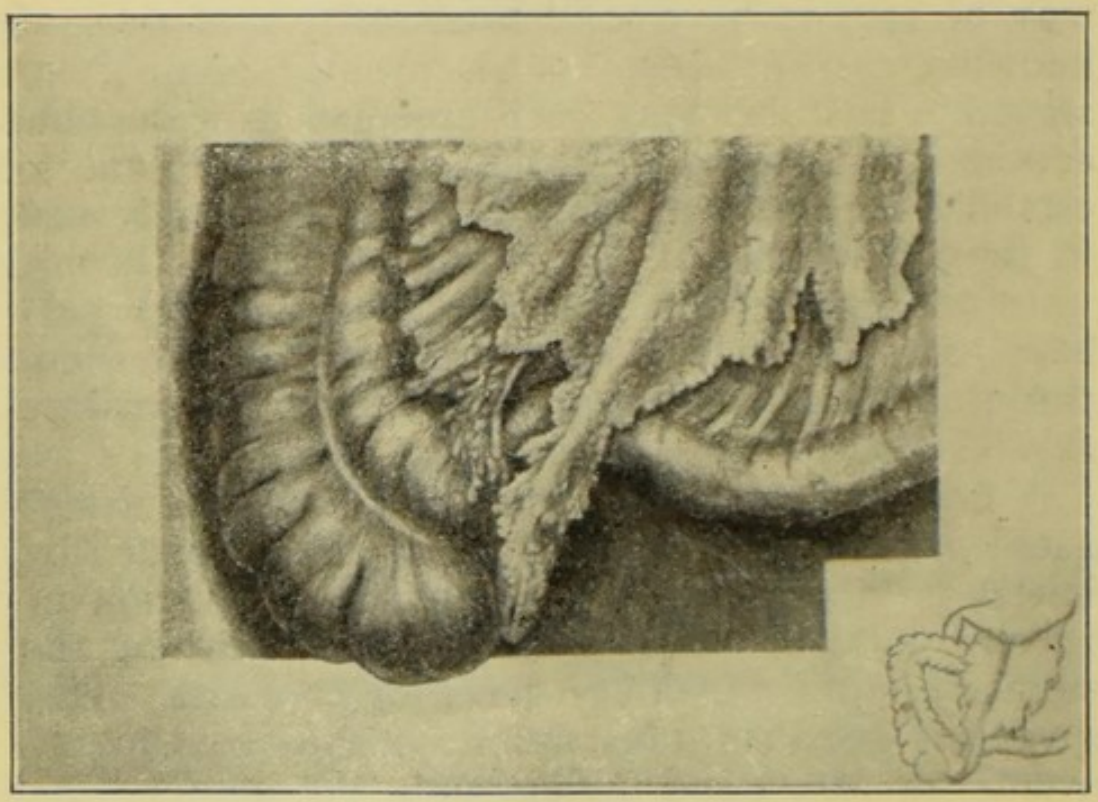

FIG. 1.—CASE I. *Inflammatory Stasis.* E. L. Post-operative adhesion of omentum to mesoappendix and stump of appendix. Band across ileum near ileocecal valve, causing constriction when in upright position—ileal stasis.

tire symptomatology, its sequelæ, or its treatment. A large and interesting literature has been formulated with reference to visceroptosis from the viewpoint of the biologist, of the internist, of the neurologist, of the orthopedist, and of the surgeon. The workers in each of the special fields of investigation have contributed their respective shares to the sum-total of helpful knowledge concerning the subject, but it may be safely said that to Mr.

Lane belongs the credit of tracing the mechanism of the various pathological changes, and of pointing out the most significant and far-reaching results of the condition.

The phenomena resulting from visceroptosis, as revealed by the investigations of Lane, have been classified by Murray Leslie[4] as follows: "A. The formation of adhesions along the lines of resistance to downward displacement. B. The production of kinks along the course of the gastrointestinal tract. C. Gastrointestinal stasis with delayed

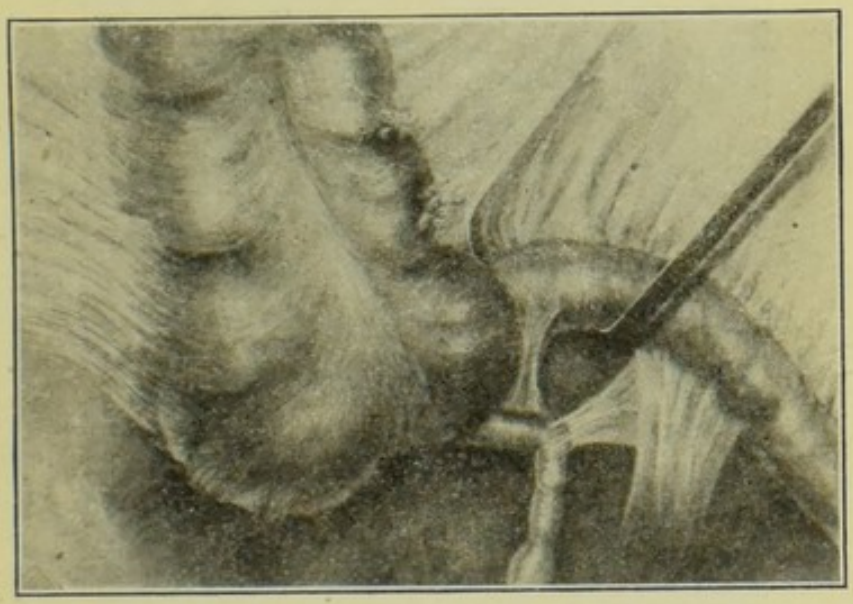

FIG. 2.—CASE II. *Evolutionary Stasis.* M. G. Typical Lane's band, with angulation of appendix. Concurrent conditions: Femoral hernia, extrauterine pregnancy, uterine fibroids. Beginning Jackson's membrane.

digestion, constipation, and autointoxication." The crux, therefore, of the stasis question is a mechanical one, in which the chief factor is the abnormal fixation of any one point in the length of the intestine, with a dropping of the tube on either side of this fixed point, thus producing a kink. The toxic symptoms are secondary to these mechanical changes.

Lane[5] has traced the mechanism of these changes, and has formulated a theory which is interesting, and apparently reasonable. In early life this ptosis of the abdominal viscera is the result of an abnor-

mal distention of the intestine, consequent upon too frequent feeding, or upon the continued use of an unsuitable diet. In later years, according to Lane's theory, it is brought about or accentuated by the erect posture which man assumes during the waking hours. The point is emphasized that the resulting pressure and strain may produce distinct changes, and that these alterations may take the form of evolutionary bands, which are practically

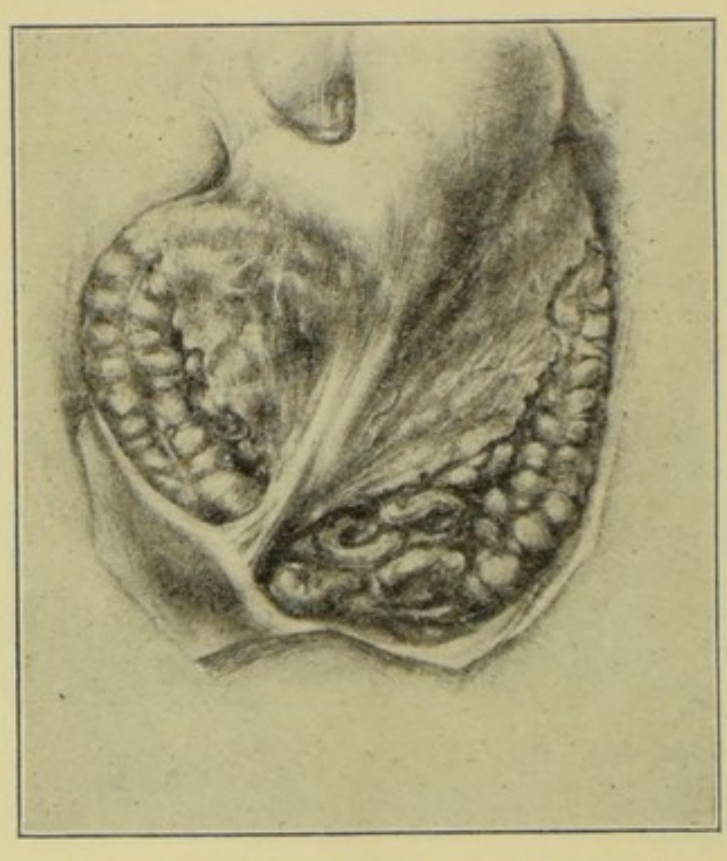

FIG. 3.—CASE III. *Inflammatory Stasis.* C. H. O. Omental adhesions to cecum, at site of old abscess of appendix, and abdominal wall; intestinal stasis. Traction upon greater curvature of stomach, resulting in fish-hook stomach.

without blood supply, and not to be confounded with inflammatory adhesions, which are apt to have a generous blood supply. These evolutionary bands exist primarily for the advantage of the individual.

Lane describes the changes which take place as follows:

"1. An abnormal fixation of the pylorus, by the development of a new band, which attaches it to the under surface of the liver, in front of the

transverse fissure. The band serves the purpose of affording an additional ligament to the stomach. It may extend forward for a considerable distance in front of the transverse fissure, and may involve the cystic duct and gall-bladder, and interfere with their normal functioning. Again, this band may extend over the pylorus and may attach and help to support the transverse colon.

"2. This fixation of the pylorus may result

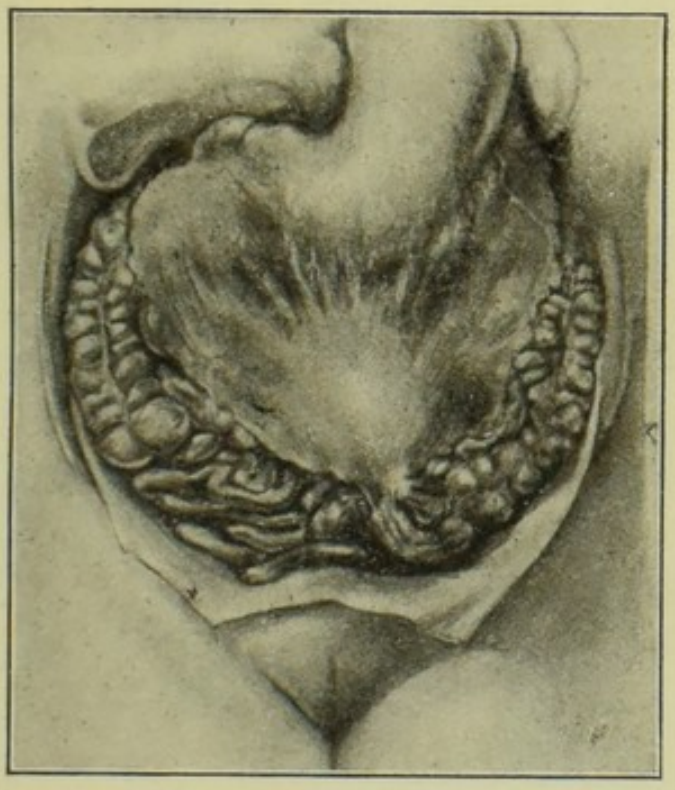

FIG. 4.—CASE IV. *Inflammatory Stasis.* E. V. P. Lipoma of omentum; adhesion of omentum to loop of sigmoid; traction upon sigmoid by omental lipoma, causing distinct kinking; chronic intestinal stasis.

in the production of a kink, which may be sufficient to interfere with the normal functioning of the stomach and duodenum. In consequence of this areas of engorgement of the mucous membrane arise in the front part of the duodenum or in the lesser curvature of the stomach. While the stress sustained at the point of engorgement is a primary factor the lower resistance power to the entry of microorganisms due to autointoxication, takes a large share in the production of the

inflammatory changes in the mucous membrane. These areas of abrasion later form ulcers which may after a time become affected by tuberculous, cancerous, or other infections. The ulcer of the duodenum rarely becomes malignant, probably because it so readily yields to treatment. For instance, the performance of a gastroenterostomy will almost certainly result in the healing of a duodenal ulcer, while its curative effect upon a gastric ulcer is often very doubtful. The varia-

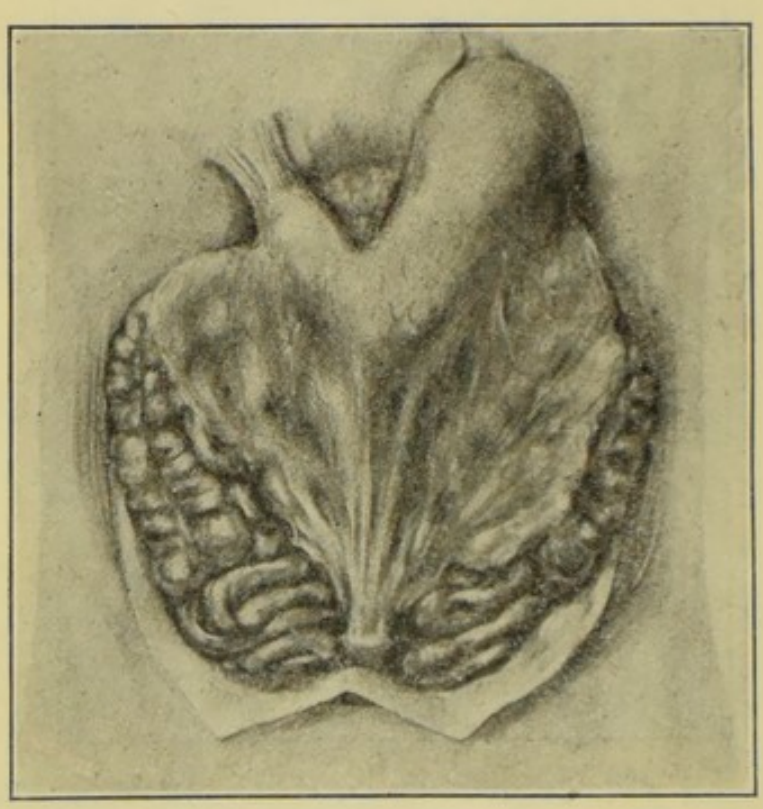

FIG. 5.—CASE V. *Inflammatory Stasis.* J. S. Adhesion of omentum to fundus uteri, making traction upon stomach, causing angulation at pylorus, resulting in marked gastric delay—relative partial pyloric stenosis.

tion in the locality of the ulcer in the two sexes would appear to be dependent on the difference in the nature of the strain consequent on the varying forms of the abdomen.

"3. There develops on the under surface of the mesentery of the last few inches of the small intestine a new band, which at first forms part of the under surface of the mesentery. Later it forms a ligament distinct from the mesentery. The liga-

ment contracts and deforms the ileum, producing a kink or obstruction of this portion of the intestines, especially in the erect posture of the trunk. In consequence of this kink the small intestine becomes very much dilated and this dilatation may extend up as far as the pylorus. The symptoms produced by this obstruction are superficially very much like those of appendicitis and in consequence

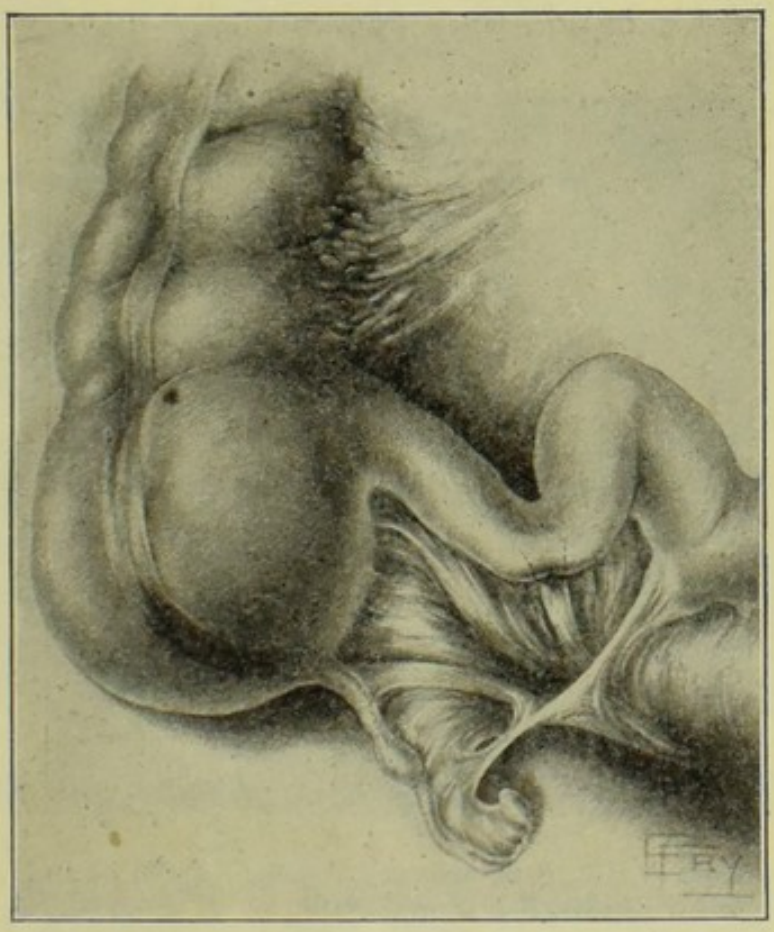

FIG. 6.—CASE VI. *Evolutionary Stasis.* E. O'R. Typical Lane's band, with kinking of terminal ileum; appendix adherent to band. Marked ileal stasis.

a large number of normal appendices have been removed to bring about the cure of symptoms resulting from this obstruction, needless to say, without any particular benefit or advantage to the patient. The symptoms produced by this type of obstruction are very definite and need not be mistaken for those which result from a kink in the appendix. This kinking of the appendix is frequently as-

sociated with the kinking of the ileum, since they are the result of the same cause, namely, the effort of nature to keep the cecum as much in its place and out of the pelvis as it can.

"4. Strong bands of peritoneal adhesions develop between the outer aspect of the cecum and ascending colon and adjacent abdominal wall with the object of holding up the cecum, which in the erect posture becomes overloaded with fluid contents. These bands may occasionally interfere with

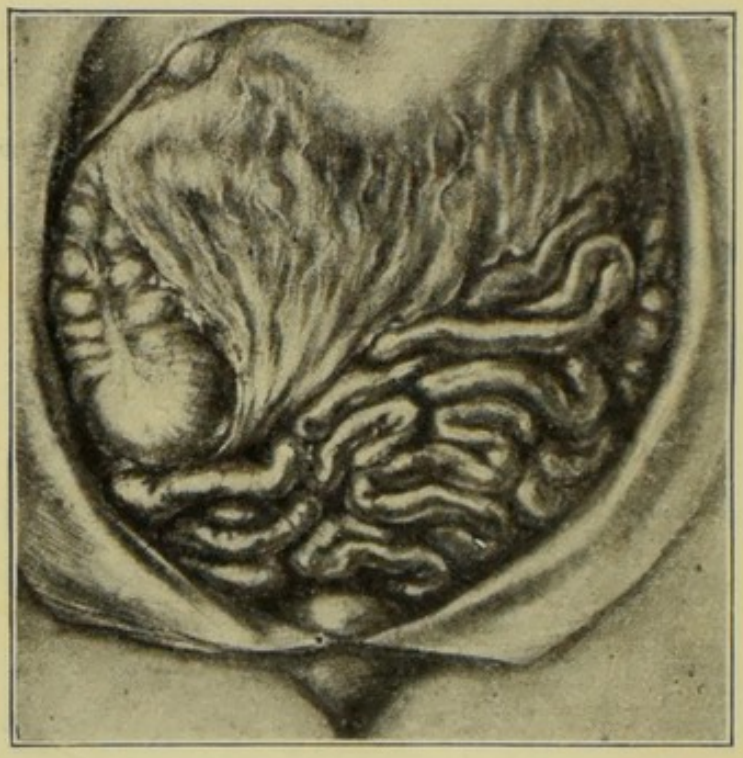

FIG. 7.—CASE VII. *Inflammatory Stasis.* T. M. Band of omentum, two inches wide, firmly adherent to mesoappendix, drawing stomach downward and to right; appendix, throughout its entire length, firmly adherent to cecum.

the evacuation of the cecum, by producing a kink. One of them not infrequently secures the appendix, which is made to form one of the ties or resistances opposing the downward displacement of the cecum. Unfortunately, the anchoring of the appendix spreads from its base and being hollow the strain upon a portion of the appendix may result in the occlusion of this tube, distal to the point of fixation, and in the formation of an obstruction. I believe

that the development of so-called appendicitis is almost always produced in this way. When the appendix is quite free, it is probable that the ileal kink is the cause of the symptoms.

"5. Both the hepatic and splenic flexures are drawn upwards, reducing the lumen of the bowel at these points and rendering the passage of feces difficult. In consequence, abrasion, ulceration, and cancerous and other infections are common in these situations.

"6. The kinking at these points is much exaggerated by the fall of the transverse colon. The

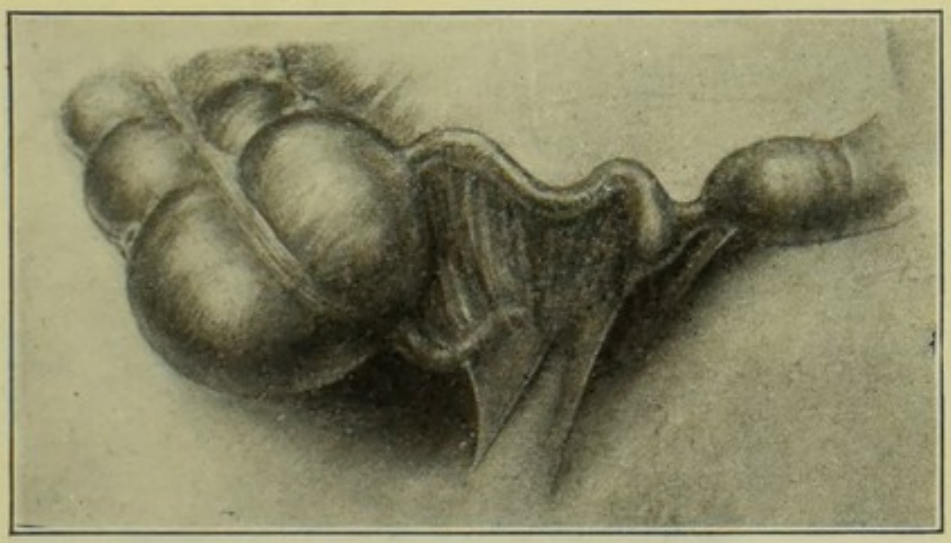

FIG. 8.—CASE VIII. *Evolutionary Stasis.* M. D. Typical broad Lane's band, with adherent appendix, mobile caput coli, and ileal stasis.

weight of the loaded transverse colon is distributed partly through the ligaments of these kinks and partly through the convexity of the stomach and through the newly developed ligament of the pylorus. When this last ligament extends to and secures the transverse colon, it may occlude its lumen materially at this point, rendering it a favorite locality for cancer. The under surface of the transverse mesocolon shows acquired bands similar to those which kink the end of the ileum.

"7. Nature attempts to keep the sigmoid loop filled with solid feces out of the true pelvis by the

formation of bands on the outer surface of the mesosigmoid. These by their contraction convert the mobile loop into a straight fixed tube. The lumen of this tube is subnormal, and its muscular coat is wasted because of its fixation. This fixation of the sigmoid renders the passage of solid feces through it difficult, and this difficulty is manifested as engorgement, abrasion, ulceration, or cancerous or other infection of the mucous membrane. Diverticula or foci of inflammation may develop. These again may become affected by cancer, tubercle, etc. Should the center of this loop escape

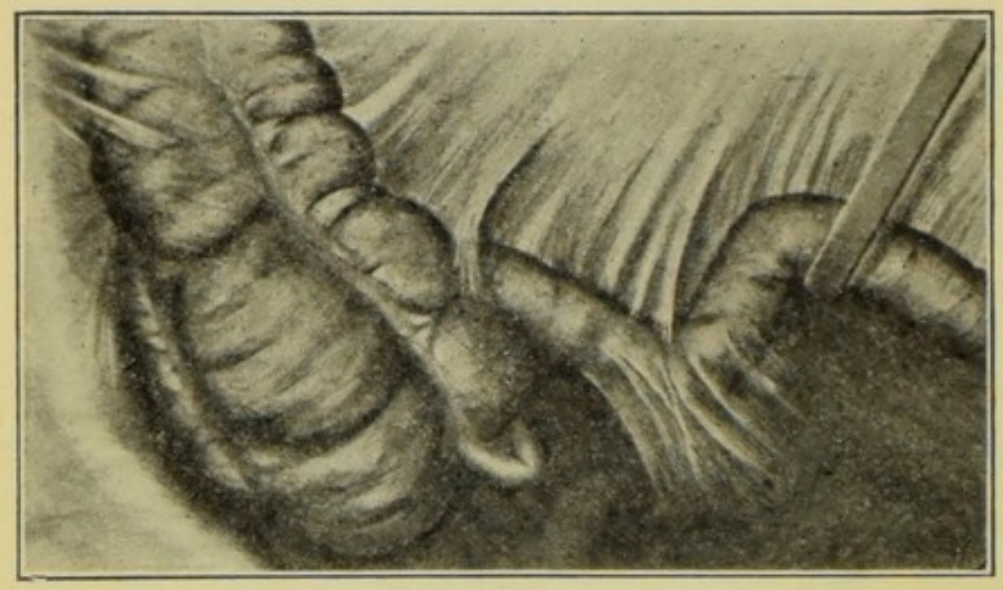

FIG. 9.—CASE IX. *Evolutionary Stasis.* V. B. Lane's band; potential kink; Jackson's membrane; ileal stasis.

from the grip of the newly formed bands, the extremities of this loop are approximated by their contraction when the loop itself becomes progressively dilated by the difficulty which arises in its evacuation so that a socalled volvulus results.

"8. The left ovary is frequently involved in the adhesions which bind down the lower portion of the sigmoid and the upper part of the rectum. The ovary becomes cystic in consequence of its fixation in the newly developed bands, later forming a tumor which for a time performs some of the functions so usefully performed by the preg-

nant uterus of raising the fallen viscera and overcoming obstruction.

"9. The condition of the rectum varies greatly. While in some cases the rectum is short and dilated, in others it is enormously elongated, so that it puddles as a long, loose tube in the true pelvis. This last condition renders the passage of solid feces through it very difficult, since any downward pressure, however great, is exerted at a marked mechanical disadvantage on the fecal contents. . . .

"10. Associated with intestinal stasis, there is a considerable ascent in the level of deleterious organisms in the small intestines with occasional infections of the biliary and pancreatic duct, producing gallstones, pancreatitis, and later cancer of these several structures."

Adhesions or "Evolutionary Bands."—Lane has repeatedly emphasized, and recently reiterated,[6] his contention that the apparent adhesions which result from the strain upon the mesentery and its attachments as a result of the dropping of the viscera are in no sense inflammatory adhesions, but are, on the contrary, merely thickened fibrous bands along the line of stress,—"evolutionary bands," as he chooses to call them. Many of those who accept Lane's theory in general see nothing unreasonable in this idea in particular. Others, however, while agreeing in some features, hold that his views in this regard are not tenable, according to anatomical, physiological, and clinical observation. It is not my purpose here to enter upon a discussion of the various theories concerning the etiology of the adhesive "veils," "webs," and "bands," noted by Lane and others. For those who are especially interested in this particular phase of the subject I append some of the more recent contributions to the literature of intestinal stasis. In a previous communication I gave a brief summary[7] of the literature of Lane's kinks and collateral matter up to May, 1912.

Classification of "Lane's Kinks" with Regard to Point of Occurrence.—Granting, then, the existence of what Lane designates as "evolutionary bands," and accepting the long-established fact that adhesions play a part in the production of varying degress of obstruction to the passage of gastrointestinal contents, we may review, categorically, the points of predilection, as demonstrated by Lane, for the formation of these bands, with the resulting kinks in the gastrointestinal tract:

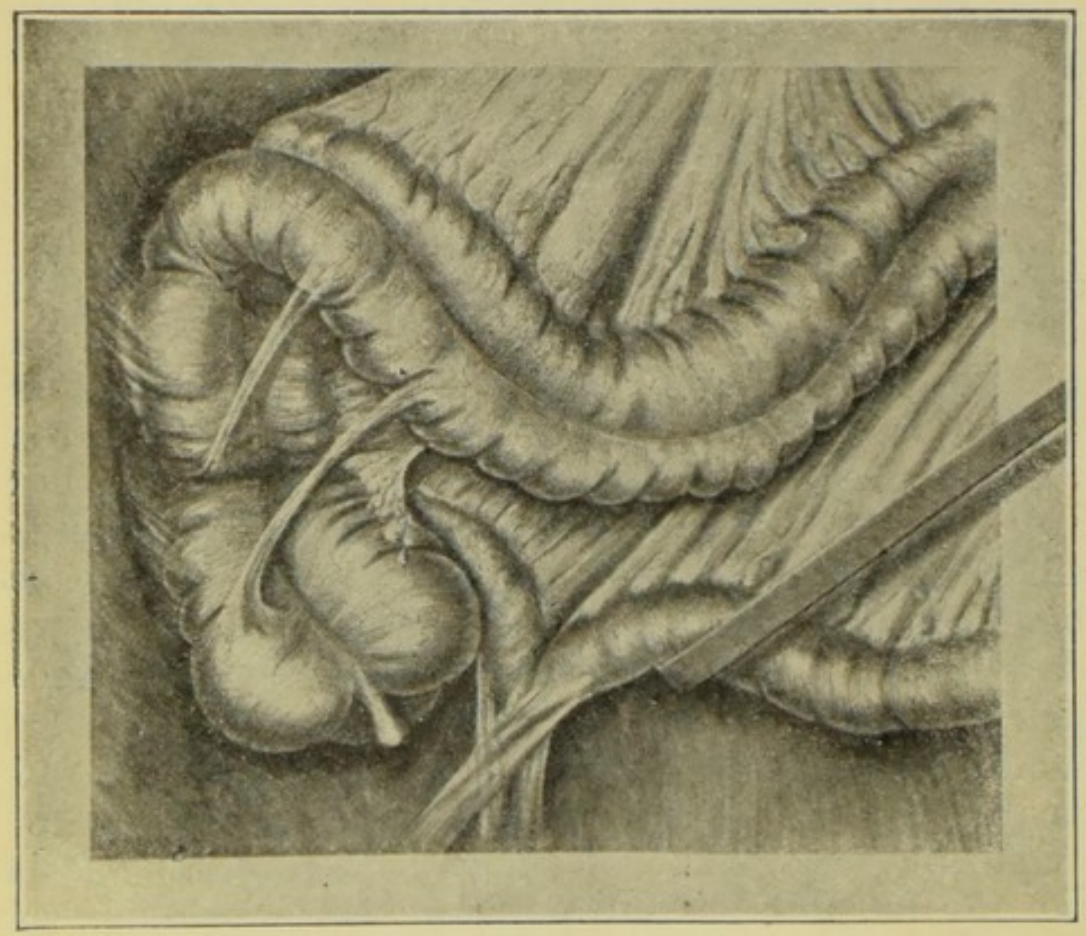

FIG. 10.—CASE X. *Inflammatory, superimposed upon Evolutionary Stasis.* W. S. L. Lane's band, with potential kink; prolapsed transverse colon, ascending colon, and sigmoid; Jonnesco's fold; Jackson's membrane. Three sets of firm fibrous bands, just below ileocecal valve, extend from ileum to right iliac fossa, one to right ovary.

1. Pyloric kinks, due to a band extending from the pyloric end of the stomach to the under surface of the liver, with angulation in the first portion of the duodenum.

2. Duodenal or duonedojejunal kinks, in the third part of the duodenum, at the commencement of the jejunum, due to the pull of an overloaded ileum, obstructed by an "ileal kink" at its termination.

3. Ileal kinks, at different points along the terminal coil of the ileum, usually with downward displacement and rotation inwards of the cecum, the result of nature's efforts to overcome the effects

FIG. 11.—See legend under Fig. 13.

of the strain caused by the ptosis of the organs.

4. Kink of the appendix, due to bands in the ileocecal region; or the appendix may be thickened and so attached as to form a suspensory ligament, when the patient is in the erect position, causing stasis of the ileum.

5. Kink of the hepatic flexure and first part of the transverse colon, usually due to the attachments of the gut to the kidney, to abdominal wall, or to the attachment, one to the other, of the two kinks of the flexure.

6. Kink of the splenic flexure, due to the strong costocolic ligament which holds this portion of the gut in place, despite the dropping of other parts, thus causing angulation when the transverse colon is ptotic.

7. Sigmoid kink, due to evolutionary adhesions fixing the sigmoid as it crosses the brim of the pelvis on the left side.

8. Kink of the rectum, not really a kink, but acting as one, in consequence of elongation of this

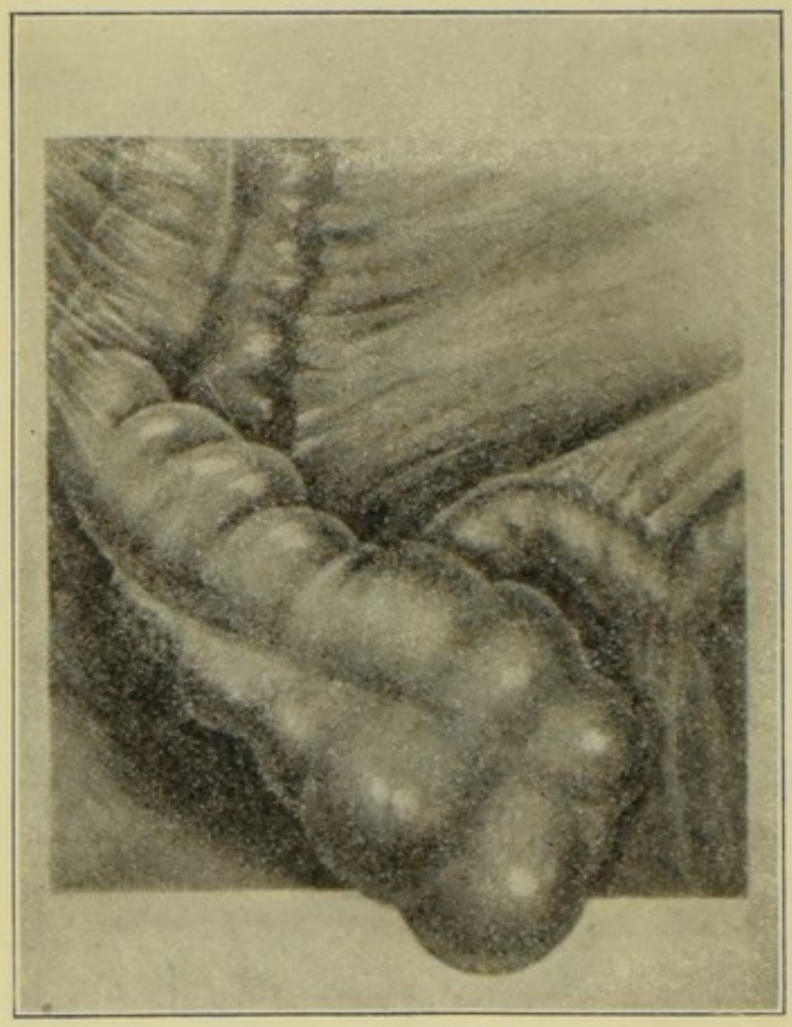

FIG. 12.—See legend under Fig. 13.

part of the tube through fixation of the upper portion of the sigmoid loop, while the remainder becomes free, joins the rectum, and thus forms a long, loose pipe, which occupies the true pelvis, af-

fording a marked obstacle to the passage of feces.*

Stasis.—The natural outcome of this kinking of any portion of the drainage tube is obstruction to the lumen of the intestine at the point of the kink, with "puddling" in the dependent portions, dam-

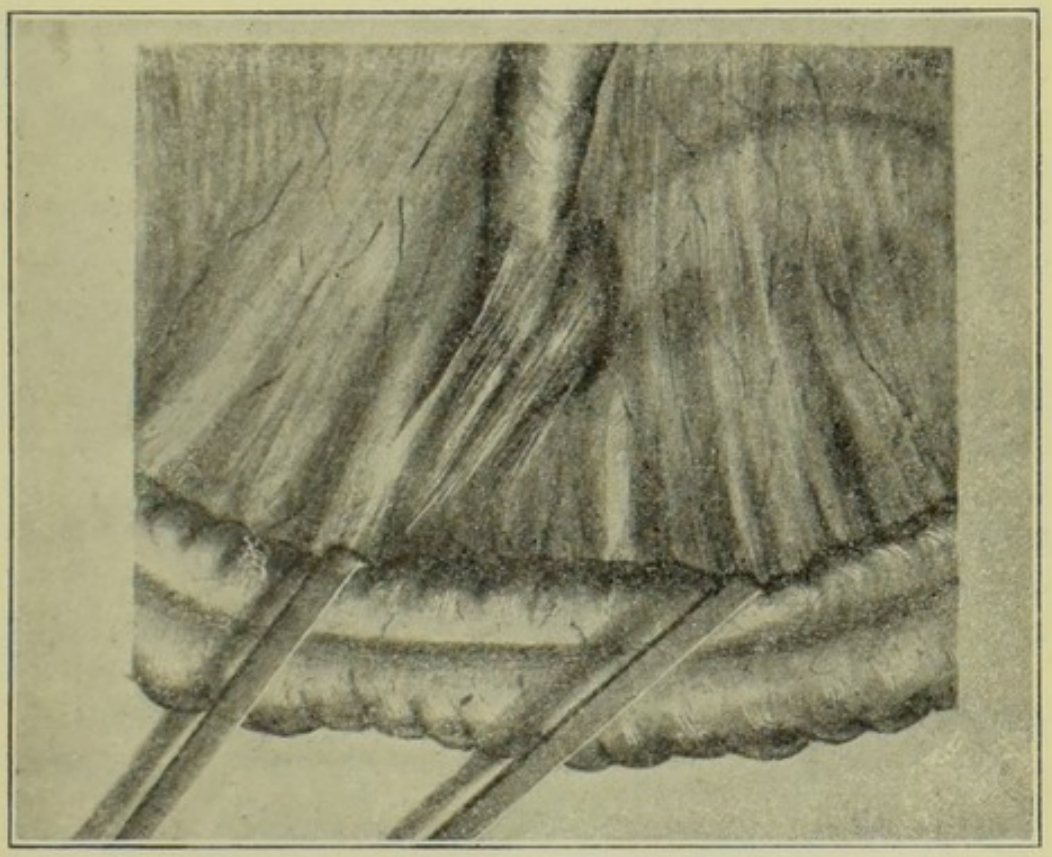

FIG. 13.—CASE XI. *Evolutionary Stasis.* H. B. Ulcer of stomarch; dilatation of duodenum; mobile cecum; Lane's band and kink; Jackson's membrane; duodenojejunal kink; adhesions between ovary, tube, and sigmoid

ming back and infection of the contents, and general slowing of the drainage of the canal. To this state of affairs Lane[8] has applied the term "chronic intestinal stasis," which he defines as follows:

*It may be noted that when the patient is in the erect position these fixed points in the intestine are above, or toward the upper part of the abdomen, while the sagging portions of the gut on either side are below. When the subject is lying down the exact reverse of this is true. When the patient is in the prone position there is a "potential kink"; when in the erect position, there is an "actual kink." This doubtless explains why, at operation, some surgeons are unable "to see the kinks."

"Such an abnormal delay in the passage of the intestinal contents through a portion or portions of the gastrointestinal tract as results in the absorption into the circulation of a greater quantity of toxic or poisonous materials than can be treated effectually by the organs whose function it is to convert them into products as innocuous as possible to the tissues of the body." This reabsorption and autointoxication, in Lane's opinion, lead to a general lowering of the resistance of the body and to the concomitant increase in susceptibility to various diseases.

Symptomatology.—The symptomatology of advanced stasis due to kinks of the intestine has been so admirably stated by Chapple[9] that I give it here as formulated by him. He reviewed fifty cases, in which he found the following constant set of symptoms: "(1) Headaches, which were severe and frequent. (2) Attacks of nausea, often followed by retching or actual vomiting. In some cases the vomiting was very frequent indeed and of a severe nature. It was very interesting to note that in several of the cases blood was frequently present in the vomit, and had led very able men to the diagnosis of gastric ulcer, although none such was found at the operation. (3) Loss of appetite was almost constantly present. (4) Loss of weight was present in all cases. (5) Markedly cold hands and feet, which gave an indication of a defective circulation. (6) Mental apathy. This was very definite in most cases. It was most marked in case XXX, who was in a state that was well described by her medical attendants as one of torpor. Many felt that death would be a welcome relief from their physical and mental misery, and two had actually attempted to bring about that end. (7) Constipation, which in all was persistent and its previous treatment had failed. One case had gone on several occasions for twenty-eight days without an action of her bowels in spite of treatment. (8)

A constant foul taste in the mouth, which was often accompanied by foul breath and carious teeth. The tongue was constantly furred. (9) Attacks of abdominal distention, which were accompanied by discomfort and relieved by eructation or the passage of flatus or an action of the bowels. (10) General muscular pain and a loss of freedom in the movement of the joints."

Physical examination, in Chapple's experience,

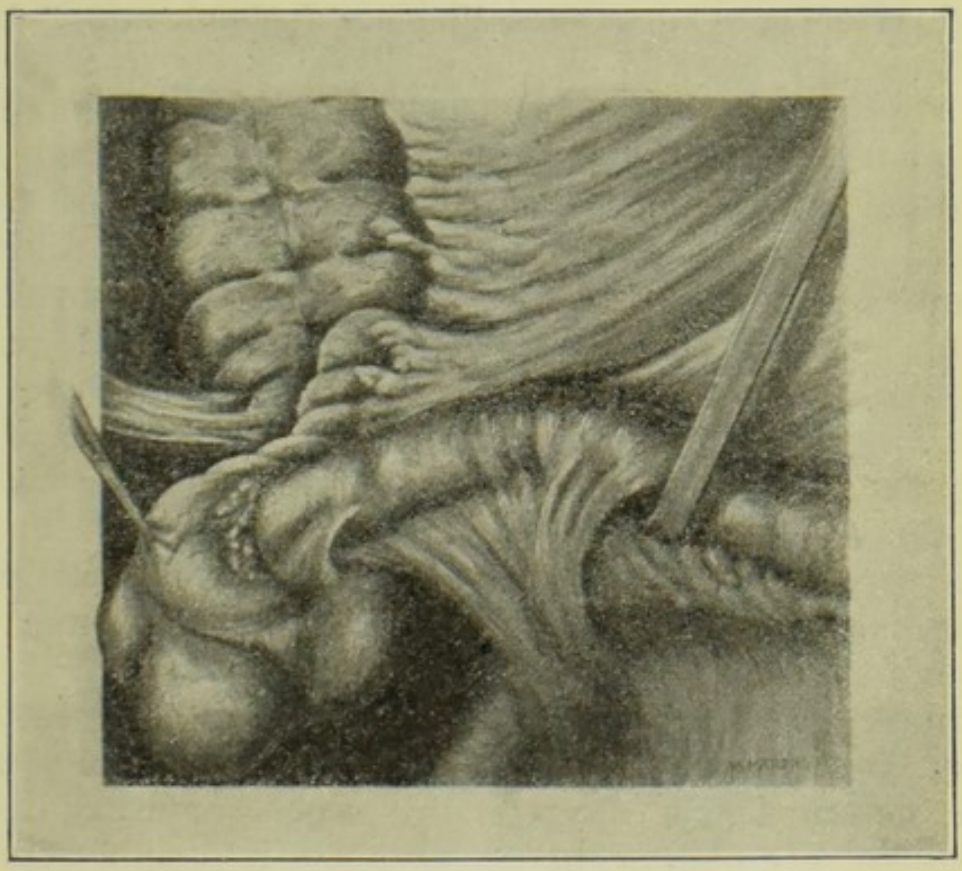

FIG. 14.—CASE XII. *Inflammatory and Evolutionary Stasis.* N. R. Mobile caput coli, with twist of ascending colon just below ileocecal valve. Typical Lane's band; ileal stasis.

which is corroborative of that of Lane and others who have studied stasis cases, revealed: (1) Skin staining, as a rule of a sallow brownish nature, associated with more definite localized patches, especially under the eyes, in the axillæ, and in the groins. (2) Breast changes, simulating, in the early stages, chronic mastitis, and in the later stages

cystic degeneration. (3) Abdominal tenderness over the areas of fixation.

Classification of Cases of Intestinal Stasis into Clinical Groups, According to Predominant Symptoms.—As the study of chronic intestinal stasis has proceeded, the cases have been classified according to the predominant symptoms. In a recent contribution Schlesinger,[10] who, as Mr. Lane's house-surgeon, Guy's Hospital, London, has had an ample opportunity of studying the cases before, during, and after operation, has classified them under the following types:

(1) Obstructive, usually regarded as having duodenal ulcer, a gastric growth, or what is known as "nervous dyspepsia." Patients of this class, usually males, complain of pain after taking food, immediately or after an interval, with relief after vomiting. Headache, cold hands and feet, pigmentation, and the usual "toxic" symptoms are present in varying degress. Such patients, according to Schlesinger, usually have thickened or spasmodic arteries, with consequent increase of blood pressure. The abdominal muscles are well developed. The point of pain, upon examination, to which such patients direct attention is over the duodenum. Tenderness to pressure in the iliac fossa. *x*-ray examination reveals a firmly fixed point in the ileum, and a dilated and hyperthrophied duodenum. He claims the patients are invariably completely cured by ileocolostomy.

(2) Toxic or suprarenal type, more generally found in women, is the type most commonly recognized. Constipation is generally present and often extreme. The group of symptoms diagnosticated as "toxic" overshadow the direct abdominal symptoms. These toxic symptoms are both subjective and objective. Mental depression, sometimes of a very marked degree, is the chief symptom. The pigmentation is marked in these cases, there are low blood pressure, cold and clammy hands and

feet, and general asthenia, suggestive of Addison's disease. Vomiting or severe retching is a fairly constant symptom. Profuse perspiration, of a disagreeable odor, headache, harsh and inelastic skin, cystic degeneration of the breast, and extensive pyorrhea alveolaris, are other symptoms noted by Schlesinger in this type of patients. Abdominal pain may not be complained of, but tenderness over

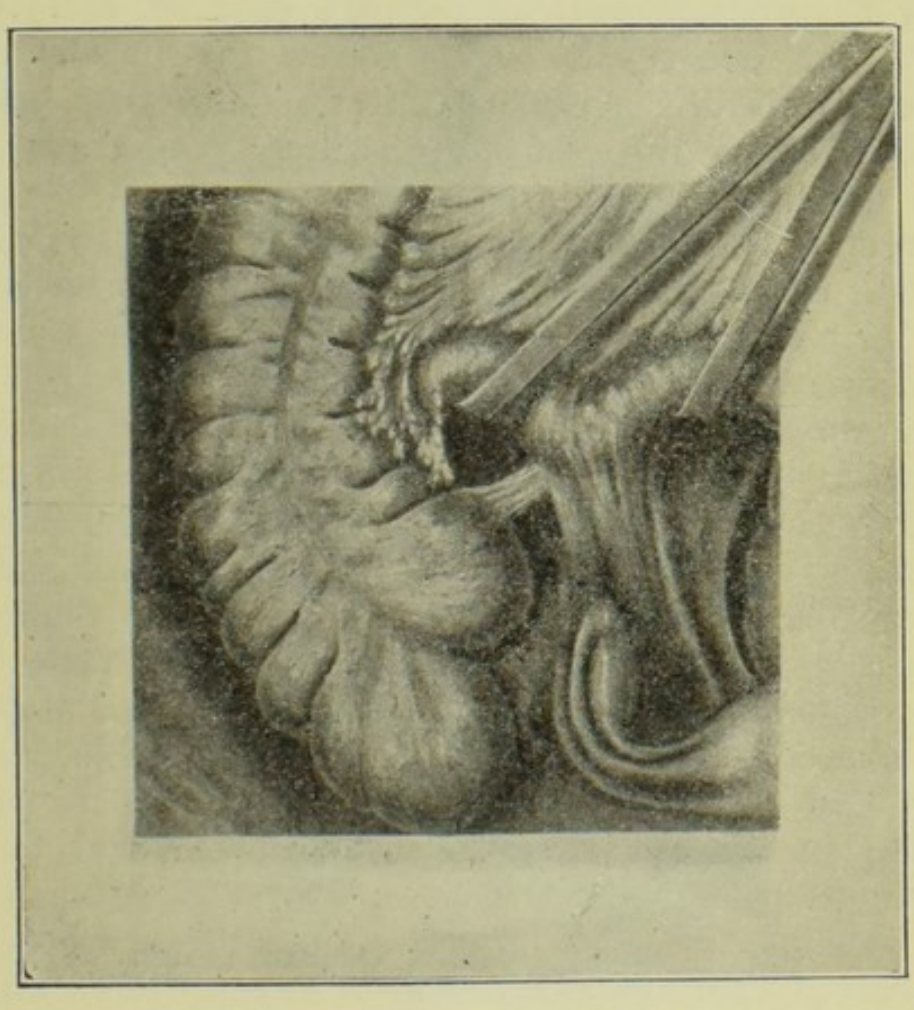

FIG. 15.—CASE XIII. *Evolutionary Stasis.* H. M. Mobile cecum; adhesion between Lane's band and cecum; adhesion between band and broad and infundibulopelvic ligaments. Ileal stasis.

the ileum and the sigmoid is elicited upon examination. The ovaries are often considered the source of trouble in these cases, and single or double oöphorectomy is not infrequently performed. "This is the extreme picture of this type of case," according to Schlesinger, "but all stages of the condition, from the patient who has occasional 'bilious at-

tacks,' through the various types of so-called indigestion, atonic constipation, neurosis, etc., can be recognized."

(3) Mixed type, including those patients who present a mixture of the symptoms of the "obstructive" type with those of the "toxic" type.

(4) End-result type, comprising a large group of cases (*e.g.*, intestinal cancer, gallstones, tuberculosis, rheumatoid arthritis, Still's disease, etc.), in which the end-result overshadows the underlying cause. This last group of cases, comprising, as it does, many of the conditions which have formerly been generally considered, and which are still considered by some, as the causative factor in the production of intestinal obstruction, brings us back to the "first horn of the dilemma" of interference with the flow of the contents of the drainage canal.

Diagnosis.—The diagnosis of "static" cases seems to have become, with Mr. Lane and his associates, almost a matter of that "imponderabilia" which amounts, practically, to what we call intuition. The symptom-complex is so well defined, once it is fully recognized and verified by repeated laparotomy, that the cases can be recognized almost at a glance. It is not to be inferred from this, however, that Mr. Lane or anyone else, no matter how skilful in diagnosis and expert in surgical technique, attempts to justify operating solely upon this snapshot picture. No patient should be subjected to laparotomy for the correction of presumptive kinks and chronic stasis until a careful physical examination has been reinforced by an equally careful radiographic study of the case. The *x*-ray readings must be checked up with the clinical findings, for it must be borne in mind that many twists and turns of intestine may be found which produce very little stasis.

The degree of obstruction, as well as the location of the obstructing kink, has been carefully studied by Mr. Lane, with the aid of the ex-

cellent radiographic work of Dr. Alfred C. Jordan, Medical Radiographer to Guy's Hospital.[11] The radiographic study of my cases has been made by means of a bismuth meal, from 4 to 6 ounces, of the subcarbonate of bismuth being given in milk, or with bread and milk, six hours before the first picture is taken. Pictures are then taken every hour for from six to twelve hours after the bismuth meal, one 24 hours thereafter, and then, according

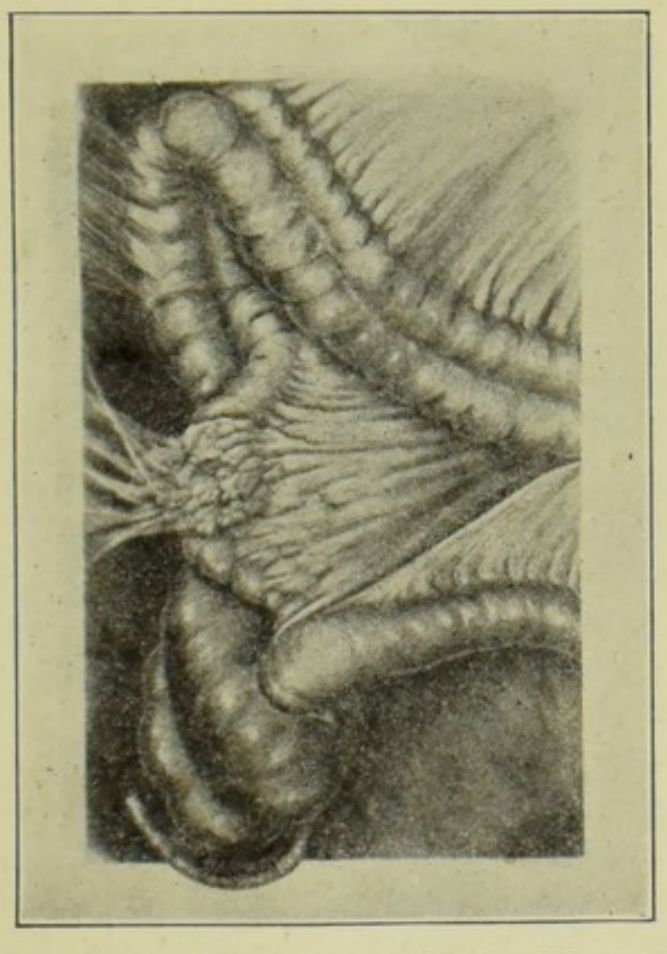

FIG. 16.—CASE XIV. *Inflammatory Stasis.* W. C. B. Adhesion between ascending mesocolon and abdominal wall. Marked ileal stasis, amounting almost to obstruction. Patulous ileocecal valve.

to the circumstances of the individual case. If, at the twenty-four-hour exposure, the results are not satisfactory, an injection of bismuth by rectum, with an immediate exposure, will sometimes demonstrate a kink which has not been shown by the other method. By using the screen and palpating the abdomen over the area being studied, the fixed

point or points can sometimes be demonstrated more clearly than by any other procedure. The rapidity of the passage of the bismuth through the canal has been found to vary widely. Jordan has called attention to the fact that the contents of the ileum pass along at a rate approaching two inches a minute, and that the bismuth meal begins to pass through the ileocecal valve within four hours. With an ordinary two-ounce meal, the entire quantity of bismuth is in the cecum and ascending colon at the end of six hours, in the average normal case. With a five or six ounce dose, some bismuth will be found in the lower end of the ileum after five, six, or eight hours in normal persons, according to Jordan's studies. He advocates, therefore, the five and six ounce doses, from which he has found no ill effects. It is important, of course to use a pure preparation of bismuth.

Classification of Cases from the Point of View of Treatment.—Having considered the cases of intestinal stasis with reference to the point of kinking, and with reference to the dominant features in the symptom-complex, we come now to the classification of cases with reference to treatment. For purposes of convenience the cases may be considered under the following types:

(1) Atonic or asthenic, in which there is general loss of muscular tone and nervous energy, with a slight degree of ptosis of the hollow viscera. In this class of cases there is usually a dropping over the brim of the pelvis of a loop of the ileum, causing increased resistance to the intestinal contents, or the duodenojejunal junction may be pulled upon and angulated. These are the milder forms of stasis, which may be easily corrected by abdominal supports, by tonic régime, by building up the nutrition, and by rest, until the tonus of muscles and nerves has returned.

In the treatment of this class of cases liquid paraffin has been found particularly useful. Mr.

Lane,[12] in calling attention to this agent in the treatment of intestinal stasis, says: "It is a curious thing that while paraffin has only very recently been employed for this purpose by the medical man, it has been in use for time immemorial among miners and savage races for the treatment of almost any known disorder. Just how paraffin acts is not perfectly clear. In animals it destroys the worms that infest the intestinal tract, and such parasites as live on their skin. The eggs of *Ascaris lumbri-*

FIG. 17.—CASE XV. *Evolutionary Stasis.* J. F. Typical Lane's band and kink; ileal stasis.

coides, which will go on dividing in glacial acetic acid, when placed in paraffin die, and no division takes place; and skin mycosis in a large bird, which resisted treatment with iodine, has been cured by daily applications of paraffin forcibly rubbed in. It also cures the dysenteric conditions to which animals are so liable, especially in captivity. Yet paraffin is apparently perfectly innocuous to the human subject, and loses none of its bulk in its passage through the intestinal tract." Liquid paraffin (oleum mineralis Russicum), is not mentioned in the National Standard Dispensatory (U. S. A.),

edition of 1909.* In the British Pharmacopeia, last edition, it is described as a colorless, thick, oily liquid, practically tasteless and odorless. Finnemore[13] calls attention to the fact that there are two varieties of liquid paraffin on the market at the present time, in addition to the pharmacopeal one. "It is prescribed," he says, "in the pure form in doses of half to one fluid ounce two or three times a day. The smaller quantity once a day is often sufficient for patients not confined to bed. Although it has practically no taste, and most patients do not object to it, yet it is not pleasant to swallow this large amount of thick, oily liquid, and it is improved by flavoring with one minim to each ounce of one of the volatile oils, such as bitter almond, anise, cinnamon, cloves, lemon, or peppermint. For those patients who find it unpleasant to take on account of its oily nature, it is a good plan to prescribe it in the form of an emulsion, which appears to the writer to have the very decided advantage, that although it is as thick as the paraffin it can be diluted with water before taking to make a thin preparation which can be taken without the slightest discomfort."

(2) Misplaced appendix. Sometimes in connection with the condition known as "cecum mobile," described by Houssmann, in 1904, by Wilms, in 1908, and referred to in connection with intestinal stasis by Coffey and others, there may be displacement and kinking of the appendix, which acts as a ligament, twisting the mobile cecum or pulling it downwards, and with it the ileocecal valve. In some instances the ileum is drawn downward below the cecum, causing a kink above. In cases where the appendix is only slightly misplaced, and the consequent kinking is of a minor degree, removal of the appendix and correction of the kink will relieve

*Efforts are being made to secure a pure and refined paraffin in this country. This should be demanded, as druggists are prone to substitute another preparation.

the resulting stasis. Before the subject of intestinal stasis was cleared up by Lane, cases of this class, which are accompanied by symptoms of appendicitis, were considered as appendicitis cases, and were operated upon accordingly. The appendix was found to be only slightly diseased but its results were successful out of all proportion to the lesion. In the severer types of this class of cases, disappointment followed removal of the appendix. Mayo,[14] in calling attention to these cases, says, "For a number of years past, in dealing with intestinal stasis believed to be due to a diseased con-

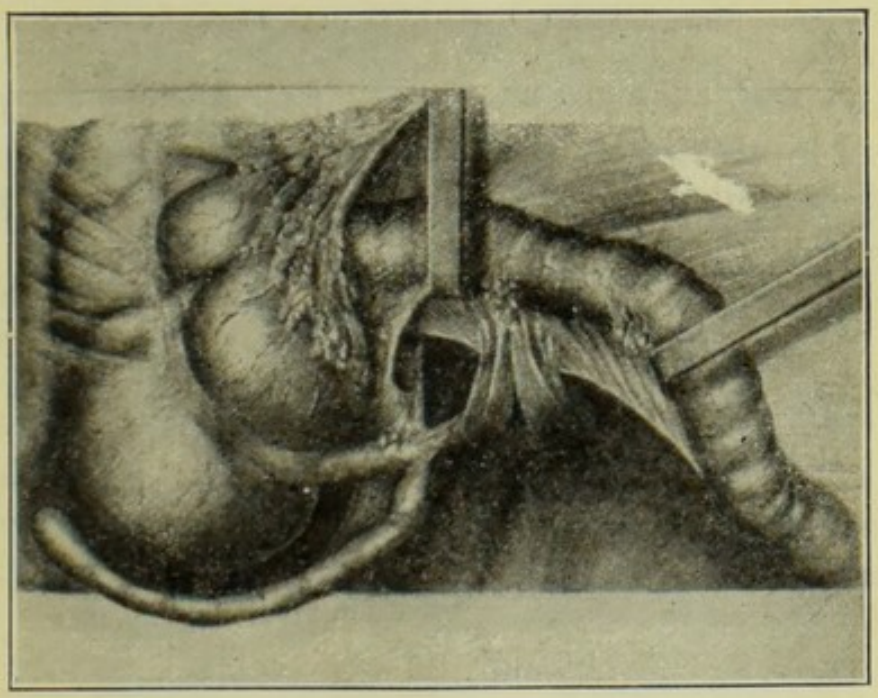

FIG. 18.—CASE XVI. *Evolutionary Stasis.* M. D. Angulation of appendix by ileal band; ileal kink; ileal stasis.

dition of the appendix, in which the seriousness yet obscurity of the symptoms required a larger incision for exploration than was usually made for the removal of the appendix when it was unmistakably diseased, and the symptoms more definite, we have at times noted a definite kink of the ileum within three inches of the ileocecal valve. However, the frequency with which the condition was seen in certain cases did not occur to us until a few years ago, when our attention was personally called to it

by Arbuthnot Lane." Coffey[15] reports having called in a number of his previously operated appendix cases and having cured them by cutting the evolutionary band which formed with the dropping down of the ileum, and placing purse-string sutures in the upper leaf of the mesentery of the ileum, thus shortening it by plication.

(3) Ileal kink, from evolutionary bands about the ileum—"crystallization of lines of strain," as Lane calls them. These kinks may occur at different points along the terminal coil of the ileum, and may be due to the development of bands along the line of the strain induced by visceroptosis, independently of misplacement or kinking of the appendix, described under (2). The milder degrees of ileal kink may be corrected by simply cutting the adhesive bands, taking care to cut one way and sew up another, in such way as to lengthen. In the form with broad bands, however, it may be necessary to divide the ileum, inserting it directly into the pelvic colon or rectum obliquely by an end-to-side anastomosis (ileocolostomy or ileoproctostomy). After the anastomosis has been made, a running suture is placed in the peritoneum intervening between the large and small bowel, and the space obliterated. Broad bands, when cut, leave raw surfaces which, if not covered, invite the formation of adhesions. These raw surfaces may be covered with peritoneum, as indicated, or by a piece of omentum. I am now testing the efficacy of the latter method. A piece of omentum is detached and split, the raw surface being covered over with one layer.

(4) Kinking of duodenojejunal junction, usually secondary to ileal stasis. Evolutionary bands in this region may cause marked kinking, with secondary effects in the duodenum, the first part of which becomes distended. The second and third parts, which are under the peritoneum, are not much affected. Adhesions may form about the pylorus,

giving rise to obstruction, which may lead to the mistake of interpreting the *x*-ray findings, reading into them "cancer of the pylorus," with the prognostication of impending death for the patient. The kink at the duodenojejunal junction can be corrected by cutting one way and sewing the other, or the loop of jejunum may be placed in the position of gastroenterostomy, held by several stitches of silk or linen. A gentle curve is thus made and the sharp

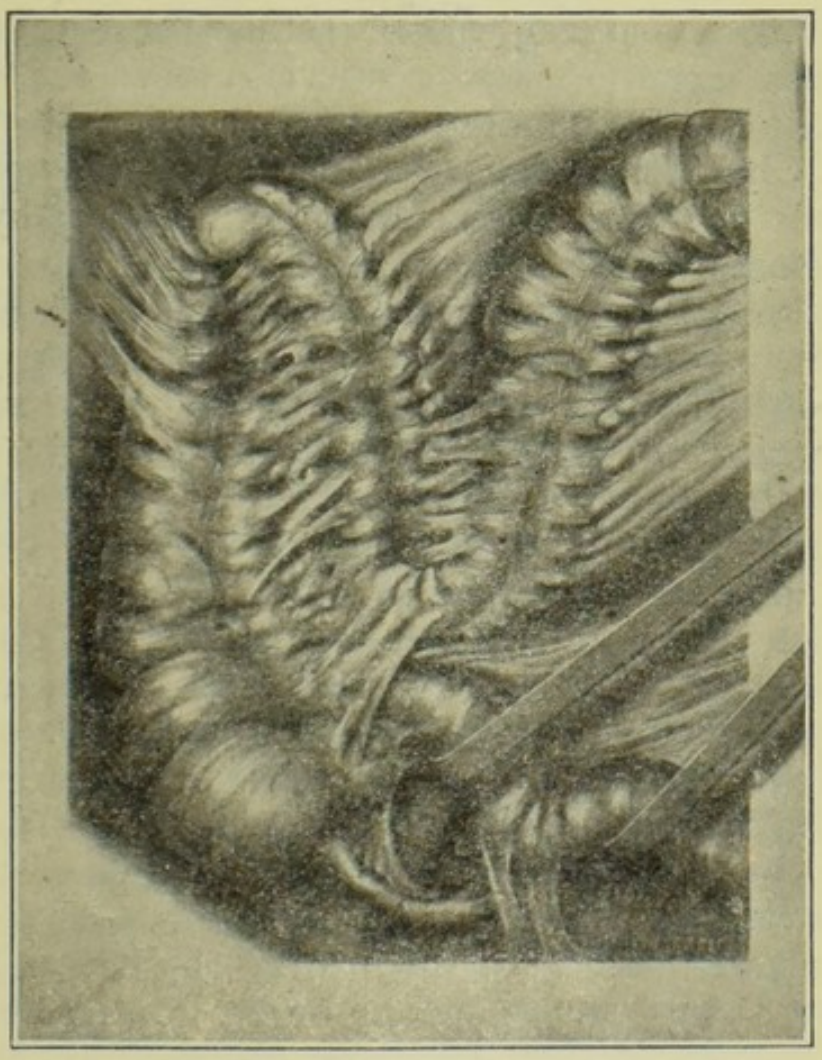

FIG. 19.—CASE XVII. *Inflammatory Superimposed upon Evolutionary Stasis.* S. F. Lane's band; ileal kink. Adhesion between ascending and transverse colon.

angle obliterated. In some of these cases it may be necessary to resort to ileocolostomy, as described by Lane. Raw surfaces are always to be turned in to prevent the formation of inflammatory adhesions.

(5) Changes at the hepatic and splenic flexures of the colon, often with the formation of adhesions. In mild cases, with prolapse of the colon, Coffey's[16] omentopexy operation may be employed. In the presence of more marked adhesions, with disease of the transverse colon, the question of colectomy may be considered. Other attempts at correction may be made before this radical procedure is employed. Kinking at the hepatic and splenic flexures, it may be said in passing, transforms these round turns into sharp angles, subjecting these areas to increased irritation, and rendering more liable the production here of malignant disease.

(6) Changes at the sigmoid loop.* Sometimes the ends of the loop are brought together by the evolutionary bands. These bands may extend from the peritoneum external to the mesosigmoid, shortening it up, until, as Lane has pointed out, the mobile loop of bowel is replaced by a short, straight tube, which crosses the iliac fossa obliquely, with only a partial peritoneal covering. Lane calls attention to the observation that this type of change exists apparently without exception in tuberculous subjects. In some of these individuals the portion of mobile gut which intervenes between the upper fixed portion of the sigmoid loop and the portion of the rectum which has no peritoneal covering, is exceedingly long. This fact renders it possible to insert the ileum into the mobile loop, close to its termination. "Never put the ileum into the large bowel above the level of the brim of the true pelvis," cautions Lane, "since the communication is then affected above the last kink, or obstruction, which, curiously, is one of the earliest to develop." Anastomosis should be between the ileum and the beginning of the pelvic colon.

*It may be noted that in the newer British textbooks on anatomy the term "sigmoid" is not employed, the portions of the colon being designated as "descending," "iliac," "pelvic," colon, and rectum.

(7) Extreme cases, with diverticulitis, many bands, and much persistent pain. Exsection of the large bowel is indicated.

(8) Various kinds of adhesions of an inflammatory and noninflammatory nature. Remove the adhesions and cover over the raw surfaces.

Treatment. Preparation for Operation.—Preparation for the radical treatment of chronic intestinal stasis is instituted 48 hours before the time of operation. An ounce or two of castor oil is given eight or ten hours before operation. Three or four enemas are given, Mr. Lane, as a rule, using treacle for the purpose, others preferring the ordinary soap enema. Nothing is administered by mouth except beef tea and brandy and water. Saline hypodermoclysis into the axillæ is begun with the anesthetic and continued throughout the operation. One quart to three pints of saline solution under each breast, in prolonged operations, sustains the patient, keeps up the blood pressure, and prevents shock. Sterile glucose or dextrose, one-half ounce to the pint of physiological saline solution may be injected under each breast.

Surgical Technique.—For the benefit of those who happen not to be familiar with the technique of the more important operative procedures concerned in the correction of intestinal kinks and the eradication of chronic intestinal stasis, the technique of the two operations advocated by Lane is given: (1) Ileocolostomy (Lane's "shortcircuiting" operation). (2) Colectomy.

Anesthesia.—It is particularly important in these cases that perfect muscular relaxation be maintained throughout, that absolute quiet on the part of the patient be insured, and that postoperative vomiting be avoided. For these reasons, I prefer to operate under the essence of orange-ether sequence, as originated and practised so successfully by Gwathmey. As a routine practice, I dilate the

sphincter ani after the operation, thus insuring freer escape of gas and other intestinal contents.

Ileocolostomy.—The abdomen is opened through the left rectus, or in the median line. The viscera are subjected to careful examination, in order to determine the location and degree of obstruction. The lowest point of obstruction is located. The ileum is divided slightly obliquely, encroaching upon the convexity; the distal end is invaginated by a purse-string suture, and the proximal end is implanted into the lowest accessible portion of the ileopelvic colon. Above this point the sigmoid is kinked. When this step of the operation is completed, a full-sized esophageal tube is introduced through the anus, up through this anastomotic juncture. It is fixed in position by a suture through the perineum. In passing the tube beyond the junction any difficulty which may be encountered is obviated by using a Higginson enema syringe, one end of which is attached to the tube, while the other is placed in a bowl of liquid paraffin. By a few squeezes of the syringe bulb, a small amount is forced up into the bowel. The tube is thus easily passed beyond the junction.

Colectomy.—If the symptoms are of sufficient severity or chronicity, or if they are recurrent after the performance of ileocolostomy, it becomes necessary to resort to the more radical procedure of resection of the colon up to the point of anastomosis of the ileum with the colon. The mesocolon is ligated and divided. The ileum is divided near the cecum and the end toward the large intestine—the distal end—is invaginated; the proximal end is implanted into the pelvic colon by a slightly oblique anastomosis.

After-treatment.—If the tube does not drain properly at the end of twelve hours, six or eight ounces of liquid paraffin may be passed in. For the first twelve hours brandy and water, or champagne, may be given, and the usual diet gradually instituted.

Morphine may be exhibited freely after the operation if there is much pain. An ounce of liquid paraffin is administered, by mouth, three times a day, as long as may be necessary. The patient is placed in the Fowler position for several days and then let down gradually. The stitches holding the tube in place are cut on the fifth day, and the tube is removed on the sixth day. The tube usually drains between twelve and twenty-nine ounces in the twenty-four hours. It should be borne in mind that, in these cases, a tendency to infection in the wound may be noted about the tenth day after operation. This is not due to external infection, but to the action of the colon bacillus, which, it has been shown, can burrow its way through the intestinal wall, without an opening.

In several cases in which gastroenterostomy was performed for pyloric obstruction secondary to intestinal stasis, a pure growth of *Bacillus coli communis* was cultivated from the contents of the stomach and duodenum, thus showing the existence of an ascending infection in these cases. In this connection it is interesting to note that examination, made by Dr. J. W. H. Eyre, of London (observations not yet published),* of the bodies of forty patients, dead of accident, showed the duodenum to be sterile.

Prognosis.—The prognosis must be modified, of necessity, in accordance with the conditions found in the individual case. In the vast majority of the milder forms of kinking and stasis, in whatever portion of the gastrointestinal tract, the simpler surgical procedures will prove effectual. In many of these types the non-surgical measures to which reference has already been made, will restore the normal relations of the abdominal viscera, allowing the unimpeded onward passage of the gastrointestinal contents, and thus relieving the stasis and its concomitant symptoms. When the more radical measures are indicated, the prognosis must be con-

sidered from the point of view (1) of the operation itself, and (2) of the relief of the condition to be remedied. Chapple and Mullins collected the histories of sixteen operations at Guy's Hospital between June, 1909, and June, 1910, with one death. This was due to the bursting of an abscess from the abdominal wall into the peritoneum seven days after the operation. With reference to the results, Chapple [9] makes the following statement: "I do not wish to convey the impression that all these patients have been restored to a condition of perfect health. In a large number this has been done. This list includes many of the earliest cases, and this brilliant piece of work has been carried out on material that might well be described as wreckage. Even a casual glance at the patients and their stories shows the nature of the conditions that had been dealt with, and we must not forget that all other treatment had hopelessly failed. Speaking generally, I take it that the object of any surgical procedure is to render the individual more efficient, and to what extent success has been attained in these cases must be obvious to all. One has only to see these patients to realize how good the results really are."

Cases.

In the vast majority of instances, unless there is a congenital defect, the conditions described are preventable and should not be allowed to progress to the degree which calls for operative interference. A more intelligent understanding of the importance of exercise, of proper hygienic régime, of position, and of adequate support to the abdominal organs, will do much toward obviating the lodging of large quantities of material at given points in the intestinal canal. With this accomplished, chronic intestinal stasis will be forestalled. It is for this reason that Mr. Lane's brilliant pioneer work deserves the most widespread and careful consideration.

Whatever may be their cause, the conditions described by Mr. Lane do exist, as I have been able to demonstrate in a large number of cases. The accompanying pictures, reproduced from drawings made at the operating table, with brief historical data of the actual conditions found, are selected from the number merely for the purpose of demonstrating various types of adhesions, "evolutionary bands," and membranes, found upon examination of the abdominal contents by laparotomy. No attempt is made to give detailed histories of the cases, to outline the surgical procedure, or to trace the results. It may be said, however, that in all cases in which the length of time has been sufficient to warrant an opinion, the symptoms, as a rule, have been relieved; in some, absolute cure has resulted. At a later date I shall present a large series of cases, with accurately collated data concerning each.

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