ADHESIONS AND CONSTRICTIONS OF THE BOWEL: THEIR DEMONSTRATION AND CLINICAL SIGNIFICANCE*

G. E. PFAHLER, M.D.
PHILADELPHIA

The importance of adhesions and constrictions of the bowel is being emphasized by the large number of writers on this subject. Throughout the medical world surgeons, roentgenologists and internists are realizing that many of the obscure abdominal symptoms, usually of a chronic nature, may be explained by the recognition and demonstration of adhesions or constrictions of the bowel.

Judged by the frequency with which Virchow found these adhesions, one must conclude that they are present often without producing symptoms, but that when symptoms are present and no satisfactory cause can be found, the possibility of adhesions or constrictions of the bowel must be carefully investigated.

The frequency of the adhesions has been further emphasized by the recent investigation of Mollison and Cameron¹¹ in fifty consecutive autopsies at Guy's Hospital, the age of the subjects varying from 3 weeks to 68 years, cases of generalized peritonitis being excluded from the series. They found that peritoneal adhesions were present in all adults and older children, and in eleven of the seventeen children under 5 years, including one of 3 weeks, they were more numerous, stronger and denser in adults than in children and in the six fetuses examined adhesions were entirely absent. They were sometimes found around the pylorus and gall-bladder, but more frequently in connection with the large intestine. The small intestine was never involved, with the exception of the last few inches of the ileum. Adhesions were frequently found in connection with the cecum, but only twice with the appendix. In fourteen cases there were well-marked bands passing from the ascending colon to the transverse colon, so as to fix the flexure at a very acute angle. Otherwise the transverse colon was generally free from adhesions, which were also infrequently in the splenic flexure and in the descending colon. The iliac and the pelvic colon were sometimes the seat of dense adhesions, but less often than the cecum and ascending colon.

My observations with the x-ray correspond roughly with the relative frequency in the respective locations described by Mollison and Cameron,¹¹ except that the evidences of adhesions were more frequently seen or recognized about the duodenum and gall-bladder regions, and in the colon the most frequent seat of stagnation or fecal retention has been in the cecum and ascending colon. On the other hand, Hertz¹² says: "With the x-ray I have rarely found even in the severest cases of constipation any prolonged stagnation in the passage of the intestinal contents before the middle of the transverse colon is reached." I cannot explain this difference in our findings.

CONSTRICTIONS DEMONSTRABLE BY ROENTGEN RAY.

The value of the Roentgen rays for the demonstration of the effect of adhesions and constrictions of the bowels

is being recognized more and more each day. With the increase of skill I feel that in all cases in which adhesions or constrictions give rise to symptoms the Roentgen-ray method should serve to demonstrate them.

Adhesions can be demonstrated by means of the Roentgen rays when they cause distortion, displacement, constriction or immobility of sections of the bowel. These adhesions may be benign or malignant. A general survey of the patient's history and other clinical evidence in conjunction with the Roentgen-ray findings will usually serve to differentiate. In some cases the Roentgen-ray evidence alone is practically conclusive.

Constrictions of the bowel may be temporary or permanent. The temporary constrictions may be spasmodic or due to kinks, intussusception, volvulus or pressure effects of loops filled with gas.

The permanent constrictions are due to adhesions or malignant growths.

In general, their effects are recognized by the administration of bismuth mixtures by mouth or by rectum, and the patient then studied both fluoroscopically and radiographically. Repeated examinations and examinations in several positions are usually necessary to avoid errors. The temporary constrictions may or may not be present at the time of the examinations, but if present they can be demonstrated. At least in most cases the conditions which would lead to temporary constrictions can be shown even in the absence of actual constrictions, such as malpositions, abnormal loops of the bowel, excessive length and mobility. The effects of such constrictions may at times be shown by local dilatations. Colonic dilatation is more apt to be shown by injections by rectum than by food given by mouth. In fact, I believe that excessive dilatation of the colon will not be shown by bismuth food followed from the mouth so long as the muscular tone remains good.

The temporary constrictions are more apt to be complete and very badly defined, while the permanent ones are seldom complete and extend over a larger area.

All of the various types or causes of constriction of the bowel have been demonstrated, roentgenologically, by myself, and most of them have been reported on by others, particularly Rieder,¹³ Haenisch,¹⁴ Koehler,¹⁵ Hertz,¹² Groedel,¹⁶ Stierlin,¹⁷ Grashey and Bruggels.

In the small bowels, the three locations in which constrictions and adhesions are most likely to occur are in the first portion of the duodenum, at the terminal portion of the duodenum and at the terminal portion of the ileum. I have been struck particularly by the frequency with which I have been able to demonstrate the effects of duodenal adhesions in the gall-bladder regions. They were clearly shown in at least seventy patients who were sent for examination. So far as I have learned only sixteen of these patients have been operated on, but in every instance the adhesions were present. In these cases, the hepatic flexure of the colon was also frequently involved, as diagnosed by the x-rays, and at times other organs. At times the adhesions were found to be very slight, while in others they were quite firm. The accuracy with which they have been recognized makes this means of diagnosis most important. The details

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* Because of lack of space this article is slightly abbreviated in THE JOURNAL. The complete article appears in the Transactions of the Section.

11. Mollison and Cameron: Guy's Hospital Reports, 1908, lxii, 143. Ref. Hertz.

12. Hertz: Constipation and Allied Intestinal Disorders, London, 1909.

13. Rieder: München. med. Wehnschr., 1906, III, Fortschr. a.d. Geb. d. Röntgenstrahlen, x, No. 4, p. 207.

14. Haenisch: München. med. Wehnschr., 1911, No. 45.

15. Koehler: Lexikon der Grenzen des pathologischen und Röntgenbildes, Hamburg, 1910, 104.

16. Groedel: Atlas und Grundriss der Röntgendiagnostik in inneren Medizin, München, 1909, 218.

17. Stierlin: München. med. Wehnschr., No. 36, 1911.

of this examination and the errors to be avoided have been published previously in *THE JOURNAL*.¹⁸

The chief evidences of these adhesions, as first described by Schurmeyer¹⁹ and confirmed by myself, are a retraction of the duodenum and pylorus upward and to the right, in the gall-bladder region or the under surface of the liver, and at times constrictions and dilations of segments of the duodenum. The chief symptoms associated with this condition are those which suggest gall-bladder or duodenal disease (in several cases duodenal ulcers and in a few gall-stones or definite gall-bladder disease was found to be associated). Pain, often of a burning nature, in the epigastrium and extending to the gall-bladder region or at times to the left, is a common symptom. It usually occurs only at intervals, and when present is felt particularly several hours after a meal. I believe that it is most likely to be present at the time when there is an associated inflammation of the duodenum or gall-bladder, and during the times when gastric peristalsis is most active. Tenderness over the gall-bladder region and in the epigastrium is common.

The constrictions at the terminal portion of the duodenum as described by Jordan,²⁰ I have seen only three times. This is a kink produced by the terminal attachment of the duodenum, occurs particularly in connection with exhausted or enfeebled states, or associated with duodenal disease and is recognized by the distention of the duodenum with the bismuth mixture as it passes through. It is usually a temporary constriction and may be missed during an examination.

"Lane's kink," or a constriction in the terminal portion of the ileum, I have recognized only a few times. This is difficult because in this class of cases there is so much overlapping of the small and large bowel. It can, however, be shown by separating the folds of the bowel (protected) by fluoroscopic palpation or by change of posture (knee-chest or Trendelenburg), which will separate the overlying folds and show the distention on one side of the kink. It can be shown at times by following food from the mouth and examining six hours after its administration. At times a distention of the terminal ileum is seen twenty-four hours after the bismuth meal. On one occasion I recognized it by the passage of a bismuth enema through the ileocecal valve to the "kink," which was located 3 inches from the valve. I believe that with increased skill we should recognize most of these, when they are sufficient to give rise to symptoms.

The constrictions of the colon are most liable to occur at the hepatic, splenic and sigmoid flexures, though they may occur anywhere. Carcinomas are especially apt to occur at the sigmoid flexure, cecum and rectum. The permanent constrictions, such as are produced by new growths and adhesions, are best recognized by the technic described by Haenisch,¹⁴ by which one watches fluoroscopically a bismuth mixture (bismuth subcarbonate 75 gm., kaolin 300 gm., water 1,000 c.c.) flow into the large bowel and notices any constriction, its degrees and whether it is permanent or only a temporary muscular contraction. After examining a patient in the recumbent posture as Haenisch does, I also examine him in the erect posture. This will often clear up doubtful points. Carcinoma may be recognized in this way quite early. At any time during the procedure plates may be made for record and for closer study.

If a carcinoma be present, the constriction will be permanent, can be recognized both during the inflow and outflow of the mixture, is usually limited to a comparatively small area when early, or associated with a distinct tumor mass when seen late, cannot be obliterated by any manipulation and is likely to be associated with localized tenderness. A meal given by mouth will often be checked at the same point.

The classical clinical symptoms associated with carcinoma of the bowel are familiar and need not be repeated here, but the early symptoms are often overlooked. The passage of a slight amount of bloody mucus, in the absence of hemorrhoids or benign rectal lesions, should at once arouse suspicion. Pain along the course of the colon, rather definitely localized in a patient past 40, should make one think of carcinoma, and a careful x-ray examination should be made.

Constrictions due to adhesions are more likely to be extensive and to be associated with folds of the bowel, or they may produce definite kinks with no actual obliteration of the lumen. This latter point may be determined by manipulating the bowel until it becomes completely distended after a temporary obstruction. When associated with the constriction the bowel is likely to be drawn out of position or fixed. These latter points are likely to be absent early in carcinoma.

Intussusception is usually acute and rarely chronic. It can be recognized by the same method as described above.

Twists in the bowel are likely to occur in patients who have an elongated colon and are usually associated with visceroptosis. They may be acute, may recur and produce a long series of intestinal disturbances which occur periodically, and are associated with gastric, intestinal and toxic symptoms. They should be demonstrated by a colonic injection, and when vomiting is not a prominent symptom they may be confirmed by food passed by mouth. In one very chronic case with symptoms extending over a period of twenty years the splenic flexure was twisted on itself and had locked up a collection of gas which gave the patient a sense of distention and pain in the left hypochondriac region. The enema will often release these twists, and an obstruction may be present at the beginning of the injection, but as the pressure is increased the obstruction disappears.

PRESSURE EFFECTS OF GAS LOCKED IN THE SIGMOID LOOP

This is a condition which, I believe, is not uncommon, and yet it is strange that it seems not to have received much, if any, recognition. It is a condition that occurs in connection with a large sigmoid loop. I am not yet clear as to whether the large sigmoid loop is the cause and primary condition, or whether the loop has been stretched by repeated distention with gas and thus elongated. This sigmoid loop may extend up to the under surface of the liver or to any height below this point. When this loop becomes distended with gas, it displaces the stomach, may obliterate the transverse colon by pressure and stop the colonic contents, may block the descending colon or both the transverse and descending colons, or may become twisted on itself. There may also be several loops or twists which will produce similar results, but to a lesser degree. Hertz¹² refers to congenital kinks of the intestines and explains this by the relatively excessive length of the pelvic colon. He says: "Where it is unusually large it becomes bent on itself once, twice or three times, and the flexures may

18. Pfahler, G. E.: *THE JOURNAL A. M. A.*, June 17, 1911, p. 1777.

19. Schurmeyer: *Fortschr. n.d. Geb. d. Röntgenstrahlen*, xv, 6.

20. Jordan: *Brit. Med. Jour.*, May 20, 1911.

be so sharp that obstruction to the passage of feces occurs." Jacobi²¹ first drew attention to the subject and he subsequently came to the conclusion that an abnormally long pelvic colon was one of the most common causes of constipation in infants. Natural recovery from constipation occurs between the fifth and seventh years, owing to the fact that the growth of the pelvic colon is relatively slow. In only severe cases the obstruction produced by the kinks may be complete, so that no meconium is discharged even with the aid of enemas until several days after birth.

I have found no cases recorded in which this excessive loop of the sigmoid (or pelvic colon) was given as a cause of temporary intestinal obstruction in an adult, nor any evidence of such condition being shown by the x-rays. I can explain this only by a failure in interpreting incomplete studies, or by the fact that patients of this group have not frequently been sent for examination, since they are usually regarded as neurotics and therefore not worthy of serious study.

The patients in whom I have recognized this condition suffer from headache, nausea and often vomiting,

I have been able to find an explanation of the symptoms so often that I feel that we shall be able to understand this group better in the future and hold out new hopes for them.

The length of this paper will not permit the report of even illustrative cases of all the conditions that I have described, but since most of them are already well recognized by the profession and since sufficient evidence is on record to show that all the conditions described can be demonstrated earlier and better by the x-rays than by any other anti-operative method, I shall confine myself to a brief report of a few cases illustrating the obstructive effects of colonic loops. The figures are tracings made from some of the reductions from the original plates which were used to illustrate the paper and are therefore true representations of the conditions as found in these cases.

CASE REPORTS

CASE 1.—Mr. E. K., aged 34, a mechanic, consulted me Oct. 2, 1911, for an x-ray study of his gastro-intestinal tract. During ten years he had suffered from "bilious attacks" which had been growing worse, but he was able to continue his work.

Fig. 1.—A, Top of sigmoid loop. B, Kink at junction of descending colon and sigmoid. C, Reduplication in first part of transverse colon.

Fig. 2.—A, Top of sigmoid loop filled with gas. B, Transverse colon compressed. C, Descending colon compressed or kinked. D, Feces in first portion of sigmoid. E, Feces in rectum.

Fig. 3.—A, Blocking of descending colon at end of forty-eight hours. B, Feces in rectum. C, Ascending and first part of transverse colon empty.

abdominal distress and a sense of gaseous distention. These conditions occur usually periodically but may be more or less constant. Drugs have given only temporary relief, and both the patients and physicians become discouraged. Looking at this group in the light of a temporary intestinal obstruction (without acute symptoms) due to a twist of or pressure by an elongated sigmoid loop distended with gas, one can understand why the attacks occur at irregular intervals and why they follow fatigue and the eating of gas-producing foods, since these are the conditions which will be associated with intestinal fermentation which distends the loop with gas.

One can also understand why a purgative will often abort an attack, and why vomiting or assuming the recumbent posture will give relief, since these are the conditions which will assist in moving the gas from the loop and permit the colonic contents to move onward.

There are a large number of patients suffering from the above-mentioned group of symptoms, and while I have examined comparatively only a few of this group,

During these attacks he was constipated and had nausea, vomiting, headache and abdominal pain and distentions.

Röntgen Examination.—Figure 1 shows an excessively long sigmoid loop which rises at least 2 inches above the umbilicus and moves freely. During the colonic injection a kink at the junction of the descending colon with the sigmoid prevented the free flow of liquid. Figure 2 shows how this loop had blocked both the transverse colon and the descending colon at the end of forty-eight hours. After a bismuth meal had been taken this remained absolutely stationary during at least nine additional hours. At the end of seventy-two hours the colonic contents had passed the middle of the transverse colon but were blocked in the descending colon (Fig. 3). This loop may rise high enough to compress the pyloric end or displace the stomach. This occurs in this case and is shown in Figure 4, in which instance it passed back of the transverse colon, showing that only at times does it cause compression of the colon.

CASE 2.—Mrs. E., aged 54, referred by Dr. J. C. Heisler, for twenty-five years had had periodical attacks of severe headache associated with severe vomiting, abdominal distention and constipation. These attacks usually recurred every two weeks, but at times she would be free from them for six weeks. Originally they lasted only a day, but at the time of examination lasted three days. The patient was chronically

²¹ Jacobi: New York Med. Jour., 1894, xlv, 613.

constipated and was much distressed by the pressure of gas after eating.

Röntgen Examination.—I found a sigmoid loop that extended up to the liver (Fig. 5). This high position of the sigmoid remained even in the standing posture and seemed to be held up by the gas at its upper pole, while the transverse colon dropped down in front of it (Fig. 6). It is easy to understand how the taking of food into the stomach, lying in front of this loop of the sigmoid, gave the patient a sense of gaseous distention which could not be relieved by belching. Figure 7 shows how this same gaseous loop blocks the contents of the trans-

verse colon. Dr. Anthony Bassler has sent me a lantern-slide, in which the patient was prepared for operation, when an enema gave relief, and subsequent dietetic and medicinal means brought about a complete recovery.

CASE 3.—Mr. C. F. B., aged 50, referred by Dr. William Martin, for four years had suffered from severe headache, associated with indigestion, abdominal distention and distress, and constipation.

Röntgen Examination.—I found a large sigmoid loop, a generally elongated colon, reduplication and twisting of the

Fig. 4.—Showing sigmoid loop causing compression and displacement of the stomach. A, Gas in sigmoid. B, Compression of pyloric end of stomach by the gas in the sigmoid.

Fig. 5.—Colonic injection showing the outline of the sigmoid loop, which rises to the under surface of the liver; also a dilated ampulla of the rectum. Supine posture.

Fig. 6.—Standing posture after colonic injection, showing double sigmoid loop, with gas at the top. A, Gas in top of second sigmoid loop. B, Gas in splenic flexure. C, Gas at top of hepatic flexure. D, First sigmoid loop. E, Dilated rectal ampulla.

Fig. 7.—Showing obstruction of the transverse colon by the sigmoid loop distended with gas, at the end of twenty-four hours after a bismuth meal, with the stomach hanging over the top of the transverse colon. A, Top of obstructed transverse colon. B, Stomach. C, Colls of the ileum still filled at the end of twenty-four hours.

Fig. 8.—Showing compression and displacement of the body of the stomach to the left by gas in the sigmoid loop. A, Transverse colon dipping into the pelvis and passing to the other side of the descending colon. B, Splenic flexure. C, Ascending portion of the sigmoid loop filled with feces. D, Top of sigmoid loop filled with gas. E, Stomach only partially filled and displaced to the left.

Fig. 9.—Obstruction caused by splenic loop filled with gas. A, Gas in loop. B, Lower end of descending colon blocked by the sigmoid loop.

verse colon at the end of twenty-four hours after a bismuth meal. Figure 8 shows that the transverse colon is displaced downward and gives freedom at the end of forty-eight hours, but the contents are now blocked at the end of the descending colon.

These are extreme cases with extreme symptoms, and yet a less extensive loop may give actual symptoms of acute intestinal obstruction, such as occurred in a case

first part of the transverse colon with abdominal retention in the cecum and ascending colon, with other evidence of interference with the passage of the colonic contents of the sigmoid.

CASE 4.—Miss A., aged 20, referred by Dr. M. P. Warmuth, had suffered from constipation, a sense of gaseous distention of the abdomen and "bilious attacks."

Röntgen Examination.—I found a large sigmoid loop associated with evidence of adhesions and localized areas of retention in the pelvic colon. These were confirmed by operation.

I have seen a number of cases in which a loop at the splenic flexure seemed to be the cause of the symptoms. The following will illustrate:

CASE 5.—Mrs. S., aged 40, referred by Dr. L. Napoleon Boston, for eighteen or twenty years had been troubled with pain and aching in the left hypochondriac region. She had been gradually getting worse. She was generally constipated.

Roentgen Examination.—I found a loop at the splenic flexure which seemed to be distinctly twisted, and locked in it was a collection of gas (Fig. 9). One can understand how the gas would accumulate in this loop and the symptoms continue until the oncoming colonic contents were sufficient in force to release this twist.

The treatment of these obstructive loops will demand a diet that will reduce fermentation to a minimum, associated with abdominal exercises, massage and, when symptoms arise, an enema to remove the contents of the colon and release the twist. Finally surgical interference may be necessary either when acute symptoms arise or for the radical relief of the condition.

I have also examined a number of patients in whom the origin of the symptoms was obscure, who complained of pain and distress in the left hypochondriac region

Fig. 10.—Obstruction caused by adhesions between the stomach and splenic flexure of colon forty-eight hours after bismuth meal. Descending colon injected per rectum. A, Gas in splenic flexure. B, Constriction. C, Serrated appearance of greater curvature.

and in whom I found the cause to be extensive adhesions about the splenic flexure. In the future it should not require years for physicians to think of an *x*-ray examination to clear up the diagnosis of such cases. A single case will illustrate.

CASE 6.—Mr. S., aged 29, had suffered for five years with severe pain in the left hypochondriac region. At first it occurred at intervals but during nine weeks had been constant day and night. The pain was not influenced by food, and his bowels moved regularly daily. He had been in three different hospitals and had consulted at least three of our best internists, with no relief and no diagnosis. In general he had been regarded as a neurotic. He came to me on his own account and begged for an *x*-ray study.

Roentgen Examination.—I found evidence of extensive adhesion at the splenic flexure which was shown by constrictions involving the last part of the transverse and the first part of the descending colon, as though one had passed a band around the two portions choking off a collection of gas resulting in dilatation of the splenic flexure above. These adhesions were shown to involve the stomach also by the serrated border on the greater curvature (Fig. 10). These findings were confirmed in every detail by Dr. Ernest Laplace at operation, and the patient recovered with complete relief from his symptoms.

CONCLUSIONS

1. Localized peritonitis resulting in adhesions is a common condition, and while it must often be present without producing any symptoms it is a pathologic condition that should be considered in all obscure abdominal cases.

2. Constrictions of the bowels may be permanent or temporary. The permanent constrictions are liable to be due to adhesions or carcinomas and have been demonstrated in many cases by a number of roentgenologists.

3. Temporary constrictions may or may not be present during an examination, but the condition which would give rise to such obstructions will be present and can be demonstrated.

4. Colonic loops, particularly affecting the sigmoid, may produce repeated temporary symptoms and have been found associated with the group of periodical "sick-headache" cases.

5. The cases of "colonic loop" that I have been able to study so far have been too few to enable me to draw definite conclusions, but point the way to the relief of many chronic cases.

I wish to thank the physicians who have made it possible to study the cases on which this paper is based and particularly Drs. Boston, Heisler, Warmuth and Martin who have permitted the brief reports of their cases, and Dr. Anthony Bassler who has loaned me lantern slides of some of his cases for study.

1321 Spruce Street.

ABSTRACT OF DISCUSSION

DR. JUDSON DALAND, Philadelphia: I think that this paper is most valuable in showing the aid that the *x*-rays are able to give in making diagnoses hitherto impossible regarding pathologic conditions of the alimentary tract. The diagrams presented showed obstructions from kinks. We have been able by means of the *x*-rays to diagnose obstructions caused by adhesions alone. A point of interest relates to the topography of the colon; we can see not only the presence of a coloptosis, but also its extent. This line of work must be supplemented by a study of the normal redundancy of the colon and its relationship to surrounding parts. In most instances a stricture of the colon can be shown by means of the *x*-ray after the introduction of a bismuth meal by mouth; the point of constriction is thus brought out accurately; a thorough and careful study of the plates is necessary to show exactly where the constriction is. By means of colonic injections we may determine the lower border of the constriction. I have not been able, however, to measure with accuracy the extent of these strictures. We must all recognize as an important point that a large experience is required on the part of the roentgenologist to interpret the findings. Each case must be dealt with by itself. Often a large series of plates must be studied and the greatest care taken. The time consumed is often considerable.

DR. ANTHONY BASSLER, New York: We should be grateful to Dr. Pfahler for introducing loops as a means of constriction of the colon. In the examination of the normal individual through the side of the abdomen, the *x*-rays show that the cecum occupies a central position. Continuing up, the ascending colon and hepatic flexure are posterior; the intestine then runs forward, coming in contact with the anterior abdominal wall at the flare of the costal arch. It then runs across the abdomen to a corresponding point on the opposite side and dips posteriorly again, running upward to the back of the abdomen under the spleen where the splenic flexure is made. The splenic flexure and descending colon, like the ascending, are posterior and take slightly forward courses at the upper end. When the sigmoid is reached, the colon runs forward from the back of the abdomen to the anterior abdominal wall, is in contact with the wall for a few inches, and then bends backward to join the rectum. Therefore the ascending and descending colons are posterior; only a small portion of

the transverse colon and a small portion of the sigmoid are anterior, and the rest of the large intestine runs forward and backward. It is in these forward and backward courses that loops occur.

A plate of mine that Dr. Pfahler showed was from a man who had been constipated for many years. One morning he was seized with nausea which gradually developed into vomiting; this continued until the third day, when it was stercoraceous in type. There was marked abdominal pain in the lower left side and general abdominal distention. There being little doubt as to the diagnosis, he was prepared for operation, because purgatives and enemas did not prove successful and no flatus had been observed for several days. It occurred to me when I saw him that there might be a looping of the sigmoid, because of the situation of the pain and the general distention of the intestines above it. Surrounded by surgeons ready to operate on him, we tried another enema in the knee-chest position, at which a hard mass of feces came away, followed by fluid and gas with a subsidence of pain and the distention; of course there was no further concern about the case. A week or two afterward I made the x-ray plate you saw, disclosing the vertical loop in the sigmoid.

In dealing with these loops, particularly of the sigmoid, we should take into consideration postural methods to untwist them. As they twist in the upright and prone-dorsal position, to untwist them the patient must be placed head and abdomen down. In these cases the feces from the proximal portion come in contact with the feces of the distal portion overlapping the intestine, and then the feces in the distal portion dam back the contents in the upper section.

DR. FRANKLIN W. WHITE, Boston: There is another side of this x-ray work that is not generally appreciated, even after one has seen the set of pictures that have been presented to us—the difficult technic, the long series needed to prove a point, the frequent artefacts, the difficulties of interpretation. A great many do not appreciate these points; many are too busy to study them carefully. All these cases show the value of this method, which requires great care. When we compare the present x-ray method with the old methods of outlining the stomach and intestines we see a great difference. Nothing can compare with the present x-ray methods in detecting constrictions of the large intestines, and in separating the medical from the surgical cases of constipation. This is a method which should be used in all gastro-intestinal cases that are difficult of diagnosis. In obstinate cases of constipation which do not yield to thorough treatment the x-rays will frequently tell us more than all the rest of the examination put together.

DR. G. E. PFAHLER, Philadelphia: As Dr. Daland has said, there is a great deal of work to be done in each case, and one can seldom make a diagnosis from one or two pictures. Those that I have presented to you were picked out. It is customary for me to make six or twelve or more plates and many repeated fluoroscopic examinations before I make a diagnosis in a given case. When I began the examination of these cases I did not know really how much work there was to do; considerable expense is incurred and much time consumed in every examination. This work is not necessarily a part of the routine work, however, but is used only in the chronic cases and those that have resisted all other means of diagnosis. It should be borne in mind that the sigmoid loop is only one place where constriction can occur; considerable stress has been laid on this because it has been so frequently overlooked. Dr. Jacobi called attention to the condition eighteen years ago as occurring in children and infants, and as being one of the causes of chronic constipation and at times of intestinal obstruction.

Industrial Disease.—Industrial disease is a misleading term, used for convenience only, or through ignorance, to indicate certain pathologic states, the results of insanitation in industry. Industry itself is never necessarily unwholesome. Industrial processes, it is true, are objectionable and crude oftentimes, but bad industrial conditions are always remediable.—W. Talbot in *Am. Jour. Public Health*.

THE STUDY OF THE URINE IN NERVOUSNESS*

EDWARD B. ANGELL, M.D.
ROCHESTER, N. Y.

At the Washington meeting of the American Neurological Association in 1910, I read in part a paper on this subject. But on account of the press of papers it was greatly curtailed and never published. Since that time analysis of a larger number of cases has deepened the conviction that the simple test there suggested has a definite value in the physical examination of patients in all cases of nervousness not dependent on organic disease. For the past nine years accurate notes of this class of cases have been kept and certain features having a definite bearing on the causation of functional disorders of the nervous system have been noted, to which I shall refer later.

For the past twenty years it has been my habit to make routine examination of the urine of practically all patients under my care and this examination is repeated at each office visit. I had already noted and even recorded at an earlier date the frequency of the reaction to which I call your attention.

TOXEMIA INDICATED BY A PIGMENT RING

In testing these urines with nitric acid, I noticed frequently a dark pigment ring in place of the well-known white ring, known as Heller's albumin ring. As you know, Heller's test consists of underlaying the urine with strong nitric acid. The albumin, if present, appears as a white ring at the point of contact between the urine and the nitric acid. It is at the same point that the pigment ring is found, a reaction which doubtless has been noticed by most of those present. The pigment ring varies from a dark brown to a bright red color. When pronounced it is very distinct and, in my experience, of definite value as a laboratory aid in diagnosis. In making this test the easiest method is to take a test-tube partly filled with the suspected urine and plunge a pipet loaded with pure nitric acid to the bottom of the urine in the test-tube. The finger covering the top of the pipet is then slowly released and the acid gradually replaces the urine at the bottom of the test-tube. By this method the procedure is both expeditious and certain. The contact line between the urine and acid is sharp and well defined.

The chemical nature of this ring I cannot explain. The chemistry of the nitrogen compounds of the urine is very difficult of determination. That it is due to the oxidization by the nitric acid of some of the aromatic constituents of the urine through degradation of the albumins is most probable. It has sometimes been confounded with indicanuria, but in my experience it is another reaction entirely. The presence of indican in the urine has been noted in conjunction with this reaction, but in the large majority of my patients indican was absent. Indicanuria may be associated with this condition, but it certainly is not the cause. The same is true also of the biliary reaction. Bile is present in the urine of these patients at times, but, as can be shown by standard tests, is more frequently absent. This pigment reaction may be associated at times with either indican or bile, or indeed with both, but certainly is dependent on neither one. This is well exemplified in the illustrations which I shall shortly bring to your

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