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Reginald H. Fitz.**

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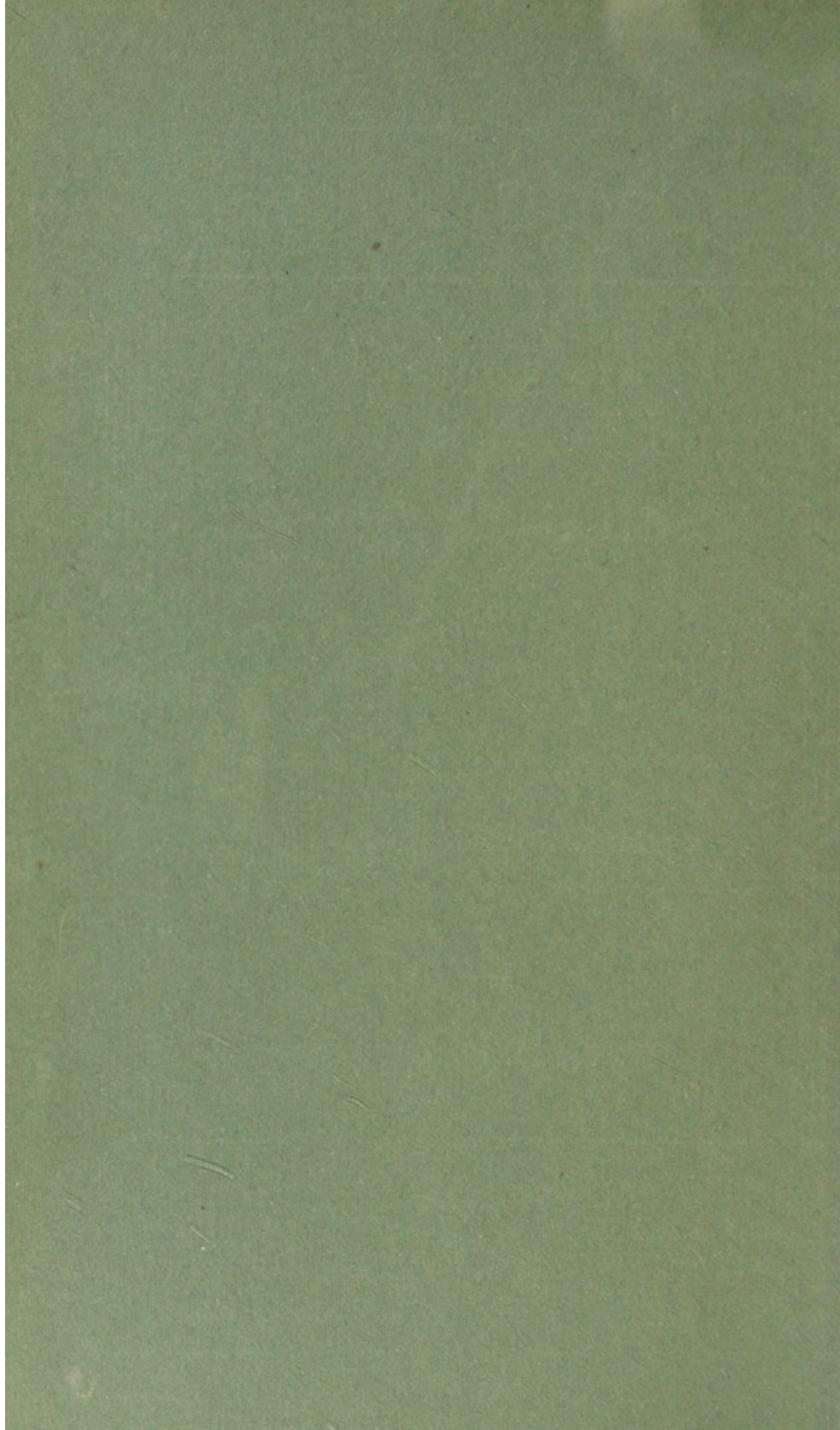
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By R. H. Fitz, M.D.

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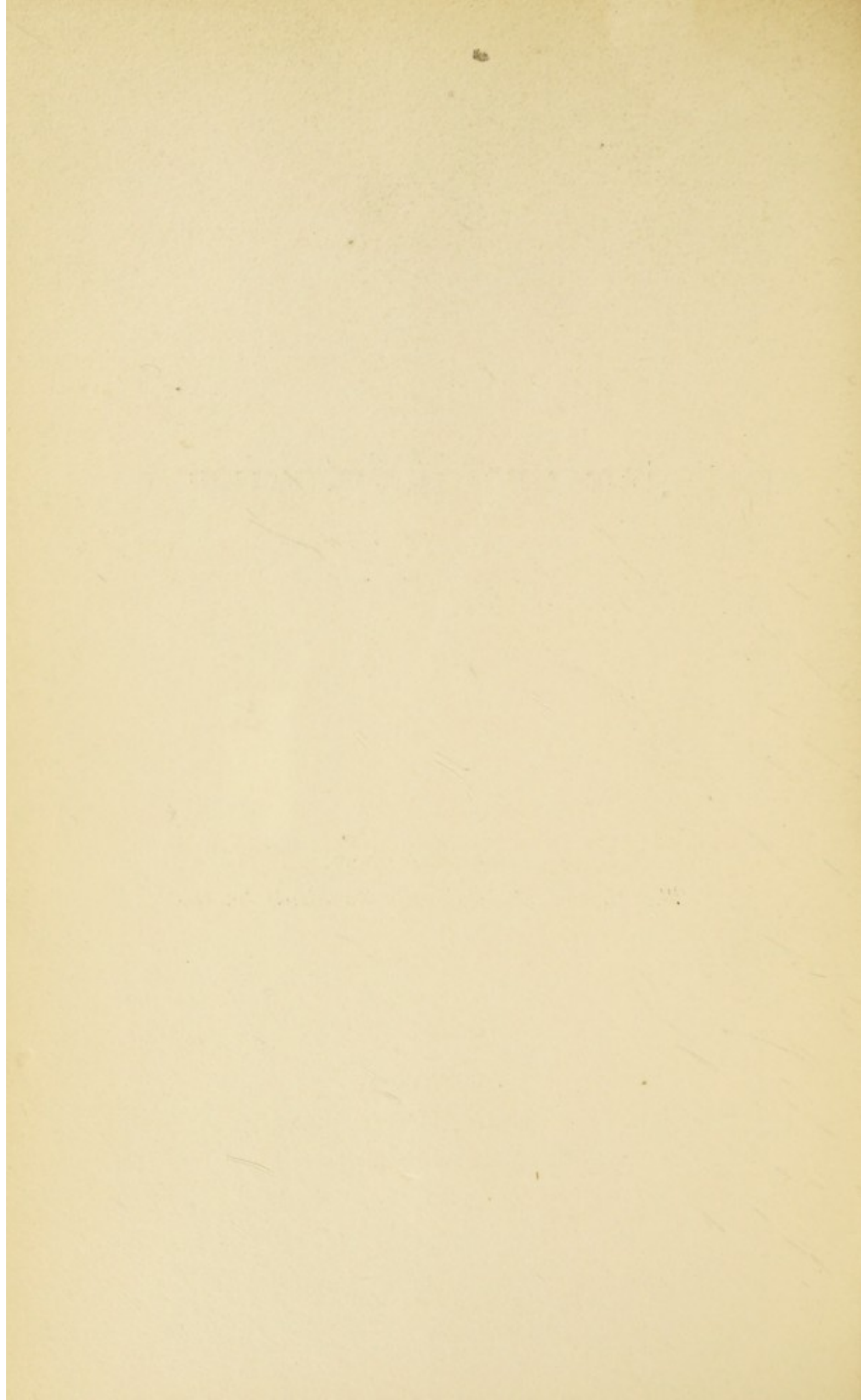
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R. H. FITZ, M.D.

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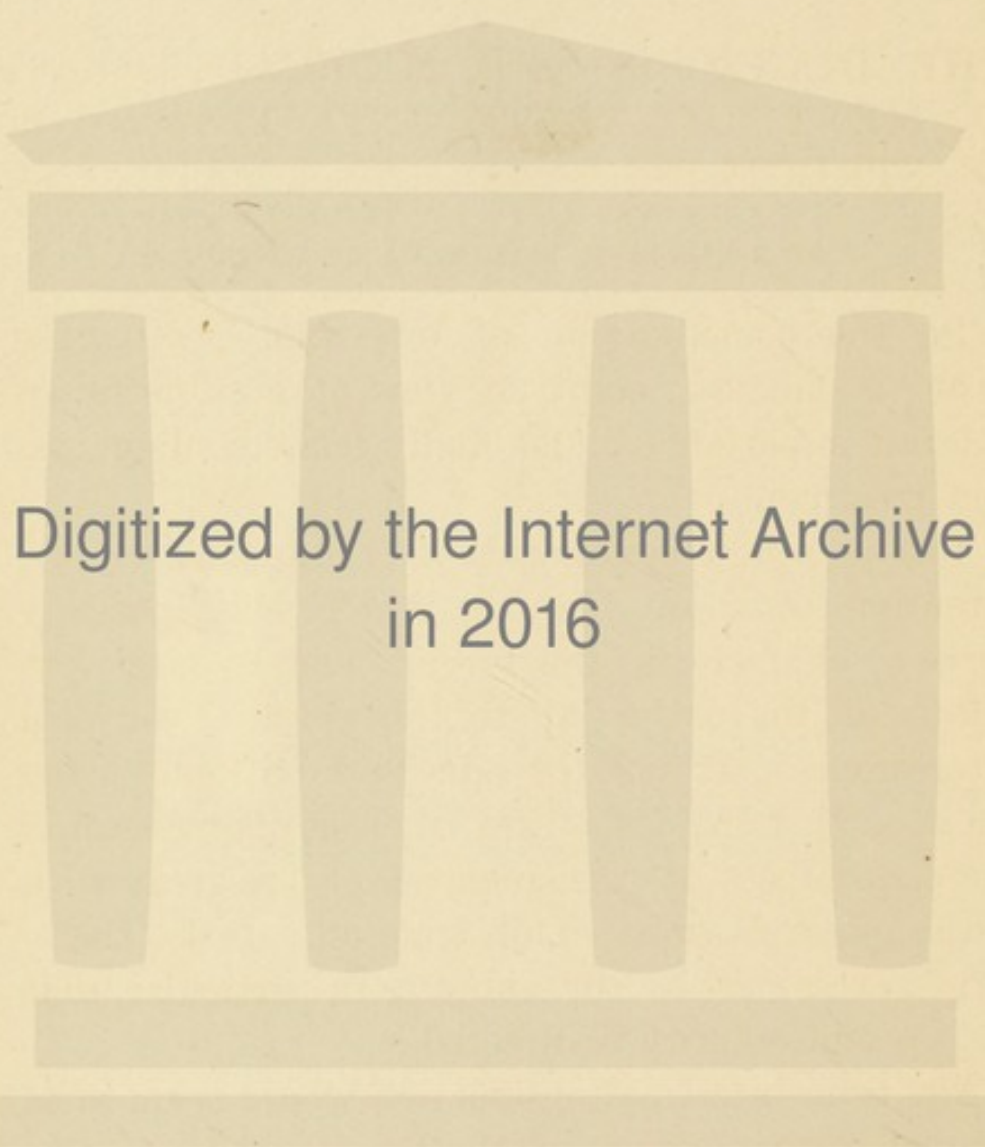
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THE DIAGNOSIS AND MEDICAL TREATMENT OF ACUTE INTESTINAL OBSTRUCTION.¹

BY REGINALD H. FITZ, M. D., OF BOSTON.

IN the consideration of intestinal obstruction from a medical point of view, the subjects of chiefest importance undoubtedly relate to diagnosis and treatment.

The present communication is intended to call attention to those features which may possibly serve to characterize the former, and to mark the limits of the latter up to the point of surgical interference. It will be admitted without much question that the difficulties of exact diagnosis, and the possibilities of permanent relief, are greatest in acute, internal forms of obstruction. It is, therefore, to this part of the subject, in particular, that the present enquiry is directed.

The term intestinal obstruction would seem to be equivalent to stoppage of the bowels, and refers to the absence of an important function of this apparatus. The conspicuous causes of such a stoppage are essentially mechanical, and the anatomist finds the bands and cords, the slits and pouches, the

¹ Read before the Congress of American Physicians and Surgeons in Washington, D. C., Sept. 18, 1888.

invaginations, twists and knots, the strictures, tumors, and abnormal contents.

But in another class of cases the stoppage is present, the patient dies, and there is not found an entirely satisfactory, mechanical cause of obstruction. If the intestinal coils are agglutinated or adherent in such a manner that valve-like projections into the canal are formed, these are considered by some a satisfactory explanation of the symptom. If the mesentery of any coil is so contracted that the legs of the loop are closely approximated, this change is frequently considered a sufficient cause. But agglutinated and adherent coils are frequently found in the absence of symptoms of intestinal obstruction, and the contracted mesentery is seen in cases where no stoppage of the bowels has occurred.

This symptom takes place in still another series of cases where the anatomist finds no suggestion of a lesion which offers the remotest possibility of acting as a mechanical cause. The physician then says the obstruction must be due to a paralysis of the muscular coat, or a spasm of the circular fibres, or a faulty innervation, or to some peculiar modification of function.

Intestinal obstruction, in a technical sense, however, means something more than stoppage of the bowels. The latter symptom may be present at the outset, it may occur later in the course of the disease, or frequent loose movements may be a most characteristic symptom of the especial variety of obstruction, as in intussusception. Frequent dejections may also occur in the early stages of other varieties of obstruction, and throughout the course

of the disease when *fæces* are the cause. Stoppage of the bowels is thus not only unnecessary as a symptom of intestinal obstruction, but, when present, its particular consideration has led to frequent errors of diagnosis. Of all the causes of stoppage, which have given rise to an erroneous diagnosis of obstruction, there is none more frequent than peritonitis.

In a general peritonitis the bowels are expected to remain inactive, and medical efforts are frequently directed to this result. In the circumscribed variety the important symptoms of localized pain and paralyzed bowels have often led to the diagnosis of acute, internal obstruction. This is particularly true in the case of inflammation of the vermiform appendix, a disease which is constantly being mistaken for acute obstruction. This error in diagnosis leads to corresponding errors in treatment. Because the bowels have been opened in such cases by powerful cathartics, quicksilver, electricity, violent movements of the body, and the like, therefore these are claimed to be valuable and efficient remedies in intestinal obstruction. Too often the speedy death of the patient results from such treatment, the local peritonitis being made general.

The only intestinal obstruction which deserves the joint consideration of surgeons and physicians is that due to well-recognized, mechanical causes. It is the acute, internal variety of mechanical, intestinal obstruction which forms the subject of this paper.

There are four, main questions which require consideration in any given instance:—

First, Is the case one of acute, internal obstruction?

Second, Where is the obstruction seated?

Third, What is the variety?

Fourth, What is to be done?

The statements which follow in this paper are essentially based upon the study of a series of cases collected from the English, German, and French medical literature since 1880. Its claim to consideration lies in the fact that all the cases have been submitted to the severest criticism, with the resulting exclusion of a very large number. They are included under the heads of strangulation by bands, cords, etc., intussusception, knots and twists, obstruction by abnormal contents, strictures, and tumors. The entire number is two hundred and ninety-five, and they are divided as follows:—

Strangulation.....	101 cases	=	34 per cent.
Intussusception.....	93 "	=	32 "
Abnormal contents.....	44 "	=	15 "
Twists and knots.....	42 "	=	14 "
Strictures and tumors	15 "	=	5 "
	295 "		100 "

Excluding from this series the cases of acute obstruction from abnormal contents and from strictures and tumors, which are of the least importance in practice, there remain—

Strangulation	101 cases	=	43 per cent.
Intussusception	93 "	=	39 "
Twists and knots.....	42 "	=	18 "
	236 "		100 "

It is interesting to compare these figures with the larger number in the collections of Duchaussoy,² Brinton,³ and Leichtenstern:⁴—

² Duchaussoy, *Mémoires de l'Académie Impériale de Médecine*, 1850, xxiv. 97.

³ Brinton, *Intestinal Obstruction*, 1867, 88.

⁴ Leichtenstern, *Ziemssen's Handb. d. Sp. Path. und Therapie*, 1876, vii. 2, 528.

Percentage of relative frequency of the more prominent causes of acute intestinal obstruction.	Number of cases included.	Strangulation.	Intussusception.	Twists and Knots
Duchaussoy	347	54	39	6
Brinton.....	481	33	54 ⁵	10
Leichtenstern	1134	35	39	6

STRANGULATION.

First in numerical importance as a cause of acute, intestinal obstruction is strangulation by bands or cords.

These are most frequently the result of a pre-existing peritonitis, and are either fibrous adhesions alone, or are formed by adherent appendages of the intestinal or genital tract. The former are epiploic, vermiform, diverticular, omental, or mesenteric. The latter are Fallopian tubes and pedunculate ovarian or uterine tumors. The diverticular appendages are either Meckel's diverticulum, (the omphalo-mesenteric or vitelline duct,) or the persistent remains of the vitelline blood-vessels. The former is usually attached by the latter to some part of the abdominal wall or contents. It may also be thus attached from peritonitis in the absence of the latter. The persistent vitelline blood-vessels or their remains may likewise form the strangulating cord in the absence of the diverticulum. Omental cords may be adherent in consequence of peritonitis, or they may result from the presence of slits or fissures in the omentum.

⁵ Brinton gives forty-three per cent. of intussusception in his table of six hundred cases of intestinal obstruction by this lesion, bands, adhesions, diverticula, or peritoneum external to the bowel, strictures (including a few tumors) involving the intestinal wall, and torsion of the bowel on its axis. *Op. cit.*, 38.

The mesentery serves as a cause of strangulation when it is fissured by a slit. Peritoneal pouches and openings may be added to the above list.

There seems to be no essential difference in the nature of the symptoms which arise from these causes of obstruction. Cases of knots and twists of the small intestine might be added to the list from the nature of their symptoms, but their number is so small, only two of each, that for practical purposes they may be omitted.

The immediate anatomical causes of the one hundred and one cases of strangulation are as follows, the numbers being regarded as equivalent to percentages :—

Adhesions	63 cases.
Vitelline remains	21 “
Adherent appendix.....	6 “
Mesenteric and omental slits.....	6 “
Peritoneal pouches and openings	3 “
Adherent tube	1 “
Pedunculate tumor	1 “
	<hr/>
	101 “

84% of the total number of cases were due to bands and cords in a limited sense. It is noteworthy that cases of diaphragmatic hernia, which form 19% of Leichtenstern's cases, were not reported in the past eight years.

The following table shows the bearing of sex in the frequency of obstruction from strangulation:—

	Adhesions.	Vitelline Remains.	Appendix.	Slits.	Pouches.	Tube.	Tumors.	Total.
Males.....	39	19	5	5	2			70
Females	24	1	1	1	1	1	1	30
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	63	20	6	6	3	1	1	100

It thus appears that 70% of the cases of obstruction from strangulation occurred among males. Further, that nearly all the cases of obstruction from vitelline remains, adherent appendices, and slits were found among men. The percentage of bands of intestinal origin and those of pelvic origin was about equal in the two sexes.

The age at which the obstruction took place is shown in the following table:—

Years of Age.	Adhesions.	Vitelline Remains.	Appendix.	Slits.	Pouches.	Tube.	Total.
1—5.....		2					2
5—10		3	1				4
10—15	2	2	1				5
15—20.....	6	2		1			9
20—25	12	5					17
25—30	8	4	1	1			14
30—35	4			2			6
35—40	1	1	1				3
40—45	6		1				7
45—50	2						2
50—55	7		1				8
55—60	1			1	2	1	5
60—65	3			1			4
65—70	2						2
70—76	1						1
	55	19	6	6	2	1	89

Strangulation in early youth was, hence, relatively uncommon. When it occurs it is most likely to result from vitelline remains. At least 40% of the cases of strangulation occurred between the ages

of fifteen and thirty years, and adhesions as the cause of the same were more than twice as frequent as vitelline remains. After the age of thirty years adhesive bands are the usual cause.

In the etiology of adhesions a record of previous peritonitis, or perityphlitis, was found in ten of the cases, about one-sixth of all, and of an associated hernia in seven instances. In a small fraction errors in diet, violent muscular exercise, blows upon the abdomen, surgical operations for pelvic caries and cancer of the bowels, were important in the etiology.

In nearly one-half of the cases of vitelline remains previous attacks of abdominal pain were recorded, and in one instance there was the history of a yellowish discharge from the navel in infancy. One-half of the cases of adherent appendix were preceded by an attack of perityphlitis. Evidence of a pre-existing attack of intestinal obstruction was found in one case of mesenteric slit; another was preceded by chronic dysentery for a year. A case of protrusion of the intestine through an opening in the coronary ligament suffered, three years before, from a severe attack of inflammation of the bowels, with intervening colic and repeated diarrhœa. The immediate attack of obstruction in two cases of mesenteric slit followed a fit of coughing in the one and took place at the stool in the other.

Evidence of antecedent peritonitis thus existed in 13% of the cases, the band then being an adhesion or an appendix. In 7% of the cases a hernia was associated with the band. In 80% of the cases there was no factor of diagnostic importance.

Abdominal pain was the first important symptom

noticed in 82% of all the cases of strangulation. The percentage of its frequency in each variety of strangulation is shown as follows:—

In Adhesions	in 50 cases	=	79 per cent.	of all the cases.
" Vitelline remains	" 18	" =	86	" " "
" Adherent appendix....	" 6	" =	100	" " "
" Slits.....	" 6	" =	100	" " "
" Pouches and openings...	" 2	" =	66	" " "
<hr/>				
82				

It was usually sudden, severe, rarely slight, and was described as colicky. It was only exceptionally accompanied, at the outset, with tenderness. In the majority of cases it was simply stated to be abdominal.

It was located at the navel in eight instances, at the epigastrium in five, in the right iliac fossa in four, at the hepatic flexure and in the right hypochondrium each in three cases, in the left iliac fossa in two, in the lumbar region, splenic flexure, along the spermatic cord, and in the spine and back each in one case. An exact localization of the incipient pain was thus recorded in 29% of all the cases. There seems to be no diagnostic importance to be attached to the seat of pain as evidence of strangulation, or of its special cause, as will become apparent when the seat of the obstruction is stated.

The initial pain was found to be early associated with nausea or vomiting, either alone or together, in 69% of the cases. The date of appearance, and the frequency in the special varieties of strangulation are given in the following table:—

DATE.	Adhesions.	Vit. remains.	Appendix.	Slits.	Pouches, etc.	Total.
1st day.....	21	13	5	2	1	42
2nd "	7	4	1	1		13
3rd "	2			1		3
4th "	2				1	3
6th "	1					1
Not given.....	7					7
	40	17	6	4	2	69

A comparison of these figures shows the occurrence of this symptom on the first day in 68% of those cases in which it was possible to determine the date with accuracy. It took place on the first day in at least one-third of the cases of adhesions, in more than one-half of those of vitelline remains, in five-sixths of those of adherent appendix, and in one-third of those of peritoneal slit. The proportion is evidently much greater when the number of cases is considered in which the date of occurrence could be definitely ascertained. The relative frequency then becomes more than one-half in the case of adhesion, two-thirds in those of vitelline remains, five-sixths in adherent appendix, and one-half in strangulation by a slit.

Its occurrence on the first day is most suggestive of an adhesion, a vitelline cord or diverticulum, an appendix, a slit, or a pouch, in the order stated.

The occasional absence of nausea or vomiting is

noteworthy, and is mentioned in two cases of strangulation by adhesions, one of which terminated fatally, the other in recovery, after laparotomy.

The vomit, as in all cases of intestinal obstruction, was usually composed, at the outset, of the food last taken. It then became mixed with bile, eventually yellow, and finally fecal. It was frequently noticed that the vomiting only became constant when material was persistently taken into the stomach.

Fecal vomit is a term which is somewhat loosely applied, and is in no way to be regarded as other than conventional. There was no evidence to warrant the idea that the contents of the large intestine were ever vomited. The distinction between a yellow vomit and the fecal or stercoraceous variety seems to depend chiefly upon the length of time during which a pyloric insufficiency has existed. It is quite probable that among the records of fecal vomit are those in which this term was applied to the ejection of a yellow, odorless, intestinal fluid. The term should be more exclusively applied to the offensive ejections which have remained sufficiently long above the point of obstruction to become fetid. The following table shows the date of this intestinal vomit in thirty-seven cases :—

DATE.	Adhesions.	Vit. remains.	Appendix.	Slits.	Total.
2nd day.....	2	2			4
3rd "	4	2	2		
4th "	3	1			4
5th "	6			1	
6th "	2	3			5
7th "	2	1			3
8th "	1				1
9th "	2				2
10th "	1	1			2
13th "				1	1
Not given.....	5	4	1		10
	28	14	3	2	47

The vomit thus became fecal most often on the third and fifth days, although on these dates in only about one-fifth of the cases in which definite dates were given.

Tympany is next in importance to abdominal pain and vomit as a symptom of obstruction from strangulation. Its occurrence in 56% of all cases is recorded, and the date of its appearance is given as follows: —

DATE.	Adhesions.	Vit. remains.	Appendix.	Slits.	Pouches.	Total.
1st day	2					2
2nd "	2	1	2	1		6
3rd "	4	2	1	1		8
4th "	4	2		1	1	8
5th "	4	2	1			7
6th "	5	2			1	8
7th "	2	1				3
8th "	1					1
9th "		1				1
10th "		1				1
11th "	2					2
13th "	2					2
Not given ...	4	1	1	1		7
	32	13	5	4	2	56

Tympanitic distention of the abdomen thus occurred in more than one-half of the cases of strangulation, and was most frequent from the second to the sixth days inclusive. It may be wholly absent as late as the eighth day, and may be much on the first day. It was sometimes enormous during the first week, but much more often slight or moderate. The distended abdomen was not especially tender to the touch.

An abdominal tumor was sometimes noticed in cases of strangulation, and a distinction is to be drawn between tympany and tumor, although tympanitic intestines may be the cause of each. Under

the general head, tumor, are included circumscribed, distended, visible intestinal coils as well as local swellings not thus characterized. The latter were either palpable or their limits were determined by dulness on percussion in an elsewhere resonant and unusually distended abdomen. Such tumors and visible coils occurred as follows in the cases of strangulation : —

	Tumors.	Visible Coils.
Adhesions	4	7
Vitelline remains	4	3
Appendix	1	1
Slits	1	
	10	11

Thus in less than one-fifth of the cases tumors were to be recognized. The numbers are not sufficient to serve any purpose of differential diagnosis.

Fever was noted in 22% of all the cases. It rarely occurred before the second day, was sometimes absent altogether, and, when present, the temperature was below 100° F. in nearly one-half of the cases. Its occurrence and intensity were of no positive value in the diagnosis of obstruction from strangulation.

Hiccough was a symptom of such infrequent record as not to demand any especial attention.

As a rule no mention was made of any peculiarities of the urine or its flow. The latter was sometimes mentioned as scanty during the first few days and after the tenth day, while it was often stated as normal on the thirteenth day. Its composition

was usually noted as normal; occasionally it was reported to contain albumen or indican. The cases furnished no evidence that any alteration of the quantity or quality of the urine is of any diagnostic value.

In like manner with regard to collapse. The date of its occurrence was given in 23% of the cases, but the figures are too few to aid much in fixing upon the time when all efforts at purely medical treatment shall cease.

DATE.	Adhesions.	Vit. remains.	Appendix.	Pouches, etc.	Total.
1st day	1				1
2nd "	2				2
3rd "	2	1	1		4
4th "		1			1
5th "	2	1	1		4
6th "	1	1			2
7th "	1	1			2
9th "	1	2			3
10th "		1			1
11th "	1			1	2
13th "	1				1
	12	8	2	1	23

The occurrence of collapse is not to be regarded as necessarily indicative of a fatal termination, as in several cases recovery followed laparotomy, where collapse was noted at or before the time of operating.

The bowel obstructed was recorded as follows in 74% of the cases :—

INTESTINE OBSTRUCTED.	Adhesions.	Vit. remains.	Appendix.	Slit.	Pouches, etc.	Total.
Small.....	39	15	6	4	2	66
Large.....	5			2	1	8
	44	15	6	6	3	74

The part of the intestine obstructed in strangulation, as determined in fully three-fourths of all the cases, is the small intestine in nearly 90% of the cases, and the large in 10%.

The region of the abdomen in which the strangulating object was found was as follows in 72% of the cases :—

	Adhesions.	V t. remains.	Appendix.	Slit.	Pouches, etc.	Total.
Right iliac fossa	19	21	6	1	1	48
Pelvis.....	7				1	8
Left iliac fossa.....	5			1		6
Left lumbar region.....	3					3
Right lumbar region	2					2
Umbilical region	2					2
Right hypochondrium.....	1				1	2
Left hypochondrium	1					1
	40	21	6	2	3	72

The position of the strangulating object was thus in the right iliac fossa in 67%, and in the lower abdomen in 83% of the cases in which its position was given. It was present in the lumbar and umbilical regions in 10%, and in the upper abdomen in 7%.

It is obvious that an absolutely exact diagnosis of obstruction from strangulation is only to be made by a post-mortem examination or a laparotomy. From this point of view the mortality is total unless operative interference has been tried with success. Of one hundred and one cases, seventy-five died and twenty-six recovered.

The following tables were prepared to show the date of death in the absence of surgical treatment, and the relation of deaths to recoveries after surgical interference.

Date of death in thirty cases of strangulation under purely medical treatment :—

DATE.	Adhesions.	Vit. remains.	Appendix.	Slit.	Pouches, etc.	Total.
2nd day... ..	4	1	1	1		7
3rd "	3	1		1		5
4th "	2	1			1	4
5th "	1					1
6th "	1	1		1		3
8th "	2					2
9th "		2				2
10th "	1					1
11th "	2				1	3
18th "				1		1
37th "		1				1
	16	7	1	4	2	30

It is evident that death occurred from the second to the fourth days, inclusive, in more than one-half of the cases where no surgical treatment was applied.

Operative interference took place in 67% of the cases, and with the following result:—

DATE.	Adhesions.	Vit. remains.	Appendix.	Slit.	Pouch, etc.	Tumor.	Total.	Death.	Recovery.
1st day.....	1						1	1	
2nd "	1	1					2	1	1
3rd "	2		1				3	3	
4th "	2	1		1			4	4	
5th "	5	2	2	1		1	11	5	6
6th "	6	1	1				8	3	5
7th "	8						8	6	2
8th "	2	1					3	1	2
9th "	3	1					4	3	1
10th "	2	1					3	1	2
11th "	2	2			1		5	5	
12th "	2						2	2	
13th "	2						2	1	1
14th "		1					1	1	
16th "		1					1		1
25th "							1		1
Not given.....	6	1	1				8	4	4
	45	13	5	2	1	1	67	41	26

The percentage of recoveries after surgical interference in cases of strangulation was 39%.

INTUSSUSCEPTION.

Of all the varieties of acute, internal, intestinal obstruction that which most often presents the

clearest clinical picture is intussusception or invagination.

Its relative frequency among the more important causes is nearly constant at 39%, and ninety-three cases are included in the series collected since 1880. None were recognized as such unless the diagnosis was substantiated at an autopsy, by laparotomy, rectal examination, or by the discharge of a slough.

It occurred among males in fifty-two cases, among females in twenty-seven; about two-thirds of the cases were thus found in the former sex and one-third in the latter. The relative frequency at various periods of life is shown below:—

Year of age.	Number of cases.	Per cent.
Under 1.....	31.....	34
From 1—2.....	5.....	
2—3.....	3.....	
3—4.....	1.....	
4—5.....	3.....	
5—6.....	4.....	
6—7.....	1.....	
7—8.....	1.....	
8—9.....	2.....	
<hr/>		
Under 10.....	51.....	56
From 10—20.....	6.....	
20—30.....	13.....	
30—40.....	9.....	
40—50.....	5.....	
50—60.....	2.....	
60—70.....	4.....	
70—80.....	1.....	
<hr/>		
91		

Exciting causes were absent in forty-two cases, 45%; and the following were possible causes in fifty-one cases, 55%:—

Diarrhœa.....	in 13 cases.
Habitual constipation.....	" 12 "
Protracted abdominal pain.....	" 7 "
Indigestible food.....	" 6 "
Violent exertion.....	" 4 "
Injury.....	" 3 "
<hr/>	
45 "	

Single cases occurred in the course of typhoid fever, gastro-enteritis, variola, pregnancy, after an operation for incarcerated hernia, and after the use of cathartics, — in all, six cases. A preceding like attack was observed in two instances.

These possible factors are of but little value in differential diagnosis; and their frequency without injurious sequences makes their further consideration of little or no importance.

Our knowledge of the method of production of the invagination has been rendered relatively exact by the experiments of Nothnagel⁶ and of Senn.⁷ The former found that a contracted bit of intestine pushed itself into a passive portion from above downwards. This contraction was induced⁸ by a faradic current, and in the course of a minute or two the invagination might become four inches long. He found that the internal and external cylinders were formed below the tetanized part, almost without exception. If the intestines were paralyzed by crushing no invagination occurred. These observations go to show that the invagination is always descending and is rather spasmodic than paralytic. Senn also found that the invagination was early formed in a relaxed bowel and could not be produced in the contracted gut.

The most important symptoms of intussusception are abdominal pain, nausea or vomiting, tympany, tumor, bloody stools, and tenesmus.

⁶ Nothnagel. *Zeitschr. f. klin. Med.*, 1882, iv. 555.

⁷ Senn. *Annals of Surgery*, 1888, vii. 4.

⁸ Nothnagel. *Wien. Med. Bl.*, 1883, v. 1433.

Their relative frequency was reported as follows :—

Pain.....	in 65 cases	=	70 per cent.
Nausea or vomit.....	" 66 "	=	71 "
Tympany.....	" 31 "	=	33 "
Tumor.....	" 64 "	=	69 "
Bloody stools.....	" 56 "	=	60 "
Tenesmus.....	" 33 "	=	35 "

The date of the appearance of these principal symptoms of intussusception is represented in the following table :—

DATE.	Pain.	Nausea or Vomit.	Tympany.	Tumor.		Bloody Stools.	Tenesmus.
				Abdomen	Rectum.		
1st day	61	51	1	9	10	32	15
2nd "	2	4	2	12	8	7	4
3rd "	1	3	8	8	7	6	5
4th "	1	3	8	2	3	3	
5th "		1	4		2	1	2
6th "			3	3	4	3	3
Later or not given		4	5	5	6	4	4
Total no. of cases.	65	66	31	39	40	56	33

Where pain was recorded as a symptom, it appeared on the first day in nearly all the cases. Its early absence, on the contrary, was conspicuous in rare instances. It was usually described as abdominal, and was sometimes located at the navel, in the stomach and epigastrium, and in the right iliac fossa.

It was referred to the left iliac fossa in rectal or colico-rectal varieties of intussusception. Of five cases in which the pain was said to be at the navel,

the intussusception was of the ileum in three instances. The seat of the pain in the right iliac fossa frequently led to the diagnosis of typhlitis, perityphlitis, or typhoid enteritis.

It was usually sudden, severe, perhaps violent, and was frequently spasmodic. In one case it was so intense as to lead to an attempt at suicide. Its importance in the diagnosis of the seat of the intussusception was merely relative. The possibility is obvious that its seat in either iliac fossa might serve to differentiate an intussusception of the colon or rectum from one near the cæcum. In like manner its position at the navel might serve to suggest the small intestine as the seat.

Nausea or vomiting occurred on the first day in nearly nine-tenths of the cases in which a definite date could be fixed. If nausea occurred in the first instance it was rapidly followed by vomiting. The latter presented no characteristics of any value in differentiating this variety of intestinal obstruction, except in the rarity of its becoming fecal. Among the ninety-three cases of intussusception fecal vomit is noted in only twelve patients, and it appeared on or after the fourth day in all but two of these. In nearly one-third of the twelve cases, the obstruction was fixed at or below the cæcum. In two-thirds the intussusception was of the small intestine; in at least one-half of these certainly away from the valve, in the other half possibly near the valve. This symptom, therefore, has no absolute value in determining the existence of an intussusception; if the latter is rendered probable, fecal vomit suggests that the seat is at or above the cæcum.

Tympany is perhaps the least important symptom of obstruction by intussusception. It occurred only in one-third of the cases, and in one-half of these on the third and fourth days.

A tumor was found in sixty-one cases,—nearly two-thirds of the entire number. It was found in the abdomen only in twenty-three cases, in the rectum only in twenty-one cases, and in the abdomen and rectum in sixty-one cases. It is stated to have been absent in four instances, while in twenty-eight its presence is not mentioned. It was found on the first day in more than one-third of the cases, on the second day in one-fourth, and on the third day in more than one-fifth of the cases. Thus in more than one-half of all cases it was present in the first two days, and in the first three days in more than three-fourths of the cases. The relative frequency of its presence in the abdomen or rectum on these days is shown in the preceding table. In the cases of intussusception of the small intestine a tumor was not observed. The general characteristics of the tumor of intussusception are sufficiently well known. It was often associated with a relaxed sphincter.

The rectal discharges in intussusception are of the greatest importance in diagnosis, especially as they not infrequently continue throughout the disease. Diarrhœa may immediately precede the attack, and the alvine discharges may be wholly fecal at the outset, but rapidly become mixed with blood. Pure blood or blood and mucus are the more frequent discharges. They may occur spontaneously, or immediately follow a rectal examination, or the use of an enema.

Bloody stools were recorded in three-fifths of the cases; and occurred on the first day in the same proportion of cases where a definite date was given.

Tenesmus was stated to be present in nearly one-third of the cases, in about the same number as was tympany. Its presence on the first day was noted in one-half of these, when a fixed date was mentioned.

Fever occurred in twenty-six cases — 28% of the entire number. Its absence in five was conspicuously stated, while no mention was made in sixty-two instances. The temperature was elevated on the first day in four cases, on the second in seven, on the third in eight, on the fourth in four, and in one on each of the three succeeding days.

Intussusceptions are classified anatomically according to the part of the bowel affected. They are, without more minute subdivision, of the small intestine into itself, into the cæcum, or into the colon, of the colon into itself or rectum, and of the rectum into itself. The relative frequency of these varieties has a decided practical importance; and of sixty-five cases the variety was as follows:—

Ileo-cæcal or ileo-colic.....	48 cases	=	75 per cent.
Enteric.....	8 “	=	12 “
Rectal.....	5 “	=	8 “
Colico-rectal.....	4 “	=	5 “
	<hr/>		<hr/>
	65		100

The intussusceptions in the vicinity of the cæcum thus represented three-fourths of the whole number. The question as to the variety in any given case will lie essentially between this form and that of the small intestine away from the valve, which occurred

in only one-eighth of the cases. The rectal and colico-rectal varieties are usually easily recognized on rectal examination.

These figures differ considerably from those of Leichtenstern,⁹ based upon a collection of four hundred and seventy-nine cases, which are as follows: Ileo-cæcal and ileo-colic, 52% ; ileal (enteric), 30% ; rectal and colico-rectal, 18%. The chief difference lies in the greater frequency of the varieties originating near the cæcum in the smaller series and in the lesser frequency of the enteric variety. It is possible that the latter difference may result from the more critical exclusion of post-mortem cases. The former difference may be due to the inclusion, for practical purposes, of ileal intussusception near the valve among ileo-cæcal forms.

The mortality in cases of indisputable intussusception was very great, excepting in the rectal variety. The following table shows the number and date of deaths of other varieties than the rectal, when the treatment was by other measures than surgical:—

Date.	Death.
1st day.....	2
2nd ".....	2
3rd ".....	6
4th ".....	3
5th ".....	5
6th ".....	1
1st week.....	19
2nd ".....	6
3rd ".....	1
Not given.....	9
	<hr/>
	35
Recoveries.....	16
	<hr/>
	51

⁹ Leichtenstern, *op. cit.*, 501.

It thus appears that of the above series 69% died and 31% recovered. Of the fatal cases nearly one-half, and perhaps a larger proportion, died during the first five days. The third, fourth, and fifth days were especially fatal.

The following table shows the mortality after surgical interference:—

Date of operation.	No. of cases.	Deaths.	Recovery.
1st day.....	1.....	1.....	0
2nd ".....	1.....	0.....	1
3rd ".....	6.....	5.....	1
4th ".....	4.....	4.....	0
5th ".....	4.....	2.....	2
6th ".....	4.....	3.....	1
7th ".....	2.....	2.....	0
8th ".....	4.....	4.....	6
9th ".....	3.....	3.....	0
Not given.....	7.....	6.....	1
	<hr/> 36	<hr/> 30	<hr/> 6

The mortality after surgical treatment was thus 80%, against 69% of medical treatment.

TWISTS AND KNOTS.

Acute obstruction from volvulus or twist occurred in forty cases, and from knots in two instances. As already stated, the symptoms from knots are essentially the same as those from strangulation. Their occurrence is so rare that they may practically be disregarded.

Of the forty cases of volvulus since 1880, the vast majority were axial, but in rare cases a part of the small intestine was twisted about another portion. As but two instances of the latter variety occurred in the series, these have been included among the former, although their symptoms are those of cords and bands, while their prognosis is, perhaps, more favorable. Their number is such as

not to materially modify the conclusions to be drawn.

Of thirty-eight cases of volvulus twenty-six occurred in males and twelve in females; 68% in the former and 32% in the latter.

The ages of the patients was as follows in thirty-four cases: —

Year of age.		Number of cases.
From	6.....	1
	15—20.....	4
	20—25.....	2
	25—30.....	2
	30—35.....	6
	35—40.....	6
	40—45.....	3
	45—50.....	2
	50—55.....	1
	55—60.....	5
	65—70.....	1
	70—73.....	1
		<hr/> 34

The extremes of life represented are therefore six years and seventy-three years. The greatest number of cases in any ten years was between the ages of thirty and forty years, and was about one-third of all.

In the etiology of this class of cases of obstruction, the previous occurrence of a similar attack was observed in five instances. A constipated habit was noted in six cases. Hernias existed in three. Two of the patients were insane, and one was paralytic. One suffered from chronic diarrhœa. Upon another the operation of ovariectomy was performed six years before the obstruction took place. In four cases violent exercise was the exciting cause; in another an attack of diarrhœa; and in still another irritating food.

The following table shows the relative frequency of the principal symptoms of volvulus :—

DATE.	Pain.	Nausea or vomiting	Tympany.
1st day.....	19	9	1
2nd "		2	1
3rd "			3
4th "	2	2	3
5th "			1
6th "		1	1
7th "			2
Later or not given	3	1	10
Total no. of cases.....	24	15	22

Abdominal pain was thus the first symptom of importance in nearly one-half of all the cases, and it occurred on the first day in nearly all where the date was recorded. It was sudden in one-half of the above number. It was either severe, intense, extreme or violent in as many cases, and in only one instance was there a record of no particular pain. It was seated near the navel in four cases, in the left abdomen and in the left iliac fossa each in two instances ; in the lower abdomen, left groin, right iliac fossa, and near the stomach each in one case.

It was found, therefore, most often, in one-fifth of the cases, on the left side, then at the navel in one-sixth of the cases, and elsewhere in the abdomen in small but equal proportion.

The pain was stated to be associated with nausea or vomiting in three-fifths of the cases where a date

was given. In two cases there was no vomit as late as the eighth day, in one till the eleventh day, and in another there was none at all.

The vomit was fecal in six cases,—in three on the fourth day, in one on the sixth day, in one on the eleventh day, and in another no mention is made of the date of its occurrence. It was slight in two of the cases. It occurred in four instances where the small intestine was obstructed, and in two where the large intestine was twisted. On the contrary, in three cases where the volvulus was of the small intestine, there was no fecal vomit.

Although tympany was recorded in more than one-half of the cases, it was present during the first week in only about one-half of these. Its occurrence during the first week was oftenest on the third and fourth days. It might be much on the first day, or slight on the fourth day. It was described as enormous on the ninth day.

Tumors are not a characteristic of twist, but the abdominal swelling might be so circumscribed as to suggest a tumor. When the flanks alone were swollen the twist was of the large intestine; when the umbilical region was conically distended the obstruction was either of the large or of the small bowel. Visible coils were present only in three cases. In one the coil was the transverse colon, the twist being of the sigmoid flexure. In a second the sigmoid flexure was also twisted. In the third the volvulus was probably of the small intestine.

A record of the temperature was made in sixteen cases. In four there was no elevation on the third, sixth, and seventh days. In two the tem-

perature was fairly normal or slightly elevated. Of the cases of distinct elevation, there were three in which the temperature on the fourth day was between 99.6° F. and 101.3° F. The temperature is first recorded as elevated on the second, third, fifth, sixth, ninth, and tenth days, each in one case. Since in only about one-fourth of the cases was there any noteworthy elevation of temperature, and since in two-thirds of these cases it took place on no particular day between the second and tenth days, it is obvious that fever is no important characteristic of obstruction from a twist.

Hiccough was present in three cases, apparently without especial dependence on the part of the intestine twisted.

Occasional records were made of the condition of the urine. It was rarely reported as modified in quantity or quality. In one case only half a pint was passed on the seventh day. In another four ounces were passed in twelve hours on the ninth day. There was retention on the fourth day in a single case. In another patient an increased quantity of indican was reported on the eighth day. In all the other cases there was either no record of its condition or the flow was reported as free or as abundant.

The seat of the twist is shown in the following table.

Seat.	Number of cases.	Per cent.
Sigmoid flexure.....	19.....	49
Ileo-cæcal region in 6 }	11	29
Cæcum in 5		
Small intestine.....	5.....	13
Ascending colon	2.....	5
Colon.....	1.....	2
Descending colon	1.....	2
	<hr/> 39	<hr/> 100

It is thus evident that about one-half of the cases of twist took place at the sigmoid flexure, and that nearly one-third of them were present in the ileo-cæcal region. It is further evident that, for all practical purposes, 87% of the cases occurred in the large intestine.

An absolute diagnosis of volvulus is only to be made by abdominal section, either before or after death. Death is, therefore, to be regarded as the probable result of this lesion unless the surgeon affords relief. This statement is made despite the fact that in five of the cases there was the previous history of a similar attack.

Death occurred as follows in cases not treated surgically : —

Date.	Number of cases.
1st day	1
3rd "	2
5th "	2
7th "	3
8th "	2
9th "	1
12th "	1
Not given.....	3
	<hr/> 15

The date and result of operative interference is given in the following table : —

Date of operation.	Number of cases.	Death.	Recovery.
3rd day	2	1	1
4th "	1	1	0
5th "	3	2	1
6th "	2	2	0
7th "	1	1	0
9th "	6	5	1
10th "	1	1	0
11th "	1	1	0
16th "	1	0	1
26th "	1	0	1
Not given.....	6	6	0
	<hr/> 25	<hr/> 20	<hr/> 5

It is apparent from the above tables that all of

the cases not treated surgically died, and that of those thus treated one-fifth recovered.

Since, of known dates of death, at least one-half took place before the eighth day, it is obvious that medical treatment should cease before this date. Furthermore, since, of the cases treated by the surgeon from the third to the sixth day, only one-third recovered, it is suggested that medical treatment should cease at the former date.

OBSTRUCTION BY ABNORMAL CONTENTS.

Acute obstruction of the intestines by abnormal contents, as biliary and intestinal calculi, more or less inspissated fæces and foreign bodies, form a series, where plugging of the bowel is the immediate cause of the disturbance.

Foreign bodies introduced into the mouth and rectum, and there causing symptoms of acute obstruction, are so immediately recognized and their treatment so apparent, that they require no consideration in the present communication. If taken into the mouth they usually offer no difficulty of diagnosis, if intestinal obstruction is to follow. The etiology is usually clear; the symptoms, as shown in the three cases of this sort occurring during the past eight years, are so mild, that the chief, if not the sole, evidence of obstruction was the absence of a stool for three days in two instances, and for twelve days in a third. Pain and nausea or vomiting were absent, except in an infant of twelve months, who had swallowed wool-fibres. There was no tympany. A soft tumor near the cæcum, on the fourth day of absent stools, was

found in one case, and was probably composed of lumbrici. There were no associated symptoms to suggest a more serious cause of tumor in the cæcal region.

There were two cases of intestinal calculi which offered grave symptoms of obstruction. The calculus in one case was composed of shellac, in the other of date seeds and gritty material.

The number of cases of obstruction from abnormal contents is thus reduced to twenty-three of biliary calculi, nineteen of fæces, and two of enteroliths, making forty-four in all.

This number may seem small, but in a critical consideration of reported cases, it is necessary to exclude many as doubtful. This is especially true with regard to gall-stones and fæcal masses. If the patient dies, and a gall-stone obstructs the bowel, the evidence furnished is rarely sufficient to exclude the possibility of the obstructive symptoms resulting from a peritonitis,—the latter occasioned, not by the presence of the calculus in the bowel, but by the destructive processes associated with its entrance into the gut. Medical treatment in this class of cases may often prove efficient, since the symptoms of obstruction may be due to the peritonitis and not to the plugging.

Similar statements hold true with regard to reported cases of obstruction from fæces. If fæcal tumors are found, and symptoms of intestinal obstruction are present, it by no means follows that the symptoms are immediately due to the fæces. An associated peritonitis from an inflamed appendix is of frequent occurrence, and alone suffices to

suggest the diagnosis of obstruction. With the presence of a fæcal tumor the diagnosis seems to be substantiated. The analysis which is to follow will show, however, that enormous fæcal accumulations may exist, and very few symptoms arise to suggest an attack of acute internal obstruction.

The sex of the cases of obstruction from abnormal contents, is as follows :—

	Gall-stones.	Fæces.	Enteroliths.	Total.
Males	5	8	2	15
Females.....	18	11	0	29
	<u>23</u>	<u>19</u>	<u>2</u>	<u>44</u>

Obstruction from gall-stones thus occurred among females in two-thirds of the cases ; while in obstruction from fæces the question of sex is not important.

The age at which the obstruction occurred is seen in the following table :—

YEAR OF AGE.	Gall-stones	Fæces.	Enteroliths	Total
At 8.....		1		1
From 10—20		4		4
20—40.....		4		4
40—45.....	1	0		1
45—50.....	3	0		3
50—55.....	3	2	1	6
55—60.....	6	2		8
60—65.....	3	4		7
65—70.....	3	1		4
70—75.....	2			2
75—80.....	1	1		2
	<u>22</u>	<u>19</u>	<u>1</u>	<u>42</u>

It is thus apparent that obstruction from gall-stones occurred only in adults, and after the age of fifty years in six-sevenths of the cases; that obstruction from fæces may occur at any time of life; while enteroliths were found in adult life.

In eleven cases, nearly one-half, of obstruction from gall-stones there was a previous attack attributed to biliary calculi. In the nineteen cases of fæcal obstruction, habitual constipation, often no dejection for several weeks, was almost invariably present.

The shellac-calculus was present in a cabinet-maker who was accustomed to drink an alcoholic solution of shellac. In the cases of fæcal obstruction loose dejections were occasionally noticed, although the bowels contained large quantities of fæces.

The accompanying table shows the date and relative frequency of the important symptoms of obstruction from gall-stones:—

DATE.	Pain.	Nausea or Vomit.	Fæcal vomit	Tympany.
1st day	13	10		1
2nd "		2	1	1
3rd "		1	3	1
4th "		1	1	2
5th "			2	3
Later or not given	6	3	7	5
	19	17	14	13

Abdominal pain was the initial symptom of the attack of obstruction in two-thirds of the cases.

It was usually sudden, severe, or intense, sometimes described as griping. It was exactly localized on the first day in but two cases. In one the seat was referred to the epigastrium, in the other to the hypogastrium. After the first day the pain was referred to the epigastrium in four cases, to the navel in two, to the hypogastrium in two, and to the right iliac fossa in one.

Nausea or vomiting was present on the first day in about three-fifths of the cases. The vomit was inky in one case on the third day, and bloody in another on the fourth day. It was slight in two cases. Faecal vomit was present in nearly two-thirds of the cases of obstructing gall-stones, and, as far as could be ascertained, most frequently on the third day.

Tympany was present nearly as often as faecal vomiting. It was usually slight or not excessive, and was repeatedly stated to have been absent.

A tumor was rarely noticed. Once in the right iliac fossa, and proved to be the calculus. Twice at the navel on the third day. It is stated to have been as large as a child's head in one of these cases. The tumor was present in the left inguinal region in one case, and once was found on rectal examination.

The temperature was as high as 101° F. in one case and between 99° F. and 100° F. in three cases on the fourth and fifth days. In the majority of cases it was either normal or subnormal.

Jaundice and hiccough were symptoms in but two cases of gall-stones, and these occurred early. The urine was diminished in quantity in five in-

stances, being noted as scanty on the second, fourth, and fifth days, and as absent on the sixth day. Once it contained cholesterine discharged from the rectum.

Of the twenty-three cases of obstruction from gall-stones there were thirteen deaths and ten recoveries. Twelve cases were treated medically and eleven surgically; of the former eight recovered and four died; of these latter one on the fifth, seventh, and tenth days respectively, and one on a date not given.

In the cases of recovery the calculi were passed on the fourth, fifth (in two cases), tenth, fourteenth, fifteenth, seventeenth, and twentieth days.

Surgical interference took place as follows:—

Date.	Number of cases.	Recovery.	Death and date.
3rd day	1	0	1 8th day.
4th "	1	0	1 4th "
5th "	1	0	1 5th "
7th "	2	1	1 7th "
8th "	2	0	2 { 8th "
9th "	1	0	1 { 9th "
17th "	1	0	1 14th "
18th "	1	0	1 18th "
Not given.....	2	1	1 Not given.
	11	2	9

The seat of the calculus in the fatal cases was the ileo-cæcal region in four, the jejunum in three, the ileum in three, the small intestine in two, and the duodenum in one case.

Since all the operative measures after the seventh day terminated fatally, and five cases recovered after this date under medical treatment alone, the condition of the patient must determine the treatment to be followed.

In fæcal obstruction pain at the outset was rare. It was present in six cases only, one-third of the

whole number, and was absent on the fifth day in one instance, on the fifteenth in two, and on the twentieth in one. It was seated in the right iliac fossa, in the region of the stomach and liver, and in the left iliac fossa each in one case.

Nausea or vomiting was present in nine cases and absent in ten. It was of late occurrence, the date being stated in only three cases, in these on the fifth, fourteenth, and nineteenth days. It was fæcal in but three cases and in these the only date assigned was the twentieth day.

Tympany was present in rather more than a third of the cases, and usually at a late date, after the first week. The abdomen of a child measured thirty-one inches, of an adult forty-three inches in circumference.

An abdominal tumor was noted in about one-half of the cases of obstruction from fæces. It occupied the entire abdomen in three instances, was situated in the left lumbar region in two, in the left hypochondrium, the left iliac fossa, the right side and right iliac fossa each in one case. The tumor was described as elongated, rounded, nodular, slightly movable, hard, dull. Scybala were occasionally to be felt in the rectum.

The temperature was rarely above the normal. The urine was scanty on the fifteenth and twentieth days in two cases of fæcal obstruction.

The seat of the obstruction was the large intestine, and its lower part was more often involved than the upper. This evidence is in favor of the view that the fæcal tumor in so-called stercoral typhlitis is rather the result of an inflamed appendix than the cause of an inflamed cæcum.

There were fifteen recoveries and four deaths among these cases. In one the death was due to perforation of the bowels, in another it was attributed to pulmonary congestion, and in two there was no obvious anatomical cause.

In the cases which recovered the obstruction lasted from two to three weeks in three cases, from three to four, four to five, five to six weeks, one in each period, and in one case it lasted for four months.

The medical treatment consisted of large enemata, irrigations, electricity, and various purgatives. Laparotomy, colotomy, and division of the anus were each performed in one instance.

It is obvious from the above consideration that obstruction from fæces may be excluded from the series of acute, internal, mechanical obstructions, because abdominal pain, tympany, and fæcal vomit were rare and late, while nausea or vomiting was also of late occurrence. A tumor was present in half the cases, and was characteristically fæcal. Fever was absent. Furthermore, rectal injections are likely, at once, to give positive evidence of fæcal obstruction.

The rarity of obstructing intestinal calculi was such that they may practically be disregarded. If present, their significance is that of gall-stones.

STRICTURES AND TUMORS.

Malignant disease and strictures of the intestine, and abdominal tumors outside the intestine, are sometimes the cause of symptoms of acute obstruction, and the former may require consideration in differential diagnosis.

There have been fifteen cases of such strictures and tumors of the intestine since 1880, of which ten occurred among females and five among males.

The age of these patients was as follows:—

Years of age.	Number of cases.
From 20—30	2
30—40	1
40—50	3
50—60	4
60—70	5
	<hr/> 15

Four-fifths of the cases thus occurred after the age of forty, and three-fifths after the age of fifty years.

In two-thirds of the patients antecedent symptoms of abdominal disturbance were present as follows:—

Chronic abdominal pain	in 3 cases
Constipation	“ 3 “
Irregular and bloody discharges	“ 1 “
Rectal uneasiness	“ 1 “
Previous attacks	“ 1 “
Hernia	“ 1 “
	<hr/> 10

The date and relative frequency of the important symptoms of intestinal obstruction from strictures and tumors is shown in the following statement:—

DATE.	Pain.	Nausea or Vomit.	Tympany.	Tumor.
1st day	8	4		
2nd “	1	1		
3rd “		2	1	
4th “		1	1	
5th “		1	1	
6th “			3	
Later or not given		3	4	4
	<hr/> 9	<hr/> 12	<hr/> 10	<hr/> 4

Although pain was the first symptom in one-half of the cases, in two the attacks began with constipation. The pain was seated in the lower abdomen in three instances.

The vomit became faecal in five cases; the earliest date was the third day. The tympany might be enormous on the third day, or moderate on the sixth day.

A tumor was perceptible by rectal examination in two cases, and by palpation in the iliac fossæ each in one case. In three instances there were visible intestinal coils.

The temperature was not elevated before the sixth day, was never higher than 102.2° F., and then not till the tenth day.

The lesion and its seat were as follows:—

Cancer of the sigmoid flexure	in 5 cases.
“ “ rectum	“ 3 “
“ “ colon	“ 2 “
“ “ cæcum	“ 1 “
Stricture of the ileum	“ 1 “
“ “ cæcum	“ 1 “
“ “ colon	“ 1 “
“ “ rectum	“ 1 “

15

The obstruction was thus of the large intestine in fourteen cases, and of the small intestine in but one instance. It was situated in the left iliac fossa or pelvis in nine cases, nearly two-thirds of the whole number, and in the right iliac fossa in two cases. The seat was thus in the lower abdomen in nearly four-fifths of all the cases of acute obstruction from strictures and tumors.

Of the fifteen cases eleven died and four recovered from the immediate symptoms of obstruction. The nature of the lesions is such that surgical treat-

ment alone offers hope. In eight cases where death occurred without surgical treatment, it took place on the fourth, fifth, eighth, twelfth, eighteenth, and fifty-fourth days each in one case, and on the seventeenth in two cases.

Surgical treatment was employed in seven cases, with the following immediate result:—

Date of operation.	Number of cases.	Recovery.	Date of death.
5th day.....	1	1	0
7th "	1	1	0
8th "	1	0	1, after 9 weeks.
9th "	2	2	0
14th "	1	0	1, 17th day.
Not given.....	1	0	1, same day.
	<hr/>	<hr/>	<hr/>
	7	4	3

As a result of the foregoing analysis the symptoms, apart from stoppage of the bowels, upon the presence of which the physician must rely to establish a diagnosis of acute, internal obstruction, are abdominal pain, nausea or vomiting, abdominal tympany, and abdominal tumor. The presence of fever, the occurrence of hiccough or jaundice, abnormal conditions of the urine, are all occasional and subordinate.

The cardinal symptoms are, then, pain, vomiting, tympany, and tumor. The vomit may become fæcal, and the tumor may be simulated by visible intestinal coils. The relative frequency, in percentages, of the occurrence of these symptoms in the main varieties of acute, intestinal obstruction, as occurring since 1880, is here shown:—

	Strangu- lation.	Intussus- ception.	Twist.	Gall- Stones.	Stricture or Tumor.
Pain	82	70	60	83	60
Nausea or } vomiting }	69	75	37	74	80
Fecal vomiting.	47	13	15	61	33
Tympany	56	33	55	56	66
Tumor.....	10	69		13	27
Visible coils	11		7		20

But the presence of these cardinal symptoms is evidence of other disease than acute, internal, mechanical obstruction of the bowels. They may result from external causes of obstruction, and the various herniæ are to be excluded. They may be the symptoms of a peritonitis in the absence of mechanical, intestinal obstruction. The various causes of peritonitis are therefore to be excluded. These include those arising from the gastro-intestinal, genital, and urinary tracts, the biliary passages, suppurating or necrotic lymph-glands, embolism of the abdominal arteries, and from the continuance of inflammatory processes through the thoracic and abdominal walls.

The diagnosis of acute, internal obstruction is then made, in the first instance, by exclusion.

The second question relates to the part of the bowel which is the seat of the obstruction. It appears from the above analysis that the chief varieties of obstruction were situated as follows:—

	Large intestine.	Small intestine.
Strangulation	8	66
Intussusception	57	8
Twist.....	34	5
Gall-stone.....	4	9
Stricture and tumor	14	1

117=57 per cent.

89=43 per cent

It is obvious that obstructing gall-stones in the large intestine are not of much consequence from their seat in that part of the bowel, as they have usually produced their important symptoms before reaching the colon.

The obstruction, therefore, is likely to be either in the small or in the large bowel in not far from equal proportion. In order to determine which is affected, the patency and capacity of the large intestine must be ascertained as thoroughly as possible.

Rectal examination by the finger alone may make the diagnosis clear, as in certain cases of intussusception, stricture, and obstruction from abnormal contents. The limits of this method, however, are easily reached. Exploration by the introduction of the entire hand into the rectum may then suggest itself as a means of determining the seat of the obstruction. The cases are but a few where such a method has been used in intestinal obstruction with success. They are so few and the evidence thus to be obtained is so indefinite, that this method of exploration may be placed among the possibilities in any given case, but as of doubtful expediency.

There remains the introduction of the rectal sound or tube. These have the advantage in length over the finger or hand; they have the disadvantage of giving rise to errors of judgment. The information to be furnished by the rectal sound is limited to the determination of the length and calibre of the rectum and sigmoid flexure, at the most as far as the junction of the two legs of the

bowel which form the loop. This may lie at the navel, as in a case recently examined by me after death. It has been my experience to fail to pass either the rigid or the flexible tube beyond the sigmoid flexure in numerous attempts both on the living and dead. After repeatedly introducing the flexible tube its entire length, it has been found compactly coiled within the rectum on passing the finger through the anus. In these respects my experience corresponds with that of Treves¹⁰ and others.

The use of the rigid tube is not without danger. I have known it, in the hand of a skilful and experienced surgeon, to perforate the intestinal wall above a stricture of the rectum.

The capacity of the large intestine, beyond the reach of the finger or a short tube, is best determined by an attempt to distend the bowel with air, gas, or water, under a certain degree of pressure. Air may be introduced by connecting the end of an inserted rectal tube with the nozzle of a syringe or a pair of bellows.

Air or gas may be allowed to escape from a siphon of aerated or carbonated water. Ziemssen¹¹ recommends that the intestine be charged, alternately and in small quantities, with solutions of bicarbonate of soda and tartaric acid, — twenty grammes (five drachms) of the former and eighteen grammes (four and a half drachms) of the latter.

The simplest and best agent, however, is warm water. It is easily procured, and the quantity used can be simply and accurately measured.

¹⁰ Treves, *op. cit.*, 398.

¹¹ Ziemssen, *Arch. f. klin. Med.*, 1883, xxxiii. 236.

Some arrangement is necessary by means of which the injected fluid shall be prevented from escaping from the anus. Forcible compression of the buttocks against the rectal tube suffices for moderate degrees of pressure. But the column of fluid may be under considerable, even extreme, pressure, especially when this diagnostic procedure becomes a remedial measure, as in cases of intussusception.

Lund ¹² figures and describes an apparatus for this purpose, consisting essentially of an annular air-cushion through which passes a tightly fitting rectal tube. The latter is connected with the injecting syringe. A similar apparatus was improvised by Forest, ¹³ who wound a roller bandage tightly around a glass vaginal syringe from which the piston was removed. The mouth of the syringe was closed with a perforated cork. A glass tube was pushed through this and was connected with the injecting syringe. This latter is most conveniently a fountain-syringe or a funnel and rubber tube. These may be elevated gradually to any desired height above the patient's level, and will permit an accurate measure of the pressure used and the quantity injected.

The force necessary to distend the large intestine sufficiently to determine its calibre may be slight. But the physician should be prepared to increase it sufficiently, within safe limits, to make it clear that the large intestine is or is not obstructed. These limits are determined by the time which has elapsed

¹² Lund. *Lancet*, 1883, i. 588.

¹³ Forest. *Am. J. Obst.*, 1886, xix. 673.

since the obstruction became apparent, the age of the patient, and the quantity of fluid injected.

Thomas¹⁴ records a case where, on the third day, an enema, under light pressure, was followed by death in an hour and a half. The case proved to be one of intussusception; a rent was found in the sheath and a half tumblerful of water in the pelvis. The earlier, therefore, this method of exploration is employed the better, especially in the case of suspected intussusception.

The age of the patient is important, since obstruction in children is most likely to be from intussusception. Lower degrees of pressure will produce rupture in them than in the adult, and the capacity of the large intestine is less.

The quantity of fluid admitted is as important as the force necessary for its injection. For diagnostic purposes all that is necessary is that a certain quantity of fluid should or should not be admitted into the bowel. The quantity which the large intestine of the adult will hold with safety may be stated at six quarts. In a case of catarrhal enteritis recently under my charge, nearly five quarts were gradually injected, without discomfort, by means of a bulb-syringe and rectal tube. Six quarts of fluid returned through the tube after removal of the syringe. Larrabee¹⁵ states that six quarts were injected into the intestine, and retained, in a case of obstruction of the ileum. The quantity which the large intestine of the infant may safely receive has been less exactly determined than the degree of

¹⁴ Thomas. *Lancet*, 1886, ii. 1219.

¹⁵ Larrabee. *Louisville Med. News*, 1881, xi. 3.

pressure which can be applied without causing rupture.

The limits of safety as defined by the above conditions will permit the elevation of the fountain-syringe to a height considerably less than that found necessary, by experiments, to rupture the bowel. Recent investigations on this point have been made by Rotch,¹⁶ who found that more than seventeen feet of pressure were necessary to tear the bowel of an infant, removed from the body. Forest¹⁷ found that the colon of an infant would bear, without rupture, from twenty to twenty-two feet of pressure. He also found that the colon of an adult would bear, with a like result, from thirty to thirty-seven feet. Young¹⁸ inserted a rectal tube into the bowel of a patient suffering from obstruction and connected it, on several occasions, with the waste-pipe of a tank which was elevated thirty feet. The patient eventually recovered from the immediate symptoms. Within safe limits will, therefore, be below ten feet in the infant, and twenty feet in the adult.

It should be remembered that, for diagnostic purposes, the indication is to distend the large intestine if possible, and without increasing the patient's danger. Anæsthesia should be employed; the patient should be inverted or placed on the right side, that the fluid may more readily pass up the bowel.

The objections which have been raised to the value of injections in determining the seat of the

¹⁶ Rotch. Boston Med. & S. J., 1882, cvi. 322.

¹⁷ Forest, *loc. cit.*, 691.

¹⁸ Young. British Med. Journal, 1884, ii. 706.

obstruction are based upon the condition of the patient and the negative value of the experiments made. It is asserted that the patient's voluntary muscles may resist the admission of the fluid; that a part of his intestine may be contracted and the rest tympanitic, with a resulting increase of the intra-abdominal pressure. The rectum may be filled with fæces, thus obstructing the entrance of fluid, or so distensible as to take in so large a quantity as to give rise to error of judgment. Again, a strictured bowel may be passable from below, but closed from above by a projecting fold of tissue. Finally, the experiments concerning the capacity of the large intestine are regarded as useless, since they are made on relaxed tissues.

These objections have a value within certain limits. If the injection is made late in the course of the disease, under slight degrees of pressure, and without anæsthesia, it may prove of no diagnostic value. If the question to be decided by injection depended upon the difference of a few ounces in the quantity of fluid admitted, the experiments on the corpse would be useless. But the diagnostic value of the injection is dependent upon a sufficient degree of pressure to overcome muscular resistance within the limits of safety, under anæsthesia. If the tympany is extreme enough to produce a doubtful result, the stomach and upper bowel may be emptied of their contents by siphonage. The quantity of fluid to be forced into the large intestine of the adult is one of several quarts or of a few pints. Since Treves¹⁹ cites the case where the rectum held

¹⁹ Treves, *op. cit.*, 397.

three pints, it is evident that, when only this quantity of fluid can be forced in, the obstruction may be at the sigmoid flexure, and that a larger quantity must be injected to ensure that the intestine above this point is passable. With these precautions and with these limitations the exploration of the large intestine by means of forced injections seems likely to prove in the future, as has been claimed in the past, a valuable, diagnostic measure.

It may, possibly, become unnecessary for the determination of the patency of the large intestine to use the higher degrees of pressure and the larger quantities of fluid. Treves²⁰ claims that by auscultation of the cæcal region it is possible to obtain pretty conclusive evidence of the arrival of injected fluid at that point. The colon must be entirely clear and the enemata quickly introduced, in an intermittent manner, without any admixture of air. The variety of abdominal sounds to be heard in cases of intestinal obstruction is so considerable that especial training in abdominal auscultation, and particularly in this affection, is regarded as necessary that this method of examination may prove of value.

Although, in general, faecal vomiting is more likely to occur in obstruction of the small intestine than in that of the large, this relation is of no importance in determining the part of the bowel affected. It occurred in forty-seven cases of strangulation, fourteen of gall-stones, twelve of intussusception, and five of malignant disease or stricture. It was present in four cases of stricture or

²⁰ Treves, *op. cit.*, 398.

tumor when the obstruction was at or below the cæcum. It was noted in four cases of intussusception in the same region, below the cæcum, in two of twist of the large intestine, and in one of strangulation of this part of the bowel. Thus, in more than one-eighth of the cases of fæcal vomit, the obstruction was of the large intestine.

The physician having determined, with more or less success, the patency and capacity of the large intestine, the question which next demands consideration relates to the special variety of obstruction which may be present.

This question is best answered by an appreciation of the relative frequency of the several varieties, the knowledge of the age of the patient, the antecedent and immediate symptoms.

The published experience of the past eight years shows that for all practical purposes the following is the relative proportion of the varieties of intestinal obstruction likely to be concerned in any individual case:—

Strangulation	101 cases	= 37 per cent.
Intussusception	93 "	= 34 "
Twist	40 "	= 15 "
Gall-stones	23 "	= 8 "
Stricture or tumor	15 "	= 6 "
	<hr/> 272	<hr/> 100

These varieties of obstruction were seated as follows:—

	Large intestine.		Small intestine.
Strangulation	7 per cent.		72 per cent.
Intussusception	51 "		8 "
Twist	30 "		5 "
Gall-stones	0 "		14 "
Stricture and tumor	12 "		1 "
	<hr/> 100		<hr/> 100

Since obstruction of the large intestine was intussusception or twist in four-fifths of the cases the differential diagnosis of these varieties is of especial importance. Etiology afforded no aid. The relative frequency among the sexes was the same.

If the patient is under thirty years of age the case is one rather of intussusception than of twist. Rectal tenesmus, bloody stools, and an abdominal or rectal tumor are significant of intussusception; they are not to be expected in twist. The greater the capacity of the large intestine the more likely is the presence of intussusception than twist, for the latter was found near the sigmoid flexure in 50% of the cases, while the former was found near the cæcum in 75%.

Finally, if the obstruction is not relieved by distention of the bowel and massage, with anæsthesia, there is probably an irreducible intussusception or a twist, each of which demands surgical treatment.

If the person is over thirty years of age, and there is neither tenesmus, bloody stools, nor a tumor characteristic of intussusception, the case is probably one of twist, tumor or stricture, or of strangulation. Twist was more than four times as common as strangulation, and more than twice as frequent as tumor or stricture. The latter was nearly twice as common as strangulation. The last is likely to be above the sigmoid flexure, while twist, cancer, and stricture are more likely to be at or below this point. Cancer and stricture are not infrequently within reach of the finger, hand, or sound.

They often have the antecedents of chronic pain, irregular and bloody discharges, and rectal uneasiness.

If the obstruction was seated in the small intestine, it was due to strangulation or gall-stone in more than four-fifths of the cases. The diagnosis of gall-stone was to be determined by its occurrence after the age of fifty years in six-sevenths of the cases, by previous symptoms attributed to this cause in one-half of the cases, by the usual late occurrence of the tympany on or after the fourth day, and by the occasional presence of a small, hard tumor.

Intussusception is to be differentiated from strangulation by its greater frequency in early youth, and the fact that a tumor is more often found. A twist of the small intestine is only to be differentiated by its extreme rarity.

What may be the immediate cause of the strangulation has but little practical value. At the best there is little else than numerical frequency to influence the opinion. It is desirable to remember that nine-tenths of the cases were due to adhesion, vitelline remains, or vermiform appendix, in the proportion of 63% : 21% : 6%. It is still more important to remember that, in the presence of urgent symptoms of acute obstruction, the source was to have been found in the lower abdomen in more than four-fifths of the cases.

The question, what is to be done by the physician, has already been partly answered. He is to remember that in the light of exact knowledge nearly all cases of acute, mechanical, intestinal obstruction die, unless relieved by surgical interference. That curative, medical treatment has proven of sure avail only in a limited number of cases of intussusception, possibly in a few of twist

in the large intestine, and in certain cases of gallstones in the small intestine. That his first duty, after relieving pain, is to determine the capacity of the large intestine. That this is best accomplished during the first two days following the initial pain, before tympany makes the task more difficult, and pathological changes cause it to be more dangerous. Finally, that the means employed for this purpose represent the most efficient curative agent in his control.

In case a diagnosis of intussusception is established, the possible benefits of medical treatment at an early stage result from the reduction of the displaced bowel. In fourteen cases where the condition of the bowel during the first five days was noted, it was found that in five, more than one-third, the bowel was irreducible on the third day. This fact should not necessarily deter the physician from an attempt at reduction at a later date. Wilson²¹ withdrew an intussusception after seventeen days of obstructive symptoms, and the patient recovered. On the other hand, although this possibility may be admitted, sloughs of the intestine may be evacuated on the ninth day.

Notwithstanding 31% of the cases recovered without any operative treatment, it does not follow that such a recovery is to be anticipated with favor, especially if it is to be associated with the evacuation of a slough. In this class of cases eventual death from annular stenosis of the intestine is to be feared, if earlier death from peritonitis does not occur, or strangulation may take place

²¹ Wilson. *Transylvania J. M.*, 1835, viii. 486.

under adhesive bands between the diseased bowel and neighboring coils. It is even possible that so much of the bowel may be detached as a slough that an insufficient quantity remains to serve for the necessary absorption of nutriment. Lanceus,²² for example, reports a slough of three feet of the ileum.

The medical treatment of intussusception consists essentially in the use of mechanical measures for the reduction of the displaced portion of bowel. The beneficial effect of such measures is all the more possible since it is evident that spontaneous reduction may occur. Senn²³ observed this fact in his experiments, and Langmaid²⁴ records a striking illustration. His patient was an infant of five months, who, on the first day, suffered from restlessness, vomiting, and bloody dejections. On the third day a tumor, with a central indentation like the neck of the uterus, was to be felt per rectum. A cylindrical tumor was also to be recognized in the region of the descending colon. After a few hours the invaginated bowel descended to the anus. In the interval between two visits the tumor disappeared. The patient had two natural dejections on the sixth day, and recovered without further disturbance.

The mechanical treatment consists of rectal injection or inflation, preferably the former, and replacement by a repositor. Almost indispensable advantage is to be derived from the associated use

²² Lanceus (Rev. Med. Quir. Buenos Ayres). Canada Lancet, 1880-81, xiii, 260.

²³ Senn, *op. cit.*

²⁴ Langmaid. Boston Med. and Surg. Journal, 1882, cvii. 33.

of anæsthesia. Massage of the tumor and inversion of the body are important adjuncts.

The use of electricity is to be condemned as irrational where intestinal contractions induce and promote the disturbance. Large doses of quicksilver have been employed within the past few years as well as in more remote times. Gronau²⁵ reports a case, in which, on the seventh day, one hundred and twenty grammes were given in two doses. The immediate effect was to check vomiting, although the pains persisted. A week later two copious dejections were noted, and on the following day eleven inches of ileum were discharged. The quicksilver did not appear till forty-four days after its administration.

The reduction of the displaced bowel by means of a probang or bougie, well padded at the end, seems useless, from reasons already stated, in any case of intussusception where the seat is above the sigmoid flexure. Even below this point inflation or injection have proven equally serviceable, and are to be preferred as freer from risk. The earlier they are employed the better, and their use is to be avoided when there is reason to suppose that gangrene is present at the neck of the tumor, or that the latter is irreducible. It has already been stated that the tumor may be irreducible on the third day, and that a slough may be passed on the ninth day. It remains to be shown what were the limits of the successful employment of injections and inflations since 1880.

²⁵ Gronau. Berl. Kl. Woch., 1882, xix. 514.

Recoveries from intussusception after inflation or injection :—

DATE.	Diagnosis certain.				Diagnosis probable.			
	Water.	Gas.	Air.	Total	Water.	Gas.	Air.	Total
1st day		1	3	4	2		4	6
2nd "			1	1	2	1	3	6
3rd "			1	1	2		1	3
4th "					1			1
Not given...	4		1	5	3		3	6
	4	1	6	11	10	1	11	22

Deaths from intussusception after inflation or injection :—

DATE.	Diagnosis certain.				Diagnosis probable.			
	Water.	Gas.	Air.	Total	Water.	Gas.	Air.	Total
1st day			1	1	1			1
2nd "	1		2	3				
3rd "	3		1	4				
4th "		1		1				
5th "	1			1				
	5	1	4	10	1			1

It thus appears that there were thirty-three cases of recovery after injection or inflation for certain or probable intussusception. In seventeen cases air was inflated, in fourteen water was injected, and in two gas introduced from a siphon-reservoir. It is further evident that the remedy

was used on the first day in ten cases, on the second day in seven, on the third in four, on the fourth in one, and on a date not given in eleven cases. The inference from these figures is that the successful use of inflation or injection may take place on the fourth day, but is most likely to occur during the first two days.

The unsuccessful use of the above treatment resulted, in eleven cases: in two on the first day, three on the second, four on the third, and in one on the fourth and fifth days respectively. Certain of these failures are due to an insufficient pressure, for after death, in these, the intussusception was easily reduced. In other cases the tumors returned, or the symptoms were not relieved. In such the tumors may not have been wholly reduced at the time of treatment. The inference is direct from the consideration of these tables showing the effect of medical treatment, that if the latter does not overcome the obstruction within the first two, possibly three, days, aid should be sought from the surgeon.

Relief, by injection or inflation, from obstruction due to a twist is of very unlikely occurrence. There is no exact evidence on this point. As in intussusception so in twist: if no relief follows inflation or injection on the second or third day, the aid of the surgeon should be sought.

The surgeon's knife offers the only hope of cure from strangulation.

In the medical treatment of obstruction from gall-stones, it is to be remembered that in the cases here collected a fatal result followed all

surgical treatment after the first week, and that five cases recovered under medical treatment after this date. The condition of the patient alone must determine the nature and duration of the treatment. Opiates, cathartics, and electricity have all been used in cases ending with recovery.

In the light of the published experience of the past eight years, the medical treatment of acute obstruction is limited to the use of injections during the first three days, under sufficient degrees of pressure, within fixed limits, to determine the patency of the large intestine. If it proves impassable the case is no longer medical, but surgical. If the large intestine is readily distended, and a diagnosis of gall-stones is admissible, and the condition of the patient is not urgent, opium is to be given; laxatives and electricity may be tried, but they are of doubtful expediency. If medical treatment is of no avail, and surgical treatment is refused, the efforts of the physician are restricted to the relief of pain and distress by narcotics, intestinal punctures, and gastric siphonage.

In conclusion, acute, intestinal obstruction is diagnosticated by exclusion. Its seat is fixed by injection. Its variety is determined by its seat, the age, antecedents, and symptoms of the patient. Its treatment is surgical, on or after the third day, if the symptoms are urgent and forced injections fail to relieve.

THE END.

