

# A TEN-YEAR SURVEY OF INTESTINAL OBSTRUCTION

E. L. ELIASON, M.D., AND ROBERT F. WELTY, M.D.

PHILADELPHIA, PA.

FROM THE SERVICE OF DR. E. L. ELIASON, HOSPITAL OF THE UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA, PA.

RECENTLY a review was carried out of all cases in which the diagnosis of intestinal obstruction was made on the Service of the senior author at the Hospital of the University of Pennsylvania during the ten-year period, 1934-1943. It was hoped that two things could be accomplished by such a survey. First, certain well-recognized features of intestinal obstruction could be reemphasized, *e.g.*, the high mortality associated with strangulation, advanced age, delayed treatment, *etc.* Second, we hoped to obtain statistical evidence to support a clinical impression that the mortality in intestinal obstruction has been reduced in the past ten years by improved treatment, the use of intestinal suction-drainage by means of the Miller-Abbott tube being an important factor. During this ten-year period, there were 292 cases who were admitted with either the primary diagnosis of obstruction or who developed this as a complication during their hospitalization. The importance of intestinal obstruction is demonstrated by the fact that 17 per cent of all surgical deaths at the Philadelphia General Hospital resulted from this condition.

In our survey the youngest patient was six weeks old, the oldest 84 years. Chart I shows the distribution by decades. The average age of all 292 cases was 45 years. Of the group who survived, the average age was 44 years, of those who died, 59—a difference of 15 years. This bears out the fact that the older patient with intestinal obstruction has a poorer chance for survival than the younger one. Carcinoma accounts for a high percentage of cases of obstruction in the older age-group. The nature of the disease in itself contributes further to the increased mortality in this group.

The cases were about equally divided between males and females, 48 per cent and 52 per cent, respectively (Table I). However, the mortality among the males was 14 per cent and among the females 9 per cent. The higher mortality in the former group is to be explained in part at least by the cases of lymphopathia venereum. Though this disease accounted for many cases of obstruction among the females, no deaths resulted from it, and during this period no cases of rectal stricture attributable to this disease were seen in the male.

A little more than half (60 per cent) were only partially obstructed (Table II). The mortality in this group, however, 10 per cent, was only slightly lower than in those who had complete obstruction, 12 per cent. One might have anticipated a lower mortality in those only partially obstructed, but, once again, the mortality in this group was increased because of the cases of carcinoma included therein. The cases were quite evenly divided between those in whom the disease was acute and those in whom it was chronic (Table III). The mortality in the two groups was exactly the same, 11 per cent, which corre-

sponded to the mortality for the entire series of 292. The nature of one of the important etiologic factors in chronic obstruction, *i.e.*, carcinoma, balances the seriousness of acute obstruction.

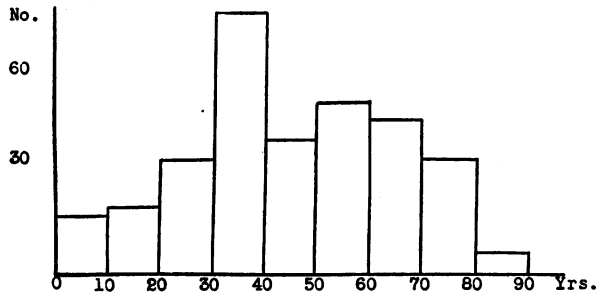


CHART I.—Distribution of cases by decades.

In the acute series, the average duration of symptoms for those who died was 2.6 days and for those who lived, 2.3 days (Table IV). There is no significant difference between these two figures. This is at variance with the

TABLE I

	SEX		Died	Mortality
	No.			
Females.....	153 (52%)		13	9%
Males.....	139 (48%)		19	14%

TABLE II

	DEGREE OF OBSTRUCTION		Died	Mortality
	No.			
Partial.....	176 (60%)		18	10%
Complete.....	116 (40%)		14	12%

TABLE III

	DURATION OF SYMPTOMS		Died	Mortality
	No.			
Acute.....	153 (52%)		17	11%
Chronic.....	139 (48%)		15	11%

generally accepted fact that the mortality for a group of cases with delayed treatment is higher than in a similar group with early treatment. About ten years ago a review of intestinal obstruction similar to this one was carried out at the Hospital of the University of Pennsylvania. Comparable figures obtained in the earlier survey showed that the average duration of the disease in those who died was 2.1 days and in those who lived, 1.2 days, a result which would be anticipated. In comparing the figures in these two series one may be justified in inferring that some cases with delayed treatment are now being salvaged who previously would have died. As more and more cases are saved

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in spite of delayed treatment, the average duration of symptoms for those surviving will increase and tend to make this figure approach more closely that of the group in whom death results. The average delay of 2.5 days before hospitalization in this series is still too long and unnecessarily increases the mortality in acute obstruction. Unfortunately, delay sometimes occurs even after admission to the hospital. In the face of a typical history and findings on

TABLE IV  
ACUTE CASES

AVERAGE DURATION OF SYMPTOMS		
	Previous Series	Present Series
Lived.....	1.2 days	2.3 days
Died.....	2.1 days	2.6 days

TABLE V  
SITE OF OBSTRUCTION\*

	No.	Died	Mortality
Small bowel.....	184	14	8%
Large bowel.....	114	18	16%

\* Some cases showed multiple points of obstruction.

TABLE VI  
CAUSE OF OBSTRUCTION

	No.	Died	Mortality
Adhesions.....	79 (27%)	4	5%
Malignancy.....	59 (20%)	20	34%
Lymphopathia venereum.....	41 (14%)	0	0%
Inguinal hernia.....	41 (14%)	2	5%
Femoral hernia.....	13 (4%)	4	31%
Ventral hernia.....	8 (3%)	0	0%
Internal hernia.....	5 (2%)	1	20%
Others.....	46 (16%)	1	2%

physical examination suggesting intestinal obstruction, one should not defer treatment if a typical roentgenogram is not found. The burden of the diagnosis and the resultant decision as to treatment should not be placed solely on the roentgenologist.

The mortality for those having small bowel obstruction, 8 per cent, was only half that in which the large bowel was involved, 16 per cent (Table V). Carcinoma of the large intestine no doubt accounts for the higher mortality in the latter group.

The commonest causes for obstruction were adhesions, malignancy, and hernia, accounting for 63 per cent of the cases (Table VI). The differences in mortality among the various groups were striking. Malignancy accounted for 20 per cent of the cases of obstruction, and 34 per cent of these died. Adhesions accounted for 27 per cent of the cases in this series, but only 5 per cent of these died. One should not infer from these figures that the mortality during this period for carcinoma of the large bowel was 34 per cent. Many

cases with this disease were admitted without evidence of significant obstruction and do not, therefore, appear in this collection.

Of the 292 cases in this series, 33 (11 per cent) were instances of post-operative obstruction.

No case with lymphopathia venereum died. The procedure carried out in this disease was usually a palliative one, such as a simple loop-colostomy or a Lahey-type of colostomy.

TABLE VII  
COMPARISON OF CAUSE OF OBSTRUCTION AND MORTALITY

	Per Cent of Series	Per Cent of Deaths
Malignancy.....	20%	63%
Femoral hernia.....	4%	13%
Adhesions.....	27%	13%
Inguinal hernia.....	14%	6%

TABLE VIII  
COMPARATIVE MORTALITY OF OLD AND NEW SERIES

Cause	Series	Mortality
Hernia.....	Previous	25.9%
	Present	10%
Adhesions.....	Previous	20.4%
	Present	5%

Twenty-three per cent of the cases were obstructed on the basis of a hernia. The inguinal region was the most common site, and carried a mortality of only 5 per cent. In contrast, the mortality in the femoral hernia group was very high—31 per cent. Failure to recognize promptly the nature of the disease is prone to occur in a femoral hernia, especially if a Richter's-type is present or if the patient is obese. At operation, one should never hesitate to divide the inguinal ligament if necessary to reduce the hernia. Also it is sometimes of value to expose the bowel from above by extending the wound and entering the peritoneal cavity through a muscle-splitting incision. Failure to follow these two suggestions leads at times to unnecessary trauma or rupture of an already strangulated intestine causing further contamination of the peritoneal cavity and increased operative mortality.

Ninety-two per cent of the deaths resulted in cases of obstruction due to malignancy, femoral hernia, inguinal hernia and adhesions (Table VII). Malignancy accounted for 20 per cent of the cases, but 63 per cent of the deaths. Femoral hernia accounted for 4 per cent of the cases, but 13 per cent of the deaths. These two conditions, therefore, were responsible for 24 per cent of the cases of obstruction, but 75 per cent of the deaths.

Comparison of the present series with the previous review of intestinal obstruction at this hospital reveals a definite improvement in the prognosis (Table VIII). In the earlier series the mortality in obstruction due to hernia was 25.9 per cent; in the present series it was 10 per cent. For obstruction due to adhesions, the mortality in the earlier group was 20.4 per cent—in the latter, 5 per cent.

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Seventy-four cases (25 per cent) showed evidence of strangulation at the time of operation; only 12 per cent of the group died (Table IX). The mortality in similar groups in the previous review ranged from 40-60 per cent. The lower mortality in the present series is related, we feel, to improved methods of treatment and probably also to the fact that the surgery was performed by a relatively small group of men, all with adequate training or supervision. The figure for the Philadelphia General Hospital series, for example, is compiled from statistics on the work of some 50 or 60 surgeons, of varied ages and degrees of experience.

TABLE IX  
STRANGULATION

	No.	Died	Mortality
Present series.....	74 (25%)	9	12%
M. G. H.....			40%
N. Y.....			55%
P. G. H.....			60%

TABLE X  
MORTALITY

	No.	Died	Mortality
Total.....	292	32	11%
Resected.....	53 (18%)	10	19%

As might be expected, the mortality in that group of cases in which resection was required, was almost double that of the total series, 19 per cent *versus* 11 per cent (Table X).

If one omits the cases of malignancy (which account for 20 of the 32 deaths in this series) and the cases of strangulation (which account for nine of the 32 deaths) then the mortality in the remaining group of 159 cases of obstruction is only 1 per cent (three deaths). The prognosis, therefore, is excellent if a patient is admitted with obstruction, but has no evidence of malignancy or strangulation.

The causes of death are listed in Table XI. Peritonitis, malignancy, pulmonary embolism, pneumonia and cardiovascular-renal disease account for 84 per cent of the deaths. Two of the cases in this series were moribund at the time of admission, and would not respond sufficiently to supportive treatment to permit operation.

Suction drainage of the gastro-intestinal tract by means of the Jutte, Levin or Miller-Abbott tube was carried out in 124 of the 292 cases as an adjunct in the treatment. In general, it has been reserved for the more serious cases. Our clinical impression was that this procedure was of value in 80-90 per cent of the cases in which it was used. Twenty-five per cent of the cases in which suction drainage was carried out required no subsequent operative procedure. Obstruction developing in the postoperative case on the basis of fresh adhesions is a particularly fertile field for correction by intubation without the necessity for subsequent operation.

During the three-year period, 1934-1936, suction drainage was carried out in 26 cases by means of a Jutte or Levin tube placed in the stomach. Eight of these cases succumbed, a mortality of 31 per cent (Table XII). In 1937 the Miller-Abbott tube became available for intubation and decompression of the small intestine. During the seven-year period, 1937-1943, this tube was used in 65 instances of obstruction, with ten deaths, a mortality of 15 per cent. Another 33 cases were treated by gastric suction drainage by means of the

TABLE XI

CAUSE OF DEATH	No.	Per Cent
Peritonitis.....	8	25%
Carcinomatosis.....	7	22%
Pulmonary embolism.....	5	16%
Pneumonia.....	4	13%
Cardiovascular-renal disease.....	3	9%
Others.....	5	16%

TABLE XII

SUCTION-DRAINAGE	No.	Died	Mortality
1934-1936 (prior to M. A. tube).....	26	8	31%
1937-1943 (after M. A. tube).....	98	15	15%

TABLE XIII

TOTAL SERIES	No.	Died	Mortality
1934-1936 (prior to M. A. tube).....	74	13	18%
1937-1943 (After M. A. tube).....	218	19	9%

Jutte or Levin tube, with five deaths. During this seven-year period, following the introduction of the Miller-Abbott tube, therefore, there were 98 cases in which suction-drainage was used, with a mortality of 15 per cent, in contrast to the mortality of 31 per cent prior to the introduction of the Miller-Abbott tube. The over-all mortality figures for these same periods reflect this drop in mortality also (Table XIII). We would like to point out, again, that suction-drainage is not routinely used in all cases of obstruction, but is reserved for those more serious cases in which it seems indicated. The last figure also shows that the over-all mortality during the last seven years is 9 per cent *versus* 11 per cent for the entire ten-year period, indicating the trend toward continued improvement in mortality in the latter part of this series.

Though a sharp fall in mortality was associated with the introduction of the Miller-Abbott tube, the improvement in prognosis must not be attributed to use of the tube alone.

Though intravenous fluids were available prior to the introduction of the Miller-Abbott tube, the derangement in body chemistry and fluid balance in intestinal obstruction was never as fully appreciated, or combated, as in

recent years. Intravenous fluids are being used more freely than ever before, and repeated determinations of the blood chemistry are carried out to aid in determining the amount and kind of fluids required.

During the period of this survey the blood bank was established at the Hospital of the University of Pennsylvania. As a result, there is a supply of readily available blood and plasma at all times. In cases of strangulation with loss of blood and plasma into the areas of involved intestine, a shock-like picture may result, and the condition of the patient can be much improved by infusions of blood and plasma. Cases requiring prolonged operation or resection of the bowel can be carried through the operation in much better condition if such is administered during the procedure. In cases of prolonged illness, on the basis of partial obstruction or carcinoma, the nutrition of the patient may be poor and the plasma protein and hemoglobin values can be raised by transfusion. The value of transfusion as a tonic in a prolonged illness is not to be overlooked.

During the latter half of this survey, the services of a medical anesthetist were obtained by the hospital, and a program of training residents in anesthesia was introduced. At all times, therefore, we have available anesthesia of the type best suited for the individual case, and the free use of intravenous therapeutics during operation, under supervision of the anesthetist, is a distinct aid in carrying the patient through the procedure in a more satisfactory condition.

Another factor of great importance in these patients was the introduction of the chemotherapeutic agents—the sulfonamide drugs. They have been of value especially in those cases in which peritonitis from contamination by the fecal stream has been a threat. During the postoperative course they have also been of help in combatting pulmonary infections so that now a postoperative fatality from pneumonia alone is uncommon.

In 18 per cent of the cases in which the Miller-Abbott tube was used we were unsuccessful in getting it to pass into the small intestine. More recently, we have failed in less than 10 per cent. These figures represent the efforts of several people, some of whom have had little experience in passage of the tube. In some of these cases of failure, persistent effort would no doubt have been successful in passing the tube, but the condition of the patient did not justify further delay in operative intervention.

In acute mechanical obstruction, if one is unsuccessful in passing the tube promptly, the question arises as to how long one should persist in the attempt. In general, if one is not successful after six hours, as shown by roentgenographic evidence of progress of the tube, decrease in distention, disappearance of pain, and slower pulse rate, then operation is indicated. If one delays too long in attempts to pass the tube, the patient becomes exhausted, the pulse rate rises and peristalsis disappears. Such a patient has become a poor surgical risk.

In the face of marked distention which cannot be handled by intubation for any reason, a Witzel enterostomy in the left lower quadrant, under local anesthesia and a muscle-splitting incision, still remains the procedure of choice and will give excellent results in most cases. In one report, 86 per cent of the cases of

obstruction following operations for appendicitis were corrected by enterostomy alone.

There is no doubt that the value of the Miller-Abbott tube increases in proportion to the experience and skill of the individual who is passing the tube. One man in the hospital who has had a wide experience in use of this tube has been successful in 75 of the last 76 attempts. The one failure might have been avoided had further delay in operation been warranted. Though passage of the tube can be accomplished in the patient's room, fluoroscopic guidance is a distinct advantage, and often saves much time, since any error in direction of the tube into the duodenum can promptly be corrected. Use of a stylet in the tube or mercury placed in the balloon may aid in more rapid passage of the tube into the duodenum. Once the tip of the tube reaches the second portion of the duodenum, the balloon can be inflated with air and further passage of the tube to the point of obstruction is usually accomplished without difficulty. Occasionally gastric distention recurs while the tube is in the small intestine. This can easily be cared for by placing a Levin tube in the stomach and emptying it by suction. If delay in operation is not justified or if the tube fails to pass and operation is necessary, it is frequently possible during the operation to pass the tube manually from the stomach into the small intestine, and thereby obtain postoperative decompression of the intestinal tract.

At operation, in which a Miller-Abbott tube has been passed, one often finds the small intestine pleated or accordionized on the tube. When removal of the tube is indicated the balloon must be deflated and the tube withdrawn slowly, usually six inches every 15-30 minutes, in order to avoid the possibility of retrograde intussusception.

This tube is a useful adjunct in the treatment of intestinal obstruction but cannot replace surgery in all cases. Certain cases of intestinal obstruction are not candidates for intubation and if used improperly, leading to delay in operation, this maneuver may actually be of harm, giving rise to increased mortality.

Large bowel obstruction requires decompression by operative intervention and should not be attempted by intubation. The Miller-Abbott tube often will not pass into the large bowel, and if it does, the contents of this part of the intestine may be too thick to be drained adequately through the small lumen of the tube. If the ileocecal valve is competent, a closed loop-type of obstruction is present. This is very serious and requires prompt correction. If small bowel distention also is present, this can be handled by intubation. Operative decompression of the large intestine is not thereby avoided, however, and following operation, the small bowel distention is automatically corrected, so intubation in these cases is usually unnecessary.

Strangulation is a strict contraindication to delay in surgery in an attempt to intubate the small intestine. Constant severe pain with exacerbations requiring morphine, tenderness, and perhaps a tender mass, tachycardia and leukocytosis, should be warning signs to prepare the patient for operation as promptly as possible. If the strangulation has progressed to an irreversible



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stage, so that resection is necessary, the procedure of choice must be determined at the time of operation—either a double-barrelled enterostomy or primary anastomosis. If primary anastomosis is carried out and the site of repair is under any question, the anastomosis may be temporarily exteriorized or a proximal enterostomy may be performed. A procedure preferable to either one of these, however, we feel, is passage of the Miller-Abbott tube to a point proximal to the site of the anastomosis. Satisfactory decompression of the bowel can be maintained in this fashion and the suture line protected against distention during the early stages of healing. Fluids by mouth can be administered during this time, since the tube will remove all fluid and gas before they reach the site of anastomosis.

### SUMMARY

- (1) A statistical review of 292 cases of intestinal obstruction is presented.
- (2) The average age of those who survived was 44 years, and of those who died, 59 years.
- (3) The mortality did not seem to be influenced by whether or not the obstruction was complete or partial, acute or chronic. Improvement in operative technic and pre- and postoperative care probably account for this.
- (4) The mortality in small bowel obstruction was one-half that of large bowel obstruction.
- (5) Thirty-four per cent of the cases of obstruction due to malignancy succumbed.
- (6) Thirty-one per cent of the cases of obstruction due to femoral hernia died. This is in contrast to a mortality of 5 per cent in the cases due to inguinal hernia.
- (7) The mortality in the group showing strangulation was only 12 per cent.
- (8) If resection is necessary, the mortality is almost doubled.
- (9) The over-all mortality in this series was 11 per cent. If the cases of malignancy and strangulation are excluded, the mortality in the remaining 159 cases in this series is 1 per cent.
- (10) Following the introduction of the Miller-Abbott tube, the mortality in this series was reduced by one-half. Other factors, including transfusion, chemotherapy and improvement in anesthesia, unquestionably, contributed to this decrease in mortality.