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# Causes and Effective Factors on Mortality of Intestinal Obstruction in the South East Anatolia

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**Abstract:** Mechanical intestinal obstruction is a common problem confronting the surgeon. The clinical records of 699 patients surgically treated for intestinal obstruction were evaluated retrospectively and factors affecting mortality in these patients were investigated. There were 202 (28.9%) women and 497 (71.1%) men, with a median age of 48.5±19.4 years involved in the study. Volvulus formed the vast majority of cases (28.6%), followed by adhesions (25.3%), strangulated hernias (24.0%) and malignancy (16.8%). Although strangulated hernias and malignancy might occur at any age, the peak incidence for causes of obstruction due to adhesions (55.9%) was in the 15-34 age group, and volvulus (64.0%) in the 55-74 age group. Average duration of obstruction symptoms was 31.8 ± 7.2 hours (range 1-7 days). Strangulated hernias had the shortest duration of symptoms, whereas malignant obstruction had the longest. Strangulation was seen in 221 patients and, it occurred frequently in patients with volvulus (60.0%); however, the incidence of strangulation was lower in intra-abdominal malignancy (13.5%). The overall mortality rate was 10.4%, with a 7.7% mortality rate in patients with simple obstruction, and 16.2% in patients who had strangulation. The common causes of mortality were cardio-pulmonary failure in the 55-84 age group and septicemia in the 15-54 age group. In conclusion, the causes of mechanical intestinal obstruction seem to vary according to geographic area and age group. Therefore, physicians should be vigilant as a result of immigration and freedom of travel between countries. All patients with complete intestinal obstruction who were particularly thought to be suffering from strangulated obstruction were subjected to early surgical exploration following rapid resuscitation. The presence of strangulation, duration of symptoms and old age are factors affecting mortality.

**Key Words:** Mechanical intestinal obstruction, volvulus, strangulation, mortality

## Introduction

Intestinal obstruction is a common and important cause of abdominal catastrophe. Epidemiological factors for mechanical intestinal obstruction are related to acquired or congenital anatomic differences, dietary habits, life expectancy and the sophistication of the local medical service. As a result the causes of intestinal obstruction may vary according to geographic area and from year to year. Fifty years ago, strangulated external hernias accounted for nearly half of all intestinal obstructions. However in the last part of the century, in Western society, adhesions have become the commonest cause of intestinal obstruction due to a continuous increase in the number of major abdominal operations, together with the earlier detection and elective treatment of hernias and intra-abdominal malignant disease. In underdeveloped and developing countries, however, the ratio of volvulus and strangulated hernia is still high (1-7). This retrospective study was carried out in order to evaluate the current spectrum of intestinal obstruction in Southeast Anatolia, and to investigate the effective factors on mortality in patients with surgically treated intestinal obstruction.

## Materials and Methods

The records of 699 patients operated upon, bearing the diagnosis of intestinal obstruction in Dicle University Medical Faculty Department of General Surgery between January 1990 and January 2000, were evaluated for age, sex and etiology. The diagnosis was based on the anamnesis and clinical picture, supported by radiological evidence and confirmed during a surgical operation. Cases diagnosed as paralytic ileus and treated by non-surgical methods were excluded from the study.

Elevation of temperature, tachycardia, leukocytosis, hypoactive or absent bowel sounds on auscultation and rigidity of the abdominal wall were considered indicative of strangulation obstruction. The fluid-electrolyte and acid-base balances of patients were first improved through aggressive resuscitation over a median 2.2 hours and surgical treatment was performed as soon as their condition was suitable for surgical intervention. In patients with incomplete intestinal obstruction thought to be secondary to adhesions, if there were no signs of strangulation, optimum rehydration, nasal enteric decompression, sequential X-ray studies, observation of the patients about flatus or bowel movements and repeated abdominal examination were performed for 24 to 48 hours. During this period, Gastrografin was also administered through the nasogastric tube to relieve the obstruction. If there were any changes in the clinical status of the patient, however, including increased pain, temperature and leukocytosis or development of peritoneal irritation, urgent surgery was scheduled. The rest of the patients were operated on after optimum rehydration, correction of electrolyte imbalance, nasogastric decompression, preoperative treatment with combined antibiotic regimen and anticoagulant prophylaxis within 36 hours of hospital admission.

Causes of intestinal obstruction were identified during laparotomy and when strangulation was identified the infarcted bowel was excised and intestinal continuity was restored by primary anastomosis, if possible. After the operation, all patients were evaluated by laboratory blood analysis, and total parenteral nutrition was started in patients with malnutrition until the return of bowel sounds. Postoperative mortality was defined as death within 30 days of surgery.

The age distribution of patients for etiologic factors and effective factors as age, etiology, duration of symptoms and presence of strangulation on mortality were investigated. On the basis of these findings, statistical analysis was carried out using the ''Z'' test. Differences were considered statistically significant if $p<0.001$.

## Results

There were 202 (28.9%) women and 497 (71.1%) men, with a median age of 48.5±19.4 (range 15-95) years; 387 (55.3%) patients were in the 45-75 age group. Age distribution according to etiologic factors are shown in Figure 1. Volvulus (28.6%), adhesions (25.3%), strangulated hernias (24.0%) and malignancy (16.8%) accounted for the vast majority of cases (Table 1). Although strangulated hernias and malignancy might occur at any age, the peak incidence for causes of obstruction due to adhesions (55.9%) is in the 15-34 age group, and volvulus (64.0%) in the 55-74 age group. The median age was determined to be 57.6±16.1 years for volvulus, 37.2±18.5 for adhesive obstruction, 52.2±17.9 for strangulated hernias and 47.9±18.2 for malignant obstruction. The average duration of obstruction symptoms was 31.8 ± 7.2 hours (range 1-7 days). Strangulated hernias had the shortest (1.3±0.2 days) duration of symptoms, whereas malignant obstruction had the longest (3.3±1.2 days).

Sigmoid volvulus was the major cause of volvulus (73.5%). The nature of adhesive obstruction was unknown in 43 (24.2%) patients while 11 (6.2%) patients had undergone more than one previous operation. The most frequent site of strangulated hernias was the inguinal area (60.7%). Intestinal obstruction secondary to diffuse intra-abdominal malignant disease was determined in 23 (19.4%) patients, and 7 of them had undergone previous bowel resections as a result of tumor.

Strangulation was seen in 221 (31.6%) patients. It occurred frequently in patients with volvulus (60.0%) and rarely in malignancy (13.5%). The physical signs of patients who had strangulation and simple obstruction are shown in Table 2. These findings, except for hypotension, were not statistically significant. The duration of symptoms was longer than 24 hours in 86 (71.6%) patients who had strangulation and in 322 (55.6%) with simple obstruction.

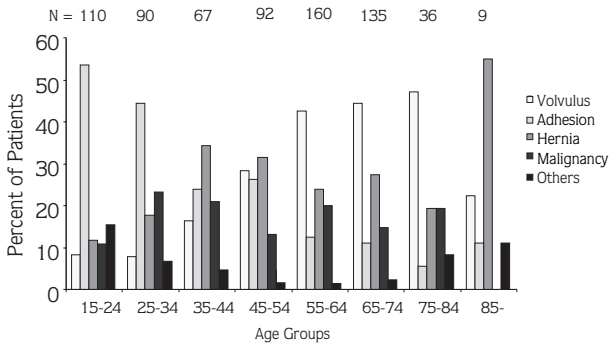


Figure 1. Distribution of causes of intestinal obstruction according to age groups.

Table 1. Etiology and mean age of patients. (Values in parentheses are percentages).

| Etiology | Simple Obstruction | Strangulated Obstruction | Total | Mean age |
|---|---|---|---|---|
| A. Volvulus | 80 (40.0) | 120 (60.0) | 200 (28.6) | 57.6±16.1 |
| . Sigmoid volvulus | 59 (40.1) | 88 (59.8) | 147 (21.0) | |
| . Ileocaecal volvulus | 20 (54.0) | 17 (45.9) | 37 ( 5.2) | |
| . Ileosigmoid knotting | 1 (6.2) | 15 (93.7) | 16 (2.2) | |
| B. Adhesions | 141 (79.6) | 36 (20.3) | 177 (25.3) | 37.2±18.5 |
| . Previous operation | 103 (76.8) | 31 (23.1) | 134 (19.1) | |
| . Idiopathic adhesions | 38 (88.3) | 5 (11.6) | 43 ( 6.1) | |
| C. Strangulated hernias | 127 (75.6) | 41 (24.4) | 168 (24.0) | 52.2±17.9 |
| . Inguinal hernia | 86 (84.3) | 16 (15.6) | 102 (14.5) | |
| . Umbilical hernia | 35 (74.4) | 12 (25.5) | 47 ( 6.7) | |
| . Femoral hernia | 6 (31.5) | 13 (68.4) | 19 ( 2.7) | |
| D. Malignancy | 102 (86.4) | 16 (13.5) | 118 (16.8) | 47.9±18.2 |
| . Colorectal carcinoma | 85 (85.8) | 14 (14.1) | 99 (14.1) | |
| . Small bowel tumors | 17 (89.4) | 2 (10.5) | 19 ( 2.7) | |
| E. Others | 28 (77.7) | 8 (22.2) | 36 ( 5.1) | 37.1±21.1 |
| . Meckel's diverticulum | 10 (90.9) | 1 ( 9.0) | 11 ( 1.5) | |
| . Intussusception | 5 (50.0) | 5 (50.0) | 10 ( 1.4) | |
| . Worms of ascaris | 5 (71.4) | 2 (28.5) | 7 ( 0.1) | |
| . Tuberculous enteritis | 7 (100.0) | - | 7 ( 0.1) | |
| . Regional enteritis | 1 (100.0) | - | 1 (0.01) | |
| Total | 478 (68.3) | 221 (31.6) | 699 (100.0) | 48.5±19.4 |

Table 2. Physical and laboratory findings in strangulated cases and simple obstruction (Values in parentheses are percentages).

| Findings | Strangulated cases | Simple obstruction |
|---|---|---|
| Hypotension | 103 (46.6) | 114 (23.8) |
| Leucocytosis | 78 (35.2) | 105 (21.9) |
| Uremia | 34 (15.3) | 94 (19.6) |
| Tachycardia | 52 (23.5) | 83 (17.3) |
| Fever | 33 (14.9) | 79 (16.5) |
| Hypoactive or no sounds of bowel | 49 (22.1) | 89 (18.6) |

Table 3. Mortality rate in simple and strangulated obstruction. (Values in parentheses are percentages)

| Type of obstruction | Number of patients | Mortality |
|---|---|---|
| Simple obstruction | 478 (68.3) | 37 (7.7) |
| Strangulated obstruction | 221 (31.6) | 36 (16.2) |
| Total | 699 (100.0) | 73 (10.4) |

The overall mortality rate was 10.4%, with a 7.7% mortality rate in patients with simple obstruction, 16.2% in patients who had strangulation (Table 3). The presence of strangulation had a statistically significant effect on mortality; however, the etiologic factor was not. The mortality and presence of strangulation rates according to etiologic factors are presented in Figure 2. As seen in Figure 3, the mortality rate was lower in the 15-35 age group and higher in patients older than 75 years. The duration of symptoms also correlated with the incidence of mortality (Figure 4). The mortality rate was significantly increased in patients who had a duration of symptoms more than 24 hours. The common cause of mortality was cardio-pulmonary failure in the 55-84 age group and septicemia in the 15-54 age group (Table 4).

## Discussion

Intestinal obstruction constitutes a large proportion of emergency general surgical admissions. It is widely stated that intestinal obstruction is seen twice as frequently in

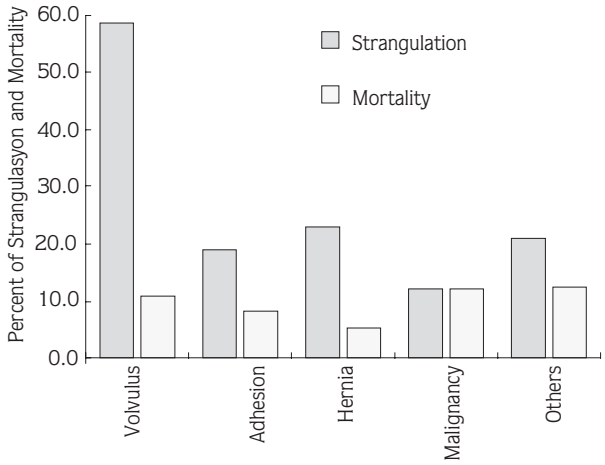


Figure 2. Distribution of strangulation and mortality rates according to causes of intestinal obstruction.

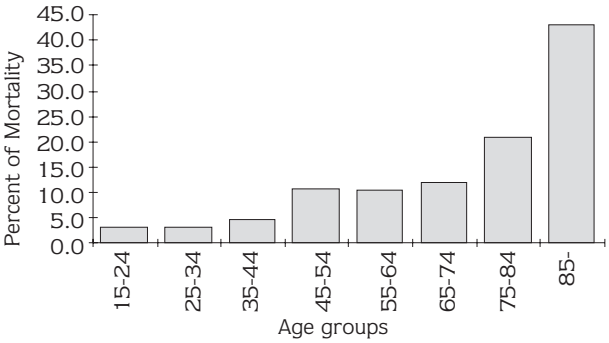


Figure 3. Distribution of mortality rates according to age groups.

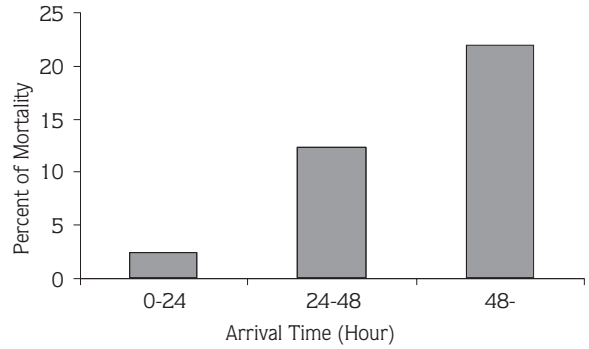


Figure 4. Distribution of mortality rate according to duration of symptoms.

males as in females. In our clinic, intestinal obstruction accounted for 32.1% of the total emergency general surgical cases and the male to female ratio was found to be 2.4. In recent years, the most common causes of intestinal obstruction are adhesions and malignancy in developed countries, but remain volvulus and strangulated hernia in developing countries (1-5).

Sigmoid volvulus is accounted for 1 to 5% of all intestinal obstruction in the United States and Western Europe and 30% to 50% in Eastern Europe, Africa and Asia (4-7). Cecal volvulus, known to be a type of volvulus, is a rare cause of intestinal obstruction (8,9). Ileosigmoid knotting is also known as compound or double volvulus (10). Furthermore, since these diseases are frequently seen in elderly people and strangulation is often noted, mortality rates vary from 0% to 75%, according to intestinal viability (9,11). Reported rates of strangulation in patients with volvulus are about 60% (3,8). Strangulation and mortality rates are high, particularly for ileosigmoid knotting (93.7% and 18.7%); however, applying mesosigmoplasty or cecostomy minimizes mortality in patients with nonstrangulated volvulus (9-11). In this study, the ratio of volvulus in total intestinal obstruction was 28.6% and strangulation occurred in 60.0% of patients and the mortality rate was 12.0%.

In recent reports documenting the etiology of mechanical bowel obstruction, adhesions accounted for 32% to 76% of intestinal obstructions, with postoperative adhesions causing 60% to 98% of them (1-5,8). Partial adhesive intestinal obstructions were first treated conservatively; however, delayed operative intervention in these patients resulted in an increase in strangulation (1,5,6). Sixty-three patients with partial intestinal obstruction, thought to be due to adhesions, responded to conservative therapy with or without gastrografin (12) during this period. However, these patients were excluded from this study because their diagnosis was not confirmed by laparotomy. In adhesive intestinal obstruction, reported strangulation and mortality rates vary from 15.9% to 29% and 1% to 4.6%, respectively (3,5,8). The ratio of adhesive intestinal obstruction was 28.6% and in 75.7% of them the causes of adhesion were a previous operation and strangulation, and mortality rates were determined to be 20.3% and 9.6% in this study.

Strangulated hernia represents 8.1% to 25% of all intestinal obstructions (1,2,4,5,8). The most alarming point about intestinal obstruction caused by hernia is the increasing incidence of strangulation resulting from surgery delays. The strangulation rate (31%), however, is lower than expected because identifying an irreducible hernia is easy and urgent surgery is always performed (8). Reported mortality rates were 4.3% and 6.9% (5,8). In this series, strangulated hernias was 24.0% of

Table 4. Causes of mortality according to etiology.
(Values in parentheses are percentages)

| Causes of Mortality | Volvulus | Adhesions | Hernia | Malignancy | Others | Total |
|---|---|---|---|---|---|---|
| Cardio-pulmonary failure | 12 (6.0) | 5 (2.8) | 8 (4.7) | 8 (6.7) | 5 (13.8) | 38 (5.4) |
| Septicemia | 10 (5.0) | 7 (3.9) | 2 (1.1) | 7 (5.9) | - | 26 (3.7) |
| Renal failure | 2 (1.0) | 3 (1.6) | - | - | - | 5 (0.7) |
| Hepatic failure | - | 2 (1.1) | - | - | - | 2 (0.2) |
| Cerebral embolus | - | - | 1 (0.5) | 1 (0.8) | - | 2 (0.2) |
| Total | 24 (12.0) | 17 (9.6) | 11 (6.5) | 16 (13.5) | 5 (13.8) | 73 (10.4) |

total intestinal obstruction, strangulation occurred 24.4% of the time and mortality rate of these patients was 6.5%.

Recently, the ratio of malignancy following adhesions has increased due to higher life expectancy. Intestinal obstruction due to intra-abdominal malignancy is 8% to 30% of all intestinal obstruction (1,4,5,8,9). The diagnosis of malignant obstruction may be difficult. In spite of the presence of clinically obvious dissemination the malignant disease obstruction might be incomplete or the ileocaecal valve might be incompetent in some patients (5,6). The reported strangulation rate is 4% in small bowel malignancy by Mucha (8) and 6.9% in left sided colonic carcinoma by Lau et al. (13). The mortality rate of intestinal obstruction secondary to intra-abdominal malignancy varies from 21.3% to 25.6% (5,8). The ratio of intestinal obstruction due to intra-abdominal malignant disease was 16.8% of total intestinal obstruction and the strangulation and mortality rate was determined to be 13.5% and 13.5% in this study.

Other causes of intestinal obstruction are intususception, gallstone ileus, radiation stricture, internal hernia, worms of ascariasis, diverticulitis, endometriosis, regional enteritis, tuberculous enteritis, ulcerative colitis, extrinsive masses, Chilaiditi Syndrome, Ogilvie's Syndrome, bezoar and fecal impaction rarely occur (4-6,8,9,14,15). In this study, other intestinal obstructions most frequently seen were Meckel's diverticulum, intususception, worms of ascariasis, and tuberculous enteritis. Mean age, strangulation and mortality rate were 37.1±21.1, 22.2% and 13.8%, respectively.

Strangulation occurs in about 10% of all intestinal obstructions (1). However, the presence of strangulation continues to be a common clinical problem in cases with intestinal obstruction because the differential diagnosis between simple and strangulation obstruction is still difficult, in spite of careful history taking, physical examination and hematological, biochemical and radiological investigations. Furthermore, in many articles, since the classic signs of strangulation, such as fever, tachycardia, localized abdominal tenderness and leukocytosis, are absent, these signs do not guarantee the identification of a patient with strangulation. This has led some surgeons to advise an early surgical operation for all patients with complete intestinal obstruction (1,2,6). In this study, the strangulation rate (31.6%) was higher than in the literature because of delays on admission to hospital after the first signs of symptoms, and strangulation signs or findings were not statistically significant from simple obstruction, except in the case of hypotension.

The overall mortality of patients with intestinal obstruction is about 10% (2,8). Postoperative mortality is related to age and increases in older patients. Although rapid diagnosis and management of strangulated obstruction has reduced the mortality rate to 10% to 20%, the mortality rate in simple obstruction is 5 to 10% presently (1,8). Overall mortality and the mortality of simple and strangulated cases were determined to be 10.4%, 7.7% and 16.2% respectively. The presence of strangulation, duration of symptoms and old age were determined to be factors affecting mortality in this study.

The results of this study indicate that it is important for surgeons to have an insight into variations in the etiology of intestinal obstruction worldwide because of immigration and freedom of travel. All patients with complete intestinal obstruction who are particularly thought to have a strangulated obstruction should

undergo early surgical exploration following rapid resuscitation. We believe that this policy will help to minimize morbidity and mortality. The presence of strangulation and old age also affected mortality, but not the etiologic factors of intestinal obstructions.

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