Etiological factors and mortality of acute intestinal obstruction: a review of 705 cases

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Objective: To figure out the etiological factors and overall mortality of the patients with acute intestinal obstruction, and to explore the rational period of conservative therapy before operation.

Methods: Medical records of all the patients with acute intestinal obstruction admitted to West China Hospital from 1995 to 2002 were retrospectively reviewed. The etiology of the obstruction was categorized, and the correlation of mortality and time interval between conservative therapy and operation was analyzed.

Results: There were 705 patients with acute intestinal obstruction included. There were 71.1% of the obstruction lesions located on the small bowel, and 82.6% of the patients experienced simple obstruction. The most frequent cause was adhesions (62.0%), and next was neoplasms (23.7%). There were 57.6% of the patients underwent the surgical treatment. The overall mortality rate was 1.6%, and the mortality rates in conservative therapy and surgical intervention groups were 1.3% and 1.7% respectively. The intestinal necrosis rate was increased gradually with the prolongation of time interval between conservative therapy and operation, and the death might occur 24 hours after strangulation.

Conclusion: The epidemiological transition to adhesive obstruction still exists in China, and it is similar to that in Western countries. In our experience, near half of the patients with simple obstruction may achieve palliation by conservative therapy. Surgical intervention is indicated for the patients with prolonged and non-palliated simple obstruction, or strangulation disease within the first 24 hours.

Keywords: intestinal obstruction; etiology; prognosis; mortality

急性的肠梗阻的病因学和病死率:705例回顾分析

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目的：总结急性的肠梗阻的病因学类型和总体病死率，探索手术治疗前合理的保守治疗时间。

方法：回顾性分析了华西医院1995年至2002年的住院病人病历，分类统计各类病因，并分析病死率与手术前保守治疗期间的相关性。

结果：共纳入705例急性肠梗阻病例，其中71.1%病变部位在小肠，82.6%为单纯性肠梗阻。最常见病因为

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Acute intestinal obstruction is one of the most common surgical emergencies, which involves a partial or complete blockage of the bowel that induces mechanical impairment or complete arrest of the passage of contents through the intestine. The etiology of acute intestinal obstruction is various and complicated. In different countries or areas, the etiology of acute intestinal obstruction is diverse to some extent. While the most frequent etiological factor is postoperative adhesions in developed countries, and strangulated hernias are more common in developing countries. Moreover, at different times, the etiology has also changed. Decades ago, the hernia was reported as the first cause of the acute intestinal obstruction, but recent reports demonstrated that intraperitoneal adhesion became the most possible cause of this disease. In China, there seemed to be the similar etiological transition trend.

It is common sense that most of the patients with acute intestinal obstruction require surgical intervention due to the mechanical nature of the disease. However, conservative therapy is still considered as a selective approach to the management of selected patients, such as incomplete adhesive obstruction. After effective intervention of gastrointestinal decompression, fasting, prophylactic or therapeutic antibiotics, and nutrition support, part of the patients with acute intestinal obstruction might achieve palliation and avoid operation. However, conservative therapy may increase the rate of strangulation, the risk of intestinal necrosis and the mortality.

The present retrospective review aims to figure out the etiological factors and overall outcomes, and to explore the rational length of time for conservative therapy before conversion of operation.

1 Clinical data and methods

1.1 Patients The medical records of all the patients with obstruction admitted to West China Hospital through the computed patients registration system from January 1995 to December 2002 were retrospectively reviewed. The search strategy was searching "intestinal obstruction" in the diagnosis field, and anyone who was diagnosed with intestinal obstruction was considered for inclusion, which required further identification individually.

All the hospital medical records of this series were reviewed, including data from patients on gender, age, etiological factors, lesion position, treatment (conservative or surgical), time interval between conservative therapy and operation and clinical outcomes (cure, relapse or death).

The patients were diagnosed by the definite symptoms, signs, and imaging (abdominal X-ray or computed tomography). Paralytic ileus was not considered for inclusion in the study. For all the patients, the conservative therapy was the initial treatment combined with fluid and electrolyte resuscitation, prophylactic or therapeutic antibiotics, gastrointestinal decompression, fasting and nutritional support. The indications for laparotomy was considered as conversion to complete obstruction, especially when strangulation recurred, or nonoperative management was more than 48-72 hours without palliation or improvement. Surgical procedures included simple reposition for intussusceptions, volvulus, incarcerated hernias, or adhesiolyis for adhesive obstruction if there was no strangulation, otherwise enterectomy and anastomosis should be considered. Besides, enterectomy or colostomy could be applied to selective patients with small or large intestinal tumors, and if it was in an inappropriate condition, enterostomy or colostomy was inevitable. If intestinal perforation recurred, the decision on enterectomy or enterostomy was dependent on local and peritoneal condition, and peritoneal lavage and drainage was necessary. Some selected pediatric patients with intussusceptions could be administered the air enema for reposition by skilled pediatric surgeons. Postoperative management was consecutive to the preoperative conservative therapy. And the intensive care unit was considered
for severe diseases with organ function disorder.

1.2 Statistical analysis The continuous data were described as median and range, and category data were reported as events frequency and percentile. Statistics analysis approaches contained Pearson Chi-square test, Fisher’s exact test and Pearson linear correlation. Two-sided \( P \) values less than 0.05 was regarded as statistically significant difference. The SPSS 13.0 software was used for statistics.

1.3 Ethics Since the present study was retrospective, informed consent was not considered, and the protocol was not approved by an institutional review board.

2 Results

2.1 Demography During the study period (1995-2002), there were 705 valid records of patients with acute intestinal obstruction admitted to West China Hospital. The proportions of male and female were close with the ratio of 1.2:1. The ages between the male (median age = 55) and female (median age = 51) were also similar. Mostly, 71.1% of the obstruction lesions located on the small bowel, and 82.6% of the patients experienced simple obstruction without vascular strangulation or intestinal necrosis. The information was summarized in Table 1.

2.2 Etiology Within these patients, the most frequent cause of acute intestinal obstruction was adhesions (62.0%), of which the majority was secondary to previous abdominal surgery. Moreover, 3.0% patients were proved with adhesive obstruction by inflammatory diseases, without any abdominal surgery. Intestinal neoplasms were the secondary cause of the disease (23.7%), and primary colorectal tumors were more common than metastatic intestinal tumors. Therefore, adhesions and neoplasms affected 85.7% of the total patients. The remaining cases were due to other infrequent and sporadic diseases including hernias, congenital intestinal diseases, volvulus, intussusception, inflammatory bowel diseases, external compression, and so on. The information was summarized in Table 1.

2.3 Mortality The patients were given either conservative therapy, or conservative therapy plus indicated surgical intervention. There were 57.6% (406/705) of the patients who had undergone surgical treatment. The overall mortality rate was 1.6% (11/705). The mortality rates in conservative therapy and surgical intervention groups were 1.3% and 1.7% respectively, and without significant statistic difference (Table 2, Figure 1). In patients with simple and strangulated condition, it was found out that half of them with simple obstruction had to undergo laparotomy after the unsatisfied conservative treatment. However, there was no significant difference in mortality rates between the two intervention groups (Table 2), indicating that proper indication and decision for conversion to surgical intervention could control the mortality, although someone experienced severe degree of simple obstruction. Moreover, all the patients with strangulated condition had been determined to receive surgical interventions, except for the one who died during the prolonged conservative treatment. There was statistically significant benefit from surgical intervention in decreasing mortality rate of patients with strangulated condition (Table 2). Patients fit for surgery, whether with simple or strangulated condition could gain similar benefit in decreasing mortality (\( P = 0.253 \)).

<table>
<thead>
<tr>
<th>Table 1 Demographic characteristics and etiology of the 705 cases of acute intestinal obstruction from 1995 to 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Gender distribution</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Lesion position</td>
</tr>
<tr>
<td>Small bowel</td>
</tr>
<tr>
<td>Large bowel</td>
</tr>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Simple obstruction</td>
</tr>
<tr>
<td>Strangulation obstruction</td>
</tr>
<tr>
<td>Etiology</td>
</tr>
<tr>
<td>Adhesions</td>
</tr>
<tr>
<td>-Previous abdominal surgery</td>
</tr>
<tr>
<td>-None</td>
</tr>
<tr>
<td>Neoplasms</td>
</tr>
<tr>
<td>-Colorectal tumors</td>
</tr>
<tr>
<td>-Metastatic intestinal tumors</td>
</tr>
<tr>
<td>Incarcerated external hernias</td>
</tr>
<tr>
<td>Intussusception</td>
</tr>
<tr>
<td>Congenital intestinal diseases</td>
</tr>
<tr>
<td>-Congenital megascolon</td>
</tr>
<tr>
<td>-Congenital intestinal atresia or stenosis</td>
</tr>
<tr>
<td>Intestinal tuberculosis</td>
</tr>
<tr>
<td>Volvulus</td>
</tr>
<tr>
<td>Gallbladder stone in feces or gallstone</td>
</tr>
<tr>
<td>External compression</td>
</tr>
<tr>
<td>-Ovarian tumors</td>
</tr>
<tr>
<td>-Enlarged lymph nodes</td>
</tr>
<tr>
<td>Meckels diverticulum</td>
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<tr>
<td>Crohn’s disease</td>
</tr>
</tbody>
</table>
Table 2  Intervention and outcomes of the 705 cases of acute intestinal obstruction

<table>
<thead>
<tr>
<th>Cases</th>
<th>Conservative therapy</th>
<th></th>
<th>Surgical intervention</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cure (     %)</td>
<td>Death (   %)</td>
<td>Cure (     %)</td>
<td>Death (   %)</td>
</tr>
<tr>
<td>Overall*</td>
<td>705</td>
<td>295 (41.8)</td>
<td>4 (0.6)</td>
<td>399 (56.6)</td>
</tr>
<tr>
<td>Simple obstructionb</td>
<td>597</td>
<td>295 (49.4)</td>
<td>3 (0.5)</td>
<td>296 (49.6)</td>
</tr>
<tr>
<td>Adhesions</td>
<td>351</td>
<td>250 (71.2)</td>
<td>0</td>
<td>101 (28.8)</td>
</tr>
<tr>
<td>Others</td>
<td>246</td>
<td>45 (18.3)</td>
<td>3 (1.2)</td>
<td>195 (78.3)</td>
</tr>
<tr>
<td>Strangulation obstruction</td>
<td>108</td>
<td>0</td>
<td>1 (0.9)</td>
<td>103 (95.4)</td>
</tr>
<tr>
<td>Adhesions</td>
<td>86</td>
<td>0</td>
<td>1 (1.2)</td>
<td>84 (97.7)</td>
</tr>
<tr>
<td>Intussusception</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>5 (100)</td>
</tr>
<tr>
<td>Volvulus</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>7 (70.0)</td>
</tr>
<tr>
<td>Incarcerated hernias</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>7 (100)</td>
</tr>
</tbody>
</table>

Surgical intervention. All the patients with simple adhesive obstruction considered for surgery underwent adhesiolysis only, while 26.1% (28/107) of the operated patients with strangulation obstruction underwent enterectomy. Reposition was applied to selected patients with intussusception, volvulus and incarcerated hernias. Colostomy was used for the patients with colorectal cancer.

Adhesions of simple obstruction. Only 1.7% (12/705) of the patients with simple adhesive obstruction experienced relapse in this retrospective series.

Others of simple obstruction. 75.0% (15/20) of the pediatric patients with intussusception was treated by air enema, while the rest underwent laparotomy.

Adhesions of strangulation obstruction. The unoperated patients with strangulation died during prolonged conservative therapy. a1 P = 0.767, conservative therapy group vs surgical intervention group, Fisher’s exact test, two-sided; b1 P = 1.000, conservative therapy group vs surgical intervention group, Fisher’s exact test, two-sided; c1 P = 0.253, the patients with simple obstruction in the surgical intervention group vs the patients with strangulation obstruction in the surgical intervention group, Fisher’s exact test, two-sided.

The correlation between time interval from onset to surgical intervention and the mortality in cases of strangulation obstruction was analyzed. The results showed that the intestinal necrosis rate was increased gradually with the prolongation of time interval, and once it was beyond 24 hours after onset, death might occur (Table 3). The accumulated mortality rate of strangulated stratum was 4.6% (5/108). There was a quite remarkable correlation between the accumulation rates of intestinal necrosis and mortality (r = 0.975, P = 0.005) (Table 3, Figure 2). Therefore, it indicated that time interval would influence the mortality of the patients with strangulation obstruction. According to the results, we recommend that once the diagnosis of strangulation is established, it might be safe to intervene surgically within 24 hours after the onset of the strangulation, and prolonged conservative therapy needs to be avoided.

Table 3  Impacts of time interval before surgical interventions on the prognosis of strangulation obstruction

<table>
<thead>
<tr>
<th>Time interval</th>
<th>n</th>
<th>Intestinal necrosis</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Events</td>
<td>Stratified rate(%)</td>
</tr>
<tr>
<td>&lt;12 h</td>
<td>6</td>
<td>1</td>
<td>16.7</td>
</tr>
<tr>
<td>∼24 h</td>
<td>16</td>
<td>3</td>
<td>18.8</td>
</tr>
<tr>
<td>∼48 h</td>
<td>31</td>
<td>6</td>
<td>19.4</td>
</tr>
<tr>
<td>∼72 h</td>
<td>38</td>
<td>10</td>
<td>26.3</td>
</tr>
<tr>
<td>≥72 h</td>
<td>17</td>
<td>9</td>
<td>52.9</td>
</tr>
<tr>
<td>Total</td>
<td>108</td>
<td>29</td>
<td>—</td>
</tr>
</tbody>
</table>

Intestinal necrosis. The intestinal necrosis was proved by intraoperative gross judgement and postoperative pathological test. Accumulation rates of intestinal necrosis and mortality, Spearman Rank Correlation, r = 0.975, P = 0.005, two-sided.
3 Discussion

Acute intestinal obstruction—a major cause of hospitalization, morbidity and financial expenditure, is one of the most common surgical emergencies[5]. As reported, over 3% of all emergency surgical admissions to general hospital were due to acute intestinal obstruction[5]. The general causes of this disease were intraperitoneal adhesion, neoplasm and hernia, etc. of which adhesion tended to be the most common one. The present study indicates that adhesive obstruction is much more likely than other causes, with the highest incidence rate (62.0%). Thereinto, 59.0% of the adhesions were secondary to the previous intra-abdominal operation. Perhaps, the evolved modern surgery has induced the increase in iatrogenic peritoneal adhesions[6]. Simultaneously, we carried out a review of the etiology of acute intestinal obstruction based on Chinese reports published in the past 5 years (Table 4)[14, 7-12]. The results proved that adhesions indeed became the dominating cause of acute intestinal obstruction in China, and the next was tumor and hernia. The meta-data showed the codition in near a half of the Chinese patients was caused by adhesions, which was lower than the data from our research, and the neoplasms was a little more than a quarter. Thus, we need to pay adequate attention to this prevalent emergency, because sometimes, adhesion obstruction is potentially lethal. A crucial problem in management is how to differentiate whether there is actual, or impending, small bowel ischaemia and whether there is a need for emergency surgery[18]. However, in clinical practice, the uncommon causes, such as recurrent cancer, an obstructive colon lesion in the presence of an incompetent ileo-caecal valve, an occult hernia, tuberculous stricture, and small bowel arterial or venous ischaemia, should be kept in mind[18, 19]. Additionally, socioeconomic status was a significant determinant of the cause of obstruction, and the epidemiological transition would affect the developing world[19].

<table>
<thead>
<tr>
<th>Reports</th>
<th>Period</th>
<th>Sample</th>
<th>First (%)</th>
<th>Second (%)</th>
<th>Third (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tang et al[9] 2002</td>
<td>1990-2000</td>
<td>599</td>
<td>Adhesions (70.4)</td>
<td>Tumor (13.5)</td>
<td>Hernia (—)</td>
</tr>
<tr>
<td>Zhao et al[10] 2002</td>
<td>1991-2000</td>
<td>504</td>
<td>Adhesions (33.9)</td>
<td>Tumor (20.6)</td>
<td>Hernia (14.2)</td>
</tr>
<tr>
<td>Rui et al[14] 2006</td>
<td>1990-2005</td>
<td>500</td>
<td>Tumor (56.9)</td>
<td>Adhesions (30.5)</td>
<td>Hernia (3.4)</td>
</tr>
<tr>
<td>Zhang et al[17] 2007</td>
<td>2002-2005</td>
<td>536</td>
<td>Adhesions (67.5)</td>
<td>Tumor (20.9)</td>
<td>Hernia (8.5)</td>
</tr>
</tbody>
</table>

A review revealed that adhesions might occur in more than three-fourths of patients following laparotomy, because peritoneal trauma resulted in a unique inflammatory process in which fibrin formation and fibrinolysis played a central role[5].

Every violation of the peritoneum carries a potentially lifelong risk of this disease, and the effects of adhesions are unpredictable but widely existent in a significant health care burden by its recurrent nature[6]. Increasing utilization of
laparoscopic surgery may reduce the extent and incidence of adhesions, and laparoscopic adhesiolysis. In experienced hands, it may be successful in managing acute obstruction or serve as a planned procedure when the obstruction has been resolved \(^{18}\). Modern computerized tomography (CT) has become an increasingly common noninvasive diagnostic modality of acute intestinal obstruction, and may demonstrate the site and cause of the obstruction and also suggest the presence of bowel ischaemia, especially with the multidetector-row computed tomography (MDCT) \(^{18, 20, 21}\). The study found that a CT scoring system was correlated with the actual treatment, and could successfully predict the need for surgery at 75% of the time \(^{26}\). Patients with a CT reading of complete obstruction, dilated small bowel, or free fluid were operated on at 77%, 66%, and 65% of the time, respectively \(^{26}\). Thus, the CT examination could be a valuable approach to the assessment of this disease in clinical practice, which can be a predictor of time for surgical intervention.

The time interval before operation must be a critical problem for acute intestinal obstruction, because prolonged conservative therapy might be harmful and potentially lethal, and on the other hand, too radical option of operation will aggravate the burden of the patients. The present study indicates that near half of the patients with acute intestinal obstruction can be cured without operation, so the conservative therapy is still not an abdicable management. However, the remaining cases which cannot benefit from conservative therapy, and especially manifest strangulated condition, have to undergo surgical intervention. The period of conservative therapy is better to be limited within one week after the onset of symptoms, and then conversion to surgery should be considered \(^{15}\). The results of the present study showed that the intestinal necrosis and mortality were highly correlated with the time interval before operation in cases of strangulated condition. Thus, we suggest that prompt operation should be carried out within the first 24 hours after the confirmation of strangulation.

The etiological transition to adhesive obstruction still exists in China, similar to the Western countries. In our experience, near half of the patients with simple obstruction can achieve palliation by conservative therapy. Surgical intervention is indicated for the patients with prolonged and non-palliated simple obstruction, or strangulated disease within the first 24 hours.

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in English.


