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# Surgical Recovery of Intestinal Obstructions: Pre- and Postoperative Care and How Could it Be Prevented?

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## Abstract

Although initial data on intestinal obstructions are based on Hippocrates, there is still no consensus on approaches today. However, parallel to the development of medical technology and the increasing experience of us surgeons, morbidity and mortality rates due to intestinal obstruction have decreased. Obstruction can occur at any point in the gastrointestinal tract. The main thing is to make a correct diagnosis and to treat the patient in the most correct way. Intestinal obstructions usually present with colic abdominal pain, nausea, vomiting, and constipation. Intestinal obstructions may be present due to various reasons. Surgeons have an important role in preventive mechanical obstructions due to adhesions. Patients must be hospitalized. If there is no emergency surgical indication, conservative methods can be applied. Patients should be mobilized early, and fluid-electrolyte balance should be adjusted and followed closely.

**Keywords:** intestinal obstructions, conservative methods, treatment

## 1. Introduction

Intestinal obstruction is a clinical manifestation that occurs since the passage of the intestinal contents, which should be into the distal levels, is prevented in any part of the passage. It is a condition frequently encountered in the emergency department, which gives positive results with early diagnosis and accurate treatment methods but may have negative consequences if it is not managed well. The patients usually present with the complaints of nausea and vomiting, colic abdominal pain, and inability to defecate. Intestinal obstruction accounts for 5–15% of the patients presenting to the emergency department with acute abdomen [1–3].

In parallel with the development of medical technology and the increasing experience of us, the surgeons, morbidity and mortality rates due to intestinal obstruction have decreased, but difficulties in diagnosis and treatment remain. Now, the cases may present with more complex conditions, and treatment may become more complicated. Nowadays, when minimally invasive and conservative methods are more popular, there is no doubt that nonoperative approach should be the preferred approach for intestinal obstruction. However, unfortunately, surgery should not

be delayed, and appropriate intervention should be performed in the presence of a condition that requires absolute surgery in its etiology.

Obstruction can occur at any point in the gastrointestinal tract. Correct diagnosis and appropriate treatment of the patient is essential. Another important point, especially in surgical treatment, is to prevent brid formation which may cause re-obstruction. In addition, absolute oncological principles should be followed in obstructions caused by tumors, etc.

Intestinal obstructions can be due to very simple benign causes that need to be considered or malignant causes where no intervention apart from palliative surgical interventions can be performed [1–6]. Here, we will examine this entity with a wide clinical, treatment, and follow-up margin.

## **2. Etiology**

Mechanical intestinal obstructions may be present due to various reasons. Etiology should be learned well to be able to determine the appropriate treatment option. The causes of intestinal obstruction can be broadly classified into three categories [3].

1. Intraluminal
2. Intramural
3. Extrinsic factors

Intraluminal causes can be defined as factors causing obstruction by not allowing intestinal passage. These can be exemplified as gallstones, foreign bodies such as bezoar, and solidified ileal content.

Tumors of the small intestine, inflammatory small bowel diseases such as Crohn's disease, intramural hematoma, invagination, and stricture due to radiotherapy can be considered as intramural causes.

This part, which is classified as extrinsic factors, appears more than the sum of the other two parts. We know that adhesions secondary to previous abdominal surgery account for approximately 75% of small intestinal obstructions. In addition, we encounter with a considerable amount of hernias, congenital anomalies, and carcinomatosis due to intra-abdominal tumors [7, 8].

According to the mechanism of formation, there are also paralytic ileus, spastic ileus, and chronic intestinal pseudo-obstruction as well as mechanical intestinal obstruction. While paralytic ileus can be observed as a result of insufficient nerve conduction due to excessive analgesic use or electrolyte imbalance, spastic ileus occurs in cases of increased nerve conduction, such as metal poisoning [2, 7–9].

## **3. Clinic**

Small intestinal obstructions usually present with colic abdominal pain, nausea, vomiting, and constipation. If obstruction is at proximal levels, vomiting is more prominent, while if it is at distal levels, abdominal distension is more prominent. Although intestinal sounds, by listening, may increase in the early period, they decrease in later periods. Strangulation or ischemia should be considered if there is severe abdominal pain that is not correlated with mild distention, and the diagnosis and treatment should be made without any delay [9].

## 4. Diagnosis

Although it is known by the world of medicine that a good anamnesis is necessary for the diagnosis, it has been shown to be more important in the diagnosis of ileus. The presence of previous abdominal surgery and intra-abdominal disease (Crohn's disease, tumor, etc.) should be questioned in the anamnesis, and the inguinal region should be checked for hernias during the examination.

Plain abdominal radiography in the standing position should be first obtained for the radiological imaging of the patient. Plain radiography is an examination that has been used for about half a century. The radiograph should be checked for enlarged small intestinal loop and air-fluid level. If present, it should be noted whether this is from the small intestine or the large intestine (**Figures 1** and **2**). It should not be forgotten that obstructions proximal to the small intestine may be overlooked as they may not be able to produce air-fluid level on the radiograph. Nevertheless, it is still used as the cheapest, most practical, and easiest diagnostic method in appropriate patients [3, 10, 11].

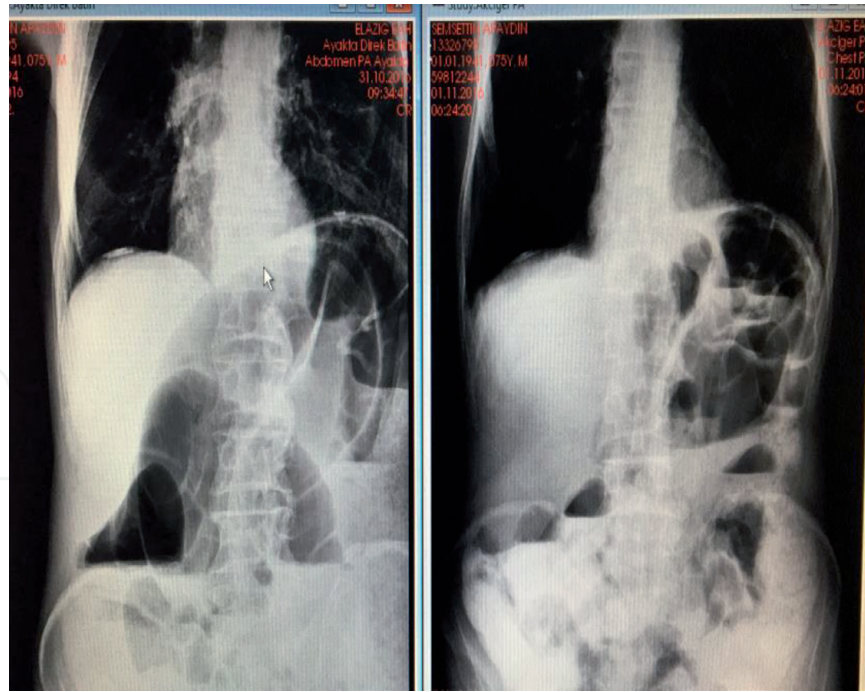
Abdominal ultrasonography is an option that may be beneficial in cases where direct radiography is contraindicated such as pregnancy, although it is not in the first place in practice [3, 12].

Computed tomography has a sensitivity and specificity of approximately 80–90% in detecting small intestinal obstructions. Tomography may show the point causing small intestinal obstruction (transition zone), loss of diameter in large loops proximal to the transition zone and loops distal to the transition zone, and decompression in the colon due to lack of ileal content. Closed loop is visible, if present. Hematoma in the small intestinal wall, tumor, and invagination can also be observed if obstruction is due to an intramural cause. Gallstones, bezoars, and foreign bodies, which are among the intraluminal causes, can also be easily observed by computed tomography [10–12].



**Figure 1.**  
*Volvulus view on plain radiography (from the archive of Burhan Hakan Kanat).*





**Figure 2.**  
*Enlarged small intestinal loop and air-fluid levels in the radiograph (from the archive of Burhan Hakan Kanat).*

In laboratory tests, it should be kept in mind that the patient may be in a hemoconcentrated state following the intravascular volume decrease due to fluid loss to the third space. Dehydration may occur due to loss of intravascular volume. Hypokalemic-hypochloremic metabolic alkalosis may occur depending on the severity of vomiting. Leukocytosis may be added to the condition due to bacterial translocation, and lactate may increase as a finding of ischemia in the presence of closed loop [2, 13, 14].

## 5. Treatment

Although some statements like “the sun should not rise” or “the sun should not set on the patient with the diagnosis of intestinal obstruction” have been made before, nonoperative approach is now applied to the patients with obstruction as in all areas of surgery. However, it should be kept in mind that complete obstruction and closed loop obstruction must be excluded for this approach [15].

Laboratory tests should be performed to see if there is an electrolyte imbalance. The dehydrated patient should be started on fluid therapy rapidly, and urinary catheter should be inserted to monitor urine output in the presence of additional diseases such as cardiac disorders. If necessary, central venous catheter insertion and CVP monitoring are among the treatment options for continuation of fluid therapy. When leukocytosis and CRP elevation are observed, prophylactic antibiotic therapy should be started to prevent peritonitis secondary to bacterial translocation.

When air-fluid level is observed on standing plain abdominal radiograph, a nasogastric catheter should be inserted, and oral intake should be restricted. As a result of this decompression, aspiration, nausea, and vomiting can be prevented [16].

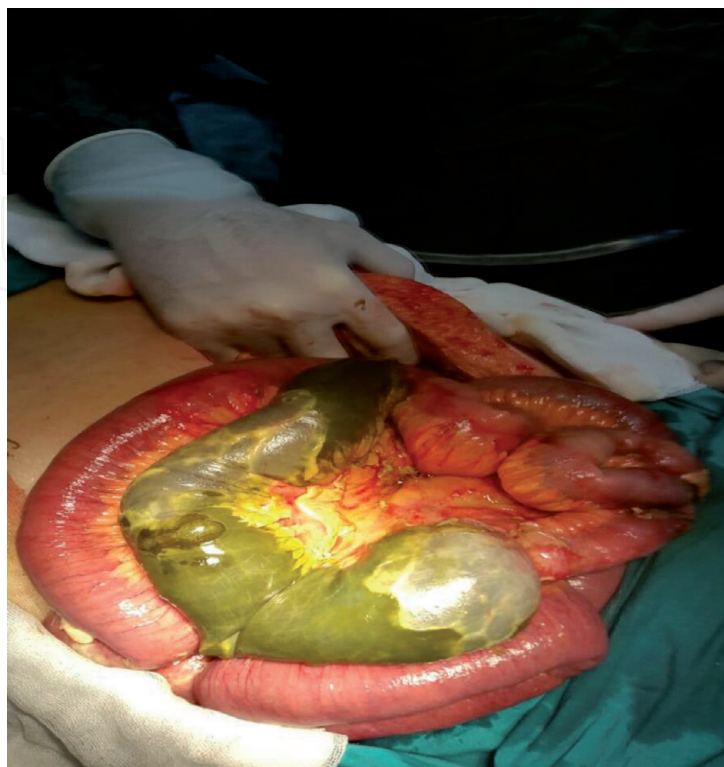
Computed tomography performed using water-soluble radiopaque materials such as gastrografin can show the location, characteristics of the obstruction, and whether complete obstruction occurred or not. Although it has not yet been proven in the literature, there are some authors who argue that gastrografin accelerating the passage inside the loop helps maintain local fluid-electrolyte balance.

After exclusion of closed loop and intestinal ischemia, the patient can be followed up with nonoperative approach. In this context, the presence of peritonitis and distention should be evaluated during regular abdominal examinations. Intermittent plain radiographs should be performed to see if the air-fluid levels seen in the first radiograph have decreased or replaced. Leukocyte and lactate values, gas-stool discharge, and nasogastric catheter flow rates should be closely monitored. Continuous mobilization of the patient during this follow-up reduces the length of hospital stay.

It was reported that no improvement was seen in approximately 5–15% of the patients within the first 48 h by nonoperative approach. Therefore, laparotomy option should be kept in mind for the patients who do not have significant improvement in their clinical findings after 48 h (**Figures 3 and 4**). It is known that the surgical decision taken after this 2-day waiting period does not increase mortality [17].



**Figure 3.**  
*Surgery image of a patient with volvulus (from the archive of Burhan Hakan Kanat).*

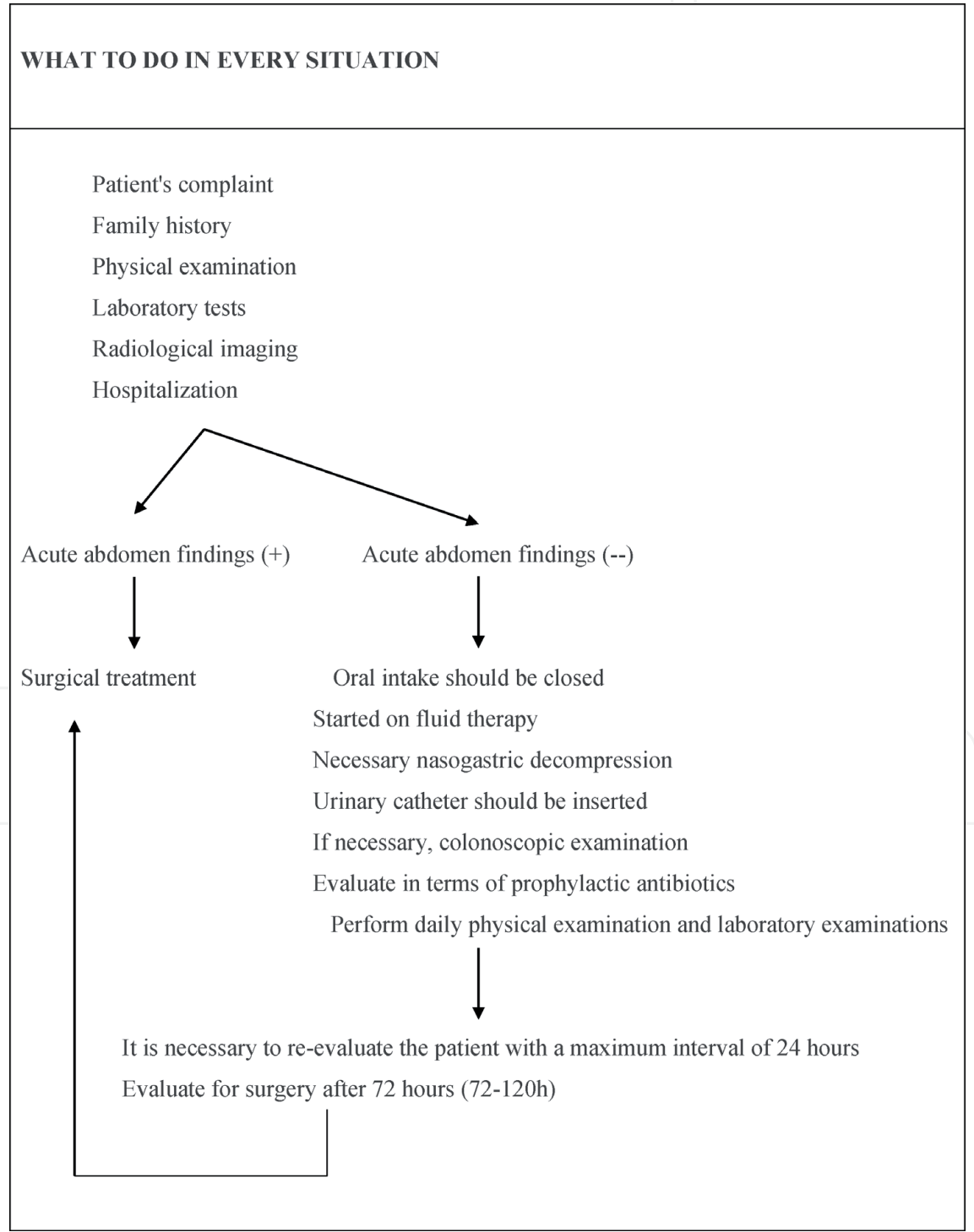


**Figure 4.**  
*Bowel loop gone to necrosis due to internal herniation (from the archive of Burhan Hakan Kanat).*

With the decrease of nasogastric catheter flow rate and the onset of gas-stool discharge, NG catheter can be withdrawn first, oral intake can be started over time, and food intake can be gradually increased.

Although open surgical technique is found in the first place in practice, there are also studies showing that laparoscopic surgery can be performed in selected cases. Important parameters such as early diagnosis, proximal obstruction, partial obstruction, and the number of previous abdominal surgeries are available [18]. The algorithm can be followed in follow-up and treatment (Algorithm).

A. Algorithm





## 6. Postoperative care and prevention efforts

Surgeons have an important duty especially in preventable mechanical obstructions due to adhesions. It is needed to pay attention to surgical rules such as minimal touching the intestines during surgery, preferring laparoscopic surgical procedures if possible, and minimizing perioperative fluid resuscitation. Transition to early oral nutrition, minimal NSAID and opioid use, administration of epidural anesthesia if possible, avoiding excessive fluid resuscitation, and close monitoring of electrolytes should be taken into consideration in the postoperative period.

The main goal in the treatment of the patients with intestinal obstruction should be to prevent unnecessary surgeries. Peristalsis-increasing agents may be given to provide anal discharge of gas in the intestine if there is no contraindication (mechanical obstruction, etc.). It is needed to prevent the introduction and production of new gas into the intestine. It may be necessary to insert a nasogastric catheter to allow the introduction of atmospheric air and easy release of air refluxing in the stomach. Although the nasogastric catheter is not very comfortable for the patient, it is very useful in some patients.

Fluid-electrolyte balance can rapidly change in these patients. It is needed to be on the alert for this condition, and the patient should be closely followed up. Fluid-electrolyte imbalance is the most important pathology that prevents physiological gas absorption from the intestinal wall. If fluid-electrolyte imbalance is corrected quickly and accurately, intestinal mucosal cell functions will be improved, and therefore a large amount of CO<sub>2</sub> can be transferred through the lumen into the blood.

There are different approaches for some patients especially those with tumor-induced obstruction. Temporary ostomy and definitive surgery can be performed after bowel cleansing in order to keep patient comfort at a better level. Or appropriate surgery can be performed in a single session considering the general condition and additional diseases of the patient.

It is recommended to follow up some of the patients requiring surgery in the secondary or intensive care units in the postoperative period. There are important steps in early follow-up and treatment of the patients. Pulse rate, respiration rate, blood pressure, oxygen saturation, and body temperature should be closely monitored. There is no standard protocol for their monitoring frequency. Many clinics or intensive care units have standardized blood test monitoring. The laboratory values to be controlled are arranged depending on the factors such as size and duration of surgery, intraoperative interventions, renal functions, etc. Blood count, bleeding-coagulation panel, and renal and liver function tests are the most frequently studied parameters. The acid-base balance of the patient is also monitored, especially if the operation is prolonged. The patient's intake and discharge should be closely monitored, and fluid intake should be adjusted accordingly. Fluid-electrolyte balance is especially important [19].

In these patients, multimodal management of nausea and vomiting, use of nasogastric catheter, application of urinary catheter and withdrawal time, stimulation of gastrointestinal motility, appropriate analgesia, when to feed the patient, and especially early mobilization are important in the postoperative period [20, 21].

The application of nasogastric catheters was first performed by Levine and Paine to reduce nausea, vomiting, and distension occurring after abdominal surgery. It has continued to be used in the same way since those years. Although many recent studies do not recommend its routine use, a considerable number of surgeons apply it traditionally [22]. Nasogastric catheter poses risks in terms of both comfort and complications for patients.



Despite advances in surgical treatment methods and increased experience of surgeons, postoperative pain is the most common symptom experienced by patients and is a condition that adversely affects patient comfort. Postoperative pain has a negative effect on the quality of life of patient and prolongs the period of return to daily activities and hospital stay. Thus, it increases the cost. Postoperative pain management is an issue that needs to be meticulously addressed. It may cause anxiety both in patients and their relatives, especially in hospitalized patients. The aim of providing analgesia is to minimize or prevent the patient's discomfort, to protect against side effects, to reduce the length of hospital stay, and to prevent recurrence of pain complaints. Pharmacological and non-pharmacological methods are used in postoperative pain management [23, 24].

Malnutrition is one of the most important patient-related factors affecting morbidity and mortality in surgical patients. The most important step in nutrition is to identify the patient with malnutrition or the patient with the possibility of developing malnutrition. There are several screening methods for this. It is essential to provide adequate support when preparing the patient for surgery. Nutritional support can be provided by direct oral intake, enteral feeding tube, and parenteral route both preoperatively and postoperatively. Each alternative has its own advantages and disadvantages. Many hospitals have nutrition teams that follow up patients and provide adequate support. There are also some authors who argue that excessive feeding in the preoperative period triggers the risk of infection due to hyperglycemia [25].

Nutritional status of the patient should be closely monitored, and necessary support should be provided for early recovery. It is recommended to gradually start oral intake after sarcoma surgeries, if there is no intervention to the gastrointestinal organs. The preferred and recommended route is the enteral route as in any patient.

## **7. How can adhesions be prevented?**

Every surgical intervention has a skin scar that appears from the outside. What about inside? Adhesion formation after surgery is inevitable but it is possible to minimize it. Minimally invasive surgery (robotic, laparoscopic, endoscopic), to which traditional open surgery is gradually giving way, can be considered as the first step to reduce adhesion formation. Minimally invasive surgery is very valuable in reducing brid formation by shortening the duration of surgery, eliminating intestinal contact, and reducing the amount of bleeding.

Bleeding during surgery and insufficient clearance of bleeding-related clots and inadequate intra-abdominal washing are predisposing factors for postoperative adhesions. On the other hand, the amount of contact with the intestines during abdominal surgery is correlated with brid formation.

Surgical planning should be made as soon as possible in infective pathologies (perforation, appendicitis, etc.). The elapsed waiting time will increase postoperative adhesion formation.

## **8. Conclusions**

After surgery, intestinal function usually returns to normal within 5 days. If it persists for longer than this, it is considered a paralytic ileus. Recovering from an ileus depends on getting the proper treatment for the underlying cause. Ileus is a relatively common condition that is easy to treat. It is especially prevalent in

those who have undergone recent abdominal or pelvic surgery. An awareness of the symptoms is key to improving the outlook and reducing the risk of complications. It is essential to seek prompt medical treatment as soon as symptoms appear.

The cornerstone of nonoperative management of small bowel obstruction caused by adhesions is starvation and stomach decompression using a nasogastric tube and fluid resuscitation. This approach seems uniform for younger and older patients. Nonoperative management should further include correction of electrolyte disturbances and nutritional support, especially in the frail older patient to avoid delirium, functional decline, and complications as a result of starvation and malnutrition. Nonoperative management is effective in approximately 70–90% of patients with adhesive small bowel obstruction in general. Though it has a significant failure rate, the nasogastric tube remains relevant in the conservative treatment of small bowel obstruction to initially relieve symptoms and avoid aspiration. An ongoing debate in the management of small bowel obstruction is the duration of nonoperative treatment that is deemed mandatory to resolve the bowel obstruction before the decision to operate. Most authors apply the 72-h safe-time rule for duration of initial nonoperative therapy irrespective of age [26–29].

## **9. Place of the endoscopy in acute conditions**

The term acute mechanical intestinal obstruction describes the condition of preventing the progression of the contents in the intestinal lumen for mechanical reasons [30]. Complaints and clinical findings can be quite guiding in the diagnosis of obstruction and can be meaningless or misleading. The accuracy rate of direct abdominal X-ray in the diagnosis of obstruction is approximately 50–70% among the initial examinations of patients with acute abdominal pain. However, it is possible to say the level and degree of obstruction in diagnostic direct abdominal X-rays and even the presence of some complications (such as perforation) [31, 32]. Today, computed tomography is the gold standard imaging method. It not only makes a diagnosis but also provides important information on determining the etiological cause, determining the level and degree of obstruction, presence of strangulation, monitoring, and treatment [33, 34].

Emergency colonoscopy, which has recently become prominent in distal intestinal obstructions, offers important diagnostic and therapeutic opportunities. Although colonoscopic examination performed in emergency conditions is more likely to not be performed optimally or fails and requires more experience, it not only shows the cause, level, degree, and presence of ischemia in cases where it is successful but also enables endoscopic treatment [30–37]. There are many endoscopic methods used in the treatment of large bowel obstructions; the most preferred among these are procedures that reduce tumor size, tube administration, stenting, dilation, and detortion.

Endoscopic stenting is a frequently preferred method for both malignant and benign bowel obstructions. Stenting has two important advantages in malignant obstructions:

1. It is also known as bridging treatment, by eliminating the emergency, giving the patient the chance to perform elective surgery with much lower morbidity and mortality rates.
2. It provides palliation in patients with stage 4 disease or poor candidate for surgery, after the removal of the emergency after stenting, so that the patient does not have to live dependent on stoma in the remaining life [30].

Emergency colonoscopy should be in the first place for patients who are considered to have mechanical obstruction especially for the colon.

## 10. Pregnancy and intestinal obstruction

Although intestinal obstruction is rare in pregnancy, it is seen in the ratio of 1/10–16 thousand. Intestinal obstruction is most common in pregnancy at the beginning of the second trimester, at the end of pregnancy, and in the puerperium. The time of its appearance is parallel to the displacement of the intestines. Pregnancy can change or mask the signs and symptoms of the disease, so its diagnosis is more difficult [38, 39].

The most important cause of pregnancy intestinal obstructions is brides. Volvulus and intussusception are other common causes. It should be remembered that malignant and benign tumors can also be seen [40]. For diagnosis, abdominal ultrasonography should be the first choice since it does not contain radiation. If it is still preferred, computed tomography should be preferred instead of X-ray [39]. Colonoscopy may be preferred in patients who are considering volvulus. In treatment, surgery should be avoided as much as possible. However, there are the same treatment options as normal patients, if necessary [38].

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