

## Perforated Viscus — Symptoms and Treatment

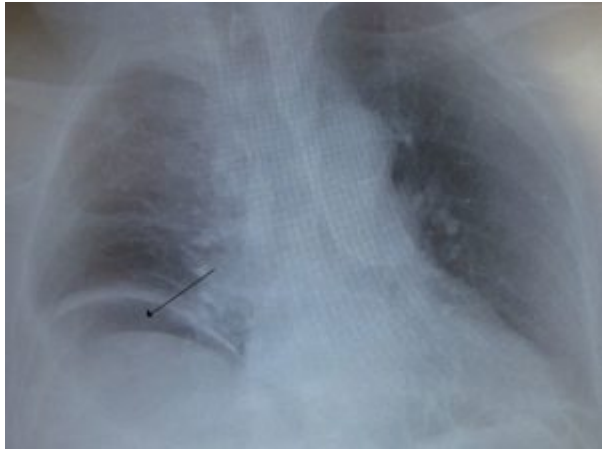
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**Intestinal perforation, viscus rupture, or bowel perforation are different terms referring to the same pathology. Upper-bowel perforation can be either free or contained. Free perforation occurs when the bowel contents spill into the abdominal cavity. Contained perforation occurs when an ulcer causes a full thickness perforation of an organ that gets walled off by another organ. Lower-bowel perforations occur in traumatic patients or in patients with acute diverticulitis or acute appendicitis.**



### Pathophysiology of Intestinal Perforation

Persons who experience an abdominal blunt trauma might develop a gastric or gastrointestinal perforation. If the stomach is healthy, i.e. free of bacteria and microorganisms, the patient will most likely regain normal gastric function without any increased risk of bacterial peritonitis. Patients with a preexisting gastric problem such as peptic ulcer disease are at risk of peritoneal contamination after gastric perforation.



[Image](#): "Free air under the right hemidiaphragm from a bowel perforated." License: Public Domain

Leakage of the gastric acidic contents, or spillage of the intestinal contents, into the peritoneal cavity causes profound chemical peritonitis. If the leakage is not closed and food particles gain access to the peritoneal cavity, secondary bacterial peritonitis might develop. The clinical scenario of abdominal pain due to chemical peritonitis, followed by hours of symptoms-freedom, and then followed by recurrence of symptoms is suggestive of bacterial peritonitis.

Perforations of the distal part of the small bowel puts the patient at an increased risk of bacterial peritonitis. The most commonly involved microorganisms include *Escherichia coli*, and *Bacteroides fragilis*. The perforation of the proximal part of the small bowel, i.e. the duodenum, is unlikely to be associated with bacterial peritonitis.

## Etiology of Intestinal Perforation

The causes of viscus rupture can be summarized in the following points:

Penetrating injury to the lower chest or upper abdomen. The small bowel is the most commonly injured intra-abdominal viscus in penetrating injury. Blunt trauma to the stomach can cause gastric rupture. Blunt trauma is more commonly encountered in motor-vehicle accidents. Ingestion of aspirin, other nonsteroidal anti-inflammatory drugs, and steroids might cause an acute ulcer and result in gastric perforation. Nonsteroidal anti-inflammatory drugs prescription in old patients with diverticulitis should be discouraged because of the increased risk of colonic perforation.

Peptic ulcer disease, acute appendicitis, acute diverticulitis, and an inflamed Meckel diverticulum might all cause a contained bowel perforation. Contained perforations are formed due to the retroperitoneal location and develop a walled-off inflammatory mass or abscess with a less dramatic clinical presentation.

Iatrogenic injuries to the bowel with colonoscopy or endoscopic retrograde cholangiopancreatography (ERCP) are also possible causes of intestinal perforation. Rarely, iatrogenic causes include laparotomy, especially cholecystectomy, and abdominal liposuction. Ischemic bowel injury, and inflammatory bowel disease can also be complicated by intestinal perforation.

Malignancy, lymphoma, and metastatic carcinoma to the bowel can present with intestinal perforation. Treatment of malignancy with newer chemotherapeutic and biologic agents has also seen increased incidence of small intestinal perforation. Colorectal cancers that are treated with colorectal stenting also have a high risk for

colonic perforations.

Infectious causes such as cytomegalovirus, salmonella, *Tropheryma whipplei*, Tuberculosis/HIV coinfection, histoplasmosis, amebiasis, and roundworm infestations can also cause intestinal perforations. Stercoral perforation usually occurs in elderly with chronic constipation and cause colonic perforations due to direct pressure of a fecaloma on the colon.

## Epidemiology of Intestinal Perforation

The estimated incidence of intestinal perforation after blunt abdominal trauma in children is estimated to be around 1 to 7%. In adults, peptic ulcer disease is becoming a less frequent cause of intestinal perforation after the widespread use of proton pump inhibitors. Up to one-third of gastric perforations are due to gastric carcinoma.

Up to 15% of patients with acute diverticulitis are expected to develop free bowel perforation. The mortality rate in patients with intestinal perforation in acute diverticulitis can be as high as 40%. Perforations due to ERCP occur in 1% of patients.

The prognosis in patients with intestinal perforation is worse in patients with malnutrition, advanced age, presence of chronic illness, and appearance of complications.

In industrialized countries, bowel obstruction and inflammatory bowel disease commonly cause nontraumatic intestinal perforations. On the other hand, infectious causes are commonly reported in developing countries.

## Clinical Presentation of Intestinal Perforation

A patient with history of penetrating abdominal injury or blunt trauma to the lower chest or abdomen might present with intestinal perforation. Aspirin, nonsteroidal anti-inflammatory drug use, or steroid ingestion are common risk factors for gastric perforation and one must inquire about them in medication history. History of peptic ulcer disease or ulcerative colitis should be explored.

A patient with intestinal perforation presents with abdominal pain, vomiting, and hiccup. History of endoscopic procedures such as colonoscopy should be explored.

The patient's general appearance, vital signs, and hemodynamic status should be assessed. Pulse and blood pressure should be taken in any patient suspected to have an intestinal perforation.

Signs of abdominal injury such as abrasion, or ecchymosis should be documented. Shallow breathing, abdominal distention, and discoloration are possible signs of viscus perforation. If peritonitis develops, bowel sounds might be absent.

## Diagnostic Workup for Intestinal Perforation

Laboratory tests including a complete blood count might reveal leukocytosis. Blood cultures are indicated if there is suspicion of bacterial peritonitis. Liver and renal function tests are helpful in assessing the severity of the systemic inflammatory response syndrome in the patient due to sepsis or peritonitis.



Image: "Pneumoperitoneum chest X-ray" by Bill Rhodes from Asheville. License: [CC BY 2.0](#)

Radiography of the chest is the first-line investigation in patients with suspected perforated viscus. Free gas can be demonstrated in up to two-thirds of the cases of gastric perforation. Patients presenting with upper abdominal pain but no pneumoperitoneum on an erect chest X-ray might still have a perforated stomach. Further imaging studies are required to adequately rule out the diagnosis of gastric perforation in such patients.

Ultrasonography can also be used to localize gas collection related to bowel perforation. Ultrasonographic evaluation of the abdomen can also help in the visualization of other intraabdominal and pelvic organs.

Computed tomography scans of the abdomen are helpful in localizing the side of perforation. They might show early inflammatory pericolonic soft tissue changes due to focal abscess formation after perforation in patients with diverticulitis. CT scan can precisely locate site of a gastrointestinal perforation in a most cases and rule out mimickers like pneumothorax, pneumomediastinum, and venous air.

Laparoscopy can be diagnostic and therapeutic in cases of intestinal perforation. In fact, in any patient with acute abdominal pain without an apparent cause, it might be reasonable to perform an exploratory laparoscopy especially if the patient's condition is severe.

Peritoneal lavage in a patient with history of blunt abdominal trauma might reveal blood or purulent material, both of which are indications for early surgical exploration.

## Treatment of Intestinal Perforation

Treatment of intestinal perforation can be classified into medical and surgical therapy. The medical emergency care includes intravenous fluid therapy, to not give anything by mouth, and administration of intravenous antibiotics.

Metronidazole is usually used in combination with an aminoglycoside for optimum gram-negative and anaerobic coverage. Gentamicin is the aminoglycoside of choice in this case.

Surgical therapy aims to correct the underlying anatomic problem "closure of the perforation", stop or correct the cause of peritonitis, and remove any foreign material from the peritoneal cavity. Surgical intervention in patients with intestinal perforation

might be complicated by impaired wound healing in case of malnutrition, sepsis, uremia, or history of immunosuppression. Many iatrogenic perforations can be safely managed by endoscopic clip application.

## References

Intestinal Perforation: Background, Anatomy, Pathophysiology. (2018, May 8). Retrieved June 25, 2018, from <https://emedicine.medscape.com/article/195537>

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