

## Review Article

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# Generalized peritonitis lead to shock: Diagnosis and management

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## Introduction

The peritoneum is a membrane consisting of one layer of mesothelial cells which is separated from the vascular connective tissue underneath by the basement membrane. It forms a closed pouch where the viscera can move freely inside. The peritoneum includes the abdominal cavity as the parietal peritoneum and bends to the organs as the visceral peritoneum (Marshall, 2003). Peritonitis is inflammation of the peritoneum (the serous lining that covers the abdominal cavity and abdominal organs therein). It is an acute form of illness, and is a surgical emergency. Can occur locally or in general, through an infectious process due to intestinal perforation, for example in appendix rupture or colonic diverticulum, or non-infection, for example due to gastric acid

discharge in gastric perforation, bile acid excretion in gallbladder perforation. In women, peritonitis is often caused by infection of the fallopian tubes or ovarian rupture [1].

Peritonitis is a complication resulting from the spread of infection from the abdominal organs, gastrointestinal rupture, or penetrating abdominal wounds. The initial reaction of the peritoneum to invasion by bacteria is the release of fibrinous exudate, pus pockets (abscesses) formed between the fibrinous attachments that limit infection. Adhesions usually disappear when the infection clears, but can persist, giving rise to intestinal obstruction [2].

Peritonitis can occur localized, diffuse, or generalized. In local peritonitis, it can occur because of the presence of a strong

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immune system and the body's defense mechanisms by localizing the source of peritonitis with the omentum and intestines. In non-localized peritonitis diffuse peritonitis, then becomes generalized peritonitis and adhesions of the intra-abdominal organs and visceral and parietal peritoneal lining. The emergence of this adhesions causes reduced peristaltic activity until paralytic ileus develops. Fluid and electrolytes are lost into the intestines resulting in dehydration, shock, circulatory disorders and oliguria. In an advanced state, sepsis can occur, due to bacteria entering the blood vessels. Perforation of a peptic ulcer is characterized by peritoneal stimulation that begins in the epigastrium and extends throughout the peritonium due to generalized peritonitis. Generalized peritonitis causes a life-threatening emergency [3,4]. Aim of this article is to review diagnosis and management of generalized peritonitis.

## Discussion

### Symptoms and signs of peritonitis

Symptoms and signs usually relate to the spreading process within the abdominal cavity. Asking symptoms is related to several factors, namely: the duration of the disease, the extent of the peritoneal cavity contamination and the body's ability to resist, the age and general health of the patient [2]. The clinical manifestations can be divided into (1) abdominal signs originating from the onset of inflammation and (2) manifestations of systemic infection. Local findings include abdominal pain, tenderness, stiffness of the abdominal wall, distension, free air in the peritoneal cavity and decreased bowel sounds which are signs of irritation of the parietal peritoneum and causing ileus. Systemic findings include fever, chills, tachycardia, sweating, tachypnea, restlessness, dehydration, oliguria, disorientation and ultimately a shock [5].

**Abdominal pain:** Abdominal pain is the most common symptom of peritonitis. Pain usually comes with a sudden onset, is severe and in patients with perforation the pain is found in all parts of the abdomen. As the disease progresses, the pain is constant, unrelenting, a burning feeling and arises with various movements. Pain is usually more pronounced in the area where the peritoneum is inflamed. A decrease in the intensity and spread of pain indicates a localization of the inflammatory process, when the increasing intensity with the expansion of the pain area indicates the spread of peritonitis [6].

**Anorexia, nausea, vomiting and fever:** Patients also often get anorexia, nausea and vomiting can be followed. Patients usually also complain of thirst and the body feels like a fever, often followed by chills that come and go. The increase in body temperature is usually around 38°C to 40°C [6].

**Hippocrates' facies:** In severe peritonitis the Hippocrates facies can be found. These symptoms include a visibly restless expression, a blank gaze, cowong eyes, cold ears, and a pale face. Patients with advanced peritonitis with Hippocratic facies are usually in the pre-terminal stage. It is characterized by their lying position with their knees flexed and limited intercostal respiration

because any movement can cause pain in the abdomen. This sign is pathognomonic for severe peritonitis with a high mortality rate, but knowing earlier the diagnosis and better treatment can reduce the mortality rate more [5].

**Shock:** In some severe cases, shock can occur due to two factors. First due to the movement of intravascular fluid into the peritoneal cavity or to the lumen from the intestines. The second is due to generalized sepsis. The mainstay of septicemia in generalized peritonitis involves Gram-negative bacteria which can produce a shock-like stage. The mechanism of this phenomenon is not clear, however, it is known from research that the effects of endotoxin in animals can exhibit syndromes or symptoms similar to those seen in humans [6,7].

Vital signs are very useful in assessing the degree of severity or complications that arise in peritonitis. In a state of metabolic acidosis, it can be seen from the respiratory rate that is faster than normal as a compensation mechanism to return to normal. Tachycardia, reduced peripheral pulse volume and narrowed pulse pressure can indicate hypovolemic shock. Matters like this should be recognized immediately and a more complete examination should be done with a certain section of special attention to prevent worse conditions [5,8].

**Inspection:** The most obvious sign in patients with peritonitis is distension of the abdomen. However, the absence of signs of abdominal distension does not exclude the diagnosis of peritonitis, especially if the patient is examined early in the course of the disease, because within 2-3 days there will be signs of abdominal distension. This occurs as a result of a buildup of fluid exudate but most abdominal distension results from paralytic ileus [6].

**Auscultation:** Auscultation should be carried out with care and attention. Bowel sounds can vary from high pitched in such as intestinal obstruction to almost inaudible bowel sounds in severe peritonitis with ileus. The presence of borborygmi and peristaltic sounds that can be heard without a stethoscope is better than the sound of a still stomach. When the high-pitched sound is suddenly lost in the acute abdomen, the cause is probably a perforation of the strangulated bowel [9].

**Percussion:** The assessment of percussion may differ depending on the examiner's experience. Loss of deafening of the liver is a sign of intestinal perforation, this indicates the presence of free air in the peritoneal cavity originating from the perforated intestine. Usually this is an early sign of peritonitis [10]. If a pneumoperitoneum occurs due to rupture of a hollow organ, air will accumulate in the right side of the abdomen under the diaphragm, resulting in a deafening of the liver that disappears [6].

**Palpation:** Palpation is the most important part of the examination of the abdomen in this condition. The basic rule of this examination is to palpate the area that is less tender before moving to the area suspected of having tenderness. This is especially true of children whose firm palpation directly of the painful area renders all examinations useless. In the group of

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people with abdominal wall weakness, such as in women who have often given birth to many children and those who are elderly, it is difficult to assess the presence of stiffness or spasm of the abdominal wall muscles [10].

The most important finding was persistent tenderness of more than one point. At an advanced stage the tenderness will become more extensive and usually involuntary abdominal muscle spasms are obtained. People who are anxious or who are easily stimulated may be quite agitated, but in most cases this can be done by distracting them. Loose tenderness arises from irritation of the peritoneum by an inflammatory process. This process can be localized in appendicitis with local perforation, or it can become diffuse as in severe pancreatitis. Loose tenderness can be localized only in the area or radiate to the point of maximum inflammation. In inflammation in the parietal peritoneum, the abdominal wall muscles involuntarily spasm as a defense mechanism. In peritonitis, the reflex muscle spasm becomes very severe as a plank [10].

### Additional examination

The simplest tests to do include a blood cell count and urinalysis. In cases of peritonitis the white blood cell count is usually more than 20,000 / mm<sup>3</sup>, except in very old patients or someone who has previously had an infection and the body cannot exert its defense mechanisms. The differential calculation shows a leftward shift and is dominated by polymorphonuclear which provides evidence of inflammation, although the leukocyte count does not show a significant increase (Schwartz et al, 1989). Analysis of blood gases, serum electrolytes, blood clotting physiology and liver and kidney function tests can be done [11].

The radiological examination in most cases of peritonitis includes only PA and lateral chest radiographs and plain abdominal radiographs. The chest radiograph can show the process of filling air in the inferior lobe which shows the intraabdominal process. By using a plain radiograph the chest radiograph can be seen to be lifted on one side or both due to the presence of free air in the peritoneal cavity rather than using a plain abdominal radiograph [12].

Ileus is an atypical finding in peritonitis, the small and large intestines are dilated, free air can be seen in cases of perforation. Plain abdominal radiograph should be performed in at least two positions, namely standing / upright or lateral decubitus or both. Photos must be seen whether there is free air or not. Gas should be evaluated with respect to the pattern, location and amount of air in the colon and small intestine [7].

### Management

The main management of peritonitis includes administration of fluids and electrolytes, operative control of sepsis and administration of systemic antibiotics [5].

**Fluid resuscitation:** Complete inflammation of the peritoneal membrane causes displacement of extracellular fluid into the peritoneal cavity and interstitial space. The return of a sufficiently large volume intravascularly is necessary to maintain good urine production and the body's hemodynamic status. If there is anemia and there is a decrease in the hematocrit, a transfusion of PRC (Packed Red Cells) or WB (Whole Blood) can be given. Crystalloid

and colloid solutions must be given to replace lost fluids [13].

In theory, colloid fluids are more effective at treating intravascular fluid loss, but they are more expensive. Meanwhile, crystalloid fluids are cheaper, easy to obtain but require a larger amount because they will then be excreted via the kidneys (Schwartz et al, 1989). Potassium supplements should not be given until perfusion from the tissues and kidneys is adequate and urine has been produced [5,13].

**Antibiotics:** The most common bacteria that cause peritonitis can be divided into aerobic bacteria, namely E. Coli, the Enterobacteriaceae and Streptococci groups, while the most common anaerobic bacteria are Bacteriodes spp, Clostridium, Peptostreptococci. Antibiotics play an important role in peritonitis therapy, giving antibiotics empirically must be able to fight aerobic or anaerobic germs that infect the peritoneum [14]. Empiric administration of antibiotics is done before culture results are obtained and can be changed according to the culture results and sensitivity tests if there are still signs of infection. If the patient is clinically well characterized by decreased fever and decreased white blood cell count, antibiotic changes should be made with caution even though the results of sensitivity testing have been obtained [13].

The effect of antibiotics on peritonitis depends on conditions such as: (1) the size of bacterial contamination, (2) the cause of traumatic or non-traumatic peritonitis, (3) the presence or absence of opportunistic germs such as candida. For therapy to be more effective, antibiotic therapy must be given first, during and after surgery (Schwartz et al 1989). In general, Penicillin G 1,000,000 IU and streptomycin 1 gram should be given immediately. Both drugs are bactericidal when maintained at high doses in plasma. The combination of penicillin and streptomycin also provides coverage for gram-negative bacteria. The use of several million units of penicillin and 2 grams of streptomycin a day until culture results are obtained is a logical terpai regimen. In patients who are sensitive to penicillin, high-dose tetracycline given parenterally is better than chloramphenicol in the early stages of infection [15].

Administration of clindamycin or metronidazole combined with aminoglycosides is as good as giving second-generation cephalosporins (Schwartz et al, 1989). The initial antibiotics used third generation cephalosporin for gram-negative, metronidazole and clindamycin for anaerobic organisms. The coverage of aerobic and anerobic microorganisms is more important than the choice of single or combination therapy. Inadequate initial antibiotic doses play a role in treatment failure. The use of aminoglycosides should be given with caution, because renal impairment is one of the clinical features of peritonitis and a decrease in intraperitoneal pH can interfere with drug activity in cells. Antibiotics are given until the patient does not have a fever, with a normal white blood cell count [16].

**Oxygen and ventilators:** Giving oxygen to mild hypoxemia that arises in peritonitis is quite necessary, because in peritonitis there is an increase in body metabolism due to infection, and interference with lung ventilation. Ventilator can be given if there are conditions such as (1) inability to maintain alveolar ventilation which can be indicated by an increase in PaCO<sub>2</sub> of 50 mmHg or higher, (2) hypoxemia characterized by a PaO<sub>2</sub> of less than 55 mmHg, (3) the presence of rapid breathing and superficial [13].

**Intubation, urinary catheter insertion and hemodynamic monitoring:** Nasogastric tube placement is used to decompress the abdomen, prevent vomiting, aspiration and more importantly reduce the amount of air in the intestines. Insertion of a catheter to determine the function of the bladder and urine output. Vital signs (temperature, blood pressure, pulse and respiration rate) are recorded at least every 4 hours. Preoperative biochemical evaluation including serum electrolytes, creatinine, blood glucose, bilirubin, alkaline phosphatase and urinalysis [17].

**Operative handling:** The primary therapy for peritonitis is surgery. Surgery is usually performed to control the source of peritoneal contamination. This procedure involves closing the intestinal perforation, resection of the bowel with primary anastomosis or with exteriorization. The specific surgical procedure depends on what is obtained during the operation, as well as removing materials from the peritoneal cavity such as fibrin, feces, bile, blood, gastric mucus and making irrigation to reduce the size and number of virulent bacteria [18].

**Sepsis control:** The goals of operative management of peritonitis are to remove all infected material, correct the underlying cause of peritonitis and prevent further complications. Except in localized peritonitis, midline incision is the best surgical technique. If contaminated tissue is found and it becomes fibrotic or necrotic, it should be removed. Routine radical debridement of the entire surface of the peritoneum and internal organs does not increase survival rates. The primary disease is then treated, and may require resection (rupture of the appendix or gallbladder), repair (perforated ulcer) or drainage (acute pancreatitis). Examination of infected fluid and tissue cultures, both aerobically and anaerobically, is immediately performed after entering the peritoneal cavity [19].

**Peritoneal lavage:** In diffuse peritonitis, lavage with isotonic crystalloid fluid (>3 liters) can remove materials such as blood, fibrin clots, and bacteria. The addition of antiseptics or antibiotics to irrigation fluids is useless and even dangerous because it can trigger adhesions (eg tetracyclines, povidone-iodine). Antibiotics given parenterally will achieve bactericidal levels in the peritoneal fluid and have no additional effect on co-administration with lavage. Moreover, lavage using aminoglycosides can cause respiratory depression and anesthetic complications because this group of drugs inhibits the action of the neuromuscular junction. After lavage, all the fluid in the peritoneal cavity must be aspirated because it can inhibit local defense mechanisms by dissolving foreign bodies and removing the surface where phagocytes destroy bacteria [5,13].

**Peritoneal drainage:** Draining is essential for intra-abdominal abscesses and localized peritonitis with plenty of fluid. Drainage from the free peritoneal cavity is ineffective and infrequent, because the installed drainage connects to the outside air which can cause contamination. Prophylactic drainage in diffuse peritonitis does not prevent abscess formation, and can even lead to abscess or fistula formation. Drainage is useful in residual focal infections or in further contamination. Drainage is indicated for inflammation of localized masses or non-resectable cavities [19].

**Postoperative procedure:** Intensive monitoring, ventilator assistance, is absolutely necessary in patients who are unstable. The primary objective is to achieve hemodynamic stability for

perfusion of vital organs, and inotropic agents may be required in addition to fluid administration. Antibiotics are given for 10-14 days, depending on the severity of peritonitis. A good clinical response is characterized by normal urine production, decreased fever and leukocytosis, decreased ileus, and improved general condition. The cure rate varies depending on the duration and severity of peritonitis. Early removal of the catheter (arterial, CVP, urine, nasogastric) can reduce the risk of secondary infection [5].

### Complications and prognosis

Postoperative complications are common and are generally divided into local and systemic complications. Infections of deep wounds, residual abscesses and intraperitoneal sepsis, fistula formation usually appears at the end of the first postoperative week. Persistent high fever, generalized edema, increased abdominal distension, prolonged apathy are indicators of residual abdominal infection. This requires further examination such as an abdominal CT scan. Uncontrolled sepsis can cause multiple organ failures, namely respiration, kidney, liver, bleeding, and immune system. The mortality rate from generalized peritonitis is about 40%. The mortality rate is about 10% in patients with perforated ulcers or appendicitis, at a young age, in patients with little bacterial contamination, and in patients diagnosed earlier [20,21].

### Conclusion

Factors that influence the high mortality rate include the type of primary disease and its duration, involvement of multiple organ failure before treatment, and age and initial health condition of the patient. Diagnosis and management should be handled well to improve prognosis.

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