Complicated Intra-abdominal Infections: Diagnosis and Treatment

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INTRODUCTION

CASE SCENARIO

A 55-year-old man presents to the emergency department (ED) with severe abdominal pain, shaking chills, nausea, and vomiting. He has had left abdominal cramping pain for about 2 days, which has worsened in the past 8 hours. He rates the pain intensity as 8 out of 10. At the ED his vital signs are: temperature 102°F (38.8°C), blood pressure 90/60 mm Hg, heart rate 110 beats/min, and respiratory rate 22 breaths/min. On exam, the patient is awake and alert and appears to be in acute pain. Examination of the abdomen reveals diffuse tenderness with rigidity and absent bowel sounds. A radiograph of the abdomen shows the presence of free air in the abdominal cavity. An emergency exploratory laparotomy is performed and the patient is found to have acute diverticulitis and a perforated colon.

This patient was diagnosed with an intra-abdominal infection secondary to a perforated colon. Intra-abdominal infection is broadly defined as the development of peritoneal inflammation in response to infectious or inflammatory materials. It is further classified as uncomplicated or complicated. Uncomplicated intra-abdominal infection is defined as an infection that is confined to a normally hollow viscus of the gastrointestinal tract without an anatomical disruption. Complicated intra-abdominal infection is defined as acute disruption of the normally sterile peritoneal cavity that results in contamination of the peritoneal space with infectious materials. Prompt recognition and treatment of complicated abdominal infection is critical because it is a potentially life-threatening event that is often accompanied by septic syndrome. Herein, we discuss the classification, microbiology, pathophysiology, diagnosis, and treatment of complicated intra-abdominal infection.

CLASSIFICATION

The classification of intra-abdominal infection has important implications for the selection of antimicrobial therapy. Intra-abdominal infection can be classified as follows:

Community-acquired intra-abdominal infections are defined as infections acquired prior to
hospitalization, within 2 days of hospitalization, or prior to recent exposure to antibiotics.

Health care–associated intra-abdominal infections are defined as infections whose onset is outside of the hospital environment but which occur in patients with at least 1 of the following risk factors: (1) presence of an invasive device prior to admission; (2) history of methicillin-resistant *Staphylococcus aureus* (MRSA) colonization or infection; or (3) history of surgery, hospitalization, hemodialysis, or residence in a long-term care facility in the preceding 12 months, with infection that developed from complications of previous elective or emergent intra-abdominal operations and is caused by nosocomial isolates particular to the site of the operation and to the specific hospital and unit.

Hospital-acquired intra-abdominal infections are defined as infections occurring more than 48 hours after hospital admission and are most commonly related to an operative infection; thus, such infections are also known as postoperative peritonitis.

Because some clinicians use the term peritonitis synonymously with complicated intra-abdominal infection, complicated intra-abdominal infections are also classified as primary, secondary, tertiary, and continuous ambulatory peritoneal dialysis (CAPD) peritonitis.1

**Primary peritonitis** does not arise from a source within the abdomen, so it is also known as spontaneous bacterial peritonitis (SBP). It is hypothesized that primary peritonitis is the result of bacterial translocation across an intact gut.3 This type of peritonitis is usually observed in patients with ascites secondary to liver cirrhosis. However, SBP can also develop in patients with ascites due to congestive heart failure or primary/metastatic intra-abdominal malignant diseases.4

**Secondary peritonitis** results from perforation of a hollow viscus, such as colon or stomach, with spillage of luminal content into the intra-abdominal cavity. In patients with adequate host defense, secondary peritonitis evolves into an intra-abdominal abscess through the process of sequestration, in which the infection is localized by the abdominal wall, bowels, and/or the omentum.

**Tertiary peritonitis** occurs after failure of treatment for secondary peritonitis. Patients with tertiary peritonitis typically have multiple infected fluid collections throughout the peritoneal cavity, with no effective sequestration of the infection. Patients with tertiary peritonitis tend to be critically ill with organ dysfunction, and have undergone multiple rounds of antimicrobial therapy, leading to infection with highly resistant organisms or nosocomial pathogens; thus, this type of peritonitis is also known as nosocomial peritonitis.

**CAPD-associated peritonitis.** Patients on CAPD are at risk for developing peritonitis. CAPD-associated peritonitis is considered a unique kind of peritonitis and thus has its own category. It is different from primary or secondary peritonitis because it usually involves a single skin microorganism such as *Staphylococcus aureus* or coagulase-negative staphylococci.5

### MICROBIOLOGY

Primary peritonitis is usually associated with a single pathogen such as *Streptococcus pneumoniae*6,7 and the common bacteria that reside within the gastrointestinal tract such as *Escherichia coli*, *Klebsiella* species, and enterococci. In contrast, secondary/tertiary peritonitis is caused by polymicrobial enteric flora. The microorganisms associated with secondary/tertiary peritonitis are summarized in Table 1.4,8,9