

Intra-abdominal Infections

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Introduction

- Intra-abdominal infections (IAIs) are those contained within the peritoneal cavity or retroperitoneal space.
- The peritoneal cavity extends from the undersurface of the diaphragm to the
- floor of the pelvis and contains
 - stomach, small bowel, large bowel, liver, gallbladder, and spleen
- IAIs may be generalized or localized, complicated or uncomplicated, and community or healthcare-associated

Cont....

- Uncomplicated IAIs are confined within visceral structures, such as the liver, gallbladder, spleen, pancreas, kidney, or female reproductive organs
- Complicated intra-abdominal infections involve anatomical disruption, extend beyond a single organ, and yield peritonitis

Peritonitis

- Is an acute inflammatory response of the peritoneal lining to microorganisms, chemicals, irradiation, or foreign-body injury
- **Primary peritonitis (SBP):** is an infection of the peritoneal cavity without an evident source of bacteria from the abdomen
- **Secondary peritonitis:** involve perforation of GIT (due to ulceration, ischemia, obstruction), post operative peritonitis, post traumatic peritonitis
- **Tertiary peritonitis:** occur in critically ill patients and is an infection that persist after adequate management of primary/secondary peritonitis

Epidemiology

- SBP occur both in children and adults
 - Occur in 10-30% patients with alcoholic cirrhosis
 - Peritoneal dialysis, cirrhosis with ascites, nephrotic syndrome
- Secondary peritonitis may be caused by
 - appendicitis; pancreatitis; diverticulitis; bowel infarction; IBD; cholecystitis; septic abortion, endometritis

Etiology

- Primary bacterial peritonitis is often caused by a single organism.
- Most common pathogen *E. coli* and *Klebsiella*, *Pseudomonas*, anaerobes, and *S. pneumoniae*
- Peritonitis in patients undergoing Peritoneal dialysis is caused most often
 - *S. aureus* , *S. epidermidis*, *Pseudomonas aeruginosa*
- Because of the diverse bacteria present in the GIT, secondary IAI's are often polymicrobial.

Pathophysiology

- In primary peritonitis, bacteria may enter the abdomen via the bloodstream or the lymphatic system
- Hematogenous spread occurs with TB peritonitis or peritonitis associated with cirrhotic ascites.
- When peritonitis results from PD, skin surface flora are introduced via the peritoneal catheter.
- In secondary peritonitis, bacteria most often enter the peritoneum as a result of **perforation of the GI female genital tracts** caused by diseases or traumatic injuries.

Cont...

- If bacteria that enter are not contained by **cellular** and **humoral** defense mechanisms, bacterial dissemination occurs throughout the peritoneal cavity, resulting in **peritonitis**.
- Sign and symptoms like fever, vomiting, or diarrhea may worsen the fluid imbalance; may result in hypotension and shock
- bacteria and endotoxins are absorbed easily into the bloodstream (translocation), and this may result in septic shock.

Cont....

- Many of the manifestations of peritonitis, result from cytokine activity.
 - Inflammatory cytokines are produced by macrophages and neutrophils in response to bacteria and bacterial products or to tissue injury
- combination of aerobic and anaerobic organisms appears to increase the severity of infection (synergism).
 - E. coli may provide an environment conducive to the growth of anaerobic bacteria.

Clinical presentation and Diagnosis

- **Symptoms**
 - Nausea, vomiting, and generalized abdominal pain, loss of appetite, bloating
- **Sign**
 - Fever
 - Tachypnea and tachycardia
 - Hypotension and shock
 - Bowel sounds are hypoactive
 - Decreased urine output

Cont....

- **Laboratory Tests**
- The WBC is high (WBCs $15\text{--}20 \times 10^3/\text{mm}^3$)
 - with neutrophils predominating
- The hematocrit and blood urea nitrogen increase because of dehydration.
- Acidosis and lactic acidemia due to
 - Reduced intravascular volume and diminished tissue perfusion.

Treatment

- **Desired outcome**
 - Resolve the infection without major organ system complications
 - Minimize drug adverse effect
- **General approach to treatment**
 - (a) prompt drainage (secondary peritonitis)
 - (b) support of vital functions; and
 - (c) appropriate antimicrobial therapy

Cont...

- **Nonpharmacologic therapy**

- 1. Drainage procedure:**

- Secondary peritonitis requires surgical removal of the inflamed or gangrenous tissue to prevent further bacterial contamination.

- 2. Fluid therapy**

- large volumes of IV fluids are required to maintain intravascular volume, CO and tissue perfusion

Cont....

- **Pharmacologic therapy**

- Goal of antimicrobial therapy

- To control bacteremia

- To reduce suppurative complications

- To prevent local spread of existing infection

- **Antimicrobial selection**

- For 2^o peritonitis should cover aerobic and anaerobic bacteria from the GIT

- **Clindamycin** and **Metronidazole** appear to be equivalent in efficacy when combined with agents effective against aerobic gram-negative bacilli (gentamicin)

Cont...

- For most patients, antimicrobial treatment can be completed
- orally with moxifloxacin, ciprofloxacin and metronidazole
- Four to 7 days of antimicrobial treatment are sufficient for most IAIs of mild to moderate severity

Recommended agent for community acquired complicated IAI

Mild-moderate infection	Severe infection
Single agent	Piperacillin–tazobactam
Cefoxitin	Imipenem–cilastatin
Moxifloxacin	Meropenem
ertapenam	Cefepime or ceftazidime + metronidazole
Combination agent	Ciprofloxacin/levofloxacin+ metronidazole
Ceftriaxone/cefazolin/cefuroxime/cefotaxime plus Metronidazole	
Ciprofloxacin/levofloxacin+ metronidazole	

Guidelines for Empiric Antimicrobial Agents for peritonitis

	Primary agent	Alternatives
SBP	Ceftriaxone, cefotaxime	<ol style="list-style-type: none"> 1. Piperacillin–tazobactam, carbapenems 2. Aztreonam +vancomycin) or quinolones with significant <i>Streptococcus spp.</i> activity (levofloxacin, moxifloxacin)
Peritoneal dialysis	<ol style="list-style-type: none"> 1. oxacillin/nafcillin or 1st generat.cephalosporin 2. <i>Ampicillin</i> 3. ceftazidime /cefepime 	<ol style="list-style-type: none"> 1. Vancomycin 1. aminoglycoside may be added for <i>Enterococcus spp</i> 2. Linezolid, daptomycin (VRE) 1. Aztreonam or an aminoglycoside
Secondary bacterial peritonitis		
Perforated peptic ulcer	Cephalosporine(1 st . 3 rd , 4 th) plus metronidazole or piperacillin–tazobactam or ticarcillin–clavulanate, carbapenem	<ol style="list-style-type: none"> 1. Ceftriaxone, cefotaxime, or 2. Ciprofloxacin withmetronidazole 3. Aztreonam with vancomycin and metronidazole 4. Cefoxitin or ceftizoxime

	Primary agent	Alternatives
Abscess	Third- or fourth-generation cephalosporin with metronidazole, piperacillin–tazobactam, or ticarcillin–clavulanate	1. Imipenem–cilastatin, meropenem, 2. Ciprofloxacinb or levofloxacinb each with metronidazole or moxifloxacin alone
Community-Acquired Acute Cholecystitis	Ceftriaxone or cefotaxime	piperacillin/tazobactam, carbapenem, aztreonam with metronidazole
Acute Contamination from Abdominal Trauma	Antianaerobic cephalosporins ^a or metronidazole with either ceftriaxone or cefotaxime	Piperacillin/tazobactam or a carbapenem 2. Ciprofloxacinb or levofloxacinb each with metronidazole or moxifloxacin alone