Intra-Abdominal Peritonitis in Adults, Lower Gastrointestinal Tract Origin - Microbiology Full Clinical Guideline

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Introduction

- The lower gastrointestinal tract consists of the small intestine (distal duodenum, jejunum, and ileum) and large intestine (caecum, colon [ascending, transverse, descending, and sigmoid], rectum, and anal canal).
- One of the outcomes of:
    - Microbial invasion from the lower gastrointestinal tract into the abdominal cavity; and
    - The subsequent inflammatory response

  is peritonitis.
- Manifestations include abdominal pain and tenderness, and fever, chills, and sweats. Temperatures > 38 ° C or < 36 ° C, respiratory rate > 20 breaths/minute, heart rate > 90 beats/minute, and hypotension can denote progression of localised infectious disease into sepsis and septic shock.
- Intra-abdominal infection of the lower gastrointestinal tract can be caused by multiple pathogens, i.e. polymicrobial infectious disease.
- Gram negatives (e.g. *Escherichia coli*, *Klebsiella* spp, *Proteus* spp, and *Enterobacter* spp), Gram positives (e.g. *Streptococcus* spp and *Enterococcus* spp), and anaerobes (e.g. *Bacteroides fragilis*, *Clostridium* spp) are commonly identified bacterial causes.
- Mechanisms of transmission include mucosal breach, enabling inoculation of gastrointestinal tract flora. Breaches in the mucosa can be secondary to:
    - Perforated viscera.
    - Surgical anastomotic breakdowns.
- Other mechanisms of transmission include contiguous inoculation. Another focus of intra-abdominal viscera infection (e.g. appendicitis, diverticulitis) disseminates locally and invades the abdominal cavity.

Investigation

- Radiology:
    - First line: in general, computed tomography (CT).
    - Second line: discuss with the surgical senior and collaborate with the consultant radiologist.
- Microbiology:
    - With the range of Gram positive, Gram negative, and anaerobic bacterial pathogens, variations in bacterial resistance and sensitivity profiles, contraindications, and side effects, microbiological investigation enables best antibiotic practice:
        - Pre-operative: blood cultures.
        - Intra-operative: fluid, pus, or tissue for microscopy, culture, and sensitivity (MC&S). Please notify the laboratory during the day (extension 88218, option 2) or the microbiology biomedical scientist on call (via switchboard), if urgent MC&S of the surgical samples is required.
- Blood sciences:
    - Full blood count (FBC), C reactive protein (CRP), lactate, urea and electrolytes (U&E), and liver function tests (LFT).

Treatment

Surgical Opinion and Intervention

- Intra-abdominal peritonitis can progress from localised infectious disease into sepsis and septic shock.
- Intra-abdominal peritonitis can be secondary to perforated viscera, anastomotic breakdown, or another focus of intra-abdominal infection (e.g. appendicitis, diverticulitis).
- Therefore, early discussion with the lower gastrointestinal tract registrar/consultant is recommended, including regarding possible transfer of care.

- Surgical intervention could enable:
    - Elimination of the origin(s) of the infectious episode.
    - Reduction of the microbial inoculum.
    - Identification of the causative agent(s).
    - Restoration of host physiological function.

Empiric, Intravenous Antibiotics

- Community acquired (symptoms, signs, and/or radiological findings of intra-abdominal peritonitis within 48 hours of hospital admission):
    - First line: beta-lactam beta-lactamase inhibitor:
        - If clinically stable: co-amoxiclav 1.2 g 8 hourly.
        - If clinically unstable (haemodynamic instability, sepsis, or septic shock): piperacillin tazobactam 4.5 g 8 hourly.
    - Second line, if non-immediate without systemic involvement penicillin allergy: metronidazole 500 mg 8 hourly and ceftriaxone 2 g daily.
    - Third line, if immediate rapidly evolving or non-immediate with systemic involvement penicillin allergy:
        - If clinically stable: metronidazole 500 mg 8 hourly and ciprofloxacin 400 mg 12 hourly.
        - If clinically unstable (haemodynamic instability, sepsis, or septic shock): metronidazole 500 mg 8 hourly and ciprofloxacin 400 mg 12 hourly and glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 15-30 mg/l.
- Hospital acquired (symptoms, signs, and/or radiological findings of intra-abdominal peritonitis > 48 hours after hospital admission):
    - First line: piperacillin tazobactam 4.5 g 6 hourly.
    - Second line, if penicillin allergy: metronidazole 500 mg 8 hourly and ciprofloxacin 400 mg 8 hourly and glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 15-30 mg/l.
    - Third line: collaborate with the microbiologist.
- NB Empiric anti-fungals can be considered in specific patients; including recurrent intra-abdominal peritonitis (for example, post-operative recurrence or after completion of anti-bacterials) or history of immunocompromise. However, in general, anti-fungals are reserved for patients with cultures of *Candida* species from blood or intra-operative fluid, pus, or tissue.

Directed, Intravenous (with sensitivities)

- Please note, directed intravenous antimicrobial chemotherapy relates to pre-operative blood cultures and/or intra-operative fluid, pus, or tissue sterile site

MC&S. Post-operative wounds and chronic drains can become colonised with single or multiple microorganisms. With the administration of pre- and post-operative broad spectrum anti-bacterials, non-sterile site investigation can isolate multi-drug resistant colonising flora, rather than causative agents.

- Reflecting the polymicrobial nature of intra-abdominal peritonitis, microbiologists commonly recommend antibiotics with Gram negative, Gram positive, and anaerobic spectrums, e.g. co-amoxiclav or piperacillin tazobactam; both for empiric and directed antimicrobial chemotherapy.
- Reflecting the polymicrobial rationale, if culture of Gram negatives only* (e.g. *Escherichia coli*, *Klebsiella* spp), according to sensitivities:
    - First line: narrowest spectrum of co-amoxiclav 1.2 g 8 hourly or piperacillin tazobactam 4.5 g 8 hourly.
    - Second line, if non-immediate without systemic involvement penicillin allergy: ceftriaxone 2 g daily and metronidazole 500 mg 8 hourly.
    - Third line, if immediate rapidly evolving or non-immediate with systemic involvement penicillin allergy: ciprofloxacin 400 mg 12 hourly and metronidazole 500 mg 8 hourly.
- Reflecting the polymicrobial rationale, if culture of *Enterococcus* species only*, according to sensitivities:
    - First line, if amoxicillin sensitive: co-amoxiclav 1.2 g 8 hourly.
    - Second line, if amoxicillin resistant: glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 15-30 mg/l, and:
        - Co-amoxiclav 1.2 g 8 hourly; or
        - If non-immediate without systemic involvement penicillin allergy, ceftriaxone 2 g daily and metronidazole 500 mg 8 hourly; or
        - If immediate rapidly evolving or non-immediate with systemic involvement penicillin allergy, ciprofloxacin 400 mg 12 hourly and metronidazole 500 mg 8 hourly.
    - Third line, if amoxicillin and vancomycin/teicoplanin resistant: linezolid 600 mg 12 hourly (or per oral [absorption 100%]) and:
        - Co-amoxiclav 1.2 g 8 hourly; or
        - If non-immediate without systemic involvement penicillin allergy, ceftriaxone 2 g daily and metronidazole 500 mg 8 hourly; or
        - If immediate rapidly evolving or non-immediate with systemic involvement penicillin allergy, ciprofloxacin 400 mg 12 hourly and metronidazole 500 mg 8 hourly.
- Reflecting the polymicrobial rationale, if culture of *Streptococcus* species only*, according to sensitivities:
    - First line: co-amoxiclav 1.2 g 8 hourly.
    - Second line, if non-immediate without systemic involvement penicillin allergy: ceftriaxone 2 g daily and metronidazole 500 mg 8 hourly.
    - Third line, if immediate rapidly evolving or non-immediate with systemic involvement penicillin allergy: metronidazole 500 mg 8 hourly and ciprofloxacin 400 mg 8 hourly and glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 15-30 mg/l.
- * If polymicrobial cultures:
    - Collaborate with the microbiology consultant responsible for sterile site investigations.

Directed, Per Oral (with sensitivities)

- Please note, directed per oral antimicrobial chemotherapy relates to pre-operative blood cultures and/or intra-operative fluid, pus, or tissue sterile site MC&S. Post-operative wounds and chronic drains can become colonised with single or multiple microorganisms. With the administration of pre- and post-operative broad spectrum anti-bacterials, non-sterile site investigation can isolate multi-drug resistant colonising flora, rather than causative agents.
- Reflecting the polymicrobial nature of intra-abdominal peritonitis, microbiologists commonly recommend antibiotics with Gram negative, Gram negative, and anaerobic spectrums, e.g. co-amoxiclav; both for empiric and directed antimicrobial chemotherapy.
- Reflecting the polymicrobial rationale, if culture of Gram negatives only* (e.g. *Escherichia coli*, *Klebsiella* spp), according to sensitivities:
    - First line: co-amoxiclav 625 mg 8 hourly plus amoxicillin 500 mg 8 hourly.
    - Second line: co-trimoxazole 960 mg 12 hourly and metronidazole 400 mg 8 hourly.
    - Third line: ciprofloxacin 500 mg 12 hourly and metronidazole 400 mg 8 hourly.
- Reflecting the polymicrobial rationale, if culture of *Enterococcus* species only*, according to sensitivities:
    - First line, if amoxicillin sensitive: co-amoxiclav 625 mg 8 hourly plus amoxicillin 500 mg 8 hourly.
    - Second line, if amoxicillin resistant: linezolid 600 mg 12 hourly **and**:
        - Co-amoxiclav 625 mg 8 hourly plus amoxicillin 500 mg 8 hourly; or
        - Co-trimoxazole 960 mg 12 hourly and metronidazole 400 mg 8 hourly; or
        - Ciprofloxacin 500 mg 12 hourly and metronidazole 400 mg 8 hourly.
    - Third line: collaborate with the microbiologist.
- Reflecting the polymicrobial rationale, if culture of *Streptococcus* species only*, according to sensitivities:
    - First line: co-amoxiclav 625 mg 8 hourly plus amoxicillin 500 mg 8 hourly.
    - Second line: clindamycin 300 mg 6 hourly and ciprofloxacin 500 mg 12 hourly.
    - Third line: linezolid 600 mg 12 hourly and ciprofloxacin 500 mg 12 hourly and metronidazole 400 mg 8 hourly.
- * If polymicrobial cultures:
    - Collaborate with the microbiology consultant responsible for sterile site investigations.

Empiric, Per Oral

- If symptoms, signs, and/or radiology features of intra-abdominal peritonitis, and microbiology negative, collaborate with a microbiologist regarding empiric options.

Duration of Antibiotics

- In general, 4 days from surgical intervention and source control.
- If the episode of intra-abdominal peritonitis has been complicated (e.g. sub-optimal source control or surgical drain in situ or bloodstream infection) collaborate with the microbiology consultant responsible for sterile site investigations.

Management of Intra-Abdominal Peritonitis, Lower Gastrointestinal Tract Origin

Clinical concerns re intra-abdominal peritonitis (manifesting symptoms and signs include abdominal pain and tenderness, and fever, chills, and sweats)

Investigate

Radiology
- First line: in general, CT abdomen pelvis
- Second line: discuss with the surgical senior and collaborate with the consultant radiologist

AND

Microbiology and Blood Sciences
- Pre-operative: blood cultures
- Intra-operative: fluid, pus, or tissue for MC&S
- FBC, CRP, lactate, U&E, and LFT

Treatment

Surgical Intervention
- Source control can enable: elimination of the origin(s) of the infectious episode; reduction of the microbial inoculum; identification of the causative agent(s); and, restoration of host physiological function
- Collaborate with the relevant surgical registrar/consultant on call regarding intervention

Empiric, Intravenous Antibiotics
- Community acquired (symptoms, signs, and/or radiological findings of intra-abdominal peritonitis within 48 hours of hospital admission):
  - First line: beta-lactam beta-lactamase inhibitor:
    - If clinically stable: co-amoxiclav 1.2 g 8 hourly
    - If clinically unstable (haemodynamic instability, sepsis, or septic shock): piperacillin tazobactam 4.5 g 8 hourly
  - Second line, if non-immediate without systemic involvement penicillin allergy: metronidazole 500 mg 8 hourly and ceftriaxone 2 g daily
  - Third line, if immediate rapidly evolving or non-immediate with systemic involvement penicillin allergy:
    - If clinically stable: metronidazole 500 mg 8 hourly and ciprofloxacin 400 mg 12 hourly
    - If clinically unstable (haemodynamic instability, sepsis, or septic shock): metronidazole 500 mg 8 hourly and ciprofloxacin 400 mg 12 hourly and glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 15-30 mg/l
- Hospital acquired (symptoms, signs, and/or radiological findings of intra-abdominal peritonitis > 48 hours after hospital admission):
  - First line: piperacillin tazobactam 4.5 g 6 hourly
  - Second line, if penicillin allergy: metronidazole 500 mg 8 hourly and ciprofloxacin 400 mg 8 hourly and glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 15-30 mg/l
  - Third line: collaborate with the microbiologist

Directed, Intravenous or Per Oral Antibiotics: with microbiology cultures and sensitivities

NB Empiric anti-fungals can be considered in specific patients; including recurrent intra-abdominal peritonitis (for example, post-operative recurrence or after completion of anti-bacterials) or history of immunocompromise. However, in general, anti-fungals are reserved for patients with cultures of *Candida* species from blood or intra-operative fluid, pus, or tissue

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Document Control

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