

LECTURE 5: SURGICAL INFECTION PART 2

Dr. Ammar Karim Alaraji

Specific infections in surgical patients

+ Surgical site infection (SSI):

- **Definition:**

An infection that occurs after surgery in the part of the body where the surgery took place.

- **Surgical site infection (SSI) classification:**

1. Superficial incisional SSI: involves only skin and subcutaneous tissue of incision.
2. Deep incisional SSI: involves deep tissues, such as fascial and muscle layers.
3. Organ/space SSI: Infection involves any part of the anatomy in organs and spaces other than the incision, which was opened or manipulated during operation.

- **Diagnosis:**

1. Superficial SSIs can be identified by pyrexia, local erythema, pain and excessive tenderness, and sometimes discharge.
2. Deeper infection may present more insidiously with pyrexia, leucocytosis, and organ dysfunction, such as prolonged postoperative ileus.
3. Diagnosis may require radiological imaging and sometimes exploratory laparotomy.

- **Treatment:**

1. Antibiotics
2. An abscess drainage.
3. Deep SSI: drainage either radiologically (under ultrasound or CT guidance) or open surgery.

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○ **Prevention:**

The risks of SSI can be reduced by:

1. Careful surgical technique to minimize tissue damage, anastomotic leaks and hematoma form.
2. Appropriate antibiotic prophylaxis

+ **Urinary tract infections (UTI):**

- range from simple cystitis to pyelonephritis or even perinephric abscess.
- Catheterized patients: increased risk of infection.
- The most common organisms are **Escherichia coli, Klebsiella species, Enterococcus faecalis and Pseudomonas aeruginosa.**
- Diagnosis:
 1. History:
 - Fever/rigors.
 - Dysuria, Urinary frequency, Lower abdominal pain, Loin pain.
 2. Examination:
 - Pyrexia
 - Suprapubic tenderness
 - Tenderness in the renal angle.
 3. Investigations:
 - General urine examination (GUE)
 - Urine culture and sensitivity.
 - Blood cultures if pyrexia.

+ **Respiratory tract infections**

- This comprises upper and lower respiratory tract infection, lung abscess and empyema.
- Causative agents:
 1. Streptococcus pneumoniae.
 2. H. influenza.
 3. E. coli.
 4. P. aeruginosa especially during or after mechanical ventilation (Staph. aureus) including MRSA.

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- Diagnosis:
 1. History:
 - Fever
 - Cough and Breathlessness.
 - Increased respiratory secretions
 2. Examination:
 - Pyrexia
 - Confusion
 - Tachypnea
 - Chest signs, e.g., dullness of percussion, bronchial breathing, coarse crepitation.
 3. Investigations:
 - Arterial blood gases.
 - Chest x-ray.
 - Cultures (blood, sputum and bronchial washings).
 - CT chest.
 4. Treatment:
 - Antibiotic treatment should follow the local hospital policy until culture and sensitivity results become available.
 - Abscess or empyema should be drained.
 - Breathing and coughing exercises preoperatively.
 - Physiotherapy, early mobilization and adequate pain relief in the postoperative period will help prevent respiratory infection.

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INFECTIONS PRIMARILY TREATED BY SURGICAL MANAGEMENT

+ Abscess

- Definition: a localized collection of pus containing neutrophils, dead tissue.
- The causative pathogens: Staph. aureus.
- Abscesses forms in
 - The abdomen or pelvis often contain a mixture of gut bacteria, e.g., E. coli, enterococci and anaerobic bacteria.
 - The skin are often painful and the overlying skin will be raised, red and hot to the touch.
- Presenting features: a **swinging pyrexia**, symptoms relating to pressure effects.
- Treatment: Drainage
 - The pus >> drained and sent for microscopy and culture.
 - Done by
 - Needle aspiration (e.g., breast).
 - Radiologically under ultrasound or CT guidance (e.g., sub phrenic).
 - Opened surgery (e.g., perianal).
 - Antibiotics do not penetrate into abscesses but may be required for treatment if the patient is systemically unwell or for prophylaxis if a surgical wound is being made in the course of drainage.

+ Necrotising fasciitis

- Severe, life-threatening infection of skin and subcutaneous tissues characterized by necrosis of deep fascia.
- There are two main types depending on causative organisms:
 - Type I: polymicrobial infection.
 - Fournier's gangrene is a special type affecting the perineal area.

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- Type II: monomicrobial infection, usually by β -hemolytic Group A streptococci (*S. pyogenes*).
- The infection usually starts at a site of trauma and can spread very quickly, as bacterial exotoxins and enzymes lead to necrosis of fat and fascia and eventually overlying skin.
- The patient is usually febrile, toxic and in severe pain.
- Initially, the overlying skin may appear normal, but as the infection progresses there is oedema, discoloration and crepitus (due to gas production).
- Urgent surgical debridement of all necrotic tissue is essential and several visits to theatre may be required.
- Initial antibiotic choice is usually empirical with a combination of broad-spectrum agents against likely pathogens, e.g., carbapenems, clindamycin and metronidazole.
- Antibiotic therapy can later be changed according to the results of pus and tissue cultures.



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+ Diabetic foot infections

- range from cellulitis to complex skin and soft tissue infection to osteomyelitis.
- Clinical diagnosis is based on the presence of cellulitis, purulent discharge, pain, tenderness and gangrene.
- Signs of systemic toxicity may be present in severe infection.
- Infections are often polymicrobial.
- Microbiological diagnosis is best achieved by culture of tissue and bone biopsy samples, as culturing surface swabs from ulcers merely indicates which microorganisms are colonizing the ulcer/wound.
- Radiological investigation for osteomyelitis includes plain x-rays and MRI.
- Antibiotic therapy is usually.

+ C. difficile infection (CDI):

- This occurs when the normal colonic microflora is disturbed by the administration of antibiotics in patients either pre-colonised with or exposed after antibiotic treatment to *C. difficile* (an anaerobic spore-forming bacillus).
- A spectrum of disease is seen, ranging from abdominal discomfort to profuse watery diarrhea (one of the most common features), severe abdominal cramps and rarely toxic dilatation of the colon leading to rupture.
- At colonoscopy characteristic yellow plaques, bleeding mucosa and islands of normal tissue are seen, which is called pseudomembranous colitis.
- Surgical patients can acquire CDI as a consequence of antibiotic treatment or prophylaxis.
- Diagnosis: Test liquid sample of faeces for the presence of toxin by enzyme immunoassay and/or detection of the toxin gene by polymerase chain reaction (PCR).

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Gas gangrene

- Rare
- High mortality.
- Causative organisms: Clostridium perfringens, Clostridium novyi and Clostridium septicum (sporing organisms found in soil).
- Risk factors: Contact with soil, especially in the battlefield; presence of devitalized tissue.
- Symptoms and signs are toxin mediated and include rapid deterioration, sepsis, spreading muscle necrosis; skin discoloration and edema; crepitus of tissues
- Management: Urgent extensive surgical excision of necrotic tissue AND high-dose antibiotics (penicillin and metronidazole).



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Tetanus

- This is caused by *Clostridium tetani*, a spore-forming anaerobic organism that enters the body through soil or animal fecal contamination of a wound, injury or burn, and then multiplies anaerobically in tissues if the wound is not adequately cleaned or debrided.
- The incubation period varies from 4 to 21 days.
- Tetanospasmin (a neurotoxin) spreads along nerves from the site of infection and causes generalized rigidity and spasm of skeletal muscles.
- The muscle stiffness usually involves the jaw (lockjaw) and neck, and then becomes generalized.
- Mortality ranges from 10% to 90%, and is highest in infants and the elderly.
- Antibiotic treatment is with penicillins or, for penicillin-allergic patients, clarithromycin, but is only an adjunct to correct surgical care of wounds and further specialized medical treatment.
- Tetanus can be prevented by immunization.
- In the UK (a low-risk area), all young children are offered the tetanus vaccine as part of the routine NHS childhood vaccination program; current advice is to have five doses over a life time.
- For nonimmune individuals who have suffered a tetanus-prone injury, Human Tetanus Immunoglobulin (HTIG) is given to provide immediate protection together with wound debridement, active immunization (three doses of tetanus toxoid at monthly intervals) and antibiotic treatment.