



# **Surgical infection & Antibiotic prophylaxis in surgery**

*Presented by :*

*Aws Ghraiz*

*Ahmad Abu Qaoud*

*Rand AL-ghazzawi*

*Mohammad Khalifa*

*Nahla abuhilaleh*

*Aya Abu Arja*

*Raghad Hwitat*

# Surgical Infections

## Background and scope of the problem

- Surgical infection has been around as long as surgical procedures have been performed.

In 2014 updated multistate prevalence statistics from surveys taken from 2009 to 2011 to assess for HAIs were reported in the New England Journal of Medicine.

a. Four percent of patients were diagnosed with at least one HAI.

b. (1) Pneumonia accounted for 22%.

c. (2) SSIs accounted for 22%.

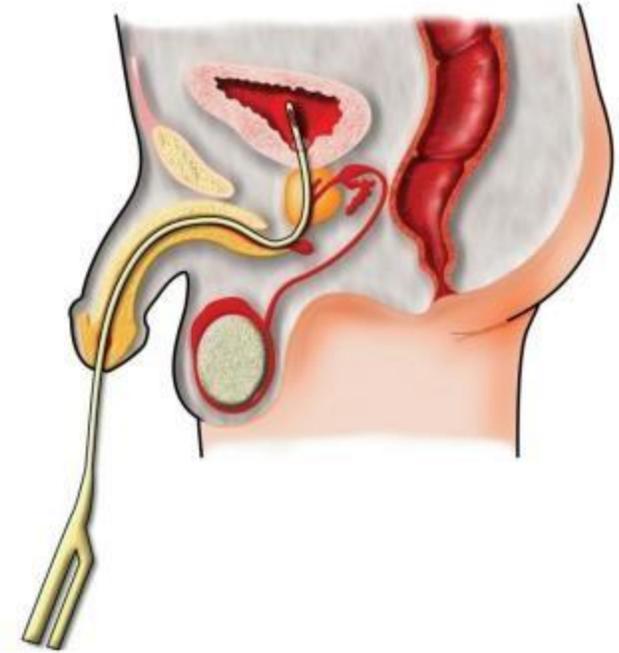
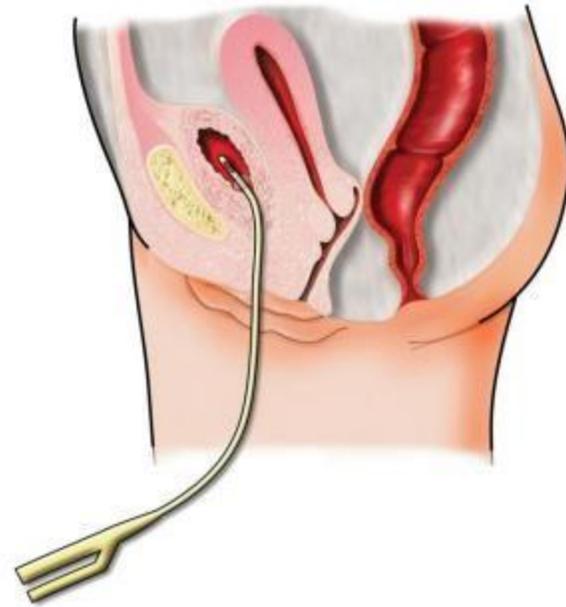
d. (3) Gastrointestinal infections (primarily *C. difficile*) accounted for 17%.

e. (4) Device-related infections accounted for 25%

# Definition

- Surgical infections encompass a range of healthcare-associated infections that occur as complications of surgical procedures.
- These infections can involve various anatomical sites and typically result from the introduction of pathogens into the patient's body during surgery or through the use of medical devices.
- Common types of surgical infections include Central Line-Associated Bloodstream Infections (CLABSI) and Catheter-Associated Urinary Tract Infections (CAUTI), in addition to Surgical Site Infections (SSI). These infections are characterized by their potential to cause localized or systemic infections, posing significant risks to patient health and requiring comprehensive preventive measures to minimize their occurrence

CATHETER-  
ASSOCIATED  
URINARY  
TRACT  
INFECTIONS



# Definitions and diagnosis

- CAUTI : must have indwelling urinary catheter in place for greater than 2 days or removed for less than one day before diagnosis

(1) Symptomatic urinary tract infection (SUTI) must meet the following:

(a) At least one of the following:

(i) Fever greater than 38°C

(ii) Suprapubic tenderness with no other causes

(iii) Costovertebral angle pain or tenderness with no other causes

(b) AND urine culture with no more than two species, one of which has colony counts of greater than 10<sup>5</sup> colony-forming units (CFU)/mL

(2) Asymptomatic bacteremic urinary tract infection (ABUTI)

(a) Urine culture with no more than two species, one of which has colony counts of greater than 10<sup>5</sup> CFU/mL

(b) Blood culture with at least one matching bacterium

note : Pyuria is not diagnostic of and should not be used as an indication for antimicrobial treatment, but the absence of pyuria in a symptomatic patient excludes CAUTI.

# Epidemiology and pathogenesis

- Fifteen percent of nosocomial bacteremia is attributable to the urinary tract and is associated with a 10% mortality.
- Top three causative agents include:
  - (1) Escherichia coli (21%)
  - (2) Candida (21%)
  - (3) Enterococcus (15%)

# Prevention

- (1) Maintain awareness to implement prompt removal. When studied, providers were unaware of patient catheterization in 28% of surveys.
- (2) Use urinary catheters in surgical patients only as necessary, not routinely. Accepted indications include but are not limited to:
  - (a) Obstruction of urinary tract distal to bladder
  - (b) Postoperatively from bladder or prostate surgery
  - (c) Close monitoring of volume status in critically ill patients (i.e., patients with hypoxemia, hypotension, congestive heart failure, need for inotropic support, repeat diuretic use, etc.)
  - (d) Postoperative care after spinal anesthesia
  - (e) Palliative care for terminally ill

# Prevention (continued)

Avoid	Avoid use of urinary catheters for treatment of incontinence unless it is for protection of decubitus wound.
Remove	For operative patients with an indwelling catheter, remove within 24 hours unless continued use is appropriately indicated. Duration of catheterization is directly correlated with CAUTI incidence
Consider	Consider alternative methods of urinary drainage, including external catheterization and intermittent catheterization.
Use	Use aseptic technique (hand hygiene, sterile gloves, drape, sponges, antiseptic solution for periurethral cleaning) for insertion

# Treatment

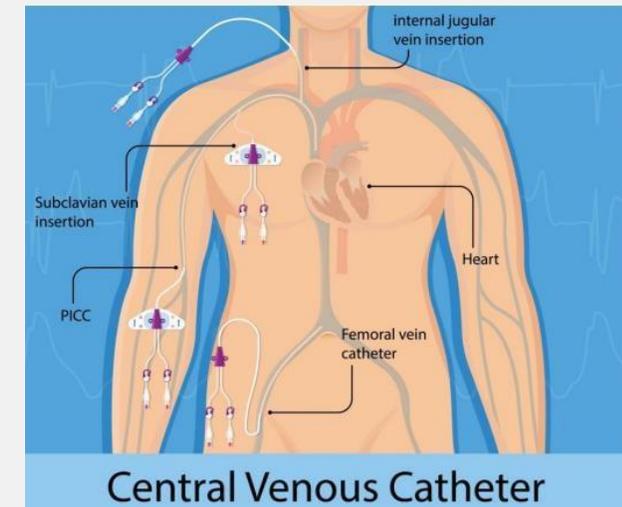
- a. Remove catheter, or replace catheter if catheter is still required.
- b. Seven days of antimicrobial therapy are recommended if prompt resolution of symptoms occurs, 10–14 days for those with delayed response.
- c. Five-day regimen of levofloxacin may be considered in patients who are not critically ill.
- d. Three-day regimen may be considered for women younger than 65 years without upper urinary tract symptoms in whom the catheter has been removed.
- e. No treatment is indicated for ASB, with two exceptions:
  - (1) Pregnant patients
  - (2) Patients who underwent traumatic genitourinary procedures resulting in mucosal bleeding

# CLABSI

- ( central line-associated bloodstream infection )

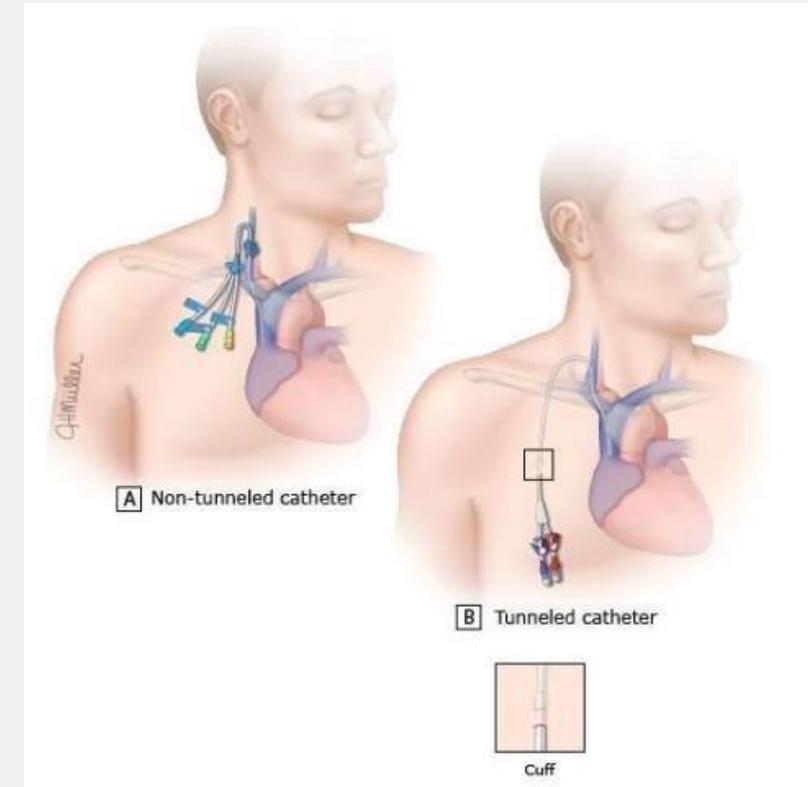
# Introduction

- A central venous catheter (CVC), also known as a central line, central venous line, or central venous access catheter, is a catheter placed into a large vein. It is a form of venous access to give fluids, blood, or medications or to do medical tests quickly
- There are three main access sites for the placement of central venous catheters, namely internal jugular, common femoral, and subclavian veins
- A central line-associated bloodstream infection (CLABSI) is a laboratory-confirmed bloodstream infection not related to an infection at another site that develops within 48 hours of central line placement.
- Of all the healthcare-associated infections, CLABSIs are associated with a high-cost burden.
- Most cases are preventable with proper aseptic techniques, surveillance, and management strategies
- TYPES OF CENTRAL LINES:
  - Peripherally inserted central catheter (PICC), this line is placed in a large vein in the upper arm, or near the bend of the elbow.
  - Subclavian line, this line is placed into the vein that runs behind the collarbone.
  - Internal jugular line. ...
  - Femoral line.
  - Umbilical line (Neonates)



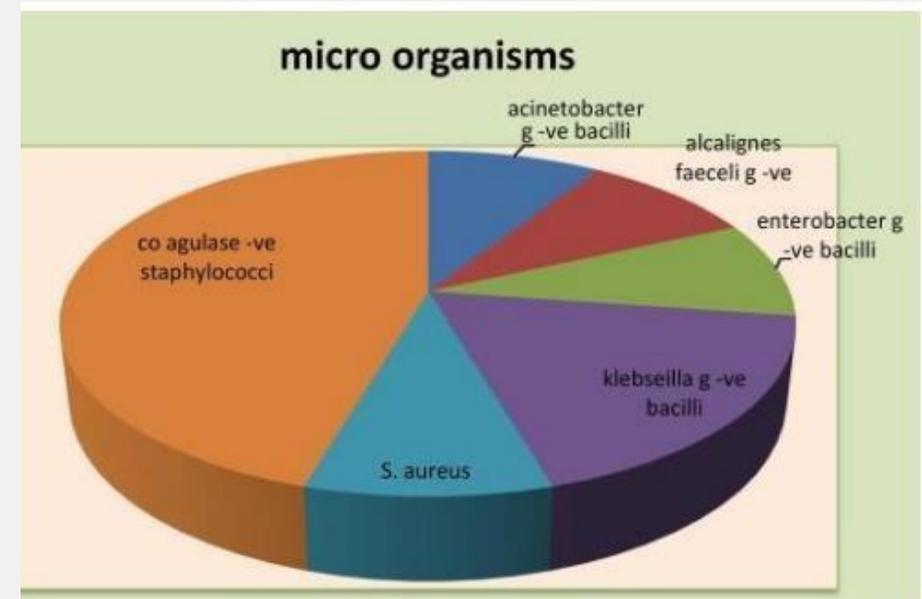
# Pathophysiology

- Central lines are of two types:
  - (1) Tunneled catheters are implanted surgically (by creating a subcutaneous track before entering the vein) into the internal jugular, subclavian, or femoral vein for long-term (weeks to months) use such as chemotherapy or hemodialysis
  - (2) Non-tunneled catheters, more commonly used.
- Within 7 to 10 days of central venous catheter placement, bacteria on the skin surface migrate along the external surface of the catheter from the skin exit site towards the intravascular space.
- Typically, tunneled catheters have a cuff that creates a barrier to bacterial migration.
- The absence of a tunnel (a subcutaneous tract) places non-tunneled catheters at higher risk for CLABSIs.



# CONT... (Risk Factors)

- Host factors that increase the risk of CLABSI are: chronic illnesses , immune-suppressed states , malnutrition, total parenteral nutrition, extremes of age, loss of skin integrity (burns) and prolonged hospitalization before line insertion.
- Femoral central venous catheters are associated with the highest risk of CLABSI. Further, the catheter type, insertion conditions (emergent versus elective, use of full barrier precautions versus limited), catheter care, and operator skill also influence the risk of CLABSI.
- Most CLABSIs from short-term central venous catheters are extraluminally acquired and result from skin flora
- Top causative agents include: Staphylococcus aureus  
Coagulase-negative staphylococcus  
Candida spp.
- SYMPTOMS : Fever , chills and sore and redness around the catheter



# Prevention

- Perform hand hygiene before procedure.
- Use maximal sterile barrier precautions (sterile gloves, cap, gown, mask, drapes, etc.) for placement of central venous catheters.
- Prep skin with greater than 0.5% chlorhexidine for central venous catheter placement.
- Subclavian placement is recommended instead of internal jugular or femoral venous placement for nontunneled central venous catheter insertion to minimize infectious risk.
- Risk of infection is 4.5% with subclavian placement versus 20% associated with femoral venous placement or 8.6% with internal jugular placement.
- Subclavian placement should be avoided in patients on hemodialysis or with advanced kidney disease.

# Cont...

- Ultrasound guidance used by trained personnel is recommended in placement of internal jugular catheters.
- Chlorhexidine-impregnated dressing sponge may be indicated for your facility.
- Promptly remove catheter that is no longer essential.
- Replace catheters placed without aseptic technique (emergent) within 48 hours.
- Routine central catheter replacement is not recommended.
- Replacement of central venous catheter for infectious cause

# Treatment

- Catheter removal and appropriate IV antimicrobial therapy
- Not recommended-routine tip culture and subsequent treatment for a positive result

# Surgical site infection

# Physiology

- Microorganisms are normally prevented from causing infection in tissues by intact epithelial surfaces, most notably the skin.
- These surfaces are broken down by trauma or surgery.
- In addition to these mechanical barriers, there are other protective mechanisms, which can be divided into:
  - chemical: low gastric pH
  - antibody-mediated immunity .
  - cellular: phagocytic cells, macrophages, polymorphonuclear cells and killer lymphocytes.
- All these natural mechanisms may be compromised by surgical intervention and treatment

# Surgical site infection

- Surgical site infections (SSIs) (Postoperative Wound infection) :are infections of the tissues, organs, or spaces exposed by surgeons during performance of an invasive procedure , typically arising within 30 days postoperatively .
- Infection within 30days without foreign body, or within 1 year with foreign body implanted.



# Etiology

## 1 Predisposing factors:

### Patient-related factors :

- **Corticosteroid therapy**
- **Malnutrition**
- **Obesity**
- **Diabetes mellitus**
- **Older age**
- **Smoking**
- **Preexisting infections or microbial colonization (e.g., with *S. aureus*)**
- **Immunosuppression or altered immune response**
- **Prolonged preoperative hospital stay**

### Procedure-related factors :

- **Suboptimal preparation**
- **Environmental: inadequate ventilation and increased traffic in the operating room**
- **High degree of wound contamination (e.g., class III or IV surgical wound)**
- **Prolonged surgery**
- **Incorrect surgical technique**
- **Improper sterile technique or instruments**

# Cont...

## 2- Causative pathogens:

- During the first 48–72 hours (uncommon): includes selected pathogens that cause necrotizing fasciitis
  - Group A Streptococcus (GAS), e.g., *S. pyogenes*
  - *Clostridium* spp., e.g., *C. perfringens*
- 48–72 hours after surgery: SSI due to endogenous organisms at the surgical site, e.g., bacteria on the skin (e.g., *S. aureus*) or in the genital or gastrointestinal tracts (e.g., *E. coli*).
- > 30 days after surgery: indolent organisms (e.g., coagulase-negative staphylococci)

# **Factors that determine whether a wound will be infected**

- Host response
- Virulence and inoculum of infective agent
- Vascularity and health of tissue being invaded (including local ischaemia as well as systemic shock)
- Presence of dead or foreign tissue
- Presence of antibiotics during the (decisive period)

# Sources of infection

- Any infection that follows surgery may be termed endogenous or exogenous, depending on the source of the bacterial contamination.
- Endogenous organisms are present on or in the patient at the time of surgery, ( present in or on the host e.g. SSSI following contamination of the wound from a perforated appendix )
- Exogenous organisms come from outside the patient. (acquired from a source outside the body such as the operating theatre (inadequate air filtration, poor antisepsis) or the ward (e.g. poor hand-washing compliance). The cause of hospital acquired infection (HAI)
- Endogenous organisms colonising the patient are by far the most common source of infection

# Cont...

- Route of infection: usually direct introduction of infection.
- Spread of infections:
  - Direct (to surrounding tissues → fistulas & sinuses).
  - Lymphatic (lymphangitis & lymphadenitis) .
  - Blood spread (pyaemia & pyaemic abscesses, bacteraemia, septicaemia, toxemia, septic shock & multiple organs failure)

# Classification of surgical wounds

	Definition	Rate of infection
Class I ( clean )	<ul style="list-style-type: none"> <li>• Non inflamed operative wound.</li> <li>• The respiratory, alimentary, genital, or urinary tracts have <u>NOT</u> been entered during surgery.</li> <li>• Primary wound closure with or without a drain.</li> </ul>	1-3 %
Class II (clean-contaminated)	<ul style="list-style-type: none"> <li>• Non inflamed and uninfected operative wound.</li> <li>• The respiratory, alimentary, genital, and/or urinary tracts <u>have been entered</u> during surgery <u>without contamination</u>.</li> </ul>	5-8 %
Class III (contaminated)	<ul style="list-style-type: none"> <li>• Fresh, open, and accidental wounds</li> <li>• <u>Inflamed</u> operative wound <u>without purulent</u> drainage</li> <li>• Clean or clean-contaminated wound with a break in sterile technique during surgery.</li> </ul>	20-25 %
Class IV (dirty or infected)	<ul style="list-style-type: none"> <li>• Old traumatic wounds with evidence of infection, <u>necrotic</u> tissue, and/or visceral <u>perforation</u></li> <li>• <u>Inflamed</u> operative wound <u>with purulent</u> drainage.</li> </ul>	30-40 %



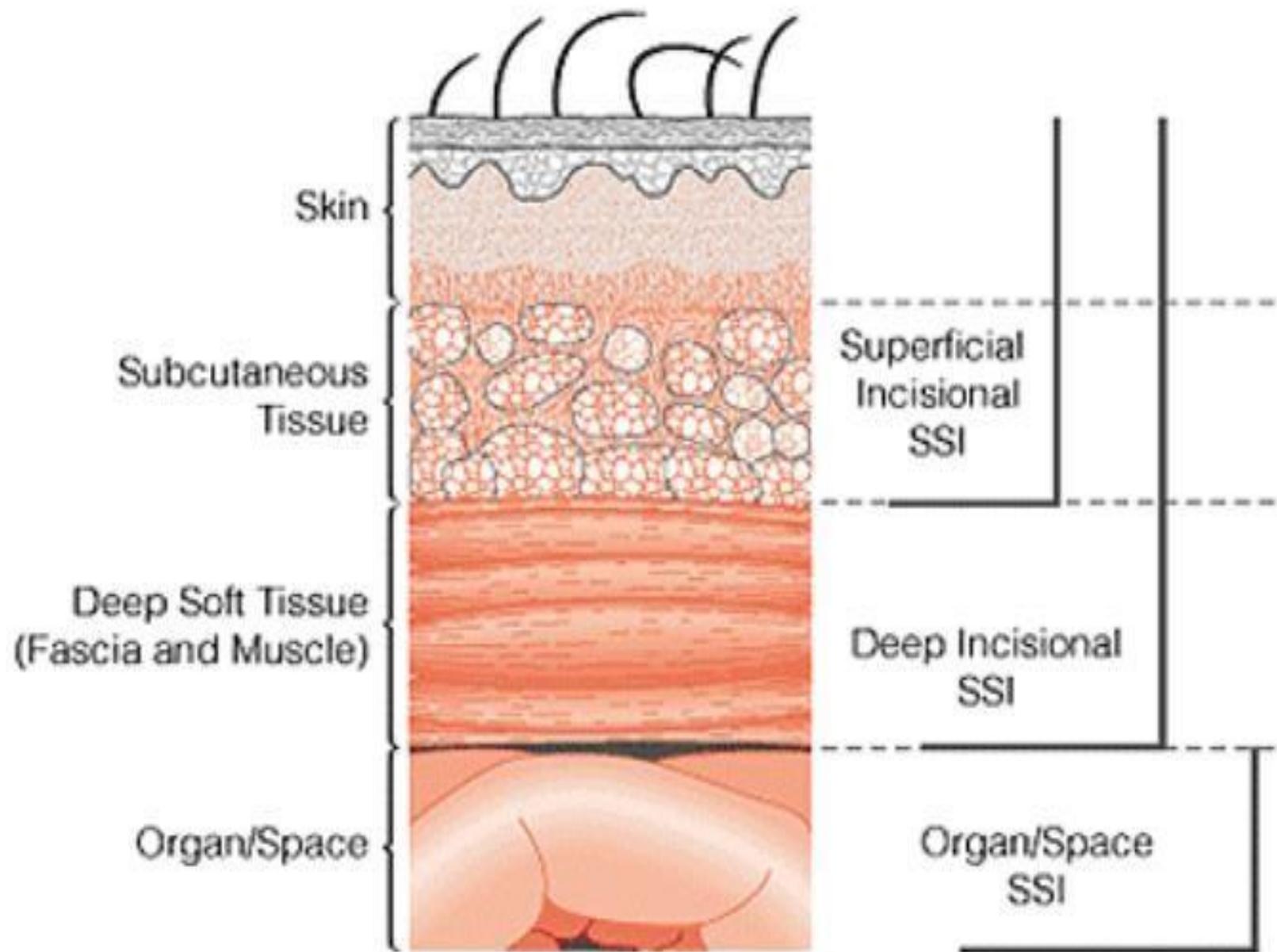
## INFLAMMATION OF THE SEAM



Wound class	Examples of class
Class I ( clean )	Thyroidectomy , hernia repair , breast biopsy specimen .
Class II (clean-contaminated)	Cholecystectomy, colorectal surgery .
Class III (contaminated)	Penetrating abdominal trauma, large tissue injury, enterotomy during bowel obstruction .
Class IV (dirty or infected)	Perforated diverticulitis, necrotizing soft tissue infections .

# Classification and clinical features of SSI

	Clinical features of SSIs	Onset	Tissue involvement
Superficial incisional <u>SSI</u>	<ul style="list-style-type: none"> <li>• Purulent discharge from the incision</li> <li>• In some cases, postoperative fever</li> <li>• Localized tenderness, erythema, warmth, and/or swelling</li> </ul>	Within 30 days postoperatively	•Skin and subcutaneous tissue at the incision site
Deep incisional <u>SSI</u>	<ul style="list-style-type: none"> <li>• Purulent discharge from deep within the incision</li> <li>• Postoperative fever</li> <li>• Tenderness at the incision site</li> <li>• Wound dehiscence</li> <li>• Necrotizing fasciitis: cloudy gray discharge, possible crepitus of tissue surrounding the wound</li> </ul>	Within 30–90 days postoperatively	•Involves deeper soft tissue (i.e., fascia and muscle layers) at the incision site than superficial incisional SSIs
Organ/space <u>SSI</u>	<ul style="list-style-type: none"> <li>• Purulent discharge from a drain placed within the organ or space, or an abscess</li> <li>• Postoperative fever</li> <li>• Additional features depend on the organs affected.</li> </ul>		•Can involve any part of the body deeper than the fascia or muscle layers that was opened or manipulated during surgery (involve organs and spaces as subphrenic, iliac or pelvic abscess)



# Presentation of surgical infection

Major and minor surgical site infection (SSI) :

- A major SSI is defined as a wound that either discharges significant quantities of pus spontaneously or needs a secondary procedure to drain it. The patient may have systemic signs such as tachycardia, pyrexia and a raised white cell count.
- Minor wound infections may discharge pus or infected serous fluid but are not associated with excessive discomfort, systemic signs or delay in return home .
- The differentiation between major and minor and the definition of SSI is important in audits and clinical trials of antibiotic prophylaxis.

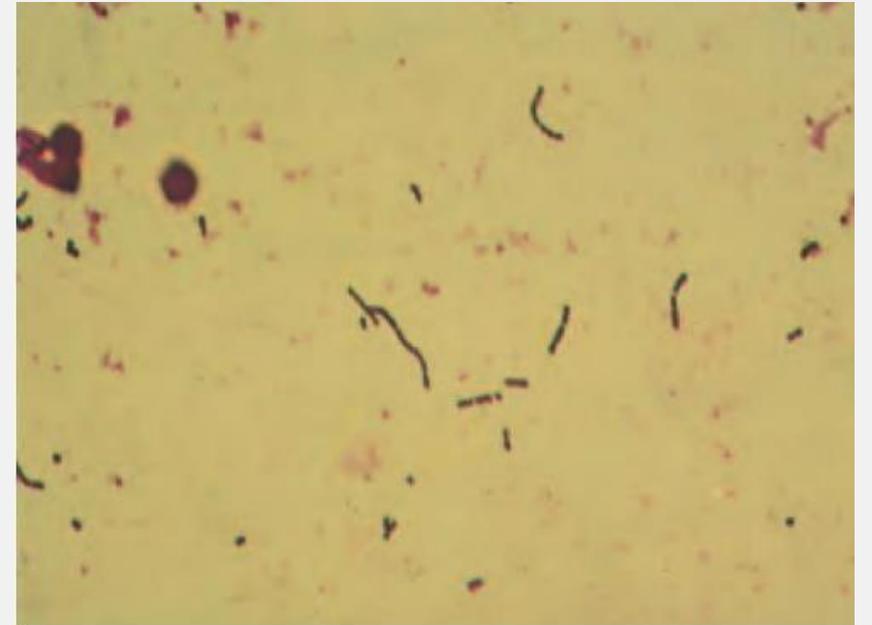


# Common bacteria causing surgical infection

# Streptococcus (gram+)

- Group A strep (*Streptococcus pyogenes*) it is the most pathogenic --- it causes cellulitis and tissue destruction through the release of enzymes like streptolysin, streptokinase and streptodornase.
- Group D strep (*Streptococcus faecalis*): it's an anaerobic enterococcus
- Both *Streptococcus pyogenes* and *Streptococcus faecalis* may be involved in wound infection after large bowel surgery
- All the streptococci remain sensitive to penicillin and erythromycin. The cephalosporins are a suitable alternative in patients who are allergic to penicillin

Streptococcus (gram+)



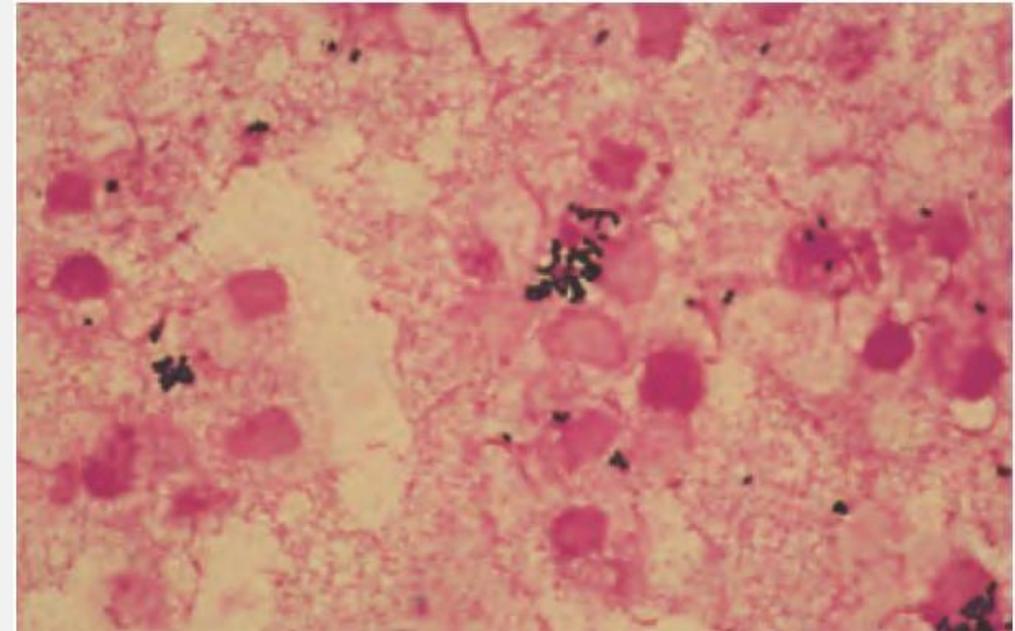
# Staphylococcus (gram+)

- Staphylococcus aureus is the most important pathogen. {it's found in the nasopharynx of 15% of the population} — some strains are resistant to many antibiotics especially MRSA and so can be difficult to treat.

Most staph. aureus strains now are resistant to penicillin.

- Staphylococcus epidermis: was regarded as a non-pathogenic commensal organism commonly found on the skin, but is now recognised as a major threat in vascular and orthopaedic prosthetic surgery and in indwelling vascular cannulas/catheters.

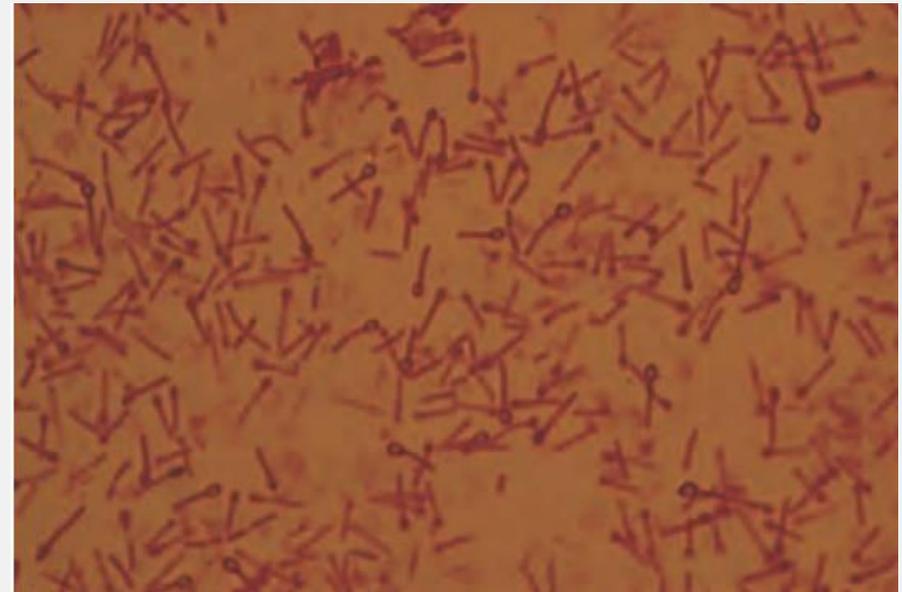
Staphylococcus (gram+)



# Clostridium (gram+)

- obligate anaerobes, which produce resistant spores
- Clostridium perfringens is the cause of gas gangrene
- C. tetani causes tetanus after implantation into tissues or a wound.
- Clostridium difficile is the cause of pseudomembranous colitis ( where destruction of the normal colonic bacterial flora by antibiotic therapy allows an overgrowth of the normal gut commensal C. diff to pathological levels ).

Clostridium (gram+)



# Anaerobic gram-negative bacilli

- These bacilli are normal inhabitants of the large bowel.
- Escherichia coli and Klebsiella spp. are lactose fermenting; Proteus is nonlactose fermenting. Most organisms in this group act in synergy with Bacteroides to cause SSIs after bowel operations (in particular, appendicitis, diverticulitis and peritonitis)
- Pseudomonas spp. tend to colonise burns and tracheostomy wounds, as well as the urinary tract.

Once Pseudomonas has colonised wards and intensive care units, it may be difficult to eradicate. Surveillance of cross-infection is important in outbreaks

# Bacteroides (gram-)

- Bacteroides are strict anaerobes that colonise the large bowel, vagina and oropharynx.
- Bacteroides fragilis is the principal organism that acts in synergy with aerobic gram-negative bacilli to cause SSIs, including intra-abdominal abscesses after colorectal or gynaecological surgery. They are sensitive to the imidazoles (e.g. metronidazole) and some cephalosporins (e.g. cefotaxime)

# The decisive period

- There is up to a 4-hour interval before bacterial growth becomes established enough to cause an infection after a breach in the tissues, whether caused by trauma or surgery.
- This interval is called the 'decisive period' and strategies aimed at preventing infection from taking a hold become ineffective after this time period.
- It is therefore logical that prophylactic antibiotics should be given to cover this period and that they could be decisive in preventing an infection from developing, before bacterial growth takes a hold

# Systemic infections

- **Bacteraemia**: is unusual following superficial SSIs, which tend to drain through the wound, but common after deep space SSIs such as follow an intestinal anastomotic breakdown. It is usually transient and can follow procedures undertaken through infected tissues (particularly instrumentation in infected bile or urine)
- Bacteraemia is important when a prosthesis has been implanted, as infection of the prosthesis can occur through haematogenous spread. Aerobic gram-negative bacilli are often responsible, but *Staphylococcus aureus* and fungi may be involved, particularly after the use of broad-spectrum antibiotics

## Summary box 5.10

### Bacteraemia

- Common after anastomotic breakdown
- Dangerous if the patient has a prosthesis, which can become infected
- May be associated with systemic organ failure

# SIRS

- Systemic Inflammatory Response Syndrome (SIRS) is a term used to describe the body's response to various forms of injury, infection, or inflammation. It's characterized by a set of clinical symptoms and signs related to the body's systemic inflammatory response. To be diagnosed with SIRS, a patient must have at least two of the following criteria:
- Fever --  $>38^{\circ}\text{C}$  , or hypothermia --  $<36^{\circ}\text{C}$
- Tachycardia –  $\text{HR} > 90$
- Tachypnea –  $\text{RR} > 20$ , or  $\text{PaCO}_2 < 32$
- Leukocytosis or Leukopenia –  $\text{WBCs} > 12000$  or  $< 4000$

# The Sepsis Continuum

## SIRS

T > 38° / < 36°  
HR > 90  
RR > 20  
PaCO<sub>2</sub> < 4.3  
WCC > 12 / < 4

## Sepsis

2 SIRS

+

Confirmed  
or  
Suspected  
Infection

## Severe Sepsis

Sepsis

+

Signs of  
end organ  
dysfxn  
(see list)

## Septic Shock

Severe Sepsis

+

Persistent  
End Organ  
Dysfxn  
despite  
fluids

- (SIRS) is a systemic manifestation of sepsis, although the syndrome may also be caused by multiple trauma, burns or pancreatitis without infection. Septic manifestations and multiple organ dysfunction syndrome (MODS) in SIRS are mediated by the release of proinflammatory cytokines such as (**IL-1**) and (**TNF $\alpha$** ).
- In sever cases, MODS may progress into multiple system organ failure (**MSOF**).

## Definitions of infected states

- SSI is an infected wound or deep organ space
- SIRS is the body's systemic response to severe infection
- MODS is the effect that SIRS produces systemically
- MSOF is the end stage of uncontrolled MODS

# Types of Localized infection

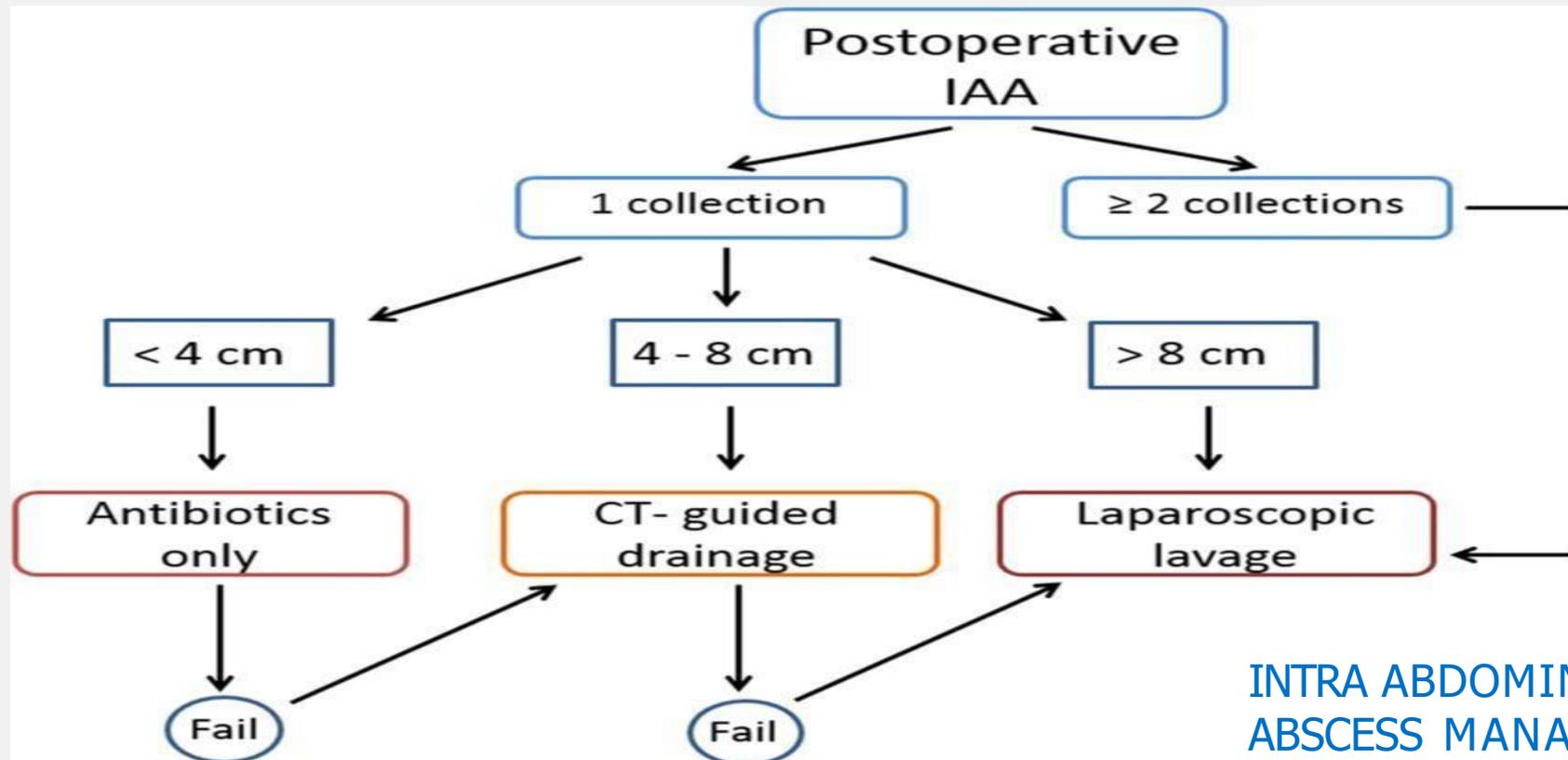
# ABSCESS



# ABCESS

- Localized collection of pus appears 7-10 days after a surgery .
- In the abdomen, abscesses are more usually result of anastomotic leakage, BUT in chronic abscess certain organisms are associated with chronicity, sinus and fistula formation like ; Mycobacterium and Actinomyces .
- Character : Hard , red(rubor) , painful(dolour) , swelling(tumor) and heat(calor) that become later on soft and fluctuant .
- Symptoms associated with a abscess: Fever , malaise , anorexia .

- Diagnosed : by CT-scan . Also, CBC test give results for anemia and polymorph leukocytosis .
- Treatment and management : broad-spectrum antibiotic , drainage , IV hydration .



INTRA ABDOMINAL  
ABSCESS MANAGEMENT

- Complications of persistent/chronic abscess : septic shock , fistula , DVT .
- NOTE : pilonidal abscess has a higher recurrence risk after such treatment because a nidus of hair may remain in the subcutaneous tissue adjacent to the abscess .

# Cellulitis



# Cellulitis

- non-suppurative invasive bacterial infection of tissues-it`s generally subcutaneous- that spread quickly and can be life threatening if left untreated .
- Most common affected sites are legs and feet .
- common causative agents are :
- 1) $\beta$ -haemolytic group A Streptococcus
- 2)Staphylococcus aureus
- 3)Clostridium perfringens

- The invasiveness of the Streptococcus is due to : production of hyaluronidase and streptokinase, which dissolve the intercellular matrix and the fibrin inflammatory barrier respectively.
- Characteristic : the skin is dark red with local edema and heat ; it blanches in pressure . May appear some vesicles .
- Symptoms associated with : pain , chills , fever , fatigue

- **NOTE** : blood cultures are often **NEGATIVE** .
- **Complications** are uncommon but can be serious like ;  
Bacteremia  
Suppurative arthritis  
Osteomyelitis o Endocarditis  
Thrombophlebitis
- **Treatment** : Immobilization, elevation and antibiotics.

# Cellulitis vs Abscess

## Is It Abscess Or Cellulitis?



Abscess	Cellulitis
Located deeper in the skin	Located beneath the skin
Filled with pus	Filled with fluid
Pain and swelling over the affected skin	Red and tender over the affected skin
Present in the skin only	Can occur in internal organs and tissues
Treated with oral antibiotics	Treated by draining and oral or IV antibiotics

**Reference**  
1. Boils, Abscess, & Cellulitis; American Academy of Pediatrics

Mom Junction

## CELLULITIS

**Cellulitis**  
Cellulitis is a bacterial skin infection. In severe cases, infection can spread to other parts of the body.



Redness and warmth of the skin

A clinician may mark the edge of the red area to monitor whether the infection is getting better or worse.

Get medical care immediately

- if the involved area grows rapidly
- if blisters or an abscess form
- if you develop a fever or flu-like symptoms



Abscess

Blisters

# Lymphangitis



# Lymphangitis

- Lymphangitis is part of a similar process and presents as painful red streaks in affected lymphatics.
- Symptoms: fever , malaise , chills , anorexia , red streak , swelling LN near groin or armpit .
- Treatment : IV antibiotics .
- MOST common complication is bacteraemia .

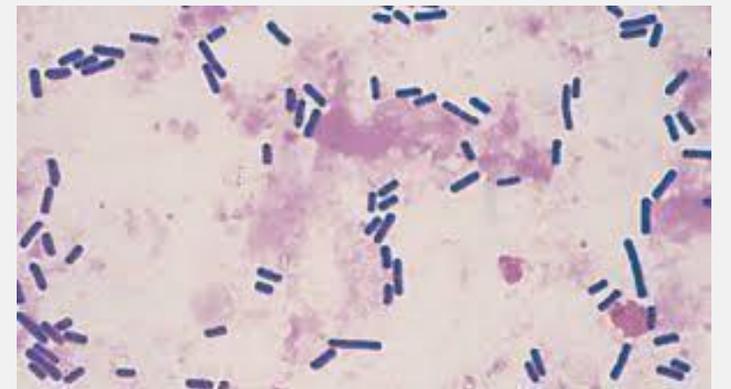
- Cellulitis is often accompanied by lymphangitis and lymphadenitis, and there may be an associated septicaemia.
- **Cellulitis** is usually located at the point of injury and subsequent tissue infection VS **Lymphangitis** is often accompanied by painful lymph node groups in the related drainage area.

# **SPECIFIC LOCAL WOUND WOUND INFECTIONS**

# Gas gangrene (clostridial myonecrosis)

## Clostridium perfringens.

- Gram-positive, anaerobic spore forming bacillus, also produces powerful exotoxins.
- The toxins have various activities, including phospholipase, collagenase, proteinase and hyaluronidase
- widely found in nature, particularly in soil and faeces.
- Military persons, traumatic surgery and colorectal operations



# Clinical features

- The incubation period is about 24 h.
- Severe sudden onset of pain , together with severe toxaemia with tachycardia, shock and vomiting.
- The temperature is first elevated and then becomes subnormal. The affected tissues are swollen, and crepitus is palpable due to gas in the tissues.
- The skin becomes gangrenous and the infection spreads along the muscle planes, producing at first dark red swollen muscle and then frank gangrene. The gas imparts a typical foul smell



# Treatment

- Large doses of IV penicillin + aggressive debridement of affected tissue.
- Hyperbaric oxygen could be helpful.

## Summary box 5.12

### Gas gangrene

- Caused by *C. perfringens*
- Gas and smell are characteristic
- Immunocompromised patients are most at risk
- Antibiotic prophylaxis is essential when performing amputations to remove dead tissue

# Necrotizing fasciitis (Flesh-eating disease)

- Also known as Synergistic spreading gangrene.
- This condition is not caused by clostridia.
- It is usually caused by bacteria, most commonly Streptococcus or Staphylococcus. These bacteria can enter the body through cuts, surgical wounds, or even minor injuries. It also may be caused by polymicrobial infection.

## Pathogenesis :

The infection spreads rapidly along subcutaneous fascial planes, initially sparing skin and underlying muscle. As the infection progresses, penetrating vessels thrombose with resultant skin and fascial necrosis, permitting extension into underlying muscle.

# Clinical features

## Clinical features :

\*Patients are almost always immunocompromised .

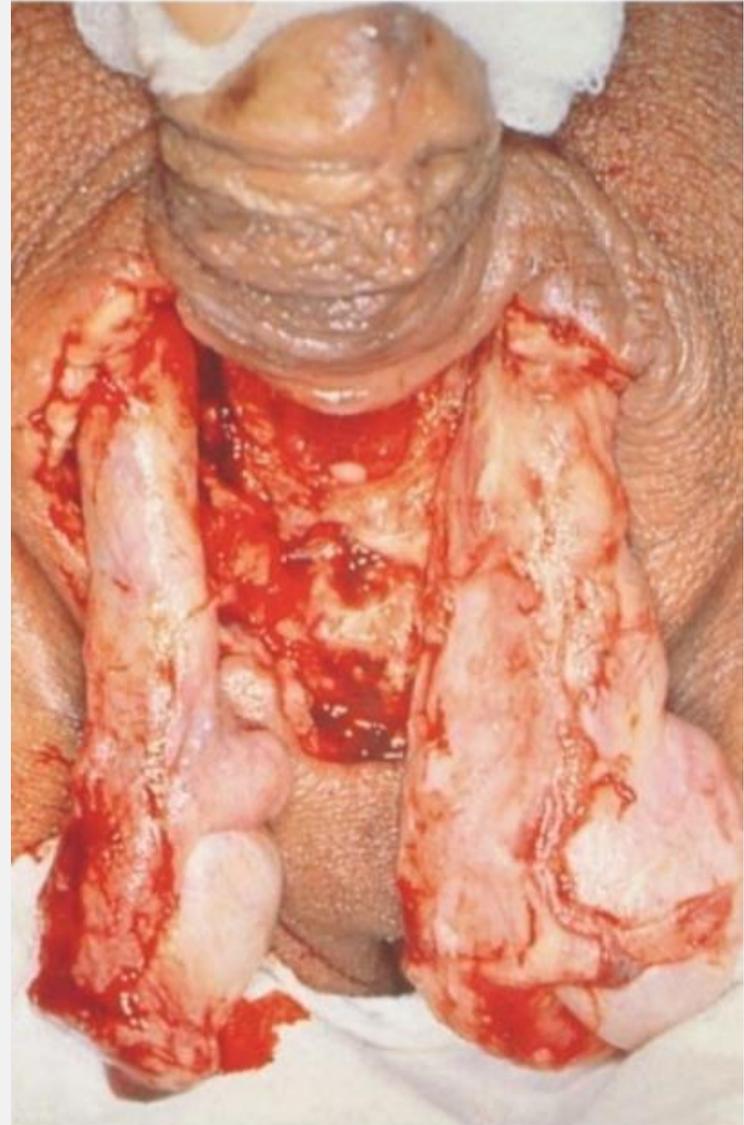
The site of initial infection is often not apparent, Around the wound an area of cellulitis appears, which spreads rapidly This is followed by rapid features of systemic sepsis, in addition to progressive local features such as swelling of the tissues, skin discolouration, blistering and the appearance of black (necrotic) .

Rapid Progression: One of the hallmarks of necrotizing fasciitis is its rapid progression. It can spread within hours or days, leading to widespread tissue death and MSOF.

- Meleney's synergistic hospital gangrene (abdominal wall)
- Fournier's gangrene (scrotal infection)



Meleney's synergistic hospital gangrene

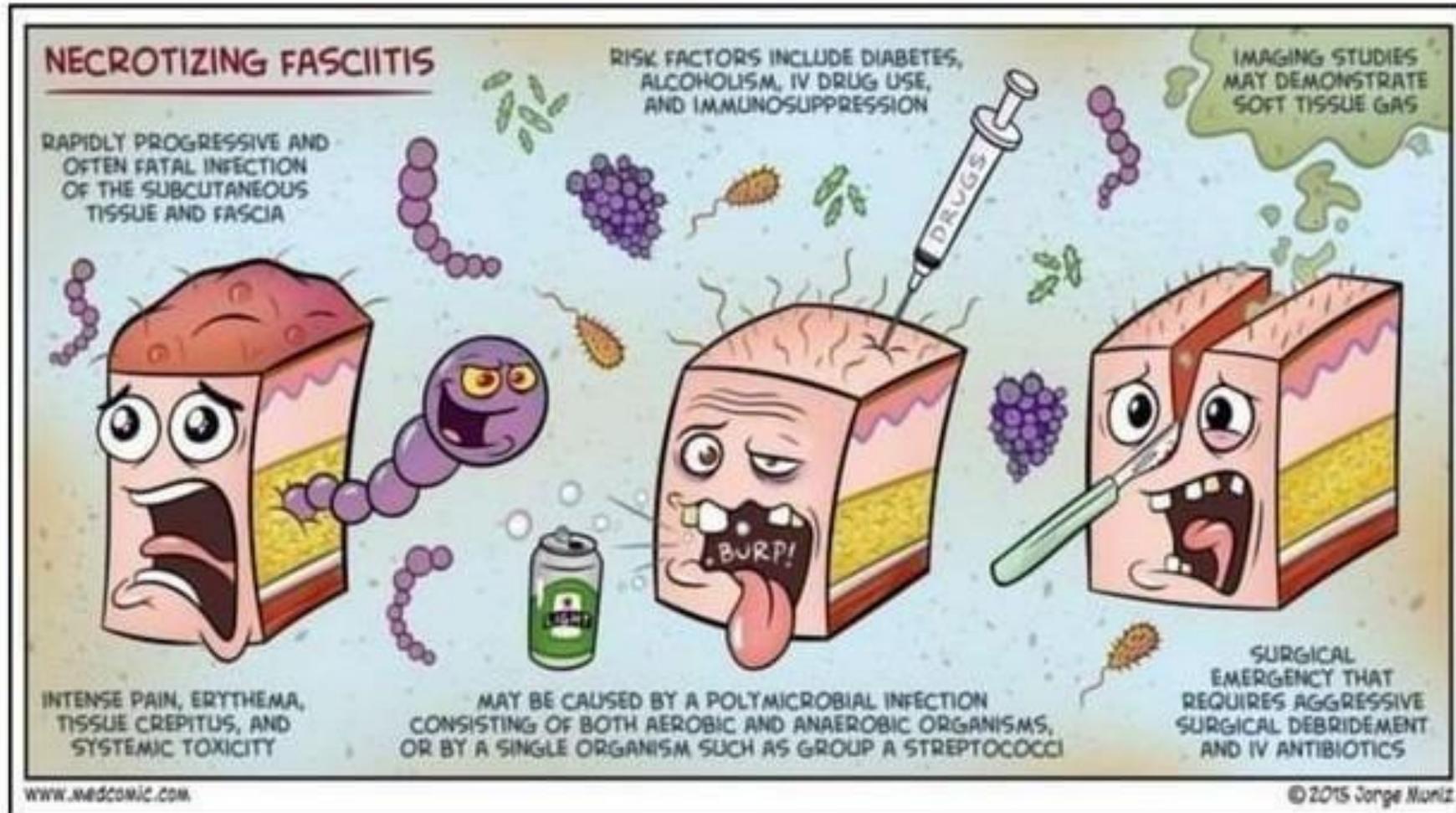


Fournier's gangrene

# Treatment

- Broad-spectrum antibiotic therapy must be combined with aggressive circulatory support. Locally, there should be wide excision of necrotic tissue and laying open of affected areas. The debridement may need to be extensive, and patients who survive may need large areas of skin grafting.

# Summary till now.....



# Clostridium Tetani

- This is a non-aerobic, spore forming, gram-positive bacterium, which can cause tetanus following implantation into tissues or a wound (which may have been trivial or unrecognised and forgotten).
- The spores are widespread in soil and manure, and so the infection is more common in traumatic civilian or military wounds. The signs and symptoms of tetanus are mediated by the release of the exotoxin tetanospasmin and they include opisthotonus, respiratory arrest and death.
- Prophylaxis with tetanus vaccine is the best preventative treatment but, in an established infection, minor debridement of the wound may need to be performed and antibiotic treatment with benzylpenicillin provided in addition.



# Treatment and prophylaxis

# Pre operative phase

- Pre operative phase :

- Shower                      → shaving
- patient dress              → Hand washing

- antibiotic prophylaxis :

- 1 hour before incision

- before induction
- before tourniquet application.

- 1 dose Vs. 3 doses

- Additional dose → if prolonged operation & excess blood loss



# Intra operative phase

-patient skin preparation :

- iodine/chlorhexidine
- allow it to dry
- incision drapes
- sterile gown and gloves
- wound dressing



**NOTE:** intravenous administration at induction of anaesthesia is optimal. In long operations or when there is excessive blood loss or when unexpected contamination occur, antibiotics may be repeated at 4-hourly intervals during the surgery , as tissue antibiotic levels often fall faster than serum levels.

# Treatment of SSI

- Drainage of pus
  - \*culture and sensitivity
    - MRSA
    - VRE (vancomycin resistance enterococci)
    - ESBL strains ( extended spectrum B lactamase )
- Debridement
- Antibiotics
- Removal of implant

## Summary box 5.13

### **Surgical incisions through infected or contaminated tissues**

- When possible, tissue or pus for culture should be taken before antibiotic cover is started
- The choice of antibiotics is empirical until sensitivities are available
- Wounds are best managed by delayed primary or secondary closure

# **Treatment of established surgical infection:**

- It is unusual to have to treat SSIs with antibiotics , UNLESS there is evidence of spreading infection , bacteraemia or systemic complication ( SIRS and MODS ).
- The appropriate treatment of localized SSIs is: interventional radiological drainage of pus or open drainage and debridement.

## **Summary box 5.16**

### **Principles for the use of antibiotic therapy**

- Antibiotics do not replace surgical drainage of infection
- Only spreading infection or signs of systemic infection justifies the use of antibiotics
- Whenever possible, the organism and sensitivity should be determined

# Antibiotic agents

## 1- Penicillin:

\*Blocks the synthesis of the bacterial wall → osmotic instability and lysis

\*Active against most gram (+) bacteria .

## 2- cephalosporin:

\*bactericidal by inhibiting bacterial cell wall synthesis

\*arranged into generations

\*for gram (+) and (-) bacteria

### 3-erythromycin :

\*bacteriostatic ; bactericidal in higher dose

\*inhibit bacterial protein synthesis

\*treatment OF CHOICE in treating mycoplasma and Legionnaire`s disase , also for actionmycosis .

## 4- Tetracyclines :

\*for gram (+) and (-) not sensitive to penicillin

\*good for TB

\*bacteriostatic

\*interfere with protein synthesis

\*for actinomycosis and nocardiosis

\*should be avoided in early childhood causing yellow discoloration of teeth .

## 5- chloramphenicol:

- \*broad spectrum and bacteriostatic
- \*inhibit protein synthesis
- \*well absorbed orally and parenterally
- \*drug OF CHOICE of typhoid fever and other salmonella infection
- \*good for meningitis and H.influenzae.

## 6- aminoglycoside :

\*bactericidal

\*for gram ( + , - ) and mycobacteria

\*toxic side effects : -auditory branch damage -nephrotoxic

## 7- sulphonamides – Trimethoprim :

- \*effective against community acquired gram (-)
- \*orally administered
- has limited usefulness in nosocomial infection

## 8- 4<sup>th</sup> generation of fluoroquinolones :

- \*good for nosocomial infections
- \*good activity against nearly all gram (-) organism

**THANK YOU**