

# SURGICAL INFECTION

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The surgery  
succeeded but  
the patient  
died

INFECTION

THE GREAT ENEMY FOR THE SURGEONS

# SURGICAL INFECTION

- has always been a major complication of surgery and trauma
- has been documented for 4000-5000 years.



# KOCH POSTULATION FOR INFECTIVE ORGANISM 1882

- ▶ postulates proving the agency of an infective organism
  - ▶ It must be found in considerable numbers in the septic focus
  - ▶ It should be possible to culture it in a pure form from that septic focus
  - ▶ It should be able to produce similar lesions when injected into another host

# HEALTH CARE-ASSOCIATED INFECTION (HAI)

- ▶ Infection that follows surgery or admission to hospital.
  
- ▶ There are four main groups:
  1. respiratory infections (including ventilator-associated pneumonia),
  2. urinary tract infections (mostly related to urinary catheters),
  3. bacteraemia (mostly related to indwelling vascular catheters)
  4. Wound infection ( SSI )

# HOST DEFENCES

## ► Natural preventive factors

1. Mechanical: intact skin, mucous membranes, tears, saliva, gastric acid.
2. Chemical: lysozyme, defensins, secretory phospholipase A<sub>2</sub>, lactoferrin, IgA.
3. Cellular: neutrophils, macrophages, polymorphonuclear cells and killer lymphocytes.
4. Cellular: phagocytes, macrophages, polymorphonuclear cells and killer lymphocytes.

**All these reduced by  
SURGERY & TRAUMA**

▶ Pathogens resist host defenses' by

1. Releasing Toxins or proteases such as hyaluronidase, lecithinase and haemolysin, which allow it to spread through the tissues.
2. Resistance to antibiotics can be acquired by previously sensitive bacteria by transfer through plasmids.

# CAUSES OF REDUCED HOST RESISTANCE TO INFECTION

- ▶ **Metabolic:**
  - ▶ malnutrition (including obesity)
  - ▶ Diabetes,
  - ▶ uraemia ,
  - ▶ Jaundice
- ▶ **Disseminated disease :**
  - ▶ cancer
  - ▶ AIDS
- ▶ **Iatrogenic:**
  - ▶ radiotherapy,
  - ▶ chemotherapy,
  - ▶ steroids



# FACTORS FOR INCREASED RISK OF WOUND INFECTION

1. Malnutrition( obesity ,weight loss)
2. Metabolic disease( diabetes ,uraemia, jaundice)
3. Immunosuppression (cancer, AIDS, steroids, chemotherapy and radiotherapy)
4. Colonization and translocation in the GIT
5. Poor perfusion( systemic shock or local ischemia)
6. Foreign body material
7. Poor surgical technique (dead space, hematoma)

# FACTORS THAT DETERMINE WHETHER A WOUND WILL BECOME INFECTED

1. Host response
2. Virulence and inoculum of infective agent
3. Vascularity and health of tissue being invaded (including local ischaemia as well as systemic shock)
4. Presence of dead or foreign tissue
5. Presence of antibiotics during the 'decisive period'

# LOCAL AND SYSTEMIC PRESENTATION

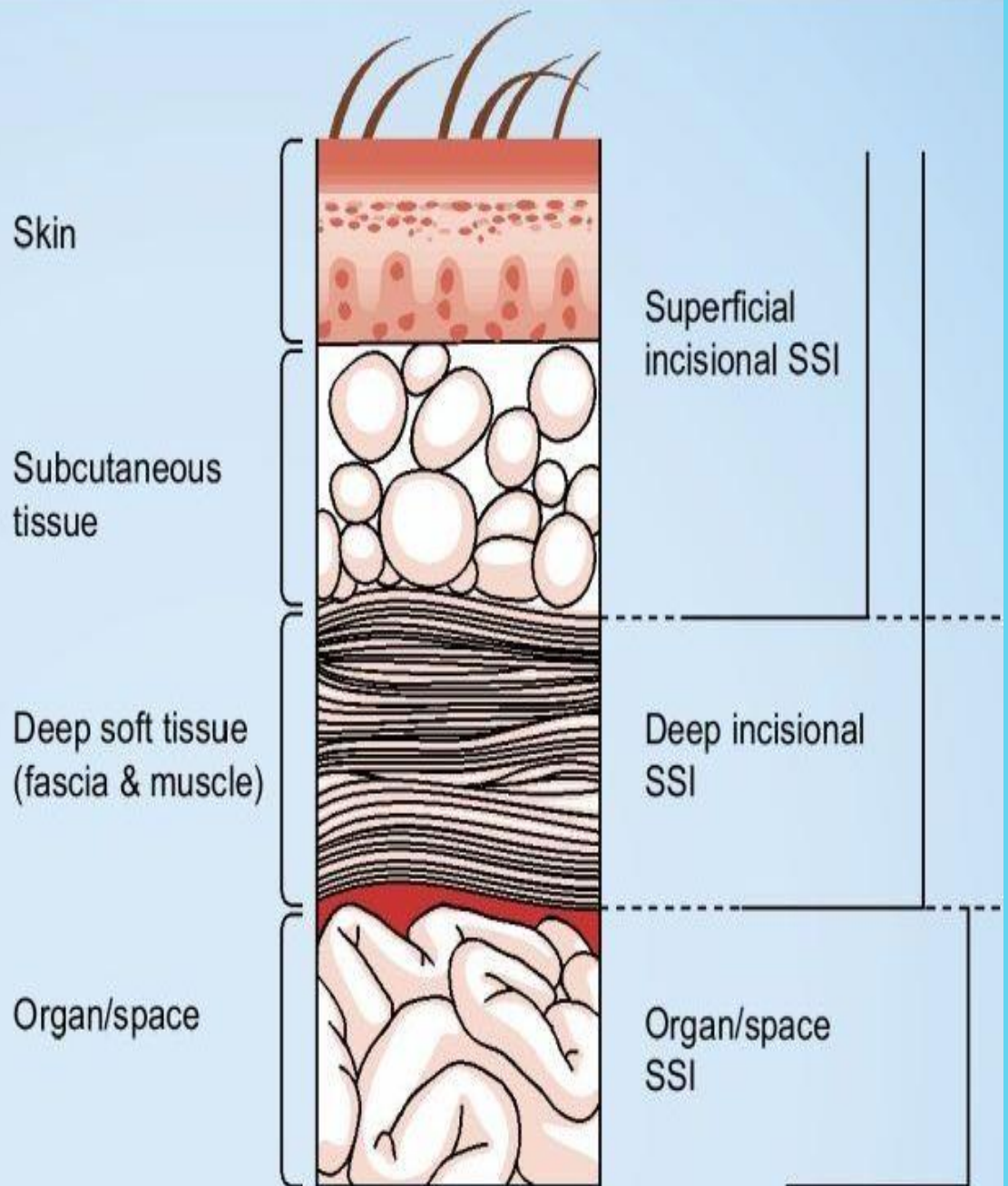
- ▶ **Infection of a wound** : defined as
  - ▶ the invasion of organism through tissues following a breakdown of local and systemic defenses, leading to
    - ▶ cellulites,
    - ▶ lymphangitis,
    - ▶ abscess
    - ▶ bactemia

# SSI

▶ Superficial

▶ Deep

▶ Organ/space



# SSI

- ▶ defined as
  - ▶ infections occurring within 30 days after a surgical operation
  - ▶ or within 1 year if an implant is left in place after the procedure)
  - ▶ that affect either the incision or tissue deep into the operation site.

# SSI

- ▶ **A wound is considered infected if it meets any of the :**
  - ▶ **isolation of pathogens from an aseptically obtained culture of fluid or tissue from the wound;**
  - ▶ **purulent drainage from the incision,**
  - ▶ **with or without**
    - ▶ **laboratory confirmation of infection;**
    - ▶ **local S&S of infection such as erythema and hotness;**
    - ▶ **diagnosis of wound infection by the surgeon**

# CLASSIFICATION OF SOURCES OF INFECTION

- ▶ **Primary: acquired from:**
  - ❖ community
  - ❖ endogenous source (such as that following a perforated peptic ulcer)
- ▶ **Secondary or exogenous ( HAI): acquired from the:**
  - ❖ operating theatre ( such as inadequate air filtration)
  - ❖ ward (e.g. poor hand-washing compliance )
  - ❖ contamination at or after surgery ( such as an anastomotic Leak)

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# WOUND INFECTIONS

- ▶ **Incidence:**
- ▶ Third most frequently reported nosocomial infection
- ▶ *S. aureus* (20%),
- ▶ *E. coli* (10%),
- ▶ *Enterococcus* (10%),
- ▶ *S. epidermidis*,  
*Pseudomonas*,  
*Streptococcus*, other  
anaerobes



# SSI

▶ SSI classified according to severity to:

1. MINOR SURGICAL SITE INFECTIONS
2. MAJOR SURGICAL SITE INFECTIONS

# MINOR SURGICAL SITE INFECTIONS

- ▶ May discharge pus or infected serous fluid
- ▶ should not delay in return home
- ▶ should not be associated with excessive discomfort, or systemic signs



# MAJOR SURGICAL SITE INFECTIONS

- ▶ Significant quantity of pus
  - ▶ (spontaneously or needs a secondary procedure to drain it)
- ▶ Delayed return home
- ▶ Patients are systemically ill
  - ▶ SIRS



# Degree of Intraoperative Contamination:

1. **Clean:** Class I
2. **Clean-contaminated:** Class II
3. **Contaminated:** Class III
4. **Infected ( Dirty ):** Class IV

# CLASS I (CLEAN)

- ▶ Atraumatic wound w/o inflammation.
- ▶ No respiratory, GU, GIT or biliary tract entered
- ▶ no gross contamination from endogenous or exogenous sources,
- ▶ e.g. skin or vascular cases
- ▶ Hernia repair
- ▶ **1.5% infection rate**

# CLASS II (CLEAN-CONTAMINATED)

- ▶ Controlled entrance into respiratory, GU, GIT, or biliary tracts
- ▶ lightly contaminated,
- ▶ e.g. gastric or biliary cases, GU, gyn, respiratory tract surgery
  - ▶ Cholecystectomy, elective bowel resection
- ▶ Infection rate about  $< 10\%$  if prophylactic antibiotics used

## CLASS III (CONTAMINATED)

- ▶ Traumatic wounds, major breaks in sterile techniques, gross spillage of GIT contents, Acute non-purulent inflammation
- ▶ heavily contaminated, e.g. penetrating trauma, bowel spillage, operations on unprepared colon
  - ▶ Appendectomy
- ▶ Infection rate about 10-15% if prophylactic antibiotics used



## CLASS IV (DIRTY)

- ▶ Old trauma wounds; devitalized tissue; existing clinical infection, perforated viscera.
  - e.g. gross pus, gangrene, bowel perforation encountered
- ▶ Hartmann's for diverticular perforation
- ▶ Infection rate < 40% if prophylactic antibiotics used

# Prevention: Recommendations

1. Careful, clean, gentle surgery,

- minimizing
  - tissue trauma,
  - wound hematomas,
  - number of ligatures,
  - pressure from retractors
  - cauterization



2. Reduction of contamination

3. Support of patient's defenses, including prophylactic antibiotics:

- indicated when wound contamination during operation likely to be high (contaminated).
- Antibiotics not shown to reduce incidence of wound infections after clean operations.

# Treatment

1. Open the wound and allow it to drain.
2. Perform digital exam to assess for facial dehiscence.
3. Antibiotics indicated if:
  1. patient immunocompromised,
  2. prosthetics involved,
  3. patient has signs of systemic toxicity
  4. surrounding area of soft tissue erythema and edema
4. Cultures should be performed in case existing infection becomes invasive.



# TYPES OF LOCALIZED INFECTION

## Abscess:

- ❖ All the clinical features of acute inflammation
  - ❖ Swelling
  - ❖ Redness
  - ❖ Hotness
  - ❖ Pain
  - ❖ Loss of Function
- ▶ Pyogenic organisms, predominantly staph..aureus, cause
  - ▶ tissue necrosis
    - ▶ and suppuration

# ABSCCESS:

- ▶ pus is composed of:
  - ▶ dead and dying WBCs that releasing damaging cytokines, oxygen free radicals and other molecules.
- ▶ **An abscess is surrounded by:**
  - ▶ an acute inflammatory response
  - ▶ and a pyogenic membrane composed of a fibrinous exudate and odema and acute inflammatory cells

- ▶ **Chronic Abscess??**

- ▶ **Fistula**

- ▶ **Sinus**

- ▶ **Antibioma ??**

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