SURGICAL INFECTION

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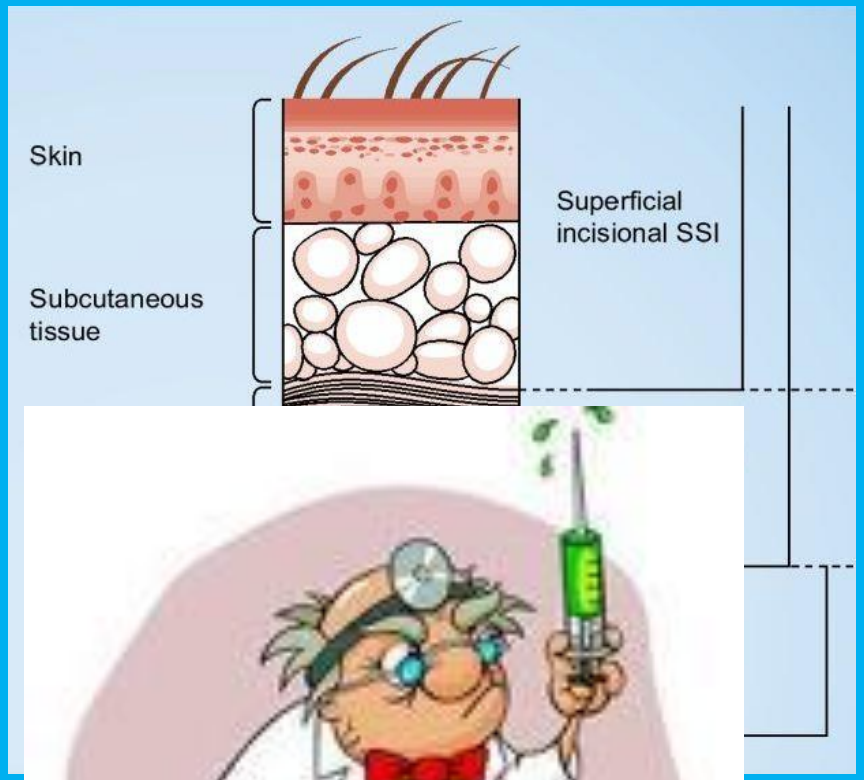
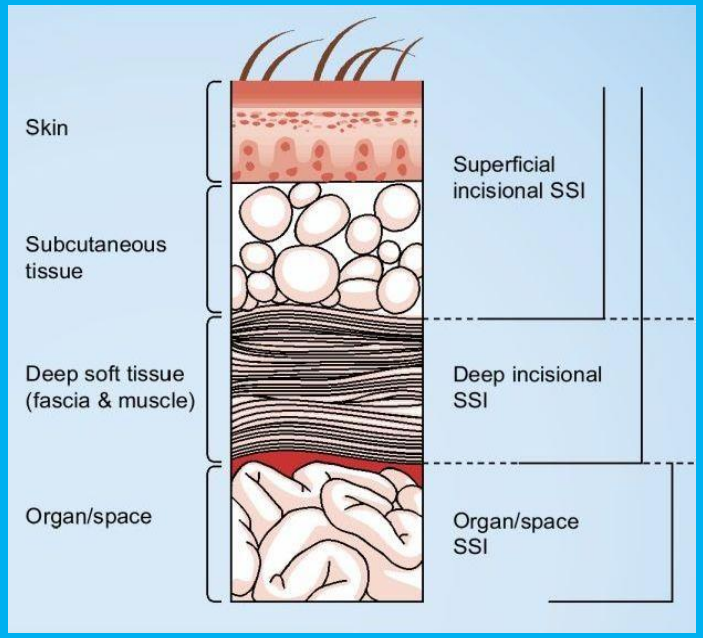
Manifestations of Surgical Infections

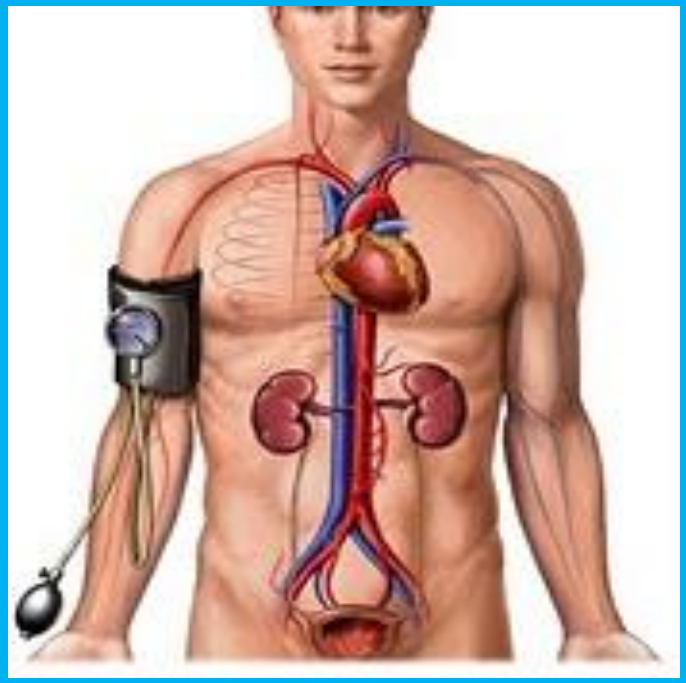
- Localized
  - Cellulites
  - Lymphangitis
  - Abscess
- Systemic
  - SIRS
  - MODS
  - MOFS



Infected States

1. SSI is an infected wound or deep organ space
2. SIRS is the body's systemic response to an infected wound
3. MODS is the effect that the infection produces systemically
4. MOFS is the end-stage of uncontrolled MODS





SIRS 2 of:

- hyperthermia (> 38°C)
  hypothermia (< 36°C)
- Tachycardia (> 90 b / min no B-blockers)
- Tachypnoea (> 20 min^{-1})
- WBC > 12 000 or < 4 000

SEPSIS

- Systemic Inflammatory Response (SIRS) to INFECTION manifested by : two or > of following:
  - Temp > 38 or < 36 centigrade
  - HR > 90 bpm
  - RR > 20 Rpm or PaCO2 < 32
  - WBC > 12,000/cu mm or < 4,000
    > 10% Bands (immature wbc)
- Sepsis syndrome: **SIRS with confirmed infectious process associate with organ failure or hypotention**

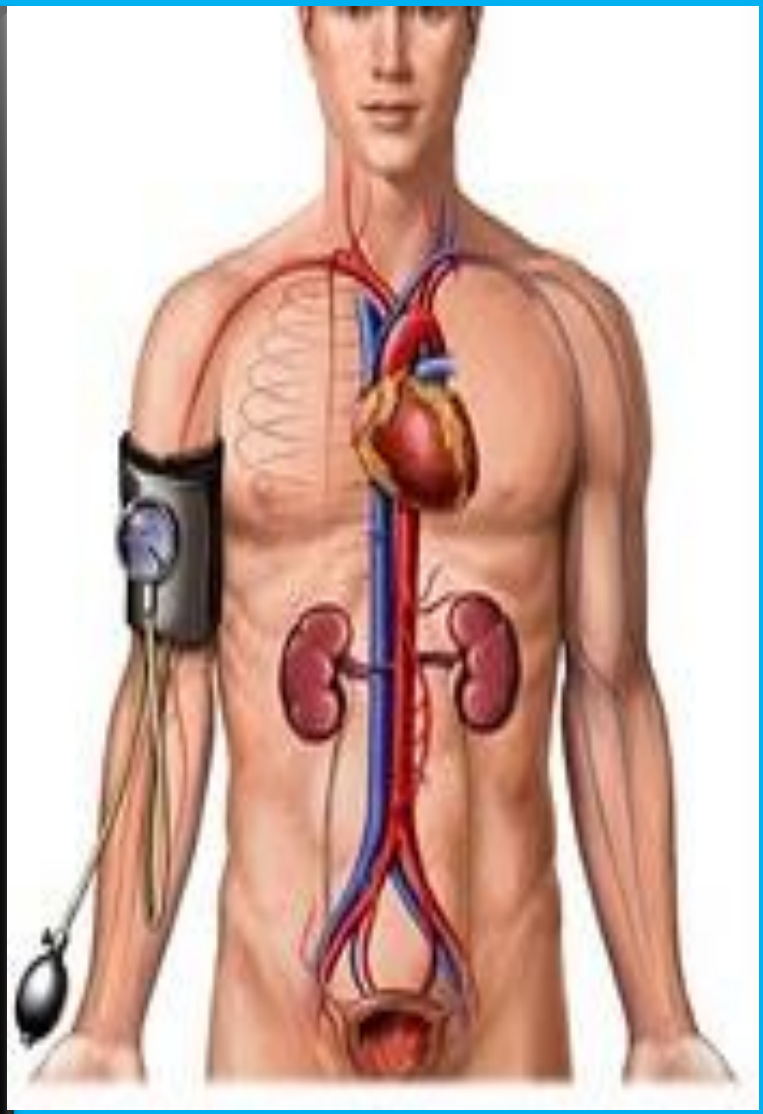
SIRS & MODS

- Sepsis is the systemic manifestation of *SIRS*,
  with a documented infection.

- *SIRS should not be confused with bacteraemia although the two may coexist .*

Severe sepsis or sepsis syndrome:

- is sepsis (SIRS + confirmed infection) with evidence of one or more organ failures
  - respiratory (acute respiratory distress syndrome),
  - cardiovascular (septic shock follows compromise of cardiac function and fall in peripheral vascular resistance),
  - renal (usually acute tubular necrosis),
  - hepatic,
  - blood coagulation systems
  - central nervous system

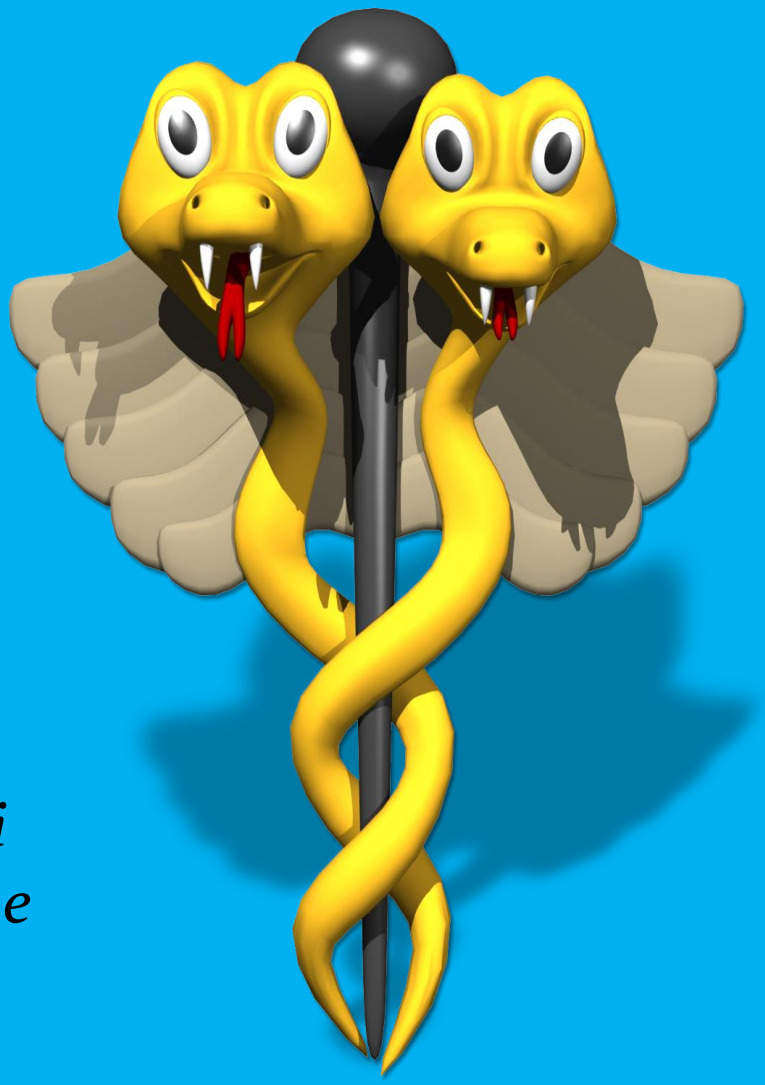


Bacteraemia and sepsis

- **Bacteraemia**
  - is unusual following superficial SSI
  - but common after deep space SSI .
  - Usually transient
- can follow procedures undertaken through infected tissues (particularly infected bile or urine).

Bacteraemia and sepsis

- is dangerous if the patient has a prosthesis
- Sepsis accompanied by MODS
  - may follow anastomotic breakdown.
- Aerobic Gram-negative bacilli are mainly responsible,
- but *Staphylococcus aureus and fungi may be involved, particularly after the use of broad-spectrum antibiotics*



Treatment of Surgical Infection

- Now early discharge (day surgery)

- Need carful prolonged follow up
  - B-haemolytic cellulitis needs 3-4 days
  - Suppurative SSI needs 7-10 days
- Ab. Initially empirical
- Best by C/S
- Remove the sutures
- Drain the pus
- In sever inf. Leave wound open (dirty wound)
  - Delayed primary or secondary closure

Prophylaxis to SSI

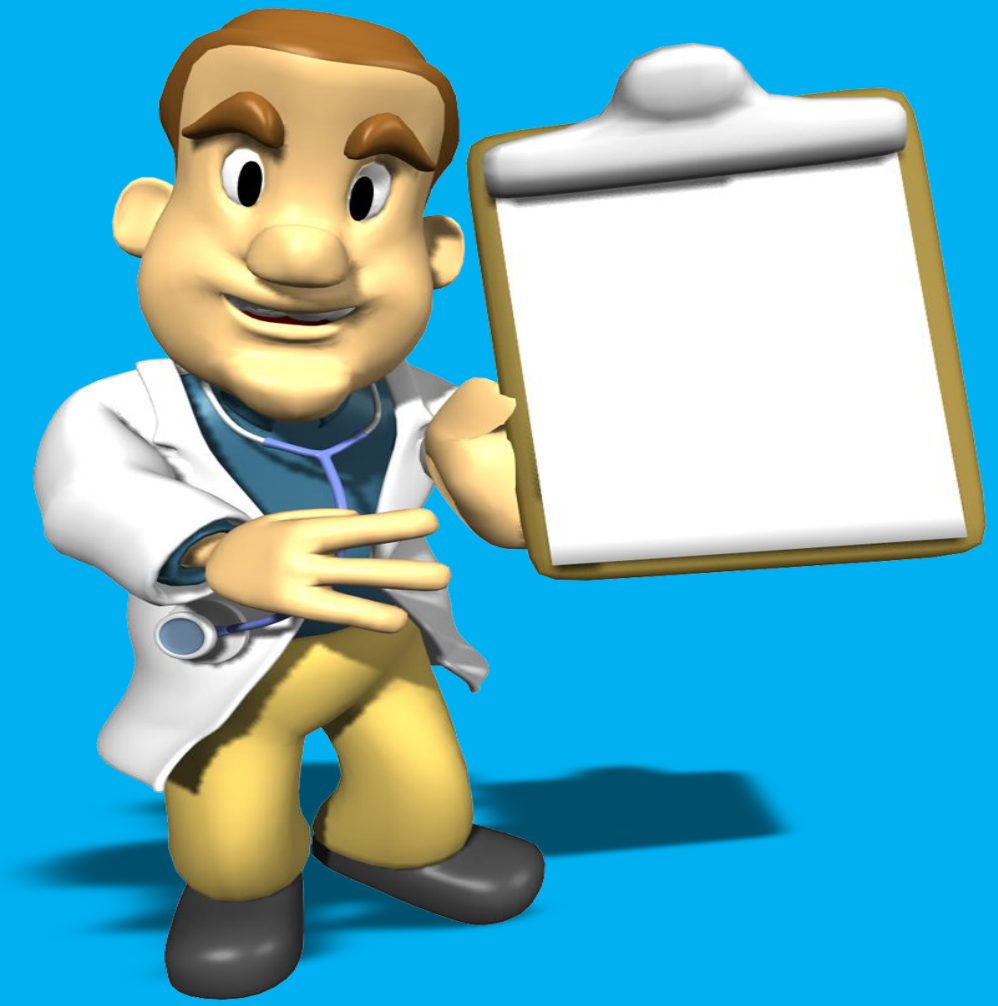
- Prophylactic AB.
- Preoperative Preparations
- Scrubbing & Skin Preparations
- Postoperative Care of the wound

Prophylaxis to SSI

- **Choice of antibiotics for prophylaxis**
  - Empirical cover against expected pathogens with local hospital guidelines
  - Single-shot intravenous administration at induction of anaesthesia
  - **Repeat** only in prosthetic surgery, long operations or if there is excessive blood loss
  - Continue as **Therapy** if there is unexpected contamination
  - Benzylpenicillin should be used if *Clostridium gas* gangrene infection is a possibility
  - Patients with heart valve disease or a prosthesis should be protected from bacteraemia caused by dental work, urethral instrumentation or visceral surgery

Preoperative Preparations

- Short preoperative stay
  ↓(MRSA & HAIS)
- Staff Hygiene
- Clean Hospital
- Patient Hygiene
- Antiseptic Path
- SHAVING



Prophylaxis to SSI

- **Avoiding surgical site infections**
- Staff should always wash their hands between patients
- Length of patient stay should be kept to a minimum
- Preoperative shaving should be avoided if possible
- Antiseptic skin preparation should be standardized
- Attention to theatre technique and discipline
- Avoid hypothermia perioperatively
- Ensure supplemental oxygenation in recovery

Prophylaxis to SSI

- Scrubbing & Skin Preperation
- Staff : 1st operation of the day
- Site of surgical site
- Decrease movement & no. of staff
- Theater ventilation
- Instrument sterilization
- Improve surgical technique
  - Excessive retraction
  - Dead space

Prophylaxis to SSI

- Postoperative Care of the wound

Specific Wound Infections

- Necrotizing Fasciitis (NF)
- Gas Gangrene
- Tetanus

Necrotizing Fasciitis

Synergistic spreading gangrene subdermal gangrene,

- necrotizing soft tissue infections (NSTI).

- mortality rates range from 30-70%
  - not decreased significantly despite modern therapy.

Necrotizing Fasciitis

- A mixed Synergistic infection of fascia

- responsible organisms are :
  - coliforms,
  - staphylococci,
  - *Bacteroides spp.,*
  - *anaerobic streptococci*

Necrotizing Fasciitis

- The wound initiating the infection
  - may have been minor,
  - but severely contaminated .
- Severe wound pain,
- signs of spreading inflammation
- with crepitus
- Bad Smell

Untreated → gangrene and MOFS

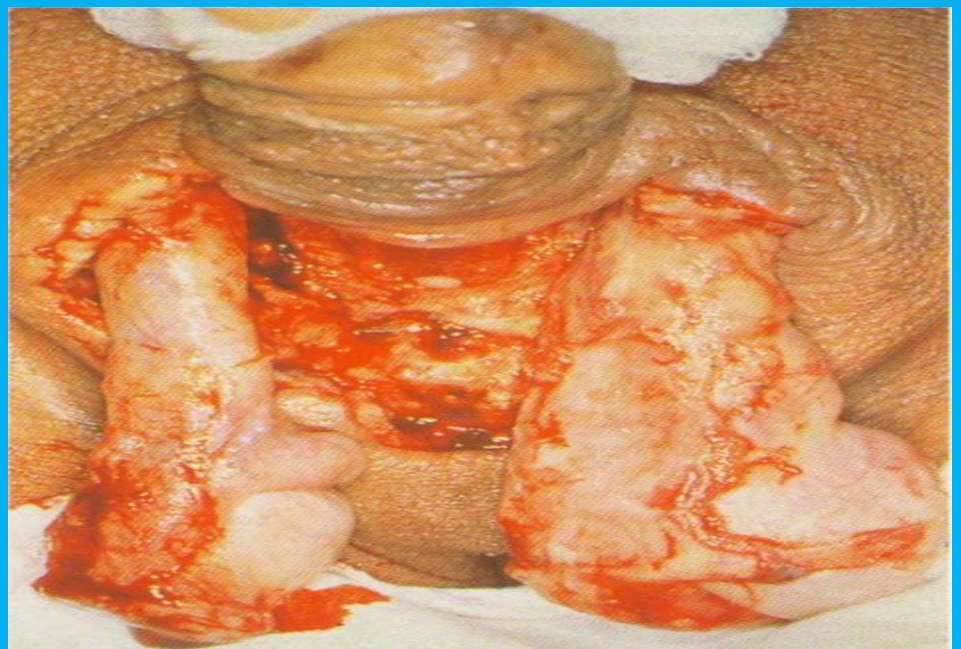
- Treatment
- Broad-spectrum antibiotic therapy
- aggressive circulatory support.
  - wide excision of necrotic tissue and leave open
  - may need large areas of skin grafting.

Necrotizing Fasciitis

Abdominal wall infections :
Meleney's synergistic hospital gangrene

Patients are almost always
immunocomp.
diabetes mellitus.

scrotal infection
Fournier's gangrene .



Necrotizing Fasciitis

- commencing in the oral cavity and invading the deep fascia of the head and neck, are called Ludwig's angina.
- Airway control is an important factor in these cases.

Myonecrosis/Gas Gangrene

- There are two main forms:

1.traumatic gas gangrene caused by clostridium perfringens

2. non-traumatic gas gangrene caused by other clostridial species

Myonecrosis/Gas Gangrene

- *C. perfringens.*
  - *Gram-positive, anaerobic, spore-bearing bacilli*
- *found in:*
  - *nature, in soil and faeces*
  - *military and traumatic surgery*
  - *Colorectal operations.*

- *Pt. are :*
  - *immunocompromised,*
  - *Diabetic*
  - *have malignant disease*
  - *if they have wounds containing necrotic or foreign material, resulting in anaerobic conditions.*

Merely a flesh wound???

Myonecrosis/Gas Gangrene

- Military wounds provide an ideal environment
  - as the kinetic energy of high-velocity missiles causes extensive tissue damage.
  - The cavitation which follows passage of a missile causes
    - a`sucking' entry wound,
    - leaving clothing and environmental soiling in the wound
    - in addition to devascularised tissue.
- Oedema and spreading gangrene
  - Due to release of collagenase, hyaluronidase, other proteases and alpha toxin.

Myonecrosis/Gas Gangrene

- *Gas gangrene wound infections are associated with*
  - *severe local wound pain*
  - *crepitus by feel*
  - *Gas on plain x-ray*
- *The wound produces*
  - *a thin, brown, sweet smelling exudate,*
- *Early systemic complications if prompt action is not taken*
  - *septic shock*
  - *MSOF*

Myonecrosis/Gas Gangrene

- Pt. at risk, amputations are performed for peripheral vascular disease with open necrotic
  - Antibiotic prophylaxis

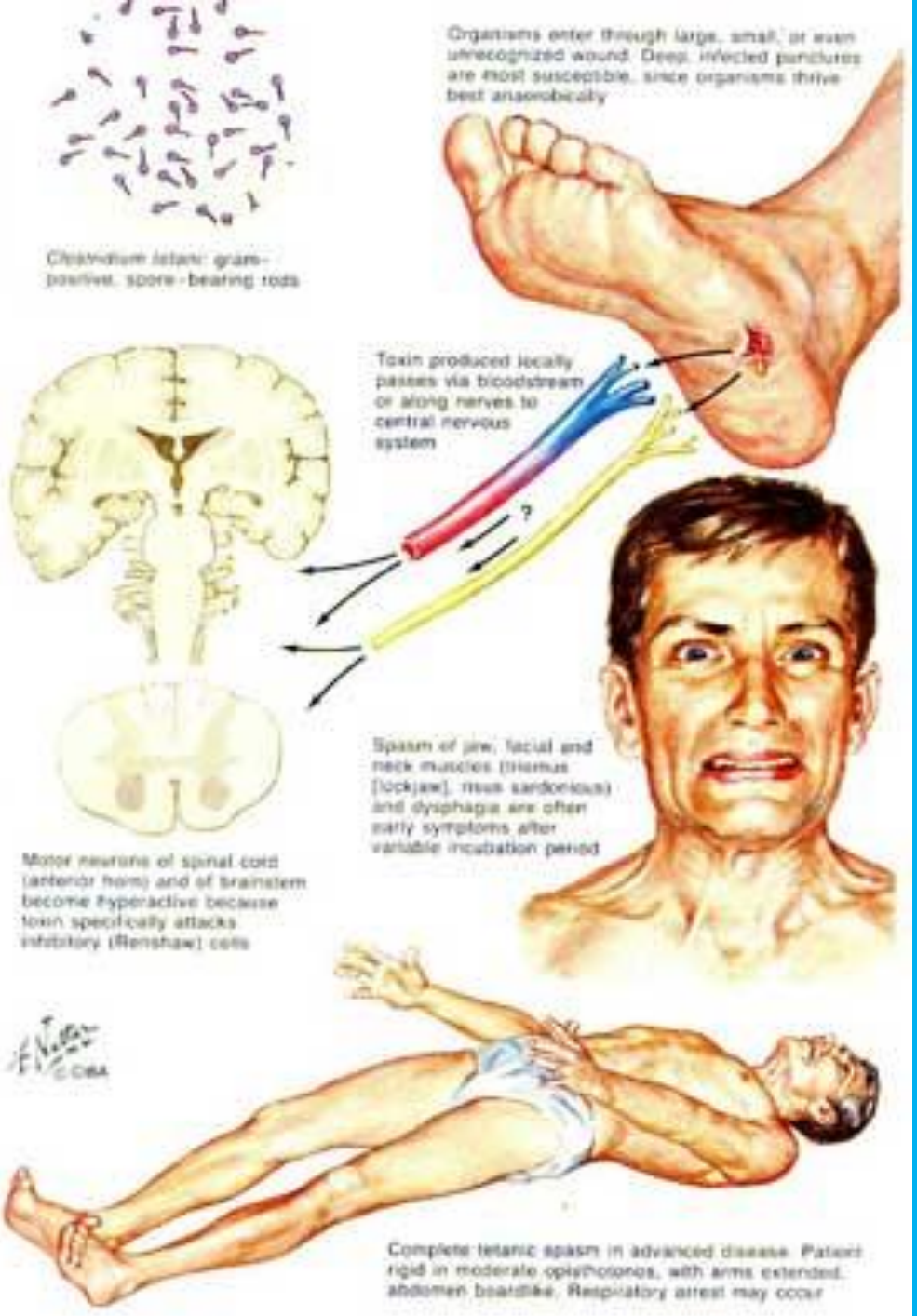
- Once a gas gangrene infection is established,
  - intravenous penicillin
  - Aggressive debridement of affected tissues
  - hyperbaric oxygen is controversial.

Tetanus

- is a potentially fatal disease
- manifested by **spasms** and autonomic instability
- caused by the potent neurotoxin of clostridia tetani.
- can be readily prevented by vaccination with tetanus toxoid
- has been virtually eliminated in developed countries,
- there are an estimated 1 million cases / y in the developing world,
- mortality of > 50% .
- It has been estimated that there are 200,000 deaths from neonatal tetanus yearly.

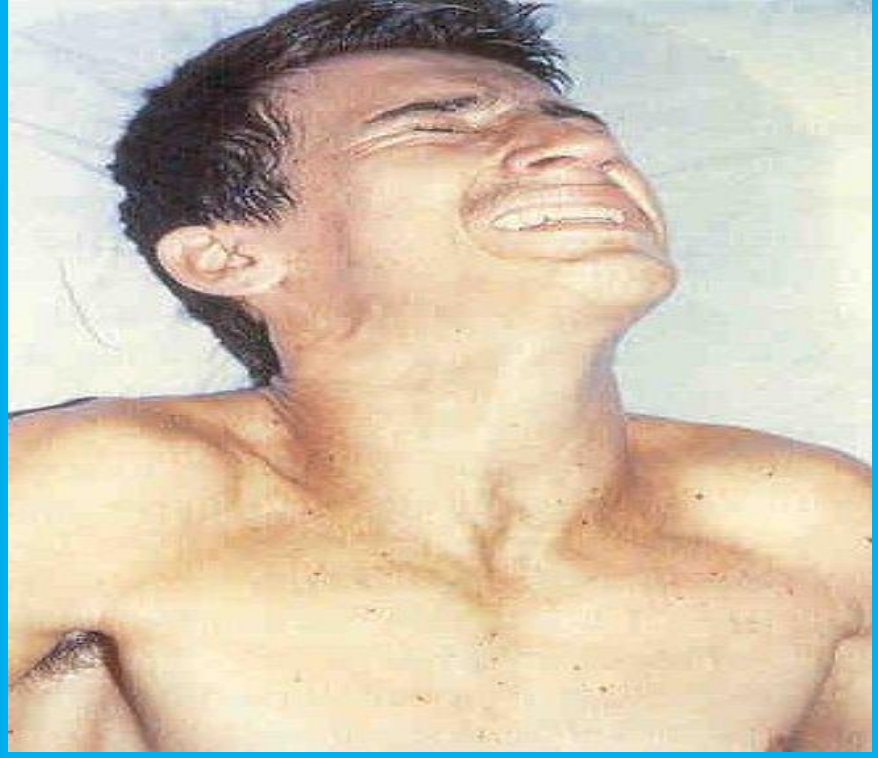
Tetanus

- **Clostridium tetani**
  - Anaerobic, Gram-positive terminal spore-bearing,
- The spores are widespread in soil and manure,
- following implantation into tissues or a wound
  - (trivial or unrecognised and forgotten).
- the infection is more common in traumatic civilian or military wounds.
- The S&S of tetanus are mediated by:
  - the release of the exotoxin **tetanospasmin,**
  - which affects
    - myoneural junctions
    - motor neurones of the anterior horn of the spinal cord.



Tetanus

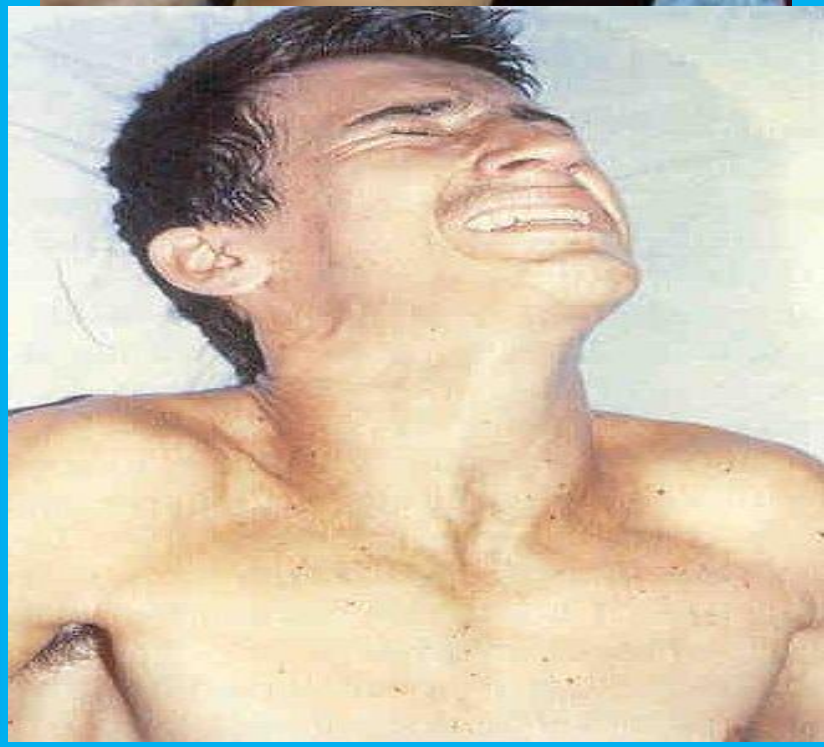
- A short prodromal period,
  - has a poor prognosis,
  - leads to spasms in the distribution of the short motor nerves of the face
  - followed by the development of severe generalised motor spasms including opsithotonus, respiratory arrest and death.
- A longer prodromal period of 4-5 weeks
  - is associated with a milder form of the disease.
- The entry wound may show :
  - a localized small area of cellulitis;
  - exudate or aspiration may give a sample that can be stained to show the presence of Gram-positive rods.



Tetanus

- Prophylaxis with tetanus toxoid is the best preventative treatment
- In an established infection,

1. Debridement of the wound
2. Antibiotic treatment with benzylpenicillin .
3. Relaxants may also be required,
4. ventilation in severe forms,
5. Anti-toxin using
   - human immunoglobulin: to be considered for both
     - at-risk wounds
     - established infection.



Tetanus

- The toxoid should be given :
  - in three separate doses to give protection for a 5-year period,
  - after which a single 5-yearly booster confers immunity.
- to all patients with open traumatic wounds who are not immunised.
- At-risk wounds are those that present late, when
  - there is devitalisation of tissue
  - or when there is soiling.

- if immunized a booster of toxoid should be given
- if not immunised at all
  - a three-dose course,
  - prophylactic benzylpenicillin,
  - anti-toxin is controversial because of the risk of toxicity and allergy.