Purulent surgical infection

Lection

Overall manifestations

Signs of sepsis or other systemic disease are nonspecific and include disturbances of thermoregulation or evidence of dysfunction of multiple organ systems.

1. Disturbances of thermoregulation - fever (temperature >38°C), hypothermia (temperature <36°C), or temperature instability.
2. Cardiovascular disturbances - tachycardia (pulse >180 beats per minute), hypotension (systolic blood pressure <60 mm Hg in full-term infants), or delayed capillary refill (<2-3 s).

3. Respiratory disturbances - apnea, tachypnea (respirations >60/min), grunting, flaring of the alae nasi, intercostal or subcostal retractions, or hypoxemia.
4. Gastrointestinal tract disturbances - rigid or distended abdomen or absent bowel sounds.
5. Cutaneous abnormalities - jaundice, petechiae, or cyanosis.
6. Neurologic abnormalities - irritability, lethargy, hypotonia, or hypertonia.

Hematogenous Osteomyelitis

Hematogenous infection begins in the medullary cavity of bones, is encased in a rigid structure, which does not allow for the expansion of the inflammatory process. . Progression of the infection restricts medullary blood supply. Passage of pus through the cortex elevates the periosteum and the resulting sub-periosteal abscess causes bony infarction as the cortical bone is supplied by end-arteries from the periosteum.

PATHOPHYSIOLOGY

Microorganisms enter bone (Phagocytosis).

Phagocyte contains the infection

Release enzymes

Lyse bone

PATHOPHYSIOLOGY

- **Bacteria escape host defenses by:**
  - ✔ **Adhering tightly to damage bone**
  - ✔ **Persisting in osteoblasts**
  - ✔ **Protective polysaccharide-rich biofilm**

PATHOLOGY

Acute □ Congested or thrombosed vessels

Chronic □ Necrotic bone
Absence of living osteocyte
Mononuclear cells predominate
Granulation & fibrous tissue

Stages

- Toxic (adynamic) stage
- Septicopyemic stage
- Local stage

Forms

- **Acute Osteomyelitis**
- **Sub-acute Osteomyelitis**
- **Chronic Osteomyelitis**

Symptoms in newborn

- Clinical of septicemia : fever (36 - 74 %) irritable, refuses to feed, rapid pulse
- Joint swelling
- Tenderness and resistance to movement of the joint
- Look for umbilical infection

Symptoms in infant

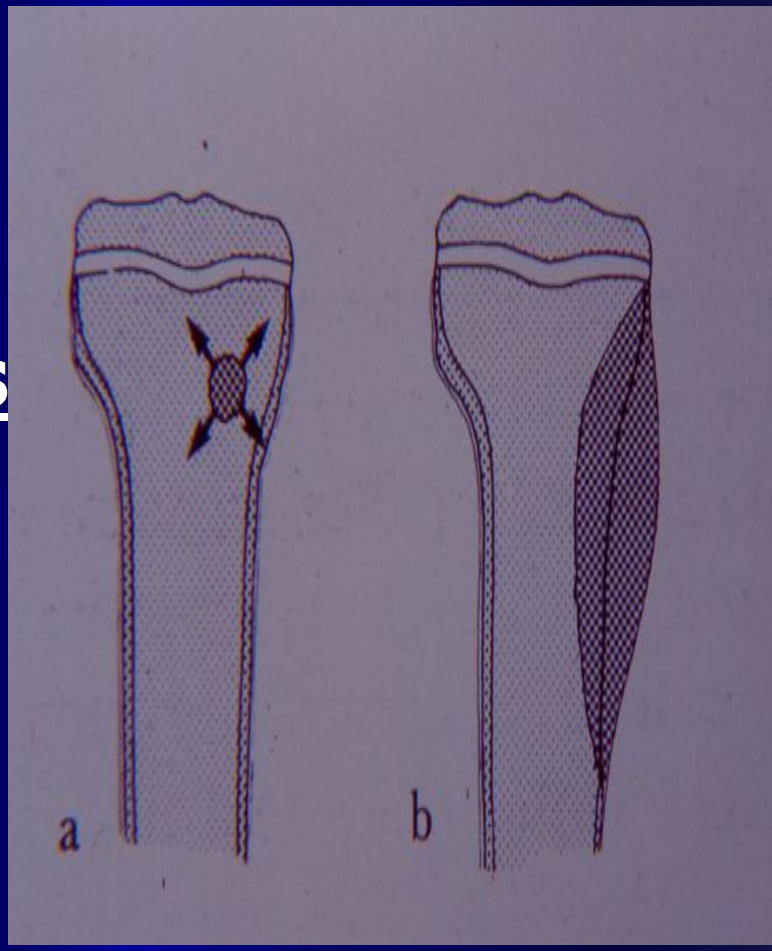
- Drowsy
- Irritable
- History of birth difficulties
- History of umbilical artery catheterization
- Metaphyseal tenderness and resistance to joint movement

Symptoms in child

- Severe pain
- Malaise
- Fever
- Toxemia
- History of recent infection
- Local inflammation pus escape from bone
- Lymphadenopathy

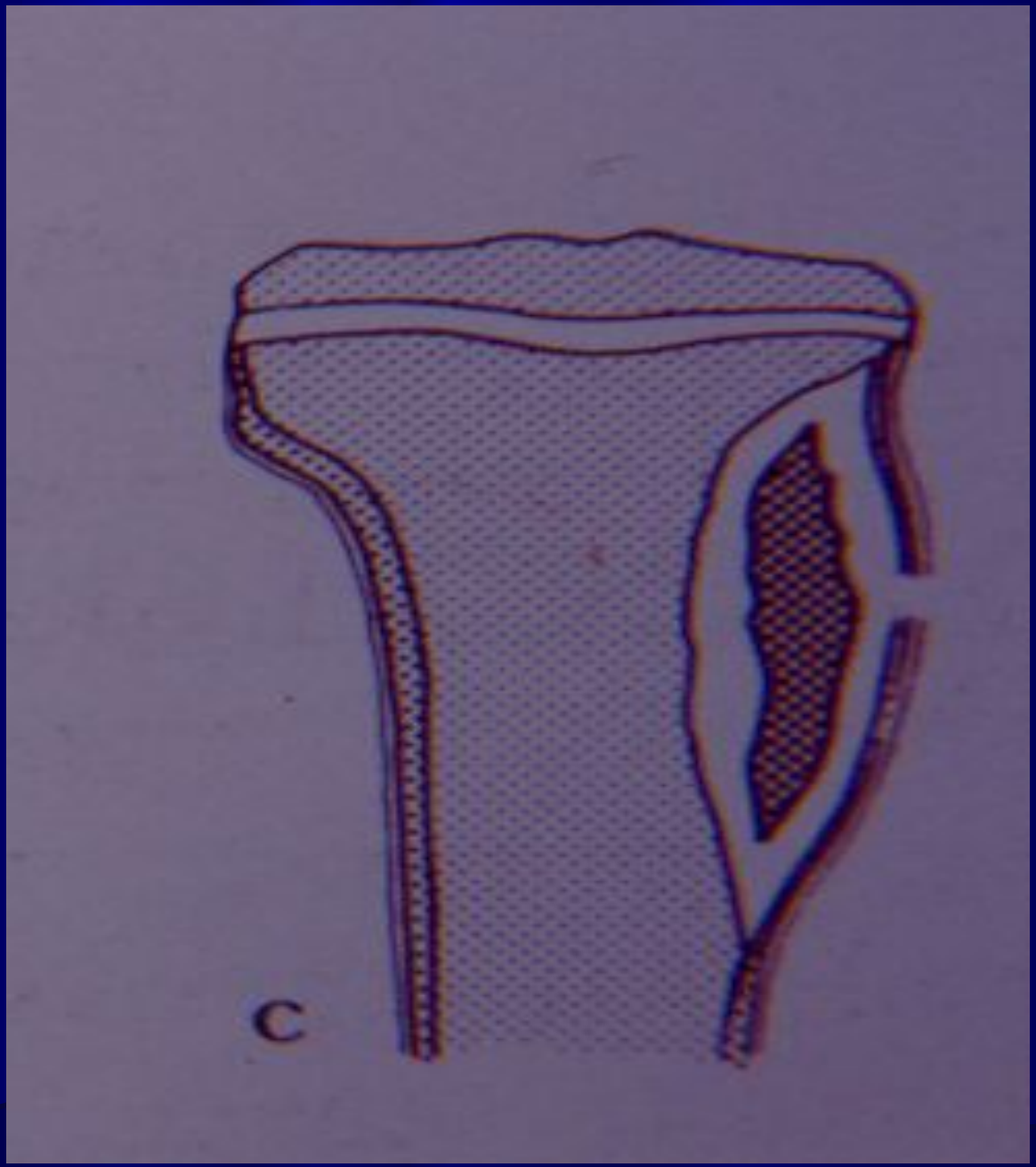
Outcomes

- **Suppuration:**
  - **4-5 days**
  - **Pus formation**
  - **Subperiosteal abscess**
  - **Pus spreading**
    - **epiphysis**
    - **joint**
    - **medullary cavity**
    - **soft tissue**



Necrosis

- Bone death by the end of a week
- Bone destruction ← toxin
  ← ischemia
- Epiphyseal plate injury
- Sequestrum formation
  - small □ removed by macrophage,osteoclast.
  - large □ remained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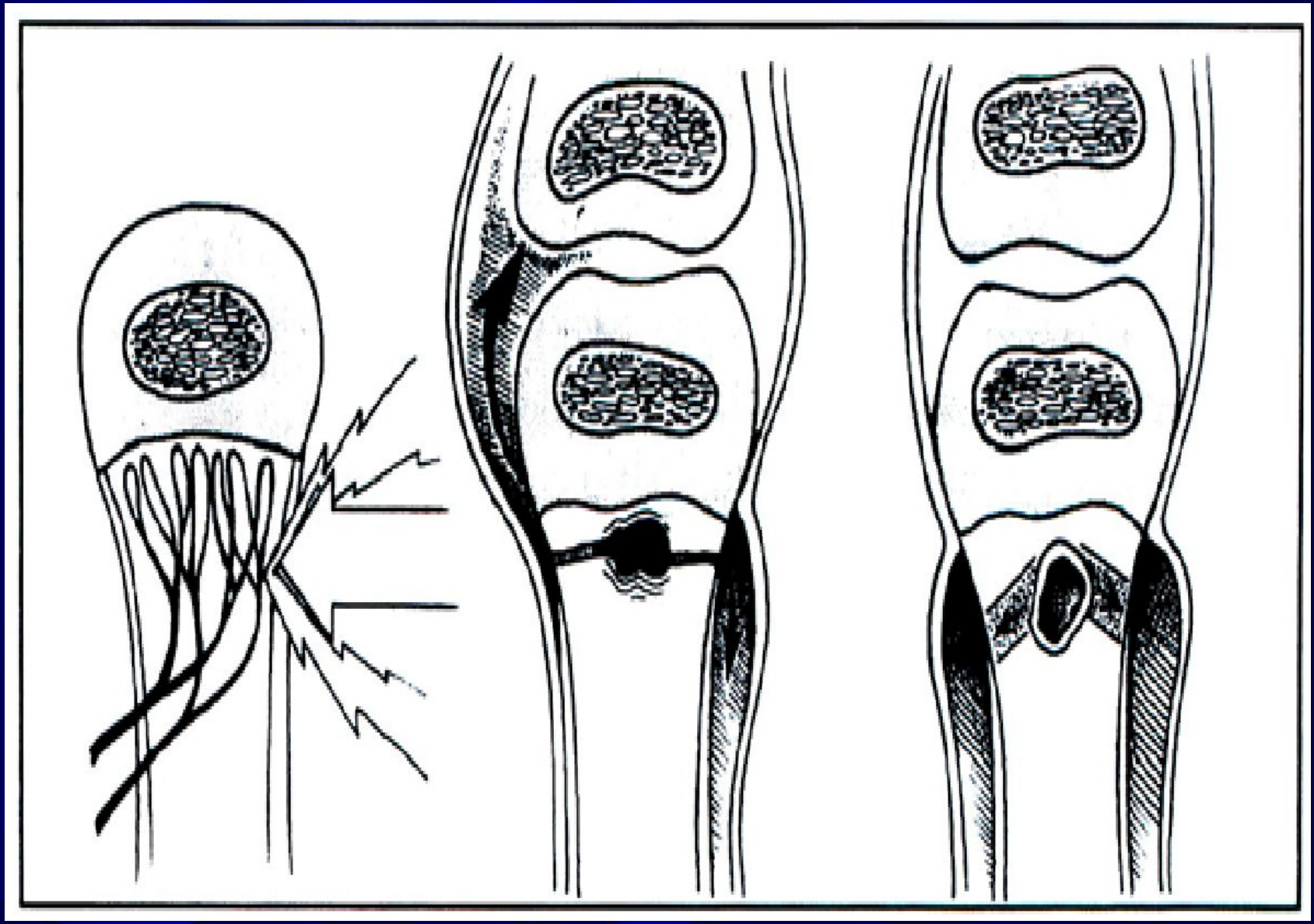
New bone formation

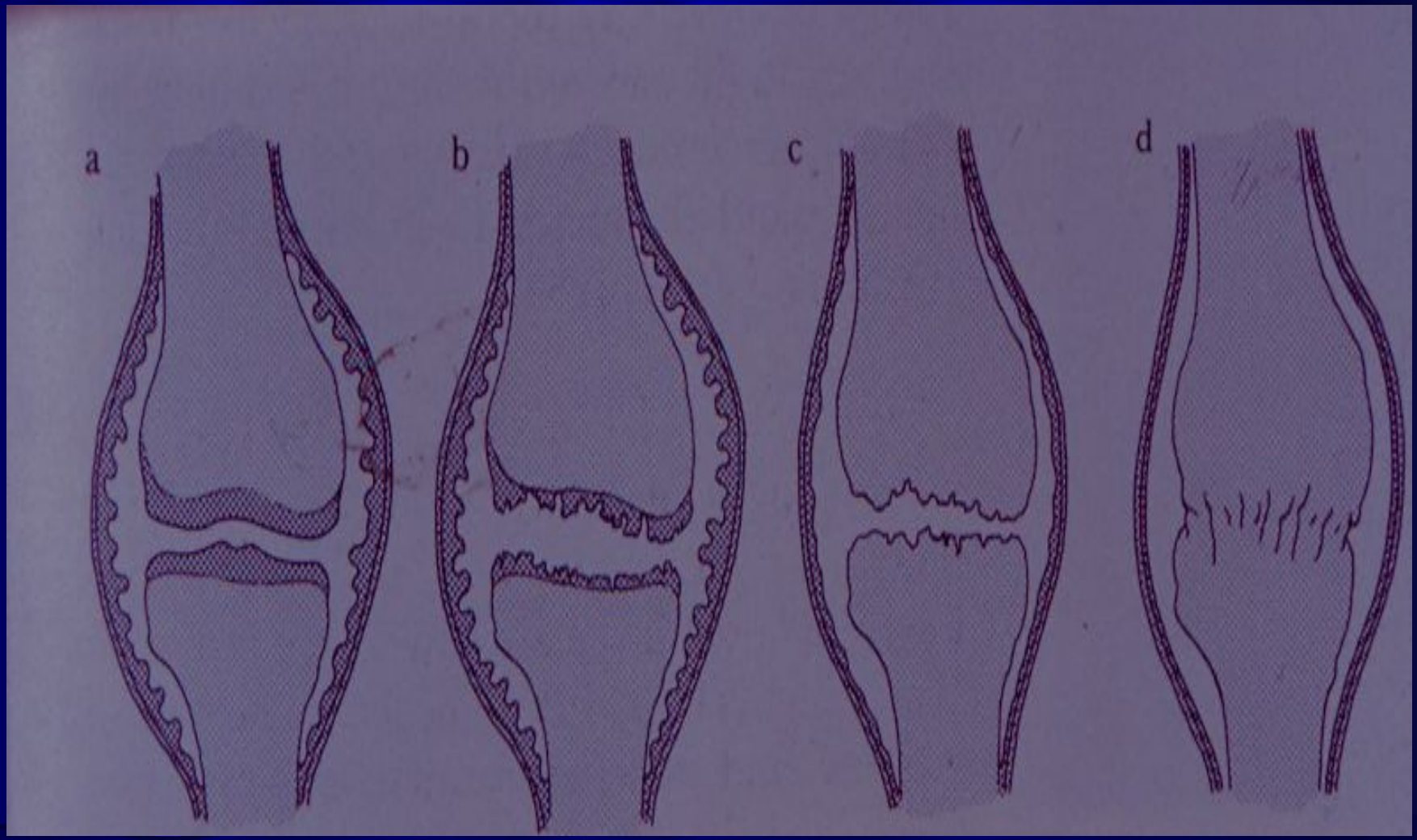
- By the end of 2nd week (10 – 14 days)
- New bone formation from deep layer of periosteum.
- If infection persist- pus discharge through sinus to skin surface Chronic osteomyelitis

Joint capsule of 4 metaphysis cause of osteomyelitis

- Femoral head and neck (hip)
- Humeral head (shoulder)
- lateral side of distal tibia (ankle joint)
- radial head and neck (elbow joint)



Septic Arthritis

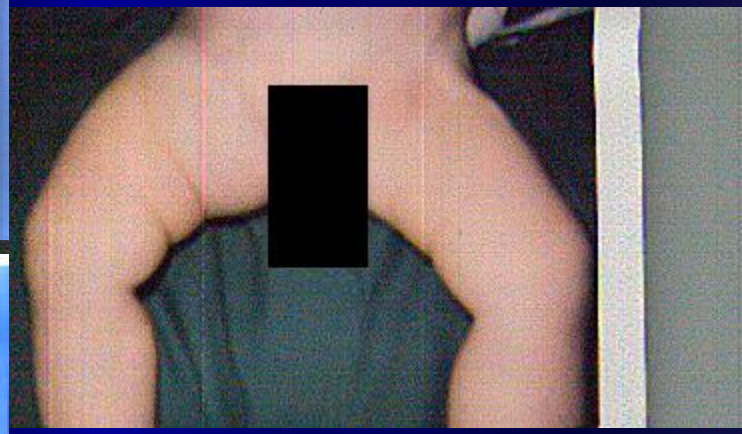


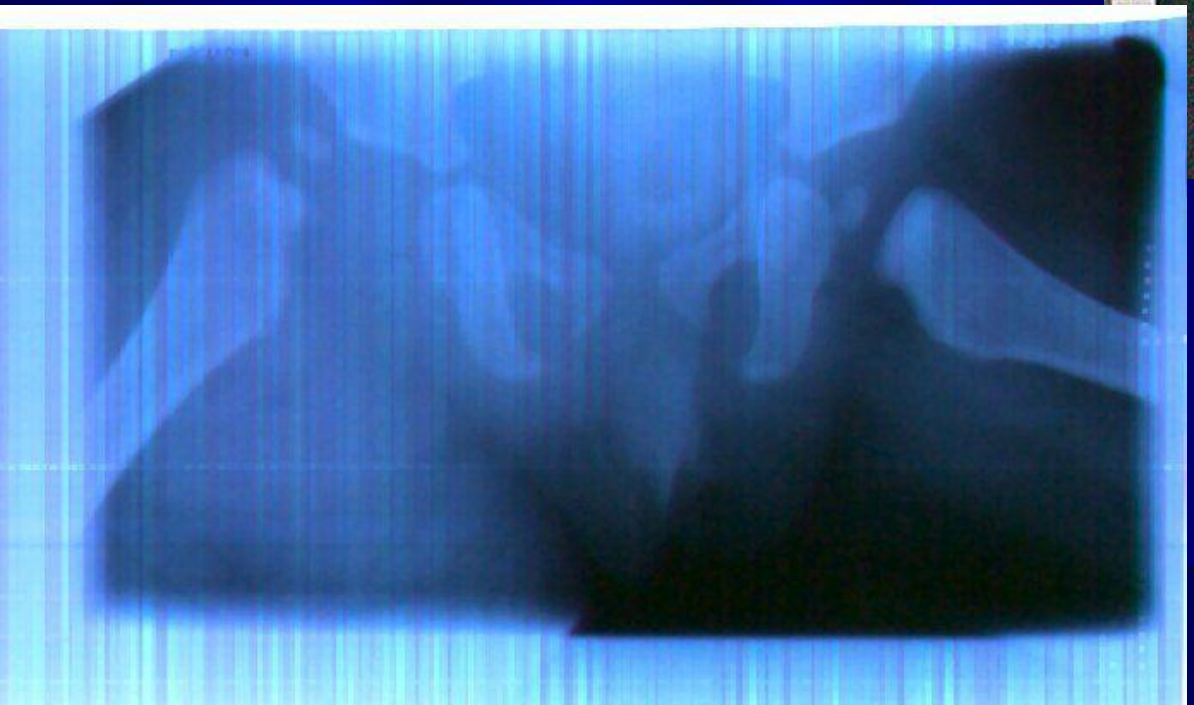
Differential diagnosis

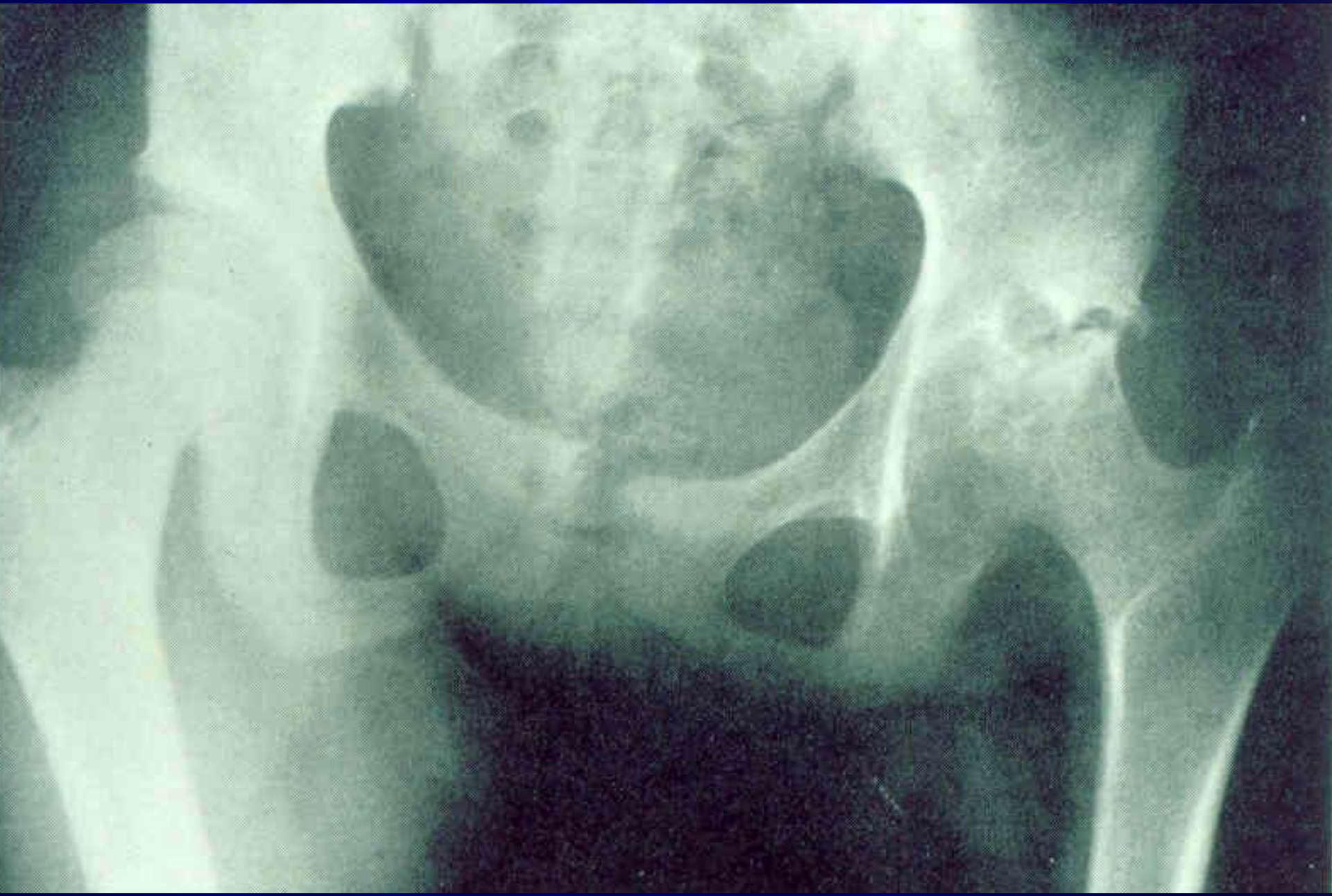
- Toxic synovitis
- Juvenile rheumatoid arthritis
- Cellulitis
- Pyomyositis
- Psoas abscess

Investigation

- Laboratory tests
- Plain film
- Ultrasonic diagnosis
- Aspirate bone liquid
- CT-scan







Septic arthritis Of Right hip

Investigation : Aspiration

- **confirm diagnosis**
- **smear for cell and organism**
- **culture and sensitivity test**

HEMATOGENOUS OSTEOMYELITIS

Microbiologic features

- Staphylococci □ Aureus, Epidermidis
- Streptococci □ Group A & B
- Haemophilus influenzae
- Gram-negative enteric bacilli
- Anaerobes
- Polymicrobial
- Mycobacterial
- Fungi

TREATMENT

- Initial treatment shoud be aggressive.
- Inadequate therapy → Chronic disease
- Antibiotic use:
  - ✔Parenteral
  - ✔High doses
  - ✔Good penetration in bone
  - ✔Full course
  - ✔Empiric therapy
- Surgery

Antibiotic treatment

Age	Pathogen	Drugs
1.Healthy Neonate (< 1 mo)	-Staphylococcal Gr. B infection	- cloxcillin 50 mg/kg/day
2. Infant and children	-Staph. Aureus -Gram neg. infection -Haemophilus infection	-2nd generation Cephalosporins or Amoxycillin with clavulanic acid
3. Adolescent (11 – 15 years)	-Staph. Aureus -Neisseria gonorrhea	150 – 200 mg/kg/day IV divide q 4 – 6 hr. max 12 gm./day
4.Sickle-cell patient	-Salmonella infection	- Co-trimoxazole - Amoxycillin with clavulanic acid

TREATMENT

Indication for Surgery

- Diagnostic
- Hip joint involvement
- Neurologic complication
- Poor
- Sequestration

PROGNOSIS

Is related to:

- Causative organisms
- Duration of symptoms & sign
- Patient age
- Duration of antibiotic therapy

COMPLICATION

- Bone abscess
- Bacteremia

- Fracture
- Loosing of the prosthetic implant

- Overlying soft-tissue cellulitis
- Draining soft-tissue tract

Post Osteomyelitis Treatment

Septic Osteomyelitis

Post Osteomyelitis Scar

Post Osteomyelitis Deformity of the Forearm

Necrotizing pneumonia

Necrotizing pneumonia is characterized by inflammation of the alveoli and terminal airspaces in response to invasion by an infectious agent introduced into the lungs through hematogenous spread or inhalation.

Pathophysiology

- The alveoli fill with proteinaceous fluid, which triggers a brisk influx and polymorphonuclear cells followed by the deposition of fibrin and the degradation of inflammatory cells.
- Intra-alveolar debris is ingested and removed by the alveolar macrophages.
- This consolidation leads to decreased air entry and dullness to percussion.
- Inflammation in the small airways leads to crackles.
- The patient must increase his or her respiratory rate to maintain adequate ventilation.

Physical examination

Newborns:

1. rarely cough
2. they more commonly present with tachypnea, retractions, grunting, and hypoxemia
3. grunting suggests a lower respiratory tract disease

Older infants:

1. grunting may be less common
2. tachypnea, retractions, and hypoxemia are common
3. may be accompanied by a persistent cough, congestion, fever, irritability, and decreased feeding

Toddlers and preschoolers:

1. most often present with fever, cough (productive or nonproductive), tachypnea, and congestion
2. sometimes emesis

Older children and adolescents:

1. This group may also present with fever, cough (productive or nonproductive), congestion, chest pain, dehydration, and lethargy.

Generalized symptoms

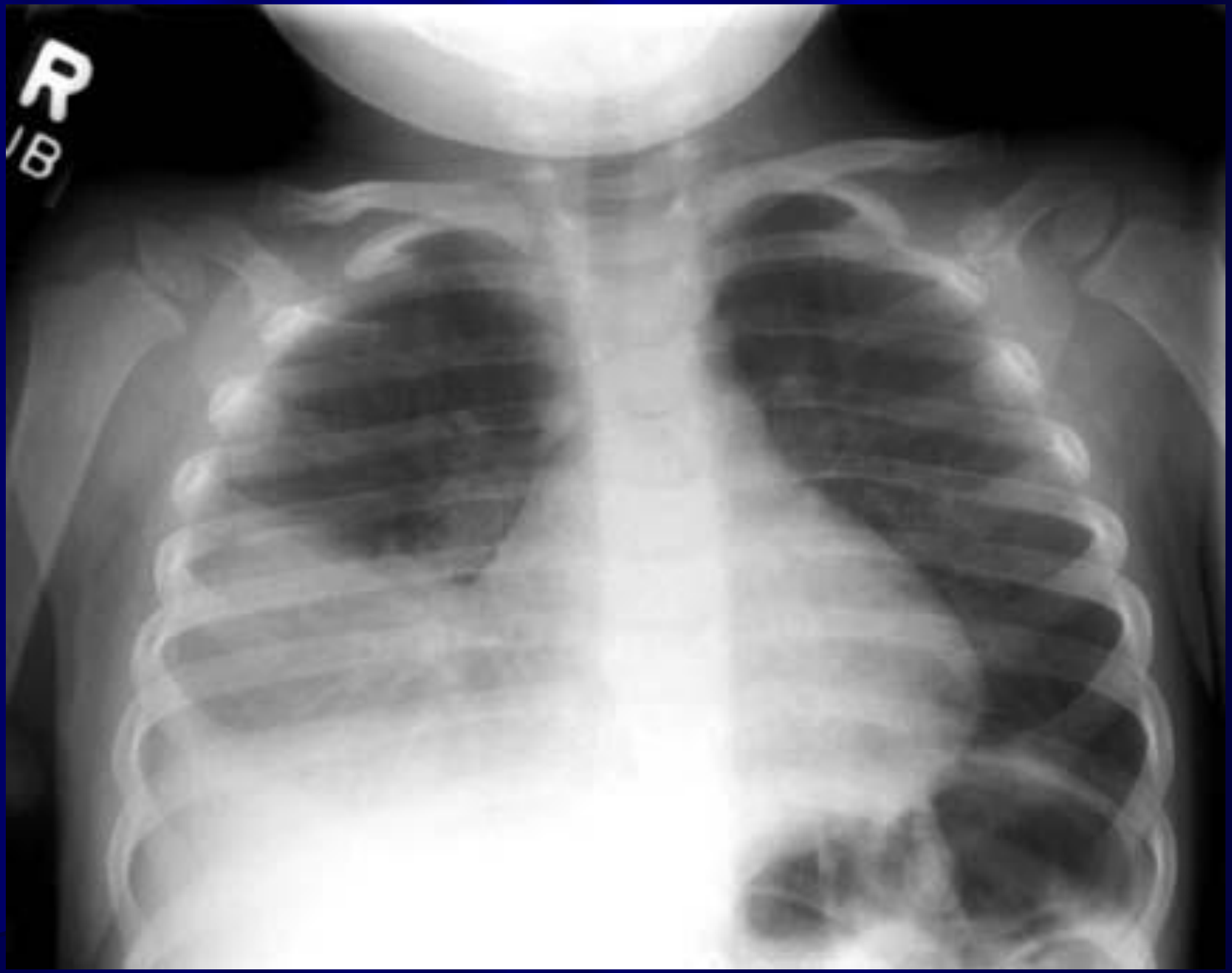
- Intoxication sundrome
- Nasal flaring
- Auscultation: dry or bubbling rales, wheezing, diminished breath sounds, tubular breath sounds, pleural friction rub.
- The affected lung field may be dull to percussion.
- Decreased tactile and vocal fremitus.

Extrapulmonary symptoms

1. Abdominal pain or an ileus accompanied by emesis in patients with lower lobe pneumonia.
2. Nuchal rigidity in patients with right upper lobe pneumonia.
3. Rub caused by pericardial effusion in patients with lower lobe pneumonia due to Haemophilus influenzae infection.

Diagnosis

- Laboratory tests (inflammation signs).
- Radiography
- Lung aspirate
- Sputum culture
- Blood culture
- Polymerase chain reaction
- Skin tests (TB pneumonia BCG)
- Bronchoscopy
- CT - scan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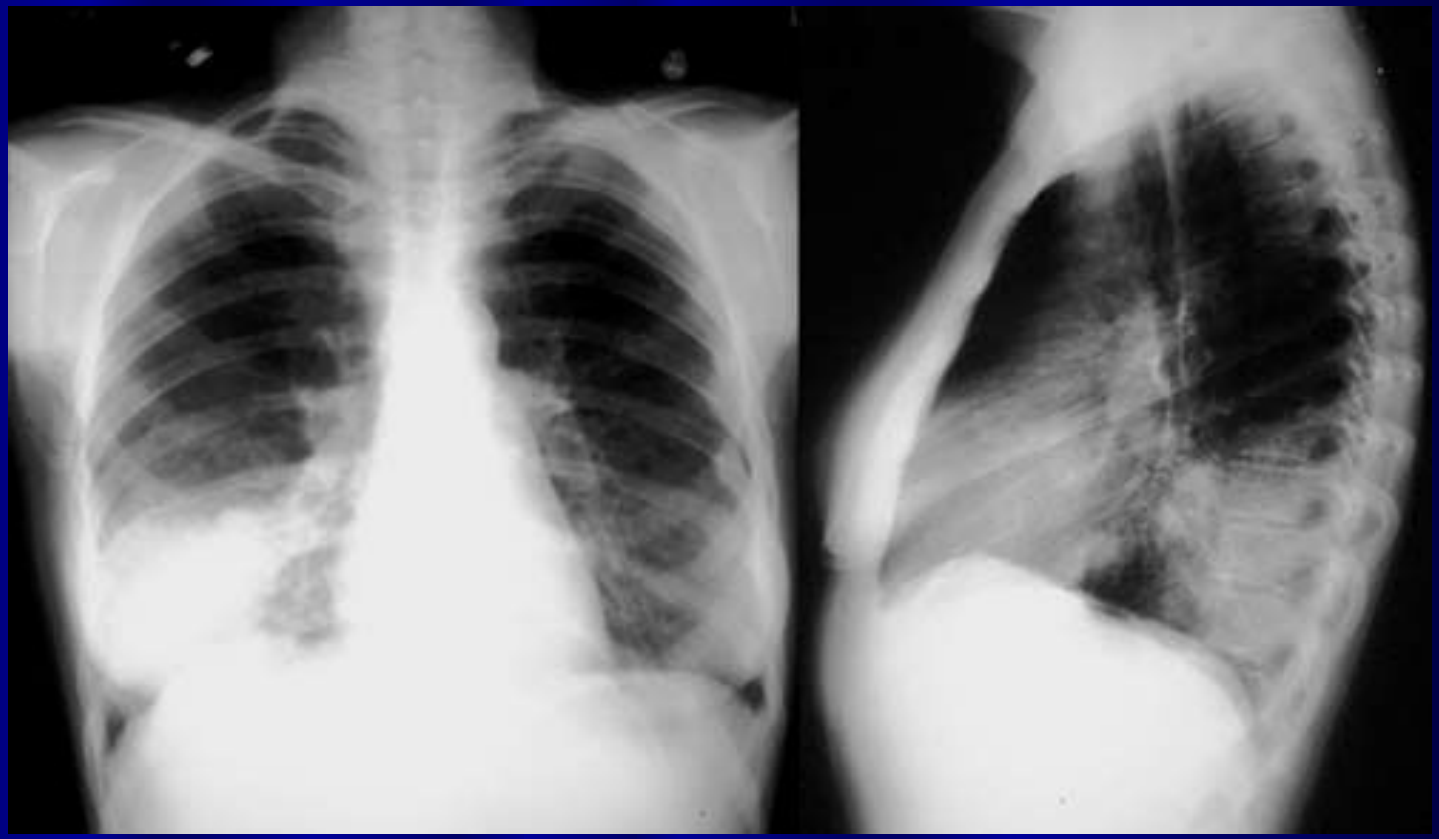
Segmental-lobar opacification



Segmental-lobar opacification with pleural effusion

Differential diagnosis

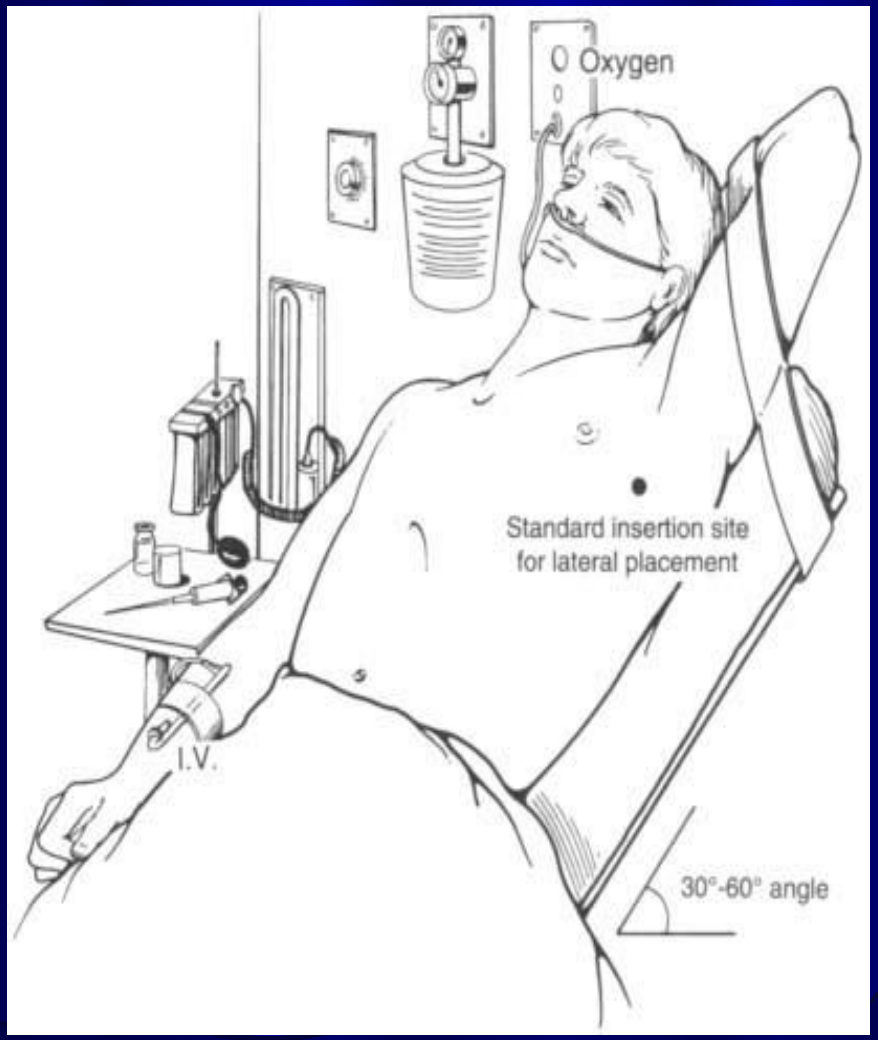
- Afebrile Pneumonia Syndrome
- Airway Foreign Body
- Aspiration Syndromes
- Bronchiectasis
- Bronchiolitis
- Bronchitis, Acute and Chronic
- Chronic Granulomatous Disease
- Congenital Pneumonia
- Cystic Adenomatoid Malformation
- Cystic Fibrosis
- Empyema
- Gastroesophageal Reflux
- Pulmonary Sequestration

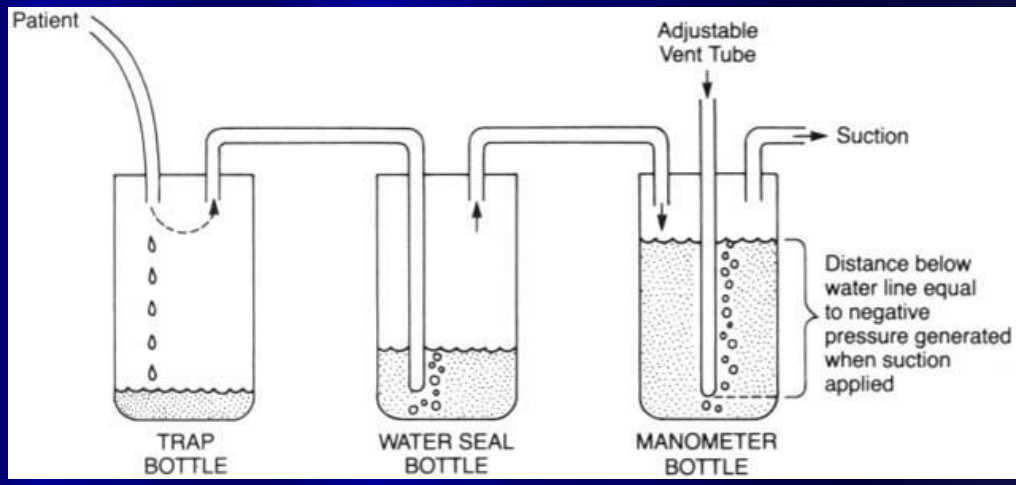
Antibacterial therapy

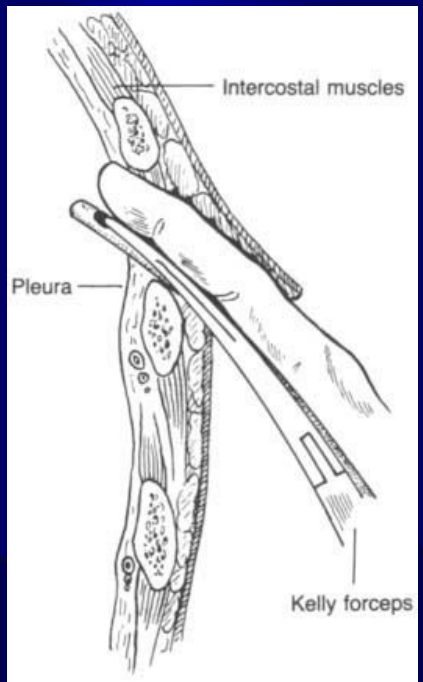
- Cephalosporins (III-IV gen.): Ceftriaxone (Rocephin), Cefotaxime (Claforan), Cefuroxime (Zinacef, Ceftin, Kefurox).

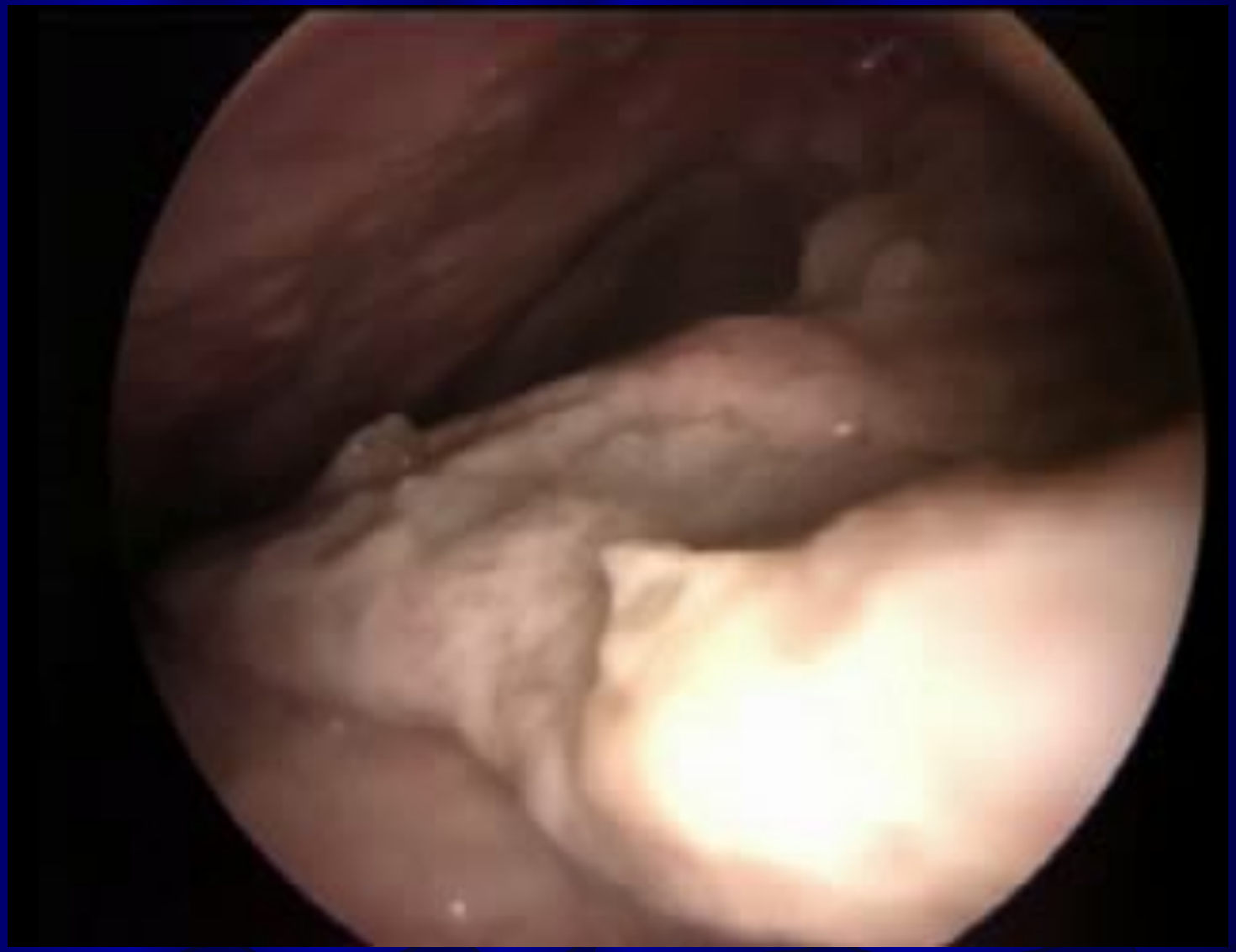
- Macrolide antibiotics: Azithromycin (Zithromax), Clarithromycin (Biaxin), Erythromycin (E.E.S., E-Mycin, Ery-Tab),

Tube Thoracostomy







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Necrotic phlegmon

Purulent lesions in the skin and hypodermic tissue, usually this process localisations in the scapular and sacrcococcygeal regions.

Necrotic phlegmon is predominantly a disease of the neonate.

Causes

- Vulnerability epidermis
- A lot of intrecellular liquid
- Progress vasculature
- Congenital hypoplasia subjacent tissues

Clinical stages

- Intoxication syndrome
- Hyperaemia
- Compression soft tissues
- Edema
- Fluctuation
- Exfolation skin

Differential diagnosis

- Aseptic necrosis
- Erythematous erysipelas
- Idiopathic erysipelas
- Phlegmonous erysipelas

Treatment

- Fluid therapy
- Antibacterial therapy (cephalosporinis III-IV gen.)
- General health-improving therapy
- Surgical treatment – chess incisions in the lesion region, irrigation aspiration.

Omphalitis

Omphalitis is an infection of the umbilical stump. Omphalitis typically presents as a superficial cellulitis that may spread to involve the entire abdominal wall and may progress to necrotizing fasciitis, myonecrosis, or systemic disease. Aerobic bacteria are present in approximately 85% of infections, predominated by Staphylococcus aureus, group A Streptococcus, Escherichia coli, Klebsiella pneumoniae, and Proteus mirabilis

Associated risk factors include the following:

- Low birth weight (<2500 g)
- Prior umbilical catheterization
- Septic delivery
- Prolonged rupture of membranes
- Immunologic disorder

Clinic

- Purulent or malodorous discharge from the umbilical stump
- Periumbilical erythema
- Edema
- Tenderness
- Ecchymoses
- Progression of cellulitis despite antimicrobial therapy

Differential diagnosis

- Umbilical fistula
- Soaking umbilical
- Enterocystoma

Complications

- Necrotizing fasciitis
- Myonecrosis
- Sepsis
- Septic embolization
- Particularly endocarditis and liver abscess formation
- Abdominal complications

Treatment

- Fluid therapy
- Antibacterial therapy (cephalosporinis III-IV gen.)
- Surgical care: management of necrotizing fasciitis and myonecrosis involves early and complete surgical debridement of the affected tissue and muscle

Neonatal Sepsis

- Clinical syndrome of systemic illness accompanied by bacteremia occurring in the first month of life
- Incidence
  - 1-8/1000 live births
  - 13-27/1000 live births for infants < 1500g
- Mortality rate is 13-25%
  - Higher rates in premature infants and those with early fulminant disease

Early Onset

- First 5-7 days of life
- Usually multisystem fulminant illness with prominent respiratory symptoms (probably due to aspiration of infected amniotic fluid)
- High mortality rate
  - 5-20%
- Typically acquired during intrapartum period from maternal genital tract
  - Associated with maternal chorioamnionitis

Late Onset

- May occur as early as 5 days but is most common after the first week of life
- Less association with obstetric complications
- Usually have an identifiable focus
  - Most often meningitis or sepsis
- Acquired from maternal genital tract or human contact

Causative organisms

- Primary sepsis
  - Group B streptococcus
  - Gram-negative enterics (esp. *E. coli*)
  - *Listeria monocytogenes, Staphylococcus*, other streptococci (entercocci), anaerobes, *H. flu*
- Nosocomial sepsis
  - Varies by nursery
  - *Staphylococcus epidermidis, Pseudomonas, Klebsiella, Serratia, Proteus*, and yeast are most common

Risk factors

- Prematurity and low birth weight
- Premature and prolonged rupture of membranes
- Maternal peripartum fever
- Amniotic fluid problems (i.e. mec, chorio)
- Resuscitation at birth, fetal distress
- Multiple gestation
- Invasive procedures
- Galactosemia
- Other factors: sex, race, variations in immune function, hand washing in the NICU

Clinical presentation

- Clinical signs and symptoms are nonspecific
- Differential diagnosis
  - RDS
  - Metabolic disease
  - Hematologic disease
  - CNS disease
  - Cardiac disease
  - Other infectious processes (i.e. TORCH)

- Temperature irregularity (high or low)
- Change in behavior
  - Lethargy, irritability, changes in tone
- Skin changes
  - Poor perfusion, mottling, cyanosis, pallor, petechiae, rashes, jaundice
- Feeding problems
  - Intolerance, vomiting, diarrhea, abdominal distension
- Cardiopulmonary
  - Tachypnea, grunting, flaring, retractions, apnea, tachycardia, hypotension
- Metabolic
  - Hypo or hyperglycemia, metabolic acidosis

Diagnosis

- Cultures
  - Blood
    - Confirms sepsis
    - 94% grow by 48 hours of age
  - Urine
    - Don’t need in infants <24 hours old because UTIs are exceedingly rare in this age group
  - CSF
    - Controversial
    - May be useful in clinically ill newborns or those with positive blood cultures

Treatment

- Antibiotics
  - Primary sepsis: ampicillin and gentamicin
  - Nosocomial sepsis: vancomycin and gentamicin or cefotaxime
  - Change based on culture sensitivities
  - Don’t forget to check levels

Supportive therapy

- Respiratory
  - Oxygen and ventilation as necessary
- Cardiovascular
  - Support blood pressure with volume expanders and/or pressors
- Hematologic
  - Treat DIC with FFP and/or cryo
- CNS
  - Treat seizures with phenobarbital
  - Watch for signs of SIADH (decreased UOP, hyponatremia) and treat with fluid restriction
- Metabolic
  - Treat hypoglycemia/hyperglycemia and metabolic acidosis

Thank you for attention!