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### **SKIN, SOFT TISSUE, AND BONE INFECTIONS**

**Clinical Correlation Series** 



### CONSIDERATIONS IN SKIN AND SOFT TISSUE INFECTION

Localization – layer(s) of tissue involved Localized vs. multifocal; disseminated vs. symmetrical

Acute, (bright red, warm, tender) vs. chronic or subacute (dusky red, indurated older eschar or ulcer along with papules)

Deep involvement, e.g. muscle (pyomyositis, osteomyelitis, panniculitis

Hematogenous vs. exogenous

Host factors, exposures

### GENERAL RULES IN SKIN INFECTION

- Pustules, tender painful papule or nodule with fluctuance pyogenic esp. Staph
- Spreading erythema, painful, recent onset Strep, Pasteurella
- **Bites** cat (Pasteurella), dog (Capnocytophaga), human (Eikenella)
- **Linear nodules** Tularemia, Mycobacterium, Sporothrix, Nocardia
- Vesicles Herpes, Rickettsialpox
- Systemic toxicity, pain out of proportion to appearance Necrotizing fasciitis
- Bullae Vibrio, Capnocytophaga, Campylobacter
- Gangrene Polymicrobial including Clostridia, enteric GNR
- **Eschar** Molds, anthrax, tick borne, septicemia
- **Purpura** Meningococcus, Strep, Staph
- Petechiae Rickettsia, CMV,EBV, HIV (acute)

### INFECTION

#### Finding

- Mastectomy
- Fish Tank
- Fresh water
- Thorn, moss
- Neutropenic, moist area
- Neutropenic, tender nodules
- Splenectomy
- Cirrhosis
- Palms, soles
- Eschar
- Lymphadenopathy

Organism(s) Group A strep M. marinum Aeromonas Sporothrix Pseudomonas Candida Capnocytophaga Vibrio

Syphilis, Rickettsia Molds, anthrax, Rickettsia Bartonella, Tularemia

### **SKIN INFECTION: GEOGRAPHIC FACTORS**

- Lyme disease (Erythema chronicum migrans)
- Blastomycosis (Ulcerated, verrucous, plaques)
- Yersinia pestis (Southwest US)
- Coccidioides (Erythema nodosum)
- Ehrlichia (RMSF-like illness)
- Vibrio, mycobacteria (Gulf coast)
- Leishmania (middle east vets)

# FEVER AND RASH: LIFE THREATENING ASSOCIATIONS

**Petechial lesions** - meningococcal, rickettsial sepsis, TTP\*

Mucosal involvement – Stevens-Johnson syndrome

Bullae – Toxic epidermal necrolysis, Vibrio

**Purpura** – meningococcus, staph, strep, or pneumococus (purpura fulminans)

**Ecthyma gangrenosum** – Gram negative sepsis **Digital infarcts** – Catastrophic APS\*\*, DIC,\*\*\* Capnocytophaga, meningococcus

- \*thrombotic, thrombocytopenic purpura
- \*\*antiphospholipid antibody syndrome
- \*\*\*disseminated intravascular coagulation

### MISCELLANEOUS CLUES TO ETIOLOGY OF SKIN INFECTION

- Urticaria hepatitis B (autoimmune reaction)
- Slapped cheek, sock and glove purpura Parvovirus
- Hemorrhagic pustules Neisseria
- Nail puncture foot Pseudomonas
- Amoxicillin EBV
- ${\rm \circ}$  Chronic severe atopy, severe burns  ${\rm HSV}$
- Intrathoracic or intraabdominal involvement Actinomycosis, TB
- Underlying osteomyelitis S. aureus, Bartonella
- Lung and /or CNS involvement Nocardia, endemic mycoses, mycobacteria

### FEVER AND RASH: IMPORTANT CONSIDERATIONS

- History must include risk factor assessment concurrent diseases, medication, travel, occupational/recreational exposure, animals
- Thorough exam including entire skin area, mucosa, lymph nodes
- Infectious and non infectious diseases can coexist
- Skin biopsy for culture and histology rarely contraindicated
- Acute retroviral syndrome self-inflicted lesions often not considered

### INDICATIONS FOR BIOPSY, FURTHER TESTING PRIOR TO RX FOR FEBRILE RASH

- Chronic or recurrent nature
- Ulceration, induration
- Failure to respond to seemingly appropriate Rx
- Worsening on Rx
- Immunocompromised host, trauma, any factor suggesting non infectious cause
- Concurrent disease elsewhere, where skin biopsy much less risky than other tissue

#### SOME USEFUL TESTS FOR FEVER AND RASH EVALUATION

Test

CXR

Cryptococcal antigen CBC with differential HIV RPR ANA, ANCA Serology for RMSF, Ehrlichia SPEP LFT

Blood culture

Suspected etiology, clinical setting

Mycoplasma, vasculitis AIDS, transplant and fever Drug reaction, parasite Fever, rash, nodes Palm/sole rash Arthralgia, renal disease Petechiae, headache Pyoderma gangrenosum Urticaria, headache, petechia Petechia, toxicity, immunocompromised



### Echthyma – S. aureus



### STREPTOCOCCAL ECTHYMA



### Carbuncle – S. aureus



# Erysipelas



## Anthrax



### **Purpura due to Meningococcus**



## Pyogenic Cellulitis



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### Linear, Nodular Lesions: Sporotrichoid Mycobacteriosis





### **INFECTIONS OF BONE**



### LOCALIZATION OF ACUTE, HEMATOGENOUS OSTEOMYELITIS



Arterial blood flows to blind loop sinusoids

## CLASSIFICATION OF OSTEOMYELITIS

#### Pathophysiologic

Acute vs. chronic Hematogenous vs. contiguous/traumatic

#### **Therapeutically Based**

Medullary Superficial Cortical Localized Diffuse

#### OSTEOMYELI TIS



Source: Skinner HB: Current Diagnosis & Treatment in Orthopedics, 4th Edition: http://www.accessmedicine.com Copyright © The McGraw-Hill Companies, Inc. All rights reserved.

### SYMPTOMS OF OSTEOMYELITIS

Pain – esp. hematogenous (pediatric, vertebral) may be exquisite or vague may signal complication, e.g. spread to epidural space indistinguishable from sickle cell pain crisis

Fever - uncommon

### SIGNS OF OSTEOMYELITIS

- Erythema, edema, necrosis, bullae, crepitance
- Purulence, sinus tract
- Non-healing ulcer: cause or consequence
- Visible bone (decubitus ulcer)
- Non–union of fracture
- Separation of components (joint prosthesis)
- Elevated WBC, platelets, sedimentation rate , normocytic anemia (of chronic disease)
- Radiologic findings

### PATHOPHYSIOLOGY OF OSTEOMYELITIS

- Hematogenous anatomically abnormal bone, prostheses, metaphyses ,vertebral end plate have either increased blood flow a nidus for infection
- Contiguous loss of soft tissue barrier, direct trauma
- MSCRAMM microbial surface components that recognize adhesive matrix molecules
- Bacteria adherent to devitalized bone much more resistant to antibiotics

### ETIOLOGIES OF OSTEOMYELITIS

- Acute S. aureus; Salmonella with sickle disease
- Contiguous skin flora; polymicrobial (fecal flora for decubiti, staph strep, anaerobes for diabetes)
- Immunocompromised mycobacteria, fungi, pseudomonas
- Prostheses related Coagulase positive and negative staph, diphtheroids
- Vertebral S. aureus, tuberculosis, endocarditis pathogens

### SEQUESTRUM OF CHRONIC OSTEOMYELITIS



#### Devitalized bone

### MEDULLARRY (HEMATOGENOUS) OSYEOMYELITIS



Resorbed bone adjacent to growth plate <

### OSTEBLASTIC RESPONSE TO CHRONIC OSTEOMYELITIS



Hyperdense calcification (involucrum)

### MR imaging for osteomyelitis



### VERTEBRAL OSTEOMYELITIS WITH EPIDURAL COMPRESSION



Source: Fauci AS, Kasper DL, Braunwald E, Hauser SL, Longo DL, Jameson JL, Loscalzo J: Harrison's Principles of Internal Medicine, 17th Edition: http://www.accessmedicine.com

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### DIABETIC FOOT ULCER -OSTEOMYELITIS



### DIAGNOSTIC PITFALLS IN OSTEOMYELITIS

- Imaging may lag in acute settings
- Imaging may distinguish post surgical or traumatic changes
- Cultures may reflect surface contaminants
- Biopsy may yield sampling error
- Nuclear studies may reflect sterile inflammation due to adjacent soft tissue
- Neuropathy, decubiti may mask pain
- Generally, MR most sensitive, x-rays lag 2 or more weeks behind, negative nuclear studies helpful

### **RX OF OSTEOMYELITIS**

- Hematogenous often cured with antibiotic alone
- Chronic types esp if cortical or diffuse, prosthesis related, non-union fracture, diabetes related need debridement
- Polymicrobial consideration for trauma, contiguous etiology
- Usually 6 weeks IV Rx, followed by weeks to months oral agent

# **MUSCLE INFECTION**

- Quite rare in absence of trauma, ischemia
- S. aureus pyomyositis HIV related in U.S., no obvious risk in tropics
- Psoas abscess relatively common complication of vertebral osteomyelitis (TB, S.aureus)
- Parasites trichinosis
- Viral influenzae B, but not clinically significant
- Clostridia part of fulminant septic picture in setting of underlying malignancy

### **PSOAS ABSCESS**



