Dermatology Lecture: 6

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**BACTERIAL SKIN INFECTIONS**

### 1-IMPETIGO

Impetigo is a highly contagious gram-positive bacterial infection of the superficial layers of the epidermis.

**I-Pathophysiology**

- **Causative Organism**: Impetigo is caused by *Staphylococcus aureus* and group A beta-hemolytic streptococci (GABHS). GABHS is also known as *Streptococcus pyogenes*. Both organisms may be present at the same time in the affected site.
- **Methicillin-resistant *S. aureus*** (MRSA), which can be hospital or community acquired, is observed more commonly with the non-bullous form of impetigo.
- Traditional antibiotic treatment may not be effective if the patient is MRSA positive.
- **Exacerbating factors** are poor hygiene, moist climates, crowding, and cutaneous conditions (e.g., varicella, scabies, insect bites), create an environment conductive to bacterial infection.

**II-Clinical Picture**

- **1-Bullous impetigo** physical findings:
  - Bullous impetigo begins as a rapid onset of blisters that enlarge and rupture. A crust (golden yellow) develops which, if removed, reveals a moist red base.
- **2-Nonbullous impetigo** physical findings:
  - Non-bullous impetigo begins with a single erythematous macule that rapidly evolves into a vesicle or pustule and ruptures, leaving a crusted yellow exudate over the erosion.

**III-Complications**

- Streptococcal impetigo may lead to poststreptococcal glomerulonephritis 2-5% → due to allergy to bacterial antigen, lower limb edema and may be hypertension.
  - Systemic Ab
  - Allergy to bacterial antigen
- Resolution occurs in many cases but it is the precursor of chronic renal diseases.
IV-Treatment

A-Topical Treatment

1-Antibacterial soap:
- Gentle debridement of lesional crusts using antibacterial soap is recommended.

2-Antibacterial washes:
- Good hygiene with antibacterial washes, such as chlorhexidine or betadine (Iodine), may prevent the spread of impetigo.
  
  - Mesh biyātkūt al-jāhām ʿulshān bi-ʾībīl → betadine
  - (wahhāna ʿāsāla ʿinda hāna)

  - Mesh biyātkūt al-jāhām ʿulshān bi-ʾībīl → non healing wounds

  - طيب نسيب الجرح مفتوح ولا نفلقه ؟! أو عي تخلي الجرح مفتوح لازم تقفله عشان نزود الـ fibroblast & hydration
  - ↑ in hydrated wound

3-Topical antibiotics:
- are used in patients with small or few lesions, applied to affected areas twice or thrice daily for 7-10 days.

  - لو في pus لازم ab
  - fibroblast & hydration
  - ↑ in hydrated wound

- The advantages of topical antibiotics include low risk of systemic adverse events, higher concentration of the antibiotic when applied to the affected area, smaller amount of drug is used, lack of effect on intestinal florae, and low cost,
- while the disadvantages include the potential production of irritant and allergic contact dermatitis, decreased penetration in the affected area, potential rapid appearance of bacterial resistance, potential alteration of cutaneous florae, and potential systemic absorption and consequent toxic effects.
- i-Mupirocin ointment used for both the lesions and to clear chronic nasal carriers. Drug of choice for localized disease; inhibits bacterial growth by inhibiting RNA and protein synthesis.
  - It has been shown to be superior to topical polymyxin B and neomycin.
- ii-Topical sodium fusidate (fusidic acid), high resistance rates have been reported with the use of fusidic acid, ranging from 32.5-50%.
  - مطرب نسيب الجرح مفتوح ولا نفلقه ؟! أو عي تخلي الجرح مفتوح لازم تقفله عشان نزود الـ fibroblast & hydration
  - ↑ in hydrated wound
  - resistance
- iii-Gentamicin ointment or cream, its use is precluded by the potential development of ear and kidney toxicity.
- iv-Bacitracin is no longer the preferred topical antibiotic because it causes frequent **allergic skin reactions.
- Topical tetracycline, topical erythromycin & topical clindamycin → not effective against staph & strept → used only in acne
- N.B. : the best Ab for ttt of drug allergy is IVIG → dose 2g/kg for 5 days

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**B-Oral Antibiotics:** ***essential in children to prevent complication**

(glomerulonephritis)

Oral antibiotics remain appropriate for many patients with impetigo. For empiric antibiotic therapy, a cephalosporin, semisynthetic penicillin, or beta-lactam/beta-lactamase inhibitor is recommended.

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### 1 - Beta-Lactams

- The beta-lactam antibiotics (penicillins, penems, carbapenems, monobactams, cephalosporins, oxycephams, and oxa-beta-lactams) act by binding reversibly to the penicillin binding proteins (carboxypeptidases, endopeptidases, and transpeptidases). This inhibition of the cell wall synthesis is dependent on active replication of the bacteria.
- Resistance to the beta-lactams has been primarily through the production of beta-lactamase enzymes that hydrolyze the beta-lactam ring. More recently, there has been an increase in resistance to the beta-lactams by modification of the penicillin binding proteins. This process is chromosomally mediated and is not rapidly disseminated from organism to organism but is the process by which Staphylococcus has become resistant to methicillin. Fortunately, S. pyogenes has not become resistant to penicillin to date, which makes penicillin the drug of choice for treating skin infections secondary to the group A beta-hemolytic streptococci.
- Beta-lactam antibiotics have many properties in common. They are among the least toxic and best tolerated antibiotics used today. Their pharmacokinetics are generally similar, with short half-lives and primary renal clearance.

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### 2 - Cephalosporins: Cephalexin (Keflex)

- **First-generation cephalosporin that arrests bacterial growth by inhibiting bacterial cell wall synthesis.**
- **Bactericidal activity against rapidly growing organisms.**
- **Primary activity against skin flora; used for skin infections or prophylaxis in minor procedures.**
- **Dose:** 500 mg orally twice daily 7-14 days; not to exceed 4 g/d.

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### 1-Lincosamides: Dicloxacillin (Dycill, Dynapen)

- **Treatment of infections caused by penicillinase-producing staphylococci.**
- **May use to initiate therapy when staphylococcal infection is suggested. 125-500 mg orally/6 hours**
- **Probenecid may increase effect of penicillins; tetracyclines may decrease effect of penicillins with concurrent use.**
- **Caution in patients with renal insufficiency.**

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### 3-Beta-Lactam/Beta-Lactamase Inhibitor (Amoxicillin/Clavulanate) or (Amoxicillin/Sulbactam):

- **No Halla** resistant

- **Gram –ve bacteria → aminoglycoside (clindamycin, (gentamycin SE: nephrotoxicity) or (streptomycin SE: ototoxicity)**
- **This combination results in an antibiotic with an increased spectrum of action and restored efficacy against amoxicillin-resistant bacteria that produce 13-lactainase.**
- **Dose:** 500/125 every 8-12 hours for 7 days.
- **Side-effects:** Diarrhea, vomiting, thrush

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**Anerobes → flagyl (metronidazole)**

**Pseudomonas → Pipracillin**
MRSA INFECTION

* MRSA should be suspected in cases of spontaneous abscess or cellulitis and in lesions that do not resolve with traditional antimicrobial therapy.
* If bacterial cultures reveal MRSA alternative antibiotics should be considered. These include ***vancomycin in a dose*** *(adults: 30 mg/kg/day in two divided doses IV; children: 40 mg/kg/day in four divided doses IV).*
* **Linezolid → ORAL**: a bacteriostatic antibiotic with no cross-resistance with other antibiotic classes.
* Linezolid should be dosed 600 mg Q12h IV or 600 mg Q12h PO for adults and 10 mg/kg Q12h IV or PO for children.
* **SE of linzolide**: thrombocytopenia (↓ platelets count)
* **Folate Inhibitors: Trimethoprim - sulfamethoxazole**
  * Selectively inhibits bacterial dihydrofolate reductase. Has good susceptibility against community-acquired MRSA but is not effective against *S pyogenes*.
  * Dose: 160/800mg Double Strength tab orally twice/day for 10 d. Precautions: Inhibits hepatic metabolism of other drugs (use with caution with warfarin and other drugs metabolized by the liver).
ERYSIPELAS (STREPTOCOCCAL CELLULITIS or SUPERFACIAL CELLULITIS)

I. Pathophysiology

- Caused by Beta-hemolytic streptococci or staph, by inoculation in skin and dissection of infection along tissue planes.
- It occurs more with patients with chronic lymphedema.

II- Clinical Picture

- Erythematous, swollen, tender, sharply marginated area with active advancing borders. Induration is common.
- Blister are possible.
- Acute onset.
- Malaise, fever (rare in cellulite, common in erysipelas), leukocytosis and hymphadenitis.
- Chronic lymphedema is a possible result from recurrent episodes.

III-Systemic Therapy

- 1-Systemic penicillin: 1gm daily for 10 days, or erythromycin.

IV-Resistant streptococcal cellulitis:

- 1- Rifampin & dicloxacillin
- 2- Prophylactic benzathin-penicillin
- 3- Prophylactic erythromycin

CELLULITIS

Bacterial infection of S.C fats

More common in diabetics

1. Suppurative inflammation involving the subcutaneous tissue
2. Causative Organism: streptococcus pyogens, staph and other.
3. Usually some type of discernible wound is the entry point
4. Often mild erythema, tenderness, malaise, chills and fever.
5. Aggressive antibiotic therapy.

NB: Abbreviations used in prescriptions: PO: orally; q.a.m.: every morning; q.d.: daily; q.h.s.: at bedtime; q.i.d.: four times daily; q.o.d.: every other day; q.o.h.s: every other night at bedtime; t.i.d.: three times daily.

***Intravenous antibiotic:***

- **Rifampin**
- **dicloxacillin**
- **benzathin-penicillin**
- **erythromycin**

***Hospitalization and IV therapy are indicated if the infection is spreading rapidly, if the patient has systemic symptoms, or if other significant coexisting conditions like immunosuppression, neutropenia, aspienia, preexisting edema, cirrhosis., cardiac failure, or renal insufficiency are present.

Initial treatment may include ceftriaxone 1 g IV Q24H, cefazolin 1 g IV Q6-8H, nafcillin 1-1.5 g IV Q4-6H, or cefazolin 2 g IV Q24H plus probenecid 1 g PO daily.

Once the patient is afebrile and skin findings have begun to resolve (generally after 3-5 days of IV therapy), patients may be switched to oral therapy with one of the following regimens: dicloxacillin 0.5 g Q6H, cephradine 0.5 g Q6H, cephalxin 0.5 g Q6H, or cefadroxil 0.5-1 g Q12-24H.