Infections in diabetes

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Diabetes

- International Diabetic Federation revealed statistics that India has the largest number of diabetes in the world (40.9 million).
- In a few years 80% of the world's diabetics will be in India

Infections in diabetes

- Studies comparing diabetics with non-diabetics reveal that
- About 46% of diabetics vs 38% non-diabetics had at least 1 hospitalization or OP visit for infections (RR=1.21)
- The risk ratio for ID related hospitalization was 2.17and 1.92 for death attributable to infection

Infections in diabetes

Common in diabetics

- Pneumonias and tuberculosis
- Pyelonephritis, cystitis, perinephric abscess
- Soft tissue infections including diabetic foot & osteomyelitis
- Necrotizing fasciitis
- Mucocutaneous candidiasis

Exclusively in diabetics

- Invasive (malignant) otitis externa
- Rhinocerebral mucormycosis
- Emphysematous infections(pyelonephritis &cholecystitis)

Infections in diabetes

- Cause considerable mortality and morbidity
- Cause metabolic derangements and conversely metabolic derangements can facilitate infection

Immune defects in diabetes

- Neutrophil function is depressed affecting adherence to endothelium, chemotaxis and phagocytosis
- Cell mediated immunity is probably depressed
- Antioxidant systems involved in bactericidal activity may be compromised
- These impairments are exacerbated by hyperglycemia and acidemia but also reversed by normalization of glucose and pH levels

Zygomycosis in diabetes

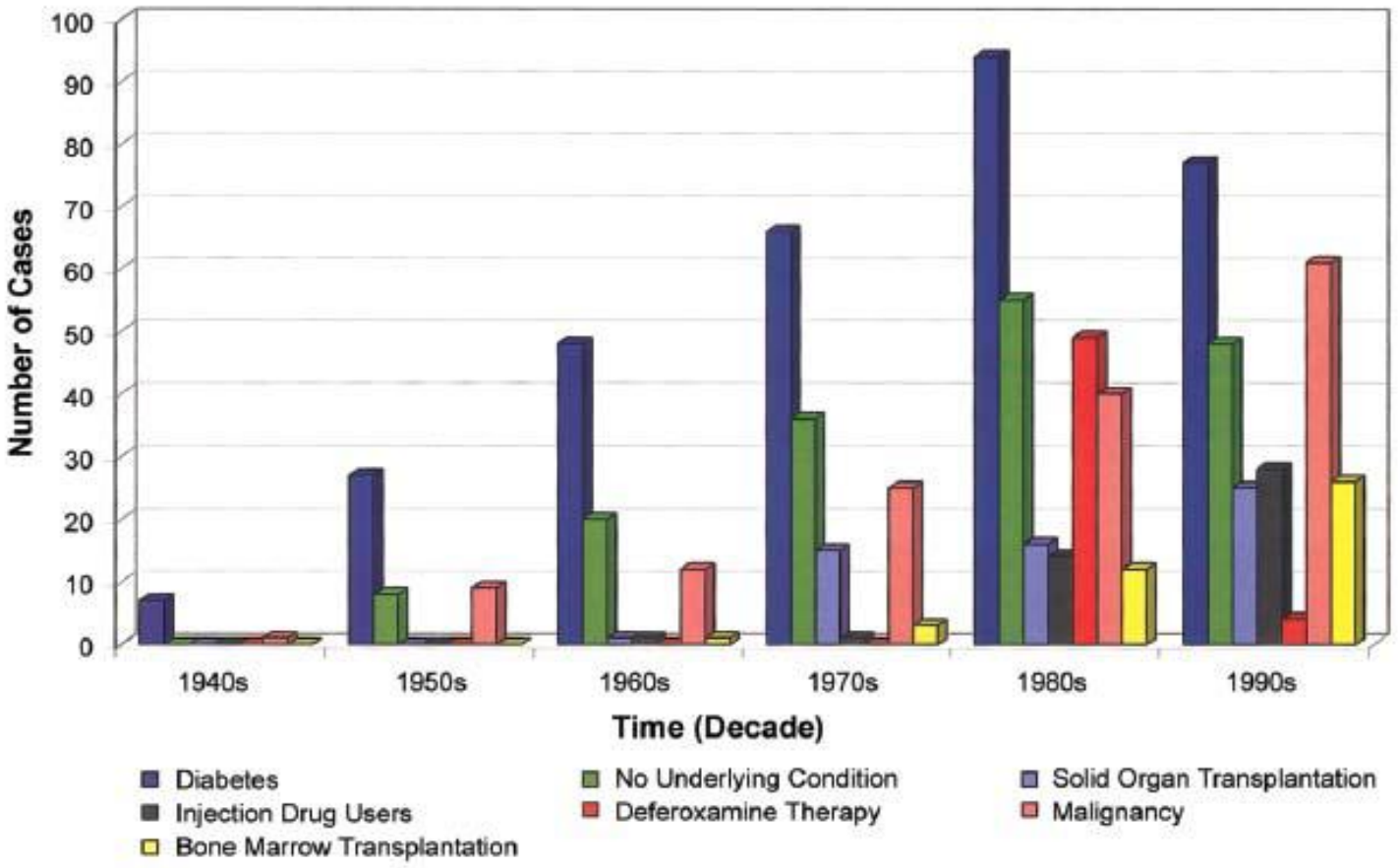


Figure 1. Incidences of zygomycosis over 6 decades (1940–1999), by host population

CID 2005;41:634-653

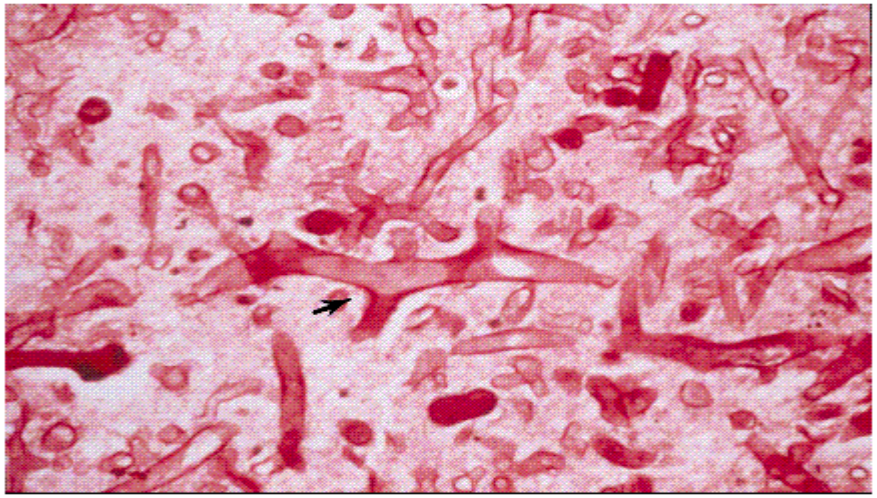
Specific infections-rhinocerebral mucormycosis

- Fungal infection caused by order of mucorales (mucor, rhizopus, absidia)
- Usually seen in diabetic ketoacidosis
- Fungus inhaled into paranasal sinuses, germinates and invades palate, sphenoid, cavernous sinus, orbit, brain.
- Neurological deficits occur when fungus involves vessels
- Proptosis, visual loss opthalmoplegia, cr nerve palsies occur

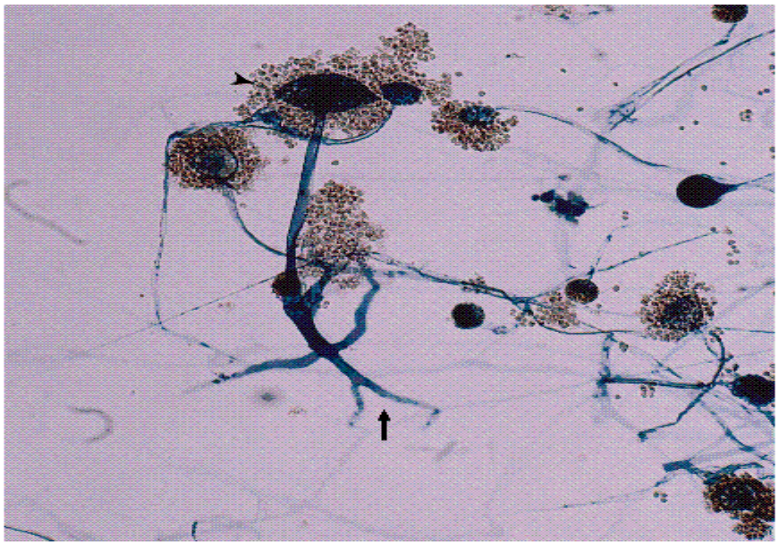
NEJM 1995;333:564

- Imaging by CT or MRI can confirm diagnosis
- Biopsies, scrapings or discharge stained with KOH can show broad aseptate branching hyphae
- Fungal culture like SDA shows sporangia and rhizoids

CT Scan of brain



Biopsy



Fungal culture in SDA

NEJM 1995; 333:564

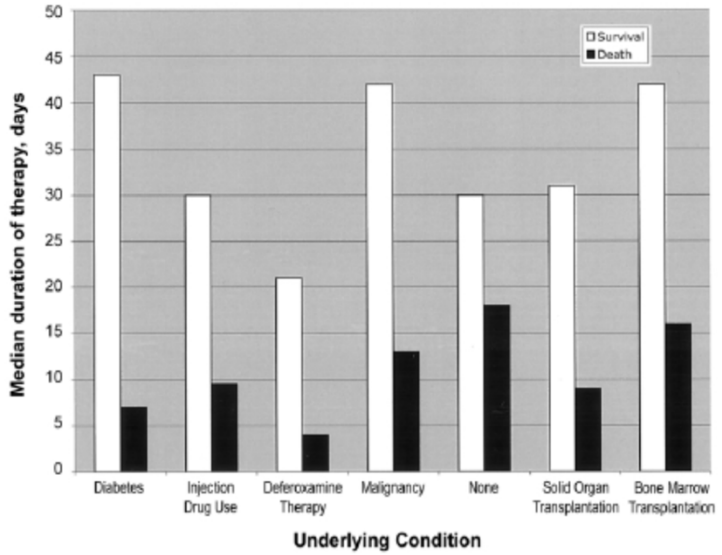
Treatment

- Mainstay of treatment is surgery
- Adjunctive treatment with high dose of amphotericin 1-1.5mg /kg/day
- Total dose=2.5-3g
- Other option is posaconazole 400 mg BD
- Cure dependent on clinical, radiological resolution, negative cultures and biopsies with recovery from immunosuppression
- Mortality is 20% despite therapy

CID 2005;41:634-653

Table 5. Treatment administered to 929 patients with zygomycosis, 425 of whom survived.

Treatment	No. (%) of all patients	No. of patients who survived/total no. who received the treatment (%)
Amphotericin B formulation		
Deoxycholate	532 (57)	324/532 (61)
Lipid	116 (12)	80/116 (69)
Itraconazole, ketoconazole, or posaconazole	15 (2)	10/15 (67)
No antifungal therapy	333 (36)	59/333 (18)
Surgery alone	90 (10)	51/90 (57)
Surgery and antifungal chemotherapy	470 (51)	328/470 (70)
Hyperbaric oxygen	44 (5)	28/44 (64)
Granulocyte colony-stimulating factor	18 (2)	15/18 (83)
Granulocyte transfusion	7 (1)	2/7 (29)
None	241 (26)	8/241 (3)



Median duration of polyene therapy for patients with zygomycosis who survived or who died, by host population

Invasive(malignant)otitis externa

- 90% of patients with this are diabetic
- Risk factors are poor glucose control, swimming, old age, hearing aid use, ear irrigation with unsterile water
- Pseudomonas aeruginosa is the pathogen most often
- Persistent external otitis, ear pain, extensive granulation tissue in the ear canal, radiological evidence of erosion of the canal

Diagnosis and treatment

- Intracranial extension into temporal bone with involvement of facial nerve, TM joint, mastoid air cells, base of skull, sigmoid sinus or the meninges
- Diagnosis: MRI with gadolinium, CT scans, gallium or technetium scans
- Management: surgical debridement of necrotic tissue and deep tissue biopsy for cultures
- Antipseudomonal therapy for long duration

Otolaryngology:Head and neck surgery 2005;133:121-125

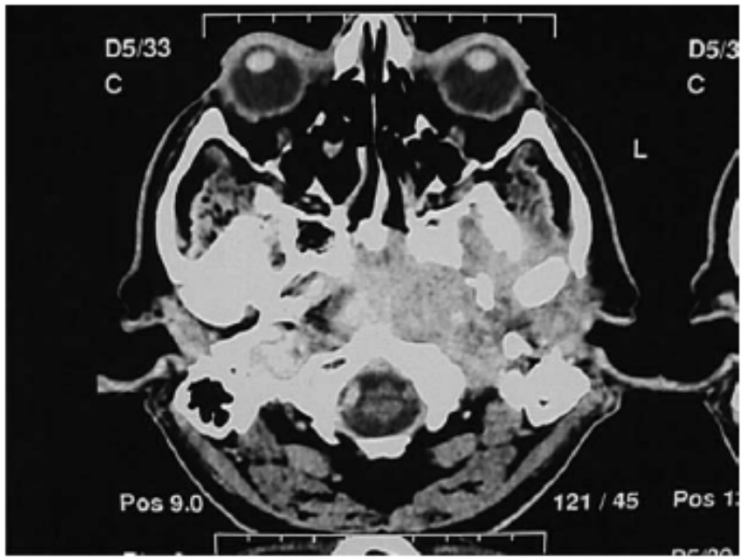


Figure 1 Case 1. A large patchy lesion in the left skull base with erosion of clivus, left petrous apex area and bulge in the nasopharynx. The lesion in left skull base mimics malignancy.

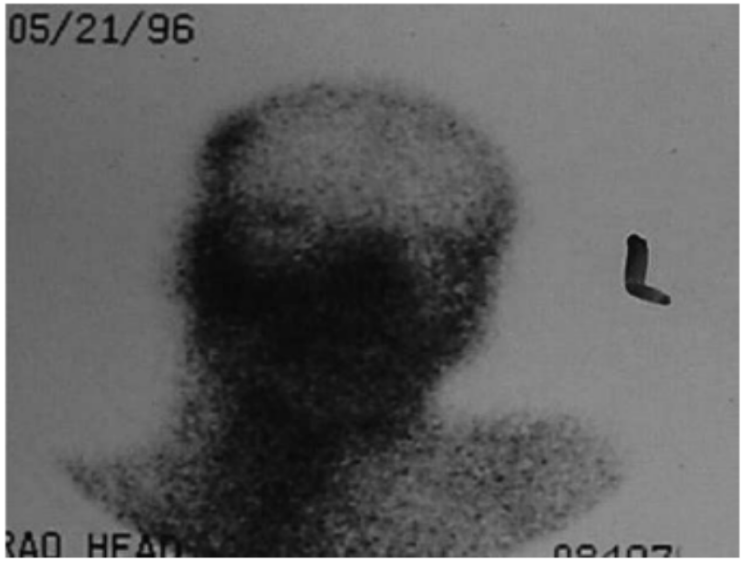


Figure 4 Case 2. Ga 67 scintigraphy shows increased uptake on the right mastoid, skull base, and lateral sinus suggestive of associated right skull base osteomyelitis with lateral sinus thrombophlebitis.

Periodontitis

- Risk of oral infections in diabetics is two to four times the risk in non-diabetics
- Leads to tooth loss and decreased nutrition

Pulmonary infections

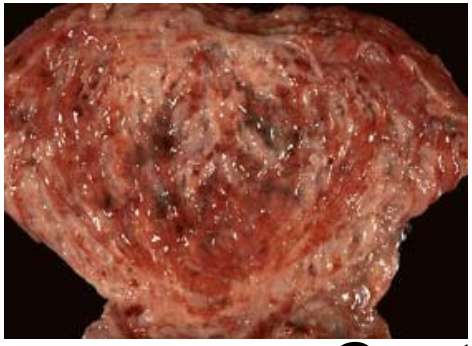
- Increased frequency for infections caused by *Staphylococcus aureus*, gram negative organisms, *Mycobacterium tuberculosis*
- Diabetics are 3 times more likely to colonize S.aureus in their nasopharynx. They are also colonized with gram negative bugs at times
- Diabetics with pneumococcal pneumonia are more likely to be bacteremic or die from it (OR=1.3)
- It is recommended that diabetics receive the pneumococcal vaccine & annual “flu” vaccine
- Treatment regimes remain same as for non-diabetics

TB and diabetics

- Significant associations between diabetes and active TB among Caucasians (OR=1.3), Hispanics (OR=2.95)
- Relative risk of developing active disease 2-4 times that of general population
- ATS recommends that preventive chemotherapy be given to diabetics who have a TST $\geq$ 10mm and no active disease
- An increase in dose of sulfonylureas may be needed if rifampicin is co-administered
- Treatment is the same. Bacteriological conversion and relapse rates are same as non-diabetics

Urinary tract infections

- Asymptomatic bacteriuria (ASB): defined as > 10^5 CFU/ml of urine
- It is 3 times more common among diabetic than non-diabetic women
- No difference in development of symptomatic UTI or hospitalization or time to onset of symptoms
- Hence ASB in diabetics need not be treated



Symptomatic bacteriuria

Cystitis

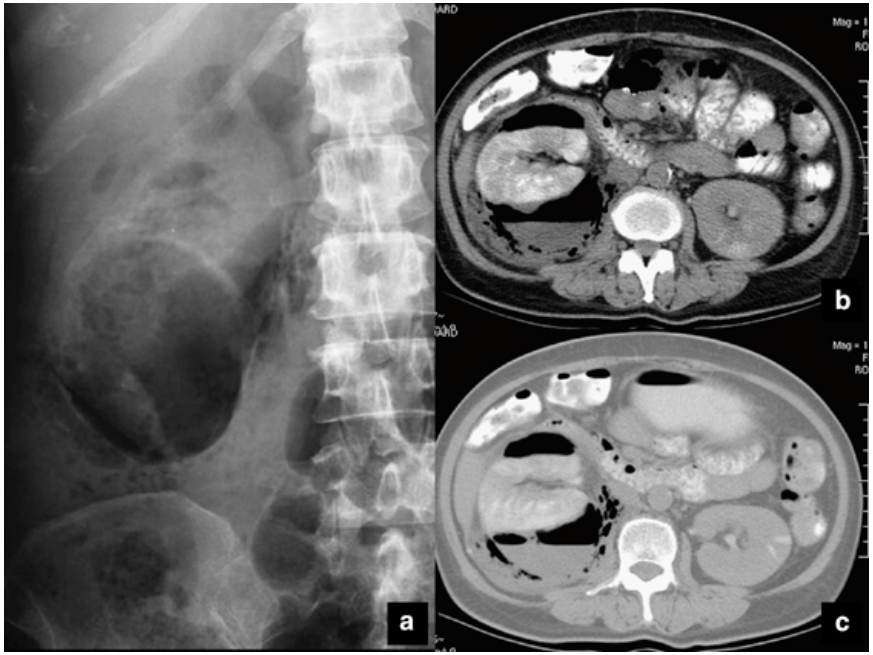
- Dysuria, frequency, suprapubic pain
- Bacteriology ~ to ASB
- High incidence of unsuspected upper UTI hence treatment is 7-14 days in a diabetic
- Emphysematous cystitis can rarely occur. Symptoms are hematuria, pneumaturia and chronic abdominal pain

Pyelonephritis

- 4-5 times more common in diabetics and bilateral
- Presents with fever with chills and flank pain
- If symptoms do not subside by the 5th day search for complications
- ↑ risk of complications such as renal or perinephric abscess, emphysematous pyelonephritis or renal papillary necrosis

Emphysematous pyelonephritis

- Exclusively seen in diabetics (70-90%)
- Severe acute multifocal nephritis
- E.coli most common followed by enterobacter, klebsiella, proteus, streptococcus and candida
- Risk factors: women, obstruction
- Clinically flank mass and crepitus in abdomen or thigh
- Gas in plain films 85% of the time
- CT scan is the test of choice
- Mortality is high 60-80% with conservative treatment alone

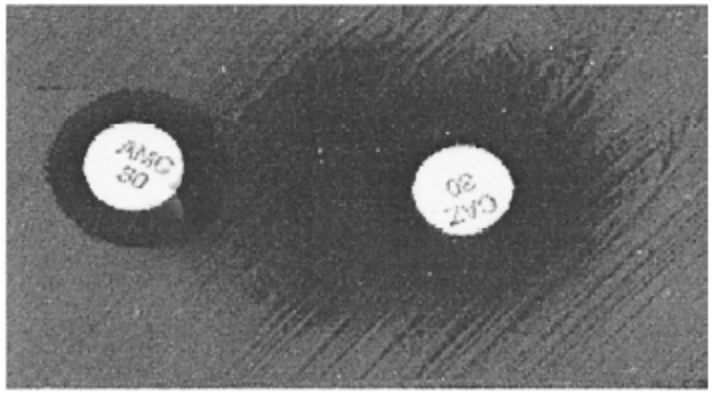


- Treatment is medical therapy with percutaneous drainage
- Nephrectomy may be indicated in some
- Risk factors for mortality are thrombocytopenia, shock, renal failure requiring hemodialysis and altered sensorium

www.nature.com

ESBL producing bacteria causing UTIs

- Extended spectrum β lactamases are produced by gram negative bacteria (E.coli, klebsiella)
- These are resistant to 3rd and 4th generation cephalosporins
- Best effective and reliable option is carbapenems which are highly resistant to the hydrolytic activity of these enzymes
- Ertapenem 1g IV OD may be given if not pseudomonas



Any organism that is confirmed for ESBL production according to CLSI criteria should be reported as **resistant** to **ALL expanded-spectrum β-lactam antibiotics (penicillins, cephalosporins, and aztreonam),** regardless of in-vitro susceptibility test result

Emphysematous cholecystitis

- Uncommon and serious biliary infection
- Risk factors are diabetes, male, GB surgery during active biliary infection, gall stones
- Abdominal crepitus may be present
- Polymicrobial (gram neg &anaerobes)
- Plain films or CT show gas
- Often complicated by GB gangrene or perforation
- Mortality 15-25%

Emphysematous Cholecystitis

- Treatment of choice is rapid removal of GB and broad spectrum antibiotic therapy

er119test.blogspot.com/2007/09/emphysematous

Enteric pathogens

- Diabetes often causes autonomic neuropathy and hence dysmotility syndromes (esophageal, gastric, colonic)
- Salmonella enteritidis 3x higher
- Campylobacter 4x higher
- Listeriosis acquired thro' GI tract causes bacteremia and meningitis. Higher mortality in diabetics

Skin and soft tissue infections

- More skin infections as compared to non-diabetics
- Sensory neuropathy, atherosclerotic vascular disease and hyperglycemia all predispose patients to SSTIs
- Blood glucose levels > 250mg/dL is a risk factor
- Other risk factors include dry skin, past cellulitis, edema, peripheral vascular disease, tinea

Intertrigo

- Inflammation involving two closely apposed surfaces
- Candidal or occasionally bacterial or viral
- Weeping red patches

Or plaques with papules

- Dx: KOH
- Rx: miconazole, clotrimazole, ketoconazole

Dermatophyte infections

- Epidermophyton, trichophyton,microsporum
- Named by location
- Diagnosis is by KOH
- Rx: If scalp- 6 wks of terbinafine 250mg OD
- Others: topical antifungals

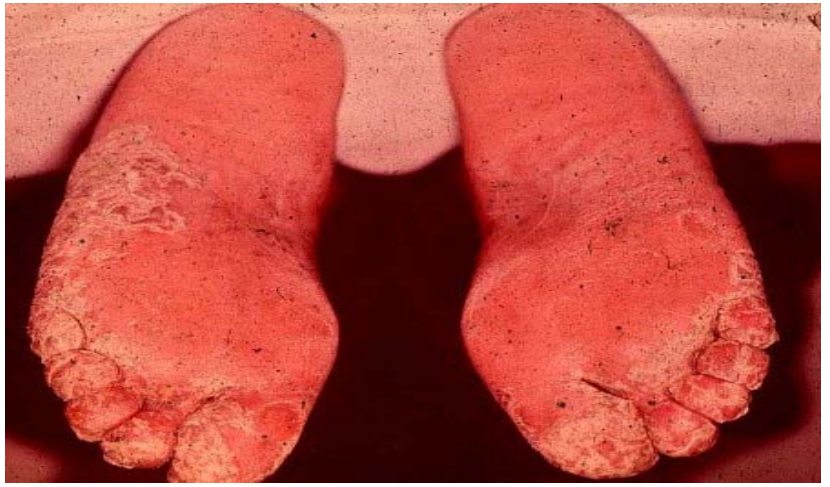


FIGURE 7.—*Trichophyton rubrum* infection on the waist of a Vietnamese infantryman. *T. rubrum* was by far the most common cause of ringworm infections in Vietnamese. The organism was morphologically distinct from strains prevalent in America and Europe and was heavily sporulating on initial culture. (Allen, A. M., and Taplin, D.: J.A.M.A. 226: 864–867, 19 Nov. 1973.)

Pyomyositis

- Bacterial infection of the skeletal muscle
- Common in diabetes
- Commonest organism is S.Aureus
- Surgical drainage along with antistaphylococcal antibiotics

Synergistic necrotizing cellulitis

- Seen in diabetics
- Necrotizing fascitis with involvement of underlying muscles
- Skin, muscle, fat, fascia are infiltrated
- Usually involves perineum and lower limb
- Present with severely painful soft tissues with necrosis and ulcers draining discolored foul smelling fluid
- Gram negatives and anaerobes
- Surgical debridement is an emergency along with broad spectrum Abx like Piperacillin Tazobactam with clindamycin

Fournier's gangrene

- Necrotizing fascitis of the male genitalia
- 40-60% of patients have diabetes
- Predisposing genito-urinary and colorectal pathologies
- Scrotal discomfort erythema, edema, skin necrosis
- Spreads to abdominal wall, buttocks and thighs
- Polymicrobial with gram negatives, clostridium, aerobic and anaerobic streptococci, bacteroides

- Mortality 20-35% despite appropriate therapy

Diabetic foot infections

- Clinically apparent neuropathy is present in 25% of the diabetics
- 35-40% of diabetics with foot ulcers will need amputation in 3 years
- Risk factors: Friction from ill fitting shoes cause blisters and ulcers- neuropathy, skin breakdown due to dermatophyte infections or paronychia

- Divided into (a) Non limb threatening (b) Limb threatening

- Mild: superficial infection with less than 2 cm of cellulitis, no ischemia, systemic toxicity or bone/joint involvement
- Serious:Full thickness ulceration with > 2 cm cellulitis with ischemia/systemic toxicity/bone or joint involvement

- Two features suggest osteomyelitis- size and depth of ulcer (see bone thro' it) and an ESR> 70mm/hr

Diagnosis

- If ulcer > 2cm & deep with a +ve probe to bone test the sens, spec, PPV for osteomyelitis is 66%, 85% and 89%
- When detected on a plain X-ray 40-70% bone is lost
- Tc scanning or In leukocyte or MRI (sens 99% & spec 83%)

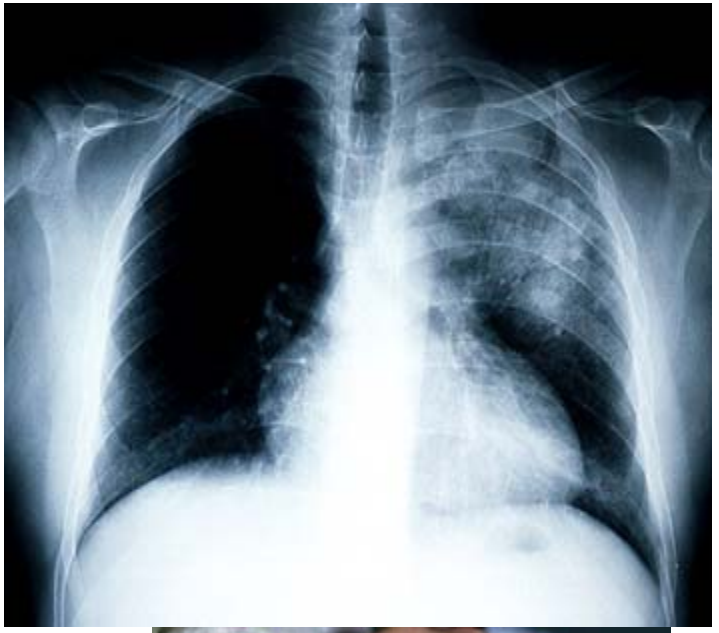
Management

- If mild- Staph or strep. Rx with Cephalexin, clindamycin, augmentin for 7-14 days
- Rest followed by xray at 2 weeks to detect occult osteomyelitis
- If osteomyelitis med-surg combined treatment is required
- If severe- S.aureus, Gr A strep, gram –ve bacilli (incl Pseudomonas), anaerobes
- Antibiotics should be given based on deep surgical specimens

Melioidosis

- Spread by inhalation, percutaneous inoculation
- Diabetes, alcohol consumption, chronic renal failure, chronic lung disease, kava consumption,thalassemias, malignancies
- Acute (88%) and chronic presentation (12%)
- Septicemic and localized
- Pneumonia, skin abscesses,genitourinary, arthritis or osteomyelitis

- Intensive phase and eradication phases
- Ceftazidime/penems followed by doxycycline



Prevention

- Foot care
- Wear shoes and socks to avoid bumps
- Check for blisters, cuts, scrapes, sores
- Oils/moisturizing lotions to avoid ulcerations that can migrate to the bloodstream
- Good urinary hygiene
- Prompt emptying of the bladder after intercourse
- Toilet hygiene and ample fluid intake
- Avoid spermicides and douches
- Consumption of yoghurt containing acidophilus

Worrying symptoms

- Foul smelling vaginal discharge
- Dysuria, painful urination
- Fever
- Painful swallowing
- Changes in bowel habits
- Warmth or redness at the site of a scrape or cut
- Or at surgical sites

Thank you