

## **Vesalius SCALpel™ : Infection/antibiotics**

SIRS: df: two or more of: T < 36C, >38, P > 90, RR > 20 or PCO<sub>2</sub> < 32, WBC > 12 or < 4 or >10% bands

systemic effects of locally released cytokines (TNF-> IL1, 2, 6)

infection, injury triggers cytokine release

TNF & IL1 pyrogens, increase vascular permeability, activate coagulation, diffuse endovascular injury -> organ failure

IL6 related to macrophage, WBC increase

MODS (multiple organ dysfunction syndrome): SIRS + organ dysfunction

Sepsis df: SIRS in response to documented infection

Severe sepsis: sepsis + organ dysfunction, hypoperfusion (lactic acidosis, oliguria, change mental status), 40% mort

Septic shock: severe sepsis, hypotension despite adequate resuscitation, perfusion abnormalities including lactic acidosis, oliguria, acute change in mental status

(activated protein C/drotrecogin alpha can moderate SIRS response and MODS if given before episode, but can't predict. promotes fibrinolysis, inhibits thrombosis & inflammation. can cause severe bleeding. Future potential?)

## **Glucose control**

ideal range: 80-120

counterregulatory hormones in stress elevate glucose

catechols, cortisol, glucagons, growth hormone (GH), cytokines (IL1, 2, 6, TNF)

insulin resistance, TPN also factors in hyperglycemia

increased glucose decreases G6DP which decreases superoxide release from WBCs

resulting in decreased bacteriocidal activity (does not affect T cells)

(no benefit to supernormal O<sub>2</sub>, may increase abd compart press)

cortisone if associated adrenal insufficiency

## **Risk factors for surgical site infections**

SENIC (& CDC NNIS) point scale includes co-morbidities on old system of clean, clean-contam etc. : abdominal op, >2h, contaminated or dirty, 3 or more medical Dx, ASA category III or higher, operation longer than the standard time (not going well), hypothermia, low O<sub>2</sub>, hyperglycemia

## **Antibiotic prophylaxis**

(1h before, up to 24h post; after 24h therapeutic, not prophylactic)

ID pts at risk or in whom infection carries a high risk

give within 30min-1h before incision so peak at skin incision (2h prior, 1h after start no benefit)

repeat at 1/2 typical dosing interval (IV dilution, fluid shifts, losses) (eg cephazolin Q8, redose @ 4)

cephalosporin: most useful, skin flora, 1<sup>st</sup> gen

2<sup>nd</sup> generation: (cephotetan, ceftioxin): biliary, colorectal, GYN  
beta lactam allergy use vanc (delivery over 1h), clinda  
(selective gut decontamination not effective, radical peritoneal debridement not useful,  
immunoglobulin experimental)

## Treatment principles

control source, drain only localized abscess, irrigate and fully drain (does not spread infect,  
but impedes WBC migration to infection site, decreases localized inflammatory  
response)

empiric coverage: extended spectrum cephalosporin & vanc  
cephtriaxime, cefotaxime

imipenim & piperacillin/tobramycin: Gm- and anaerobic coverage

aminoglycosides: nephrotoxic, replaced by third generation cephalosporins

quinolones (cipro) broad Gm+: Achilles rupture, cartilage defect in child

MRSA: vanc, linezolid

left vent assist device common infection, most Gm+

endocarditis prophylaxis for: prosthetic valve, prior Hx, complex ht. disease

advanced HIV (CD4 < 100) prone to cerebral toxoplasmosis

progression of HIV: viral load > 30K; CD4 (normal 800-1200) decreasing from 600  
to 200 (opportunistic infection level)

> 1 organism in urine sample probably contaminated specimen

open packing to prevent abdominal compartment syndrome

peritonitis: broad spectrum empiric antibiotic coverage before culture, including anaerobic  
(choice rarely needs to be changed after culture results)

mild-moderate: ceftioxin, cephotetan, ticarcillin/clavulinate, ertapenem, clindamycin +  
monobactam (aztreonam)

severe: broad spectrum carbapenem (imipenem, meropenem) or triple combo: penicillin  
(Gm+), aminoglycoside (Gm-), flagyl/clinda (anaerobic)

few STDs present with inguinal adenopathy: LGV, syph, granuloma inguinale, chancroid,  
herpes simplex

pneumonia most common infection after multiple trauma

duration:

prolonged duration often not necessary; after afebrile, normal WBC without shift, rare flare  
up after stopping regardless of day (80% still febrile and elevated WBC at end of  
course of antibiotic will develop further infection, 30% if only WBC is elevated)

tertiary peritonitis: after treatment of secondary peritonitis: unusual opportunistic pathogens: candida,  
enterococcus, s. epidermidis; poor response to Rx, marker for mortality

## Fungal infection

colonization common in ICU, infection less common

25% if cath-related UTIs fungal; remove Foley, reculture, asymptomatic -> 40% resolution

risks: severity of injury (APACHE score 20 or higher)

age, DM, female, immunosuppressed  
intensity of colonization  
prior exposure to broad spectrum antibiotics  
high index of suspicion: failure to respond or relapse after treatment  
culture blood, urine, sputum, drain  
examine eye grounds: candida retinopathy in 40% of systemic candida infections, 100%  
diagnostic regardless of blood culture (often false negative)  
Rx: amphotericin B 0.5 mg/kg/d IV 7-10 days or azol (fluconazole) 400mg/d IV 3-4d  
increase cell wall permeability or interfere w cell wall synthesis  
liposomal amphotericin B decreased nephrotoxicity, increased delivery  
until response, then PO additional 7d  
candida cruzi resistant, glabrata relatively resistant  
remove central catheter, Foley, most common sources  
hepatic/splenic candidiasis 2w Rx, repeat CT

### **Diabetic foot infection**

usually polymicrobial  
risks: neuropathy, vascular, altered response to infection  
neuropathy -> insensitivity, abnormal wt bearing, callus formation, tissue breakdown  
mild: no bone involvement, minimal cellulitis, no significant ischemia, no systemic toxicity,  
reliable pt  
treat as outpatient: relieve stress (podiatry), debride, dressing changes, culture tiss,  
broad spectrum antibiotics (semi-synthetic penicillin with beta lactamase  
inhibition [ampicillin/clavulinate])  
severe: deep ulcer, bone involvement, cellulitis, systemic toxicity  
admit, C&S, early aggressive surgical debridement; revascularize as soon as possible  
if ischemic  
adjunctive antibiotics: 90% Gm+, 50% Gm-, 50% anaerobes, cover all

### **Hand infection**

common in ER, 60% trauma, 30% human bite, 10% animal bite  
most infections from neglected injury, early antibiotics prevent most complications  
35% s. aur, 35% anaerobic (50% of human bite infections predominantly anaerobic)  
I&D compartments, culture, Rx broad spectrum (semi-synthetic penicillin with beta  
lactamase inhibition [ampicillin/clavulinate])(penn allergy: erythromycin, flagyl)  
immobilize, splint, rest, elevation

### **Invasive Gm+**

most commonly strep, occasionally staph, increasing frequency and virulence  
puerperal sepsis, scarlatina maligna, septic scarlet fever, bacteremia, erysipelas, necrotizing  
soft tissue infection/fasciitis, gangrene, myositis  
necrotizing soft tissue infection/fasciitis  
80% following minor trauma, 20% post op

initial mild erythema progressing rapidly to swelling, erythema, fever (24h) to systemic toxicity (48h)

group A hemolytic strep most common, occasionally staph, enteric including clostridia  
aggressive surgical debridement, initial empiric antibiotic coverage likely orgs, cult  
50% mort (more than earlier eras, ?increased virulence, decr specif immune)

### **C. diff diarrhea**

most common nosocomial infection on surgical units, 13% mort

presentation variable: asymptomatic (carrier), mild to severe diarrhea with pseudomembranes, peritonitis, toxic megacolon, perforation, death

clinical criteria for Dx: 3 or > loose stools/d > 2d without obvious cause

prior antibiotics or antineoplastic agent within 6w, response to oral vancomycin or flagyl (3-5d)

lab: stool culture most sensitive (false positives with carriers, not specific), identify toxin A or B, not all test (80%) positive (clinical Dx + cult adequate to confirm Dx even without toxin ID)

endoscopy: if culture and toxin negative and high index of suspicion, scope (rigid/flex) -> 60-80% diagnostic: most patients with severe symptoms have pseudomembranes; lack does not R/O, may need full colonoscopy

prior exposure confers no immunity, 20% relapse

severe rare but need aggressive Rx, 100% mort without surgery

peritonitis, organ failure, worsening CT, toxic megacolon do total abdominal colectomy/ileostomy (36-50% mort, 2X w less than tot colectomy)

### **Tetanus**

wound care,, passive immunization with tetanus immune globulin if uncovered

if 2 or more immunizations, booster Q 10y, if > 5y since last and serious injury give booster

### **Risks to surgeon**

HIV: 0.1-0.3, no case of surgeon to patient transmission

post-exposure prophylaxis: if documented exposure start <1-2h 2 drug Rx, 3 for hi

risk (hollow core needle/hi inoculum): zidovudine, lamivudine, indinavir

hepatitis:

more serious risk than HIV, shift toward C predominance > B

antigen/ab pattern after acute exposure to B: early antigens, then antibodies, decrease over years

chronic active B different pattern: elevation hepatitis surface B antigen and remains up long periods; antibody to the core antigen remains up; hep E elevated and persists; antibody to E very late in course, highly infectious with reasonable inoculum during this time

antibody to B surface antigen (not core) indicates appropriate immunization

if core antibody also positive, had virus and developed immunity

unvaccinated pt. needs immune globulin and to begin immunization

vaccinated: test Ab level, if good, no Rx, if not IG and booster  
hep B most likely to be transmitted in OR, 62% > hollow needle stick  
80% chronic hep C after acute illness; most common indication for liver TP  
hep. B is DNA virus, hep. C RNA