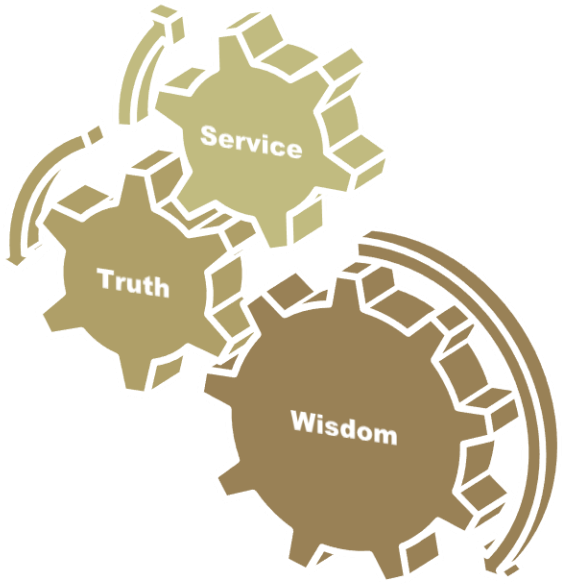

بسم الله الرحمن الرحيم

SURGICAL INFECTIONS

Dr. Faiza Firdous

Senior Registrar GS, SU-2, BBH

Mission Statement of RMU

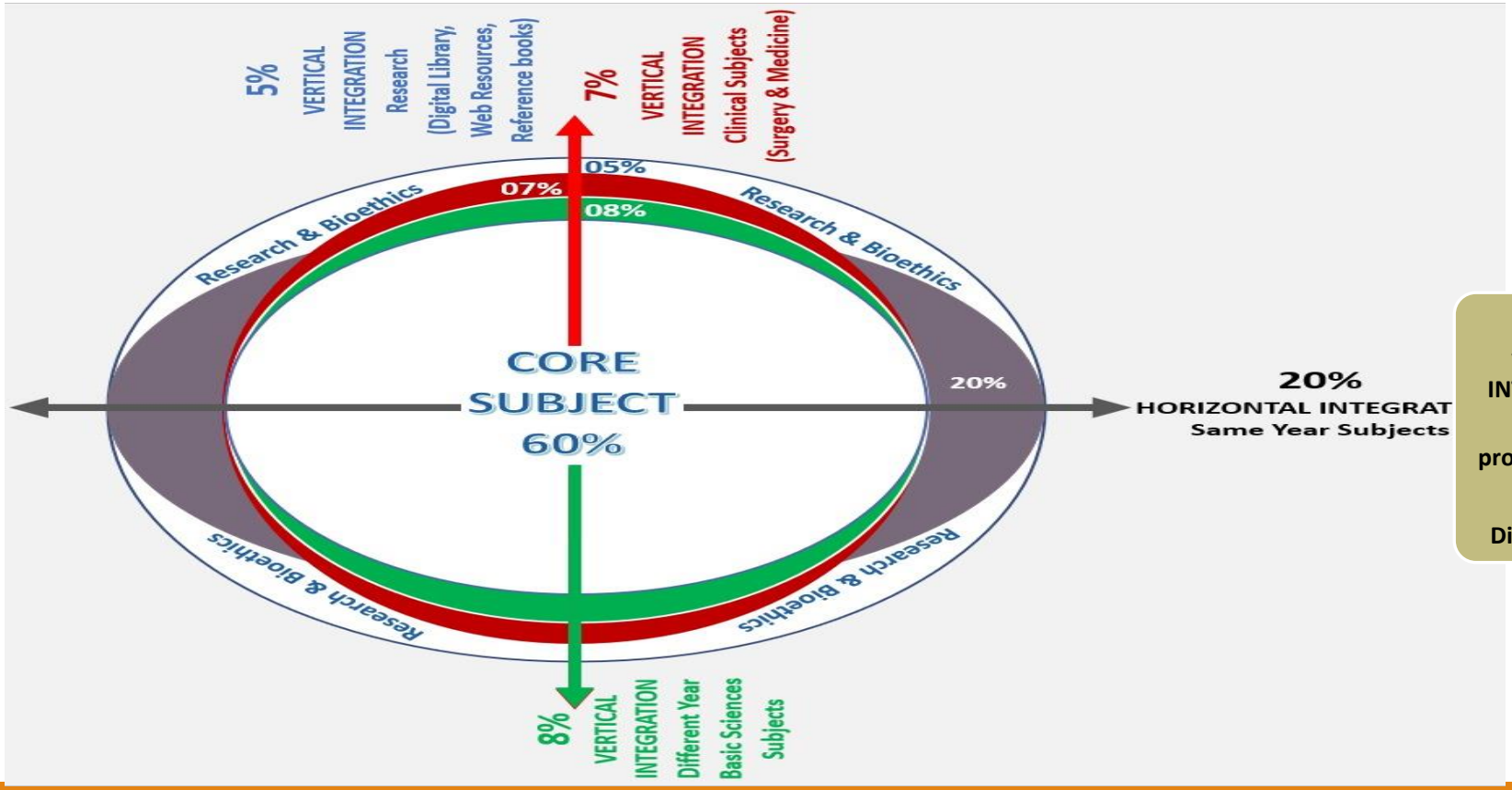


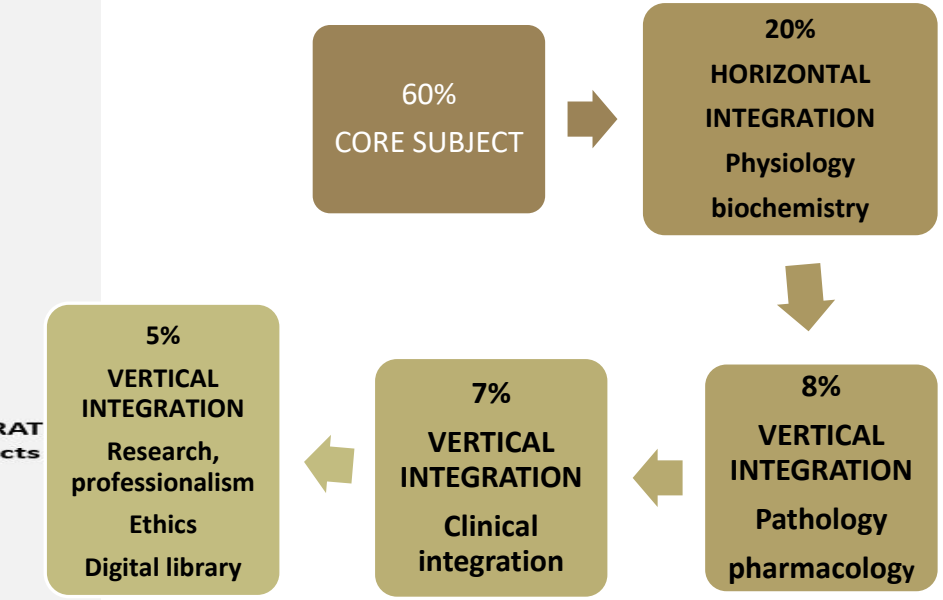
To impart evidence based research oriented medical education

To provide best possible patient care

To inculcate the values of mutual respect and ethical practice of medicine

Professor Umar Model of Integrated Lecture





Learning Objectives

At the end of the lecture, you will be able to:

1. Recall the definition of infection
2. Describe the pathogenesis of surgical infections
3. Understand clinical features and investigations
4. Identify common pathogens and infections
5. Recognize antibiotic use

INFECTION

Invasion of the body by pathogenic microorganisms and reaction of the host to organisms and their toxins

SURGICAL INFECTIONS

- A surgical infection is an infection which requires surgical treatment and has developed before, or as a complication of surgical treatment.

Surgical Infection

- *A major challenge*
- *Accounts for 1/3 of surgical patients*
- *Increased cost to healthcare*

Factors contributing to infections

- Adequate dose of microorganisms
- Virulence of microorganisms
- Suitable environment (closed space)
- Susceptible host

Pathogenicity of bacteria

Exotoxins: *specific, soluble proteins, remote cytotoxic effect*
Cl.Tetani, Strep. pyogenes

Endotoxins: *part of gram-negative bacterial wall, lipopolysaccharides e.g., E coli*

Resist phagocytosis: *Protective capsule*
Klebsiela and Strep. pneumoniae

Host Resistance

- Intact skin / mucous membrane.

- Immunity:

  Cellular (phagocytes)

  Antibodies

Prevention of surgical infection

- Patient in best general condition. (host defense)
- Minimize introduction of pathogens during surgery.
- Good surgical technique.
- Peri-operative care (support defense)

Clinical features

- *Local-* pain, heat, redness, swelling, loss of function
  (apparent in superficial infections)
- *Systemic-* fever, tachycardia, chills
- *Investigations:*
  - Leukocytosis
  - Exudates- Gram stain, culture
  - Blood culture (chills & fever)
  - Special investigations (radiology, biopsy)

Principles of surgical treatment

- *Debridement- necrotic, injured tissue*
- *Drainage- abscess, infected fluid*
- *Removal- infection source, foreign body*
- *Supportive measures:*

immobilization elevation antibiotics

STREPTOCOCCI

- Gram positive

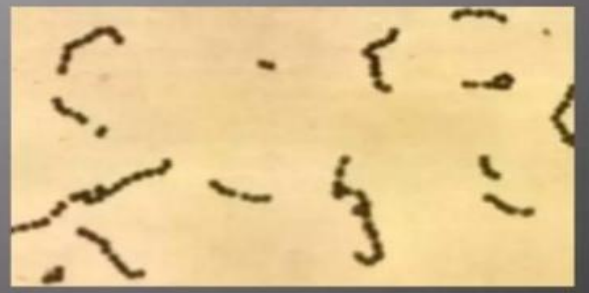
Flora of the mouth and pharynx, (bowel)

Streptococcus pyogenes –(βhemolytic) 90% of infections e.g.,lymphangitis, cellulitis, rheumatic fever

Strep. viridens- endocarditis, urinary infection

Strep. fecalis – urinary infection, pyogenic infection

Strep. pneumonae – pneumonia, meningitis



STREPTOCOCCAL INFECTION

Erysipelas

- Superficial spreading cellulitis & lymphangitis
- Area of redness, sharply defined irregular border
- Follows minor skin injuries
- Strep pyogenes
- Common site: around nose extending to both cheeks
- Penicillin, Erythromycin

SREPTOCOCCAL INFECTION

Cellulitis

- *Inflammation of skin & subcutaneous tissue*
- *Non-suppurative*
- *Strep. Pyogenes*
- *Common sites- limbs*
- *Affected area is red, hot & indurated*
- *Treatment : Rest, elevation of affected limb*
  Penicillin, Erythromycin Fluocloxacillin
  (staph. suspected)

NECROTIZING FASCIITIS

Necrosis of superficial fascia, overlying skin

Polymicrobial

strep, staph, enterococci, bacteroides, enterobacteriaceae

Sites- abd.wall (Meleny's), perineum (Fournier's), limbs,

Usually follows abdominal surgery or trauma

NECROTIZING FASCIITIS

- More in diabetic patient
- Starts as cellulitis, edema, systemic toxicity
- Appears less extensive than actual necrosis
- Treatment:

  Debridement , repeated dressings, skin grafting

  Broad spectrum antibiotics

  ampicillin, clindamycin, aminoglycosides

STAPHYLOCOCCI

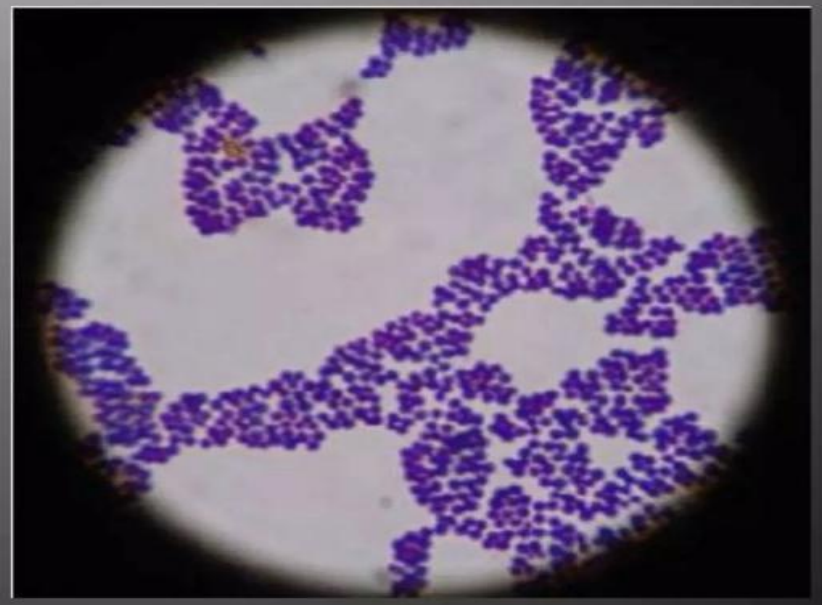
Inhabitants of skin, Gram positive

Infection characterized by suppuration

Staph.aureus- SSI, nosocomial ,superficial infections
Staph. epidermidis- opportunistic (wound, endocarditis)

Antibiotics: Penicillin, Cephalosporin, Vancomycin

MRSA: Vancomycin



STAPHYLCOCCAL INFECTIONS

- ***Abscess-*** *localized pus collection*
  Treatment- drainage, antibiotics
- ***Furuncle-*** *infection of hair follicle / sweat glands*
- ***Carbuncle-*** *extension of furuncle into subcut. tissue*
  common in diabetics
  common sites- back, back of neck
  Treatment: drainage, antibiotics, control diabetes

Parotid abscess

Furuncle

Carbuncle

Surgical site infection (SSI)

- *38% of all surgical infections*
- *Infection within 30 days of operation*
- *Classification:*

Superficial: *Superficial SSI–infection in subcutaneous plane (47%)*

Deep: *Subfascial SSI- muscle plane (23%)*

Organ/ space SSI- intra-abdominal, other spaces (30%)

Staph. aureus- *most common organism*
E coli*, Entercoccus ,other Entetobacteriaceae- deep infections B fragilis – intrabd. abscess*

Major wound infection and delayed healing presenting as a faecal fistula in a patient with Crohn's disease.

Surgical site infection (SSI)

- *Risk factors:* age, malnutrition, obesity, immunocompromised, poor surg. tech, prolonged surgery, preop. shaving and type of surgery.
- *Diagnosis:*

  Sup.SSI- erythema, oedema, discharge and pain

  Deep infections- no local signs, fever, pain, hypotension. need investigations.
- *Treatment:* surgical / radiological intervention.

Surgical site infection (SSI)

Intra-abdominal infections

- Generalized
- Localized
- Prevention- good tech., avoid bowel injury, good anastomosis.
- Diagnosis- History, exam., investigations.
- Treatment- surgery/ intervention

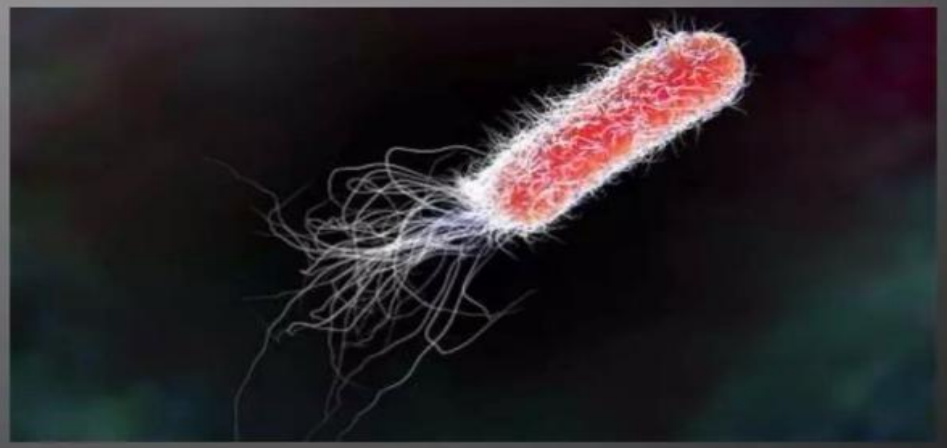
  Antibiotics (aerobe+ anaerobe)

GRAM NEGATIVE ORGANISMS

(Enterobactericiae)

Escherichia coli

Facultative anaerobe, Intestinal flora Produce exotoxin & endotoxin
Endotoxin produce Gram-negative shock



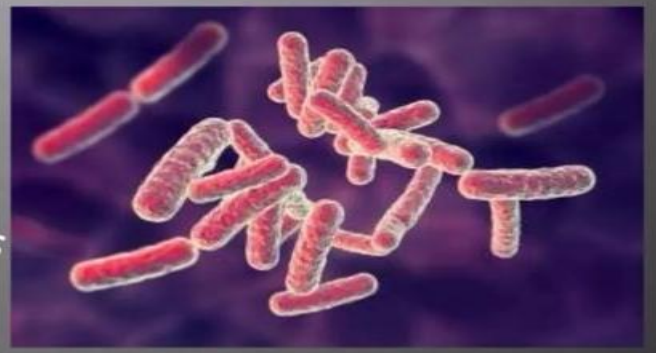
Wound infection, abdominal abscess, UTI, meningitis, endocarditis

Treatment- ampicillin, cephalosporin, aminoglycoside

GRAM NEGATIVE ORGANISMS

Pseudomonas

- aerobe, occurs on skin surface
opportunistic pathogen
- may cause serious & lethal infection
- colonize ventilators, iv catheters, urinary catheters
- Wound infection, burn, septicemia
- Treatment: aminoglycosides, piperacillin, ceftazidime



CLOSTRIDIA

- Gram positive, anaerobe
- Rod shaped microorganisms
- Live in bowel & soil
- Produce exotoxin for pathogenicity
- Important members:
  - Cl. Perfringens, Cl. Septicum (gas gangrene)
  - Cl. Tetani (tetanus)
  - Cl. Difficile (pseudomembranous colitis)

GAS GANGRENE

- ***Cl. Perfringens, Cl. Septicum***

Exotoxins: lecithinase, collagenase, hyaluridase

- *Large wounds of muscle (contaminated by soil, foreign body)*
- *Rapid myonecrosis, crepitus in subcutaneous tissue*
- *Seropurulent discharge, foul smell, swollen Toxemia, tachycardia, ill looking*
- *X-ray: gas in muscle and under skin*
- *Treatment: Penicillin, clindamycin, metronidazole*

Wound exposure, debridement , drainage, amputation

Hyperbaric oxygen

TETANUS

Cl. Tetani, produce neurotoxin Penetrating wound
(rusty nail, thorn)
Usually wound healed when symptoms appear
Incubation period:7-10 days

Trismus- first symptom, stiffness in neck & back Anxious look with mouth drawn up (risus

sardonicus)

Respiration & swallowing progressively difficult

Reflex convulsions along with tonic spasm

Death by exhaustion, aspiration or asphyxiation

TETANUS

- **Treatment:**

  wound debridement, penicillin
  Muscle relaxants, ventilatory support
  Nutritional support

- **Prophylaxis:**

  wound care, antibiotics
  Human TIG in high risk (un-immunized)
  Commence active immunization (T toxoid)
  Previously immunized-
  booster >10 years needs a booster dose
  booster <10 years- no treatment in low risk wounds

PSEUDOMEMBRANOUS COLITIS

- *Cl. Difficile*
- *Overtakes normal flora in patients on antibiotics*
- *Watery diarrhea, abdominal pain, fever*
- *Sigmoidoscopy: membrane of exudates (pseudomembranes)*
- *Stool- culture and toxin assay*
- *Treatment :*

  stop offending antibiotic
  oral vancomycin/ metronidazole
  rehydration, isolate patient

GRAM NEGATVE ANAEROBES

Bacteroides fragilis

- *Normal flora in oral cavity, colon*
- *Intra-abdominal & gynecologic infections (90%)*
- *Foul smelling pus, gas in surrounding tissue, necrosis*
- *Spiking fever, jaundice, Leukocytosis*
- *No growth on standard culture*
- *Needs anaerobe culture media*
- *Treatment:*

  Surgical drainage

  Antibiotics- clindamycin, metronidazole

ANTIBIOTICS

Chemotherapeutic agents that act on organisms

- *Bacteriocidal: Penicillin, Cephalosporin, Vancomycin Aminoglycosides*
- *Bacteriostatic: Erythromycin, Clindamycin, Tetracycline*

ANTIBIOTICS

- **Penicillins**- *Penicillin G, Piperacillin*
- **Penicillins with β-lactamase inhibitors**- *Tazocin*
- **Cephalosporins (I, II, III)**- *Cephalexin, Cefuroxime, Ceftriaxone*
- **Carbapenems**- *Imipenem, Meropenem*
- **Aminoglycosides**- *Gentamycin, Amikacin*
- **Fluoroquinolones**- *Ciprofloxacin*
- **Glycopeptides**- *Vancomycin*
- **Macrolides**- *Erythromycin, Clarithromycin*
- **Tetracyclines**- *Minocycline, Doxycycline*

ROLE OF ANTIBIOTICS

- *Therapeutic:*

  To treat existing infection

- *Prophylactic:*

  To reduce the risk of wound infection

ANTIBIOTIC THERAPY

(Guideline for surgical infections)

- ***Pseudomembranous colitis-*** *oral vancomycin/ metronidazole*
- ***Biliary-tract infection-*** *cephalosporin or gentamycin*
- ***Peritonitis-*** *cephalosporin/ gentamycin + metronidazole/ clindamycin*
- ***Septicemia-*** *aminoglycoside + ceftazidime, Tazocin or imipenem, (may add metronidazole)*
- ***Septicemia due to vascular catheter-*** *Flucloxacillin/ vancomycin or Cefuroxime*
- ***Cellulitis-*** *penicillin, erythromycin (flucloxacillin if Staphylococcus infection. Suspected)*

ANTIBIOTIC PROPHYLAXIS

- *Prophylaxis in clean-contaminated/ high risk clean wounds*
- *Antibiotic is given just before patient sent for surgery*
- *Duration of antibiotic is controversial (one dose- 24 hour regimen)*

ANTIBIOTIC PROPHYLAXIS

BASED ON SURGICAL WOUND CLASSIFICATION

- A. Clean : CLASS I e.g. surgeries on thyroid gland, breast, hernia,
- • No need for prophylaxis in clean surgeries, except for :
  - Immunucompromised patients, e.g. diabetics, patients using corticosteroids.
  - If the surgery include inserting foreign materials such as artificial valves.
  - High risk patients like those with infective endocarditis.

The risk of postoperative wound infection is around 2%.

ANTIBIOTIC PROPHYLAXIS

- B. Clean/Contaminated (minimal contamination) : CLASS II
  e.g., biliary,urinary, GI tract surgery

- Prophylaxis is advisable, and the risk of infection is about 5-10%.

ANTIBIOTIC PROPHYLAXIS

- C. Contaminated (gross contamination) : CLASS III e.g. during bowel surgery
- Prophylaxis is advisable and the risk of infection is up to 20%.

ANTIBIOTIC PROPHYLAXIS

- D. Dirty : CLASS IV *through established infection*
  e.g., peritonitis (up to 50%)
- The use of antibiotic is considered to be of therapeutic nature (not prophylactic).

- The risk of infec@on is up to 5CD.

Thank you.

Sources

1. Bailey & Love's Short Practice of Surgery, 28th Edition.
2. Schwartz principles of surgery