Antibiotics in Head and Neck Surgery

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Introduction

• Classification of wounds
• Commonly used antibiotics
• Indications for perioperative antibiotics in head and neck surgery
Wound Infections

- Largest group of postoperative infectious complications of surgery
- Second most frequent type of nosocomial infection
Considerations for the use of antibiotic therapy

- Risk of developing wound infection
  - classification of wound
  - host and local factors
- Cost of therapy
  - 1992 cost of treating a wound infection $36,000
- Side effects and development of resistance
Resistance to Antibiotic Therapy

- Virtually all bacterial pathogens have the ability to acquire resistance to antibiotic therapy
- This problem is more common in nosocomial pathogens such as VRE and MRSA
- More recently, community acquired pathogens have developed resistant strains
Resistant Strept. Pnuemoniae

- Resistance to penicillin is found in 30 to 70% of isolates depending on the hospital.
- Some strains are also found to be resistant to one of the following: cephalosporins, Bactrim, chloramphenicol, or a macrolide.
- Children are more likely than adults to be infected with strains resistant to chloramphenicol, erythromycin or Bactrim.
Classification of Wounds

- Clean
- Clean contaminated
- Contaminated
- Dirty
Clean wounds

• Associated with an elective case
• No break in aseptic technique
• No associated inflammation
• Infection rate of 1% to 5%
Clean Contaminated Wounds

- Oropharyngeal, respiratory, alimentary or GU tract is entered under controlled conditions
- Most head and neck surgeries fall under this category
- Infection rate is 8% to 11% in general, although major head and neck cases have a rate of 28% - 87%.
Contaminated Wounds

• Result after:
  – Spillage from the GI tract
  – Major break in sterile technique
  – With acute nonpurulent inflammation

• Includes fresh traumatic wounds

• Infection rate of 15%-17%
Dirty Wounds

- Organisms causing post-operative infection are present prior to operation.
- Wounds associated with old trauma, an abscess, or a perforated viscus.
- Infection rate greater than 27%.
Timing

- Antibiotics are most effective when given before bacteria enters the bloodstream or tissue.
- Studies have shown antibiotics have less effect if given after 3 hours from inoculation.
Route

- Parenteral administration is the traditional route.
- IM injections achieve the highest sustained level.
- It is recommended in contaminated cases to administer IV and IM loading doses followed by a continuous IV or intermittent IM injections.
Commonly Used Antibiotics
Penicillins

- Act by causing abnormal cell wall development in actively dividing bacterial cells.
- Groups are as follows:
  - Natural penicillins, penicillinase resistant penicillins, aminopenicillins, antipseudomonal penicillins, and extended spectrum penicillins.
Natural Penicillins

- Drug of choice for *St. pyogenes* and *St. pneumoniae*, and *Clostridia perfringens*
- 30% of isolates of *St. pneumoniae* are penicillin resistant.
- Oral form in PenV, IM form is PenG
Synthetic Penicillins

- Include nafcillin, oxacillin, and methicillin, cloxacillin and dicloxacillin.
- Used when *S. aureus* is suspected as these drugs are resistant to B-lactamase.
- Side effects include interstitial nephritis, leukopenia, and reversible hepatic dysfunction.
Aminopenicillins

- Include ampicillin and amoxicillin
- Not effective in presence of B-lactamase
- Antibiotics of choice for *Enterococcus sp.*
- Active against some gram - rods (*E. coli* and *P. mirabilis*)
Antipsuedomonal Penicillins

- Include carbenicillin and ticarcillin.
- Similar gram negative activity as aminopenicillins
- Poor activity against Klebsiella sp.
- Side effects: sodium loading and platelet dysfunction
- Synergistic with aminoglycosides against Psuedomonas.
Extended Spectrum Penicillins

- Include mezlocillin and piperacillin
- Similar to antipseudomonal penicillins but more active against *Klebsiella sp.* and *Streptococcus.*
Cephalosporins

- Divided into first, second, and third generation classes
- Inhibit bacterial cell wall synthesis
First Generation Cephalosporins

- Cephalothin, cephapirin, cephradine, and cefazolin
- Active against *Strept. sp* and *Staph sp.*
- Limited gram negative activity
- Side effect: allergic reactions, drug eruptions, phlebitis, and diarrhea.
Second Generation Cephalosporins

- Cefoxitin, cefotetan, cefuroxime
- Increased gram negative coverage
- Cefoxitin and cefotetan are more active against anaerobes
Third Generation Cephalosporins

- Cefotaxime, ceftizoxime, ceftriaxone, ceftazidime
- Less active against Gram positive organisms
- More active against the *Enterobacteriaceae* and other Gram negative organisms
- Side effects include hypersensitivity reaction, hematological disturbances, GI and renal complaints.
Macrolides

- Erythromycin, Pediazole (E-mycin and sulfisoxazole), Azithromycin and Clarithromycin
- Inhibits protein synthesis
- Similar spectrum as PenG plus Mycoplasma, Legionella, Actinomyces, and H. infl.
- Side effects include nausea, vomiting, diarrhea, and hepatitis.
Other Antibiotics

- Clindamycin inhibits protein synthesis
- Active against most Gram positive, and anaerobic organisms.
- Good penetration into bones and abscesses.
- Side effects include pseudomembranous colitis, mild nausea and diarrhea, leukopenia, and hepatotoxicity.
Vancomycin

- Antibiotic of choice for MRSA
- Associated with nephrotoxicity or ototoxicity when given with aminoglycoside
- Associated with emergence of VRE
- Great activity against *Staph* and *Enterococcus*. 
Metronidazole

- Good for anaerobic organisms
- Well absorbed into abscesses
- Side effects include seizures, cerebellar dysfunction, disulfiram reaction with ETOH, pseudomembranous colitis
Aminoglycosides

- Include gentamycin, tobramycin, and amikacin
- Good gram negative coverage including *Pseudomonas*
- Used in head and neck surgery against mixed microbial abscesses and when organisms from GI tract are suspected.
Sulfonamides

- Bactrim
- Very active against Gram negative aerobic organisms and some Gram positive such as *Staph* and *Strept.* species
- Should not be used in last month of pregnancy
Flouroquinolones

- Norfloxacin, Levofloxacin, Ciprofloxacin, and Ofloxacin.
- Good efficacy against gram negative organisms and some *Staph* species.
- Do not use in children or adolescents.
Indications for Antimicrobial Treatment
Otologic Surgery

- Postoperative use of ototopical antimicrobial drops reduces the incidence of otorrhea after tympanostomy tube insertion.
- Studies show a reduction from 16.4% to 8% when Cortisporin drops are used from 1 to 5 days postop.
Other Otologic Procedures

- No significant decrease in postoperative infection rates in those patients treated with perioperative antibiotics.
- Wound infection is prevented more effectively by starting with a dry ear and observing good surgical technique.
- Neurotological procedures may require some antibiotic prophylaxis. More studies need to be carried out.
Tonsillar Surgery

- Antibiotics given 5-7 days post-operatively decrease dysphagia, fever, pain, mouth odor and poor oral intake
- Ampicillin, amoxicillin in children
- Augmentin in adults
- Currently a 7 day course is recommended
Odontogenic Infections

- Most commonly caused by oral flora
- Have tendency to deepen causing neck space abscess or cellulitis
- After appropriate drainage, treatment is recommended with IV penicillin or Cleocin.
- Can be augmented with Cleocin mouthwash
Neck Abscess

- Usual organisms are *Staph*, *Strept*, and anaerobes
- High incidence of B-lactamase resistant organisms
- Antibiotic therapy with or without surgical drainage
Facial Fractures

- Open mandible fractures have been shown to have a 30% decreased incidence of infection when perioperative treatment with clindamycin or penicillin is used.

- Antibiotics covering the oral flora are recommended in open mandible fractures and any surgical procedures where the wound will be exposed to oral flora.
Lacerations and Soft Tissue Injuries

- Soft tissue injuries of the head and neck including crush injuries, wounds contaminated by body secretions, pus or soil, wounds with devitalized tissue and those wounds seen three hours after injury should receive antibiotics
Dog Bites

- 5% result in infection
- Treatment is with Augmentin
- Need to debride devitalized tissue
Human Bites

- *Staph, Stept, Eikenella, Bacteroides, Peptostrep*
- Treatment is based on length of time from inoculation
- Augmentin, Unasyn
Nasal and Sinus Surgery

- Current recommendations are to give anti-staph coverage in patients with nasal packing and to coat merocel packing with antibiotic ointment.
- One study showed patients receiving low dose Erythromycin after FESS reduced post-surgical sinusitus complaints.
 Thyroid, Parotid and Submandibular Surgery

- No efficacy in giving prophylactic therapy in these cases
Cranial Base Surgery

- High risk for postoperative infections
- More studies need to be done in this area
- Current recommendation is a single broad spectrum antibiotic for at least 48 hours
Oncological Head and Neck Surgery

- High risk for infection if surgical site contaminated with aerodigestive secretions
- Depending on the study, infection rate is from 28 - 87% without antibiotics.
- This is reduced to 14% with antibiotic therapy in one study
- Major fistula is the most common complication
Antibiotics are recommended in major clean contaminated head and neck oncological surgery

- Time course remains an issue. In most cases at least a short course of 1 to 3 days is effective

Need for gram negative coverage

- One study showed a reduction of infection rate from 36 to 10 % with the addition of an aminoglycoside
Summary

- Decision of whether to give antibiotics is based on the individual case
- Need to consider cost, side effects and development of resistance, incidence of infection without antibiotics
- Antibiotics are never a substitute for good surgical technique