

What Should Dentists Know about Medicine...

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Learning Outcomes

1. Medical Conditions and Their Impact on Dental Care.
2. Medical Emergency & Resuscitation in the Dental Practice.
3. The Special Care Needs Patient.
4. Geriatrics: Oral Medicine and the Ageing Patient.
5. Management of the Oncologic Patient.
6. Oral Soft Tissue Lesions, Temporomandibular Disorders and Orofacial Pain.
7. Infections, Infectious Diseases and Dentistry.
8. Nutrition and Oral Health.
9. **Clinical & Applied Pharmacology and Dental therapeutics.**

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Pharmacology & Therapeutics in Dentistry

- We are all dealing with an increasing ageing population who are retaining their teeth well into old age. A large proportion of this population will be taking one or two medicines to enable them to continue with their normal daily activities.
- Certain drugs are the mainstay of dental practice. These include **antibiotics**, **analgesics**, **local anesthetics**, and **agents to control anxiety**.

Pharmacology & Therapeutics in Dentistry

- Many of our patients are medically compromised and this raises **three** important issues with respect to the delivery of routine dental care:
 1. Can the patient's medication cause an **adverse reaction** in the mouth and associated structures?
 2. Can the drugs that I wish to prescribe **interact** with their current medication?
 3. What **medical emergencies** are likely to arise in this population and how should they be dealt with?

Antibiotics

- **Antibiotics** are chemical substances **produced by microorganisms**, which have the capacity, in dilute solutions, to **inhibit the growth of (bacteriostatic)** or to **destroy (bactericidal) bacteria and other microorganisms**.
- They are hugely significant compounds in medical practice with **lifesaving properties**.

Antibiotics

- However, they are also the subject of **intensive abuse**, both **over-prescription** and also **administration for inappropriate reasons**. This has led to the worldwide problem of **bacterial resistance**.
- These drugs are used extensively in dentistry for **two main reasons**:
 1. to prevent an infection (chemoprophylaxis) and
 2. in the treatment of an infection.
 3. Their use in the management of **periodontal diseases** is often as an adjunct to conventional treatment.

Antibiotic Therapy in Managing Odontogenic Infections

- Many new antibiotics/antimicrobials have been developed, but **none have been determined** of significant benefit **to replace or supplant the use of penicillins** for the management of **orofacial infections**.
- Sensible use of antibiotics in **conjunction** with **surgical therapy** is the **most appropriate method to treat odontogenic infections**.
- Using the antibiotic "du jour," **many times promoted by pharmaceutical representatives**, results in costly and unnecessary complexity of care.

A return to the basics is indicated for the antibiotic management of odontogenic infections!

Antibiotic Therapy in Managing Odontogenic Infections

- **Chemotherapy** is the use of **synthetic, semi-synthetic, and naturally occurring chemicals** that **selectively inhibit specific organisms** causing disease.
- The term antibiotic means **"against life"** (anti = against and biosis = life).
- The clinician must first **diagnose the cause** of the infection and **determine the appropriate dental treatment** that may include multiple modalities: initiation of **endodontic** therapy and **pulpectomy, odontectomy, or surgical or mechanical disruption of the infectious environment**.

Antibiotic Therapy in Managing Odontogenic Infections

- The **determination** as to whether **conjunctive antibiotic therapy** is indicated is based on **several factors**, including:
 - host **defence** mechanisms,
 - host **underlying medical condition**,
 - **severity** of the infection,
 - **magnitude** of the **extension** of the infection, and
 - expected **pathogen**.
- Because of the **lack of circulation within dental pulp**, the normal host defences (**inflammation and immunity**) are **compromised** and the root canal system **becomes a unique environment to harbour a limited group of bacteria**.

Antibiotic Therapy in Managing Odontogenic Infections

- Most **odontogenic** infections are **polymicrobial** and are composed of at **least two predominating bacteria**.
- Most **bacteria** comprising the **oral flora** are **non-pathogenic** and have NOT been shown to proliferate and grow in host tissue.
- When the **dental pulp** is **overwhelmed** from the bacterial attack, a local **acute inflammatory response** is seen, **followed by nonspecific and specific immunologic reactions** with the presence of **lymphocytes, plasma cells, and macrophages**.
- Eventually **polymorphonuclear lymphocytes (PMNs)** are **chemotactically** attracted to the area of damaged tissue.

Antibiotic Therapy in Managing Odontogenic Infections

- An **abscess, a fibro-collagenous layer of tissue**, may form around an accumulation of PMNs in the **region of infection, isolating** it from surrounding tissue.
- Because the **host** may be **unable to resorb the abscess** and **resolve the infection**, **RCT, extraction, or other surgical therapy is needed to remove the cause**.
- Recent studies demonstrate that a **localized abscess** may be an **inflammatory/immunologic phenomenon** and in some patients represents a **non-bacterial cause for the periapical localized clinical symptoms** (Torabinejad M et al, 1994; Kettering JD et al, 1991)

Antibiotic Therapy in Managing Odontogenic Infections

- Oral antibiotic as **primary and sole treatment** for an infection of odontogenic aetiology is **highly questionable** because of the **lack of effective circulation in a necrotic pulp system and an abscess**.
- This concept reinforces that **surgery of some kind is the primary treatment of an infection of odontogenic source, and antibiotic therapy is adjunctive**.

Antibiotic Therapy in Managing Odontogenic Infections

- Many clinicians, however, do treat odontogenic infections primarily with antibiotics.
- Endorsement of a philosophy of care that antibiotic administration is **low risk and potential high yield cannot** be substantiated, especially with the current concern regarding **bacteria that have developed resistance to current antibiotic therapy**.

Antibiotics should not be prescribed as a substitute for proper dental treatment!

Mechanism of Action

- Antibiotics have **various effects** on bacteria based on their **pharmacologic action**.
- The **most commonly used antibiotics** in dentistry (**penicillins**, **cephalosporins**, and **vancomycin**) work by attacking the **cellular processes necessary for the bacterial cell wall synthesis** while having **no effect on host cells**.
- **Other commonly used antibiotics** in dentistry exert their effect by **inhibiting translation needed for bacterial protein synthesis** (**erythromycins**, **tetracyclines**, **aminoglycosides**, and **chloramphenicol**).

Mechanism of Action

- **Metronidazole**, indicated in dentistry for **anaerobic bacterial infections**, is a **direct-acting agent that binds and degrades DNA in bacteria**.
- Still other antibiotics (**amphotericin B**, **polymyxins**) act by inhibiting **cell membrane function**.
- Further development in **determining the difference between host and bacterial protein synthesis may lead to the development of alternative sensitive and specific antibiotic therapeutics**.

Mechanism of Action

- New **synthetic antibiotics** for potential use in dental-related infections are the **quinolones** (**cinoxacin**, **nalidixic acid**, and **methenamine**) and the **fluoroquinolones** (**ciprofloxacin**, **norfloxacin**, and **ofloxacin**).
- These agents should **ONLY be considered when culture results have revealed that these antibiotics are warranted**.
- They have a **broader spectrum of action** and **inhibit bacterial DNA replication** (fluoroquinolones inhibit DNA gyrase that inhibits the uncoiling of DNA for replication).
- The **limited indication** and the **high cost** of these drugs is a serious consideration before prescribing.

They are rarely used in the management of odontogenic infections!

Mechanism of Action

- The emergence of **resistant bacteria is growing**.
- The microbial ecosystem is engaged in trying to remain **opportunistic** and by **mutating and adapting, RESISTANT STRAINS DEVELOP**:
 - Specific **enzymes** can **destroy the antibiotic once it has entered the bacteria**,
 - **permeability into the cell wall can become difficult**, and
 - an **alteration of certain targets that the drug attaches to become apparent**.
- Mutations in any of these functions can result in **loss of sensitivity and specificity** to any antibiotics.

Mechanism of Action

- Bacteria have **two major advantages** that allow them to survive and prosper in the host system.
 - They **replicate quickly** and **can produce multiple mutations spontaneously** – once a mutation is present, all bacteria offspring generally acquire the new trait.
 - Genetic transfer is another process that bacteria possess – it allows **families of bacteria** to **share** desirable traits with a wide range of microbial species.
- It has recently been found that antibiotic-resistant genes can be passed among EVERY species of bacteria!**

Indications for the Use of Antibiotics

- Clinical effectiveness in treating an infection is based on **correct diagnosis**.
- Once the source has been established, **dental procedures should be used immediately to disrupt the microorganisms involved**.
- Antibiotic therapy should be used as an **adjunct** to dental treatment and **never used alone as the first line of care**.

Indications for the Use of Antibiotics

- Antibiotic therapy is indicated in the following situations:
 - SIRS** (Systemic Inflammatory Response Syndrome) is present. Evidence includes:
 - Body temperature** less than 36°C or greater than 38°C
 - Heart rate** greater than 90 beats per minute
 - Tachypnea** (high respiratory rate), with greater than 20 breaths per minute; or, an arterial partial pressure of carbon dioxide less than 4.3 kPa (32 mmHg)
 - White blood cell count** less than 4,000 cells/mm³ (4×10^9 cells/L) or greater than 12,000 cells/mm³ (12×10^9 cells/L); or the presence of greater than 10% immature neutrophils (band forms)
- Pain** is severe and not responsive to analgesics.
- Fever** is present and not responsive to antipyretics.
- Antibiotic treatment** is indicated if the swelling spreads to extraoral spaces or obstructs breathing or swallowing.

Indications for the Use of Antibiotics

- The **choice of an antibiotic** should be based on knowledge of the **usual causative microbe**.
- The **empiric approach** usually results in **favourable outcomes**.
- Penicillin is the first choice in managing odontogenic infections** because it is susceptible to **gram-positive aerobes** and **intraoral anaerobes**, organisms found in **alveolar abscesses, periodontal abscesses, and necrotic pulps**.
- Patients with **compromised host defence systems** may indicate antibiotic therapy in conjunction with their **dental treatment** – **organ transplant patients** and patients with **poorly controlled diabetes**.

Indications for Culturing

- Rarely required in managing odontogenic infections**, but is necessary to resolve a **progressive infection**.
- Culturing methods have improved over the years; however, **bias may occur during the isolation and culturing** of bacteria.
- Many anaerobic microbes are killed quickly when exposed to oxygen**.
- Needle aspiration techniques** and **transfer under inert gas** should be used when culturing for **aerobic** and **anaerobic** bacteria in the oral cavity.
- The **antibiotic is then chosen to treat the predominant** microbe found in the culture **if empiric therapy has failed**.

Indications for Culturing

- Indications** for culturing odontogenic infections:
 - The patient **is not responding to the first antibiotic prescribed** after **48 hours and appropriate dental treatment has been completed**.
 - The infection is **progressing to other facial spaces**.
 - The patient is **immunocompromised** or has a history of **bacterial endocarditis and is not responding to the antibiotic therapy**.
- Antibiotic treatment should begin **immediately** even when a culture is taken because of the rapid spread of oral infections.

Antibiotics of Choice

- **Penicillin is still the gold standard in treating dental infections.**
- Penicillin has contributed to a dramatic decrease in **mortality** in **serious odontogenic infections** such as **Ludwig's angina** and **diffuse orofacial cellulitis**.
- **Aerobic and anaerobic** microorganisms are susceptible to penicillin (Sabiston CB et al, 1974)
- Pen VK is the obvious choice over Pen G because of the greater oral absorption by Pen VK.
- Pen VK is **bactericidal** and **active against replicating bacteria** often encountered in odontogenic infections (Smith CM et al, 1992)
- The **side effect encountered** most often in penicillin is **hypersensitivity**, which is found in roughly **3–5% of the population**.

Antibiotics of Choice

- Certain bacteria can develop **resistance** to the **penicillins** because of the **B-lactamase enzymes** that inactivate the penicillin.
- A combination antibiotic consisting of a **penicillin and clavulanic acid**, a **B-lactamase inhibitor**, or the use of **clindamycin**, an antibiotic specific for infections caused by **staphylococci, streptococci, pneumococci**, and other bacterial species **may be necessary in an infection not responding to penicillin alone**.
- Cephalexin, cephadrine, or cephadroxil (**first generation cephalosporin**) provide a **SLIGHTLY broader antibiotic spectrum**, especially in **gram-positive organisms** are suspected.

Cephalosporins beyond the first generation are not indicated in most odontogenic infections!

Antibiotics of Choice

- If an antibiotic is warranted, providing **adequate blood levels is essential**.
- A **loading dose of 2000 mg Pen VK** approximately **1 hour** before beginning surgical therapy followed by **500 mg** every 6 hours for 5–7 days is optimal.
- If the infectious signs and symptoms **continue beyond 5–7 days**, additional antibiotic therapy may be indicated.

Antibiotics of Choice

- If **within 48 hours** the patient is not responding to penicillin, one could consider adding **metronidazole**.
- It is prescribed in a **500-mg dose every 8 hours** for the duration of the antibiotic therapy.
- Metronidazole is active only against **obligate anaerobic bacteria** by penetrating all bacterial cells and inhibiting DNA replication.
- It should **NOT** be used in **pregnant patients** or **patients with a history of seizures**.
- If **combined** with **ethyl alcohol** can produce **nausea** and **vomiting**.

Antibiotics of Choice

- Another **alternative** to treat an infection that is **not responding to penicillin** is **clindamycin**.
- It **MAY** be used as a **first-line antibiotic** if the infection is deemed to be more mature and potentially has spread to bone.
- Indiscriminate use should be avoided.
- A loading dose of **600 mg** may be administered **approximately 1 hour** before surgical therapy begins, followed with **300 mg every 6 hours** for the duration of the infection (5–7 days).

Antibiotics of Choice

Appropriate diagnosis and surgical therapy COUPLED with the empiric use of antibiotics and sound clinical judgment in assessing improvement is the STANDARD of care in the management of odontogenic infections

Antibiotic Preparations for Odontogenic Infections

1. **Pen VK** 500 mg every 6 hours, tablets: 125 mg, 250 mg, and 500 mg
2. **Amoxicillin** 500 mg every 8 hours, tablets: 250 mg
3. **Metronidazole** 500 mg every 8 hours, tablets: 250 mg and 500 mg
4. **Clindamycin** 150–300 mg every 6 hours, capsules: 75 mg and 150 mg

A Step-by-Step Approach for Diagnosing & Treating Odontogenic Infections

1. Listen to the **chief complaint of the patient**. This is the symptom that the patient is experiencing and describes in his or her own words.
2. Take a **comprehensive medical history**. Review systemic diseases, past surgeries, injuries, and medications the patient is taking. Review any allergic responses a patient may have experienced.
3. Obtain a **thorough dental history of existing problems**: When did the problem begin, is it getting worse or better, and what medications is the patient taking for it?
4. **Extraoral and intraoral examination** for the presence and extent of pathosis. Percussion, palpation, and pulp vitality testing are indicated to diagnose pulpal and periodontal disease.

A Step-by-Step Approach for Diagnosing & Treating Odontogenic Infections

5. **Radiographic examination** is an adjunct in determining dental disease. Most pathologic states in pulpal tissue are not visible on a radiograph. Only when the cortical plate has been resorbed does the dental radiograph become helpful in identifying disease.
6. Treatment planning is **discussed with the patient** once the nature of the pathosis has been identified. Determine the difficulty of the case and whether handling it is within your comfort level or if the case should be referred. The clinician should calculate a prognosis for each case including a **contingency prognosis** if problems are encountered after treatment has begun.

A Step-by-Step Approach for Diagnosing & Treating Odontogenic Infections

7. **Designing the appropriate dental treatment** should be rendered: emergency and definitive treatment.
8. **Case selection completed** and referral to a specialist if found that the patient's needs are beyond the capacity of the clinician's capabilities.
9. **Appropriate analgesics** and **postoperative instructions given**.

A Step-by-Step Approach for Diagnosing & Treating Odontogenic Infections

10. **Selection of an antibiotic if warranted:**
 - Choose the narrowest spectrum antibiotic possible to prevent disturbing the host's normal microbial flora.
 - Prescribe the medication with the appropriate dose and duration.
 - Educate the patient about the importance of taking the medication for the proper length of the time.
 - Provide adequate analgesic therapy along with antibiotic therapy if the patient is also experiencing pain.
 - Closely monitor the patient and follow up in 48 hours to make sure the dental treatment and antibiotic therapies have reduced the patient's symptoms. If there has not been a reduction in symptoms, consider adding another antibiotic, culturing the infection, or referring the patient to a specialist.

Antibiotic Myths

- There are many myths that pervade the clinical practice of dentists regarding the **diagnosis** and **management** of **odontogenic infections**.
- These behaviours have been **observed repeatedly in the course of clinical practice**.
- To dispel the continued improper use of antibiotics in the dental environment, these myths are exposed in this lecture.

Myth #1: Antibiotics are Not Harmful

- The unnecessary administration of antibiotics is not without risk. The risks for **pseudomembranous colitis** and **allergic reaction** must be taken into consideration before prescribing.
- Many antibiotics can **disturb the normal microbial flora of the gastrointestinal tract**, which may cause **severe diarrhea** and potentially **fatal pseudomembranous colitis**.
- These reactions **occur more frequently when using oral administration of antibiotics** versus **parenteral administration**, based on variation of hepatic circulation of the drug associated with the two mechanisms of administration.

Myth #1: Antibiotics are Not Harmful

- Various degrees of allergic responses have been reported with the use of **common** antibiotics used for odontogenic infections.
- Dermatologic reactions such as **rash** or **hives** represent **milder reactions**, whereas life-threatening **anaphylactoid reactions** have occurred.
- It has been estimated that **100-300 FATAL allergic reactions to penicillin occur annually in the USA and UK** (Rudolph AH et al, 1973; Turck M, 1976)
- For an allergic reaction to have occurred, **previous exposure to the drug is necessary**. This may have occurred by the patient receiving the antibiotic in beef, milk, or poultry products where the uncontrolled use leaves a residue of the antibiotic in food products.

Myth #1: Antibiotics are Not Harmful

- It has been estimated when given amoxicillin that (Bighly M et al, 1986; Samra A et al 1987; Duern GV et al 1996):
 - 1 in every 10 patients develops a rash,**
 - 1 in every 10,000 develops anaphylactic reactions,** and
 - 1 in every 100,000 dies from an allergic reaction** [12-14].
- Two** types of allergic reactions can arise.
 - An **acute allergic response** or an **anaphylactic reaction** occurs within **30 minutes** of receiving the drug and the reactions include **bronchoconstriction, urticaria, angioedema, and shock**. Treatment of this type of reaction involves the administration of **epinephrine, antihistamine, and possible corticosteroids**.
 - Delayed allergic responses** take longer than **2 hours** to develop and demonstrate **mild skin rashes, glossitis, and local inflammatory reactions**.

Therefore, antibiotic therapy should not be prescribed unless justification for the need is warranted!

Myth #2: Doses & Duration of Antibiotic Treatment Should be Nonspecific & Variable for Most Odontogenic Infections

- INAPPROPRIATE DOSING** of an antibiotic can result in **INADEQUATE CONCENTRATION** of the drug at the site of the infection.
- This practice can promote **recurrence of infections** and development of **resistant bacterial strains**:
 - As **vulnerable microorganisms die**, the number of **surviving microbes increases**, making each successive bacterial generation **better equipped to resist future antibiotic challenges**.
 - This selection **process accelerates when the drugs** are administered in **doses small enough to allow stronger bacteria to survive the antibiotic assault**.
 - Eventually, strains of **bacteria are created that can resist antibiotic therapy**.

Myth #2: Doses & Duration of Antibiotic Treatment Should be Nonspecific & Variable for Most Odontogenic Infections

- In an **average size patient with an odontogenic infection** serious enough to warrant antibiotic therapy, **there is little indication for the use of doses of penicillin as low as 250 mg**.
- 500 mg of penicillin is the lowest dose that should be prescribed** for an **adult**.
- INADEQUATE DURATION** of the therapy or **overdosing of the antibiotic** can also result in **damaging the host response and producing toxic effects**.
- A rule of thumb when prescribing is that the antibiotic should last for **3 days after the patient's symptoms have resolved**.
- Treatment of most **odontogenic infections requires an average of 5-7 days of therapy**; however, treatment of **severe infections** or **immunocompromised patients' therapy may be of longer duration**.

Myth #2: Doses & Duration of Antibiotic Treatment Should be Nonspecific & Variable for Most Odontogenic Infections

- PATIENT COMPLIANCE** is another complication in effective treatment.
- The drug may be too **expensive** or **not covered** by a third party payer (insurance) or **unavailable** in Bahrain and the prescription remains unfilled.
- Dosing frequency may be complicated**.
- The **compliance issue most often observed** is **missed doses after clinical symptoms have subsided**.
- Another challenge to compliance is the **untoward or unexpected side effects** that can occur when taking antibiotics.
- In all these cases, mutated **microbes can flourish and cause serious consequences**.

Myth #3: Antibiotics are Always Indicated When Treating Dental Pain (Odontalgia)

- Irreversible pulpitis is a result of severe inflammation of the pulp system.
- A large quantity of inflammatory mediators and neuropeptides are present, which results in vascular permeability and elevated capillary pressure.
- Because of the hard tissue in which the pulp is encased and its low-compliance environment, the pulp is unable to neutralize these mediators.

Myth #3: Antibiotics are Always Indicated When Treating Dental Pain (Odontalgia)

- Pain is often caused by the release of these mediators that lower pain thresholds and causes spontaneous firing of sensory nerves.
- Pain of irreversible pulpitis may be sharp, dull, localized, or diffuse, and may last minutes to days.
- Chemo-mechanical removal of the pulpal tissue is the treatment of choice.
- An old but often popular idea was the use of intra-canal medicaments to help alleviate the patient's pain complaint. This concept can be dismissed as it is useless.

Myth #3: Antibiotics are Always Indicated When Treating Dental Pain (Odontalgia)

- Cleaning and shaping of the root canal with the use of sodium hypochlorite, a dry cotton pellet, and temporization of the access is the desired treatment. (Hasselgren G et al, 1989)
- Odontectomy may be indicated if the tooth is deemed to be non-restorable.
- Appropriate analgesics may be indicated but antibiotics are not.
- The patient's condition should improve rapidly once the source of the infection is eliminated. If the problem persists, consultation with a specialist may be warranted.

Myth #4: Clindamycin is a First Line Drug for Infections

- Clindamycin is an antimicrobial reserved for anaerobic, later stage odontogenic infections.
- It exhibits bacteriostatic activity, thereby inhibiting protein synthesis.
- Clindamycin should be considered ONLY as the first line of choice if the patient has had an allergic reaction to penicillin or if it can be determined that an osteomyelitis caused by anaerobic microbes is present – It is an excellent choice for treating serious intraosseous infections (Sabiston CB et al, 1974)

Myth #4: Clindamycin is a First Line Drug for Infections

- Clindamycin has less antigenic potential than penicillin, but has a slightly higher incidence of gastrointestinal adverse effects caused by the overgrowth of Clostridium difficile.
- Recent studies show that colitis is a possible adverse effect of most antibiotics, especially broad-spectrum penicillins and cephalosporins.
- This condition is often observed in recently hospitalized elderly patients who have had previous abdominal complaints and received high doses of an antibiotic.

Myth #5: If a Periapical Radiolucency, Sinus Tract, Fistula, or Localized Abscess is Present, Antibiotics are Always Indicated

- A periapical radiolucency, sinus tract, or fistula indicates a NECROTIC PULP – a vital pulp cannot exist with any of these objective signs.
- Because there is no significant vascularization to necrotic canals or abscesses, the effectiveness of antibiotic therapy is highly questionable – therapeutic concentrations of an antibiotic at the site of the infectious process cannot be obtained.
- A localized abscess (swelling) begins from the necrotic debris in the root canal and diffuses into the surrounding bone at the apex of the tooth, resulting in a swelling or sinus tract formation.

Myth #5: If a Periapical Radiolucency, Sinus Tract, Fistula, or Localized Abscess is Present, Antibiotics are Always Indicated

- Controlled clinical trials using penicillin, placebo, and neither medication in patients presenting with pulpal necrosis and periapical pain or localized swelling showed **no differences between groups in the course of recovery** or symptoms after debridement of the root canal system (Fouad A et al, 1996)
- Local dental treatment is most important in resolving the infection.** Root canal treatment or extraction if the tooth is not restorable accomplishes the removal of the irritants and drainage of the swelling. Incision and drainage is indicated if there is no drainage obtained from the tooth or tooth socket.

Myth #6: Antibiotics Must Be Given for Several Days Before Implementation Of Surgical Treatment

- The polymicrobial environment of odontogenic infections **persists** until the source of **the irritation is removed**.
- Dental treatment establishes a **favourable environment to the host to alleviate the disease**.
- The key to successful resolution of the infection is **initial drainage of the infection coupled with** either **thorough chemo-mechanical debridement of the root canal system** or **extraction** of the tooth or as an emergency measure until such time that definitive dental therapy can be implemented.

Myth #6: Antibiotics Must Be Given for Several Days Before Implementation Of Surgical Treatment

- The **vast majority of localized odontogenic infections can be SUCCESSFULLY treated by appropriate dental treatment ALONE**.
- Even **Medically compromised patients** who present with dental pain, sinus tracts, radio-lucencies, apical periodontitis, or localized intraoral swellings **DO NOT routinely require antibiotics** (Fouad A et al, 1996)

Myth #6: Antibiotics Must Be Given for Several Days Before Implementation Of Surgical Treatment

- It is **appropriate** however to administer oral **antibiotics approximately 1 hour before surgical therapy** - as it disrupts vascular supply to the infected area.
- Any time differential **greater than 1 hour** between administration of oral antibiotic and surgical therapy is **not warranted**.
- If the **antibiotic is administered parenterally**, tissue levels adjacent to the **infection are established in much less than 1 hour**.

Myth #7: Indurated Soft Tissues Means Drainage is Not Indicated

- DO NOT wait until a swelling becomes soft or fluctuant before incising and draining.**
- Diffuse fluctuant or indurated** soft tissues are a **more severe** manifestation of **the localized abscess**.
- Surgical therapy (root canal treatment or extraction)** is indicated primarily if the aetiology is a **necrotic tooth**. If adequate drainage is **NOT accomplished**, **soft tissue incision and drainage may be indicated**.

Myth #7: Indurated Soft Tissues Means Drainage is Not Indicated

- If **soft tissue swellings (cellulitis)** are **left untreated**, infection can spread to adjacent facial spaces resulting in serious consequences such as:
 - airway compromise,
 - sepsis, blindness,
 - mediastinal involvement, and
 - death.
- Fluctuant swellings** usually emit **purulence immediately** when incised, whereas a more **indurated swelling** results in **small quantities of blood and serous fluid**.

Myth #7: Indurated Soft Tissues Means Drainage is Not Indicated

- Draining **both types of swellings** releases pressure from the area and facilitates good recovery by:
 - providing oxygen to an anaerobic environment,
 - increasing blood circulation, and
 - thereby optimizing host defence mechanisms.
- A **culture and sensitivity should be obtained** when draining an infection, not to guide the initial antibiotic selection, but to be available should the empiric antibiotic therapy used fail.

Myth #8: Over-prescription of Antibiotic Therapy Does not Occur in Dentistry

- **Overuse and improper use of prescription drugs by dentists has been well documented.**
- The USA national Centres for Disease Control and Prevention estimate that approximately **one third of all outpatient antibiotic prescriptions are unnecessary.**
- **Nearly \$23 billion worldwide** has been spent on antibiotics in the last year (Slavkin H et al, 1997)
- **Approximately 10% of antibiotics** are now rendered **INEFFECTIVE** (Slavkin H et al, 1997)

Myth #8: Over-prescription of Antibiotic Therapy Does not Occur in Dentistry

The patient who demands to leave the appointment with a prescription in hand may drive the misuse of antibiotics.

The reality is that appropriate dental treatment, analgesic therapy, and education of the patient will alleviate the patient's symptoms and build trust in the doctor-patient relationship.

Chemoprophylaxis

- **Chemoprophylaxis** is the **use of antimicrobial agents to prevent an infection.**
- In dentistry, this can arise in **two contexts**:
 1. the prevention of an **infection at or near** the site of a surgical operation or
 2. **at a different site elsewhere** in the body.
- With respect to the latter, the main issues relate to the prevention of **infective endocarditis** and **infection in patients with hip and other joint prostheses.**

Infective Endocarditis

- **Infective endocarditis** is a **microbial infection of the endocardial surfaces usually involving the heart valves.**
- The infective organisms are usually **bacteria**, but infective endocarditis can also be caused by **fungal species.**
- **Infection on a compromised endocardial surface (especially damaged or prosthetic heart valves)** gives rise to the **formation of vegetations.**
- These **vegetations proliferate** and eventually can **destroy the valves.**
- **Embolism of fragments of the vegetations** can **damage organs and tissues including the brain, lung, and coronary arteries.**

Infective Endocarditis

- The overall global **incidence of infective endocarditis is difficult to determine** – In the UK, approximately **1,500–1,800 cases** are reported annually. In the USA, there is a reported incident rate of **11.6 per 100,000 person-years** (Berlin JA et al, 1995)
- The **mortality rate** of infective endocarditis, even with antibiotic therapy, is **30%** (Netzer BO et al, 2000)
- It is interesting to note that the **prevalence of infective endocarditis has remained consistent**, even after the introduction of antibiotic prophylaxis in the 1940s (Bayliss R et al, 1983) – **Note/ dramatic RISE** in the number of patients receiving **artificial heart valves AND** in addition to a **range of cardiac conditions, other risk factors** for infective endocarditis include **drug abusers, alcoholics, and patients with poor oral health.**

Microbiology of Infective Endocarditis

- Microorganisms most frequently cited include **S. aureus** and oral **streptococci** (especially α -hemolytic viridans streptococci).
- The primary event in the pathogenesis is **bacterial adherence to damaged heart valves**. This event is completed **within minutes** during **transient bacteremia** and involves **valve tissue** and **bacterial factors**.
- The second stage involves **persistence and growth of the bacteria** within the cardiac lesion and the formation of vegetations.
- After valve colonization, the infecting microorganisms **must survive and avoid host defenses**. A key event in this process is **maturation of the vegetation** within which the bacteria can become fully enveloped.

Dental-Induced Bacteremia

- Many **dental procedures**, especially those **involving dento-gingival manipulation**, will give rise to a bacteremia.
- The **more inflamed the gingival tissues**, the **greater the risk** and **magnitude of bacteremia**.
- Many **oral hygiene procedures** and even **chewing** can result in significant bacteremia of **similar magnitude** to the occurrence after certain dental procedures (Roberts GJ et al, 1999)
- Bacteremia arising from **dental treatment, oral hygiene practices, or even chewing** are of **low-grade intensity** (1×10^4 to 2×10^5 colony-forming units/ml of blood) and of **short duration** (30–600 seconds).

Dental-Induced Bacteremia

- For the **dental procedure to be considered** then this has to have been completed or carried out **within 14 days** of the **diagnosis of infective endocarditis**.
- **Often dentistry is blamed for infective endocarditis** because cardiologists just ask patients in whom infective endocarditis is suspected whether they have received or visited the dentist recently.
- It may well transpire that **spontaneous bacteremia** may be **MORE responsible for infective endocarditis** than **dental treatment**.

Dental-Induced Bacteremia

- Roberts (1999), evaluated the evidence of **dental-induced bacteremia** and infective **endocarditis** – **Three conclusions** :
 - **gingival bleeding** is a **POOR predictor** of **dental-induced bacteremia**,
 - the **intensity of bacterial inoculae** arising from dental operative procedures is **LOW** when compared to the **high intensity** needed for a **90% infective dose** in experimental animals.
 - The **procedures most often regarded as requiring antibiotic prophylaxis DO NOT** carry the **greatest risk of cumulative bacteremia**. **The latter arise from chewing and various oral hygiene practices.**

If laws of probability are applied to this data then either patients at risk from infective endocarditis should be on continuous chemoprophylaxis or the need to provide cover for dental treatment is grossly overstated!

Dental-Induced Bacteremia

- Further evidence to support this finding comes from an **analysis of cases whereby dental treatment has been implicated** as the cause:
 - **Oral streptococci** cause approximately 50% of all **infective endocarditis** cases.
 - Similarly, only 15% of patients, where infective endocarditis has been diagnosed, **report medical or dental treatment within the previous 3 months**.
 - It has been estimated that 4% or less of all **infective endocarditis** cases are **related to dental treatment induced bacteremia** (Bailly R, 1982; Guntheroth WG, 1984). Whether such bacteremia arises from **dental treatment** or is **spontaneous in nature** is not discernible. It has been suggested (Oakley CM, 1986) that if **spontaneous** random bacteremia cause 96% of all cases of infective endocarditis, then these bacteremia, as opposed to those arising from **dental treatment**, may also have caused the remaining 4%.

Chemoprophylaxis and the at Risk Patient

- There is debate between the **various governing bodies** as to what **underlying cardiac condition** requires chemoprophylaxis.
- Each country has slightly different guidelines, but many have followed those issued by the **American Heart Association in 1997 and 2007**.
- In 2006, the **British Society of Antimicrobial Chemotherapy** published their guidelines for the prevention of endocarditis and details.
- There are many **similarities** between the two sets of guidelines, in particular their **recommendations for the cardiac conditions that require antibiotic chemoprophylaxis**. **Differences** do exist with respect to the **dose of amoxicillin**.

American Heart Association Guidelines on Cardiac Conditions for when Chemoprophylaxis for Dental Procedures is Recommended

1. Prosthetic cardiac valve
2. Previous history of infective endocarditis
3. Congenital heart disease (CHD)
 - (a) Unrepaired cyanotic CHD, including palliative shunts and conduits
 - (b) Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first 6 months after the procedure (to allow for full endothelialization)
 - (c) Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibit endothelialization)
4. Cardiac transplantation recipients who develop cardiac valvulopathy

American Heart Association Guidelines for Dental Procedures for which Endocarditis Prophylaxis is Recommended

'All dental procedures that involve manipulation of gingival tissue on the periapical region of teeth or perforation of the oral mucosa'

American Heart Association have stated the following:

The following procedures and events do not need prophylaxis

- Routine anesthetic injections through non-infected tissue
- Taking dental radiographs
- Placement of removable prosthodontic or orthodontic appliances
- Adjustment of orthodontic appliances
- Placement of orthodontic brackets
- Shedding of deciduous teeth
- Bleeding from trauma to the lips or oral mucosa

American Heart Association Regimens For A Dental Procedure

Situation	Agent	Regimen: single dose 30-60 min before procedure	
		Adults	Children
Oral	Amoxicillin	2 g	50 mg/kg
Unable to take oral medication	Ampicillin or Cefazolin or ceftriaxone	2 g IM or IV 1 g IM or IV	50 mg/kg IM or IV 50 mg/kg IM or IV
Allergic to penicillins or ampicillin - oral	Cephalexin ^{1,2} or Clindamycin or Azithromycin or clarithromycin	2 g 600 mg 500 mg	50 mg/kg 20 mg/kg 15 mg/kg
Allergic to penicillins or ampicillin	Cefazolin or ceftriaxone ² or Clindamycin	1 g IM or IV 600 mg IM or IV	50 mg/kg IM or IV 20 mg/kg IM or IV

IM, intramuscular; IV, intravenous.

¹Or other first-generation or second-generation oral cephalosporin in equivalent adult or pediatric dosage.

²Cepalosporins should not be used in an individual with a history of anaphylaxis, angioedema, or urticaria with penicillins or ampicillin.



Thank You

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