Antimicrobial assignment in dentistry

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Abstract

The prescribing of antibiotics by dental practitioners has become an important aspect of dental practice. For this reason, antibiotics account for the vast majority of medicines prescribed by dentists. Antibiotic prescribing may be associated with unfavorable side effects ranging from gastrointestinal disturbances to fatal anaphylactic shock and development of resistance. Treatment of acute apical abscesses involves incision for drainage and root canal treatment or extraction of the involved tooth to remove the source of infection. There are no well established guidelines for the treatment of various dental infections, though the agent of preference will depend on the nature of disease and the choice of dentist.

Keywords: Dental infection, Pathogens, Antimicrobials.

Introduction

Dental infections most commonly occur when bacteria invade the pulp and spread to surrounding tissues; this can be due to dental caries, trauma, or dental procedures. The bacteria most frequently isolated in odontogenic infections (*S. viridans*, *Peptostreptococcus* spp, *Prevotella intermedia*, *Porphyromona gingivalis* and *Fusobacterium nucleatum*). Most odontogenic infections are caused by more than 1 species of the bacteria normally found within the oral cavity. Roughly 50% of odontogenic infections are caused by anaerobic bacteria alone, 44% by a combination of aerobic and anaerobic bacteria and only 6% by aerobic bacteria alone. Odontogenic infections progress through 3 stages: inoculation, cellulitis and abscess. Periodontal infections first involve the gingival tissues causing gingivitis and, over time, periodontitis. The periodontal disease mostly results from poor or ineffective dental hygiene leading to plaque and calculus accumulation and subsequent inflammation of tissues that support the teeth.^[1] Acute dental infection typically occurs when bacteria invade the dental pulp (nerve) and spread to tissues surrounding the tooth. Radiological signs of tooth associated infection in the supporting bone are extremely common, affecting 0.5-13.9% (mean 5.4%) of all teeth in a large systematic analysis.^[2] Occult dental infection can cause persistent fever. In a review of adults with prolonged fever related to dental infection, only 19% had dental symptoms.^[3] Periapical abscesses usually occur near the tip of the root of the tooth. They are more common among children than among adults. Children with poor dental hygiene are particularly at risk of periapical abscesses. Dental abscesses are usually painful. The pain may be situated in the tooth itself, the surrounding gum or be more generalized, including the jaw,

cheeks, or even neck or face, depending on the location of the abscess. Types of periodontal abscess are Acute periodontal abscess: The abscess develops in a short period of time and lasts for a few days or a week. An acute abscess often presents as a sudden onset of pain on biting and a deep throbbing pain in a tooth in which the patient has been tending to clench. The gingiva becomes red, swollen and tender. In the early stages, there is no fluctuation or pus discharge. Chronic periodontal abscess: This is the condition that lasts for a long time and often develops slowly. In the chronic stages, a nasty taste and spontaneous bleeding may accompany discomfort.^[4] Cone-beam CT (CBCT) is useful in assessing periapical disease, pericoronitis, and osteomyelitis. CT with contrast can help in evaluating the extent and severity of fascial space infection.^[5] A draining abscess or a fistula containing a chronic infection usually requires only root canal treatment or extraction. However, other disease processes, including periodontal abscesses, pericoronitis, acute periapical abscesses and deep fascial space infections may require antimicrobial therapy. Management of localised dental infection usually can be achieved by extraction of the infected tooth; incision and drainage of any collections of pus; or root canal treatment.^[6]

Antimicrobial Choice

Antibiotics are typically prescribed in dental practice for some of the following purposes: (a) as treatment for acute odontogenic infections; (b) as treatment for non-odontogenic infections; (c) as prophylaxis against focal infection in patients at risk (endocarditis and joint prostheses); and (d) as prophylaxis against local infection and systemic spread in oral surgery.

Table 1: Antimicrobial Dosing chart

Drug	Dose	Creatinine clearance 10-15ml/min	Creatinine clearance < 10ml/min
Amoxycillin	500/1000mg /8 hr	Every 8-12 hr	Every 12-14 hr
Amoxycillin + Clavulanate	500-875mg/ 8hr	Every 8 hour	Every 12-24 hour
Clindamycin	300mg/ 8hr	No adjustment required	No adjustment required
Doxycycline	100mg/ 24hr	No adjustment required	No adjustment required
Erythromycin	250-500mg / 6 hr	No adjustment required	No adjustment required
Azithromycin	500mg/ 24 hr for 3 days	No adjustment required	No adjustment required
Metronidazole	250-500mg / 8hr	Every 8-12hr	Every 12-12hr
Ciprofloxacin	500mg / 12 hr		Reduce Dose
Penicillin G	0.3-1,2 million IU / 6-12hr	50-100% dose	25-50% dose

There is considerable agreement that the beta-lactam derivatives are the antibiotics of choice for these processes, provided there are no allergies or intolerances. Prophylaxis of local infection is taken to comprise the administration of antibiotics on a pre-, intra- or postoperative basis, to prevent bacterial proliferation and dissemination within and from the surgical wound. The use of antibiotics in endodontics should be reserved for patients with signs of local infection, malaise of fever. Prophylactic or preventive use should be reserved for endocarditis and the systemic disorders commented above – avoiding indiscriminate antibiotic use^[7] Cephalosporins are broader spectrum antibiotic but they do not offer any advantage over amoxicillin in treating odontogenic infections. The overall cure rate for Amoxycillin and clavulanic acid was (87%); the cure rate was (94%) in acute infections and (86%) in chronic ones Erythromycin was used commonly for odontogenic infections. Side effect like gastric upset and because of high resistance of odontogenic microorganisms has led to fewer prescriptions for erythromycin in odontogenic infections. The drugs ciprofloxacin, norfloxacin, ofloxacin, and levofloxacin are bactericidal and have potent gram negative activity. But their activity against gram positive bacteria is poor. Furthermore, some researchers observed that amoxicillin/clavulanic acid and clindamycin are the only orally administered antimicrobials with adequate pharmacokinetic/pharmacodynamic properties to be effective against the most commonly isolated oral pathogens for the treatment of orofacial infections. Clindamycin is a broad-spectrum antibiotic with activity against aerobic, anaerobic, and β -lactamase-producing pathogens. This antibiotic has been used for many years as prophylactic treatment during dental procedures to prevent endocarditis. The use of ciprofloxacin and fluoroquinolones in pediatric patients has been limited due to arthropathy noticed in weight bearing joints. As there is no clear guideline for use of antibiotics in dentistry, it has been misused or overused in most of the cases; therefore, antibiotic resistance is increasing. The invasive dental procedures require antimicrobial prophylaxis.^[8]

Table 2: List of Invasive dental Procedures requiring adequate antimicrobial coverage

Matrix band placement	Root canal treatment before establishment of an apical stop
Subgingival rubber dam and clamp	Prefabricated metal crowns
Fixed prosthesis extending subgingivally	Surgical subgingival scaling and root planning
Abscess incision and drainage	Tooth extractions
Dental implants involving temporary anchorage devices, mini-implants	Surgical treatment requiring manipulation of a mucoperiosteal flap or mucogingival area (e.g., apicectomy)
Implant substructures uncovering	

Antibiotics^[9] are not an alternative to dental intervention; they are adjunct. Antibiotics are indicated when clinical signs of involvement are evident. The major use of antibiotic prophylaxis for dental procedures, are cases which cause bleeding in the oral cavity, has become a common practice among dentists. Antibiotics are indicated in dental practice for treating immunocompromised patients, evident signs of systemic infection and if the signs and symptoms of infection progress rapidly. Patients at high risk include those with infective endocarditis, immunocompromised conditions and dental procedures which may produce bacteraemia. Invasive dental procedures if performed in such patients should be preceded with an antibiotic prophylaxis.

Advantages of combination therapy in dentistry

1. Broadens the antimicrobial range of a therapeutic regimen beyond that of a single antibiotic.
2. Prevents or delays the emergence of bacterial resistance by using agents with overlapping spectra.
3. Lowers the required dose of a potentially toxic drug

Use of antibiotics in periodontics

1. Patients who exhibit continuing loss of periodontal attachment despite diligent conventional mechanical periodontal therapy (Recurrent or refractory periodontitis).
2. Patients with aggressive types of periodontitis. Or with medical conditions predisposing to periodontitis may benefit from antibiotic therapy.
3. Patients with acute or severe periodontal infections (periodontal abscess, acute necrotizing gingivitis/periodontitis).
4. Patients with chronic periodontitis may also benefit from antibiotics with improvement in clinical attachment level, but many questions regarding the indications for this therapy remain unanswered.^[10]

Conclusion

Acute dental infection typically occurs when bacteria invade the dental pulp (nerve) and spread to tissues surrounding the same. Antibiotic therapy essential in dentistry in specified indications. Patients at high risk include those with infective endocarditis, immunocompromised conditions and dental procedures which may produce bacteraemia. Invasive dental procedures if performed in such patients should be preceded with an antibiotic prophylaxis. Adjunctive use of parenteral broad spectrum antibiotics is indicated for example, combinations of a broad spectrum β lactam, metronidazole, and gentamicin. For most of dental infections β lactams remain the drug of choice, where it may be combined with metronidazole as required.

Funding

None.

Conflict of Interest

None.

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