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Specific Application of Antibiotic Use in Oral and Maxillofacial Surgery.

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ABSTRACT

Antibiotic prophylaxis in Oral & Maxillofacial Surgery aims the prevention of the infection of the surgical wounds. Discovery of antibiotics was one of the most important health advances in human history and regarded as miracle drugs as they are our most effective weapons against infectious diseases brought about by microorganisms like bacteria, fungi and parasites. Antibiotics have a well-documented efficacy in treatment of established infectious and as prophylactic agents in medically compromised patients and are most important in Oral & Maxillofacial Surgery.

Keywords: Infections, Antibiotics, Prophylaxis

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INTRODUCTION

The use of antibiotics is integral part of practice of surgery, medicine and dentistry. Antibiotics introduced to clinical use long back. The Golden era of anti microbial chemotherapy began with clinical use of Penicillin in 1941. Clearly these drugs have eliminated or greatly reduced the morbidity and mortality of infection. Several important infections, diseases have been so well controlled that many young physicians and dentists know them only through their textbooks. The antibiotics are used either for prevention of infection or to treat infections. The clinicians are quick to use antibiotics for any clinical problem that might be bacterial infections, some times in viral infections also. This standard approach has lead to a striking over use of antibiotics, which in turn led to evolution of bacteria that resistant to antibiotics.

Antibiotics in Oral and Maxillofacial Surgery

Dentoalveolar surgery

Although the oral microbiological flora contaminates intraoral extractions wounds and surgical wounds, the infection rate is very low [1,2]. This is due to excellent blood supply to oral tissue. It is unnecessary to use prophylactic antibiotics to prevent infection in healthy individual. Prophylactic antibiotics are indicated If the procedure involves the maxillary sinus OR nasal cavity, can result in cross contamination with new organisms, If the patient host defense mechanism is compromised e.g.; Poor nutritional states, complicating medical problems, presence of necrotic tissue / foreign body and decreased blood supply to the region. Patients who have received organ transplants may be on long-term immunosuppressive therapy and patients who are receiving chemotherapy for cancer should have their surgery done under preventive antibiotic coverage. Patients who have diagnosed metabolic disease (diabetes mellitus) that is well controlled do not require antibiotic therapy. However patients with uncontrolled metabolic disease (fluctuation in glucose level, under insulin therapy) prophylactic antibiotic cover indicated. Patient undergoing chemotherapy antibiotic prophylaxis is considered if invasive dental procedure is carried out. Patient with AIDS, in the absence of bacterial infection does not generally require antibiotic prophylaxis. Antibiotics considered in case where more chances of bacteraemia may occur (In case of extraction of teeth with abscess). AHA/ADA reconsiders use of antibiotic coverage for chronic intravenous drug abusers and for patients who have undergone splenectomy [3-5].

Impacted third molar surgery [5]

The use and benefits of antimicrobial prophylaxis in third molar surgery is controversial and there are no definite recommendations on the role of prophylactic antibiotics. Medically compromised patients are a group which may benefit from antimicrobial use. Antibiotic administration is not without risks including anaphylaxis, development of resistant bacteria and unjustified medical costs. Third molar surgery is one of the most commonly performed procedures in oral and maxillofacial units and in general practice. Prophylactic antibiotic therapy is defined as 'the administration of any antimicrobial agent that prevents the development of disease' the antibiotic must be present in the systemic circulation at a high level at the time of surgery and is usually given as one dose.

Post-operative complications and prophylactic antibiotics

There is a considerable volume of evidence that advocates antibiotics for the prevention of infection following third molar surgery. Improvement from trismus, reduction of pain and swelling with improved healing are outcomes that have been used to assess the success of antibiotics. Many workers recommend the use of prophylactic antibiotics for extractions, including third molar surgery, only when active infection is present at the time of surgery. But Barclay [6] compared the use of metronidazole versus a placebo involving non-acute pericoronitis patients in a randomized controlled study. There is a plethora of studies that advocate or disapprove of the use of antibiotics in the removal of third molar surgery. Many have been criticized for methodological shortcomings, fuelling an ongoing controversy in antimicrobial use. Most of the studies focus on a potential relationship between antibiotics and post-operative complications and avoiding issues such as use of aseptic technique, and surgical procedure to minimize trauma.

Medically compromised patients are a group, which may benefit from antimicrobial use. There appears to be very little clinical gain by the administration of a postoperative oral antibiotic alone. When contemplating the surgical removal of bone-impacted third molars, one dose of parenteral prophylactic antibiotics at induction may be considered. However there is no advantage in patients where bone removal is not required. Taking into account the above finding, there is no justification for the routine use of prophylactic antimicrobials in third molar surgery and therefore it cannot be recommended. The prescription of antibiotics in the exodontia of low third molars should be based on criteria of efficacy, safety, convenience and cost. As to efficacy, results demonstrate the antibiotic is efficacious, because IC frequency is between 3 and 24 times greater if not prescribed [7].

Dental Implants [8]

The early antibiotic prophylactic regimens for dental implants did start with a pre-treatment dose of 2g of penicillin, orally one hour prior to the procedure but were continued for up to 10 days. Subsequently, they have been progressively shortened to one to three day regimens. Dental implants are an interesting subset in dento-alveolar surgery. They involve the elective placement of a large foreign body through a microbiologically infested field into the bone. If a dental implant becomes bacterially infected the chance of failure is high. For this reason antibiotic prophylaxis is universally applied. As with dento-alveolar surgery, much of the current practice is not based on scientific evidence but on anecdotal statements of individual practitioners. There are many reasons that implants fail including poor surgical technique, factors leading to early loading, lack of bone quality and patient factors including habits such as tobacco smoking. As stated in the section on the principles of prophylaxis, the reason to use prophylactic antibiotics is if there is a demonstrated high rate of postoperative infection or the results of a post-operative infection are severe deleterious effects. Neither of these conditions apply with dental implants. If dental implants become infected the worst that can happen is the implant is lost. In a more recent studies which was large multi-centric analyzed the implant failures and found that significant reduction in failure up to stage 2 surgery seen when high dose preoperative antibiotics were given [9]. These findings were confirmed in a follow up study at 36 months in the same patient population 4.6% vs. 10 % failure. *These studies showed the benefit of using prophylactic antibiotics in dental implant patients.*

Orthognathic surgery

Orthognathic surgery performed via an intra oral approach and surgeries that involve maxillary sinus and nasal passage are clean contaminated wounds and short-term antibiotics have been shown to reduce the postoperative infection rates [10,11]. In one study in which a 5 day regimen was shown to be better than one day regimen [12]. But Aboobaker pointed out that; the difference was caused by the difference in the criteria used to establish wound infection [13].

Maxillofacial fractures

Patients with condylar process fractures treated by either by open reduction/ closed reduction require (extra oral incision) no prophylactic antibiotic coverage [13]. Fractures in non-tooth bearing areas that are not in communication with the mouth are considered clean wounds do not require antibiotic therapy. In patients with compound fractures of the facial skeleton antibiotics are necessary to prevent infection at fracture sites. Approximately 50 % fractures in patients who do not receive antibiotics become infected. The administration of antibiotic reduces this to less than 10 % [14, 15] . But in most of these studies, however antibiotics were not only given preoperatively but also for a long period postoperatively. More recent investigations are shown that short-term antibiotic prophylaxis equally effective in these situations [16].

Mid facial fractures compounded in the mouth, nose/ para-nasal sinuses requires antibiotic coverage, other studies [14, 16] have shown that it may not be necessary. One of these studies [17] was not well controlled and other studies had relatively small number of cases used, the issue remains unresolved. So it should be reasonable to consider such wounds as clean contaminated wounds and preoperative prophylactic antibiotics should be used. Patients with traumatic injuries that involve the oral mucosa, gingiva, tongue do not require prophylactic antibiotics because such wounds, although contaminated, generally heal without infections [4]. Simple extra oral lacerations from relatively clean objects that are closed within 4 hours also have low infections rate and do not require prophylactic antibiotics [18]. Extra oral soft tissue injuries, such as

those caused by blunt injuries, gun shot wounds and bites and injuries that involve oro-cutaneous communication fall into either the category of clean contaminated/ contaminated wounds and the patients should receive pre treatment antibiotic prophylaxis. If the wounds are extremely dirty such patients also should receive postoperative therapeutic antibiotics.

Major head and neck surgery [4]

Several studies/ researchers support the fact that patients who undergo major surgical procedures in the head and neck region, such as oncologic and reconstructive surgery, should receive preoperative antibiotics. There is question regarding how long they should be used post operatively. Several studies that have shown that there is no advantage in extending the prophylactic antibiotics beyond one day after surgery in such cases unless there are packs / drains in the wounds/ it is impossible to obtain primary closure and if there is prolonged leakage of saliva into the wound [19]. Trans-oral pre-prosthetic surgery, craniofacial surgery and tumor surgery considered to be class2/ clean contaminated [1, 20] have been demonstrated that the *use of short-term perioperative antibiotics demonstrated to be effective in preventing postoperative wound infections.*

Odontogenic infections

Odontogenic infections are the most commonly occurring infectious process. In last four decades of managing infectious disease significant changes occurred in the use of antibiotics and antimicrobials. The decisions to use antibiotics in managing odontogenic infections were based on several factors. The clinician must first diagnose the cause of infection and should determine the appropriate dental treatment to reduce /control infectious process [21]. It is important to understand the mechanism of antimicrobial resistance, its potential problems, and the means of overcoming it before selecting a appropriate antibiotic therapy alternative.

Sinus infections

Sinus problems most of the time mimics the pain of the odontogenic origin. Some times sinus infections may be of dental origin. An oral and maxillofacial surgeon may have to treat these conditions commonly. Antibiotic treatment should be reserved for patients who already have been treated for 7 days with only decongestants and analgesics and who have maxillary/ facial pain/ purulent nasal discharge. Patients with severe pain / fever may require antibiotic therapy sooner and hospitalization may be necessary. If antibiotics have been prescribed in previous month/if the incidence of strept. pneumonia is more than 30%, amoxicillin and clavulanic acid/ second-generation cephalosporin is prescribed for 2 weeks [22]. Recent studies show that penicillin/ amoxicillin alone is as effective as other broad spectrum and expensive antibiotics [23]. In chronic sinusitis flora becomes more anaerobic, antibiotic alone may not be sufficient and corrective surgery and consultation with otorhinolaryngology is indicated. If a patient with diabetes mellitus / immunocompromised patient, patient on deferoximine therapy previously diagnosed with sinus infections, fungal infections should be suspected. Amphotericin B and surgery are indicated.

Osteomyelitis of the jaws

Osteomyelitis has arrange of clinical presentations depending on the virulence of the infecting organisms, the resistance of the host, and the reaction of the bone and periosteum to the inflammation. Calcitonin was used to treat successfully such a case in the humerus, and long standing intractable diffuse sclerosing osteomyelitis of the mandible with calcitonin, and the results were encouraging. Calcitonin 50 Units /day subcutaneously and then reduced to 50 units twice a week . Flucloxacillin 500 mg 4 times a day and metronidazole 400 mg three times a day for 2 weeks , results in improvement and proven beneficial [24]. Odontogenic pathogens are the most frequent causative agents of osteomyelitis. Actinomyces are another prominent pathogen in chronic osteomyelitis. Long course of antibiotic effective against these organisms are required. Oral penicillin plus probencid can be used for long term out patient therapy. Probenecid inhibits the renal excretion of penicillin and increases the blood level obtained by oral route.

Fungal infections

Various fungi cause a wide spectrum of infectious manifestations in the head and neck. The major fungal infections of concern to oral and maxillofacial surgeon are histoplasmosis and blastomycosis, which cause granulomatous lesions, aspergillosis and mucormycosis, which cause sinusitis, and candidiasis, which cause surface lesions in non-immuno-compromised patients and may cause disseminated and invasive disease in immune-compromised persons. Sampling culturing, histological examination and use of molecular method diagnose these infections. In general fungal infections are treated with azole type antifungal agents for less severe cases and amphotericin B for disseminated and severe disease. In surface candidiasis in a healthy immune system, clotrimazole is a better- tasting yet economical alternative to nystatin.

Clefts

Primary closure of cleft lip and palate is classified as a clean contaminated operation , and wound infection is a recognized risk. The consequences of surgical wound infection after repair of cleft lip or palate can be devastating in both the short and the long term. Antibiotics are likely to reduce the incidence of wound infection and complications. Usually a slightly higher proportion of surgeons would not use any form of antibiotic prophylaxis for repair of a cleft palate than for isolated repair of a cleft lip, and although nearly half would not use any antibiotic prophylaxis afterwards, a third would continue to give it for 5 days [25].

Single dose antibiotic prophylaxis in outpatient oral surgery [26]

The use of antimicrobial agents to prevent infection is effective in many circumstances, and it is limited to specific, well-accepted indication to avoid excess cost, toxicity, and antimicrobial resistance. Preoperative topical, oral, and intravenous antimicrobial prophylaxis has been important in decreasing the incidence of surgical site infection. The time taken for an antibiotic to reach an effective concentration in any particular tissue reflects its pharmacokinetic profile and the route of administration. Administration of prophylaxis more than three hours after the start of the operation significantly reduces its effectiveness. For maximum effect, it should be given just before or after the start of the operation. Preoperative antimicrobial surgical prophylaxis is recommended for operative procedures that have a high rate of postoperative wound infection, when foreign materials must be implanted, or when the wound infection rate is low but the development of a wound infection results in a disastrous events. Infection of the incised skin or soft tissues is a common but potentially avoidable complication of any surgical procedure. Some bacterial contamination of a surgical site is inevitable, either from the patient's own bacterial flora or from the environment. In procedures that require the insertion of implants or prosthetic devices, the term surgical site infection is used to encompass the surgical wound and the implant. Surgical site infection also encompasses infections involving the body cavity (e.g. a. subphrenic abscess), bones, joints, meninges and other tissues involved in the operation. Prophylactic administration of antibiotics inhibits growth of contaminating bacteria and their adherence to prosthetic implants, thus reducing the risk of infection.

CONCLUSION

The goals of prophylactic administration of antibiotics to surgical patients are to reduce the incidence of surgical site infection, use antibiotics in a manner that is supported by evidence of effectiveness, minimize the adverse effects and cause minimal change to the patient's host defenses. It is important to emphasize that surgical antibiotic prophylaxis is an adjunct to, not a substitute for, good surgical technique. Antibiotic prophylaxis should be regarded as one component of an effective policy for the control of hospital acquired infection.

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