Antibiotic therapy in pediatric dentistry

Gabriela García Alvarez, Laura Elena Villarreal García, Sonia Martha Lopez Villarreal, Osvelia Esmeralda Rodriguez Luis, Juan Carlos Medrano Rodríguez, Nubia Maricela Chavez Lamas, Ana Karen Gonzalez Alvarez and Juan Manuel Solis Soto

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Abstract

Introduction: Antibiotics in pediatric dentistry are drugs used to prevent and treat bacterial infections in children.

Objective: To analyze the most recent literature on the use of antibiotic therapy in pediatric dentistry, its use in dental infections, dental traumatology, and facial cellulitis and as antibiotic prophylaxis.

Methodology: Articles on the use of antibiotic therapy in pediatric dentistry were analyzed in the databases PubMed, Scopus and Google Scholar with emphasis on the last 5 years. The keywords used were: "antibiotics", "dental infection", "dental traumatology", "facial cellulitis", and "antibiotic prophylaxis".

Results: The use of antibiotics in dental infections is only indicated when there are systemic signs of infection, in dental traumatology they are only recommended in cases of avulsion of permanent teeth and in lesions that may have been contaminated, they are also recommended in cases of facial cellulitis and as antibiotic prophylaxis in immunosuppressed patients or those with systemic diseases.

Conclusion: Nowadays the use of antibiotics in pediatric patients is very controversial, this is due to their inadequate use and the increase in bacterial resistance in recent years, for this reason, it is important that the pediatric dentist has knowledge of their adequate use in order to carry out correct prescription and administration and thus minimize bacterial resistance.

Keywords: Antibiotics, dental infection, dental traumatology, facial cellulitis, antibiotic prophylaxis.

1. Introduction

The overuse of antibiotics and the emergence of antibiotic-resistant bacterial strains is a worldwide concern. It has been shown that 80% of all antibiotic prescriptions that are used before outpatient procedures are unnecessary, as risk factors were not present and lead to antibiotic overuse. Due to the overuse of antibiotics, the degree of antibiotic resistance is so great that some bacterial species are resistant to the full range of currently available antibiotics. Other complications associated with inappropriate antibiotic prescribing in the pediatric population are: the risk of developing diabetes in children, due to sugary medications, and the risk of developing allergy and/or asthma in children treated with antibiotics. It is also believed that early antibiotic exposure modifies the gut microbiota, with subsequent long-term adverse effects such as obesity, infections with Candida species and photosensitivity.

It has also been found that amoxicillin exposure during early childhood may be associated with enamel development defects in both permanent first molars and upper central incisors.

The number of patients with antimicrobial resistance is increasing every day worldwide and this is due to the inadequate use of antibiotics in medical practice and their excessive use. For this reason, the aim of this study is to analyze the most recent literature on the use of antibiotic therapy in pediatric dentistry, its use in dental infections, dental traumatology, and facial cellulitis and in immunosuppressed patients or those with systemic diseases.
2. Materials and Methods
Articles on the subject published through the PubMed, SCOPUS and Google Scholar databases were analyzed, with emphasis on the last 5 years. The quality of the articles was evaluated using guidelines, i.e., identification, review, choice and inclusion. The quality of the reviews was assessed using the measurement tool for evaluating systematic reviews. The search was performed using Boolean logical operators and, or and not with the keywords: “Antibiotics”, “dental infection”, “dental traumatology”, “facial cellulitis”, and “Antibiotic prophylaxis”. The keywords were used individually, as well as each of them related to each other.

3. Results and Discussion
3.1 Dental Infections
Current clinical guidelines and recent articles on antibiotic prescribing indicate that antibiotics should be prescribed only when needed for a bacterial infection and as an adjunct, not as an alternative to other interventions implemented to control the source of infection (e.g., pulp therapy, extraction, scaling and root planning) [1, 2, 12].

Bacteria can gain access to pulp tissue through caries, exposed pulp or dentinal tubules, cracks in the dentin, and defective restorations, so if a child presents with acute symptoms of pulpitis, treatment (i.e., pulpotomy, pulpectomy, or extraction, without the need for antibiotics, since in these cases, the lack of blood circulation in the root canal prevents antibiotics from reaching the area, i.e., they are ineffective in eliminating the microorganisms, so antibiotic therapy is neither indicated nor effective [13, 14]. In case of discrete and localized swelling, drainage alone is considered sufficient without the need for additional medication, it should be taken into account that the patient has no systemic signs of an infection, i.e., no fever, no facial swelling [3].

Evidence has shown that antibiotics have no effect on pain associated with dentoalveolar infection, for which analgesics/anti-inflammatory drugs are indicated and not antibiotics [4]. For edema and fondness/heat, anti-inflammatory medications are prescribed and in cases of the presence of purulence, this should be resolved by pus drainage/debridement, however, if a patient presents with acute odontogenic abscess with diffuse swelling that is associated with pyrexia in the last 24 hours, this indicates that there is a systemic response to the infection; therefore, in these cases, antibiotics should be prescribed [1, 3, 8, 15].

In the results of recent literature it has been found that in pediatric patients with dental infection, the prescription of antibiotics is indicated in cases that present systemic signs of infection, however, if there are no systemic signs of infection antibiotics should not be indicated, since when the indicated dental treatment is performed, the infection will disappear.

3.2 Dental Trauma
When dental trauma occurs, factors related to host risk, such as age, systemic disease, comorbidities, malnutrition, and type of wound (e.g., laceration, puncture) are of great importance, as these should be evaluated to determine the risk of infection and subsequent need for antibiotics [1, 8].

Speaking about facial lacerations and puncture wounds after trauma, these may require topical antibiotic agents, in case of gingival and vestibular injuries of the teeth 0.12% chlorhexidine is prescribed for 4-5 days [16, 17]. It is recommended in children ≥ 8 years and adults to perform rinses with 15 millilitres of chlorhexidine 2 times a day, once after breakfast and once before bedtime for 30 seconds and then expectorate [18, 19]. As for intraoral puncture wounds and lacerations that appear to have been contaminated by extrinsic bacteria, debris (e.g., dirt, soil, gravel), foreign bodies, open fractures and joint injuries, these tend to have a higher risk of infection, so they should be managed with systemic antibiotics [3] in addition, it is important to inquire in the clinical history about tetanus vaccination status, as this is a factor to consider when prescribing antibiotics [3].

As for the medication, it should be administered as soon as possible to obtain the best result [20]. In recent literature systemic antibiotics are recommended as adjuvant treatment for avulsed permanent incisors with an open or closed apex, on the other hand, in the case of luxation lesions in the primary dentition, antibiotics are not indicated, because there is limited evidence for their use, and there is no evidence that antibiotics improve the outcome of teeth with root fracture [16, 20, 21].

As for medication, as has been studied for many years, amoxicillin or penicillin is the drug of choice in dentistry because of its efficacy against oral flora and low incidence of adverse effects [20]. In the guidelines recently published by the American Academy of Pediatric Dentistry, they recommend tetracycline (doxycycline twice daily for 7 days) as an alternative to penicillin, because it exhibits antimicrobial, anti-inflammatory and antiresorptive properties, which makes its use appropriate for dental trauma, however, the age of the child should be taken into account in the systemic use of tetracycline due to the risk of discoloration in the developing permanent dentition, for which penicillin V or amoxicillin can be administered as an alternative in patients under 12 years of age [23].

Current recommendations on the prescription of antibiotics in dental trauma are based on factors related to the risk of the host, such as age, and the presence of a systemic disease, among other factors. Among the indications for use are in cases of patients with intraoral puncture wounds and lacerations that may have been contaminated, and in cases of dental avulsion of permanent teeth, on the other hand, its use is not indicated in cases of luxation injuries in primary dentition.

3.3 Facial Cellulitis
Facial cellulitis of odontogenic origin (FCOO) refers to acute inflammation and infection of the subcutaneous tissue arising from an infected tooth and is of polymicrobial aetiology, characterized by highly virulent etiologic bacteria [22]. OCOF in children usually requires hospital admission for management, due to the potential for life-threatening complications, so providing definitive treatment for the dental source of infection is critical to reduce the length of hospital stay and resolve the infection, therefore, the use of antibiotic therapy should not be the mainstay of treatment, if not dental treatment [23-25]. For odontogenic infections with non-localized and progressive swelling and with manifestations of systemic involvement and septicemia are present such as fever, general malaise, asymmetry, facial swelling, lymphadenopathy, trismus, tachycardia, dysphagia, airway compromise, respiratory distress, emergency treatment and surgical intervention should be immediate, where medical treatment with intravenous antibiotic therapy contribute to faster healing, as for antibiotic therapy, it is recommended to administer broad-spectrum antibiotics, for which penicillin derivatives remain the empirical choice for odontogenic infections in children.
infections, however, additional adjuvant antimicrobial therapy, such as metronidazole, may be considered for the involvement of anaerobic bacteria [11, 6, 26, 27]. Amoxicillin has been found in the literature to be the most commonly recommended antibiotic for short durations of 3 to 5 days in the presence of absorption in the presence of food in the stomach and better compliance of pediatric patients [30]. As for alternative antibiotics in penicillin-sensitive patients are metronidazole or azithromycin, which are administered for 3 days [1, 28]. At the hospital level, amoxicillin with clavulanic acid or intravenous clindamycin is frequently used [23, 25]. Recently published guidelines and articles on antibiotic therapy recommend the use of systemic antibiotics in cases of facial cellulitis of odontogenic origin. They also indicate that in cases in which the patient presents manifestations of systemic involvement, the patient should be referred to the hospital for intravenous antibiotic treatment, taking into account that definitive treatment for the dental source of infection should be provided as soon as possible since it is essential to reduce the length of hospital stay and resolve the infection.

3.4 Antibiotic prophylaxis

Prophylactic antibiotics are recommended when patients at high risk for adverse outcomes from bacteremia and infection undergo invasive oral/dental procedures [29, 19]. This is because of a person's ability to fight a simple infection, thus, the rationale for antibiotic prophylaxis is to reduce or eliminate transient bacteremia caused by invasive dental procedures [30, 31]. The American Academy of Pediatric Dentistry recommends antibiotic prophylaxis in all dental procedures involving manipulation of gingival tissue, the periapical region of teeth, or perforation of the oral mucosa [29], in patients with systemic conditions such as rheumatic heart disease, endocarditis, heart/orthopedic prostheses, or in patients with any type of immunocompromise: AIDS, cancer, autoimmune diseases, corticosteroid therapy, as well as in patients with immunocompromised diseases such as cyclic neutropenia, pancytopenia, uncontrolled diabetes, to name a few common ones, as well as, after solid organ transplantation/grafting (cardiac/renal/bone marrow/liver/brain) [8], however, antibiotic prophylaxis is not recommended for anesthetic injections through non-infected tissue, taking dental radiographs, placement of orthodontic appliances or removable prostheses, adjustment of orthodontic appliances, placement of orthodontic brackets, loosening of primary teeth, and bleeding from trauma to the lips or oral mucosa [29]. The decision to use antibiotic prophylaxis should be made on an individual basis, and it is appropriate to discuss the risk and susceptibility to bacteremia-induced infections in the child [32]. The antibiotic of choice is amoxicillin at a dose of 50 mg/kg (maximum 2g) 30-60 minutes before the dental procedure [29, 33]. The American Heart Association no longer recommends clindamycin for prophylaxis of infective endocarditis due to severe and frequent reactions, therefore, doxycycline is recommended as an alternative for patients who are allergic to penicillin, cephalosporin and macrolide, and the indicated dose is in children < 45 kg, 2. 2 mg/kg and in children > 45 kg, 100 mg, however, it is known that the use of tetracyclines in children under 8 years of age can cause discolouration, for such reason, a study was recently conducted on the use of tetracyclines. In this study they found that short-term use (less than 21 days) of doxycycline has not been associated with tooth discolouration in children under eight years of age; however, more specialized future studies are expected for its indication in pediatric patients [33, 34]. For penicillin-allergic patients, azithromycin has been found to be one of the safest antibiotics, but there are risks of cardiac complications, including cardiotoxicity, so care should be taken in which patients to indicate; the recommended dose is 15 mg/kg orally [29, 35]. As for patients allergic to penicillin or ampicillin and who are unable to take oral medication, Cefazolin or ceftriaxone 50 mg/kg Intramuscular or intravenous is recommended [29]. Nowadays, the use of prophylactic antibiotics in patients with systemic conditions is very controversial, so the decision to use them should be made individually in each patient. Current guidelines recommend antibiotic prophylaxis in the therapeutic approach involving manipulation of gingival tissue or perforation of the oral mucosa, on the contrary, its use is not recommended in anaesthetic injections through non-infected tissue, taking dental radiographs, placement and adjustment of orthodontic appliances, detachment of primary teeth and bleeding from trauma to the lips or oral mucosa.

4. Conclusions

The inadequate use of antibiotic therapy and the increase in bacterial resistance in pediatric patients has increased in recent years, so it is important for pediatric dentists to be aware of its adequate use. Among the indications in the recent literature, it has been found that the use of antibiotics in dental infections is only indicated when systemic signs of infection are present, in dental traumatology it is only recommended in cases of avulsion of permanent teeth and in lesions that may have been contaminated, they are also recommended in cases of facial cellulitis and as antibiotic prophylaxis in immunosuppressed patients or those with systemic diseases.

5. References

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~ 83 ~