



AN OVERVIEW ON ANTIBIOTICS USE IN ENDODONTIC MANAGEMENT

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ABSTRACT

Disinfection of the root canal system followed by abscess drainage or tooth extraction is generally sufficient to manage most chronic and even acute endodontic infections. Antibiotics in this circumstance are not needed. However, Gram-positive and Gram-negative facultative anaerobes involve a combination of polymicrobial infections and strictly anaerobic bacteria, such as odontogenic infections and particularly endodontic infections, can gain from antibiotics as an accessory to endodontic therapy. The Medline, Pubmed, Embase, NCBI, and Cochrane databases were searched for studies using systemic antibiotics to treat endodontic lesions. PubMed database was used for articles selection, and the following keys were used in the mesh ("Antibiotics [Mesh]) AND ("in endodontic management" [Mesh]) OR (Antibiotics in endodontic management Mesh)). The focus was awarded to those studies which reported the diagnosis of endodontic disease therapy options and outcomes and data on the type of antibiotic prescribed. It is imperative to improve upon current antibiotic-prescribing manners in the therapy of endodontic infections and to introduce educational initiatives to inspire their comprehensible and appropriate use, as antibiotics tend to be over-prescribed for endodontic infection management.

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Introduction

Penicillin was the first antibiotic ever discovered. Alexander Fleming made this discovery in 1928. Howard Walter Florey introduced the use of antibiotics in clinical practice in 1940. Dentists have been making wide usage of them ever since. Antibiotic resistance is when a microorganism changes its response to the use of antibiotics initially designed to kill it and develops the ability to defeat the antibiotic initially designed for the treatment of infections it caused. It has come to attention that certain bacteria including, those involved in apical periodontitis [1], currently the most available antibiotics are becoming resistant. healthy patients who use antibiotics and analgesics for endodontic pain management do not follow the guidelines [2]. However, if the cause of the infection has been thoroughly managed, antibiotic therapy is unnecessary for most endodontic infections (obliteration, and sealing of the pulp space from the oral environment and complete debridement of the pulp space). However, the American Association of Endodontics (AAE) recommends the prescription of antibiotics in medically healthy patients if they present signs of diffuse swelling and systemic manifestations of the bacteria [3]. the role of antibiotics in decreasing pulpal pain or literature on this subject presents minimal information regarding either the type and dose of the analgesic needed and Pain management is even less documented. It has been reported that the prescription of antibiotics for endodontic management in some parts of the world is oftentimes inappropriate and unnecessary, despite the presence of infection [4]. This is a survey of the attitude and knowledge displayed in prescribing antibiotics and analgesics for medically healthy patients during endodontic management, by general dentists and specialists alike.

Materials and Methods

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This review aims to discuss the Antibiotics in endodontic management, indications, and if it has been prescribed inappropriate way or not.

Around 90 publications were chosen as the most clinically relevant out of 1,202 articles indexed in the previous two decades, and their full texts were evaluated. Thirty-one of the 90 were included after a thorough examination. Additional research and publications were found using reference lists from the recognized and linked studies. Expert consensus recommendations and commentary were added where relevant to help practicing physicians assess cirrhosis most simply and practically possible. Selection in the articles in regards to the inclusion criteria, based on the incorporation of one of the following topics: Antibiotics in endodontic management. Exclusion criteria were all other articles, which did not have one of these topics as their essential endpoint. PubMed database was used for articles selection, and the following keys were used in the mesh (“Antibiotics” [Mesh]) AND (“in endodontic management” [Mesh]) OR (Antibiotics in endodontic management) Mesh)).

Results and Discussion

The utilize of antibiotics in pulp capping procedures is not supported by any scientific proof. Rather the contrary, the cause of the disease (such as caries) must be addressed [4, 5] before MTA or other calcium silicate-based materials are to be utilized. Additionally, topical antibiotics have no evidence to support the use amid root canal treatment either. Sato *et al.* 1996 [6], The use of antibiotic intracanal dressings in REP is likely to cause many side effects, such as dentine discoloration which often accompanies the use of minocycline in an intracoronal TAP [7-9]. It is important to apply reason to the use and duration of antibiotic therapy because commensal flora in the oral cavity and other parts of the body are destroyed due to prolonged usage of antibiotics, thus weakening and/or terminating resistance to colonization [10]. In addition, considering where the world population is more concentrated such as China, Indonesia, Brazil, Bangladesh, Russia, Japan, and Mexico have little available data regarding dentists’ prescription patterns for antibiotics. Surveys to gauge dentists’ patterns in prescribing antibiotics in the therapy of endodontic infections should be encouraged in these countries. A systematic review was recently published which analyzed the available evidence regarding the administration of antibiotics for infections of the endodontic and pain. Indeed, this review complete that the best available clinical demonstrate only supports the usage of antibiotics the patient is febrile, or both when the spread of endodontic infection is systemic. It does not support the necessity of prescribing antibiotics for the treatment of endodontic diseases in general [11].

Treatment

Endodontic treatments use antibiotics either systemically or topically, and topical antibiotics propose the use of a few endodontic therapies (such as pulp capping, root canal therapy, regenerative endodontic procedures, and tooth avulsion) . Dental pulp capping consists in placing a medicated or nonmedicated material on a vital pulp that has been exposed. Retain a thin layer of dentine over a nearly exposed pulp (indirect capping) to allow it to recover and regain its normal function, the practitioner can either apply a protective agent or dressing to the exposed pulp (direct capping) [12]. many researchers and clinicians have utilized local antibiotics in pulp capping [13-21], but this practice has not proven to be very effective. Locally applied antibiotics are being used in root canal treatments, as systemic antibiotics in some pulpal and periapical conditions carry a risk of adverse effects and, additionally, are ineffective [22]. Polyantibiotic paste that contained penicillin, bacitracin, streptomycin, and caprylate sodium was the first topical antibiotic reported to have been used locally [23]. These topical antibiotics are generally used in root canal treatments, as it is proposed that they reduce and/or prevent postoperative symptoms. However [24], symptomatic apical pathosis has no effect on pain or swelling in teeth [25].

Regenerative endodontic procedures (or REPs) are biologically based treatment procedures outlined to restore feasible tissue with the normal function of the pulp-dentine structure and reinstate damaged tissue, as defined by Murray *et al.* (2007) [26]. the use of intracanal medicaments to achieve disinfection, rather than mechanical debridement that is utilized on chemical debridement Mostly relies on REPs [27]. The antibiotic mixture is known as a triple antibiotic paste (TAP) or ‘3mix’ is, to date, the preferred intracanal medicament in REPs today [27]. It is composed of ciprofloxacin, metronidazole, and minocycline. It is also recommended to use a topical antibiotic on an avulsed tooth before replanting, as it is advocated to enhance the healing process. Systemic antibiotics have been reported to be less beneficial than Topical antibiotics in cases of tooth avulsion: evidence states that antibiotics may have an important role in reducing the probability of inflammatory resorption [28, 29]. inflammatory root resorption could be avoided by administration of Topical antibiotics which help in managing a replanted tooth, which is one of the major challenges faced by clinicians amid the management of tooth avulsion [30]. Penicillin VK is the most often-prescribed antibiotic in the United States, as prescribed by 69% of dentists as opposed to 28% of American endodontists who prescribe amoxicillin [31]. Patients were prescribed Erythromycin and clindamycin when allergic to penicillin [32]. In Europe, surveys show that amoxicillin only with clavulanic acid is the recommended prescription antibiotic in endodontic infections with systemic effects, [33-38]. Amoxicillin is a moderate-spectrum, bacteriolytic, b-lactam antibiotic with a synthetic improvement upon the original penicillin molecule. It is a viable option in treating orofacial infections because its absorption rate is better than penicillin, it is effective against a wider range of bacteria and it can be taken with food. In addition, antibiotics recommended for the therapy of odontogenic infections are Co-amoxiclav (amoxicillin/ clavulanic acid). Co-amoxiclav is a wide spectrum, has greater antibacterial effectiveness than penicillin VK, and has a low incidence of resistance and tolerance [39]. Cultivated root canal samples show low resistance of bacteria [40]. Ineffective of Penicillin VK within 48–72 hours, it is recommended to administer metronidazole in combination with penicillin VK, or penicillin VK can

be switched to amoxicillin/clavulanic acid or clindamycin if the patient is allergic to penicillin. It has not been defined precisely how long to use the antibiotic in the treatment of endodontic infections. A complete course of antibiotic therapy is required for bacterial infections considered by some dental practitioners [41], but there seems to be a general tendency for antibiotics to be administered for 3–7 days [42].

Conclusion

Antibiotic therapy in combination with endodontic treatment is illustrated in the following situations as prescriptions of antibiotics in endodontics should be limited to specific cases to avoid their over-prescription [43].

1. Medically compromised patients presenting an acute apical abscess;
2. Systemic involvement noted in an acute apical abscess (elevated body temperature above 38°C, localized fluctuant swellings, lymphadenopathy, trismus, malaise);
3. Rapid onset of severe infection in less than 24 hours, such as cellulitis, osteomyelitis progressing infections where the intervention of an oral/maxillofacial surgeon may be required;
4. Replantation of avulsed permanent teeth [43, 44]. In these cases, it may also be necessary to administer topical antibiotics [45].
5. Trauma to soft tissue (e.g. sutures, debridement) [46].

The administration of antibiotics is not to be used as a replacement for endodontic treatment, despite their efficacy in cases that pose a risk to the patient. Indeed, endodontic treatment is the main procedure to reach the best outcome with endodontic lesions: Proceeding with the chemomechanical removal of the infection from the root canal system as well as drainage of pus to obtain successful outcomes is indispensable, and the administration of antibiotics should only be considered as an adjunct to endodontic treatment.

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References

1. Keiser K, Hargreaves KM. Building effective strategies for the management of endodontic pain. *Endod Topics*. 2002;3(1):93-105. doi:10.1034/j.1601-1546.2002.30109.x
2. Siqueira Jr JF, Rôças IN. Exploiting molecular methods to explore endodontic infections: part 2—redefining the endodontic microbiota. *J Endod*. 2005;31(7):488-98. doi:10.1097/01.don.0000157990.86638.49
3. Morrow S. Use and abuse of antibiotics. *American Association of Endodontics-Colleagues for Excellence Newsletter* [Internet]. 2012. <https://www.aae.org/specialty/wp-content/uploads/sites/2/2017/07/ecfewinter12final.pdf>, 2012
4. Bogen G, Kim JS, Bakland LK. Direct pulp capping with mineral trioxide aggregate: an observational study. *J Am Dent Assoc*. 2008;139(3):305-15. doi:10.14219/jada.archive.2008.0160
5. Li Z, Cao L, Fan M, Xu Q. Direct pulp capping with calcium hydroxide or mineral trioxide aggregate: a meta-analysis. *J Endod*. 2015;41(9):1412-7. doi:10.1016/j.joen.2015.04.012
6. Sato I, Ando-Kurihara N, Kota K, Iwaku M, Hoshino E. Sterilization of infected root-canal dentine by topical application of a mixture of ciprofloxacin, metronidazole and minocycline in situ. *Int Endod J*. 1996;29(2):118-24. doi:10.1111/j.1365-2591.1996.tb01172.x
7. Hoshino E, Kurihara-Ando N, Sato I, Uematsu H, Sato M, Kota K, et al. In-vitro antibacterial susceptibility of bacteria taken from infected root dentine to a mixture of ciprofloxacin, metronidazole and minocycline. *Int Endod J*. 1996;29(2):125-30. doi:10.1111/j.1365-2591.1996.tb01173.x
8. Y Miller F, Campus G, Giuliana G, R Piscopo M, Pizzo G. Topical fluoride for preventing dental caries in children and adolescents. *Curr Pharm Des*. 2012;18(34):5532-41. doi:10.2174/138161212803307464
9. Rodríguez-Benítez S, Stambolsky C, Gutiérrez-Pérez JL, Torres-Lagares D, Segura-Egea JJ. Pulp revascularization of immature dog teeth with apical periodontitis using triantibiotic paste and platelet-rich plasma: a radiographic study. *J Endod*. 2015;41(8):1299-304. doi:10.1016/j.joen.2015.05.002
10. Longman LP, Martin MV. The use of antibiotics in the prevention of post-operative infection: a re-appraisal. *Br Dent J*. 1991;170(7):257-62. doi:10.1038/sj.bdj.4807487
11. Aminoshariae A, Kulild JC. Evidence-based recommendations for antibiotic usage to treat endodontic infections and pain: A systematic review of randomized controlled trials. *J Am Dent Assoc*. 2016;147(3):186-91. doi:10.1016/j.adaj.2015.11.002

12. Miyashita H, Worthington HV, Qualtrough A, Plasschaert A. Pulp management for caries in adults: maintaining pulp vitality. *Cochrane Database Syst Rev.* 2007;(2). doi:10.1002/14651858.CD004484.pub2
13. Cowan A. Treatment of exposed vital pulps with a corticosteroid antibiotic agent. *Br Dent J.* 1966;120(11):521-32.
14. Mjör IA, Ostby BN. Experimental investigations on the effect of Ledermix on normal pulps. *J Oral Ther Pharmacol.* 1966;2(5):367-75.
15. Clarke NG. The corticosteroid-antibiotic dressing as a capping for inflamed dental pulps. *Aust Dent J.* 1971;16(2):72-6. doi:10.1111/j.1834-7819.1971.tb02309.x
16. Lakshmanan CD. Evaluation The of a Corticosteroid Antibiotic Agent in Pulp Capping. *Int Endod J.* 1972;6(2):24-34. doi:10.1111/j.1365-2591.1972.tb00069.x
17. McWalter GM, El-Kafrawy AH, Mitchell DF. Pulp capping in monkeys with a calcium-hydroxide compound, an antibiotic, and a polycarboxylate cement. *Oral Surg Oral Med Oral Pathol.* 1973;36(1):90-100. doi:10.1016/0030-4220(73)90270-3
18. Soldati GD. Pulp capping with antibiotics. *N Y J Dent.* 1974;44(4):120-2.
19. Abbott PV, Hume WR, Heithersay GS. Effects of combining Ledermix® and calcium hydroxide pastes on the diffusion of corticosteroid and tetracycline through human tooth roots in vitro. *Dent Traumatol.* 1989;5(4):188-92. doi:10.1111/j.1600-9657.1989.tb00358.x
20. Yoshida K, Yoshida N, Iwaku M. Effects of antibacterial capping agents on dental pulps of monkeys mechanically exposed to oral microflora. *J Endod.* 1995;21(1):16-20. doi:10.1016/S0099-2399(06)80551-0
21. Cannon M, Cernigliaro J, Vieira A, Percinoto C, Jurado R. Effects of antibacterial agents on dental pulps of monkeys mechanically exposed and contaminated. *J Clin Pediatr Dent.* 2008;33(1):21-8. doi:10.17796/jcpd.33.1.761h028338322578
22. Mohammadi Z, Abbott PV. On the local applications of antibiotics and antibiotic-based agents in endodontics and dental traumatology. *Int Endod J.* 2009;42(7):555-67. doi:10.1111/j.1365-2591.2009.01564.x
23. Grossman LI. Polyantibiotic treatment of pulpless teeth. *J Am Dent Assoc.* 1951;43(3):265-78. doi:10.14219/jada.archive.1951.0213
24. Veitz-Keenan A, Spivakovsky S, Lo D, Furnari W, ElSayed H. Adhesive restorations for the treatment of dental non-carious cervical lesions. *Cochrane Database Syst Rev.* 2019;2019(12). doi:10.1002/14651858.CD011449.pub2
25. Cope AL, Wood F, Francis NA, Chestnutt IG. General dental practitioners' perceptions of antimicrobial use and resistance: a qualitative interview study. *Br Dent J.* 2014;217(5):E9-. doi:10.1038/sj.bdj.2014.761
26. Murray PE, García Godoy C, García Godoy F. How is the biocompatibility of dental biomaterials evaluated?. *Med Oral Patol Oral Cir Bucal (Internet).* 2007;12(3):258-66.
27. Diogenes A, Henry MA, Teixeira FB, Hargreaves KM. An update on clinical regenerative endodontics. *Endod Topics.* 2013;28(1):2-3. doi:10.1111/etp.12040
28. Hammarström L, Blomlöf L, Feiglin B, Andersson L, Lindskog S. Replantation of teeth and antibiotic treatment. *Dent Traumatol.* 1986;2(2):51-7. doi:10.1111/j.1600-9657.1986.tb00124.x
29. Lee SH, Kim YJ. A comparative study of the effect of probiotics on cariogenic biofilm model for preventing dental caries. *Arch Microbiol.* 2014;196(8):601-9. doi:10.1007/s00203-014-0998-7
30. Andersson P, Westergren A, Johannsen A. The invisible work with tobacco cessation—Strategies among dental hygienists. *Int J Dent Hyg.* 2012;10(1):54-60. doi:10.1111/j.1601-5037.2011.00530.x
31. Whitten BH, Gardiner DL, Jeanson BG, Lemon RR. Current trends in endodontic treatment: report of a national survey. *J Am Dent Assoc.* 1996;127(9):1333-41. doi:10.14219/jada.archive.1996.0444
32. Yingling NM, Byrne BE, Hartwell GR. Antibiotic use by members of the American Association of Endodontists in the year 2000: report of a national survey. *J Endod.* 2002;28(5):396-404. doi:10.1097/00004770-200205000-00012
33. Tulip DE, Palmer NO. A retrospective investigation of the clinical management of patients attending an out of hours dental clinic in Merseyside under the new NHS dental contract. *Br Dent J.* 2008;205(12):659-64. doi:10.1038/sj.bdj.2008.1044
34. Mainjot A, D'Hoore W, Vanheusden A, Van Nieuwenhuysen JP. Antibiotic prescribing in dental practice in Belgium. *Int Endod J.* 2009;42(12):1112-7. doi:10.1111/j.1365-2591.2009.01642.x
35. Rodríguez-Núñez A, Cisneros-Cabello R, Velasco-Ortega E, Llamas-Carreras JM, Torres-Lagares D, Segura-Egea JJ. Antibiotic use by members of the Spanish Endodontic Society. *J Endod.* 2009;35(9):1198-203. doi:10.1016/j.joen.2009.05.031
36. Segura-Egea JJ, Velasco-Ortega E, Torres-Lagares D, Velasco-Ponferrada MD, Monsalve-Guil L, Llamas-Carreras JM. Pattern of antibiotic prescription in the management of endodontic infections amongst Spanish oral surgeons. *Int Endod J.* 2010;43(4):342-50. doi:10.1111/j.1365-2591.2010.01691.x
37. Skučaitė N, Pečiulienė V, Manelienė R, Mačiulskienė V. Antibiotic prescription for the treatment of endodontic pathology: a survey among Lithuanian dentists. *Medicina.* 2010;46(12):806. doi:10.3390/medicina46120113
38. Kaptan RF, Haznedaroglu F, Basturk FB, Kayahan MB. Treatment approaches and antibiotic use for emergency dental treatment in Turkey. *Ther Clin Risk Manag.* 2013;9:443. doi:10.2147/TCRM.S52009
39. Stein K, Farmer J, Singhal S, Marra F, Sutherland S, Quiñonez C. The use and misuse of antibiotics in dentistry: A scoping review. *J Am Dent Assoc.* 2018;149(10):869-84. doi:10.1016/j.adaj.2018.05.034

40. Lucena MI, Andrade RJ, Fernández MC, Pachkoria K, Pelaez G, Durán JA, et al. Determinants of the clinical expression of amoxicillin-clavulanate hepatotoxicity: a prospective series from Spain. *Hepatology*. 2006;44(4):850-6. doi:10.1002/hep.21324
41. Pallasch TJ. Antibiotics for acute orofacial infections. *J Calif Dent Assoc*. 1993;21(2):34-44.
42. Fazakerley MW, McGowan P, Hardy P, Martin MV. A comparative study of cephadrine, amoxycillin and phenoxymethylpenicillin in the treatment of acute dentoalveolar infection. *Br Dent J*. 1993;174(10):359-63. doi:10.1038/sj.bdj.4808171
43. Segura-Egea JJ, Gould K, Şen BH, Jonasson P, Cotti E, Mazzoni A, et al. Antibiotics in Endodontics: a review. *Int Endod J*. 2017;50(12):1169-84. doi:10.1111/iej.12741
44. Hinckfuss SE, Messer LB. Splinting duration and periodontal outcomes for replanted avulsed teeth: a systematic review. *Dent Traumatol*. 2009;25(2):150-7. doi:10.1111/j.1600-9657.2008.00761.x
45. Andersson L, Andreasen JO, Day P, Heithersay G, Trope M, DiAngelis AJ, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. *Dent Traumatol*. 2012;28(2):88-96. doi:10.1111/j.1600-9657.2012.01125.x
46. DiAngelis AJ, Andreasen JO, Ebeleseder KA, Kenny DJ, Trope M, Sigurdsson A, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations of permanent teeth. *Dent Traumatol*. 2012;28(1):2-12. doi:10.1111/j.1600-9657.2011.01103.x