

CLINICAL PRACTICE GUIDELINE

Rational Use of Antibiotics in Endodontics - Brazilian Endodontic Society Guideline

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Abstract

Antimicrobial resistance is one of the major challenges facing global public health, and Dentistry accounts for a substantial share of antibiotic prescriptions, many of which lack an appropriate clinical indication. Most endodontic infections remain confined to the root canal system and the periapical tissues and are controlled by local procedures, so that systemic antibiotics rarely constitute the primary therapy. This guideline, developed by the Brazilian Endodontic Society (SBEndo), provides evidence-based recommendations for the rational use of antibiotics in Endodontics. It defines the clinical situations in which systemic antibiotics are indicated as adjunctive therapy (acute apical abscess with systemic involvement, progressive infections, immunocompromised patients, replantation of avulsed permanent teeth, extensive soft tissue trauma and selected persistent infections) and those in which they are not indicated. It also establishes recommendations on the choice of antimicrobial, with amoxicillin as the first-choice agent, alternatives for penicillin-allergic patients, the role of microbiological culture, the duration of treatment guided by clinical progress, and the indications for antibiotic prophylaxis according to current cardiology recommendations. In all situations, antibiotics are regarded exclusively as adjunctive therapy, and elimination of the source of infection through endodontic treatment, drainage or other local interventions remains the main determinant of therapeutic success.

Key words

Anti-Bacterial Agents; Antibiotic Prophylaxis; Antimicrobial Stewardship; Endodontics; Periapical Abscess; Practice Guideline.

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Introduction

Antimicrobial resistance is currently one of the major challenges facing global public health. The excessive and inappropriate use of antibiotics has contributed substantially to the emergence of resistant microorganisms, progressively reducing the effectiveness of therapies that have historically transformed the prognosis of infectious diseases. Dentistry plays a relevant role in this scenario. Dentists are estimated to account for a substantial share of antibiotic prescriptions in the community, and studies conducted in different countries have shown that a considerable proportion of these prescriptions are issued without an appropriate clinical indication (1).

In Endodontics, the use of antibiotics has particular characteristics. Unlike many other infections of the body, most endodontic infections remain confined to the root canal system and the adjacent periapical tissues. In these cases, eliminating the source of infection through local procedures is sufficient to control the disease and promote tissue repair. Consequently, systemic antibiotics rarely constitute the primary therapy and should be considered only as an adjunctive measure in specific situations.

The aim of this guideline is to provide recommendations based on the best available scientific evidence to guide the rational use of antibiotics in Endodontics, thereby contributing both to patient safety and to global efforts to preserve the effectiveness of antimicrobials.

General Principles

Endodontic infection is essentially a localized infection whose microbial reservoir lies predominantly within the root canal system. Therefore, the fundamental therapeutic approach should always seek to eliminate or reduce this microbial load through local procedures.

Endodontic treatment, drainage through the root canal, incision and drainage of the soft tissues when indicated and, in specific situations, tooth extraction constitute the main methods of infection control. Systemic antibiotic therapy does not replace any of these interventions.

The decision to prescribe antibiotics should be based not only on the endodontic diagnosis but, above all, on the assessment of the extent of the infection, the presence of systemic signs and the patient's medical conditions. In other words, the need for antibiotics is determined far more by the host response and the risk of spread of the infection than by the pulpal or periapical diagnosis alone.

In cases of pulp necrosis, the absence of vascularization within the root canal system limits the delivery of systemic antibiotics to the main microbial reservoir. In addition, the organization of microorganisms in biofilms, high cell density, reduced metabolic activity and other local conditions may decrease their susceptibility to antimicrobials. These factors reinforce the need for local control of the infection through endodontic treatment and drainage, when indicated. However, when the infection spreads to periapical tissues or vascularized anatomical spaces, or produces systemic involvement, antibiotics retain a relevant adjunctive role.

Why are antibiotics rarely necessary in Endodontics?

The belief that any odontogenic pain or infection must be treated with antibiotics remains relatively common among both patients and professionals. However, decades of clinical investigation have shown that most endodontic conditions derive no measurable clinical benefit from the use of systemic antibiotics (2,3).

In symptomatic irreversible pulpitis, for example, the inflammatory process remains confined to the pulp tissue. Although the pain may be intense, there is no disseminated infection that would justify antibiotic therapy. Controlled clinical trials have shown that antibiotics neither reduce pain nor accelerate the resolution of symptoms when compared with appropriate local treatment.

A similar situation occurs in pulp necrosis, with or without apical periodontitis. In these cases, microorganisms remain predominantly confined to the root canal system, and the mechanical and chemical removal of the infection is the treatment of choice.

Likewise, chronic apical abscesses with a sinus tract and localized acute apical abscesses can generally be managed adequately by drainage and endodontic treatment, with no additional benefit from the use of systemic antibiotics.

The indiscriminate use of antibiotics in these situations not only fails to provide relevant clinical benefit but also exposes patients to unnecessary risks, including allergic reactions, gastrointestinal disturbances, *Clostridioides difficile* infection and the selection of resistant bacteria.

Indications for Systemic Antibiotics in Endodontics

Although most endodontic infections can be controlled by local interventions, some clinical situations justify the use of systemic antibiotics as adjunctive therapy. In these circumstances, antimicrobials do not replace endodontic treatment but assist in controlling infections that have exceeded the host's capacity for local containment. The decision to prescribe antibiotics should be based primarily on the presence of signs of systemic involvement or spread of the infection, as well as on medical conditions that reduce the patient's immune response. The signs most frequently associated with systemic involvement include fever, general malaise, fatigue or prostration, regional lymphadenopathy, trismus and clinical evidence of spread of the infection to adjacent tissues (Table 1).

Table 1. Clinical signs suggestive of systemic involvement or spread of infection.

Clinical finding	Significance
Fever (>38 °C)	Possible systemic involvement
General malaise	Systemic response to infection
Fatigue or prostration	Systemic involvement
Regional lymphadenopathy	Regional response to infection
Trismus	Possible involvement of deep spaces
Cellulitis	Spread of infection
Rapidly increasing swelling	Progressive infection
Fascial space involvement	Severe infection
Signs of airway compromise	Medical emergency

SBEndo Recommendations

SBEndo recommends the use of systemic antibiotics as adjunctive therapy in the following situations:

1. Acute apical abscess with systemic involvement

Characterized by the presence of one or more of the following signs or symptoms:

- body temperature above 38 °C;
- general malaise;
- fatigue or prostration;
- regional lymphadenopathy;
- trismus;
- clinical signs of spread of the infection beyond the periapical tissues.

2. Progressive infections

Characterized by:

- rapidly increasing swelling;
- spread of the infection to adjacent tissues;
- cellulitis*;
- fascial space involvement;
- osteomyelitis of odontogenic origin;
- spread to deep cervicofacial spaces;
- risk of airway compromise.

* Odontogenic cellulitis is a diffuse inflammation of the soft tissues caused by the spread of a bacterial infection, usually characterized by swelling and induration of the tissues, with poorly defined borders and no localized purulent collection. It may progress to abscess formation or coexist with areas of suppuration. Depending on its location, erythema, increased local temperature and pain may be present.

In these situations, referral for hospital care or evaluation by a specialized team should be considered.

3. Immunocompromised patients

Antibiotic therapy may be indicated even in localized infections when there is significant impairment of the immune response.

Examples include patients with neutropenia, leukemias, hematological malignancies, pharmacological immunosuppression, transplant recipients, diabetes mellitus with inadequate metabolic control and other conditions associated with a significant reduction in the immune response.

Whenever necessary, treatment should be carried out in conjunction with the patient's physician.

4. Replantation of avulsed permanent teeth

Systemic antibiotic therapy may be indicated as part of the management protocol for avulsed permanent teeth, particularly in cases of delayed replantation or when there is a high risk of inflammatory resorption (4).

5. Soft tissue trauma associated with dental injuries

Extensive traumatic injuries involving lacerations, the need for suturing or significant contamination of the soft tissues may justify systemic antibiotic therapy, according to individual clinical assessment.

6. Selected persistent infections

In exceptional situations, characterized by persistent exudation and the persistence of clinical signs of infection despite the adequate performance of conventional endodontic procedures, systemic antibiotic therapy may be considered after careful diagnostic reassessment and exclusion of other local causes.

In all of the situations described above, antibiotics should be regarded exclusively as adjunctive therapy. Elimination of the source of the infection through endodontic treatment, drainage or other local interventions remains the main determinant of therapeutic success (Table 2).

Table 2. Indications and situations in which systemic antibiotics are not indicated in Endodontics.

Clinical situation	Systemic antibiotic
Symptomatic irreversible pulpitis	✗ Not indicated
Pulp necrosis without systemic signs	✗ Not indicated
Symptomatic apical periodontitis	✗ Not indicated
Chronic apical abscess with sinus tract	✗ Not indicated
Localized acute apical abscess in an immunocompetent patient	✗ Not indicated
Endodontic postoperative pain	✗ Not indicated
Asymptomatic periapical lesion	✗ Not indicated
Acute apical abscess with systemic signs	✓ Indicated
Odontogenic cellulitis	✓ Indicated
Progressive infection with spread	✓ Indicated
Odontogenic osteomyelitis	✓ Indicated
Immunocompromised patients (individual assessment)	⚠ Consider
Replantation of avulsed permanent teeth	✓ Indicated
Extensive soft tissue trauma associated with dental injuries	⚠ Consider
Selected persistent infections	⚠ Consider

Choice of Antimicrobial

When systemic antibiotic therapy is indicated, the selection of the antimicrobial should take into account the microbiological profile of endodontic infections, the patient's systemic condition, the history of drug allergies and the principles of rational antimicrobial use.

Endodontic infections are typically polymicrobial, involving predominantly anaerobic and facultative anaerobic bacteria. Accordingly, the selected antibiotics should have adequate activity against these microorganisms, using the narrowest antimicrobial spectrum capable of providing clinical benefit.

SBEndo Recommendations

First choice

Amoxicillin is the antibiotic of first choice for most endodontic infections requiring systemic antibiotic therapy, owing to its clinical efficacy, favorable safety profile and adequate activity against the main microorganisms involved in odontogenic infections.

Recommended dosage:

- Loading dose: 1 g
- Maintenance: 500 mg every 8 hours.

Patients should receive clear guidance on the signs of worsening and on the need to seek care immediately should they occur. Clinical progress should be reassessed within 48–72 hours, or earlier in the event of deterioration. The contacts made, the progress observed and the clinical decisions taken should be documented in the patient's record.

Absence of initial clinical response

In cases in which there is no clinical improvement after 48–72 hours, it is initially recommended to reassess the diagnosis and the effectiveness of local infection control. When antibiotic therapy remains indicated, the following may be considered:

- addition of metronidazole to the ongoing therapy; or
- replacement with amoxicillin combined with clavulanate.

Patients allergic to penicillins

In patients with confirmed penicillin allergy, the following may be used:

- azithromycin;
- clarithromycin;
- clindamycin, when clinically indicated.

Given the increased risk of *Clostridioides difficile*-associated colitis and other serious adverse events, clindamycin should not automatically be regarded as the first alternative for penicillin-allergic patients. Whenever appropriate, alternatives such as azithromycin or clarithromycin should be considered.

Microbiological culture

The initial choice of antimicrobial therapy is generally empirical and should take into account the microbiota likely to be involved, the severity and extent of the infection, the patient's systemic conditions, the history of allergies and previous exposure to antimicrobials and, when available, local resistance patterns. Thus, culture and antimicrobial susceptibility testing are not necessary in most endodontic infections. They may, however, be considered in persistent or recurrent infections or in those refractory to conventional treatment.

Duration of Treatment

The duration of antibiotic therapy should be determined by the patient's clinical progress rather than by predetermined fixed periods.

The aim of treatment is to control the spread of the infection until the host defense mechanisms and local treatment bring about resolution of the infectious process. Consequently, unnecessary continuation of antibiotic therapy offers no additional clinical benefit and may increase the risk of adverse events and the selection of resistant microorganisms.

In practical terms, antimicrobial treatment may be discontinued when the clinician verifies the resolution of the clinical signs and symptoms that justified its prescription, provided that local control of the infection has been adequately achieved and there is no evidence of progression.

SBEndo Recommendations

- Follow-up of clinical progress by remote or in-person contact is recommended whenever possible, with clinical and systemic reassessment within 48–72 hours, or earlier in the event of deterioration.
- The prescription should establish a defined initial duration, generally 3 to 5 days. Continuation or discontinuation of antibiotic therapy should be guided by the clinician on the basis of clinical progress, considering the resolution of the systemic signs and symptoms that justified its prescription, provided that local control of the infection has been adequately achieved and there is no evidence of progression.
- Treatments longer than 7 days are rarely necessary and should be justified by specific clinical circumstances.

Persistence or worsening of clinical signs after the start of antibiotic therapy should prompt immediate diagnostic reassessment and investigation of failures in local infection control (Table 3).

Table 3. Antimicrobials recommended by SBEndo for endodontic infections.

Clinical situation	Drug	Dosage
First choice	Amoxicillin	Loading dose of 1 g, followed by 500 mg every 8 hours
Initial clinical failure or presence of cellulitis	Amoxicillin + metronidazole	Amoxicillin loading dose of 1 g and 500 mg every 8 hours + metronidazole 400 mg every 8 hours
Initial clinical failure	Amoxicillin + clavulanate	875/125 mg every 12 hours or 500/125 mg every 8 hours
Penicillin allergy	Azithromycin	500 mg on the first day, followed by 250 mg/day
Penicillin allergy	Clarithromycin	500 mg every 12 hours
Selected situations	Clindamycin	300 mg every 6 hours

Note: Clindamycin should not automatically be regarded as the first alternative for penicillin-allergic patients because of the higher risk of serious adverse events, including *Clostridioides difficile* infection.

Antibiotic Prophylaxis in Endodontics

Antibiotic prophylaxis should be reserved for specific situations in which the risk of complications arising from transient bacteremia outweighs the potential risks associated with the use of antimicrobials. The indication for prophylaxis does not depend on the endodontic procedure itself, but on the patient's medical conditions and the individual risk of developing infectious complications.

SBEndo Recommendations

In accordance with the current recommendations of the American Heart Association (AHA) and the European Society of Cardiology (ESC), antibiotic prophylaxis should be reserved for patients with cardiac conditions associated with the highest risk of adverse outcomes from infective endocarditis when undergoing procedures that involve manipulation of the gingival tissue, manipulation of the periapical region of the teeth or perforation of the oral mucosa (5,6).

The groups traditionally considered at high risk include:

- patients with prosthetic cardiac valves or prosthetic material used for valve repair;
- patients with a previous history of infective endocarditis;
- selected patients with high-risk congenital heart disease, according to current cardiology recommendations.
- In cardiac transplant recipients with valve regurgitation due to a structurally abnormal valve, considering the differences between the AHA and ESC recommendations, SBEndo recommends that the indication for antibiotic prophylaxis be assessed individually and, when necessary, discussed with the patient's cardiologist.

For these patients, the indication and the prophylactic regimen should follow the current recommendations of the American Heart Association, considered together with any updated national cardiology recommendations.

Antibiotic prophylaxis is not routinely recommended for patients with prosthetic joints; exceptional situations should be assessed individually in conjunction with the attending physician (7).

Other medical conditions potentially associated with a higher risk of infectious complications, such as severe immunosuppression, previous radiotherapy to the head and neck region, or the use of antiresorptive and antiangiogenic therapies, should be assessed individually, taking into account the patient's systemic status, the type of procedure performed and specific medical recommendations.

Whenever there is doubt about the need for antibiotic prophylaxis, prior discussion with the patient's physician is recommended (Table 4).

Table 4. Antibiotic prophylaxis in Endodontics.

Medical condition	Antibiotic prophylaxis
Prosthetic cardiac valve	✓ Recommended
Prosthetic material for valve repair	✓ Recommended
Previous history of infective endocarditis	✓ Recommended
High-risk congenital heart disease	✓ Recommended
Cardiac transplant with valve regurgitation due to structural valve abnormality	⚠ Individual assessment
Prosthetic joint	✗ Not routinely recommended
Severe immunosuppression	⚠ Individual assessment
Previous head and neck radiotherapy	⚠ Individual assessment
Intravenous antiresorptive therapy	⚠ Individual assessment
Antiangiogenic therapy	⚠ Individual assessment

Final Considerations

The Brazilian Endodontic Society reaffirms that the judicious use of antibiotics is an integral part of contemporary endodontic practice. Reducing unnecessary prescriptions, combined with adequate local control of the infection, represents one of the most effective strategies for ensuring patient safety and confronting the advance of antimicrobial resistance. The commitment to responsible prescribing must be shared by all professionals involved in dental care, contributing to an Endodontics that is increasingly evidence-based, safe, effective and sustainable.

Guideline Update

The recommendations presented in this guideline reflect the scientific evidence and the national and international guidance available at the time of its preparation. SBEndo recognizes that changes in antimicrobial resistance patterns, in drug availability and in the recommendations of health authorities may require its revision. For this reason, this document should be updated periodically or whenever new relevant evidence justifies modification of its recommendations. Until a new version is published, these recommendations should be applied in conjunction with clinical judgment, the individual conditions of the patient and the health regulations in force.

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