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Endodontics Newsletter™

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Do you or your staff have any questions or comments about ***Endodontics Newsletter?*** *Please write or call our office. We would be happy to hear from you.*

Endodontics and Antibiotics

Over the last few years, there has been a growing concern regarding the overprescribing of antibiotics in medicine and dentistry. Infections in the oral cavity and teeth, especially endodontic infections, are polymicrobial, involving a combination of gram-positive, gram-negative, facultative anaerobes and strict anaerobic bacteria, many of which can become resistant to antibiotics even if exposed only to small dosages for a short time. To compound the problem, over time these bacteria can develop an ability to exchange this resistance.

Indiscriminate use of antibiotics also increases the risk of potentially fatal anaphylactic reactions. In the case of oral infections, side effects of the antibiotics may outweigh any discomfort from the infection, causing the patient to stop taking the medications too early. This further increases the risk that resistant bacteria will develop.

Endodontic issues are among the most common reasons dentists prescribe antibiotics. Many studies have shown that antibiotics do not reduce pain or swelling arising from teeth with symptomatic apical pathosis, and a systematic review found no evidence that antibiotics relieve pain in cases of irreversible pulpitis, where the pulp is still vital.

To determine when it is appropriate to use antibiotics, Segura-Egea et al from the University of Sevilla, Spain, recently published a review paper. They concluded that, in general, use of systemic antibiotics in endodontics should be limited to specific cases. Antibiotics could be used as adjuncts, after the root canal system has been debrided, to prevent further spread of infection in acute apical abscesses that have systemic involvement.

In acute situations, antibiotics could be used in

- medically compromised patients with an acute apical abscess with localized fluctuant swellings
- patients with systemic involvement (fever, lymphadenopathy and/or malaise) and localized fluctuant swellings

With progressive and persistent infections, antibiotics could be used in patients with

- cellulitis or a spreading infection

- rapid onset of severe infection (<24 hours)
- osteomyelitis
- a chronic exudation that has not resolved by standard instrumentation and intracanal medications

Antibiotics could also be used prophylactically in patients with

- systemic diseases accompanied by compromised immunity
- a localized congenital or acquired altered defense capacity
- a history of infective endocarditis, prosthetic cardiac valves or recent prosthetic joint replacement

In most cases of endodontic infection, instrumentation of the affected tooth and possibly additional incision and drainage are sufficient. There is usually no need for antibiotics, because they will not reduce the patient's pain or hasten healing—only removal of the infected intracanal debris will.

The authors also investigated which antibiotics were most indicated and used in conjunction with endodontic infection. They concluded that penicillin VK, possibly combined with metronidazole, is effective in most cases (Table 1). However, they recommended amoxicillin over penicillin VK because of better absorption and lower risk of side effects. In cases of confirmed penicillin allergy, lincosamides, such as clindamycin, would be the preferred drug of choice.

Segura-Egea JJ, Gould K, Hakan Şen B, et al. Antibiotics in endodontics: a review. Int Endod J *2016;doi:10.1111/iej.12741.*

Table 1. Effective antibiotics prescribed in endodontics

Drug of choice	Loading dose	Maintenance dose
Penicillin VK[a]	1000 mg	500 mg q4–6h
Amoxicillin with or without clavulanic acid	1000 mg	500 mg q8h or 875 mg q12h
Clindamycin[b]	600 mg	300 mg q6h
Clarithromycin[b]	500 mg	250 mg q12h
Azithromycin[b]	500 mg	250 mg q24h
Metronidazole	1000 mg	500 mg q6h

[a]If penicillin VK alone is not effective in 48 to 72 hours, metronidazole (loading dose 1000 mg followed by 500 mg q6h) can be used in combination with penicillin VK, or penicillin VK can be switched to amoxicillin/clavulanic acid or clindamycin. [b]If the patient is allergic to penicillin.

Undetected Dental Trauma In Primary Teeth

Many epidemiological studies of dental trauma in young children are based on interviews with the patients or their parents, and most rely on clinical appearance of the teeth. But these approaches risk underestimating the true prevalence of traumatic dental injuries (TDIs). Without radiographic examination, some injuries may go undetected. Also, the persons involved do not always have a reliable memory, and clinical signs on teeth can be deceptive.

Holan and Yodko from the Hebrew University-Hadassah School of Dental Medicine, Israel, investigated the correlation between radiographic and clinical signs of TDIs in the primary dentition. Radiographic signs were root fracture, pulp canal obliteration, tubelike mineralization, internal resorption, arrested dentin deposition, external inflammatory root resorption and periapical radiolucency. They then noted any clinical signs of trauma, such as enamel and crown fractures, color changes and the presence of a draining sinus.

The researchers evaluated 674 children (342 boys, 332 girls; mean age, 51 months; age range, 17–106 months). They found a high prevalence of TDIs, with 60.5% of the children showing some clinical evidence. Signs of TDIs included

- enamel fracture (38.0%)
- pulp canal obliterations (16.0%)
- yellow coronal discoloration (14.4%)

Because another sign of a possible TDI in primary teeth may be expansion of the dental sac of the permanent successors, the authors evaluated the radiographs for this phenomenon as well. Expansion of the dental sac of permanent teeth was found in 19% of the children. There was no statistically significant association between dental sac expansion and TDIs (Table 2) except in cases of enamel fracture, which could indicate a relationship between these 2 findings.

The researchers discovered that 17 children had radiographic but no clinical signs of dental trauma, confirming that clinical evaluations are not enough to deter-

Table 2. Distribution of children with traumatized teeth (excluding those with enamel fracture only) and the presence of expansion of the dental sac of the permanent successor incisors

Expansion of the dental sac	Children with traumatized teeth *n* (%)		
	Yes	No	Total
Yes	58 (12.1)	39 (8.1)	97 (20.3)
No	172 (35.9)	210 (43.9)	382 (79.7)
Total	**230 (48.0)**	**249 (52.0)**	**479 (100)**

χ^2 p < .01.

mine its prevalence. Thus, children with suspected TDIs should undergo a radiographic evaluation.

Holan G, Yodko E. Radiographic evidence of traumatic injuries to primary incisors without accompanying clinical signs. Dent Traumatol *2016;doi:10.1111/edt.12315.*

Cervical Root Resorption in Endodontically Treated Teeth

One of the enigmas in dentistry is external cervical resorption (ECR), often invasive to the point where the tooth is likely to be lost (Figure 1). However, the etiology, progression and treatment options for ECR are still poorly understood. This kind of resorption generally starts just below the epithelial gingival attachment, at or very close to the crestal bone. It then continues primarily in a coronal–apical direction in the dentin but does not appear to penetrate the innermost dentin—known as predentin—into the vital pulpal space.

Dental trauma is most often associated with this kind of resorption; however, other reported triggers include

- injuries from crown and restoration preparations
- aggressive periodontal scaling
- bruxism
- orthodontic movements
- exposure to feline viruses

In addition, some cases have reported idiopathic cervical resorption locally in both a single tooth and/or multiple teeth.

Although most of the recent ECR research focuses on teeth with vital pulps, the researchers agree that the pulpal tissue has no effect on this type of root resorption except possibly to protect predentin. In teeth with a vital pulp, this type of resorption rarely penetrates the pulp chamber, so it is of interest to know if ECR progresses similarly in teeth that have been endodontically treated prior to formation of the resorption.

Mavridou et al from KU Leuven, Belgium, studied 6 patients in whom ECR had been diagnosed in 7 endodontically treated teeth. After clinical examination of the teeth, including probing into the resorptive defect, and radiographic examination with cone-beam computed tomography, the teeth were extracted, then further investigated using nano-focus computed tomographic imaging, hard tissue histology and scanning electron microscopy. The researchers systemically analyzed the lesions and attempted to compare growth mechanisms of ECR in endodontically treated teeth with those recognized in teeth with vital pulps.

All 7 teeth showed a resorptive pattern similar to teeth with vital pulps. The researchers identified 3 stages similar to what is known about teeth with vital pulps; however, there were a few differences in each stage, namely

- **Resorption initiation:** At the portal of entry, no ingrowth of the adjacent bone tissue and fusion with the tooth structure were noted.
- **Resorption pattern:** Much higher intensity of resorption was observed in teeth that were endodontically treated.
- **Reparative stage:** Repair was required to a lesser extent in endodontically treated teeth.

Early diagnosis of ECR is paramount so treatment can begin as soon as possible. Once the root resorption

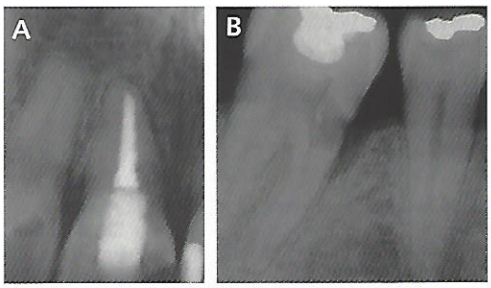

Figure 1. (A) An anterior tooth with a previous endodontic therapy and cervical root resorption that appears to have resorbed into the gutta-percha filling. *(Image courtesy of Dr. Noah Chivian.)* (B) Radiograph of a vital molar tooth with mesial cervical root resorption shows the typical coronal–apical extension of a cervical resorption, yet there is still some dentin left between the defect and the vital pulp. *(Image courtesy of Dr. Asgeir Sigurdsson.)*

has extended apically along the root dentin, the tooth has a very poor prognosis due to the defect's inaccessibility and likely weakening of the tooth.

The authors concluded that ECR detection is important for endodontically treated teeth because the resorptive stage seems to be more accelerated and destructive. Access via surgery is needed, but in many cases, the resorptive defect is interproximal and therefore inaccessible without risks to the adjacent teeth.

Mavridou M, Hauben E, Wevers M, et al. Understanding external cervical resorption patterns in endodontically treated teeth. Int Endod J *2017;doi:10.1111/iej.12744.*

When Is Endodontic Therapy "Good Enough"?

As judged by radiographic appearance, endodontic therapy does not always meet the gold standard for technical quality. Because the standard is open to subjective interpretation by clinicians, agreement varies about how endodontic therapy should look (e.g., filling length, apical size and taper of the preparation, and presence or absence of sealer puff).

Education levels among clinicians vary, especially between specialists and general dental practitioners (GDPs). While some dentists appear to perform and accept endodontic fillings of suboptimal radiographic appearance, on what bases GDPs accept or reject the quality achieved is not well understood. Some argue that instead of continuously striving toward perfection, dentists usually aim to find levels of acceptability that are "good enough." That level is hard to define, though, and should be explored further.

Dahlström et al from the University of Gothenburg, Sweden, explored and analyzed GDPs' reasons and arguments for the acceptance or rejection of substandard root-filling quality. They recruited 33 GDPs to participate in group interviews (4 to 6 GDPs/interview). Prior to the session, all had received identical radiographs of 17 root-filled molars (37 roots).

At the beginning of the session, a summary of the current group's assessment of the cases was presented. A wide variation was noted in most of the cases, and radiographs of the 3 cases with the most divergent opinions were selected and projected onto a video screen. Nine predetermined open questions were asked, and discussion was encouraged.

What emerged as a key factor in accepting endodontic therapy was the balance between the pathological situation in the pulp and periapical tissues.

- In cases of a vital pulp and no periapical pathosis, many GDPs were more likely to accept short and/or inadequate fillings, because the infection was more likely to be confined to the pulpal tissue.
- When there was a periapical lesion, the demand for better technical quality was higher.
- Some practitioners seemed to accept technically defective results in all cases provided that the patient was asymptomatic after therapy.
- The strategic "value" of the tooth, as well as patient age, were important factors for some GDPs. For more important teeth and younger patients, their demands were higher.

For every completed endodontic therapy, the dental practitioner has to decide whether or not to accept the final outcome. The GDPs who participated in this study appeared to focus not only on the technical details of the root filling but also on the context of the case. A decision to re-treat or correct a poor-looking filling has to account for how, and if, it can be improved, and should take into consideration potential risks, such as root perforations, over-instrumentation, and damaged crowns or bridgework, vs the likely outcome of the case without re-treatment.

Dahlström L, Lindwall O, Rystedt H, Reit C. "It's good enough": Swedish general dental practitioners on reasons for accepting sub-standard root filling quality. Int Endod J *2017;doi:10.1111/iej.12743.*

In the next issue Autumn 2017

- Effect of instrumentation techniques and preparation taper on apical extrusion of bacteria
- Endodontics, re-treatment and apical surgery vs tooth extraction and implant placement

Our next report will focus on these issues and studies that discuss them, as well as other articles exploring topics of vital interest to you as a practitioner.