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Insights into the November 2020 issue of the JOE



Welcome to the November 2020 issue of the JOE. Here, we share some of our favorite articles that are published in this issue of the *Journal*. We hope you look forward to reading these and other articles in the JOE.

FEATURED PAPERS FROM THIS ISSUE

More than 20 years ago, laboratory studies demonstrated that calcium hydroxide can degrade lipopolysaccharide or endotoxin, which is a potent biological irritant found in the cell wall of gram-negative bacteria. Since then, several clinical studies have been conducted to test this concept. In the systematic review and meta-analysis by Bedran and colleagues¹ in this issue of the JOE, 9 studies were identified for qualitative evaluation, of which 7 were included in a meta-analysis. The analysis distinguished the role of calcium hydroxide alone or combined with other antimicrobial agents, and when used before or after traditional chemo-mechanical preparation. The findings confirm the efficacy of calcium hydroxide in reducing, but not eliminating, lipopolysaccharide in the root canal environment, regardless of other antimicrobials used. However, the certainty of the evidence was very low and larger clinical trials are warranted.

The World Health Organization declared coronavirus disease 2019 (COVID-19) as a pandemic on March 11, 2020. Soon after, in many parts of the world, nonessential services, including elective dental procedures, were suspended and aerosol-generating procedures were to be avoided. This posed significant challenges in the management of patients in need of endodontic emergencies. In this issue of JOE, Patel et al² evaluated the success of palliative care (ie, pharmacologic therapy and/or non-aerosol-generating procedural interventions) on endodontic emergencies rendered for 25 teeth in 21 patients, during the COVID-19 pandemic. At a follow-up rate of 96%, 83% of endodontic emergencies required no further treatment or intervention after palliative care. They also evaluated survivability and rate of adverse events for 31 teeth that had received partial or full root canal debridement and intracanal medication with Ca(OH)₂ before the shutdown. With a mean time to complete treatment of 13 weeks, at a recall rate of 100%, 77% of teeth did not experience any adverse events due to delays in treatment completion. Although the sample size of this study is small, overall, they found that palliative care for management of endodontic emergencies is a successful option when aerosol-generating

procedures are restricted to reduce risk of transmission of COVID-19 infection during subsequent shutdowns.

Single-visit pulpotomies in permanent molars have possible application in special circumstances, such as a medical, pandemic, or other situations that dictate single appointment procedures. In this issue of the JOE, Linas and colleagues³ conducted a retrospective study evaluating the outcomes of full pulpotomies in permanent molars using intermediate restorative material (IRM; Dentsply Sirona, Charlotte, NC) and stainless steel crowns on a selected population. Of 608 pulpotomy procedures, 263 cases (43%) were followed up with a median recall time of 24 months. The overall success rate was 89%, with an additional 7.6% having an uncertain outcome and 3.4% being ineffective.

Preoperative factors including lesion etiology, stage of tooth development, or technical difficulty (eg, anatomy) were not associated with altered success rates. Although the overall recall rate was relatively low, the authors concluded that single-visit pulpotomies should be considered during emergency situations, such as during a pandemic, that are optimally addressed by 1-visit procedures.

External root resorption (ERR) is a common sequela of complicated traumatic injuries to teeth. In general, interceptive strategies are considered for ERR. These strategies aim to arrest the resorption and promote repair of the periodontal ligament and the adjacent bone. Medication with calcium hydroxide has been recommended in the literature. In this issue of the JOE, Lu et al⁴, described regenerative endodontic procedures (REPs) for a replanted avulsed tooth with severe ERR, as well as root perforation (tooth #9), and for an extruded tooth (tooth #8) on a 9-year-old patient, at 4 months after the initial trauma. The teeth #9 and #8 were followed for a period of 24 months and 12 months, respectively. It was observed that the clinical symptoms and the periapical lesions resolved for both the teeth. The ERRs were arrested, and the root perforation was repaired for tooth #9. It was also reported that the teeth #8 and #9 exhibited pulp canal obliteration after REPs. Although more rigorous investigations are justified, this case report suggested REPs as a possible therapeutic strategy to treat traumatized immature permanent teeth with a necrotic pulp and apical periodontitis associated with ERR and root perforation.

Toll-like receptors (TLRs) are crucial pathogen recognition receptors whose

activation represents one of the earliest immune response events in response to tissue injury and infection. Indeed, TLRs recognize specific microbial components and generate intracellular signaling cascades after activation of TLR4 and TLR2 by lipopolysaccharides and lipoteichoic acid, respectively. Yet comparatively few studies have evaluated expression of TLRs in dental stem cells. Here, Fehrmann et al⁵ report that stem cells of the apical papilla (SCAPs) express 10 different TLRs. Importantly, exposure of SCAP to inflammatory mediators in vitro resulted in the upregulation of TLR1, TLR2, TLR4, TLR5, TLR6, and TLR9, and downregulation of TLR3, TLR7, TLR8, and TLR10 expression. These interesting findings suggest that SCAPs are well-equipped to detect various microorganisms and endogenous injury-related molecules. Thus, SCAPs likely participate in the overall immune response to infection and tissue injury in immature teeth.

Endodontic clinicians frequently must perform nonsurgical endodontic therapy through an existing full-coverage crown. In many instances, if the crown is clinically intact, it is preferable to try to preserve the crown so that the patient can continue to use it for the future without having to obtain a new one. Many techniques and much armamentaria are available for the clinician to help in this effort, but sometimes, performing endodontic access may damage the crown beyond repair and it will need to be remade. One long-held concern is whether the choice of restoration to restore the access preparation through an existing crown affects the longevity of the crown. In this month's edition of the JOE, a study by Brezinsky et al⁶ addressed this concern. In this repeated-measures study, porcelain fused to metal crowns were fabricated in a standardized manner for 38 extracted molars, and were cemented with zinc phosphate. After waiting for 24 hours, the crowns were removed with a material testing machine to measure the force needed to overcome the retention of the crown. The crowns were cleaned and recemented and then displaced again after access preparation, and then after placement of the various restorative materials. Results indicated that access preparation decreased the retention of the crown to the tooth, but once it was restored, the retention strength actually increased to levels that exceeded the original retention of the pre-access crown. The type of restorative material did not matter. Other qualitative findings in this report were also interesting, but the authors correctly point out that retention strength alone is not the only

factor needed to clinically maintain a crown, and additional research is needed to assess resistance and material integrity to help clinicians preserve existing restorations.

Locating and instrumenting calcified canal systems are challenging aspects of many endodontic cases. Several approaches to this clinical problem have been addressed, but all have some limitation. Dynamic navigation systems have only recently been applied to endodontic procedures. These systems provide real-time feedback of handpiece location using a computer algorithm that simultaneously tracks handpiece motion and location, using passive optical tracking, with radiographic parameters generated from prior cone-beam computed tomography images. Here, Dianet and coworkers⁷ compared a dynamic navigation system versus the freehand technique for locating calcified canals in extracted human teeth. The authors reported that linear and angular deviations, reduced dentin thickness, time for access, and the number of mishaps were all significantly improved using the dynamic navigation system group. They opined that the dynamic navigation system was more accurate and efficient in locating calcified canals than doing it freehand. This method offers the potential to increase clinical efficiency and reduce iatrogenic errors.

Endodontic microsurgery is a commonly performed clinical procedure for treatment of apical periodontitis in a previously treated tooth. The typical protocol for apical surgery entails the complete removal of the contents of a lesion with submission of the resultant specimen for biopsy. This can, however, lead to impingement on biologic spaces and anatomic structures with unintended negative consequences. In this issue, Nesari and colleagues⁸ present a case series in which a technique of selective curettage was used to treat large lesions that either impinged on anatomic spaces or structures or represented through-and-through lesions. They found that by removing only 50% of the tissue from the lesion, they observed complete healing at recall. All specimens were submitted for biopsy to rule out cysts or other pathology that might otherwise require complete enucleation. These findings suggest that in many instances, aggressive removal of granulation tissue from the surgical crypt may not be necessary and may prevent damage to adjacent structures or inadvertent impingement on biologic spaces. Exceptions would be where the biopsy indicates that there is a cyst, nonodontogenic lesion, or actinomycotic infection that could then require a second surgical intervention for complete enucleation.

Autotransplantation of immature teeth falls within the scope of REPs, as this method is highly predictable, with 96% 10-year survival rates reported⁹, and often associated with continued root development and a return of

positive responsiveness to pulp testing procedures. However, autotransplantation may be difficult to perform when donor teeth are adjacent to anatomic structures such as nerves, and resorption may occur if the extraoral time is prolonged, or if the periodontal ligament is damaged during transplantation to the recipient site. In this issue of the JOE, Strbac and colleagues¹⁰ report a fully digital method to prepare 3-dimensional (3D) printed templates for guided osteotomies and a 3D tooth replica for recipient site preparation for autotransplantation of a severely impacted mandibular second premolar. The 3D tooth replica included space for the apical papilla and Hertwig epithelial sheath in order to inhibit tissue compression and promote continued root development of the donor tooth. In addition to extensive descriptions and figures in the paper, the contribution is expanded by inclusion of 30 supplemental online figures that provide a comprehensive illustration of the various steps in the procedure. The total extraoral time was 46 seconds. On recall examination, continued root development was observed, the tooth regained responsiveness to pulp testing, and orthodontic treatment was initiated at 6 months after surgery.

We hope you enjoy this issue of your *Journal of Endodontics*.

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