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THE APPLICATION OF NOVEL SEALANTS IN THE MANAGEMENT OF APICAL PERIODONTITIS IN PERMANENT DENTITION

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Abstact. To acquire clinical expertise in the use of novel sealers for the management of apical periodontitis in permanent teeth. The treatment of chronic apical periodontitis in permanent teeth included root canal obturation with a novel epoxy resin-based sealer and a bioceramic sealer.
Keywords: endodontic therapy, root canal filling, sealer, novel materials.
Utilization of novel sealers in the endodontic treatment of permanent teeth demonstrates their ease of application and efficacy in achieving favorable clinical results.

Endodontics is one of the most intricate domains of therapeutic dentistry. Endodontic treatment is significantly complicated by the variety of nosological forms of pulp and apical periodontal diseases, the intricate and variable anatomy of the root canal system, the range of methodologies for mechanical and medicinal intervention in the endodont, and the diverse techniques and systems for root canal obturation and post-endodontic restoration. The aims of root canal system obturation are to eradicate connectivity between the root canal and the coronal portion of the tooth cavity, isolate residual germs, and obstruct the ingress of tissue fluid from periapical tissues into the canal. For obturation, a filler, preferably gutta-percha, and a sealer are used. The sealer's roles include filling microspaces and dentinal tubules, smoothing canal wall imperfections, and facilitating the glide of gutta-percha points. Currently, the following categories of sealers are identified: resin-based ("AH Plus", "Acroseal", "EndoRez"); those derived from Mineral Trioxide Aggregate (MTA) ("MTA-Fillapex", "Aureoseal"); silicone-

based ("RoekoSeal", "GuttaFlow"); glass ionomer cements ("Ketac Endo", "Endosil"); zinc oxide-eugenol ("Roth", "Kerr PCS", "Endomethasone N", "Canason"); calcium hydroxide-containing ("Sealapex", "Apexit"); dentin adhesive-based ("Epiphany"); and bioceramic ("Sure-Seal Root"). At now, resin-based sealants are the predominant choice in clinical practice. Their benefits include biocompatibility, effective sealing capability, low viscosity, and manageable working duration. This group's drawbacks include susceptibility to moisture (the canal must be thoroughly dried prior to obturation), sensitivity to residual oxidizing agents in the canal (the final irrigant must not be hydrogen peroxide), and post-obturation discomfort in the event of extrusion (dynamic verification of working length is essential). The epoxy resin-based sealer "BJM Root Canal Sealer" (BJM) represents a recent advancement in this category. The Immobilized Antibacterial Technology (IABT) imparts distinctiveness to this substance. The approach involves incorporating "Biosafe HM4100" molecules (BioSafe Inc., USA), a quaternary ammonium chemical, inside the sealer. The action mechanism of these cationic compounds involves electrostatic interactions with anionic bacterial cells, resulting in alterations to their membrane permeability and eventual cell death. Key attributes of "BJM Root Canal Sealer" encompass high radiopacity, excellent wettability and flowability (surpassing numerous other epoxy resin-based sealers), enduring stability attributed to effective sealing capability and moderate flexibility that mitigates cracking of the cured substance, alongside minimal shrinkage. The cold gutta-percha approach involves the following stages for using "BJM Root Canal Sealer":

• Dehydrating the root canal (subsequent to mechanical and therapeutic intervention),

• Introduction of the sealer (e.g., via a paper point), • Introduction of gutta-percha points coated with the sealer and their compaction. This sealer is universal, suitable for all varieties of heated and thermoplasticized gutta-percha.

Clinical Case Patient M. inquired about the potential therapeutic intervention for tooth

3.6. The tooth had a prior treatment for caries. The patient sought treatment from a regular dentist due to the loss of a filling, who then recommended her for the extraction of tooth 3.6.

Clinical presentation. A profound carious cavity was seen on the occlusal surface of tooth 3.6, accompanied by a remnant of an old filling on the distal surface. Exploration of the carious cavity and percussion elicited no discomfort. The mucosal membrane in the area of tooth 3.6 remained unaltered.

Radiographic results indicate a piece of a filling and a deep carious cavity in tooth 3.6, which is in communication with the pulp chamber. The lumens of the root canals are seen. In the region of the apices, there are foci of bone tissue degradation with indistinct margins, measuring 0.4×0.5 cm and 0.6×0.7 cm (Fig. 1).

Diagnosis: Chronic apical periodontitis of tooth 3.6.

The patient was presented with a treatment plan for tooth 3.6, including the following stages:

Initial mechanical and therapeutic intervention of root canals with apex positioning, followed by a two-week filling with aqueous calcium hydroxide.

Repeated mechanical and therapeutic intervention of root canals with apex localization, followed by obturation using gutta-percha points and "BJM Root Canal Sealer".

Postponed rehabilitation with photocomposite material.

Subsequent evaluations at 3, 6, and 12 months.

Informed permission for this strategy was acquired from the patient, subsequent to which actions 1–2 were executed.

The patient returned for a follow-up examination four months post-obturation. No complaints were reported, including post-obturation soreness. During the clinical examination, the restoration in tooth 3.6 was intact, percussion of the tooth elicited no

discomfort, and there was no response from the mucous membrane in the area corresponding to this tooth. Radiographic data indicate that the root canals were thoroughly and distinctly filled over their entire length; in the periapical tissues, there was a reduction in the size of the destructive foci accompanied by evidence of healing. The subsequent follow-up examination occurred one year post-obturation. The patient reported no problems; visual-tactile examination indicated no alterations in the condition of tooth 3.6. Radiographic results indicate a little expansion of the periodontal ligament space at the apex of the mesial root of the tooth.

Bioceramic sealers are a novel category of materials that includes zirconium oxide, calcium silicates, calcium dihydrogen phosphate, calcium hydroxide, and other constituents. The first substance from this category recorded in the Republic of Belarus was "Sure Seal Root" ("Sure Dent"). The material's most significant property is its lack of shrinking.

- Guaranteeing three-dimensional obturation.
- Affinity for water.
- Synthesis of hydroxyapatite.
- Biocompatibility and osteogenic characteristics.
- Chemical connection with dentin.
- Antibacterial efficacy (pH > 12).
- Radiopacity.
- Flexible working duration and scheduling (25 minutes – 2.5 hours).
- User-friendliness (pre-prepared paste).

Clinical Case Patient M. reported darkening of the crowns of the upper central incisors. Historical context: these teeth had endodontic treatment throughout academic years. Clinical presentation. The crowns of teeth 1.1 and 2.1 exhibited discoloration;

acceptable fillings were present on the proximal and palatal surfaces. The cold test yielded a negative result. The percussion was devoid of discomfort. The mucosal membrane in the area of the upper incisors remained unaltered. Radiographic findings: signs of obturation materials were seen in the root canals of teeth 1.1 and 2.1; in the periapical region, there were foci of bone tissue degradation with distinct contours, measuring 0.4-0.5 cm. Diagnosis: Chronic apical periodontitis of the teeth. The patient was presented with and consented to a treatment plan. The therapy included the following phases:

• Isolation of teeth using a rubber barrier and extraction of existing fillings.
• Extraction of antiquated root canal fillings and negotiating of canals with K-file #15.
• Establishment of working length with an apex finder, followed by radiographic confirmation (1.1 – 24 mm, 2.1 – 25 mm).
• Treatment of the cervical and middle thirds of the canals with ProTaper SX/S1 and S2, respectively.
• Processing and structuring of the apical portion of the canals using ProTaper F1, F2, F3, F4, and F5 instruments.
• Confirming working length with an apex locator after each instrumentation and therapeutic application of sodium hypochlorite (3%) and EDTA (17%). After completing instrumentation, further irrigation is performed with iodides, hydrogen peroxide, and distilled water. Activation of all solutions using an endoactivator for a duration of 30 to 60 seconds.
• Canal obturation using the lateral condensation method with gutta-percha and the bioceramic sealer "Sure Seal Root," followed by delayed repair with glass ionomer cement.

Conclusion

Experience with novel sealers in the management of apical periodontitis in permanent

teeth indicates that they are practical, efficacious, and suitable for broad clinical use in dentistry.

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