Septodont

Case Studies Collection

No. 21 - February 2021

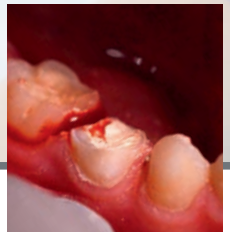
Maxillary sinusitis of endodontic origin

Alveolar healing

Conservative treatment for a symptomatic irreversible pulpitis

Vital pulp therapy of a dens evaginatus

Pulpotomies in anterior and posterior primary teeth



Focus on: Alveogyl Biodentine™ BioRoot™ RCS

septodont

Editorial

Since its foundation Septodont has developed, manufactured and distributed a wide range of high quality products for dental professionals.

Septodont recently innovated in the field of endodontics, dentine care, bone grafting and gingival preparation with the introduction of BioRoot™ RCS, Biodentine™, R.T.R. and Racegel which are appreciated by clinicians around the globe.

Septodont created the *"Septodont Case Studies Collection"* - a series of case reports - in 2012 to share with you their experience and the benefits of using these innovations in daily practice.
Over the past years, authors from more than 15 countries have generously contributed to the success of our magazine that is now distributed on the 5 continents.

Each new issue of the Case Studies Collection is the opportunity to discover new clinical challenges and their treatment solutions. The 21st issue features 1 case for BioRoot™ RCS, 1 case for Alveogyl, and 3 cases for Biodentine™:

- BioRoot™ RCS is the new paradigm for endodontic obturations. Its outstanding sealing properties combined with anti-microbial and bioactive properties allow to get a high seal of the endodontium without having to use complex warm gutta techniques.
- Biodentine™, the first biocompatible and bioactive dentin replacement material. Biodentine™ uniqueness not only lies in its innovative bioactive and "pulp-protective" chemistry, but also in its universal application, both in the crown and in the root.
- Alveogyl is a one-step, self-eliminating treatment requiring no suturing and no special attention other than observation of the healing process. It provides a soothing effect on the alveolar tissues thus helping to rapidly alleviate the pain.

The cases are written by the practitioners, the products' application in every case is under the responsibility of the author. Septodont reminds that every product has an official indication, available in the product's information notice.

Content

Maxillary Sinusitis of Endodontic Origin non-surgical management

Pamela Rebeca Mora Favela (Dental Surgeon)[1], Ignacio Jiménez Bueno (Masters in Endodontics)[2], Brissa Itzel Jiménez Valdés (Masters in Normative and Forensic Stomatology)[3]
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Summary

Introduction: Maxillary Sinusitis of Endodontic Origin (MSEO) is a fast-spreading and potentially fatal infectious process that can be resolved non-invasively with timely diagnosis and treatment.

Clinical Case: 17-year-old female patient presenting with yellowish and foul-smelling nasal discharge, hemifacial pain, and hyperthermia. On inspection, tooth 26 was observed as having a large cavity and being sensitive to intra- and extraoral palpation, as well as to horizontal and vertical percussion. A necropulpectomy was performed using the hydraulic sealing technique and BioRoot™ RCS (root canal sealant). A pharmacological treatment was introduced in cooperation with the ENT department.

Discussion: With the use of diagnostic aids, interviews, procedures, and use of appropriate bioceramic materials, orthograde endodontic treatment provides an effective non-surgical alternative.

Conclusions: The use of bioceramic materials such as BioRoot™ RCS improves the effectiveness of non-invasive treatment by providing a hermetic seal in the apical zone.

Introduction

Maxillary Sinusitis of Endodontic Origin is an inflammatory response of the maxillary sinus mucosa to pathogenic agents originating from a dental organ (Tataryn, 2018). The spread of odontogenic infectious processes towards craniofacial anatomical areas has been documented since 1943 by Bauer, and it has been discovered over the years that it is more common than has been recognised (AAE 2018). Some other authors, like Abrahams, have asserted that approximately 60% of cases of pulp necrosis in upper molars present this pathology (Abrahams, 1996). This change can be brought about by infectious agents generated by necrosis of the pulp with subsequent development of apical abscess which, when perforating the layer of bone that forms the maxillary sinus floor, penetrates into this space and produces various clinical and radiographic signs and symptoms (Duzgun, 2013). During its progression, the inflammation of the antral mucosa will obstruct the cavity, displaying symptoms compatible with rhinosinusitis. The inflammation may not be limited to the maxillary sinus but may expand to more vulnerable areas such as the nasal cavity, the ethmoid and frontal sinuses, in severe cases even affecting the orbital cavity, which can lead to orbital cellulitis, blindness, meningitis, brain abscess, and cavernous sinus thrombosis (Obayashi, 2004).

Timely detection of this entity permits a minimally invasive approach in conjunction with individualised pharmacological treatment consistent with the symptomatology and general condition of the patient (Rosenfeld, 2015), as well as using three-dimensional sealing techniques with bioceramic materials. The objective of these materials is a biological approach where they interact with the dentin in the root canal, resulting in minimising porosity compared to the lateral condensation technique (Moinzadeh, 2015). This also allows us to achieve a gutta-percha-dentin interface with dimensional stability, antimicrobial potential, and bioactivity, with the ability to stimulate the repair of the periapical tissue (Trope, 2014) as it has calcium-releasing properties, alkalising activity, and the ability to form apatite. (Siboni, 2017).

Clinical case

A 17-year-old female patient attended the Postgraduate Endodontics Clinic at UAEMex, referred by her private Odontologist for presenting with slight pain on mastication. During the interview she said that she had left hemifacial pain, which increased when leaning, as well as also presenting with yellow and foul-smelling nasal discharge and episodes of hyperthermia progressing over two weeks. The patient said she was allergic to Penicillin.

During extraoral exploration, there was sensitivity to palpation in the left lower third of the face (maxilla) and superciliary area; on intraoral exploration, tooth 26 was identified as having a large cavity ***(Fig.1)***, grade 1 mobility, sensitivity to horizontal and vertical percussion, and

Fig. 1: Occlusal intraoral photograph where the cavity can be seen in tooth 26.

negative responses to thermal sensitivity tests. Periapical radiography was taken ***(Fig.2)*** and CBCT 5x5 ***(Fig.3)*** requested. Once collected, all the tests confirmed a diagnosis of pulp necrosis with a chronic apical abscess with drainage to the maxillary sinus, which was also causing Maxillary Sinusitis of Endodontic Origin.

The canals were treated in one session after suitable complete isolation. The operating field was disinfected with 5.25% NaOCl, caries were removed, and the disinfection procedure was repeated. Once access was gained to the pulp chamber, it was neutralised with 5.25% NaOCl. The canals were located and permeated with a K Flexofile #15.02, the working length was obtained with foramen locator DPex III (Wood Pecker), and the instrumentation mechanised with the ProTaper Universal system (mesial and distal canals as far as F2, palatal canal F3). With continuous irrigation with NaOCl 5.25% and EDTA 17%, the canals were sealed afterwards by hydraulic condensation technique using BioRoot™ RCS as a sealing cement ***(Fig.4 and 5)***.

A cross-discipline consultation was carried out with the Otorhinolaryngology department, which began pharmacotherapy due to rhinorrhoea and a change in the general condition of the patient. It consisted of Levofloxacin 500 mg / 24 hours / 7days, Ambroxol 30 mg / 8 hours / 10 days, Oxymetazoline 2 sprays / 12 hours / 7 days, as well as thermotherapy and continuous nasal irrigation with saline solution. It was restored with a Biodentine™ core and afterwards a resin overlay-type restoration was placed ***(Fig.6)***.

The symptomatology subsided completely seven days after treatment and has remained asymptomatic to date. During the follow-up appointments with CBCT at 3 ***(Fig.7)*** and 8 months ***(Fig.8)***, gradual positive development of the mucosa and the maxillary sinus floor was observed.

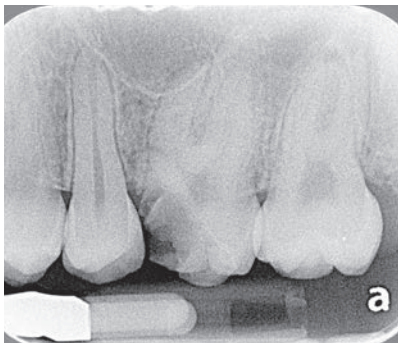

Fig. 2: Initial orthograde radiography.

Fig. 3: CBCT 5x5 with axial view where an increase in maxillary sinus mucosa and nasal turbinates (mucositis) volume can be observed, as well as loss of continuity in the maxillary sinus floor.

Fig. 4: Intraoral photograph of treatment of canals sealed with BioRoot™ RCS.

Fig. 5: Final mesioangular radiography showing the palatal, distal, mv1, and mv2 canals sealed along the working length with presence of sealer puff in the palatal canal.

Fig. 6: Intraoral photograph of the core with Biodentine™.

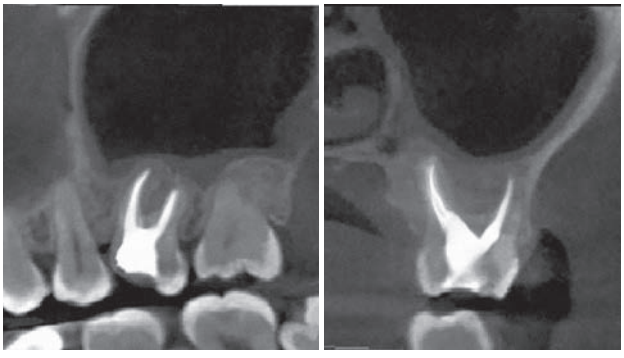

Fig. 7: CBCT 5x5 control examination at 3 months showing thinning of the antral mucosa as well as bone repair.

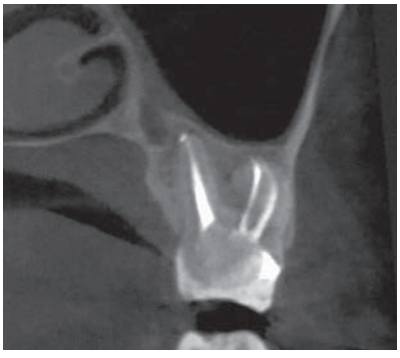

Fig. 8: CBCT 5x5 control examination at 8 months; the patient remains asymptomatic.

Discussion

The objective of treating root canals is to foster a suitable environment so that periradicular lesions and the affected anatomical areas can recover, thus avoiding more invasive treatments. Non-surgical treatment of early stage Maxillary Sinusitis of Endodontic Origin offers the patient a non-invasive and rapid progress option (Kretzschmar, 2003). It is very important to use CBCT to assess the anatomical structures involved, the condition of the antral mucosa, the bony part of the maxillary sinus floor, and to confirm our diagnosis.
The development of canal treatment with a suitable isolation technique, chemical-mechanical disinfection, and three-dimensional sealing is crucial to the success of the treatment. Using a sealant that allows us to obtain a three-dimensional seal is essential, which is why relatively recent materials such as bioceramics are chosen. In this case it was BioRoot™ RCS, which is composed of silicate and calcium phosphate, providing physical and biological properties such as an alkaline pH environment, antibacterial activity, and is a biocompatible material. (Maillet, 2011)

Using a hydraulic condensation technique provides a three-dimensional seal, ensuring the minimal presence of spaces between sealant, gutta-percha, and dentin. Similarly, its alkaline properties provide an environment where micro-organisms will not thrive, as well as avoiding having to use the kind of force during sealing that could encourage the appearance of radicular fissures or fractures. These properties result in the disappearance of symptoms in a period of 7 days and positive development at 8 months.

Conclusion

Given the high percentage of cases that can develop in this way (MSEO) and how often they are overlooked, it is important for all clinical practitioners, odontologists, physicians, and radiologists alike, that they are thoroughly familiar with the close relationship between the paranasal sinuses and the oral structures, in order to be able to arrive at a more accurate and timely diagnosis. The use of diagnostic aids, such as computerised tomography or orthopantomography, is essential for confirming this. The patient's systemic condition, as well as their age and progression of the illness, will be instrumental in choosing an adjuvant pharmacological treatment and its complexity.

The use of the hydraulic sealing technique with BioRoot™ RCS not only facilitates this stage of the treatment, providing sufficiently long handling times to manage it (approximately 12 minutes), but also allows us to adapt the consistency to the specific needs of each case, and can provide a more liquid or solid mixture as necessary. Similarly, its antimicrobial properties provide the ideal environment to heal periapical tissues quickly.

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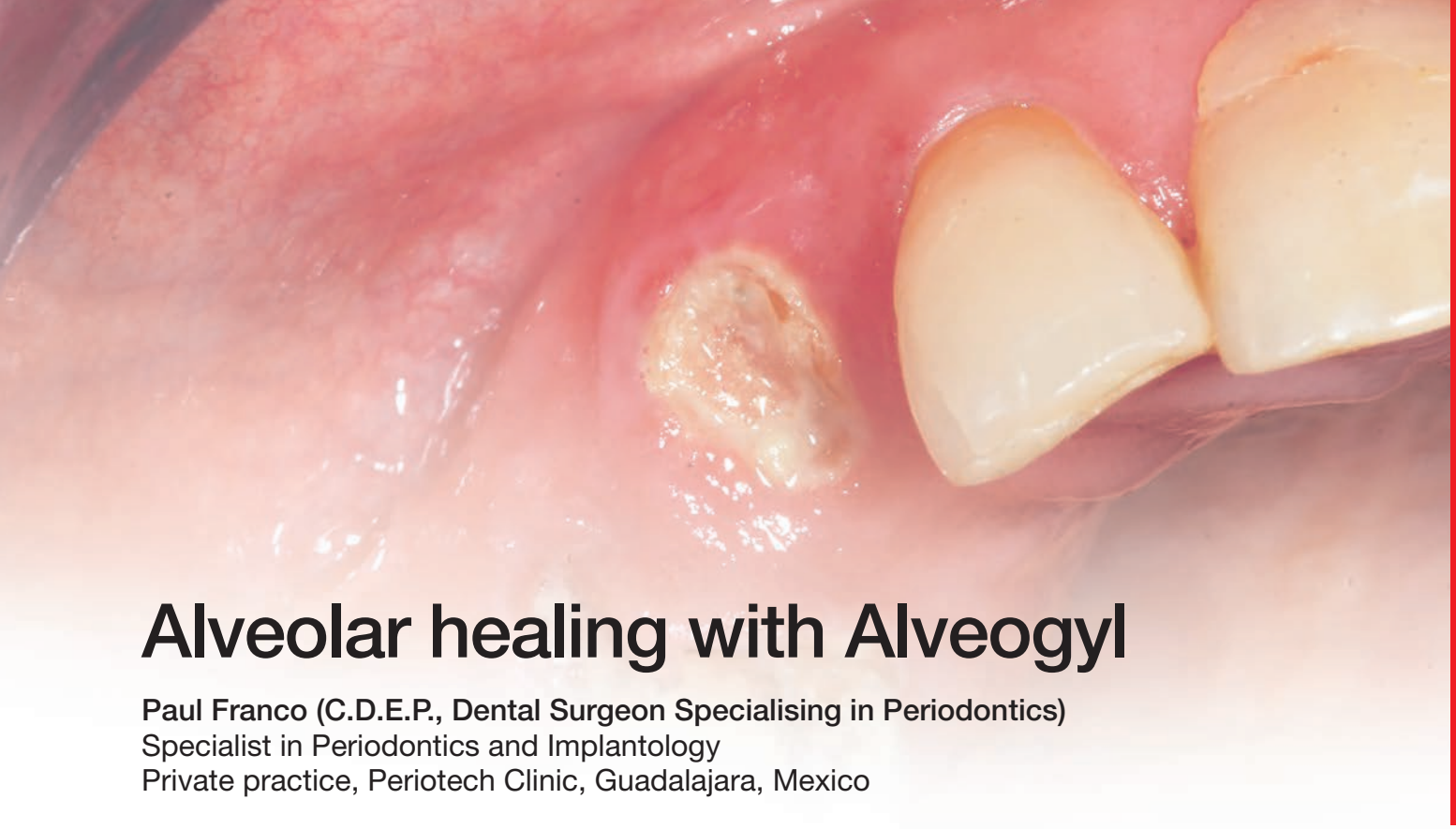
BioRoot™ RCS

Indications: Permanent root canal filling in combination with gutta-percha points in case of inflamed or necrotic pulp.
Permanent root canal filling in combination with gutta-percha points following a retreatment procedure.
BioRoot™ RCS is suitable for use in single cone technique or cold lateral condensation.



Alveolar healing with Alveogyl

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Summary

Male patient with longitudinal fracture of tooth 13 that was impossible to restore. The tooth was indicated for extraction and the patient was informed about the possibility of performing a bone regeneration immediately after extraction; the patient refused a treatment. We proceeded to perform an atraumatic extraction and follow a dry socket prevention protocol.

Introduction

Alveolar healing is a predictable and safe process, however there are situations which jeopardise the integrity of the alveolus and its future healing. Among the most common post-extraction complications is a dry socket or alveolitis (2), a situation caused by the lack of bleeding and the lack of formation of a good-quality clot.

Dry socket is a condition that causes intense and acute pain in the area where the extraction was performed (5). Its aetiology is the exposure of bone that could not be covered with granulation tissue due to inadequate bleeding. On average, the pain that the patient reports is on the third day after the procedure and is often treated as a dental emergency.

The treatment consists in inducing bleeding in the alveolar bone to ensure the formation of a clot. In addition to this, aids are used such as collagen-based haemostatics, surgical cements, or haemostatic fibrous matrices, the latter better known as the Septodont brand Alveogyl. In addition to being used as a curative, the indications for Alveogyl have been broadened to include haemostasis immediately after performing the dental extraction.(3)

The following publication presents a clinical case using Alveogyl to prevent alveolitis.

Case presentation

A 55-year-old patient presented for consultation with the reason given as “my tooth has fractured and it needs to be removed.” The patient was clinically examined and it was observed that tooth 13 was fractured, compromising the integrity of the rest of the tooth and its stability inside the alveolus.

The extraction was performed atraumatically in order to avoid rupturing the cortical layers and damage to soft tissues ***(fig. 1)***. After this, adequate bleeding was verified so that an instrument to induce bleeding in the bone was not necessary.

A small amount of Alveogyl was placed inside the alveolus to maintain haemostasis ***(fig.2)***. There are Penghawar fibres among the material components, and they generate a network in which fibrin will form the initial clot. The fibrous structure provides the ideal environment for a strong and high-quality clot, preventing the appearance of alveolitis (1).

The instructions given to the patient focused on avoiding dislodging the Alveogyl prematurely. In some instances, Alveogyl can remain for more than a week and be uncomfortable for the patient. It doesn’t irritate the new tissue, however, and the only reason to return to the practice is to remove fibres which haven’t been eliminated.

The patient was prohibited from using cleaning items such as toothpicks, swabs, or a toothbrush in the extraction area as these might damage the clot formed and even dislodge it (4).

Although Alveogyl was initially indicated to treat alveolitis, its bioadhesive properties mean that it can be used in post-extraction sites.

During the 7 day post-operative check-up, we observed that the fibrin layer created by the body was thick and stable, the surrounding tissues showed no signs of inflammation or irritation ***(fig. 3)***, and the patient reported no pain or discomfort. It is necessary to clarify that these procedures were not orientated toward a major bone regeneration greater than that which the body will perform.

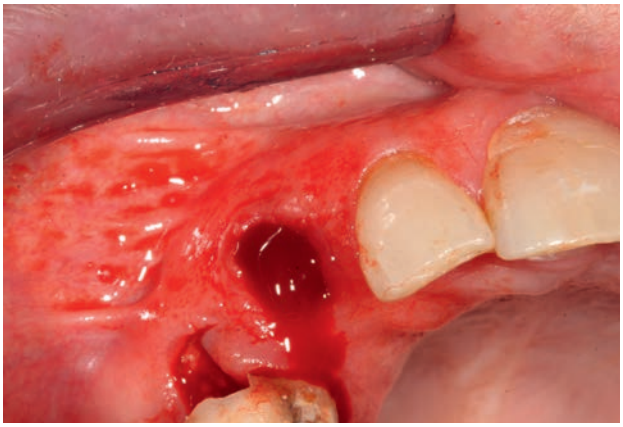

Fig. 1: the alveolus presents an adequate amount of bleeding to form a clot.

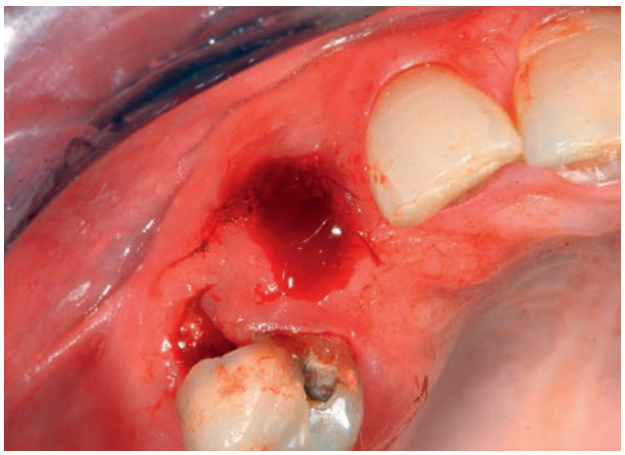

Fig. 2: the Alveogyl fibres stabilise the clot and avoid exposing the bone.

Fig. 3: during the 7 day check-up, we observed stable tissues and the thick fibrin layer. Excess fibres were removed.

Conclusion

The use of dressings like Alveogyl helps encourage good quality healing, avoiding post-operative complications such as alveolitis and reassuring the patient as to the progress of their treatment. Establishing good alveolar healing improves the patient's condition for a future prosthetic reconstruction. This increases the probability that a patient will accept future treatments to help bring back their masticatory function.

It is important to talk to the patient before carrying out the extraction because this procedure does not get rid of the problem. On the contrary, it creates another problem which is the absence of teeth and limited functioning. With proper planning, a good diagnosis, and planned future treatments, patients will be more aware of the importance of rehabilitation after a dental extraction.

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Alveogyl
Indications: Alveogyl is a paste used as dressing in case of dry socket or post-extraction dressing following a difficult or traumatic extraction in patients with history of dry sockets.

Conservative treatment for a symptomatic irreversible pulpitis using Tricalcium Silicate

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Summary

I would like to share an interesting and challenging situation for today's odontologist. For decades we have been taught that, for a symptomatic irreversible pulpitis, we always had to perform a complete biopulpectomy because it was not possible to clinically and clearly identify the extent of the inflammation contained inside the neurovascular bundle.

The objective of the treatment after exposing the pulp is to encourage the healing of the pulp tissue and facilitate the formation of restorative dentin to maintain the vitality and health of the pulp (Abarajithan M, Velmurugan N, Kandaswamy D, 2010).

Sensitivity tests guide the professional tentatively in interpreting the condition of the pulp, whether it is healthy, reversibly inflamed, or so inflamed that the only treatment option is to remove it completely.

Currently, thanks to histopathological understanding and to advances in biomaterials such as those based on tricalcium silicate like Biodentine™ (Septodont, Saint-Maur-des-Fossés, France), used in regenerative treatments where the resulting response of the dentin-pulp tissue is evidently better, the doors have been opened to attempt to go beyond the paradigms established in this respect.

The choice of Biodentine™ is underpinned by its excellent biological properties such as biocompatibility (Kettering J.D., Torabinejad M.1995), (Osorio R.M., Hefti A., Vertucci F.J., Shawley A.L, 1998), (Septodont, 2013); low induction of inflammation, bioactivity, good interaction with different tissues such as periodontal ligament and pulp (Lee S.J., Monsef M., Torabinejad M, 1993), (Abedi H.R., Ingle J.I. 1995), antibacterial capacity, (Torabinejad M., Hong C.U., McDonald F., Pitt Ford T.R, 1995); (Torabinejad M., Hong C.U., Pitt Ford T.R., Kettering J.D, 1995), but specifically in cases of repairing interradicular furcation perforations, as well as its great compressive and flexural strength, similar to dentin, capable of withstanding mastication forces without fracturing (Septodont. Biodentine™ Active Biosilicate Technology Scientific File, 2013).

It is precisely in this respect that these things may not be so accurate: where these precepts rooted deep in our consciousness begin to fall apart and where we understand that interpreting the symptoms a patient expresses, to which we attribute a histological meaning to then prescribe a treatment. This leaves the professional in a delicate position of having to establish some preparatory steps, which we can indicate as progressive development, before the indicated treatment. Cases have been published (Qudeimat and others 2017, Taha et al. 2017) which showed successful results in teeth with partial irreversible pulpitis and apical periodontitis, respectively. The presence of apical radiolucency has been assumed to be a contraindication to performing therapy on the vital pulp in permanent teeth. However, a retrospective study showed a high percentage of success, including in teeth that underwent pulpectomy using MTA (mineral trioxide aggregate) (Linsuwanont et al. 2017).

In so doing, jumping to conclusions and indicating an irreversible treatment for a symptom is not recommended. It is recommended to move forward gradually while observing those macroscopic clinical signs that provide us with some missing data in order to determine the appropriate treatment.

Clinical case

9-year-old male patient presenting at the Autonomous University of Chile, comprehensive paediatric chair II, with a pulp diagnosis of symptomatic irreversible pulpitis due to the progression of a carious lesion that was evidenced clinically by occlusion of tooth 4.6 ***(Fig. 1)*** and radiographically by the large cavity near the pulp chamber ***(Fig. 2)***. Following the pattern of confronting the previously outlined conservative treatments, it was decided to move forward gradually while removing the unsupported enamel - the dentin was completely decayed - exposing a pulp that was seen to be clinically inflamed. Spontaneous haemorrhage then occurred after removing 2 millimetres of pulp. At this point, it was decided to remove

Fig. 1: Clinical examination of the carious lesion.

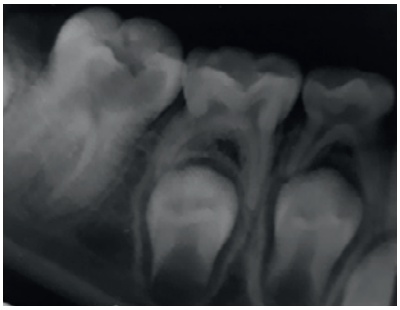

Fig. 2: Radiographic examination of the extent of the carious lesion.

Fig. 3: Inhibiting haemorrhage while cutting.

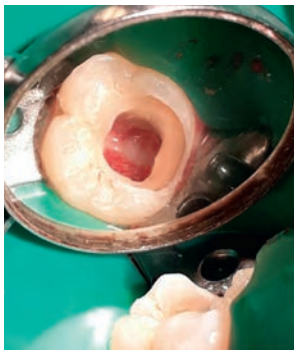

Fig. 4: Macroscopic examination of the remaining pulp.

Fig. 5: Biodentine™, protecting the remaining pulp.

the pulp completely from the pulp chamber *(Fig. 3)*, thus containing the haemorrhage, using a sterile gauze moistened in saline solution for two minutes, to assess possible inflammation of the radicular pulp. Gratifyingly, there was no spontaneous bleeding of the remaining pulp, thus suggesting a tissue without irreversible inflammation from a macroscopic point of view *(Fig. 4)*.

Thanks to the excellent qualities of bioceramics such as Biodentine™ (Septodont, Saint-Maur-des-Fossés, France), pulp remnants are protected *(Fig. 5)* and benefit from its biocompatibility, bioactivity, and excellent mechanical properties that provide it with a suitable and conducive medium to begin the healing process, also benefiting from its mineral tissue-inducing property.

Fig. 6: Radiographic control examination at 7 months.

The patient had a follow-up examination at 7 months, at which the tooth was asymptomatic, functional in so far as there was no radiographic sign of apical pathology *(Fig. 6)*, and responding positively to sensitivity tests.

Discussion

It is essential to reassess the position of the professional when interpreting the signs and symptoms presented by the patient. It is important to understand that the histology will not always be accurately reflected clinically; knowledge of this fact should be enough to consider the possibility of the tooth undergoing conservative treatment, regardless of the initial symptomatology.

It is recommended to move forward gradually while observing those macroscopic clinical signs that provide potential missing data in order to determine the appropriate treatment.

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Active member of the Endodontics Society of Chile.
Coordinator in the area of conservative treatments in immature permanent teeth, in the Autonomous University of Chile.
Private professional practice for 24 years.

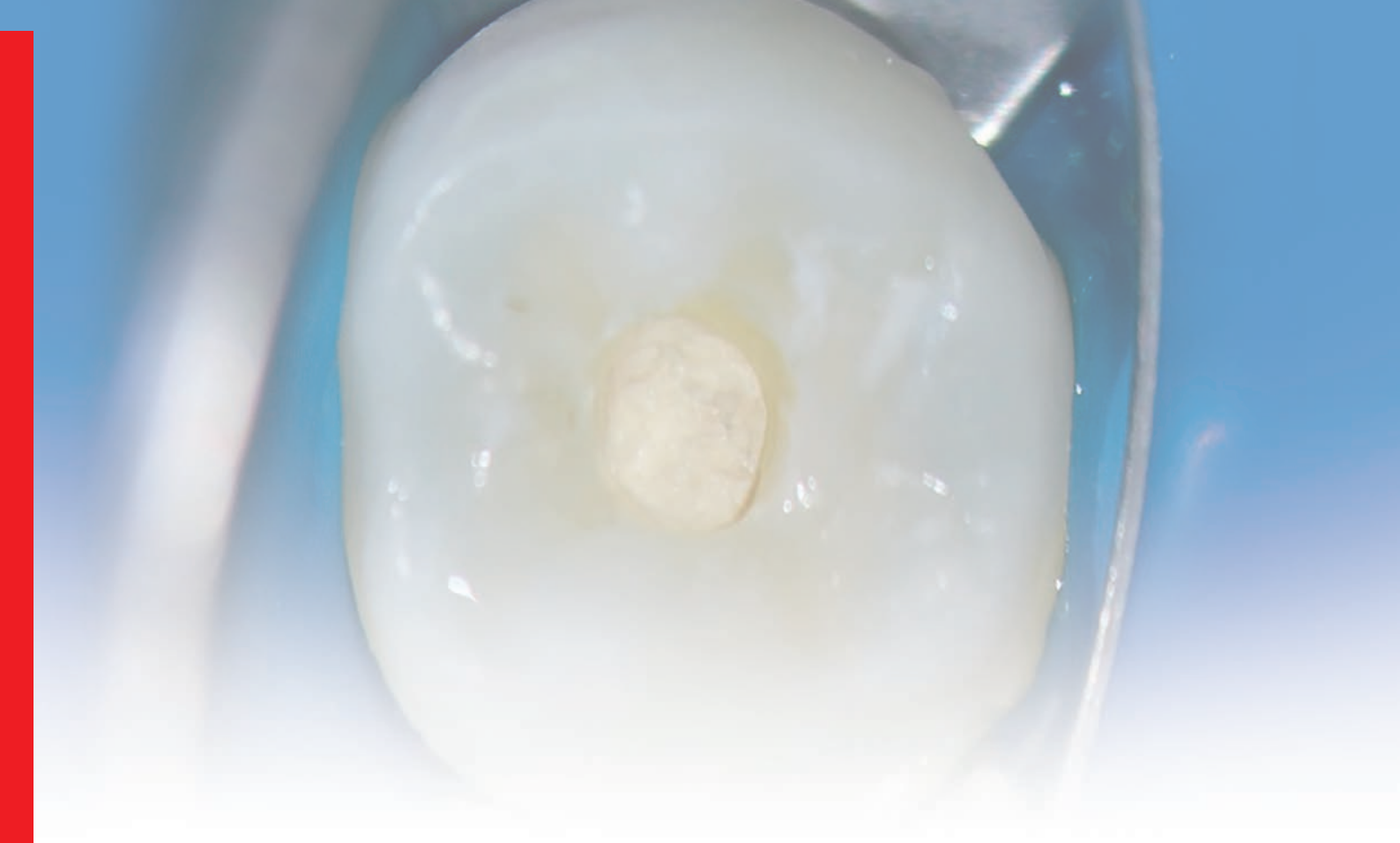
Conference topics:
- Regenerative Endodontics
- Conservative treatments in immature permanent teeth
- Bioactive cements
- Complex treatments using bioceramics

Biodentine™

Biodentine can be used wherever dentin is damaged, both in the crown and in the root:

In the crown: temporary enamel restoration, permanent dentin restoration, deep or large carious lesions, deep cervical or radicular lesions, pulp capping, pulpotomy (reversible and irreversible pulpitis).

In the root: root and furcation perforations, internal/external resorptions, apexification, retrograde surgical filling.



Vital pulp therapy of a dens evaginatus using Biodentine™

Author: Dr. Mark Parhar
D.M.D M.Sc Dip. Endo

Summary

Dens evaginatus is a rare developmental anomaly of human dentition characterized by the presence of tubercle on the occlusal surface of mandibular premolars and lingual surface of anterior teeth (mainly maxillary lateral incisors (2)). Due to occlusal wear, this tubercle suffers attrition or may fracture thus exposing the pulp that is present within. This may lead to pulp necrosis which may arrest the development of the root. The consequence is an underdeveloped root in which the survival is compromised due to the thin root walls. This case report outlines the treatment of a dens evaginatus of the mandibular second premolar by a partial pulpotomy. Biodentine™ was used as it is bioactive and promotes the pulps ability to heal itself. The symptoms resolved after treatment and the pulp vitality was maintained when seen at a 4 month recall.

Introduction

Dens evaginatus (DE) is a developmental aberration of a tooth resulting in formation of an accessory cusp whose morphology has been variously described as an abnormal tubercle, elevation, protuberance, excrescence, extrusion, or bulge (1). This uncommon anomaly projects above the adjacent tooth surface, exhibiting enamel covering a dentinal core that usually contains pulp tissue that on occasion may have a slender pulp horn which extends various distances up to the full length of the tubercle's dentin core ***(Fig. 1)***. The presence of pulp within the cusp-like tubercle has great clinical significance and distinguishes the anomaly from supplemental cusps, such as the cusp of Carabelli, which contain no pulp. DE is predominantly found on the occlusal surface of mandibular premolars and lingual surface of anterior teeth (mainly maxillary lateral incisors (2). DE predominantly occurs in people of Asian descent (including Chinese, Malay, Thai, Japanese, Filipino, and Indian populations) with varying estimates reported at 0.5 to 4.3%, depending upon the population group studied (3). It is usually observed as bilateral, symmetric distribution, with a slight sexual predilection for females. The DE tubercle may extend above the occlusal surface anywhere from 1-6 mm and this will result in a malocclusion as the tooth erupts. The resultant occlusal traumatic force causes abnormal wear or fracture of the tubercle, and is the usual manner of pulp exposure for this anomaly. Subsequent pulpal inflammation or infection will most likely ensue. It is important for the clinician to be able to recognize and treat the entity soon after affected teeth have erupted into the oral cavity to avoid pathological conditions such as pulp necrosis, acute apical periodontitis, and acute apical abscess.

Vital pulp therapy of immature teeth is performed to encourage the physiological development and formation of the root to full length and thickness along with apical closure. This will increase the survival of a tooth as thin root walls and decreased pericervicaldentin may lead to increased root fractures or restorative failures (4). Over the years many materials have been used for vital pulp therapy such as calcium hydroxide and mineral trioxide aggregate (MTA). The bioceramic materials have become the material of choice for these types of procedure (5). If the tooth can be treated before pulp necrosis occurs, then the success rate for the vital pulp therapy utilizing a bioceramic material is over 90% (6).

Biodentine™ (Septodont, Saint-Maur-des-Fosses, France) is a calcium-silicate based material which has several clinical applications, such as root perforations, apexification, resorptions, retrograde fillings, pulp capping procedures, and dentine replacement. In vital pulp therapy, Biodentine™ works by inducing biomineralization after its application which creates an interface that prevents leakage and contamination of the pulp.

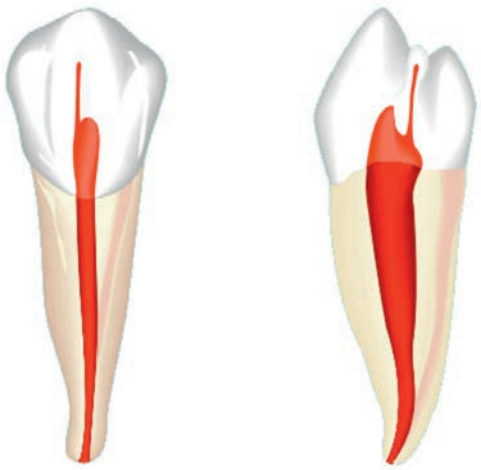


Fig. 1: Dens Evaginatus (Courtesy Visual Endodontics).

Case report

A 10 year old Asian female was referred to our office by her Pedodontist to assess and treat the mandibular second premolar that presented with a Dens Evaginatus (DE). DE was present bilaterally ***(Fig. 2)***. She had been having symptoms in the mandibular left side with cold over the past 6 months after the tubercle was fractured due to occlusal forces. Treatment was rendered by the Pedodontist to seal the occlusal surface with composite ***(Fig. 3)***. However, cold sensitivity along with intermittent discomfort persisted. Periapical radiographs ***(Fig. 4 and 5)*** were taken and an open apex was noted. The tooth responded severely to cold testing without lingering and was mildly responsive to biting.

Upon assessment, a decision was made to perform a partial pulpotomy with the goals of maintaining the vitality of the pulp and promoting the continued development of the root in length and thickness. Anesthetic was given (Lignospan® Anesthetic, Septodont) via an Inferior Alveolar Nerve Block and then a rubber dam was placed to isolate the tooth. A conservative access was made using a tapered diamond bur in a high speed handpiece and copious water. When the pulp was entered, moderate bleeding was noted ***(Fig. 6)***. Approximately 2 mm of the inflamed pulp was cut away and sodium hypochlorite was applied to disinfect and control any excess bleeding. Sterile cotton pellets were also used to arrest the bleeding ***(Fig. 7)***.

A Biodentine™ capsule was used as per the manufacturer's instructions: 5 drops of the liquid was placed into the capsule and the capsule was mixed for 30 seconds. Biodentine™ was carefully placed on to the pulp tissue and gently

Fig. 2: Contralateral Bicuspid.

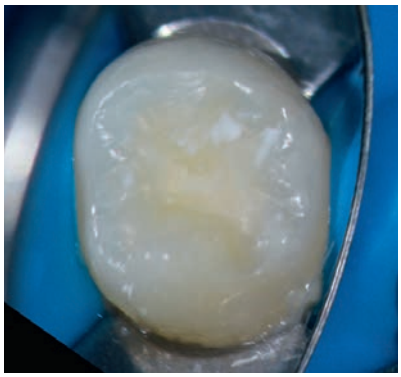


Fig. 3: Pre-operative.

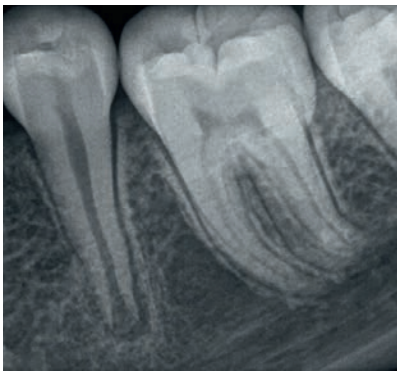


Fig. 4: Pre-operative Radiograph.

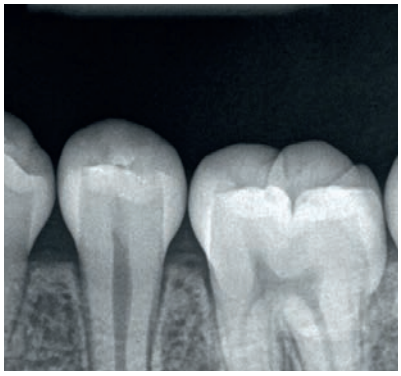


Fig. 5: Pre-operative Radiograph.

Fig. 6: Inflamed pulp.

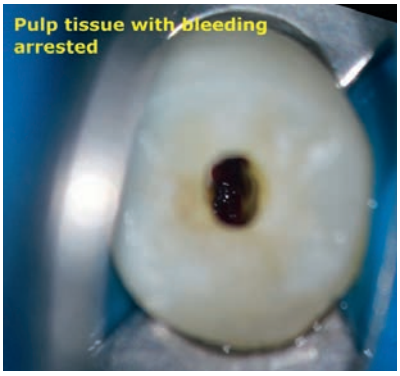


Fig. 7: Bleeding arrested.

packed with sterile paper points and a plugger ***(Fig. 8)***. After the Biodentine™ was placed, it was allowed to set for 12 minutes. The tooth was etched with phosphoric acid (Ultra Etch) and then a bonding agent (Clearfil Photo Bond, Kuraray) was placed and light cured for 10 seconds. A dual cure core build-up material was placed (Absolute Dentin, Parkell) on the Biodentine™ and the occlusal surface was sealed with composite (Filtek Z-100, 3M ESPE). The composite was cured for 30 seconds and then finishing and polishing were done ***(Fig. 9)***.

The patient was seen for a 4 month recall and reported normal functioning without any symptoms. Upon testing, the tooth had a normal cold response similar to the adjacent teeth and without lingering. Periapical radiographs were taken and the continued root development was noted along with the development of a dentin bridge below the Biodentine™ ***(Fig. 10 and 11)***. The findings are suggestive that the pulp vitality has been maintained and that continued root development will take place.

Fig. 8: Biodentine™ placed.

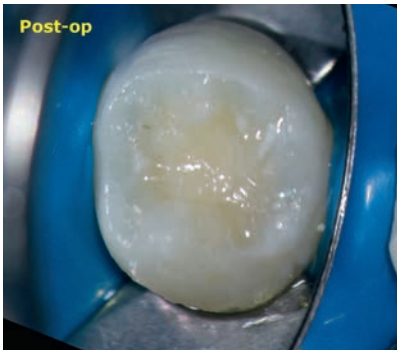


Fig. 9: Final restoration placed.

Discussion

DE in mandibular premolars can pose challenges due to the early pulp exposure that can occur, particularly with immature roots. The occlusal forces may damage the tubercle and expose the pulp prematurely, as was the case in this report. Early recognition and treatment is key for the proper management of these teeth, otherwise pulp necrosis can occur and these teeth will fail to develop adequately which will make these prone to root fractures and a short survival. In this case the pulp was still vital and vital pulp therapy was indicated. Biodentine™ is an excellent material for these types of cases as it promotes pulpal health, root development, apex closure and allows the permanent restoration to be placed on top of it in the same appointment.

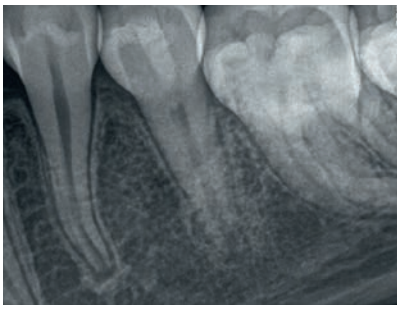


Fig. 10: 4 month recall.

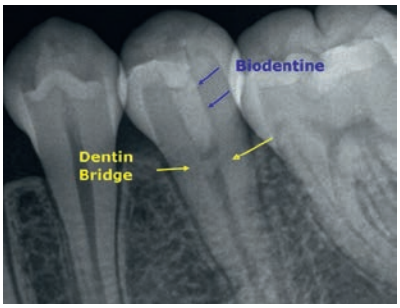


Fig. 11: Dentin bridge formation noted.

Conclusion

Vital pulp therapy was performed with success in this case, which was facilitated by the application of Biodentine™. The pulp vitality was maintained, the root continues to develop, and the patient can function normally without any discomfort. Further follow-ups are required in the future to monitor the longevity of these types of treatments. Biodentine™ was an excellent material for this case and should be considered in all vital pulp therapy cases due to its superior properties.

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2012-2014: North Shore Endodontics, Private practice as an associate endodontist, North Vancouver, B.C
1997-2009: Private Practice in General Dentistry, Private practice with a special interest in Endodontics, Implantology, Sports Dentistry, and Oral Sedation, Vancouver, B.C.
2010-2012: UBC Master's of Science (supervisor Dr. Markus Haapasalo). Evaluation of Ultrasonic Irrigation Systems for Debris and Smear Layer Removal in Root Canals: A SEM study
2007-2010: International Olympic Committee, Dental Screening Program. Working with IOC dental members to provide dental screenings at the Olympic games with the purpose of gathering data to assess disease patterns and devising treatment protocols for future Olympic games.
1996-1997: BOLD Laboratory, Vancouver, B.C., Dr. David Sweet Research Assistant, assisted with various Forensic Odontology research projects including post-mortem examination, bite-mark analysis, and radiographic comparison
1990-1991: University of British Columbia, Department of Biochemistry. 4th year Honors Thesis, Dr. Rudi Aebersold, thesis project involved research on developing protocols for protein coupling and identification
2019: TODS Annual Meeting October 25, Kelowna, BC-Presenter Management of Traumatic Dental Injuries
2019: International Academy for Endodontics, June 28, 2019, Phoenix, AZ-Presenter Decision Making in the Use of Bioceramic Sealers
2019: Pacific Dental Conference March 7, Vancouver, BC-Presenter Management of Dental Trauma
2018: Nelson Dental Study Club, September 18, Nelson, BC-Presenter Modern Endodontics
2018: Connect 4 Study Club, March 6, Richmond, BC-Presenter Management of Traumatic Dental Injuries

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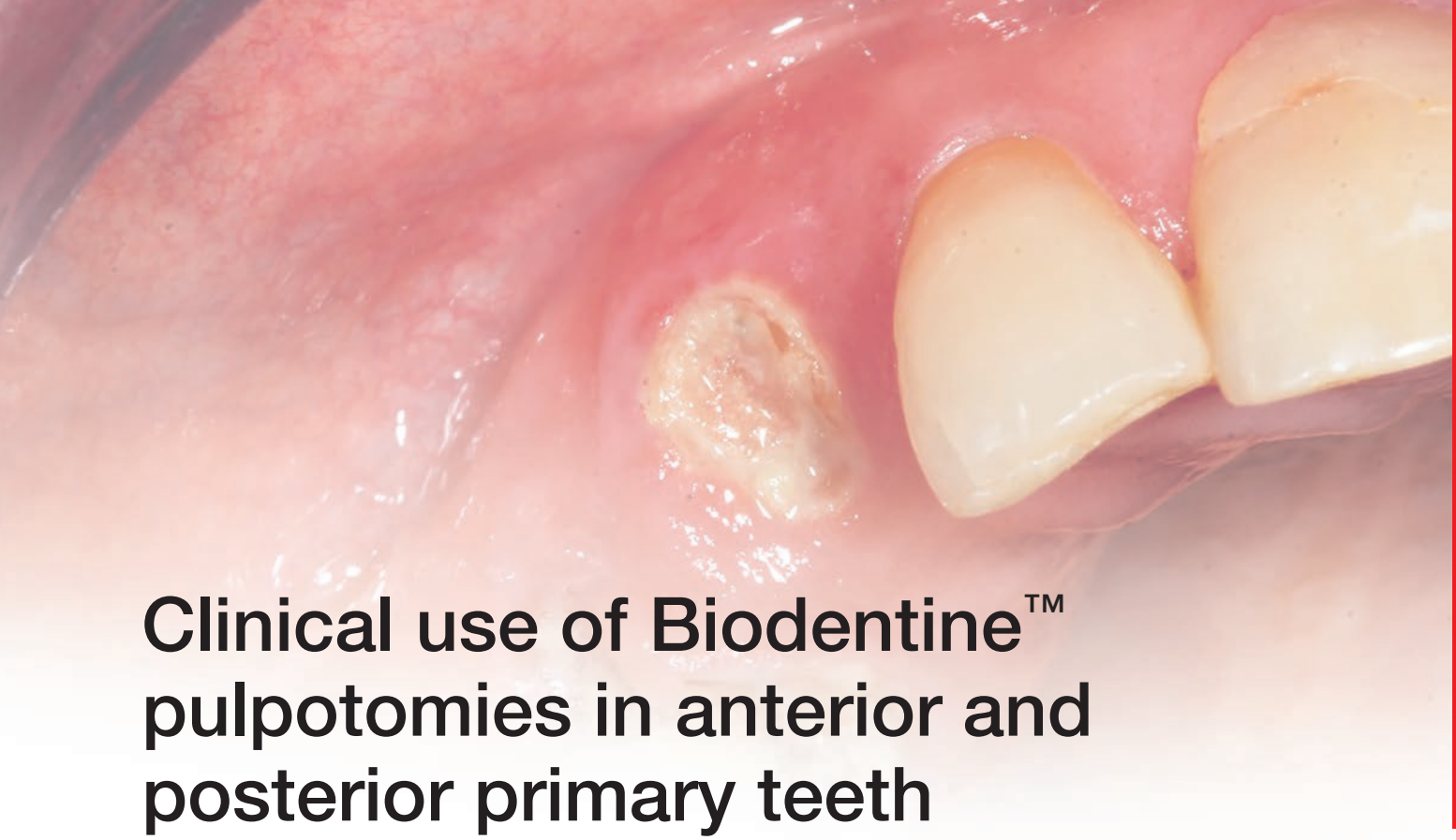


Clinical use of Biodentine™ pulpotomies in anterior and posterior primary teeth

Author: Jarod W. Johnson, DDS

Introduction

Vital pulp therapy plays a key role in treatment of the primary dentition; The American Academy of Pediatric Dentistry has established guidelines for vital pulp therapy. (1) Pulpal therapy, specifically pulpotomies, can maintain a primary tooth and avoid potential problems such as pain, swelling, infection, and premature tooth loss which can lead to the need for space maintenance, or in some cases more expensive dental procedures such as orthodontics. (2)

For years formocresol has been considered the gold standard for pulpotomies in primary teeth. Although highly successful Formocresol has long been known to possess carcinogenic and cytotoxic properties. (3) Recently consumers and practitioners have expressed concerns about the safety of dental materials used in children. Other traditional pulpotomy materials such as calcium hydroxide and ferric sulfate have left practitioners with more to be desired as they consistently have been shown to have inferior success rates when compared with formocresol.[1] Developments made in the field of bioceramics, led by mineral trioxide aggregate (MTA), have generated new excitement around vital pulp therapy in primary teeth.

The most recent guidelines from the American Academy of Pediatric Dentistry on vital pulp therapy puts bioceramics such as MTA on the same tier of efficacy as formocresol. This development provides practitioners with sound evidence to make the switch to utilizing bioceramics for pulpotomy treatment in the primary dentition. (1)

While MTA has demonstrated a highly successful clinical outcomes, it has multiple disadvantages. MTA stains when in contact with sodium hypochlorite which presents a cosmetic challenge for dentists, especially when treating teeth in the anterior region. (4) The two to four hour setting time can make it difficult to treat teeth in a single visit, and it has been known for its high cost and difficult handling properties. (5) Newer products have been developed to help alleviate some of these concerns.

Biodentine™

Biodentine™, has demonstrated a strong track record of clinical success. Biodentine™ (Septodont) is a calcium silicate material that contains tricalcium and dicalcium silicates, aluminum oxide, and calcium chloride. It has demonstrated a wide variety of uses in both the primary and permanent dentitions. It can be used for indirect and direct pulp therapy, pulpotomies (full and partial), apical barriers (apexification), perforation repairs, and obturation. (6)

Handling Properties

Bioceramics come in many different forms of mixing and delivery. Traditional MTA comes in a powder and liquid form and requires hand mixing. The powder to liquid ratio can impact the handling of the material and be frustrating for providers. Too much or too little water and the material will be difficult place in the tooth. One of the easiest bioceramics to handle, Biodentine™ is mixed with water and titrated into putty that handles like intermediate restorative material (IRM). (6)

Setting Time

Traditional MTA has a long setting time, it takes approximately two to four hours to reach its final set. Newer bioceramics have a shorter set time, which is advantageous when providers are attempting to restore teeth at the same visit that pulp therapy is performed. Biodentine™ sets in 9-12 minutes, making single visit procedures predictable. (6)

Discoloration

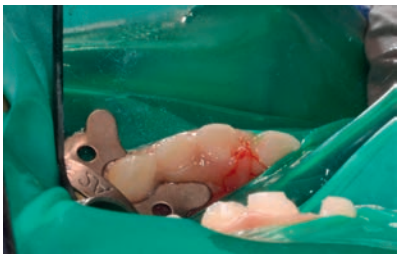
Staining of bioceramic products is due to the use of bisthmuth oxide and sodium hypochlorite. When the two materials are used a grey discoloration appears within the tooth structure. Bisthmuth oxide is used to add radiopacity to the traditional calcium silicates. Biodentine™ contains aluminum oxide to make the material radiopaque on radiographs and will not cause staining when in contact with sodium hypochlorite. (4)

Technique: Anterior Pulpotomy

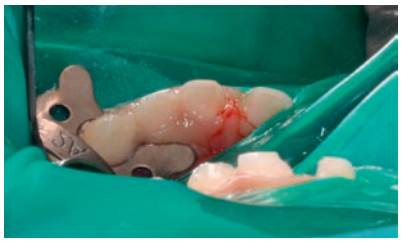
Studies show that pulpotomies have similar success rates as pulpectomies on vital anterior teeth.
Teeth #E and #F presented with deep carious lesions and inadequate remaining dentin thickness for indirect pulp therapy. The teeth were anesthetized with local infiltration with 4% Articaine HCL with 1:100k epinephrine (Septodont). Rubber dam isolation was obtained, and caries removal was completed resulting in vital carious exposures on teeth #E, and #F. The pulp was amputated to the level of the CEJ and disinfected with 6% NaOCl (Vista Dental). Biodentine™ was used the pulpotomy medicament, and core buildup material. The teeth were restored with resin veneered stainless steel crowns (Kinder Krowns).

1: Local anesthesia.

2: Rubber Dam Isolation.



3: Caries removal.



4: Pulpotomy to the level of the CEJ.

5: Disinfection 6% NaOCl.

6: Biodentine™ Placement.

7: Glass Ionomer or IRM Base (Optional, not necessary if Biodentine™ is used as a base).

8: Allow Biodentine™ or Glass Ionomer/ IRM Base to set.

9: Prepare for final restoration.

10: Final restoration.

Technique: Posterior Pulpotomy

Clinical trials and the most recent systematic reviews show that Biodentine™ consistently performs at the same level clinically and radiographically as MTA.

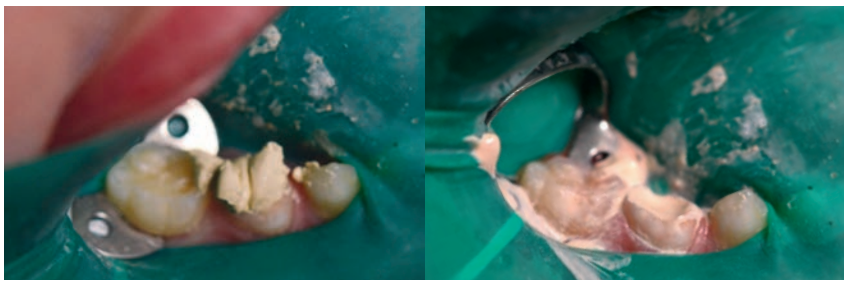
A 5-year-old presented with severe early childhood caries. The patient was referred from a general dentist due to the extent of decay present upon initial evaluation. The patient was asymptomatic at the time of presentation. Of note the patient presented with carious lesion on tooth #S and #T. Radiographic examination showed no signs of furcal or apical pathosis ; however, tooth #S had inadequate remaining dentin thickness. Both teeth were diagnosed with reversible pulpitis and normal apical tissues. Due to the extent of dental needs, and cooperation of the patient general anesthesia was used as a behavior management plan. Teeth #S and #T were anesthetized with 4% Articaine HCL with 1:100k epinephrine (Septodont), and isolated with a rubber dam. Caries removal was completed, tooth #S resulted in a carious exposure. A pulpotomy was performed with 6% NaOCl (Vista Dental) and Biodentine™ (Septodont). In this case the entire chamber was filled with Biodentine™ (Septodont) to act as a base. Both teeth were restored with stainless steel crowns (Hu-Friedy).

1: Local anesthesia.

2: Rubber Dam Isolation, caries removal.

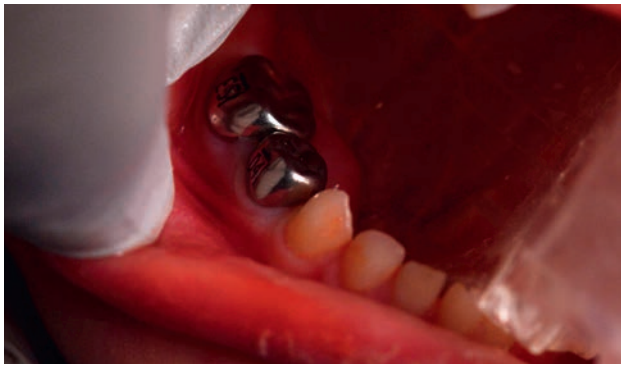
3: Pulpotomy to the level of the CEJ.

4: Disinfection 6% NaOCl.



5: Biodentine™ Placement.

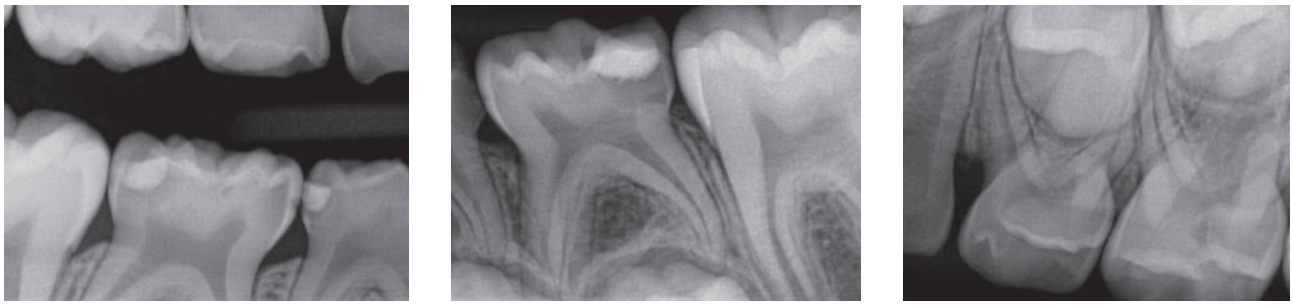
6: Preparation for Stainless Steel Crown.



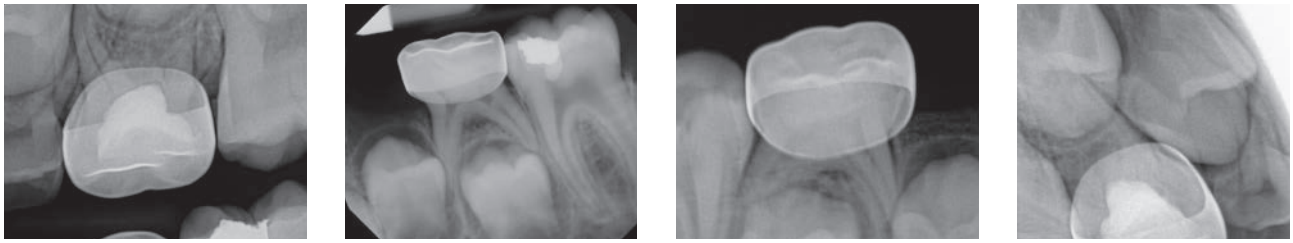
7: Final restoration.

Post-operative Evaluation of Pulpotomies

Pulpotomies should be evaluated clinically and radiographically six months after placement. Successful pulpotomies should be free of resorption, furcal or apical pathology radiographically. Clinically the patient should be asymptomatic and be free of signs of infection (sinus tract or abscess). After the initial re-evaluation they should be evaluated clinically at recalls and radiographically yearly. (7)



1: Preop.



2: Recall: One year recall of Biodentine™ pulpotomies on (A) (J) (K) and (T) showing no signs of furcal or apical pathology.

Report of a Clinical Case

A 6-year-old male presented for consultation after being referred from a general dentist. The patient had moderate discomfort to sweets in the mandibular right quadrant. A comprehensive oral evaluation was performed, and it was determined that the patient had multiple carious lesions. Periapical radiographs show decay on multiple teeth, and no furcal pathosis was apparent. Due to the extent of the decay on teeth #S, and #L they were deemed to be non-restorable.

Treatment

The patient was treated in an outpatient setting under general anesthesia due to the extent of dental needs, and patient cooperation. The teeth were anesthetized with local infiltration with 4% Articaine HCL with 1:100k epinephrine (Septodont) Teeth #L, and #S were extracted, #J, #K, and #T were treated with pulpotomies using 6% NaOCl (Vista Dental) and Biodentine™ (Septodont), and the teeth were restored with stainless steel crowns (Hu-Friedy). The patient returned for regular recall examination five months later. Teeth #J, #K, and #T remain aysymptomatic, free of swelling or sinus tract, and show no signs of apical or furcal pathosis.

Conclusion

The advantages of bioceramics in vital pulp therapy are clear. Unlike formocresol which causes pulpal necrosis and fixates the coronal portion of the apical pulp, bioceramics can help maintain a vital radicular pulp throughout the radicular root system. (8), (9)

Author:
Dr. Jarod Johnson

Dr. Jarod Johnson has a private practice in Muscatine, Iowa. Dr. Johnson has received advanced training in behavior management, sedation, hospital dentistry, trauma, special health care needs, interceptive orthodontics, space maintenance, oral hygiene, and dietary counseling.
His energetic personality allows him to relate to kids on an individual level. He understands the importance of children having a positive dental experience and strives to provide the best care tailored to each child's needs.
Dr. Johnson enjoys educating children and their families on the importance of oral health so they can establish good habits for a lifetime of smiles. His goal is to develop relationships with each of his patients to establish a dental home that is welcoming from infancy through adolescence.
Dental Degrees & Certifications.

Dr. Johnson has earned:
Bachelor of Science in Biomedical Engineering, University of Iowa.
Doctor of Dental Surgery, University of Iowa.
Certificate in Pediatric Dentistry, University of Nevada, Las Vegas, School of Dental Medicine.
Diplomate of the American Board of Pediatric Dentistry.
American Academy of Pediatric Dentistry Speakers Bureau, Member.

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Biodentine™

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In the root: root and furcation perforations, internal/external resorptions, apexification, retrograde surgical filling.

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