Kreena Patel

Kreena is a Specialist in Endodontics. She graduated from the University of Manchester and completed her specialist training at King's College London, where she qualified with distinction. Kreena has also worked in general practice and carried out further hospital training in Oral Surgery, Paedodontics and Restorative dentistry.

Kreena is passionate about her work and enjoys the technical precision involved in Endodontics and Endodontic Surgery. She is also keen on improving the field of Endodontics and her research has been published in several international journals. She taught on the Specialist Endodontics Programme at Guy's Dental Hospital (King's College London) as a senior clinical teacher from 2016 - 2021.

Kreena currently works at Brigstock Dental Practice (South London) & Oaktree Dental Practice (Berkshire). She continues to lecture & teach, and has her own online endodontic programme "The Endo Course", and hands-on course 'Endo Expertise'.

You can also follow her endodontic educational content on Facebook and Instagram @kreenaspecialistendodontics.

Full pulpotomy using Biodentine™ XP on an immature tooth with pre-eruptive intracoronal resorption

How long have you been using Biodentine™?

I have been using Biodentine™ for over 10 years and have slowly pushed the boundaries of its use in this time. In my opinion it is the best material on the market to date when working both in close proximity to the pulp and for perforation repair.

Why do you use the Bio-Bulk Fill procedure with Biodentine™? What are the main advantages for you?

I initially used Biodentine™ as a thin layer but switched to using it in Bio-Bulk Fill procedure in later years. Biodentine™ lends itself well to being used in this way; it has similar mechanical properties to dentine and bonds to it, providing an excellent seal that is resistant to leakage. I also find the handling and placement of the material quicker and easier to use this way. I nearly always use Biodentine™ in a one-stage procedure and am more confident adjusting the coronal aspect when it has been placed as a thicker increment.

In which cases do you use the Bio-Bulk Fill procedure?

- Direct / indirect pulp capping and pulpotomies: I fill the dentine portion of the tooth using Biodentine™. Following the initial 12-minute set, I carefully clean the coronal cavity and add a >2mm composite layer.
- Perforation repair: I carry out the endodontic (re)treatment first. Following good hemostasis, I repair the perforation and fill

the pulp chamber using the Bio-Bulk Fill procedure. This ensures a thick layer of Biodentine™ is used to provide an excellent seal around the repair.

- Internal repair of external cervical resorption (ECR) lesions when they are not amenable to surgical repair. In these cases, I mechanically and chemically clean the lesion as fully as possible internally, and fill the root canal and pulp chamber with Biodentine™. There is some evidence that this can help prevent resorption progression.
- Apexification: I use Biodentine™ for apexification of teeth with short roots to prevent coronal staining. I fill the entire root and pulp chamber with Biodentine™.

Summary

Introduction
The clinical case presented is about a 13-year-old child who had an uncommon resorptive defect called pre-eruptive intracoronal resorption (PEIR) and caries affecting their lower second molar.
Vital pulp therapy was carried out to retain the tooth and maintain root development.

Methods
A full pulpotomy was performed with Biodentine™ XP in a single visit, using the Bio-Bulk Fill procedure with a coronal composite.

Discussion
Vital pulp therapy was advantageous to maintain root development. It was also a faster and less technique sensitive procedure to carry out on a young child. Biodentine™ XP was used in a Bio-Bulk Fill procedure in this case. Using Biodentine™ in this manner requires fewer materials, clinical stages and time. This is particularly important in children where cooperation is sometimes challenging.

Conclusion
This case shows Biodentine™ XP can be successfully used for full pulpotomies on teeth with PEIR where the pulp was exposed and sealed a few weeks prior to treatment.

Introduction

The clinical case presented had pre-eruptive intracoronal resorption (PEIR). PEIR is a rare resorptive defect located in coronal dentine. It occurs just below the enamel-dentine junction of unerupted teeth on the mesial or occlusal portion of the crown. Due to the similar radiographic appearance, PEIR is often misdiagnosed as caries. Consequently, these lesions were previously referred to as “pre-eruptive”, “hidden” or “developmental” caries.

PEIR has a prevalence of 0.5-2% and usually affects a single tooth (74-88%). Mandibular second molars are most commonly involved, followed by first molars and rarely premolars and canines. No associated factors have been found between PEIR and race, gender, systemic or medical factors and fluoride supplementation.

The aetiology of PEIR is unknown. Is it thought that odontoclasts originating from the surrounding bone penetrate the tooth via defects in the inner enamel epithelium. The dentine is gradually resorbed and replaced with vascular connective tissue. Resorption of enamel occurs at a much slower rate most likely because it is more calcified. Histologically, PEIR is distinguished by the presence of multinucleated giant cells, osteoclasts and chronical inflammatory cells. The pulp is surrounded by a protective resorption resistant sheet (PRRS), which shields it from the resorptive process until late in the process. The nature of the resorptive process resembles external cervical resorption (ECR). However, the location within the tooth structure differs. ECR starts at the cervical margin (just below the cemento-enamel junction) and PEIR is localized to the crown.

The resorptive process is asymptomatic and the progression rate varies. The vascular supply to the odontoclasts originates from the dental follicle. After eruption the clastic cells lose their nutrient supply and the connective tissue within the resorptive lesion undergoes necrosis. The resorptive process is arrested leaving friable material and decomposed dentine within the crown. The surrounding enamel walls are unsupported and occlusal forces can result in their fracture. The lesion can also become secondarily affected by bacteria and present as a large carious-like lesion. PEIR lesions provide an internal environment where bacteria can thrive and normal oral hygiene measures are ineffective. The relatively large size of the radiolucency compared to the amount of time the tooth has been erupted should guide the clinician to the true origin of the lesion.

PEIR is typically detected as an incidental radiographic finding. Early detection and treatment can help prevent pulpal exposure of these immature teeth. Small lesions in unerupted teeth can be monitored at 6-12 months intervals and any intervention postponed until after tooth eruption.

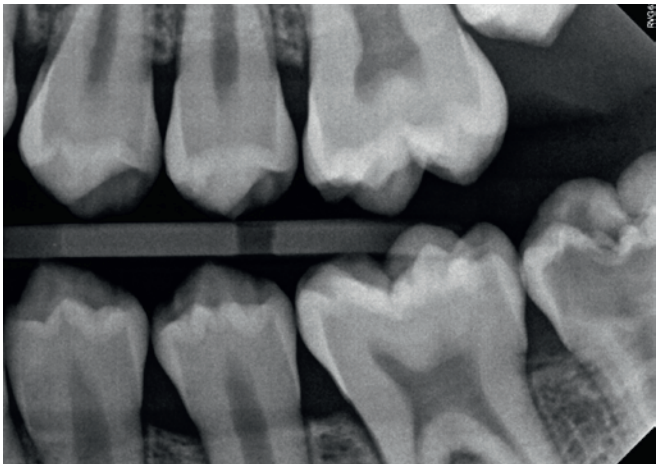

Fig. 1 - Referral bitewing radiograph showing an intracoronal radiolucency on LL7.

Fig. 2 - Preoperative photograph.

Following eruption, the enamel can then be sealed (with a resin sealant or GIC) to prevent secondary infection. The prognosis of these is considered to be favorable. If the lesion appears to be rapidly progressing or is in close proximity to the pulp, the crown will need to be surgically exposed.

Lesions with a deeper penetration into the dentine will require cleaning and restoration. Lesions that have not communicated with the pulp will require an indirect pulp cap. However, if the pulp has been penetrated the clinician can consider a direct pulp cap or partial or complete pulpotomy followed by the placement of a well-sealed restoration. Extensive lesions may require root canal treatment or extraction.

Vital pulp therapy aims to preserve the pulp, which performs a plethora of important functions including dentinogeneis, immune cell defense and proprioception. They focus on minimal intervention and can be a more cost effective and less technique sensitive option. It is particularly important for teeth affected by PEIR because they often have immature root apices and continued root formation is advantageous.

This clinical case describes a full pulpotomy procedure that was carried out on a tooth with PEIR secondarily affected by caries several weeks after the pulp was exposed.

Case report

Clinical signs and symptoms

A 13-year-old child patient presented to his general dentist with caries in partially erupted LL7 ***(Fig. 1)***. His general dentist started caries removal, which resulted in a pulpal exposure. A cotton pledget with calcium hydroxide and temporary restoration were placed. The patient was then referred to me for further management. The general dentist was not aware of the underlying PEIR diagnosis.

The patient attended for an endodontic consultation several weeks following the initial treatment. Clinically, the patient was asymptomatic. The LL7 was partially erupted and not tender to percussion or buccal palpation ***(Fig. 2)***. It responded positively and normally to sensibility testing.

Radiographic examination was carried out using periapical radiographs. The LL7 had immature root apices with no obvious periapical radiolucencies. There was a small radiopacity noted distal to the roots of LL7 but no clear evidence of a developing wisdom tooth *(Fig. 3)*.

Diagnosis

PEIR with secondary caries & Reversible pulpitis LL7.

In light of the clinical and radiographic evidence, a partial or full pulpotomy procedure was planned. The patient understood that root canal treatment or extraction may be required depending on the clinical findings during treatment.

Procedure and treatment

Local anaesthetic (2.2ml 2% lidocaine 1/80k adrenaline, Lignospan Special, Septodont & 2.2ml 4% articaine 1/100k adrenaline Septanest, Septodont) was administered via an ID block and buccal infiltration. The partially erupted tooth was challenging to isolate. An operculectomy was performed exposing the distal aspect of the tooth and facilitating rubber dam placement.

The temporary restoration was removed using a high-speed handpiece under copious irrigation. Soft caries was noted amongst the resorptive tissue *(Fig. 4)*. The lesion was fully debrided was carried out using a tungsten carbide bur and the pulp appeared inflamed *(Fig. 5)*.

A sterile diamond bur and high-speed handpiece was used to remove 2-3mm of pulp tissue below the exposed pulp. A cotton pledget dampened in 2.5% sodium hypochlorite was held over the exposed pulp for 5 minutes *(Fig. 6)*. Haemostasis could not be achieved so a full pulpotomy was attempted. An access cavity was created and the coronal pulp tissue was removed using a sterile red-banded diamond bur. A new cotton pledget dampened in 2.5% sodium hypochlorite was placed over the pulp stumps and this time good haemostasis was achieved *(Fig. 7)*.

Biodentine™ XP (Septodont) was placed directly over the pulp stumps. It was also used to fill the pulp chamber using a Bio-Bulk Fill procedure. The tip of the Biodentine™ gun was placed close to the cavity base and Biodentine™ XP injected while slowly retracting. The material was gently adapted in place using minimal pressure *(Fig. 8)*. The material was given 12 minutes for the initial setting reaction to take place. A tungsten carbide gooseneck and ultrasonics were used to refresh the dentine margins.

A definitive 2-3mm composite restoration (Etch, Prime & Bond Active, SDR (DentsplySirona) & HRi (Micerium)) was placed over the Biodentine™ XP. The occlusion was checked *(Fig. 9)*.

Follow up

The patient was asymptomatic at the 1- and 7-month reviews. The review radiograph showed continued root formation *(Fig. 10)*.

It is recommended that LL7 is monitored at yearly intervals. The LL7 has now entered the restorative cycle and has a fairly large restoration present. If the wisdom tooth develops, it may be worth considering extraction of the LL7 to allow it to erupt in its position. The extraction should be done in a timely manner (when the furcation of LL8 has just formed) to aid maximum space closure.

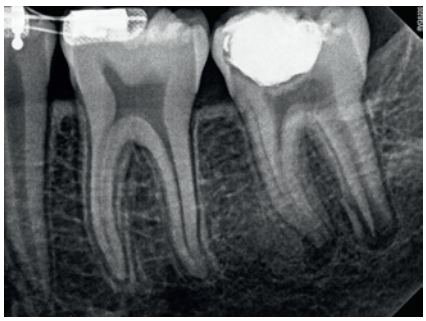

Fig. 3 - Preoperative radiograph.

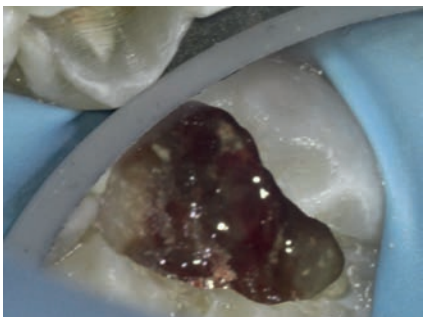

Fig. 4 - Temporary filling removal.

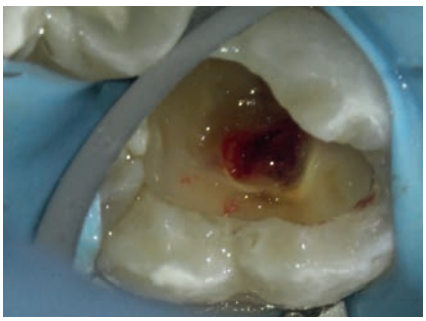

Fig. 5 - Caries removal and pulp exposure.

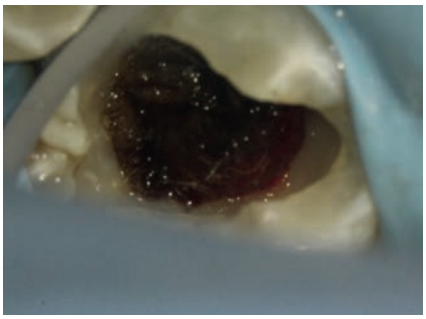

Fig. 6 - 2.5% NaOCl dampened cotton pledget held over the exposed pulp for 5 minutes.

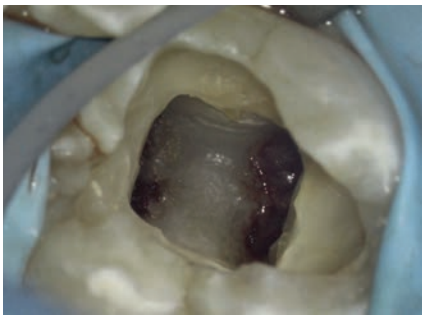

Fig. 7 - Full pulpotomy. Adequate heamostasis of the pulp stumps.

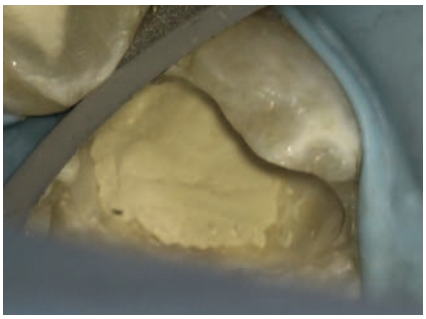

Fig. 8 - Biodentine™ XP placement.

Fig. 9 - Review photograph.

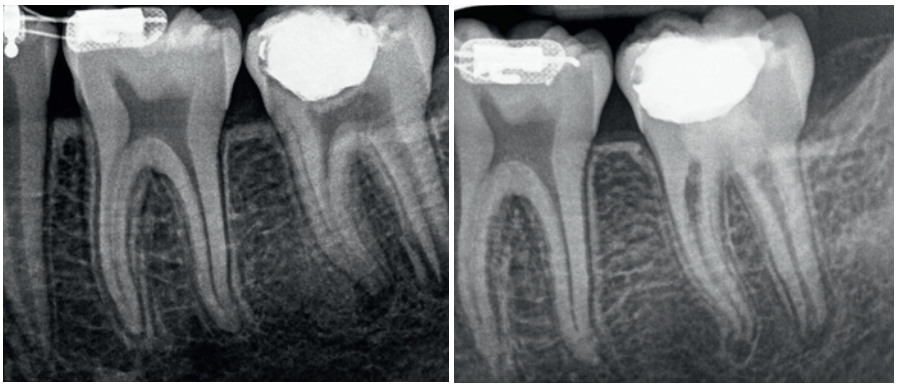

Fig. 10 - Preoperative and 7-month review radiograph showing continued root formation.

Discussion

The tooth presented had PEIR affected with secondary caries. Vital pulp therapy was particularly advantageous to maintain root development. It was also a faster and less technique sensitive procedure to carry out on a young child.

Case selection and clinical technique are important factors for success. Treatment was carried out under rubber dam with strict isolation. A partial pulpotomy was attempted but the pulp was too inflamed and a full pulpotomy was required. It is important to ensure pulpal haemostasis is achievable within 5 minutes prior to placing the pulp capping material.

Biodentine™ (Septodont) has been used for vital pulp therapy for over 12 years with impressive success rates. It is biocompatible, has antibacterial properties and provides a marginal seal via mineral deposition within and around open dentinal tubules. It is also bioactive, and favorably interacts with pulp cells to give an anti-inflammatory response and encourage dentine bridge formation. It has several advantages over mineral trioxide aggregate (MTA). These include a faster initial set and it does not cause tooth discoloration. Biodentine™ also has physio-mechanical properties (compressive strength, flexural strength and hardness) which are comparable to dentine. It can therefore be used in a Bio-Bulk Fill procedure as a pulp dressing and base material simultaneously. Biodentine™ XP is mixed in a capsule to give a predictable mix. It is administered via a gun with a flexible nozzle so the material is dispensed directly into the cavity giving it a far superior handling.

Biodentine™ XP was used in a Bio-Bulk Fill procedure in this case. Using Biodentine™ in this manner requires fewer materials, clinical stages and time. The tooth was restored to function using a composite restoration in a single visit which reduces patient morbidity and clinician time. This is particularly important in children where cooperation is sometimes challenging.

PEIR is an uncommon diagnosis and not widely known. It is important to educate general dentists, endodontic and orthodontic specialists as well as paediatric dental specialists on diagnosis and treatment planning aspects of these lesions.

Conclusion

This case shows Biodentine™ XP can be successfully used for full pulpotomies on immature teeth where the pulp has been exposed and sealed for a few weeks prior to treatment. The procedure was completed in a single visit using Biodentine™ XP using a Bio-Bulk fill procedure with a coronal composite.

Acknowledgements

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Septodont
58 rue du Pont de Créteil - 94100 Saint-Maur-des-Fossés - France
www.septodont.com

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