Direct pulp capping as a conservative procedure to maintain pulp vitality

By Dr. Jenner Argueta, Guatemala

From a completely optimistic point of view, the ultimate goal for every dentist performing a restorative and/or endodontic procedure should be to maintain the pulp vitality and functionality of the tooth without any discomfort for the patient. The pulp tissue is needed to provide nutrition, innervation and immunocompetence, with these acting as a defence mechanism and alerting to the presence of any external aggression.()

The pulp tissue may be exposed to the oral environment as a result of dental caries or by mechanical means when performing restorative or prosthodontic procedures. Two possible treatment options in these types of cases are root canal therapy and tooth extraction; the former procedure is a good choice, whereas the latter should be avoided at all costs in order to maintain the patient's oral health and natural function.()

A third alternative in the case of pulp exposure is to use conservative vital pulp therapy procedures, which include direct pulp capping, indirect pulp capping where the pulp is not fully exposed, and partial or total pulpotomies; this way, it is possible to maintain the vitality of the tooth, the nociceptive function and the body's self-defence system. Thanks to the points mentioned previously, among others, it has been shown that teeth with no root canal therapy survive longer than those that have been treated endodontically.()

Next, we present two clinical cases in which the pulp tissue was exposed mechanically when carious tissue was removed. In both cases, it was managed to maintain the pulp vitality of the affected teeth by means of direct pulp capping. The vital pulp capping protocol suggested in this article is presented in the first case. The second case describes a treatment performed with long-term follow-up, where full formation of calcified tissue below the capping material could be observed by means of radiography. The treatment protocol was similar in both cases.

Clinical Case 1

The 24-year-old patient attended the dental clinic with transient provoked pain in tooth #19 (Fig. 1). The diagnosis was reversible pulpitis. The carious tissue was removed under complete isolation, producing two incidences of pulp exposure, with minimal bleeding (Fig. 2). Bleeding was stopped by applying pressure for 10 seconds using a cotton swab dampened with a sterile saline solution. The cavity was disinfected with 2.5% sodium hypochlorite (Fig. 3), and then white mineral trioxide aggregate (MTA, Produits Dentaires) was placed as a direct pulp capping material (Fig. 4). To ensure that the MTA was placed accurately, the MAP System micro-applicator for dental materials (Produits Dentaires) was used. The patient was instructed to return in 5 days for evaluation. On the second visit, the restoration was asymptomatic with no radiographic evidence of radiopaque healing. The patient was asymptomatic for the next 6 months before returning with pain. Further evaluation confirmed the need for root canal therapy.

Clinical Case 2

The 34-year-old patient attended the dental clinic with transient provoked pain in tooth #9 (Fig. 5). The diagnosis was reversible pulpitis. The carious tissue was removed under complete isolation, producing two incidences of pulp exposure, with minimal bleeding (Fig. 6). Bleeding was stopped by applying pressure for 10 seconds using a cotton swab dampened with a sterile saline solution. The cavity was disinfected with 2.5% sodium hypochlorite (Fig. 7), and then white mineral trioxide aggregate (MTA, Produits Dentaires) was placed as a direct pulp capping material (Fig. 8). To ensure that the MTA was placed accurately, the MAP System micro-applicator for dental materials (Produits Dentaires) was used. The patient was instructed to return in 5 days for evaluation. On the second visit, the restoration was asymptomatic with no radiographic evidence of radiopaque healing. The patient was asymptomatic for the next 6 months before returning with pain. Further evaluation confirmed the need for root canal therapy.
was used. This system allows the clinician to place the material exactly on the exposure site, and this avoids staining the dentinal walls, which could over time show pigmentation due to the material used (Figs. 5 & 6).

Once the MTA was placed on the sites of pulp exposure and the deep parts of the pulp chamber roof, a light-curing calcium hydroxide paste was applied.

This was used to protect the material (Fig. 7) and to be able to proceed to the bonding procedure, to put the final restoration of the tooth in place during the same session (Figs. 8 & 9).

Seven days after the procedure, the patient was completely asymptomatic and the tooth responded normally to sensitivity tests. In clinical situations like this, it is expected that there will be radiographic evidence of mineralised tissue formation below the cap between six and nine months after the procedure.

Clinical Case 2
The 35-year-old patient attended the dental clinic with transient provoked pain in tooth #4. The diagnosis was reversible pulpitis. The same vital pulp therapy protocol described in the first case (Figs. 10–12) was followed, except that in this case, the permanent restoration was not put in place during the same session. In its place, a temporary non-radiopaque restorative material was placed.

This made it possible to ascertain the suitable thickness of the pulp capping material and its precise positioning at perforation level, while keeping the dental margin clear for a good bonding protocol (Figs. 13–15).

It has been reported that the success rate of vital pulp therapy procedures may drop when the final restoration is put in place two days after the initial procedure. The MAP System is very useful for precise and stable placement of the capping material in direct procedures, indirect procedures, and partial and total pul-
Endodontics is the specialty of dentistry which prevents or treats pathologies of pulpal and periapical origin. The ultimate goal is to cure the endodontic disease and allow the affected tooth to be reestablished as an aesthetic and functional function. Before the use of a complementary restorative treatment.

Obturation of the root canal system is an important step in endodontic treatment and its function is to fill and seal the canals to prevent their recontamination. With the evolution of intracanal microbiological knowledge, and the impact of new canal modeling instruments with continuous or alternating rotation, we know that it is not possible to completely eliminate the microorganisms inside the endodontic microanatomy. However, we also know that this is not necessary for success, and that the significant reduction in the levels of intracanal infection, in most cases is sufficient to achieve success (Siqueira). Thus, at the time of obturation, it is necessary to create an intracanal environment which is unfavourable to the population growth of the remaining bacteria. Therefore, another function of obturation is to prevent or hinder the growth of residual bacteria not eliminated during the cleaning and disinfection process. To achieve the desired objectives, obturation cements must have essential properties in order to be used clinically. These are: capacity to fill, seal, and maintain dimensional stability; not being soluble in the organic tissue fluids; having a film thickness or no more than 10 micrometers; being radiopaque; having good flow and non-resinous or no more than 50 micrometers; tissue fluids; having a film thickness of at least 1 mm; and being suitable for use as an obturating cement. Thus, Bio-C is a new class of biocompatible, bioceramic obturating endodontic cement. It is suitable for use in the obturation of all endodontic canals, including those with accessory canals. Bio-C is effective in the obturation of narrow and wide access canals. It is easy to manipulate and set quickly. It has a high radiopacity and is not absorbent. Its biocompatibility makes it suitable for use in the obturation of all endodontic canals, including those with accessory canals.
After the modeling of the canals, the system of canals was dried and filled with EDTA T 17% and an ultrasonic ultrasound tip (Helix) was used to passively activate the substance for 3 cycles of 15 seconds with renewal of the substance for each cycle. After the ultrasonic passive activation, the canals were again irrigated with 5ml of Sodium Hypochlorite at 2.5%. The main gutta percha cones were tested and adjusted. After this, the system of canals was dried with aspiration micro-suction and was connected to a vacuum suction.

The Fillapex MTA cement (Angelus) was prepared and introduced into the canals using the main gutta percha cones. The excess from the cones was cut using a heat transfer system (Touch’n Heat Sybron Endo) and cold-compressed vertically. The pulp chamber was sealed with photopolymerizable composite resin and the patient was sent to her dentist for definitive restoration of the dental element to be performed. After 17 months, the patient came in for a control consultation, and on the X-ray, it was possible to observe endodontic success characterized by the absence of signs and symptoms, the tooth functioning physiologically, normality of the periapex, and reabsorption of the surplus Fillapex MTA.

**References**

Top performance Flexible NiTi file HyFlex EDM performs well internationally

Full control in the dental practice

As an established Endo provider, COLTENE has been working closely with leading dentists, universities and endo experts for many years. The multitude of sophisticated treatment aids, ranging from specially hardened instruments to bioactive obturation materials, reflects the self-image of the Swiss innovation leader. True to the company’s motto “Upgrade Dentistry”, the COLTENE service team regularly asks practice owners and endodontists about their wishes for even more confident work in virtually all situations. This also formed the basis for the development of the production process called “Electrical Discharge Machining” (EDM for short) by the dental manufacturer’s renowned R&D department, which ultimately gave the exceptionally break-resistant files their name. The practice-oriented Endo offer is complemented by a large number of application-related workshops, training materials and personal services.

Further product information: https://hyflex.coltene.com/

By Coltene

In the course of two major international events in the dental industry, Swiss dental specialist COLTENE interviewed over 150 dentists and Endo experts about their experiences with its latest NiTi file system. The results of the product tests are more than impressive: 98% of the participants would continue to use the HyFlex EDM for the treatment of their endodontic cases, even after the tough test.

The necessary cutting edge

Every two years, both the International Dental Show in Cologne (IDS for short) and the Congress of the European Society for Endodontics (ESE Congress) serve as an international platform for professionals with an interest in endodontics to exchange experiences between colleagues. Thus, both events in 2017 provided the ideal occasion for a large-scale test campaign for the latest NiTi file generation from COLTENE. Selected dentists and joint practices throughout Europe were given the opportunity to put the flexible HyFlex EDM’s file system through its paces.

76% of the participants particularly praised the high flexibility that leads to good adaptation in the canal. The pre-bendable files work reliably in all the lengths and sizes currently available on the market without displacing the centre of the canal. Like the proven HyFlex™ CM files, the HyFlex™ EDM files also possess the so-called “Controlled Memory” effect and are distinguished by their high level of flexibility. In contrast to traditional NiTi files, a special combination of material surface and tapering allows a significant reduction in the number of files used without compromising the preservation of the natural root canal anatomy. These smart features were also evaluated positively in the test and the dentists use the robust, high-performance instruments primarily for cases where they want to produce reliable results quickly, even with a reduced number of files.

Additional files sizes allowing more flexible application

Due to limited access endo experts often want more flexibility from their instruments. Pre-bendable tools can extend the horizon into new dimensions. Particularly in a limited working space, modular nickel-titanium systems display their full strength. With a total of seven highly flexible file variants, COLTENE offers a wide-ranging HyFlex NiTi program. In addition to the usual lengths of 25 mm, all preparations of the popular EDM series are also available in 21 mm working length. The application of the more agile, shorter models is particularly recommended in the posterior molars and in patients with common mandibular problems.

The new HyFlex EDM 20/05 pre-bent file augments the existing HyFlex EDM line. The additional file enables fans of the flexible NiTi range to treat curved channels only with the efficient EDM files. After creating a glide path with the Glidepath file 20/05, the new file with the same taper allows minimally invasive, fast preparation of the canal. Subsequently the actual shaping can be done in the usual manner with the universal file HyFlex EDM One-File, size 25. Depending on the canal anatomy, apical preparation can be finished with EDM files up to ISO size 6x. Even in those large-size the files work safely and without transportation of the canal centre.
The pathway to perfect endodontics

Julian Webber introduces the latest glide path file from Dentsply Sirona that completes the WaveOne Gold reciprocating system.

"The endodontic glide path is a smooth, radicular tunnel from canal orifice to physiologic terminus. Its minimal size should be a 'super loose No. 10' endodontic file." John West DDS, endodontist, Tacoma, Washington, USA and key opinion leader for Dentsply Sirona.

The glide path is the starting point for all endodontic shaping procedures. It fulfils a biological requirement indicating that we can get from the orifice of the canal to the terminus, giving us a road map for all other shaping instruments to follow. Whilst some endodontists do not believe a glide path is necessary prior to starting the shaping procedure with mechanical endodontic shaping instruments the literature is unequivocal that without a glide path ledges, blockages, perforations and instrument fracture can easily occur. In my opinion, if there is no glide path, we should not be attempting to use any nickel titanium rotary or nickel titanium reciprocating shaping files.

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WaveOne® Gold offers you the simplicity of a one-file shaping system combined with higher flexibility* to respect the canal anatomy. Now available with a corresponding glide path file to optimize your shaping preparation. Experience the feeling of confidence throughout your treatment.

The WaveOne® Gold Glider reciprocating glide path file uses the same post manufacturing heat treatment process as WaveOne® Gold. This technique gives the instrument the same distinctive gold appearance, but more importantly, it significantly improves its strength and flexibility when compared to NiTi that has not had this heat treatment. Specifically designed as a single use instrument the ring on the shaft, just as with WaveOne® Gold files, will expand if the file is put through a steriliser, rendering it unusable.

Using the same parallelogram-shaped cross section as WaveOne® Gold, the reciprocating motion means the backward movement of the file is greater than the forward movement, reducing the torsional effect on the instrument and greatly increasing its resistance to cyclic fatigue. It comes with a size 15 tip in a choice of three lengths (21, 25 and 31mm) with an active length of 16mm. The 11mm shaft length helps to improve access to the more difficult-to-reach areas of the mouth. Due to its flexibility and lack of shape memory the file can be slightly pre-bent, helping to improve the placement of the tip in the back of the mouth or for patients with limited opening.

The process of obtaining a glide path with a No. 10 hand file, expanding the glide path with WaveOne® Gold Glider, then shaping the canal, in the majority of cases, with a single WaveOne® Gold Primary file, provides dentists and endodontists with a simple technique that can be accomplished with confidence. WaveOne® Gold Glider completes the WaveOne® Gold reciprocating system, making the preparation and shaping of canals even easier whilst taking safety to a new level.

About the Author
Julian Webber was the first UK dentist to receive a Masters Degree in Endodontics from a university in the USA. He received his BDS from Birmingham University in 1974 and his MSc and Certificate in Endodontics from Northwestern University Dental School, Chicago, USA in 1978. He has been a practicing endodontist in Central London since 1978 and opened the Harley Street Centre for Endodontics in October 2002. Julian has travelled abroad on many occasions to lecture to major world dental congresses and endodontic societies. Through his various workshops and hands-on courses, he has helped to train many general dentists in the skills of modern endodontic technique.

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WaveOne® Gold consisted of three rotary expansion files. This evolved into ProGlider, a single glide path expansion file used in a rotary motion made from pre-manufacture heat treatment technique known as M-Wire, which increased flexibility and provided greater resistance to cyclic fatigue.

With the launch of the new generation WaveOne Gold reciprocating files in 2015, it became obvious there was now a need for a reciprocating glide path expansion file to complete the WaveOne Gold system. Four of the original key opinion leaders involved in the development of WaveOne Gold, my colleagues, Dr. Clifford Ruddle (USA), Dr. Sergio Kuttler (USA), Dr. Wilhelm Pertot (France) and myself have now gone on to develop and launch WaveOne Gold Glider from Dentsply Sirona. We were assisted in this project by Dr John West (USA) and Drs. Berutti, Cantatore and Castellucci (Italy).

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