



Simple · Speedy · Safe
MARUCHI
PRODUCTS

MARUCHI
Regenerative Endodontic Materials

We would like to provide assistance to your efforts to restore teeth to their natural state.

MARUCHI Regenerative Endodontic Materials

We would like to provide assistance to your efforts to restore teeth to their natural state.

Maruchi Inc. has introduced various innovative and creative products based on the science of pozzolan reaction patented technology. We have developed and advanced new modes of endodontic therapy, with proven safety and effectiveness through collaborations with distinguished domestic university endodontic departments. We continue innovating and disseminating knowledge through publications in renowned international journals.

03

Gray MTA

ENDOCEM MTA

Mineral Trioxide Aggregate



MTA Root Canal Filler

ENDOSEAL

Mineral Trioxide Aggregate

25



White MTA

ENDOCEM Zr

Mineral Trioxide Aggregate

19



02

CAUTION : U.S. Federal Law restricts this material to the sale by, or on the order of a dentist.



Non-sterile



Do not re-use



Temperature limitation



See instructions for use



2195

ENDOCEM MTA

Mineral Trioxide Aggregate
Regenerative Endodontic Material

300mg/1 package
Mixing ratio(P/L) = 300mg/0.12cc



ENDOCEM MTA is a revolutionary next generation MTA product based on the science of pozzolan reactions; featuring quick setting times, easy handling with consistent outcomes; excellent sealing capabilities; and outstanding biocompatibility. ENDOCEM MTA exhibits high efficacy not only in apical retro-filling and root perforations, but also in vital pulp therapies such as direct pulp capping.

Fast setting time · Adequate consistency / Mechanical property 04

ENDOCEM MTA is a great product of choice when bleeding is difficult to control as it is non-miscible. It maintains stability even in less than ideal clinical situations with saliva or blood contamination or presence of active inflammation or infection. Resin bonding is possible immediately after setting with ENDOCEM MTA's quick working time. ENDOCEM MTA works well with all types of bonding agents.

Super sealing property 06

ENDOCEM MTA exhibits solid clinical outcomes even in the presence of severe inflammation where Pozzolan reactions minimize dead space.

Least discoloration 07

ENDOCEM MTA allows teeth to maintain natural esthetics as it does not cause discoloration.

Antibacterial effect 08

ENDOCEM MTA has antimicrobial effects, not only on *S. Mutans* but also on *E. Faecalis*.

Excellent biocompatibility 09

Our patented manufacturing techniques guarantee ENDOCEM MTA's excellent biocompatibility.

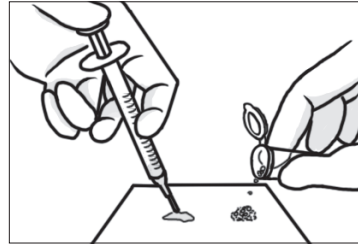
Fast setting time
Adequate consistency
Mechanical property

ENDOCEM MTA is non-miscible with liquid components, including blood, and thus is ideal for use in clinical situations where bleeding is difficult to control.

It has a fast setting time that allows for resin bonding to occur immediately after setting.

ENDOCEM MTA maintains its integrity in less than ideal clinical situations, including contamination with blood or saliva and presence of inflammation or infection.

It is compatible with any type of bonding agents.



Mixing with ENDOCEM MTA 300 mg and Physiological saline (D.I.water) 0.12 cc

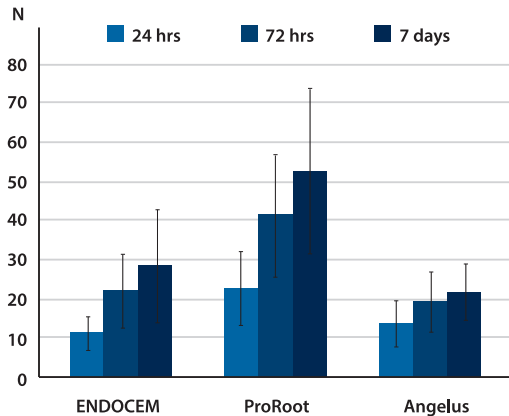
Initial and final setting time

Material	Initial setting time	Final setting time
ENDOCEM MTA	2 min (± 30 s)	4 min (± 30 s)
ProRoot MTA	78 min (± 5 min)	261 min (± 21 min)
IRM	6 min (± 30 s)	10 min (± 30 s)

(n=10, gilmore technique, 30 s interval)

When used while pulpal bleeding occurs, a thin layer is applied first, and bleeding is controlled with cotton pellet. The remaining ENDOCEM MTA may then be applied.

Setting may be confirmed by spraying water vigorously with an air/water syringe. Incomplete setting is identified when water spray washes away part of the material placed. If this is found to be the case the restoration should be removed in its entirety with the process started anew.

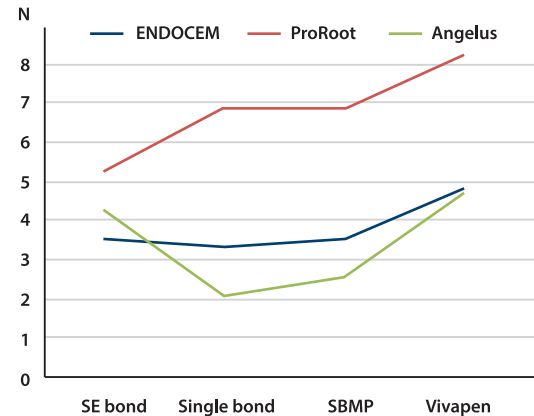


Dentin bonding strength (push-out bond strength) by MTA types

Anterior teeth were vertically sectioned along the long axis, and 2 mm thick dentin slices made. A perforation 1.5 mm in depth was drilled in the root canal, and filled with MTA (mixed in accordance with manufacturer's guidelines). Wet cotton was placed on top, and left for 1, 3, and 7 days. Push-out bond strength of MTA against dentin was measured with 1 mm/min crosshead speed. (n=10) Please see test results above.

ENDOCEM MTA is seen as reaching a lower level of strength than ProRoot MTA initially. However, the bond strength increases over time.

Unlike conventional MTAs that exhibit bonding strength changes dependent on external factors such as saliva, blood, or inflammation, ENDOCEM MTA exhibits a consistent level of bond strength regardless of external factors.



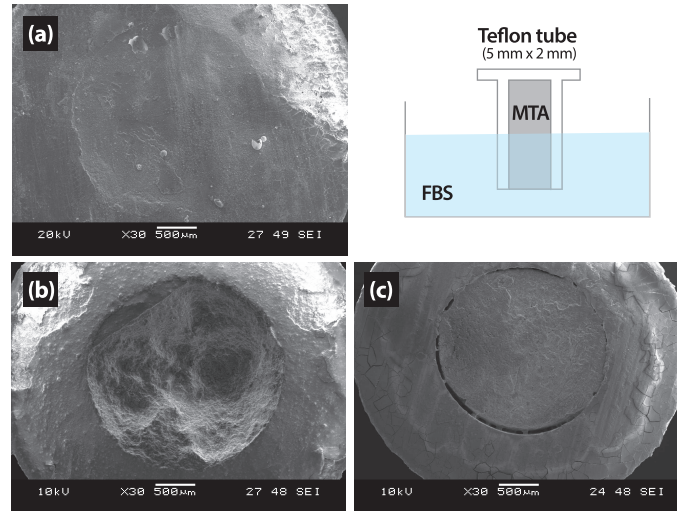
Shear bond strength between MTA and various resin bonding agents.

A perforation 4 mm in diameter and 2 mm deep was drilled in a cylindrical block, and filled with MTA (mixed in accordance with manufacturer's guidelines). It was left to harden for 1 week under conditions of 98°F at 100% humidity. At this point flowable resins representing 4th, 5th, 6th and 7th generations were bonded to the block and shear bond strength measured. (n=10) Please see test results above.

MTA exhibits consistent shear bond strength across all bonding agent types. This is further proof that ENDOCEM MTA is compatible with all bonding agents, and not adversely affected by specific characteristics of certain bonding agents.

Super sealing property

This is an example of stable clinical outcomes in presence of severe inflammation with minimization of dead space resulting from pozzolan reaction.



After MTA was mixed in accordance with manufacturer's guidelines, it was applied in a 5 mm X 2 mm Teflon tube, and then immediately immersed in FBS. After 24 hours it was taken out, washed, and observed under SEM.

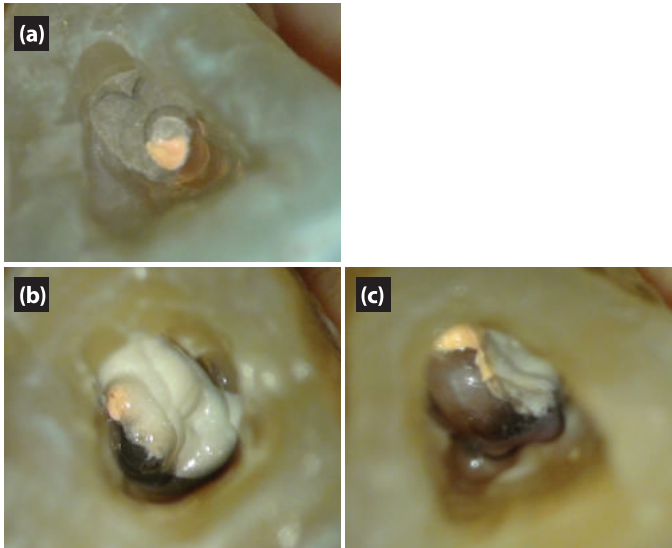
(a) ENDOCEM MTA, (b) ProRoot MTA, (c) IRM

When (b) ProRoot MTA is used for the same protocol the FBS infiltrated part was found to have been washed away during the setting process. When (c) IRM is used for the same protocol resistance to wash-out is comparable to that of (a) ENDOCEM MTA. However, many adjacent gaps are observed, and this is indicative of weaknesses where liquids, including water or blood, could possibly invade.

When exposed to liquids, i.e. saliva or GCF, the seal may be compromised over time due to degradation. Therefore, adding a resin base will be necessary before final restoration in direct pulp capping.

Least discoloration

ENDOCEM MTA allows teeth to maintain natural esthetics as it does not cause discoloration.



Picture view after tooth was filled with MTA and restored in artificial saliva.
(a) ENDOCEM MTA, (b) ProRoot MTA, (c) Angelus MTA

Unlike (b) ProRoot MTA or (c) Angelus MTA, (a) ENDOCEM MTA does not cause discoloration of adjacent tooth.

This is possible through the pozzolan reaction's blockage of dentinal tubules. However, it should be noted that if leakage occurs in the final restoration, ENDOCEM MTA itself could undergo corrosion and that process may lead to discoloration.

Antibacterial effect

ENDOCEM MTA has antimicrobial effects, not only on *S. Mutans* but also on *E. Faecalis*.

Inhibition zone size as bacteria and MTA types

(n=10)

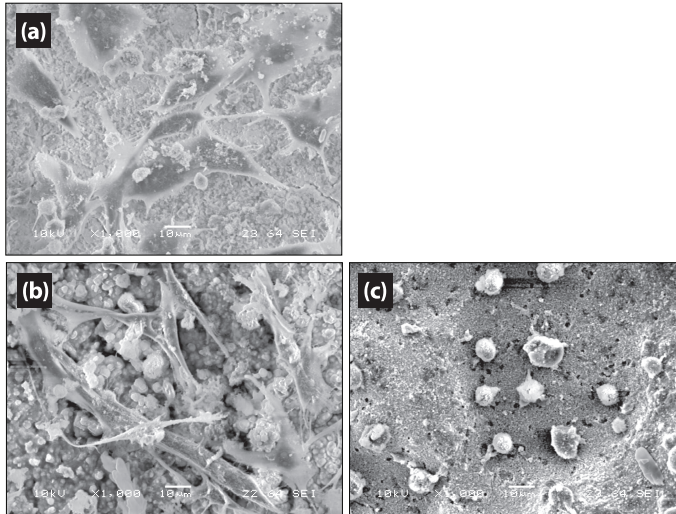
Bacteria	MTA	inhibition zone size (mm)		
		24 hrs	48 hrs	72 hrs
<i>S. Mutans</i>	ENDOCEM	10.45	9.60	10.40
	ProRoot	12.20	12.45	12.25
	Angelus	16.15	17.55	16.25
<i>E. Faecalis</i>	ENDOCEM	5.45	4.95	4.80
	ProRoot	-	-	-
	Angelus	-	-	-
<i>P.Gingivalis</i>	ENDOCEM	-	-	-
	ProRoot	-	-	-
	Angelus	-	-	-

Enterococcus Faecalis is a pathogenic bacterium found with highest frequency in roots of endodontic failures, and is resistant against most MTA.

ENDOCEM MTA possesses strong anti-bacterial properties against *E.Faecalis*.

Excellent biocompatibility

Our patented manufacturing techniques guarantee ENDOCEM MTA's excellent biocompatibility.

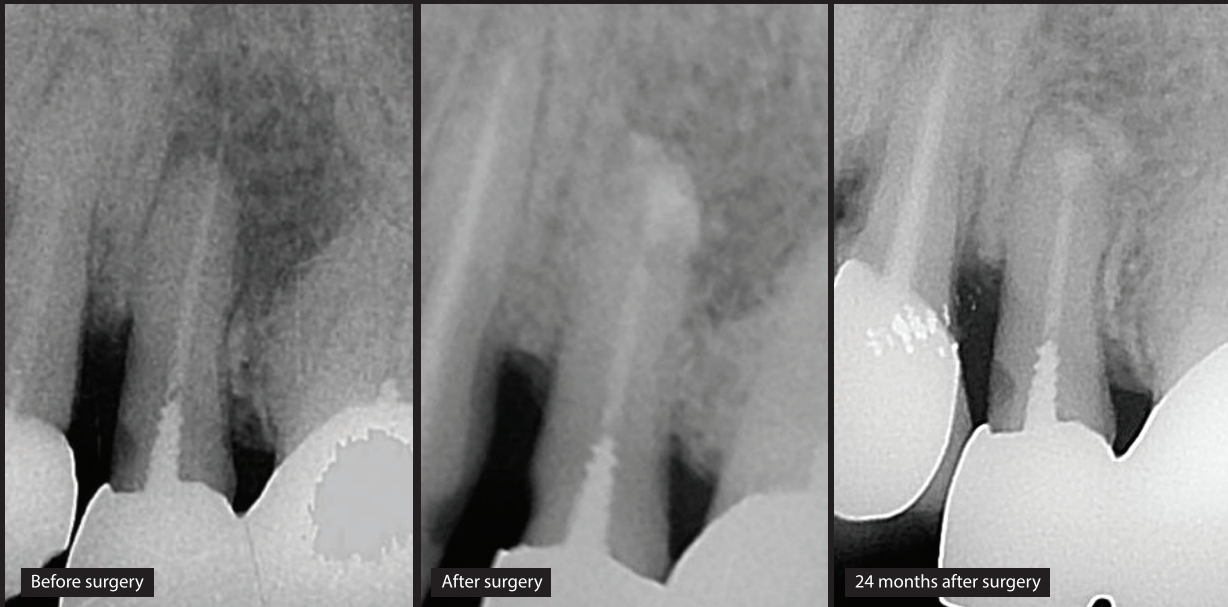


SEM observation (x1000) of MG63 cells incubated for 72 hrs on (a) ENDOCEM MTA, (b) ProRoot MTA, (c) IRM

In (a) ENDOCEM MTA and (b) ProRoot MTA, cells grow well and many cytoplasmic extensions are found, indications that these two materials have excellent biocompatibility.

However, cells on (c) IRM image are all round in shape, indicating cell death.

Apicoectomy #1



Surgical method was selected over prosthetic approach due to post positioning.
A distinct linear alba may be observed after surgery using ENDOCEM MTA.

Apicoectomy #2



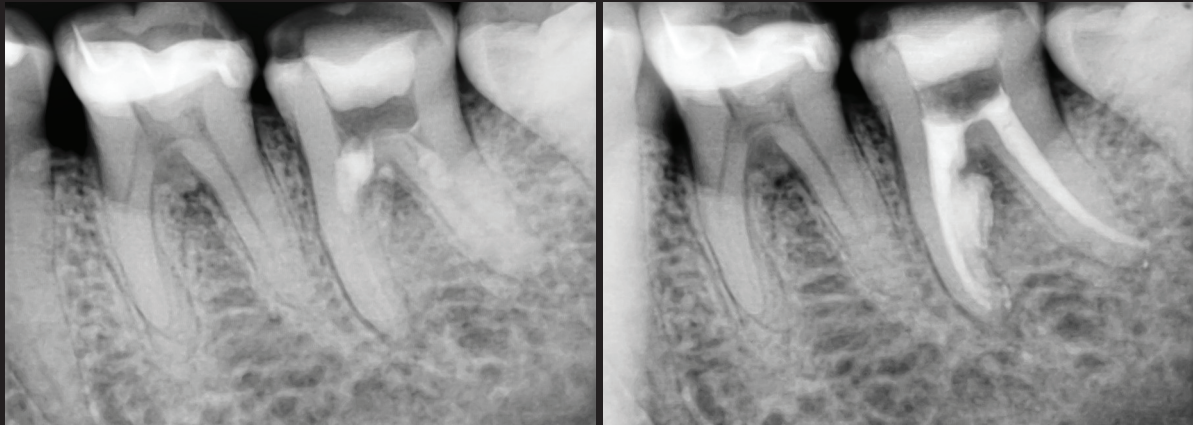
Due to the length of the post, surgical approach was best in this case. The restoration was poorly placed resulting in the tooth experiencing excessive occlusal interference. Nevertheless, the tooth is seen in the process of healing after surgery and placement of ENDOCER MTA.

Replantation



Extraction was necessary due to extensive root contamination and apical lesion.
Retro-filling was completed using ENDOCEM MTA and replantation was performed.
11 months post-operatively, good healing with development of new hard tissues found on radiograph.

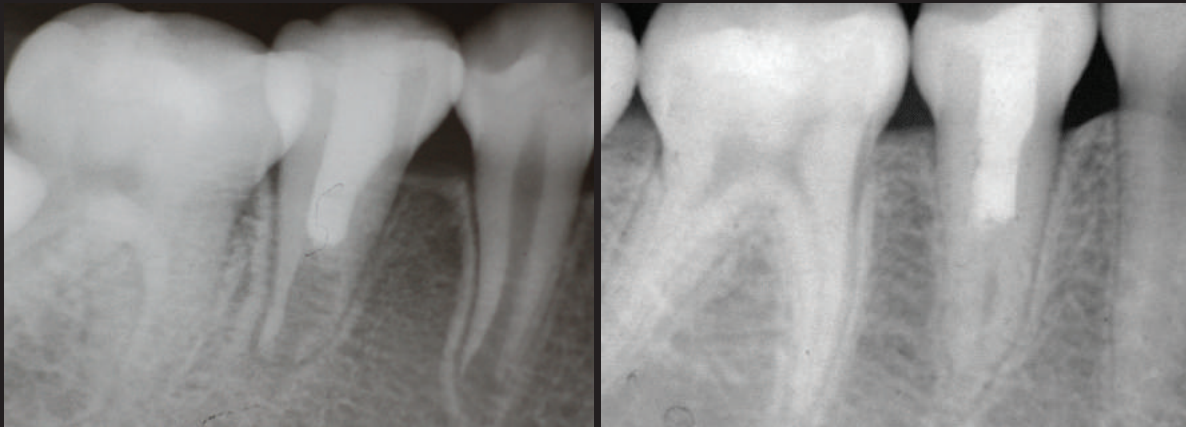
Perforation Repair



ENDOCEM MTA particles are smaller in size on average than conventional MTA products, and it also has a high viscosity. Therefore, it is easily applied using an appliance such as the CENTRIX gun. Another important feature is ENDOCEM MTA's non-miscibility that allows it to maintain integrity in less than ideal clinic conditions such as uncontrolled bleeding, without fear of wash-out. The unique characteristics of ENDOCEM MTA facilitate its use in areas that may be difficult to isolate and maintain a dry field.

Strip perforations may be successfully restored with ENDOCEM MTA. Please see above.

Apexogenesis



Case of pulpal inflammation due to Dens Evaginatus and fracture.

After canal irrigation was performed up to the necrotized area, the canal was filled with ENDOCEM MTA by retro-filling method.

After case completion the treated area looks almost indistinguishable from natural root.

Vital pulp therapy #1



Many studies have found that success rates of direct pulp capping is significantly affected by the cause of pulp exposure, scope of pulp exposure, and patient's age. However, ENDOCERM MTA boosts rates of successful outcomes to the point that it exceeds that of the conventional endodontic treatment regardless of aforementioned factors in direct pulp capping.

Vital pulp therapy #2



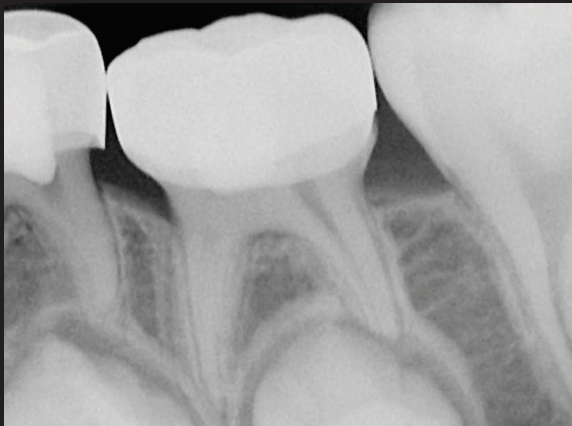
When pulp exposures occur in anterior teeth, Partial pulpotomy with MTA is likely the best treatment option. When doing so, ENDOCEM MTA, impervious to contamination by blood, is the safest product choice for successful clinical outcomes.

Vital pulp therapy #3



Direct pulp capping and resin core build up on maxillary 1st molar
ENDOCEM MTA makes immediate resin bonding and preparation possible after treatment due to its fast setting time.

Pulpotomy of deciduous tooth



ENDOCEM MTA may be used in primary teeth without total bleeding control, with placement of stainless steel crown immediately after treatment.

ENDOCEM is biocompatible; and thus, causes low level of irritation resulting in less calcification. However, clinical findings from pulpotomy treatments show that ENDOCEM MTA also induces calcification in root canals

CAUTION : U.S. Federal Law restricts this material to the sale by, or on the order of a dentist.



Non-sterile



Do not re-use



Temperature limitation



See instructions for use



2195

300mg/1package
Mixing ratio(P/L) = 300mg/0.14cc



ENDOCEM Zr

Mineral Trioxide Aggregate
Regenerative Endodontic Material

ENDOCEM Zr is a next generation MTA with minimal discoloration and calcification. Its physical properties include enhanced esthetics with a tooth color formula; excellent sealing property and biocompatibility; less discoloration; and decreased calcification, optimized for partial pulpotomy of anterior teeth.

Some issues may arise when using MTA for endodontic microsurgery and vital pulp therapy over time.

The first issue is that of compromised esthetics. There are numerous products that are alleged to be tooth colored formula MTAs which designed for use on anterior teeth. Many of these products do not meet expectations esthetically, as discoloration is seen on treated or adjacent teeth after clinical application.

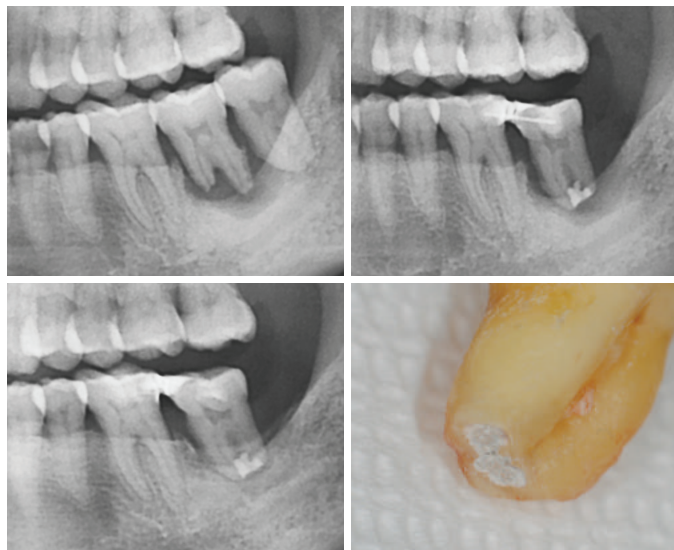
Another issue is that of calcification. When vital pulp therapy is performed on anterior teeth using MTA, partial pulpotomy is often performed to ensure adequate thicknesses of MTA and the final restoration. When doing so, calcification of the root canal or pulp chamber ensues, problematic for future treatment.

ENDOCEM Zr is the most esthetic MTA with minimal tooth discoloration. It is the safest MTA that exhibits low grade discalcification of pulp chambers and root canals even long after partial pulpotomy therapy. Great handling properties in partial pulpotomy therapy of anterior teeth such as fast setting time, flowability, and radiopacity allow for meticulous sealing of long, narrow canals of anterior teeth.

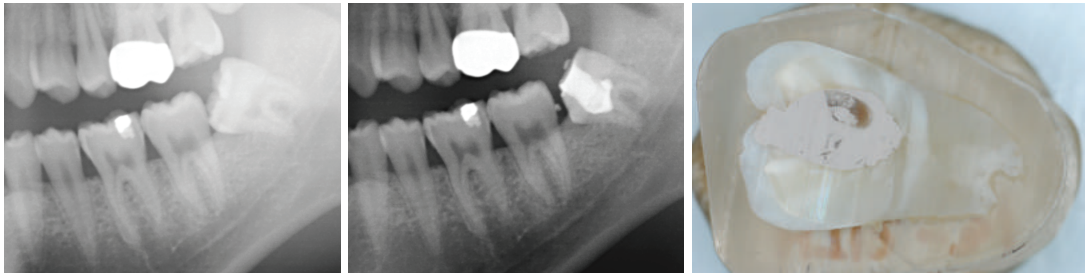
ENDOCEM Zr
Mineral Trioxide Aggregate

Least discoloration ***Least calcification***

With ENDOCEM Zr, tooth discoloration and calcification of pulp chamber and root canal have been minimized.



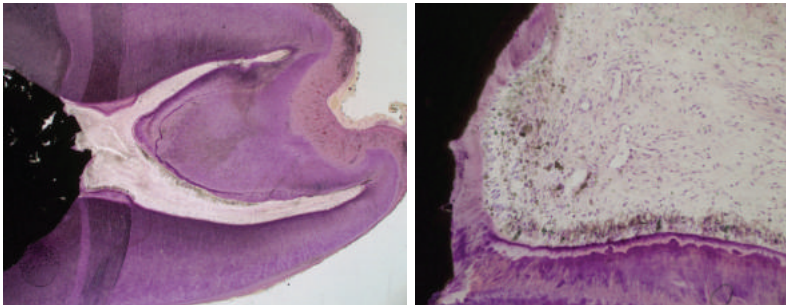
Apical view of tooth extracted 1 year after intentional transplantation (retro-filling with ENDOCEM Zr) was performed for regeneration of alveolar bony tissue. No tooth discoloration is found.



Crown of a wisdom tooth which engages IAC was removed and partial pulpotomy was performed using ENDOCEM Zr, extracted 8 months after treatment. No discoloration whatsoever is found at the sectioned surface of the extracted wisdom tooth.

However, it should be noted that if bacterial growth ensues, ENDOCEM Zr surface may become discolored because ENDOCEM Zr is multi-porous in structure and has no cytotoxicity. Also, long term exposure to saliva or tissue fluid could cause degradation of the surface, and thus cause the surface to darken.

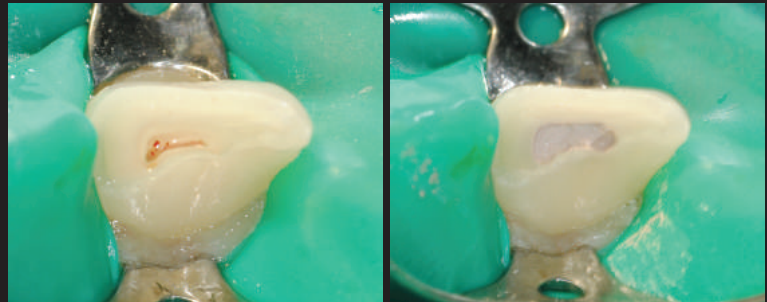
To avoid discoloration, treatment should be done with bleeding controlled, and the surface of ENDOCEM Zr should be covered for protection by composite resin after setting.



This SEM view shows thin layer of secondary dentin on the ENDOCEM Zr contact area, with healthy pulp tissue free from infiltration of inflammatory cells or calcification of pulp chamber or root canal.

1. Application of direct occlusal force should be avoided because ENDOCEM Zr exhibits less tensile strength than conventional MTA.
2. ENDOCEM Zr should be used as a liner, not as a base, in vital pulp therapy.
Composite resin with a sufficient thickness is absolutely necessary to avoid contamination with saliva, discoloration, and compromise of sealing.
3. Although lack of bleeding control does not affect treatment outcomes, it may cause discoloration.
Bleeding may be controlled by filling 5.25% NaOCl in the cavity.
ENDOCEM Zr should be applied immediately after bleeding is controlled and excess NaOCl is absorbed.
Blood clots formed through this process are key to successful tissue regeneration.
4. After ENDOCEM Zr application, sealing should be maximized according to clinician preference, such as condensing with the handle of a paper point.
5. In partial pulpotomy, if excessive force is used to place ENDOCEM Zr in the pulp chamber or root canal, severe discomfort including percussion reaction could occur, lasting approximately 1 month.
(If problems are found on post-operative radiographs the clinician may prescribe anti-inflammatory analgesic drug and notify patient.)
6. Unlike direct pulp capping, blood supply does play an important role in partial pulpotomy, and if it is judged that the blood supply is insufficient, the treatment should be completed by performing direct pulp capping.
7. Once unsealed, ENDOCEM Zr must be used and discarded, as it may become denatured and result in failure.

Partial pulpotomy of anterior teeth #1



Partial pulpotomy performed using ENDOCER Zr
and resin filling restoration on a fractured anterior tooth
Unlike conventional MTA cases,
there is no dark color observed underneath the restoration.



Partial pulpotomy of anterior tooth #2



Due to a pin-point pulp exposure after preparation, partial pulpotomy was performed to ensure thickness of ENDOCER Zr and resin filling. After partial pulpotomy and bleeding controlled with NaOCl, ENDOCER Zr was used to fill and condensed well with cotton ball to ensure proper sealing. (Excessive force should be avoided.) After confirmation of setting of ENDOCER Zr, resin filling was completed for protection after removing a slight amount of ENDOCER Zr in cavity opening.

CAUTION : U.S. Federal Law restricts this material to the sale by, or on the order of a dentist.



Non-sterile



Do not re-use



Temperature limitation



See instructions for use



2195

ENDOSEAL

Mineral Trioxide Aggregate
Regenerative Endodontic Material

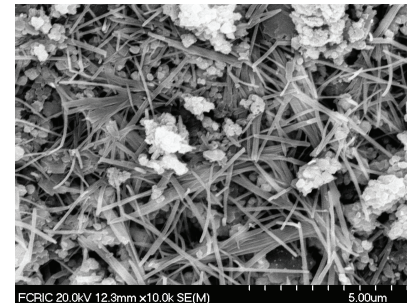
300mg/1package
Mixing ratio(P/L) = 300mg/0.14cc



ENDOSEAL is a new concept MTA for canal filling of which setting time and flowability were enhanced and optimized for routine directional canal filling, while retaining the beneficial properties of ENDOCEM MTA and ENDOCEM Zr. Due to its unique crystalized structure and physical property, it shows an outstanding effect not only in restoring root perforation but also in apex or canal filling of primary molars that exhibit severe inflammation.

Properties of ENDOSEAL

- Improved flowability leads to ease in filling canals or adjusting for varying lengths
- Excellent biocompatibility and sealing property
- Excellent antimicrobial effect
- Improved esthetics with tooth color formula
- Radiopacity
- Easy removal with Ni-Ti file when retreatment is necessary
- Enhanced flowability makes for better restoration of complicated perforations
- Boosts re-vascularization of immature roots
- Aids healing without hindering eruption of secondary dentition when pulp therapy is performed in primary teeth that are severely inflamed or compromised in any way



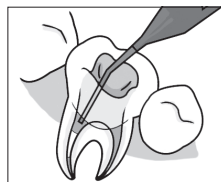
Crystalline structure of ENDOSEAL

ENDOSEAL
Mineral Trioxide Aggregate

Root canal filling with Ultrasonic compaction

ENDOSEAL is a pure MTA product with no resin added. It has the best sealing capability on apices, with excellent flowability and radiopacity, making it ideal for use in filling canals.

Ultrasonic compaction method dramatically reduces lateral and vertical forces applied to the root during filling.



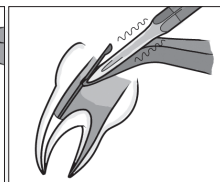
Coronal plug formation



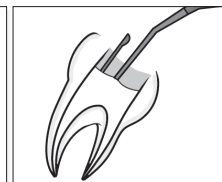
Renturo spiral (#35)



Insert the G.P. cone



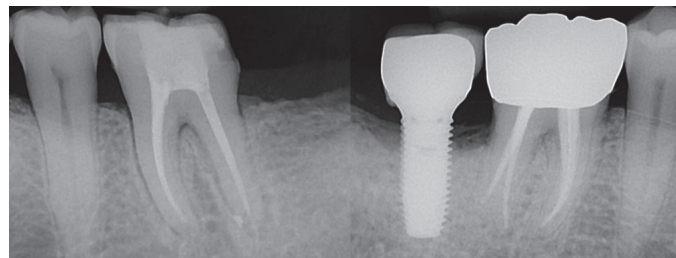
Ultrasonic vibration for
apical plug formation



Sealing of pulpal floor
and Cut the G.P. cone

After routine canal enlargement, ENDOSEAL and master cone are filled, and canal filling is completed with ultrasonic compaction.

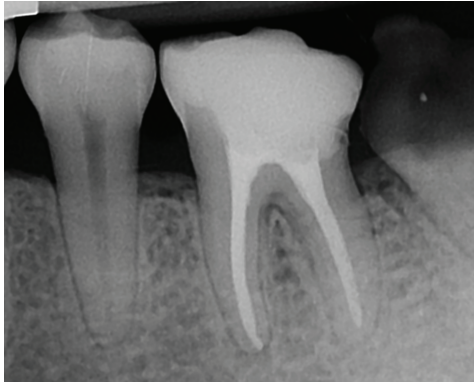
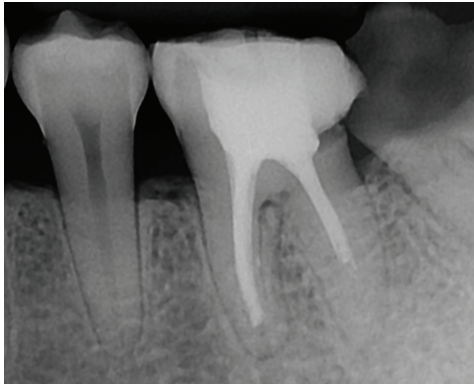
(Please note that only the master cone is used, not accessory cones.)



ENDOSEAL
Mineral Trioxide Aggregate

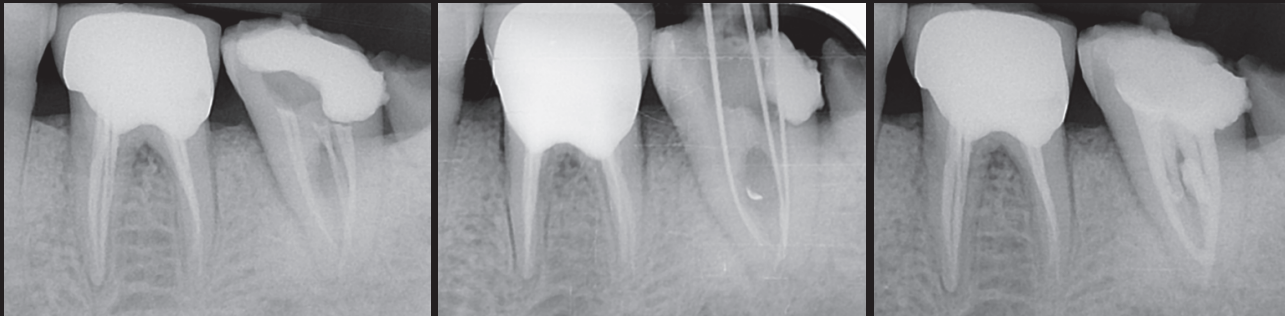
Easy removal for Retreatment

ENDOSEAL may be removed with Ni-Ti file easily
when retreatment is necessary.

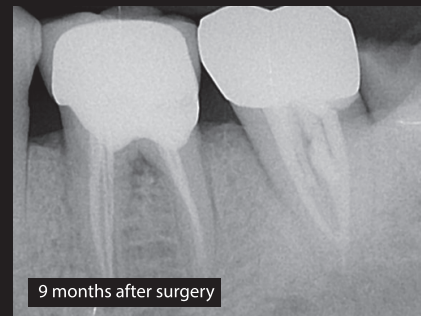


Retreat case at 1 year post-operative
ENDOSEAL is easily removed with Ni-Ti file.

Repair of deep strip-perforation



This patient came in with chronic clinical symptoms due to deep strip perforation of C-shaped canal in mandible. Adequate canal enlargement and irrigation were performed, and ENDOSEAL filling was completed. Clinical symptoms subsided from time of ENDOSEAL placement.

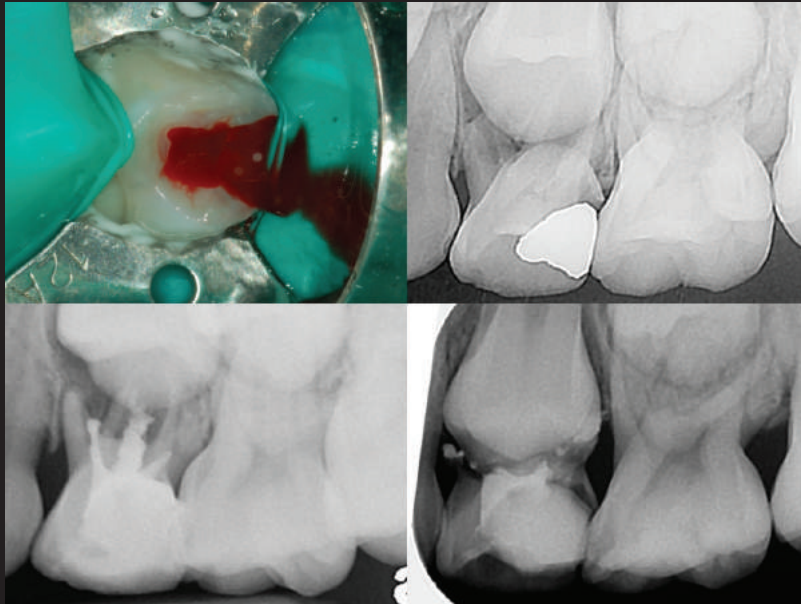


***Root canal filling of deciduous teeth
esp. root resorption with furcation involvement #1***



The patient came in with history of previous pulpotomy, severe swelling, and root resorption. After routine endodontic treatment, ENDOSEAL filling was placed, with normal eruption of permanent tooth and healing.

***Root canal filling of deciduous teeth
esp. root resorption with furcation involvement #2***



In this case, furcation involvement and resorption of root apex are seen at baseline. The patient presented with severe gingival swelling. After routine root canal enlargement, ENDOSEAL filling was placed. In 1 year post-operative view, the treated tooth is shown to have been well maintained until time of extraction.



Maruchi Inc. strives to develop that improve upon the status quo in simplicity, safety, and speed.

Simple · Speedy · Safe

Maruchi Inc. is committed to being the number one dental material manufacturing company
leading the world market with top-notch technology
by continuously developing and providing creative, innovative, and global new products.



MARUCHI Inc.

2-208, Medical Industry Complex Bldg., 42-10, Taejanggongdan-gil, Wonju-si, Gangwon-do, South Korea, 220-962
TEL. +82-33-734-0330 FAX. +82-33-746-2804

www.endocem.com