



FKG  
swiss endo

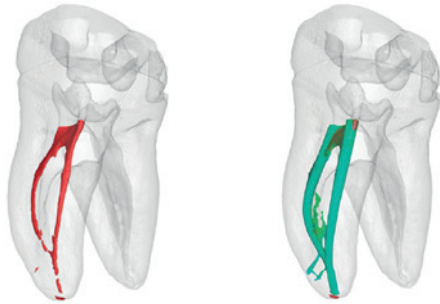


EN

**TotalFill®**  
Premixed Bioceramic Materials

## General 3D bioceramic concept

The aim of canal filling is to provide an impermeable seal, to prevent recolonisation of the canal system by bacteria, and to eliminate any free space that could potentially accommodate them. Preceded by appropriate canal shaping, cleaning and disinfection, bioceramics are designed to provide a 3D hermetic seal of the root canal, in order to ensure the long-term effectiveness of the treatment.



Bioceramics have been used for many years in various medical fields; but their introduction in endodontics is relatively recent.

TotalFill® range products are part of the bioceramics family, and are recognised for their biological properties such as biocompatibility, bioactivity and antibacterial activity, as well as for their excellent physico-chemical properties. They do not shrink during setting, but tend to expand slightly. They provide an excellent seal between the dentin and filling material, and are also hydrophilic.

TotalFill® products are also distinguished by their ease of use. They are ready to use, and so do not require any mixing. They provide a perfect consistency, reproducible between applications. The TotalFill® range includes a bioceramic canal sealing cement, as well as a material dedicated to root repair, available in 3 consistencies, which are presented in this brochure.

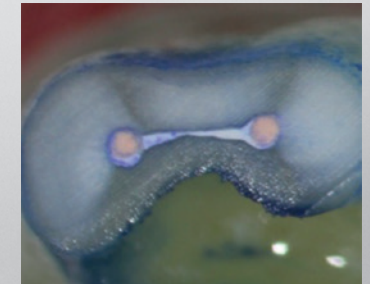
# 01

## Filling

The objective of canal filling is to maintain low microbial count obtained after the disinfection phase of endodontic treatment. It is used to seal the treated canal system, and limit development of residual bacteria to prevent any resumption of infection. **TotalFill® BC Sealer™**, dedicated to canal sealing, was developed in order to meet these objectives.



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Endodontics, All rights reserved

3D filling using TotalFill BC Sealer and TotalFill BC Points

## TotalFill® BC Sealer™



Unlike conventional filling cements, the setting reaction of TotalFill BC Sealer is triggered by the moisture present in the dentinal tubules. Using this moisture, TotalFill BC Sealer forms hydroxyapatite, to ensure optimum chemical adhesion between the dentin and the cement.

### Product advantages

- ▶ Ease of manipulation and deployment
- ▶ Economic
- ▶ 3D filling at room temperature

### Clinical advantages

- ▶ Bond between cement and dentin
- ▶ Bond between cement and TotalFill® BC Points™
- ▶ Increased fracture resistance
- ▶ Limited microorganism growth
- ▶ Conservative canal preparation

*"These products represent a major advance in bonded root filling restorations. A high pH during setting, biocompatibility when set and dimensional stability are important advantages over traditional root canal sealers."*

- Dr. Martin Trope, Clinical Professor, University of Pennsylvania

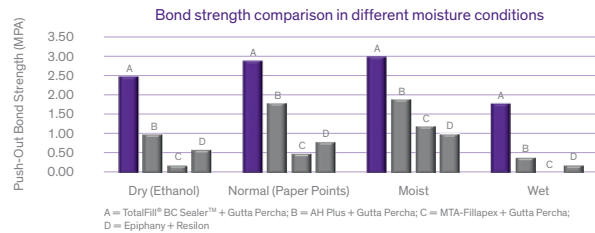
## TotalFill® BC Points™



Unlike traditional Gutta Percha points, TotalFill BC Points are coated and impregnated with bioceramic nanoparticles. Combined use of TotalFill BC Sealer and TotalFill BC Points obtains a bond and therefore adhesion between the bioceramic particles of the two materials, thereby eliminating any gap there may be between a cement and a standard Gutta Percha point.

## Superior quality sealing

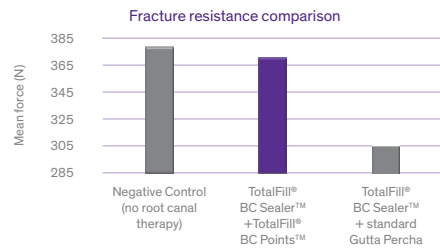
In order to ensure optimum 3D filling, the cement must provide perfect adhesion to the dentin and the cone used. Adhesion between these various components is influenced by the moisture present in the tooth. As the components of TotalFill BC Sealer enable the formation of calcium hydroxide and hydroxyapatite, they ensure an excellent bond to both the dentin and the filling material. The study below demonstrated that TotalFill BC Sealer has a stronger bond than other commonly used cements. This study compared the influence of the moisture conditions on the bond strength. TotalFill BC Sealer outperformed all the other cements regardless of the moisture level.



Source:  
Dentin moisture conditions affect the adhesion of root canal sealers.  
Nagas E, Uyanik MO, Eymirli A, Cehreli ZC, Vallittu PK, Lassila LV, Durmaz V; J Endod. 2012 Feb;38(2):240-4. doi: 10.1016/j.joen.2011.09.027.

## High fracture resistance

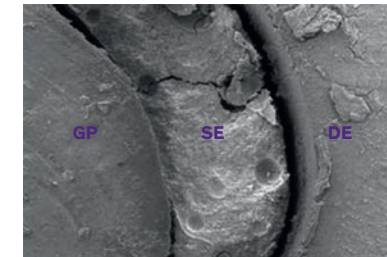
One of the key objectives of canal filling consists in reinforcing the root, and thereby significantly increasing the fracture resistance after treatment. Combined use of TotalFill BC Sealer and TotalFill BC Points meets this objective.



Source:  
Resistance to fracture of roots obturated with novel canal-filling systems.  
Ghoneim AG, Lutfy RA, Sabet NE, Fayyad DM; J Endod. 2011 Nov;37(11):1590-2.

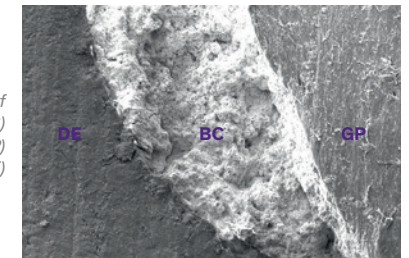
## SEM views

The canal filling must limit the development of residual bacteria, by depriving them of nutrients and limiting any free space that could potentially accommodate them. Hence the filling materials used must ensure a 3D filling, leaving no empty space that could compromise the filling impermeability (including between the cement and cone). The SEM views below make it possible to compare the adhesion of a conventional cement, on the one hand, and TotalFill BC Sealer on the other hand, on the surface of the dentin and of the Gutta Percha.



Spaces between a conventional sealing cement (SE), Gutta Percha (GP) and dentin (DE)

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Perfect adhesion of TotalFill BC Sealer (BC) to TotalFill BC Points (GP) and to the dentin (DE)

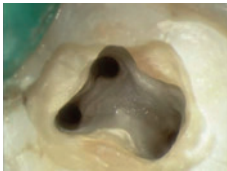
© Dr. Guillaume Jouanny (France), All rights reserved

*"In all my years of viewing high magnification SEMs, I have never seen a sealer form such a consistently intimate bond with dentin."*

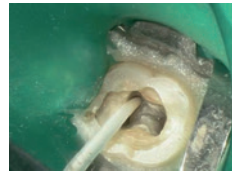
- Dr. Martin Trope, Clinical Professor, University of Pennsylvania

## Clinical cases, TotalFill BC Sealer and TotalFill BC Points

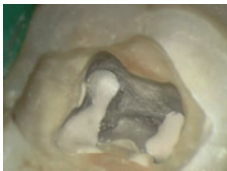
### Case 1



Cleaned canals



Cement injection



Filled canals



Cone insertion



Obturated canals



Post-op

© Dr. Ali Nasseh (USA), All rights reserved

### Case 2



Pre-op



Post-op



Follow-up (2 years)

© Dr. Bartosz Cerkaski (Poland), All rights reserved

## Availability

<b>TotalFill® BC Sealer™</b>		
	2 g syringe + 15 tips	08.650.00.007.XX
<b>TotalFill® BC Sealer HiFlow™</b>		
	1.5 g syringe + 15 tips	08.650.00.008.XX
<b>TotalFill® BC Tips™</b>		
	15 tips	08.650.00.002.XX
<b>TotalFill® BC Points™</b>		
	Cones and paper points 15-60/.02 (300 pcs)	08.650.02.S60.RB
	Cones and paper points 15-60/.04 (300 pcs)	08.650.04.S60.RB
	Cones and paper points 15-60/.06 (240 pcs)	08.650.06.S60.RB
	Cones 25-60/.02 (100 pcs)	8 references
	Cones 15-80/.04 (60 pcs)	12 references
	Cones 15-50/.06 (60 pcs)	8 references
<b>TotalFill® BC Points HiFlow™</b>		
	Cones 15-55/.04 (60 pcs)	8 references
<b>TotalFill® BC Pellets™</b>		
	Pellets (100 pcs)	08.650.00.005.XX

# 02

## Root repair

Root repair materials can be used in cases of orthograde or retrograde repairs. These materials must ideally present physico-chemical and biological properties such as biocompatibility, bioactivity and radio-opacity. They must remain dimensionally stable. Their ability to provide a perfectly impermeable seal, in order to counter bacteria and fluid leakages that might cause inflammation, is also of the utmost importance.

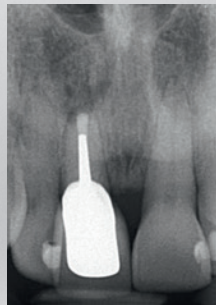
It has been demonstrated by a host of studies that TotalFill range repair materials meet all of these conditions. Furthermore, thanks to their ease of manipulation and short setting time, they remain easy to use and convenient.

TotalFill® BC RRM™ products are available in three consistencies, to suit your requirements: injectable paste (TotalFill® BC RRM™ Paste), putty (TotalFill® BC RRM™ Putty) or malleable putty (TotalFill® BC RRM™ Fast Set Putty).



Repairing a root perforation  
(Full case on page 13)

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Retrofilling  
(Full case on page 16)

© Prof. Dr. Von Arx (Switzerland),  
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## Perforation, resorption and pulp capping

### TotalFill® BC RRM™ Paste



TotalFill BC RRM Paste is dedicated both to treating perforations and resorptions, as well as pulp capping. The objective is to provide a perfectly impermeable seal and enable tissue regeneration. BC RRM Paste is present in the form of low-viscosity premixed injectable paste, and is packed in 1 g syringes.

### Product advantages

- ▶ Ease of manipulation and introduction
- ▶ Highly resistant to washout
- ▶ Radiopaque
- ▶ Short setting time (approx. 2 hours)

### Clinical advantages

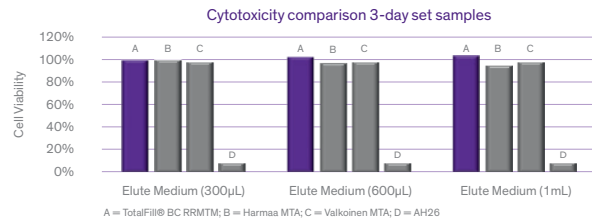
- ▶ Highly biocompatible
- ▶ Bioactive and osteogenic
- ▶ Hydrophilic
- ▶ Antibacterial (+12 pH)

*"We now have a root repair material with an easy and efficient delivery system. This is a key development and a serious upgrade. This allows many clinicians, not just specialists, to take advantage of its properties."*

- Dr. Ken Koch, Dr. Dennis Brave, Dr. Allen Ali Nasseh

### Excellent biocompatibility

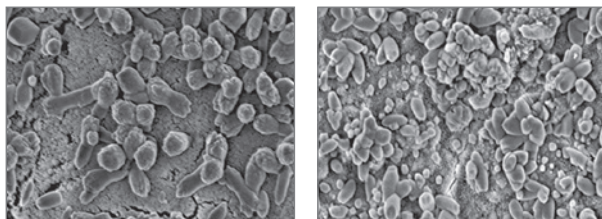
Biocompatibility is a vital factor in the success of an endodontic treatment. This means that the material must not be cytotoxic. The graph below presents the results of cytotoxicity tests conducted on TotalFill BC RRM, as well as on other common root repair materials.



Source:  
Cytotoxicity evaluation of endosequence root repair material.  
Alanezi AZ, Jiang J, Safavi KE, Spangberg LS, Zhu Q; Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2010 Mar;109(3):e122-5. doi: 10.1016/j.tripleo.2009.11.028.

### Bioactivity

A canal repair material must not only guarantee optimum sealing, but also enable biomineralisation leading to the formation of mineralised barriers protecting the canal from bacteria and toxins. The SEM images below show the crystalline surfaces of MTA and TotalFill BC RRM Paste. They visually confirm that TotalFill BC RRM Paste is bioactive and leads to effective biomineralisation.



MTA,  
Crystalline structure

TotalFill BC RRM Paste,  
Crystalline structure

Source:  
Biocompatibility of two novel root repair materials.  
Ma J, Shen Y, Stojicic S, Haapasalo M; J Endod. 2011 Jun;37(6):793-8. doi: 10.1016/j.joen.2011.02.029.

### Clinical cases, TotalFill BC RRM Paste

#### Case 1

Root perforation



Pre-op

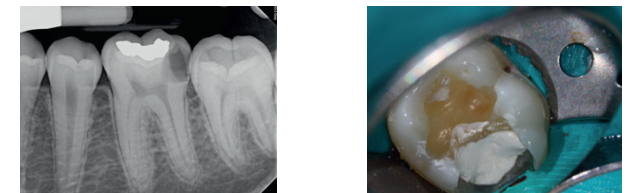
Post-op

Follow-up

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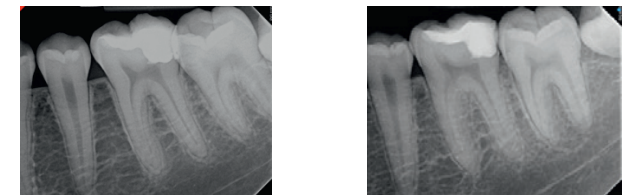
#### Case 2

Pulp capping



Pre-op

Placement of the paste



Post-op

Follow-up (2 years)

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# Apexification and retrofilling

## TotalFill® BC RRM™ Putty



TotalFill BC RRM Putty is dedicated to apexification and retrofilling. The main objective is to create a long-lasting apical barrier and tissue regeneration. TotalFill BC RRM Putty comes in the form of premixed condensible putty. Its consistency is slightly thicker and more malleable than TotalFill BC RRM Paste. This product is packed in 2.5 g jar.

### Product advantages

- ▶ Malleable, easy to manipulate and apply
- ▶ Highly resistant to washout
- ▶ Radiopaque
- ▶ Short setting time (approx. 2 hours)
- ▶ Usable for various clinical applications

### Clinical advantages

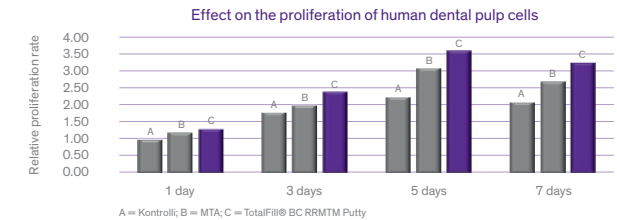
- ▶ Highly biocompatible
- ▶ Bioactive and osteogenic
- ▶ Hydrophilic
- ▶ Antibacterial (+12 pH)
- ▶ Insoluble

*"Advances [...] materials (including bioceramic retrofilling materials and clinical techniques for their efficient use) have enable endodontists to treat challenging cases with much greater efficiency."*

- Dr. Allen Ali Nasseh, Dr. Dennis Brave

## Excellent biocompatibility

Biocompatible materials promote tissue healing by stimulating the proliferation of healthy cells. The graph below demonstrates that TotalFill BC RRM Putty (used in this case for pulp capping) contributes significantly to this proliferation.

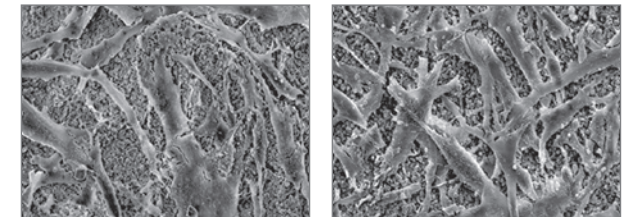


Source:

*Evaluation of a bioceramic as a pulp capping agent in vitro and in vivo.*  
Liu S, Wang S, Dong Y; *J Endod.* 2015 May;41(5):652-7. doi: 10.1016/j.joen.2014.12.009.

## Bioactive

Canal repair biomaterials stimulate apical healing. Cell adhesion plays a major role in the healing process. The images below show adhesion of gingival fibroblasts on MTA and TotalFill BC RRM Putty. After 7 days' incubation, the number of cells attached to each other has increased considerably, forming a matrix on the surface of the TotalFill BC RRM Putty.



MTA  
Adhesion of fibroblasts

TotalFill BC RRM  
Adhesion of fibroblasts

Source:

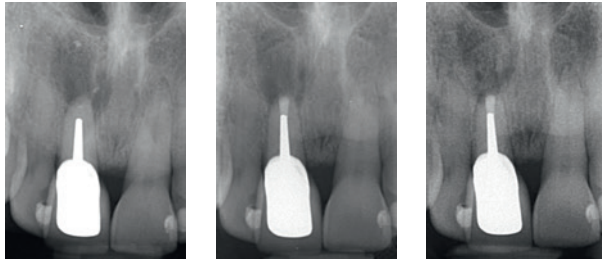
*Biocompatibility of two novel root repair materials.*  
Ma J, Shen Y, Stojicic S, Haapasalo M; *J Endod.* 2011 Jun;37(6):793-8. doi: 10.1016/j.joen.2011.02.029.



## Clinical cases, TotalFill BC RRM Putty

### Case 1

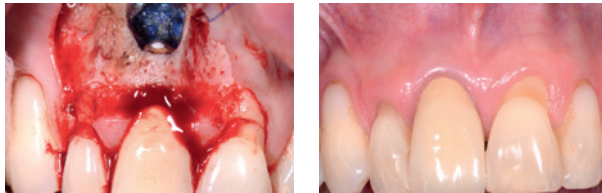
Retrofilling



Pre-op

Post-op

Follow-up (1 year)



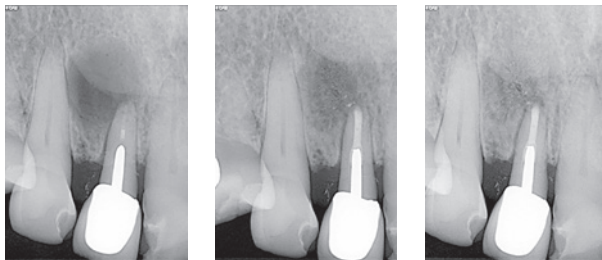
Post-op

Follow-up (1 year)

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### Case 2

Retrofilling



Pre-op

Follow-up (6 months)

Follow-up (1 year)

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## TotalFill® BC RRM™ Fast Set Putty



TotalFill BC RRM Fast Set Putty is a derivative of TotalFill BC RRM Putty. It has the same properties, but its chemical composition differs slightly, which enables it to harden in a record time: just 20 minutes. It is ready to use and packed in 0.3 g Sanidose™ syringes.

### Product advantages

- ▶ Ideal consistency, malleable and easy to manipulate
- ▶ Packed in Sanidose™ syringes
- ▶ Extremely resistant to washout
- ▶ Radiopaque
- ▶ Shorter setting time (20 min)
- ▶ Usable for various clinical applications

### Clinical advantages

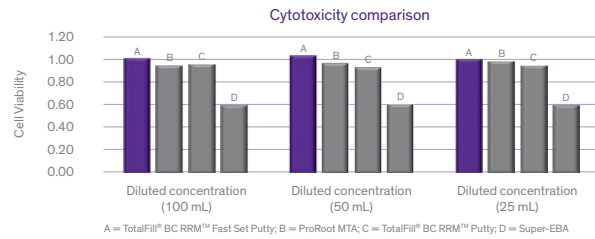
- ▶ Highly biocompatible
- ▶ Bioactive and osteogenic
- ▶ Antibacterial (+12 pH)
- ▶ Hydrophilic
- ▶ No significant discoloration

*“The accelerated hydration reaction of TotalFill BC RRM Fast Set Putty improves treatment efficiency and resistance to washout. Total-Fill BC RRM Fast Set Putty represents the next logical step in root repair and retro-fillings and exemplifies the benefits of pre-mixed bioceramics”*

- Dr. Allen Ali Nasseh, Clinical Instructor, Harvard School of Dental Medicine

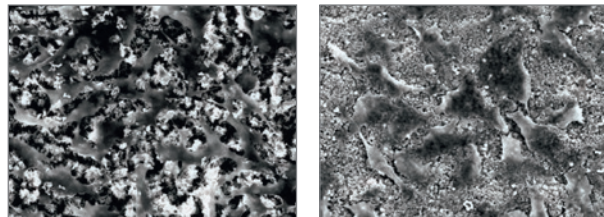
### Excellent biocompatibility and bioactivity

The cytocompatibility of the repair materials plays an important role in the success of a treatment. This must enable tissue repair and contribute to osteogenesis. The study from which the illustrations below originate demonstrated cytocompatibility between osteoblasts and TotalFill BC RRM Fast Set Putty. The graph below presents the results of cytotoxicity tests on various root repair materials. It demonstrates that TotalFill BC RRM Fast Set Putty is not cytotoxic, and contributes to cell proliferation.



Source:  
A comparative study on root canal repair materials: a cytocompatibility assessment in L929 and MG63 cells.; Jiang Y, Zheng Q, Zhou X, Gao Y, Huang D; ScientificWorldJournal. 2014 Jan 12;2014:463826. doi: 10.1155/2014/463826.

The following SEM images make it possible to compare the adhesion and proliferation of osteoblasts on the surfaces of two biomaterials. TotalFill BC RRM Fast Set Putty possesses the highest cell density and the most filopodia.



Source:  
A comparative study on root canal repair materials: a cytocompatibility assessment in L929 and MG63 cells.; Jiang Y, Zheng Q, Zhou X, Gao Y, Huang D; ScientificWorldJournal. 2014 Jan 12;2014:463826. doi: 10.1155/2014/463826.

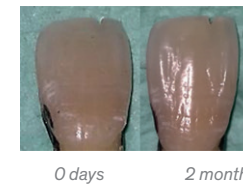
In conclusion, this study demonstrated that TotalFill BC RRM Fast Set Putty presents the best cell adhesion. This can be explained in particular by the microarchitecture of this biomaterial. It comprises small-sized particles (even smaller than TotalFill BC RRM Putty particles), thereby facilitating cell adhesion and their proliferation.

### Discoloration

During an endodontic treatment, esthetic appearance is also an important factor. Tooth discoloration following use of certain biomaterials has been highlighted by a host of articles. This discoloration in particular may be due to the presence of heavy metals in the composition of these biomaterials.

A recent study (Kohli et al., J Endod. 2015 Nov) compared TotalFill BC RRM Fast Set Putty with other commonly used root repair materials. The images below demonstrate that TotalFill BC RRM Fast Set Putty (as well as TotalFill BC RRM Putty) does not cause any clinically visible color variation.

TotalFill BC RRM Fast Set Putty



TotalFill BC RRM Putty



White MTA



Grey MTA



© Kohli et al., All rights reserved

## Clinical cases, TotalFill BC RRM Fast Set Putty

### Case 1

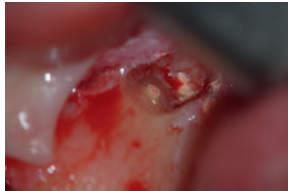
Retrofilling



Access marginal flap



Curetted periapical lesion



Apicoectomy



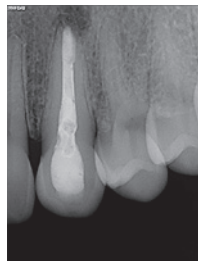
Ultrasonic retrograde preparation



Retrofilling



Obtured canal



Post-op

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### Case 2

Retrofilling



Pre-op



Post-op



Follow-up (3 months)

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## Availability

TotalFill® BC RRM™ Paste	TotalFill® BC RRM™ Putty	TotalFill® BC RRM™ Fast Set Putty
- Perforation - Resorption - Pulp capping	- Apexification - Retrofilling	- Apexification - Retrofilling
Setting time: 2 hours	Setting time: 2 hours	Setting time: 20 minutes
1 g syringe + 7 tips	2.5 g jar	0.3 g syringe
08.650.00.003.XX	08.650.00.004.XX	08.650.00.006.XX

## References

The characteristics of products sold under the EndoSequence® and iRoot® brands mentioned in the studies are identical to TotalFill® range products.

**A comparative study on root canal repair materials: a cytocompatibility assessment in L929 and MG63 cells.**

Jiang Y, Zheng Q, Zhou X, Gao Y, Huang D; *ScientificWorldJournal*. 2014 Jan 12;2014:463826. doi: 10.1155/2014/463826.

**A review of bioceramic technology in endodontics**

Koch K, Brave D, Nasseh AA; *Roots*. 2012; 4/2012, 6-12.

**Apicoectomy: The Misunderstood Surgical Procedure.**

Nasseh AA, Brave D; *Dent Today*. 2015 Feb;34(2):130, 132, 134-6.

**Bioceramic materials in endodontics**

Wang Z; *Endodontic Topics* 2015, 32, 3-30. doi: 10.1111/etp.12075

**Biocompatibility of two novel root repair materials.**

Ma J, Shen Y, Stojicic S, Haapasalo M; *J Endod*. 2011 Jun;37(6):793-8. doi: 10.1016/j.joen.2011.02.029.

**Cytotoxicity evaluation of endosequence root repair material.**

Alanezi AZ, Jiang J, Safavi KE, Spangberg LS, Zhu Q; *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2010 Mar;109(3):e122-5. doi: 10.1016/j.tripleo.2009.11.028.

**Dentin moisture conditions affect the adhesion of root canal sealers.**

Nagas E, Uyanik MO, Eymirli A, Cehreli ZC, Vallittu PK, Lassila LV, Durmaz V; *J Endod*. 2012 Feb;38(2):240-4. doi: 10.1016/j.joen.2011.09.027.

**Evaluation of a bioceramic as a pulp capping agent in vitro and in vivo.**

Liu S, Wang S, Dong Y; *J Endod*. 2015 May;41(5):652-7. doi: 10.1016/j.joen.2014.12.009.

**Bioceramics in endodontics**

Bellhari K, Laurent E; *Clinic* 2015; 36, 593-603

**Les ciments biocéramiques et l'obturation [Bioceramic cements and filling]: la technique monocône est-elle une technique d'avenir [is the single-cone technique a technique of the future]?**

Atlan A, Dantan Q, Jouanny G; *Information Dentaire*. 2015 Sep; 97 (32).

**Obturation de l'endodonte [Filling the endodontium]**

Pommel L, Pertot WJ; *Endodontie, Editions CdP* 2012, ISSN 1294-0585

**Resistance to fracture of roots obturated with novel canal-filling systems.**

Ghoneim AG, Luffly RA, Sabet NE, Fayyad DM; *J Endod*. 2011 Nov;37(11):1590-2. doi: 10.1016/j.joen.2011.08.008.

**Root filling materials and techniques: bioceramics a new hope?**

Trope M, Bunes A, Debelian G; *Endodontic Topics* 2015, 32, 86-96. doi: 10.1111/etp.12074

**Spectrophotometric Analysis of Coronal Tooth Discoloration Induced by Various Bioceramic Cements and Other Endodontic Materials**

Kohli MR, Yamaguchi M, Setzer FC, Karabucak B; *J Endod*. 2015 Nov;41(11):1862-6. doi: 10.1016/j.joen.2015.07.003.

Further articles and studies available on [www.fkg.ch](http://www.fkg.ch)



## FKG Dentaire Sàrl

Founded in Switzerland in 1931, FKG Dentaire Sàrl gained a new momentum in 1994, the year Jean-Claude Rouiller took over the reins of the company.

He propelled FKG to the forefront in the development, manufacturing and distribution of dental products destined for general practitioners, endodontists and laboratories.

The FKG strategy is centered on innovative high-precision products and the creation of machines designed specifically for the dental field. Its aim is to offer solutions that meet the most demanding needs of end users.

In 2011 the son of Jean-Claude Rouiller, Thierry, succeeded to the head of the company. Through his incentive, the network of distributors has expanded significantly and allowed FKG to make its products available in over 100 countries worldwide.

In 2012, the Swiss Venture Club rewarded FKG for its dynamism, high product quality, and its continuing innovation.

Equipped with a clean room since 2013, FKG is now developing a range of sterile products.

In 2013 and 2014 the company unveiled state-of-the-art training centers in La Chaux-de-Fonds, Dubai, and Oslo.

FKG Dentaire is certified according to international norms and regulations.

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www.fkg.ch



TotalFill® BC Sealer™;  
TotalFill® BC RRM™;



Innovative BioCeramik Inc.  
101 - 8218 North Fraser Way  
Burnaby, BC V3N 0E9, Canada



TotalFill® BC Points™;  
TotalFill® BC Pellets™;



Sure Dent Corporation  
#809, 52, Seogimakgol-ro, Jungwon-gu  
Seongnam-si, Gyeonggi-do, Korea

