

RealSeal 1™ Technical Bulletin



Carrier-based obturation systems have proven to be popular among the general dentist population due to their ease of use and three-dimensional radiographic appearance. The majority of endodontists do not share this appreciation for these systems due to inherent design flaws in these products. These flaws inadvertently lead to poor fills, such as when the filling material is stripped from the carrier by a constriction in the canal, or if the carrier overfills the canal and protrudes beyond the apex. These flaws are undetectable to the clinician due to the uniformity in radiopacity of the filling material, the carrier and the sealer. Complicating this issue is the difficulty in retreating these systems, particularly when the small carriers are used.

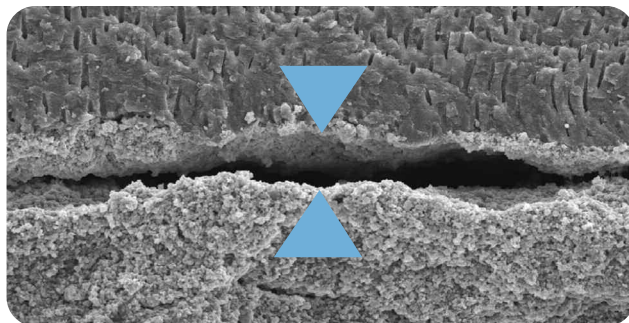
SybronEndo has introduced a new system of obturators, the RealSeal 1 Bonded Obturation System, which eliminates the design flaws of these car-

rier-based systems. These obturators have been designed to eliminate the potential for poor fills due to stripping or to overfilling. The radiopacity of the system enhances diagnosis and provides a dense three-dimensional fill.

Like the original RealSeal Obturation System, RealSeal 1 utilizes Resilon as the filling material. In this case, it coats the outside of the core and is thermo-plasticized by a proprietary oven. RealSeal 1 also introduces a new self-etching, resin-based sealer which eliminates the priming step of the original system. By using a resin-based filling material, a resin-based sealer and a resin-based core, RealSeal 1 creates a homogenous fill that significantly enhances sealing, overcomes leakage associated with stripping, promotes accurate diagnosis of the core's placement and makes retreatment dramatically easier.

Problem 1

Conventional carrier-based systems rely on gutta percha as the filling material. Gutta percha has been used in endodontics since the 1860's for a variety of reasons, one being that it is inert and the body does not react to it. This is a benefit of being inert. This inertness of gutta percha prevents materials from adhering to it, which is a drawback. Because currently available sealers cannot reliably adhere to gutta percha, gaps can develop between the gutta percha and the sealer. This is particularly true when the gutta percha is thermoplasticized or heated, as it is in carrier based systems. After being heated, the gutta percha will shrink. This shrinkage will cause it to pull away from the sealer. The result will be a gap formation along the interface of the gutta percha and the sealer. This gap can be used by bacteria to travel from the coronal portion of the canal to the apical portion resulting in failure.

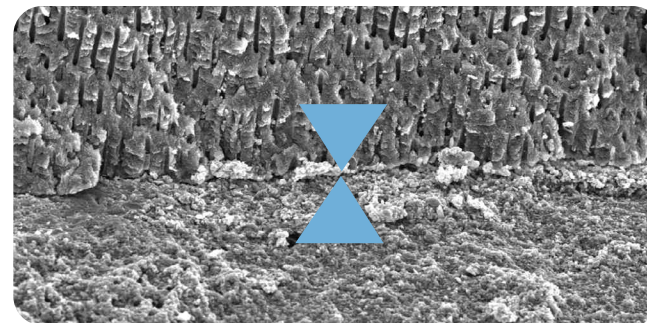


SEM courtesy of Dr. Martin Trope

Traditional gutta percha shows fissures and gaps between its surface and the dentin – just the place for harmful bacteria to multiply.

Solution 1

All of the filling components of the RealSeal 1 Obturation System are comprised of compatible resins. As a result, these components will adhere to each other eliminating any gaps or seams that could form between each component. The specially selected resin core material allows adhesion of the resin-based Resilon filling material. The Resilon filling material adheres to the resin-based sealer. The resin-based sealer has a self-etching component in the formula. This self-etching component allows this sealer to remove the smear layer of the canal dentin so that the sealer can ionically bond to the canal walls. Consequently, the sealer adheres to the dentin, the Resilon adheres to the sealer and the core adheres to the Resilon. This adhesion eliminates any gaps or seams between each component of the system significantly reducing the potential for leakage along any of the interfaces.



SEM courtesy of Dr. Martin Trope

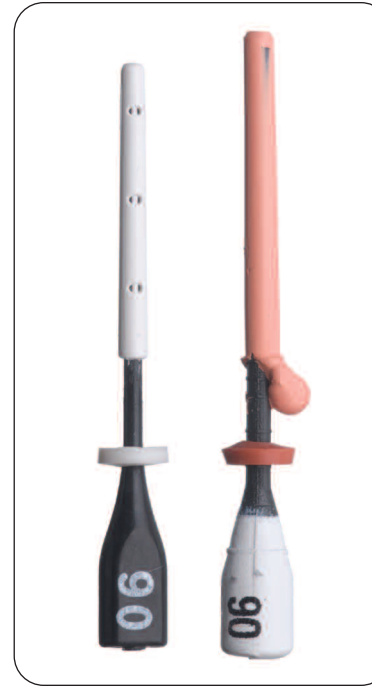
RealSeal (Resilon™) fills seamlessly and smoothly, eliminating leakage.

Problem 2

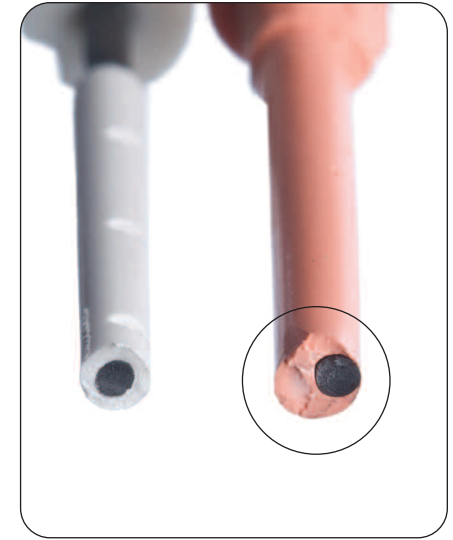
Current carrier-based systems utilize a plastic carrier (sometimes a metal one) and a gutta percha coating as the filling material. Because of the nature of gutta percha, it cannot be injection molded. Rather, it must be applied to the carrier by dipping. This process can lead to an uneven distribution of gutta percha on the carrier. When these carriers encounter a constriction in the canal, the gutta percha coating can be stripped off rather easily. Unfortunately, the uniform radiopacity of the carrier, the gutta percha and the sealer, do not alert the clinician to this circumstance. As a result, the portion of the canal beyond the constriction is only filled with the denuded carrier and sealer. This is an inadequate seal and leakage can occur.

Solution 2

The RealSeal 1 Obturator is comprised of a resin core covered by resin-based Resilon. The Obturator is formed and covered with Resilon using injection molding, making for a consistent covering of the core. The compatibility of the resin-based Resilon and the resin core material allow adhesion of the Resilon to the core. When the obturator encounters a constriction in the canal, only the surface portion of the Resilon is stripped away. A thin layer of Resilon still remains adhered to the carrier. This thin layer of Resilon is sufficient to allow adhesion of the resin-based sealer to the core.



Photography provided by SybronEndo



Photography provided by SybronEndo

Injection molding ensures a consistent amount of Resilon as the RealSeal 1 core (left) is centered in the middle of the filling material.

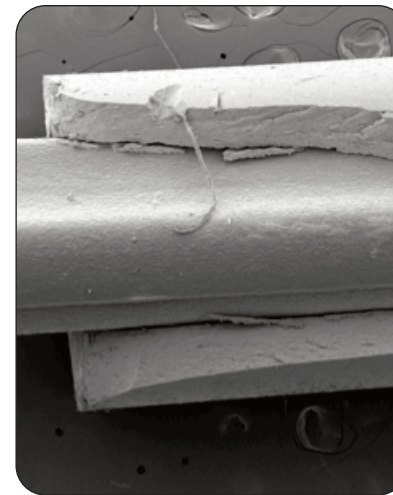
A hand-dipped obturator (top right) often results in uneven distribution of the filling material.

Problem 3

The absence of the stripped gutta percha filling material creates a void in the canal beyond the constriction. Current carrier-based systems use sealers that do not adhere to the metal or plastic carriers. Thus, the sealer in the canal will not adhere to the stripped carrier beyond the constriction. As a result, a void between the carrier and the sealer can develop where the gutta percha was supposed to be and bacteria can travel down this void to the apex. This can lead to leakage and subsequent failure.

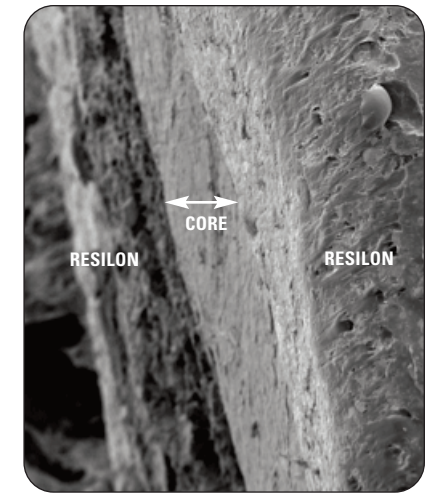
Solution 3

Because the RealSeal 1 Obturation System uses a resin-based core and a compatible resin-based sealer, adhesion of the sealer to the core will occur beyond the constriction. Even in the unlikely event that the Resilon is completely stripped from the core, the compatible resins of the core and sealer will allow adhesion to occur, eliminating gap formation and subsequent leakage.



SEM courtesy of Dr. David Jaramillo, Loma Linda University

Thermafil shows a gap at the gutta percha/carrier interface.



SEM courtesy of Dr. David Jaramillo, Loma Linda University

RealSeal 1 shows a seamless interface between the core and the Resilon coating.

Problem 4

One of the design flaws of carrier-based obturation is the inability to diagnose where the carrier is situated in the canal. The uniform radiographic appearance of the gutta percha, sealer and carrier make it virtually impossible to detect what is where. The rubber endo stop along the neck of the carrier is supposed to ensure proper placement of the obturator at the apex. However, it is not hard to inadvertently move the endo stop when placing the obturator into and taking it out of the oven. Back flowing gutta percha can also push the endo stop up the neck of the carrier, creating an inexact fill. As a consequence, the carrier can be extended out the apex or the obturation can be filled perilously short. This leads to complications for the doctor and the patient.

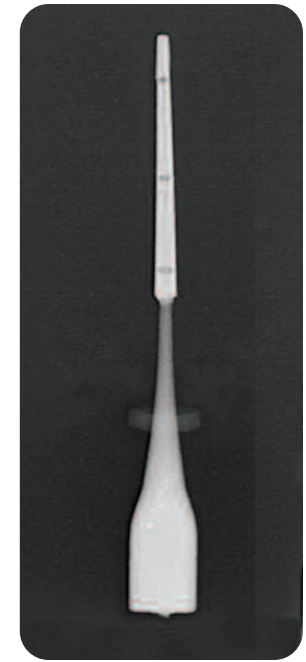
Solution 4

The resin material used to manufacture the core of the RealSeal 1 Obturator was selected, in part, because it was a little more radiolucent than the sealer and the filling material. This contrasting radiolucency clearly allows identification of the core, so that its position in the canal can be diagnosed on the check radiograph. Remedial action can be taken immediately if the canal is overfilled and a decision made in the case of a short fill. The radiopacity of the Resilon material and the sealer are quite dense and provide outstanding evidence of a solid, three-dimensional fill.



Radiograph showing positioning of RealSeal 1's core material.

Radiograph courtesy of Marvin W. Berlin, DDS. mckinneydentist.com

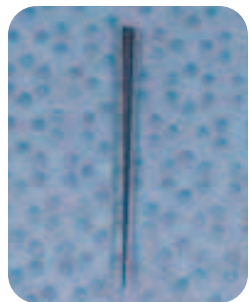


Radiograph of RealSeal 1 Obturator.

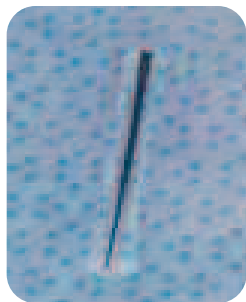
Radiograph courtesy of Dr. Michael Gordon

Problem 5

One of the acknowledged deficiencies of carrier-based obturators is the difficulty encountered when trying to remove them for retreatment or post placement purposes. Larger sized obturators can be removed in a reasonable amount of time through the use of solvents and files or drills by experienced practitioners. The real challenge comes when trying to remove smaller obturator/carriers in the auxiliary canals of molars. This can be quite stressful and time consuming, taking hours in some circumstances. This is one of the main reasons – maybe the largest reason – why a significant proportion of endodontists do not recommend carrier-based systems.



0 minutes



10 minutes

THERMAFIL

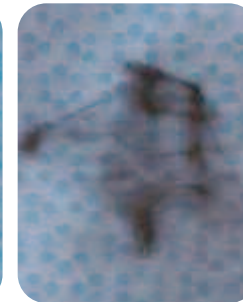
Photography provided by SybronEndo

Solution 5

Removal of the Resilon filling material and the core of the RealSeal 1 obturators are relatively easy to accomplish if a post space or retreatment is required. A post space can be created by using a Touch 'n Heat or the System B device to remove the Resilon. The remaining Resilon and core can be removed by careful use of a post drill or a GatesGlidden drill. For retreatment, solvent will soften both the Resilon and the obturator core in just a few minutes. Even small diameter RealSeal 1 Obturators can be significantly softened or dissolved within 5 minutes for easy removal from curved canals of molars.



0 minutes



3 minutes

REALSEAL 1

Photography provided by SybronEndo



Top Five Resilon® Research Studies

IN VIVO STUDIES

1. "Periapical Inflammation after Microbial Inoculation of Dog Roots Filled with Gutta Percha or Resilon." Trope et al., Journal of Endodontics, Vol. 31 (2), Feb. 2005, pp 91 -96.
"This in vivo study found that after 14 weeks mild inflammation was observed in 82% of the roots with gutta percha and an epoxy resin sealer as compared to only 19% of the roots filled with Resilon."

IN VITRO LEAKAGE STUDIES

2. "An in vitro Comparison of Microleakage between Resilon and Gutta-Percha with a Fluid Filtration Model." Vail et al., Journal of Endodontics, Vol. 33 (12), Dec. 2007, pp 1447 -1449.
"The results showed that Resilon is a suitable replacement for gutta-percha as a root canal filling material on the basis of its *increased resistance to fluid microleakage.*"

CLINICAL SETTINGS

3. "Treatment Outcome of Teeth Treated with an Evidenced-Based Disinfection Protocol and Filled with Resilon." G.J. Debelian, Journal of Endodontics, Vol. 32 (3), March 2006.
"Vital cases: 66 of 67 (98.5%) cases were free of apical periodontitis. The one failed case was due to a confirmed root fracture. Nonvital cases: 50 of 53 (94.3%) showed diminished or no radiographic signs of apical periodontitis. One of the three failed cases was due to a confirmed root fracture. *No case showed evidence of degradation of the filling material.* This study confirms that, if an evidence-based protocol is followed in private practice, outcomes similar to those published in University based studies are possible."

SEALER SETTING STUDY

4. "Setting Times of Resilon and Other Sealers in Aerobic and Anaerobic Environments." Baumgartner et al., Journal of Endodontics, Vol. 32 (2), Feb. 2006, pp 130 -132.
"Eleven sealers, including Resilon sealer, were mixed according to manufacturer's instructions. Setting times were determined in both aerobic and anaerobic environments. Resilon sealer set in 30 minutes in both anaerobic environments. However, in the presence of air, Resilon took a week to set and when placed in a phosphate buffered saline solution, an uncured layer remained on the surface."

RETREATMENT STUDIES

5. "A Comparison of Resilon and Gutta-Percha Dissolving Qualities in Endodontic Solvents." Kunath et al., Journal of Endodontics, Vol. 32 (3), March 2006.
"The purpose of this study was to compare Resilon versus gutta-percha with 3 different solvents. The results show that Resilon took significantly less time to dissolve in chloroform than gutta-percha. Resilon dissolved in halothane here as the gutta-percha samples did not. Resilon took significantly less time to dissolve in chloroform than in halothane. Neither Resilon nor gutta percha dissolved in eucalyptol oil in the time allotted for this study. *The results show that chloroform and halothane can be used to remove Resilon root canal material.*"