

THE DENTAL ADVISORTM

“Improving Patient Care Through Research & Education”



Instrument Sterilization and Monitoring

Instrument processing and sterilization require specialized equipment, adequate space, multiple steps, and qualified personnel. Appropriate cleaning, packaging, sterilizer loading procedures, sterilization methods, storage practices, and routine quality control checks are essential to ensure that processed items are safe for reuse on patients. This issue of THE DENTAL ADVISOR reviews instrument sterilization and recommends equipment and sterilization monitoring procedures.

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Instrument Sterilization and Monitoring

A basic principle for effective infection prevention in the oral cavity is: *do not disinfect when you can sterilize*. Sterilization of cleaned reusable instruments is a fundamental component of an infection control program. Recommendations from the Centers for Disease Control and Prevention (CDC) and the American Dental Association (ADA) recognize heat sterilization of patient-care items as the standard of care.

Categories of Patient-care Items			
Category	Definition	Examples	Comments
Critical	Penetration of soft tissue or bone	Scalers, burs	Clean and heat sterilize
Semi-critical	Touching only mucous membranes or non-intact skin	Air/water syringe tips, mirrors, amalgam condensers	Clean and heat sterilize or process with high-level disinfection, if heat sensitive
Non-critical	Contacting only intact skin	X-ray heads, counter tops	Clean and disinfect or use disposable barrier protection

Sterilization Methods

Sterilization equipment with claims of effectiveness and safety must be cleared by the Food and Drug Administration (FDA). Heat-tolerant instruments are usually sterilized by steam under pressure (autoclaving), dry heat, or unsaturated chemical vapor. The method chosen must be compatible with the items to be sterilized and the sterilization wrapping materials or containers, such as cassettes. The remaining discussion will focus on steam sterilizers. A table summarizing the characteristics of the three most commonly used heat sterilization methods can be found in the online issue.

Q What are the basics of an autoclave?

A Steam sterilizers use moist heat at higher temperatures in the form of saturated steam under pressure. As the steam fills the sterilizer chamber, cooler air is pushed out via an escape valve, which then closes and slows a buildup of pressure. Steam sterilization requires exposure of each item to direct steam contact at a required temperature and pressure for a specified time to kill microorganisms.

Common operating temperatures and times not including sterilizer warm-up or cool down periods are:

- 250°F (121°C) for 15-30 minutes or
- 270°F (132°C) for 3-10 minutes.

Sterilization intervals vary with:

- load size
- use of different instrument wraps, and
- nature of the materials to be sterilized.

A.

Gravity Displacement Sterilizers

Gravity displacement sterilizers (*Delta Q, Pelton Crane; Tuttnauer EZ10 Automatic Autoclave, Tuttnauer; Tuttnauer 3870M Large Capacity Manual Autoclave, Tuttnauer*) function by using steam that is self-generated within the chamber or created by a steam generator that is a component of the sterilizer. The steam enters at the top or the sides of the sterilizer and because the steam is lighter than air, unsaturated air is pushed out of the chamber through a drain or escape valve. Gravity displacement sterilizers have served as a standard of efficient heat sterilization of instruments for over a century when used properly and routine maintenance and monitoring occur.

Of concern during this process is the possible formation of cool air pockets within the chamber resulting in extended penetration times for porous items. Also, because these air pockets may not reach required temperatures for sterilization, a sterilization failure may occur which might not be detected via routine sterilization monitoring. As a result, sterilizers use pressure-pulsing techniques along with gravity displacement techniques to help remove the air from the chamber before the sterilization cycle.

B.

Pre-vacuum Sterilizers

Pre-vacuum sterilizers also called Class B sterilizers (**Bravo**, *SciCan*; **Elara11**, *Tuttnauer*; **Lisa**, *A-dec*) help overcome the trapping of air in the chamber. These units are fitted with a pump that creates a vacuum in the chamber to ensure air is removed from the sterilizing chamber before the steam enters. Compared to gravity displacement, this type of sterilizer allows faster and more thorough steam penetration throughout the entire load. Pre-vacuum autoclaves also have a post-sterilization vacuum cycle that facilitates drying. At the end of the total sterilization cycle, instrument packs typically can be completely dry.

To ensure that pre-vacuum sterilizers are working as intended, they should be tested periodically for adequate air removal and air leaks. A commercial test pack is usually placed near the door and over the drain. If the test pack indicates that the sterilizer failed the air removal test, the sterilizer should not be used until inspected by sterilizer maintenance personnel and then passes the air removal test. Air removal testing should also be performed during initial sterilizer installation, following sterilization failures (i.e., a positive biological monitoring test), and after sterilizer relocation, malfunction or repair. Recent technological advances with some of the newer tabletop pre-vacuum steam sterilizers can obviate the need for daily manual testing because of built-in assays, alarm systems or design differences.

C.

Hybrid Sterilizers

A hybrid version of gravity displacement and pre-vacuum sterilizers also called pressure pulse sterilizers (**Statim**, *SciCan*) has been available for over 20 years. This technology pulses injections of steam into the chamber in cycles as air is removed. The latest generation (**M3 UltraFast**, *Midmark*; **M11 UltraClave**, *Midmark*; **Statim 7000**, *SciCan*) injects thermal energy carried by steam into a pouch or cassette. As the energy is transferred to the instrument load, the steam evaporates, leaving dry instruments and pouches at the end of the cycle.

A For most sterilizers it is paper up but for the **STATIM** autoclaves it is paper down. The reason the **STATIM** is different is because in this unit the steam is pulsed in from the top and air is removed from the bottom of the chamber, in contrast to other autoclaves. In those, the drying cycle causes water vapor to evaporate upward, and it must get through the paper portion of the pouch. If the plastic is up, the steam cannot get through and will condense back onto the instruments.

Sterilization Monitoring

Mechanical Monitoring

Mechanical techniques for monitoring sterilization include assessing cycle time, temperature, and pressure by observing the gauges or displays on the sterilizer and noting these parameters for each load. Even though correct readings do not ensure sterilization, incorrect readings can be the first indication of a problem with the sterilization cycle.

Chemical Monitoring

Internal and external chemical indicators use sensitive chemicals to assess time and temperature conditions during sterilization cycles. They can detect certain equipment malfunctions and help identify personnel procedural errors. External indicators applied to the outside of a package such as chemical indicator tape or special markings change color rapidly when a specific parameter is reached, thereby verifying that the package has been exposed to the sterilization process. Unfortunately, some external indicators change color long before appropriate sterilization conditions are even met. “Autoclave” tape is an example of an external indicator that can be problematic at times because it often changes to show the striped pattern following a brief exposure to steam.

A significant innovation developed for instrument packaging has been the addition of a more reliable external chemical indicator that changes color when sterilization conditions are reached in the unit chamber. However, because heat and pressure conditions may be different on the inside of a loaded pouch from the outside, updated guidelines have called for placing an additional chemical indicator on the inside of each package in order to verify penetration of sterilizing vapor (*Comply Steam Chemical Indicators, 3M; IMS® Sterilization Steam Indicators, Hu-Friedy® Mfg.; SPS Medical Steam Indicator Strips, SPS Medical; Steam Sterilization Monitors, SciCan*). The use of separate temperature-sensitive impregnated strips does not replace routine biological monitoring of the sterilizer, which demonstrates destruction of heat-resistant bacterial spores.

Pouches are available which contain built-in internal and external multi-parameter steam indicators (*Assure Plus Sterilization Pouches, Sultan Healthcare; Bagette® Sterilization Pouches, Hu-Friedy® Mfg.; Defend+ Sterilization Pouch, Mydent International; Peelvue Pouches, DUX Dental; SURE-CHECK Sterilization Pouch, Crosstex International*). These pouches provide reliable, visible information concerning time, temperature, and exposure of items to steam in an autoclave. When packages are removed after being run through a cycle, failure of either of the dual quality control indicators to change color quickly alerts a person to a situation where the sterilization cycle has failed and instruments should not be used.

Biological Monitoring

Biological indicators contain heat-resistant bacterial spores (*Geobacillus stearothermophilus* or *Bacillus atrophaeus*). They represent the most accepted method for monitoring the sterilization process because they assess directly the killing of known highly resistant microorganisms. *G. stearothermophilus* preparations are appropriate for monitoring steam sterilizers and unsaturated chemical vapor sterilizers, while *B. atrophaeus* preparations provide a more rigorous challenge for dry heat sterilizers. Both types of spores are routinely present in a single vial or strip so that it can be used in the testing of any of the sterilization modes. Proof of destruction of these heat-resistant forms after exposure to the sterilization cycle is used to infer that all microorganisms exposed to the same conditions have been destroyed.

The test medium contained in the vials or used to incubate test strips includes a pH indicator, which changes color when germinating spores produce acids. This provides a visual display of sterilization cycle success or failure. Manufacturer’s directions indicate the placement and location of biological indicator in the sterilizer, as well as appropriate incubation times and temperatures. A control biological indicator, from the same lot as the test indicator and not processed through the sterilizer, should be incubated with the test biological indicator, and yield positive bacterial growth. A table summarizing sterilization monitoring can be found in the online issue.

SURE-CHECK Sterilization Pouch

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Crosstex
888.276.7783
www.crosstex.com



Product Description: *SURE-CHECK® Sterilization Pouch* is a self-sealing, single-use, disposable sterilization pouch indicated for use in steam. *SURE-CHECK* has built-in external and internal multi-parameter steam indicators (time, temperature and sterilant contact) printed on the pouch. It is wet-strength treated and made from virgin medical grade paper with a transparent film to allow a clear view of the contents and internal indicators. Additionally, *SURE-CHECK* features triple seals to prevent penetration or tearing from sharp instruments and a wider self-seal adhesive strip that securely seals sterilization pouches.



Sterilization Monitoring Services

Sterilization monitoring can be accomplished using mail-in services (*Confirm , Crosstex International; EMS Monitoring Service, SPS Medical; Sterilizer Monitor Service, THE DENTAL ADVISOR*), programs from dental schools (*University of Detroit Mercy, Indiana University*), or in-office monitoring systems (*Attest, 3M; Confirm 24, Crosstex International; Ensure, SciCan; SporeCheck® 24 Hour In Office Biological Monitoring System, Hu-Friedy® Mfg.; Spore View, SPS Medical*). Most current biological indicators require one-day incubation to detect viable spores. Rapid-readout assays are also available that utilize a bacterial enzymatic reaction instead of viable bacterial spores (*Attest 290 Auto-Reader, 3M*). This system can provide results in as little as 1 to 3 hours for gravity or vacuum steam sterilizers when incubated in a special auto-reader incubator.

The CDC recommends that correct functioning of routine sterilization cycles be verified for each sterilizer using a biological indicator and control at least once a week. Consult state laws regarding local requirements for using biological indicators. Every load containing implantable devices should be monitored with mechanical, chemical, and biological indicators, and the items quarantined until biological indicator results are known.

Sterilizers - Gravity									
Product	Company	Chamber Size	Number of Cassettes	Number of Trays	Total Cycle Time, Wrapped*	Total Cycle Time, Unwrapped*	Total Dry Time, Wrapped*	Total Dry Time, Unwrapped*	Clinical Rating
3870EA	Tuttnauer	15" x 30"	15 full	2	66 min cold, 57 min hot	32 min cold, 23 min hot	30 min	1 minute (venting)	na
Delta Q 10" Sterilizer	Pelton & Crane	9.9" x 17.5"	3 large and 3 small or 15 exam cassettes	2	--	--	--	--	na
Delta Q 8" Sterilizer	Pelton & Crane	8.25" x 14"	9 small or 3 large cassettes	4	--	--	--	--	na
EZ10 Autoclave	Tuttnauer	10" x 19"	3 full and 3 half	4	64 min cold (dry to dry cycle time), 48 min hot (dry to dry cycle time)	30 min cold, 14 min hot	30 min	1 minute (venting)	na
EZ10k Kwiklave	Tuttnauer	10" x 19"	3 full and 3 half	4	55 min cold (dry to dry cycle time), 25 min hot 45 min hot (dry to dry cycle time)	21 min cold, 11 min hot	30 min	1 minute (venting)	na
EZ9 Autoclave	Tuttnauer	9" x 18"	2 full and 2 half	3	61 min cold (not sure where this came from yet), 47 min hot (dry to dry cycle time)	27 min cold, 13 min hot	30 min	1 minute (venting)	na
ZipClave	Summit Dental Services	10" x 18"	5 small (10 instrument)	2	--	--	--	--	na

Sterilizers - Hybrid									
Product	Company	Chamber Size	Number of Cassettes	Number of Trays	Total Cycle Time, Wrapped	Total Cycle Time, Unwrapped	Total Dry Time, Wrapped	Total Dry Time, Unwrapped	Clinical Rating
M11 UltraClave	Midmark	11" x 18"	12	4	52 min	48 min	--	--	96%
M3 UltraFast	Midmark	12.1" x 7.6" x 1.6"	--	1	10 min	6 min	25 min	25 min	ce
M9 UltraClave	Midmark	9" x 15"	6	4	47 min	44 min	--	--	91%
STATIM 2000	SciCan	11" x 7" x 1.5"	4-8 small	0	22 min	14 min	--	--	nt
STATIM 5000	SciCan	15" x 7" x 3"	4-8 medium	0	34 min	16 min	--	--	96%
STATIM 7000	SciCan	13.7" x 8.6" x 2.5"	2 large	0	40 min	24 min	--	--	nt

M11 UltraClave

+++++

Midmark Corporation
800.649.6275 -
937.526.3662
www.midmark.com



Product Description: The *M11 UltraClave* is a self-contained, countertop steam sterilizer. The 22.9-cm diameter sterilizer chamber offers the option of utilizing two 23 x 38-cm and two 17 x 38-cm trays, four standard instrument cassettes, or a pouch pack. The sterilizer has preprogrammed cycle settings as well as programmable controls for time, temperature, drying time, and vent. An LCD display shows the settings and cycle status. Sterilization cycles range from 18 to 44 minutes depending on whether instruments are unwrapped or placed in pouches or packs.

M3 UltraFast

Automatic Sterilizer

Midmark Corporation
800.649.6275 -
937.526.3662
www.midmark.com



Product Description: The Midmark *M3 UltraFast*® Automatic Sterilizer is everything you need in an autoclave. Sterilize unwrapped instruments and handpieces in just 6 minutes and pouched instruments in about 10 with the touch of a button. The M3 is the simple, intelligent and fast choice for your sterilization needs with the reliability you count on from Midmark.

Sterilizers - Class B

Product	Company	Chamber Size	Number of Cassettes	Number of Trays	Total Cycle Time, Wrapped	Total Cycle Time, Unwrapped	Total Dry Time, Wrapped	Total Dry Time, Unwrapped	Clinical Rating
BRAVO	SciCan	10" x 13.5", 10" x 17.5"	3 large, 3 large and 3 small	5	30-40 min	22-35 min	--	--	92%
Elara 11	Tuttnauer	11" x 19.8"	4 full and 4 half	5	42 min (at 273 degrees F)	15 minutes (at 273 degrees F)	20 min (at 273 degrees F)	1 minute	ce
Lisa Sterilizer	A-dec/ W&H	9.84" x 11.81"	3	5	19-50 min	19-50 min	--	--	96%

BRAVO

++++ 1/2

SciCan
800.572.1211
www.scican.com



Product Description: *BRAVO* is a fractionated vacuum sterilizer that incorporates both pre-vac and post-vac cycles designed for optimum steam penetration and uses only fresh distilled water for every cycle. *BRAVO* runs self-diagnostics upon initiation and has four pre-sets for the most popular cycles. It is available in two capacities (17 and 21 liter); both units are available in two voltages (120v and 220v), single-button operation and a two-year warranty. Cycle times are in the range of 33 minutes for wrapped cycles to dry.

Elara11

Tuttnauer USA
800.624.5836
www.tuttnauer.com



Product Description: The *Elara11* is a pre/post-vacuum Class B Sterilizer which features a high-volume vacuum pump, a large 11", 7.5 gallon chamber, accessible front or top water filling options, an automated double safety locking door mechanism and an independent steam generator which allows continuous steam for no waiting time between cycles. The *Elara11* is provided with 5 stainless steel trays and a standard cassette capacity of 4 full and 4 half. The overall dimensions of the unit are W 20.8 inches X H 17.4 inches X D 25.4 inches.



TDA Recommends The Following Products:

- Hybrid Sterilizer - *M11 UltraClave* (Midmark Corp.)
- Class B Sterilizer - *BRAVO* (SciCan)
- Sterilization Pouch - *SURE-CHECK* (Crosstex)

Kuraray America
800.879.1676
www.kuraraydental.com

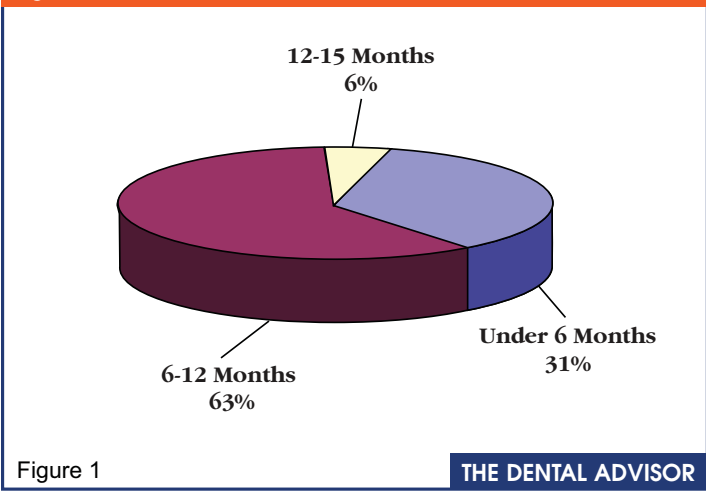
Description

CLEARFIL MAJESTY Esthetic is a universal, light-cured, nanofilled, radiopaque composite for anterior and posterior use. **CLEARFIL MAJESTY Esthetic** is available in 18 shades: A1, A2, A3, A3.5, A4, B1, B2, B3, C3, T, E1, E2, E3, OA2, OA3, OA4, BL1, and BL2. The composite can be applied in a single shade or layered for complex esthetic cases. **CLEARFIL MAJESTY Esthetic** is available in 3.6 g syringes or kits of 20, 0.26-g unit-dose tips. **CLEARFIL SE PROTECT** is a two-component, self-etching (6th-generation) bonding agent. This light-cured adhesive contains fluoride as well as the functional monomer MDPB which offers an antibacterial effect. **CLEARFIL SE PROTECT** is available in 6 mL bottles of Primer and 5 mL bottles of Bond.

Clinical Evaluation Protocol

- 232 **CLEARFIL MAJESTY Esthetic** restorations were placed in 67 patients.
- **CLEARFIL SE PROTECT** was used to bond all restorations.
- All restorations were placed in anterior teeth.
- 95 restorations were available for evaluation of clinical performance up to 14 months after placement (Figure 1).
- Restorations were evaluated on a 1-5 rating scale:
1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent (Figure 2).

Age of CLEARFIL MAJESTY Esthetic Restorations at Recall



Clinical Observations

Wear Resistance

No visible signs of wear were noted on any of the restorations recalled (Figure 2).

Consultants' Comments

- ◆ *"Great composite for all-around use."*
- ◆ *"Blends well with the enamel."*
- ◆ *"With CLEARFIL SE PROTECT and CLEARFIL MAJESTY Esthetic, I never see a white line at the margin."*
- ◆ *"No post-op sensitivity."*

Ratings of CLEARFIL MAJESTY Esthetic Restorations at 1-year Recall

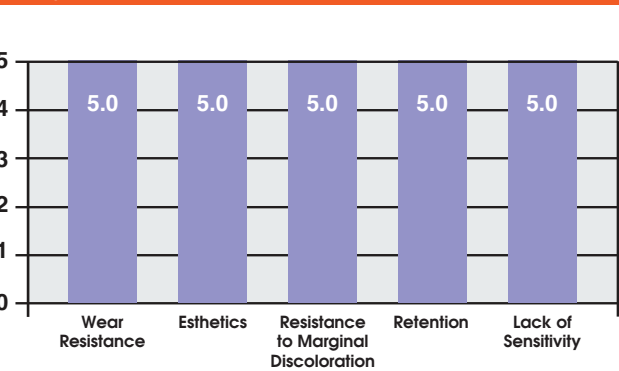


Figure 2

Esthetics

CLEARFIL MAJESTY Esthetic exhibited excellent blending with the surrounding enamel, producing highly esthetic restorations (Figure 2). During this first year after placement, shades and translucency were well maintained.

Resistance to Marginal Discoloration

CLEARFIL SE PROTECT was used to bond the **CLEARFIL MAJESTY Esthetic** restorations without the use of phosphoric acid etching of peripheral enamel. No staining at the cavosurface margins was observed (Figure 2).

Retention

All restorations were intact; no de-bonding occurred (Figure 2).

Sensitivity

No post-operative sensitivity was reported when patients were asked at their recall appointments (Figure 2).

Summary

Ninety-five **CLEARFIL MAJESTY Esthetic** restorations bonded with **CLEARFIL SE PROTECT** were evaluated for clinical performance during the first year after placement. All of these anterior restorations were intact upon recall and were rated excellent in all categories evaluated. The strong bond provided by **CLEARFIL SE PROTECT** resulted in no marginal staining and no sensitivity. **CLEARFIL MAJESTY Esthetic** with **CLEARFIL SE PROTECT** received a 100% clinical rating. ■

Miele, Inc.
800-991-9380
www.mieleusa-professional.com

Description

The **G 7881 Dental Disinfector** is a stainless steel, large capacity washer-disinfector with short program durations for processing instruments in a dental office. It is the only instrument cleaning system that also provides high level disinfection. The unit features *Multitronic Novo Med 45* controls with five standard cleaning and disinfecting programs, a four-fold filter system, double-skinned construction with insulation for low noise emissions, a flow meter for control of water intake, an electric door lock, program failure check, visual and audible signals for end of program and two spare sensors for temperature monitoring and control. Water quality is essential to the proper function of **G 7881 Dental Disinfector** (see box). The user may select a wash cycle with or without disinfection and optional drying. Disinfection occurs when the water is held at 200°F (93°C) for 10 minutes. The unit may be permanently installed under the counter like a dishwasher, or it can be free standing or slid into a 24" space. Special detergents, a neutralizer and rinse aid, tested for use in the machine, are required. The liquid detergent and neutralizer are dispensed automatically into the washer via tubing to bulk packages of the products. The **G 7881 Dental Disinfector** is designed for large loads and holds numerous instrument cassettes. Loose instrument baskets are also available. The **G 7881 Dental Disinfector** was evaluated by nine consultants during an eight-month period. It received a 91% clinical rating.

Suggested Retail Cost

- \$ 9,799.00 (Package Price includes baskets and inserts)

Equipment Features

The **G 7881 Dental Disinfector** is a safe and effective alternative to hand scrubbing or ultrasonic cleaning of stainless steel instruments with the added feature of high level disinfection. Because the full cleaning, disinfection and drying cycles takeover an hour, the workflow of instrument processing often has to change. Blood and/or organic debris should not be hand scrubbed from instruments before loading in the washer, as long as the machine is then run within a six hour timeframe. A quick rinse cycle can also be run at any time to keep blood and/or organic debris from drying and hardening on instruments. Cement and composite residue, however, will "bake on" the instruments and will need to be removed before processing in the machine. Consultants liked the clean appearance of the instruments after processing in the **G 7881 Dental Disinfector**. Instruments and cassettes come out clean, dry and ready for sterilization. Overall, it is a very tidy method of processing instruments and reduces the handling of



Consultants' Comments

- ◆ *"I like that it holds a lot of cassettes and that there is space for individual instruments as well. Works well for washing, rinsing and drying."*
- ◆ *"I like how shiny and clean the instruments and cassettes look after the cycle."*
- ◆ *"This is so much better than dealing with dirty ultrasonic water."*
- ◆ *"Lesser quality instruments rust."*
- ◆ *"I would love a "Clean/Dirty" indicator on the outside of the unit."*

contaminated items. Seventy-one percent of consultants reported that the **G 7881 Dental Disinfector** was better than their current cleaning system and 14% reported that it was equivalent. Fifty-seven percent would switch to the **G 7881 Dental Disinfector** and 57% would recommend it.

Clinical Tips

- Run once after the morning patients and once in the afternoon before leaving for the day.
- Smaller hygiene cassettes are easier to put in and take out of the top rack if you stand them up instead of laying them sideways.
- After the drying cycle, allow items to cool before handling.
- Items that are not suitable for processing in this washer-disinfector include aluminum, carbon steel or chrome-plated instruments; handpieces; burs; endodontic instruments; and plastics that cannot withstand the high temperature.
- Be prepared for the extra time involved and cost of cleaning agents for the machine. ■

Synergy D6 3-Year Clinical Performance + + + + ½

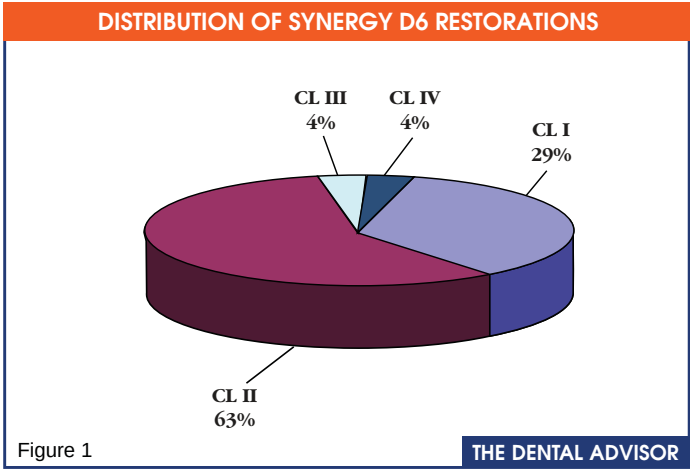
Coltene/Whaledent, Inc.
800.221.3046 • 330.916.8800
www.coltenewhaledent.com

Description

Synergy D6 is a resin composite system composed of seven dentin duo shades (D6 designation) and two enamel shades. The material is a sculptable, radiopaque, highly filled nano-hybrid composite for the restoration of anterior and posterior teeth. The average filler particle size is 0.6 µm with a particle size range of 0.02 to 2.5 µm. The filler content is 80% by weight and 65% by volume. The dentin *Duo Shades* (White Bleach, A1/B1, A2/B2, A3/D3, A3.5/B3, A4/C4, C2/C3) are created by combining Vita shades with similar color (hue), intensity (chroma) and lightness/darkness (value). The two enamel shades (Universal and White Opalescent) have high translucency. The composite can be cured with halogen or LED light-curing units. **Synergy D6** is packaged in kits containing eight, 4 g syringes or 80, 0.25 g unit-dose tips; *One Coat 7.0 Bond*; and accessories.

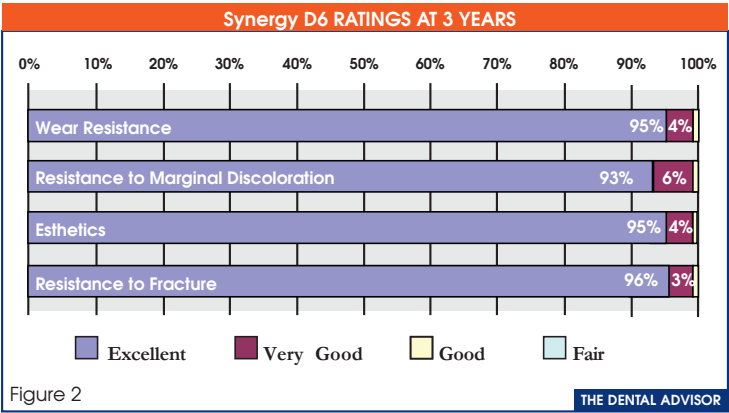
Clinical Evaluation Protocol

Two hundred fifty-two posterior and anterior restorations in 145 patients were available for evaluation of clinical performance at three years after placement (Figure 1). A 6th-generation bonding agent, *One Coat Self-Etching Bond*, was used to bond all restorations. Restorations were evaluated on a 1-5 rating scale: 1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent.



Clinical Observations

Resistance to Fracture
Over 96% of **Synergy D6** restorations observed at three years showed no chips or fractures (Figure 2). Two restorations were chipped, which warranted refinishing via polishing. Only one restoration (tooth #18-DB) fractured, requiring replacement.



Wear Resistance
Synergy D6 exhibited excellent wear resistance for three years. Ninety-five percent of restorations were rated excellent, as they exhibited no visible signs of wear (Figure 2).

Resistance to Marginal Discoloration
One Coat Self-Etching Bond was used to bond all **Synergy D6** restorations. No additional etching of peripheral enamel was done at the time of placement. After a period of three years, approximately 93% of restorations had no visible staining at the margins (Figure 2). Light and moderate staining along the margins was noted in six percent of restorations. Two restorations were replaced because of stain at the margin. One replacement (tooth #13-DO) was due to heavy stain at the margin of the restoration. Decay was noted under one restoration (tooth #2-MO), requiring replacement.

Lack of Sensitivity
Synergy D6 exhibited low postoperative sensitivity. Three patients reported sensitivity at six months; one restoration required replacement. No further reports of sensitivity were noted.

Esthetics
Nearly 99% of restorations were rated very good to excellent in esthetic qualities after three years (Figure 2). **Synergy D6** dentin

Sparkle Propphy Angle + + + +

Crosstex
888.276.7783
631.582.6777
www.crosstex.com

Request a Sample:
Visit www.dentaladvisor.com to request a sample or more information!



Description

Sparkle Propphy Angle is a disposable, latex-free propphy angle with a non-slip contour to reduce hand fatigue and micro-traumas. The angle consists of a light-colored shell/dark cup designed for improved visibility in the mouth. It features a patented beveled gear to provide a smooth-running propphy angle with low vibration and noise and no over-heating or locking. **Sparkle Propphy Angles** are available in 100- and 500-count boxes in color-coded soft (purple), firm (white) and tapered (soft or firm) cups. **Sparkle Propphy Angles** were evaluated by 34 consultants in 1417 uses. They received a 90% clinical rating.

- Suggested Retail Cost**
- \$42.95/100-count box (Soft and Firm Cup)
 - \$199.95/500-count box (Soft and Firm Cup)
 - \$75.00/100-count box (Tapered Brush)

Product Features

Consultants liked the ergonomic design of **Sparkle Propphy Angles**. The angles produced less splatter than what consultants saw with their current propphy angles. The gearing produces smooth operation, with no chatter or vibration. As with other angles, if heavy pressure is applied, stalling can occur. Consultants commented on how well the cups adapted to the tooth and that they were flexible enough to go under the gum line. The propphy angles with soft cups are especially useful on patients with light



Consultants' Comments

- “They worked great with no stalling or skipping – very smooth operation.”
- “These ran smooth, and I like the lack of splatter.”
- “I liked that the soft angle was flexible and would easily adapt to cervical contours.”
- “The purple color of the soft cup was easy to distinguish from the tooth no matter what color propphy paste was used.”
- “Cups flattened out during use and did not keep pumice in contact with the tooth.”
- “The white cups were too firm.”

stain or plaque. Twenty-six percent of consultants reported that **Sparkle Propphy Angles** were better than their current propphy angles and 35% reported that they were equivalent. Sixty-eight percent would switch to **Sparkle Propphy Angles** and 71% would recommend them. ■

Synergy D6 3-Year Clinical Performance + + + + ½

shades have moderate opacity and effectively block out underlying stained dentin. This quality of the material is desirable in cases where esthetics is a top priority. However, when the dentin shades were used alone, the finished restorations were rated lower, with dentists noting that the appearance was too opaque or dull (10/252 restorations). In the majority of cases, this was avoided by layering one of the translucent enamel shades over the dentin shade of composite, as recommended by the manufacturer.

Summary

Synergy D6 was used with *One Coat Self-Etching Bond* in restoring anterior and posterior teeth. 252 restorations were evaluated

in 145 patients as they reported for their regularly scheduled dental appointments at approximately six-month intervals up to three years after placement. Eleven restorations (two anterior, nine posterior) debonded and were replaced. Marginal staining was minimal, and the restorations overall showed little wear. Postoperative sensitivity reported at six months was very low. **Synergy D6** used in anterior and posterior restorations received a 95% rating at three years.

Editors' Note: A 7th-generation bonding agent, *One Coat 7.0 Bond*, is currently supplied with **Synergy D6**. ■

ULTRAMAT 2 + + + + +

SDI (North America) Inc.
800.228.5166 - 630.238.8300
www.sdi.com.au

Description

Ultramat 2 is a dual-voltage amalgamator that has a high-precision microprocessor controlled timer (0-16 second) to provide consistent and accurate trituration, ensuring optimal handling and clinical characteristics of mixed materials. It is designed for intermittent use. Maximum continuous duty cycle is 30 operations of 8 seconds per hour. It is indicated for the trituration of all encapsulated dental restorative materials. **Ultramat 2** features a simple-to-use touch control system, a surface cover that can be cleaned with any dental disinfectant, a safety micro-switch that automatically halts trituration when the lid of the **Ultramat 2** is lifted, a mixing frequency of 4600 oscillations per minute, low energy usage, and a five-year warranty. The kit contains: **Ultramat 2** multiple voltage amalgamator (110/240 V), power cord, 3 mm Allen key for transit screw removal, manufacturer's instructions, and product literature. **Ultramat 2** was evaluated by six consultants in 158 uses. It received a 99% clinical rating.

Consultants' Comments

- ◆ "Ultramat 2 is extremely quiet."
- ◆ "Easy to setup and easy to change settings."
- ◆ "Compact to store in a convenient space."
- ◆ "I plan to buy a couple of these."
- ◆ "Five-year warranty is outstanding."
- ◆ "The prongs were stiff when placing and removing the capsule."

Suggested Retail Cost

- \$667.10/Unit

Product Features

All of the consultants reported that **Ultramat 2** was quieter than any other capsule mixer they had used. It is simple to use and easy to change time settings from 1-16 seconds. The metal arms that hold the capsule are fairly stiff, and placing and removing the capsule requires some effort. One hundred percent of consultants reported that **Ultramat 2** was better than their current amalgamator/triturator, and all would switch to **Ultramat 2** and recommend it. ■

Zooby™ Propphy Paste + + + + ½

Denticator
1-800-227-3321
www.denticator.com

Description

Zooby™ Propphy Paste is available in six kid-friendly flavors: *Turtle Melon™*, *Gator Gum™*, *Chocolate Chow™*, *Happy Hippo Cake™*, *Growlin' Grrrape™*, and *Spearmint Safari™*. All of the flavors are offered in standard grits of fine, medium and coarse. In addition each bag of **Zooby Propphy Paste** includes an autoclavable **Zooby Paste Cup Gripper**, which has a wide comfortable base allowing clinicians easier handling of the paste cup. **Zooby Propphy Paste** is gluten-free and contains both xylitol and 1.23% fluoride. Each package contains a 100-count box of unidose cups of prophy paste, an autoclavable **Zooby** character paste cup gripper and a flavor card. **Zooby™ Propphy Paste** was evaluated by 32 consultants (dentists, dental assistants, hygienists) and 112 patients in 856 uses. It received a 94% clinical rating.

Suggested Retail Cost

- \$22.00/100-count package

Product Features

Nearly all of the consultants reported that **Zooby Propphy Paste** was enjoyed by their pediatric patients. The children liked choosing a fun flavor, with the most popular being *Happy Hippo Cake* (57%)

Consultants' Comments

- ◆ "Kids enjoyed the flavors."
- ◆ "Patient experience was improved."
- ◆ "The variety and names of flavors are great for kids."
- ◆ "The names on the paste cups were hard to read because of the small print."
- ◆ "The paste was smooth, but had some splatter and was somewhat hard to rinse."

and *Spearmint Safari* (27%). Hygienists would have preferred paste cups that were color coded by flavor rather than by grit. The paste performed well but was somewhat hard to rinse completely. The texture is smooth and creamy, which was appealing to children but splattered more than more viscous pastes. The *Zooby prophy Paste Cup Gripper* held the cup securely and continued the fun animal theme. Eighty-eight percent of consultants reported that the **Zooby Propphy Paste** flavors made their patients more comfortable during their dental visits. Ninety-four percent of consultants reported that **Zooby Propphy Paste** was equivalent to or better than their current prophy paste. Eighty-one percent would switch to Zooby Propphy Paste and 88% would recommend it. Ninety-nine percent of children in the evaluation wanted **Zooby Propphy Paste** used at their next visit with *Gator Gum* and *Chocolate Chow* being the flavors they looked forward to trying next time. ■

Onset + + + + ½

Onpharma
877.336.6738
www.onpharma.com

Description

Onset is a chairside anesthetic buffering system. It is indicated to reduce injection pain. It does this by raising the pH of the standard dental cartridge of lidocaine with epinephrine (average pH is 3.5) to a more physiologic level (body pH is 7.4). The published literature on buffering suggests that this also increases the effectiveness of anesthetic and hastens the onset of anesthesia. The **Onset** system adds a precise amount of sodium bicarbonate neutralizing solution directly to the anesthetic cartridge immediately before injection. The **Onset** system includes an **Onset Mixing Pen**; **Onset Cartridge Connectors**; and *Onpharma Sodium Bicarbonate Inj., 8.4%, USP Neutralizing Additive Solution*, a sterile, non-pyrogenic, solution of sodium bicarbonate in water for injection. At the start of the day, the practitioner loads the *Mixing Pen* with a sodium bicarbonate cartridge. During the day, immediately before delivering a local anesthetic injection, the practitioner connects a standard 1.8 mL anesthetic cartridge to the *Mixing Pen*, which transfers a precise amount of buffering solution into the anesthetic cartridge, while automatically removing the same amount of anesthetic. The now-buffered cartridge is disconnected from the mixing pen, loaded into the dental syringe, and the injection is delivered per the practitioner's normal technique. The standard one-week Trial Kit contains one reusable **Onset Mixing Pen**; four 3-ml cartridges of *Onpharma Sodium Bicarbonate Inj., 8.4%, USP Neutralizing Additive Solution*; four **Onset Cartridge Connectors** training/supporting materials; and a Quick Start Guide. Seventeen consultant practitioners evaluated **Onset** in 394 uses. They gave **Onset** a 92% clinical rating.

Suggested Retail Cost

- Contact Onpharma for Introductory Special

Product Features

The **Onset** system is easy to use and easy to incorporate into a practice.

Consultants reported that patients became anesthetized very quickly with the buffered anesthetic. The mixing pen is easy to load, and once loaded the mixing pen can buffer up to nine carpules of anesthetic in a clinical day. Dental assistants noted that they would like a more durable metal device rather than plastic and a better, more precise way of visualizing the amount of sodium bicarbonate remaining in the cartridge. Seventy-six



Consultants' Comments

- ◆ "Easy to use and incorporate into the routine."
- ◆ "Patients became anesthetized very quickly."
- ◆ "Great solution for patients who are hard to numb."
- ◆ "After administering a mandibular block, I can begin working in 1-2 minutes."
- ◆ "There is a short learning curve to preparing the pen."
- ◆ "Provide a system with smaller doses or single dose."

percent of consultants stated that using **Onset** saved clinical time by allowing them to start treatment right away. Many consultants would like the option of a smaller cartridge for days in which they anticipate administering fewer injections. Seventy-eight percent of consultants reported that the **Onset** system was better than their current method to decrease injection pain and would switch to it; 94% would recommend the **Onset** system.

Clinical Tips

- Buffer the anesthetic immediately before use (do not buffer and allow to stand).
- This product is labeled for use only with lidocaine at this time.
- Once the sodium bicarbonate cartridge has been loaded into the pen the cartridge should be used within 12 hours. Do not keep overnight once opened.
- Make it a habit to change buffer and cartridge connector at the same time.
- Store at room temperature.
- Do not autoclave the mixing pen; use a barrier sleeve or disinfectant wipe. ■

3M ESPE Lava Crowns and Bridges 8-year Clinical Performance + + + + ½

3M ESPE
800.634.2249
www.3mespe.com

Description

3M ESPE Lava Crowns and Bridges are *Lava* Zirconia-based restorations overlaid with an approved veneering ceramic. The zirconia copings and frameworks provide the strength while the veneering material provides the esthetics. The system is used for crowns, implant abutments, and bridges with a span of up to 48 mm in length. Tooth preparation is similar to PFM preparations with only slightly less reduction occlusally and circumferentially. Dies are scanned and then the copings or frameworks are milled and sintered. The zirconia substructure is colored with one of eight available shades, including a bleach shade, to coordinate with the final restorations. *Lava* restorations can be cemented with traditional or self-adhesive resin cements. *Lava* received a 95% clinical rating.

Clinical Evaluation Protocol

- Over 1600 *Lava* restorations have been placed and documented since 2003. These restorations include anterior and posterior crowns, 3- to 6-unit bridges and implant abutments. Most restorations were cemented with *3M ESPE RelyX Unicem Self-Adhesive Universal Resin Cement*.
- Nine hundred and sixty-three restorations were recalled over a six-month period. The distribution of restorations evaluated is shown in Figure 1.
- Restorations were rated on a 1-5 scale, 1=poor, 2=fair, 3=good, 4=very good, 5=excellent.

Clinical Observations

Resistance to Fracture and Chipping

The fracture and chipping of *Lava* restorations at 1, 4, and 8 years of service are shown in Figure 2. Of the recalled restorations, 29 were replaced because they received a rating of 1 or 2 out of 5. In many cases the fractures resulted in the delamination of a large portion of the veneering ceramic, and the restorations could not be polished or repaired. Forty-eight restorations received a rating of 3 or 4. These were chipped restorations that either did not need any smoothing or polishing or could be polished and smoothed satisfactorily. In many cases the patient was not aware that the restoration had chipped.

The causes of the fractures could be the thickness of unsupported porcelain or possibly too rapid heating or cooling of the veneering ceramic. Rapid cooling of the restoration can result in the buildup of undesirable stresses within the restoration. None of the fractures involved a zirconia substructure or coping failure. They all involved the veneering ceramic.

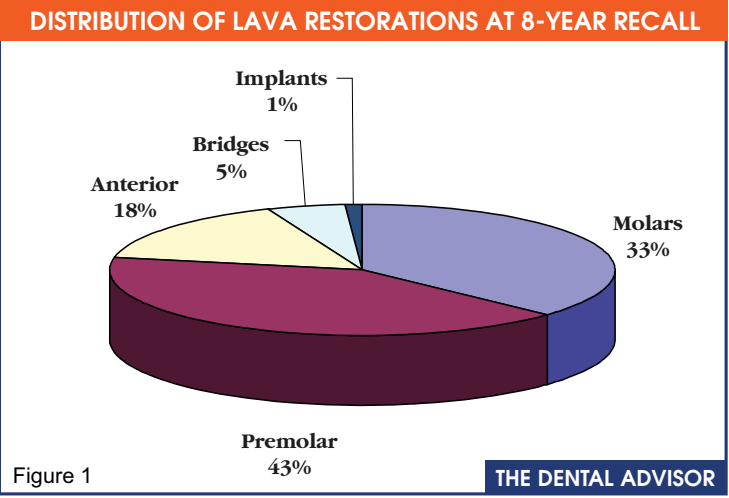


Consultants' Comments

- "I have been very pleased with the *Lava* restorations.
- "My patients love the life-like quality of *Lava* restorations and prefer them over the grayness of PFM crowns."
- "Over 1500 zirconia-based restorations have been placed in our office during the past eight years. The results have been phenomenal."

Laboratory Comments

- "As the owner of a dental laboratory, it is much more gratifying to work with zirconia as compared to metal, because the esthetic results are superior."



Esthetics

The vast majority of *Lava* restorations received a 5 or excellent rating for esthetics. Only 46, or 4.8%, of 963 restorations received a rating less than 5. *Lava* restorations have definitely superior esthetics when compared to PFM restorations, especially because the *Lava* coping can be shaded to closely simulate dentin, eliminating the graying caused by a metal substructure. Once

Riva Light Cure HV + + + + ½

SDI (North America) Inc.
800.228.5166 - 630.238.8300
www.sdi.com.au

Description

Riva Light Cure HV is a high-viscosity, fluoride-releasing, light-cured, resin-reinforced glass ionomer restorative material. It is designed for easy shaping and contouring without sticking and lift-off/pull back. It is indicated for minimal Class I restorations, non-functional Class II restorations, Class V restorations, deciduous teeth restorations, geriatric restorations, partial core build-ups, root surface restorations, temporary fillings, and as a base/dentin replacement using the sandwich technique. It is available in shades A1, A2, A3, A3.5, and B1. *Riva Light Cure HV* is supplied in capsules for trituration. The kit contains: 50 *Riva Light Cure HV* capsules, product literature, easy reference guide instructions, and expanded instructions/MSDS. *Riva Light Cure HV* was evaluated by 29 consultants in 758 uses. It received a 91% clinical rating.

Product Features

Consultants reported that *Riva Light Cure HV* was easy to place. The heavy viscosity allows better sculpting compared to other glass

Consultants' Comments

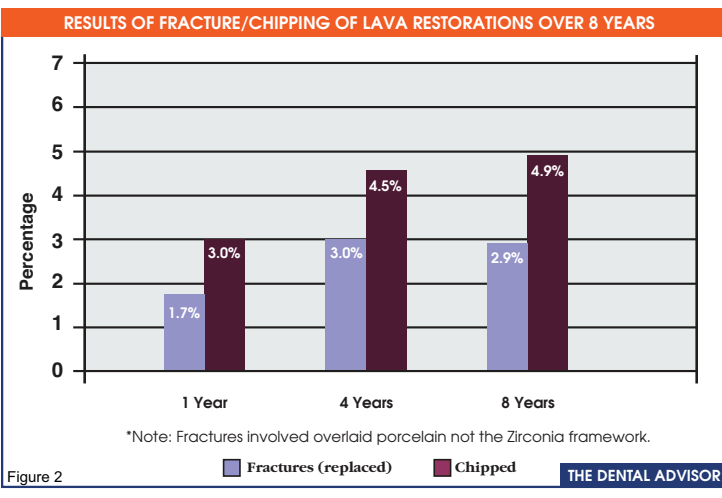
- "Easy to place – material provides good adaptation."
- "Finishes nicely."
- "Sets quickly."
- "It was hard to activate the capsule."
- "Shades are too light for most root surfaces."
- "Provide the conditioner in the kit."

ionomers. The material finishes nicely and provides reasonable esthetics. Additional shades are needed for cervical areas. Finished restorations are distinctly radiopaque. Forty-five percent of consultants reported that *Riva Light Cure HV* was better than their current glass ionomer restorative material and 48% reported that it was equivalent. Sixty-two percent would switch to *Riva Light Cure HV* and 79% would recommend it.

Clinical Tips

- Do not use for pulp capping.
- Use polyacrylic acid conditioner or phosphoric acid etchant, if preferred. recommend them. ■

3M ESPE Lava Crowns and Bridges 8-year Clinical Performance + + + + ½



the patient experiences the esthetics of a *Lava* zirconia based restoration, they are elated with the outcome.

Resistance to Marginal Discoloration

Over 98% of *Lava* restorations received an excellent rating for resistance to marginal discoloration. Advantages of *Lava* crowns

are the opaque core and the zirconia coping margins can be very close to the margin of the preparation. These characteristics reduce or eliminate graying at the margin due to microleakage that can be visible in more translucent restorations. During the eight-year evaluation, only 2.1% of the restorations exhibited slight graying at the margins.

Wear Resistance

Over 97% of *Lava* restorations received an excellent rating for resistance to wear. A small number (2.8%) of the recalled restorations exhibited some wear of the overlaid ceramic at eight years. Minimal to moderate wear was noted in about 15% of the teeth opposing *Lava* restorations; this wear was mostly visible in anterior teeth.

Summary

3M ESPE Lava Crowns and Bridges performed exceptionally well over the eight-year evaluation period with excellent resistance to fracture and marginal discoloration and minimal wear. *Lava* is proving itself to be a reliable and practice building type of restoration. ■

VOCO America, Inc.
888.658.2584
www.vocoamerica.com

Description

Dimanto is a one-step polishing system for pre-polishing and high-gloss polishing of composite restorations. The diamond-interspersed silicone polishers are suitable for repeated use. The recommended speed is 3,000-8,000 rpm. **Dimanto** can be used with or without water spray. **Dimanto** is provided in a five-piece kit containing a small point, a large point, a small cup, a large cup, and a lens. These are also available individually in 10-piece kits. **Dimanto** was evaluated by 27 consultants in 676 uses. It received a 96% clinical rating.

Suggested Retail Cost

- \$51.00/Intro Kit of 6 assorted polishers
- \$91.00/Refill Kit of 10 of same type

Product Features

Dimanto polishers were easy to use to achieve high gloss on composite restorations. The polishers were durable and maintained their shapes, even after repeated usage and sterilization. Consultants were pleased with the gloss produced by **Dimanto**, particularly when used with water spray. The selection of shapes is ideal, and the sizes are small enough to polish detailed anatomy of the restoration. The polishers are re-usable after sterilization. Thirty-seven percent of consultants reported that **Dimanto** was better than their current composite polishing system and 48% reported that it was equivalent. Sixty-three percent would switch to **Dimanto** and 89% would recommend it.



Consultants' Comments

- ◆ *"Concentric wheels – good selection of shapes."*
- ◆ *"Firm, reusable tips – they do not degrade quickly."*
- ◆ *"Produces polish without a lot of pressure."*
- ◆ *"Good polish after repeated sterilization cycles."*
- ◆ *"Infection control recommendations in the instructions are not relevant to US standards."*

Clinical Tips

- Do not use at speeds exceeding 20,000 rpm.
- Works best following finishing with a fine diamond or carbide bur. ■

Editors' Note: The manufacturer is currently updating the directions for use to reflect US standards for infection control recommendations.)

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