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Are Your Class II Resin-Based Composites Serving Well?

Gordon's Clinical Observations: Composite restorations have now been used in dentistry since the early 1960s. They have evolved through several major changes, but they remain as refined versions of their previous generations. To our knowledge, major changes in composite products are not coming soon. Current products are generally very good and are more similar than different from one another. However, they do vary in aspects such as: working characteristics, ease of use, radiopacity, color-matching properties, depth of cure, and cost. *CR scientists and clinicians have compared multiple current brands indicated for Class II restorations to provide for you an observation of some important characteristics to guide your use.*

- **Many clinicians are frustrated** with Class II resin-based composite restorations because they require significant time and provide low revenue. There are third-party payment issues, and these restorations require significant expertise to place adequately *(see Clinicians Report February 2014).*
- **Three-year data on current nanofill brands** of resin-based composites show promise *(see Clinicians Report April 2014).*
- **Clinicians today are still using amalgam** for multiple reasons—including ease of placement, caries prevention, and durability—despite health concerns or other reservations.
- **Because of esthetic characteristics of resin-based composites,** most patients currently choose this material over amalgam.

This report outlines the current state of Class II resin-based composites by: CR survey data, a comparison of characteristics among brands, clinical tips, and CR Conclusions.

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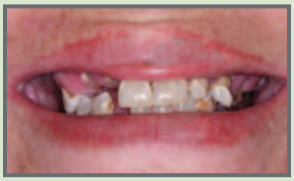
Dry Mouth

Gordon's Clinical Observations: What clinical situation occurs more frequently in your practice and gives you more frustration than patients who have inadequate oral lubrication? *Dry mouth.* Gingival tissues are irritated and sensitive, dental caries activity is rampant, dentures won't stay in place, bad breath is present, and patients complain of their dry mouth, which is uncomfortable and can limit speech. *In this report, CR staff, practicing project directors, and consultants provide help for this oral dilemma.*



The "dry mouth syndrome" is painful; constantly uncomfortable both inside the mouth and on the lips; and contributes to gross caries.

Dry mouth is a symptom of an underlying problem and not a disease in itself. Most dentists consider dry mouth an annoyance, although it can lead to more severe problems and reduce the quality of life for those affected. Diagnosis is not difficult as most patients seek help.

This report will help you diagnose the causes of dry mouth and formulate a plan to correct the many problems that occur.

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Is Amalgam a Systemic or Environmental Hazard?

Gordon's Clinical Observations: The amalgam controversy is as old as modern dentistry and debates on the subject go back to the 1840s. Many are concerned about the alleged toxicity of amalgam when placed in the mouth, while others are concerned about the affect dental amalgam scrap has on the environment. It appears to be impossible to have agreement on the answers to these questions, as you will see from the CR questionnaire accomplished on the topic. *Since a USA federal government regulation is supposed to be activated in June of this year, CR scientists and clinicians have developed a state-of-the-art report on the topic to aid your understanding.*

- **Use of amalgam** as a restorative material at least some of the time is present in most USA practices.
- **Removal of amalgam** for replacement with resin-based composite, other direct materials, or with indirect restorations causes a common aerosol contaminant, and this has been stated to be potentially hazardous to the dental team.
- **All dental units** have debris traps, ***but these are not amalgam separators*** which can remove about 99% of amalgam debris.
- **Amalgam scrap,** if not removed by amalgam separators, can contribute to the contamination of the environment.

Questions answered in this report are: How much amalgam scrap is responsible for the known environmental toxicity challenges related to mercury contamination from all sources? What should dentists do to reduce this challenge?

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Products Rated Highly by Evaluators in CR Clinical Trials

The following products were rated excellent or good by CR Evaluator use and science evaluations.

Monobond Etch & Prime: Glass-ceramic primer that eliminates need for hydrofluoric acid etch

Evolve Highspeed Handpiece: Low-cost air turbine handpiece with excellent concentricity, small head, and light weight

Visalys Core: Dual-cure core material with Active-Connect-Technology *(ACT)*

QuickSplint: Temporary occlusal splint designed for quick fabrication

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Are Your Class II Resin-Based Composites Serving Well? *(Continued from page 1)*

Comparison of Class II Resin-Based Composites

The following table shows various characteristics of 27 resin-based composites, listed alphabetically. Additional brands are available. Recent CR survey data showed **high overall clinical satisfaction with brands used.** In-vitro test data shown are intended to provide guidance in selecting a resin for clinical use. *Blue highlights denote areas of favorable performance in testing.*

Brand ***Manufacturer***	**Approx. Cost / mL**	**Handling Type**	**Anterior Use Indication**	**Posterior Use Indication**	**Shades Available**	**Radiopacity** *(% Aluminum equivalency; dentin = 96; enamel = 175)* higher is more opaque	**Flexural Strength** *(MPa)* higher is stronger	**Flexural Modulus** *(MPa)* lower is more flexible	**Shrinkage Stress** *(MPa)* lower is better, less risk of white lines	**Gloss after Brush Cycle Wear Test** *(GU)* higher is more esthetic †	**Depth of Cure** *(mm)* ‡	**User Ratings Online**	**TRAC 3-Year Data**
ACTIVA Bioactive Restorative, *Pulpdent*	$27.90	Flowable	✔	✔	5	108	98	3.6	Low 2.18	High–Medium 51	Full *(dual-cure)*		
Admira Fusion, *Voco*	$57.10	Putty	✔	✔	18	248	97	8.1	Low 2.11	Medium–Low 10	6.0		
Aura, *SDI (nano-hybrid version)*	$54.50	Putty	✔	✔	15	222	103	8.0	Low–Medium 2.83	High–Medium 56	5.5		
Bulk EZ, *Danville*	$16.90	Flowable	✔	✔	3	311	118	6.6	Medium 3.15	High 70	Full *(dual-cure)*		
Clearfil AP-X, *Kuraray*	$32.90	Putty	✔	✔	14	347	141	16.5	Low–Medium 2.64	High 63	4.0	◆	
Clearfil Majesty ES-2 Classic, *Kuraray (premium also available)*	$38.30	Putty	✔	✔	16	158	89	5.7	Low 2.15	High 67	4.5	◆	
Clearfil Majesty Posterior, *Kuraray*	$47.00	Putty	✔	✔	6	283	126	19.9	Low–Medium 2.60	High–Medium 57	5.5	◆	◆
Estelite Sigma Quick, *Tokuyama*	$41.00	Putty	✔	✔	20	189	82	6.9	Low–Medium 2.66	High 60	3.5	◆	
Esthet-X HD, *Dentsply*	$52.60	Putty	✔	✔	31	268	138	9.1	Medium 3.50	High–Medium 48	3.0	◆	◆
Fill-Up!, *Coltene*	$34.60	Flowable	✗	✔	1	226	113	7.2	Medium 3.74	High–Medium 42	Full *(dual-cure)*		
Filtek Bulk Fill Posterior, *3M*	$44.80	Putty	✔	✔	5	274	147	11.0	Medium 3.23	High 68	5.5	◆	
Filtek Supreme Ultra, *3M*	$63.60	Putty	✔	✔	36	256	121	10.7	Medium 3.62	High 62	5.0	◆	
GrandioSO, *Voco*	$58.80	Putty	✔	✔	17	255	132	15.8	Low–Medium 2.72	Medium 35	3.5	◆	
Heliomolar, *Ivoclar Vivadent*	$42.60	Putty	✔	✔	8	207	87	5.4	Low 2.04	High–Medium 46	4.0	◆	◆
Herculite Ultra, *Kerr*	$57.80	Putty	✔	✔	30	257	123	7.8	Medium 3.58	High–Medium 40	2.5	◆	◆
HyperFil, *Parkell*	$5.40	Flowable	✔	✔	2	236	139	8.8	High 4.44	High 60	Full *(dual-cure)*		
IPS Empress Direct, *Ivoclar Vivadent*	$56.60	Putty	✔	✔	32	344	123	8.3	Low–Medium 2.55	Medium–Low 18	2.5		◆
Mosaic, *Ultradent*	$51.90	Putty	✔	✔	20	262	148	12.4	Low–Medium 2.83	Medium 37	5.5		
N'Durance, *Septodont*	$49.50	Putty	✔	✔	14	373	119	7.8	Low–Medium 2.85	High–Medium 41	5.5		◆
Nuance, *DenMat*	$44.60	Putty	✔	✔	9	156	93	6.6	Low 2.26	High–Medium 48	4.5		
Simile, *Pentron*	$32.00	Putty	✔	✔	20	214	126	9.6	Medium 3.68	High–Medium 41	5.5	◆	
SonicFill 2, *Kerr*	$56.50	Putty*	✔	✔	4	223	103	9.3	Low–Medium 2.61	High–Medium 49	6.5	◆	
Tetric EvoCeram, *Ivoclar Vivadent*	$52.30	Putty	✔	✔	22	333	102	6.8	Low 2.26	Medium–Low 23	3.5	◆	
Tetric EvoCeram Bulk Fill, *Ivoclar Vivadent*	$49.60	Putty	✗	✔	3	318	105	8.8	Low 2.34	Medium 35	5.0	◆	
TPH Spectra LV, *Dentsply (HV also available)*	$54.50	Putty	✔	✔	26	307	116	9.5	Medium 3.16	High–Medium 42	4.0	◆	
Venus Diamond, *Heraeus*	$58.70	Putty	✔	✔	24	290	164	11.8	Low 2.16	Medium–Low 28	4.0	◆	◆
Venus Pearl, *Heraeus*	$62.90	Putty	✔	✔	27	271	176	10.9	Low 2.29	High–Medium 51	4.5	◆	

* Sonic-vibration handpiece increases flow of material.

† In-vitro test results after extended brush cycles using conventional toothbrush and toothpaste.

‡ Using manufacturer-recommended cure time for high-intensity curing light at 3mm distance with Valo Cordless *(Ultradent)* in standard mode *(1470 mW/cm²);* cure based on 90% ideal hardness; A2 or similar shade. Due to varying clinical factors *(such as presence of matrices, light alignment, proximity issues, and reliability of curing lights),* **clinicians are advised to not cure increments deeper than 4mm at a time if using bulk fill technique.**

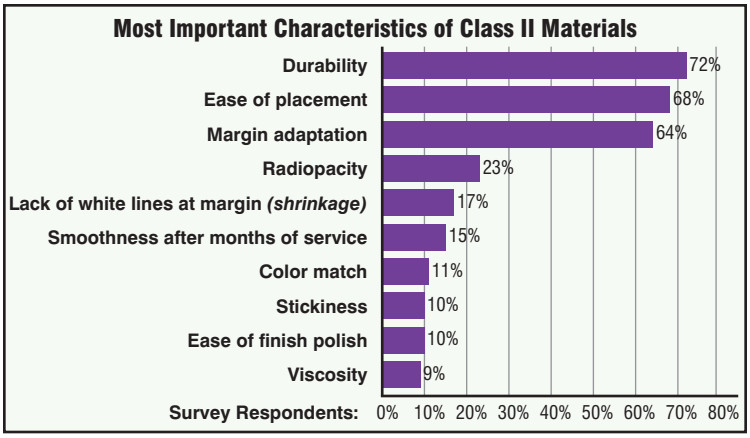
◆ **Clinician ratings *(per CR survey data)* of durability, ease of placement, and other criteria of these products available online at www.CliniciansReport.org under Complimentary Information. Brands with few responses not included.**

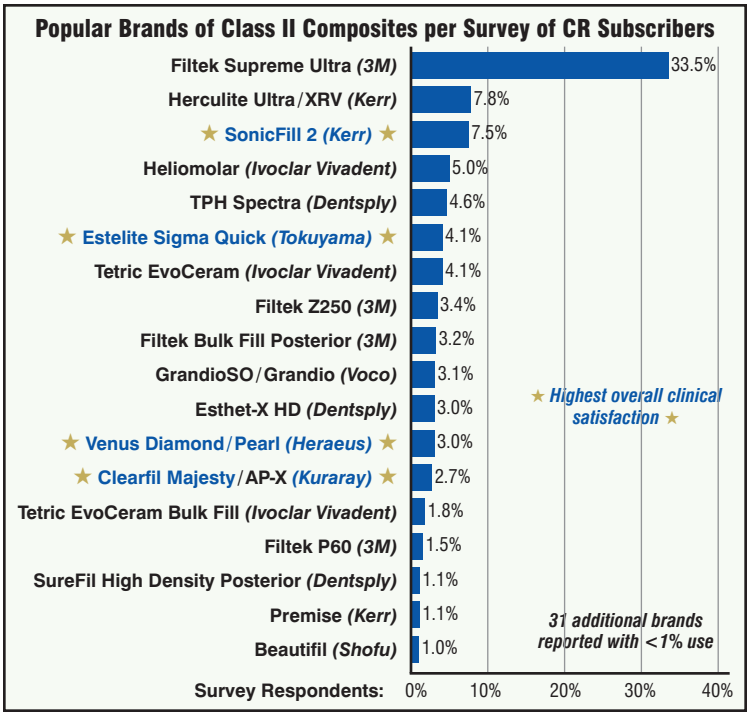
◆ **3-year clinical data on service of these select products available from TRAC Research; see *Clinicians Report* April 2014.**

Are Your Class II Resin-Based Composites Serving Well? *(Continued from page 2)*

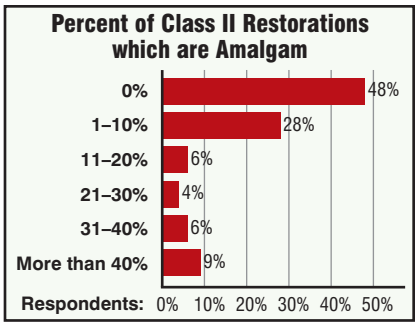
CR Survey: Class II Resin-Based Composites

• Respondents: 1,241 total; 96% general dentist; 84% with 21+ years average in practice. *Results are from CR subscribers; general population may vary.*





Clinical Tips



• **White lines at margins** can form from composite shrinkage, debonding, trauma, overheating due to improper finishing, and/or inadequate cure. White lines consist of enamel microcracks and/or restorative material separation from tooth structure which creates a surface void at the margin, subsequently filled with finishing and polishing debris. Composites with less polymerization shrinkage stress decrease risk of white lines.

• **Composites are more technique-sensitive than amalgam.** They must be placed carefully to seal margins, avoid overhangs, and provide proper contours.

• **Incremental placement** of resin-based composite is a well-proven technique. Recommended increment depth is 2 mm, as greater depths can potentially create problems clinically. The "bulk-fill" technique of using greater increment depths is possible with select products and careful technique, but requires additional considerations *(see Clinicians Report October 2014).*

• **Place conservative Class II restorations.** The smaller the prep, the more possibility for non-sensitive, long-lasting restorations. Preparations for resin-based composites are generally more conservative than those for amalgam restorations.

• **Consider indirect restorations** *(onlays)* for large Class II restorations.

• **Composite restorations are not cariostatic.** Encourage patients to practice good oral hygiene and use fluoride toothpaste and rinses. A glass ionomer material *(GI or RMGI)* may be placed in the floor of the prep for cariostatic activity or moisture challenges *(see Clinicians Report February 2016 for more on glass ionomer use).*

• **Early detection of caries is important** to avoid large Class II restorations which have shorter longevity for many situations.

• **A dry field is necessary.** Rubber dam is best for many situations, but not popular *(see Clinicians Report May 2015).*

• **Use sectional matrices to predictably form tight contacts** *(examples: Composi-tight by Garrison, V3 by Ultradent/Triodent, Palodent by Dentsply).*

• **Overcome resin "stickiness"** by using a wetting agent *(examples: Composite Wetting Resin by Ultradent, Brush & Sculpt by Cosmedent)* on placement instrument to promote marginal integrity without "pullback."

• **To improve the flow and handling** of a resin-based composite, consider the use of a resin warmer *(example: Calset by Addent).*

• **Two one-minute applications of glutaraldehyde** *(examples: MicroPrime G by Danville, Gluma by Heraeus)* are recommended for disinfecting/desensitizing all Class II preparations.

• **Use suitable light curing technique.** With higher-intensity lights *(>1000 mW/cm²),* provide 3–5 second cure with air, followed by 2–3 seconds with air only and then an additional 3–5 cure with air. The closer the light is to the resin, the better the cure. Keep the light perpendicular to the material. *(See Clinicians Report January 2016 for more information on curing more effectively.)*

• **When finishing the restorations,** round the marginal ridges. Sharp ridges chip and break. Control heat during finishing. Overheating can lead to early margin breakdown.

CR Conclusions:

• **Current generation of products indicated for Class II composite restorations are serving well** in general. According to a recent CR survey, Filtek Supreme Ultra is most popular, with SonicFill 2, Estelite Sigma Quick, Venus Pearl/Diamond, and Clearfil Majesty brands receiving highest overall clinical satisfaction.

• **In-vitro testing of many Class II composite brands** showed no individual product exhibited best results across all characteristics tested. SonicFill 2, N'Durance, and Aura had the most favorable results overall *(see table on page 2).* Composite formulation in general can still be improved.

• **Clinicians are encouraged to reduce or eliminate amalgam use** and refine use of alternative restorations.

• **Proper clinical technique is crucial** for Class II composite restoration longevity *(dry field, incremental placement, curing adequately, etc.).*

Dry Mouth *(Continued from page 1)*

CR Survey Results *(n=1168)*

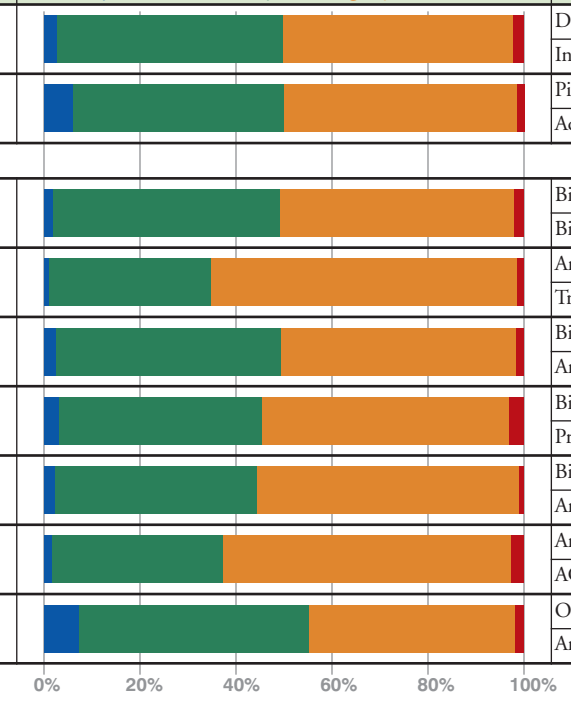
• What percent of your patients suffer from dry mouth?

Under 10%.....35.1%
10–20% 42.6%
20–40% 18.6%
40–60% 3.4%
60–80% 0.3%
Over 80%.....0.1%

• What methods do you use to diagnose dry mouth? *(multiple responses possible)*

Review patient health history/current medications 92.0%
Observation of dry/cracked lips, oral mucosa, and corners of lips, etc. ..91.9%
Questioning patient *(do you have difficulty swallowing dry foods?, etc.)*.....91.4%
Clinical examination *(mouth mirror sticks to buccal mucosa, etc.)*.....89.2%
Diagnostic tests *(salivary flow test, etc.)*.....4.6%

Treatment	Reported Use	Most Popular Products from Survey	Reported Use
Behavioral changes	97.0%	Drink water frequently	86.0%
		Increased fluoride	77.6%
Prescription medications *(infrequent)*	28.8%	Pilocarpine *(Salagen)*	30.0%
		Aquoral	28.0%
Over-the-Counter Medications			
Mouthwash/oral rinse	72.9%	Biotène Dry Mouth Oral Rinse	65.4%
		Biotène Moisturizing Oral Rinse	19.8%
Sugar-free chewing gum	57.9%	Any *(no specific brand)*	49.0%
		Trident Xtra Care Gum	15.2%
Saliva substitute gels	54.9%	Biotène OralBalance Moisturizing Gel	87.8%
		Any *(no specific brand)*	4.4%
Dry mouth toothpastes	45.6%	Biotène Dry Mouth Fluoride Toothpaste	55.3%
		PreviDent 5000 Dry Mouth Toothpaste	35.3%
Saliva substitute sprays	45.3%	Biotène Moisturizing Spray	73.3%
		Any *(no specific brand)*	8.1%
Lozenges	29.2%	Any *(no specific brand)*	51.3%
		ACT Total Care Dry Mouth Lozenges	17.6%
Oral patches/melts	19.3%	OraCoat XyliMelts for Dry Mouth	65.3%
		Any *(no specific brand)*	16.0%



Protective Role of Saliva

- Components in saliva are antibacterial *(help prevent decay)*, antiviral, antifungal
- Neutralize acids produced by plaque
- Contain phosphorus and calcium to aid in natural remineralization
- Moistens food to enable comfortable swallowing
- Boosts sensations in mouth to aid in detecting food texture and taste

Symptoms of Dry Mouth

- Gloved finger sticks to buccal mucosa during soft tissue exam
- Saliva feels thick and sticky
- High rate of tooth decay, especially cervical lesions
- Rough, dry tongue; feels like it "sticks to the palate"
- Problem chewing and swallowing, particularly dry foods
- Reduced ability to taste foods
- Bad breath
- Mouth ulcers; soft tissue more likely to abrade
- Dry lips
- More susceptible to infections, especially thrush
- Excessive buildup of food and plaque on teeth
- Burning sensations in mouth
- Inability to obtain suction for retention of dentures
- Tissue more susceptible to irritation by dentures

Demographics: It is estimated that 10% of general population and 25% of those over 65 years old have dry mouth symptoms.

Diagnosis

Physical Exam

- Mucosal surfaces appear dry and rough
- Increased rate of cervical decay

Saliva test: Roll out lower lip and dry. In normal individuals, lip will re-moisten in less than 30 seconds

Medical History: Thorough history and list of current medications

Causes of Dry Mouth

Medications *(main cause for Dry Mouth Syndrome (DMS) in older population)*. Meds most likely to cause DMS are those for:

- Depression and anxiety disorders
- Antihistamines and decongestants
- Bronchodilators
- Parkinson's Disease

For a detailed list, go to www.CliniciansReport.org ("Prescriptions and Xerostomia" at bottom of home page under Complimentary Information)

Diseases:

- Sjögren's syndrome
- HIV/Aids
- Alzheimer's
- Diabetes
- Anemia
- Cystic fibrosis
- Rheumatoid arthritis
- Mumps

Chemotherapy

Radiation to head and neck

Dehydration

Life Style:

- Smoking
- Chewing tobacco
- Mouth breathing
- Excessive alcohol use

Dry Mouth *(Continued from page 4)*

Treatment

Behavioral and Other Therapies

- Suck on ice during the day *(do not chew).*
- Drink copious water during the day.
- Discontinue use of alcohol *(including mouthwashes),* caffeine, and soda.
- Humidify sleeping area with cool mist vaporizer.
- Lubricate lips *(lanolin products).*
- Consult with patient's physician to see if some meds can be altered.
- If due to blockage, surgery to remove blockage.
- Carefully check for underlying diseases, e.g., Sjögren's syndrome, diabetes, lupus.

Over-the-Counter Therapies

- Example dry mouth products that contain lubricating agents:
  - Biotène Products
  - MouthKote by Parnell
  - OraCoat XyliMelts
  - ACT Dry Mouth Lozenges
  - Oasis Mouthwash
  - GC Dry Mouth Gel
  - Spry Mints by Xlear
  - Fluoride Supplements
- Non-alcohol mouthwash *(Biotène, Oasis, Crest Pro-Health, etc.)*

Prescription Medications

For severe xerostomia caused by radiation treatments or Sjögren's syndrome. Beware of side effects, precautions, and contra-indications (diarrhea, incontinence, cardiac sensitivity, etc.; do not take with uncontrolled asthma, acute iritis, or narrow angle glaucoma, etc.).

- Pilocarpine *(Salogen)* 5mg tablets:
  1 tablet taken 5–6 times per day
- Cevimeline HCl *(Evoxac)* 30mg capsules:
  1 capsule taken 3 times per day

Fluoride Therapy

- PreviDent 5000 fluoride toothpaste
- 5000 ppm fluoride gel/foam in tray

Thank you to John A. Svirsky, DDS, MEd, for his contributions to this article.

CR Conclusions:

Xerostomia can be a minor nuisance or can deteriorate the quality of life by making tasting, eating, and swallowing food difficult. It can also lead to rampant decay, periodontal disease, and abrasions of the oral mucosa. While not always possible, it is the practitioner's responsibility to attempt to find the causes of xerostomia and alleviate the problem. This often requires consulting the patient's physician to see if certain medications can be altered or eliminated. Some simple therapies *(such as sucking on ice chips or spraying water with an atomizer)* and some over-the-counter items *(such as the Biotène products)* can help alleviate dry mouth. Prescription medications to treat dry mouth should be reserved for only the most difficult and damaging cases.

Is Amalgam a Systemic or Environmental Hazard? *(Continued from page 1)*

CR Survey *(n=949)*

- 61% place amalgam
- 70% of those placing amalgam place amalgam in only up to 10% of posterior restorations *(see graph on page 3).*
- The majority of respondents estimate small amalgams *(less than 1/3 of the isthmus width in size)* to serve for 16–25 years.
- The majority of respondents estimate small composites *(less than 1/3 of the isthmus width in size)* to serve for 6–20 years.
- The majority of respondents estimate large amalgams *(1/3 or more of the isthmus width in size)* to serve for 6–25 years.
- The majority of respondents estimate large composites *(1/3 or more of the isthmus width in size)* to serve for 6–15 years.
- 92% remove amalgam to replace defective or unesthetic restorations.
- 44% clean suction lines daily; 43% clean weekly.
- Most popular suction line cleaners:
  - Purevac *(Sultan Healthcare)*
  - Bio-Pure *(Bio-Pure Products)*
  - Biovac *(Micrylium)*
  - Citrizyme *(Pascal)*

  Note: do not use bleach with suction cleaners!
- 58% have an amalgam separator.
- 7% of those without a separator plan to obtain one soon.
- Most have staff maintain the separator.
- Most used brands of amalgam separators:
  - Hg5, Solmetex
  - Acadia, Air Techniques
  - The Amalgam Collector, R&D Services
- 41% of the geographic locations reporting require dentists to have an amalgam separator.
- The majority of dentists feel that amalgam waste is *not* a serious problem.
- 10% say amalgam should be banned, 11% are undecided, and 79% say it should *not* be banned.

Amalgam Contribution to Overall Health Problems and Environmental Mercury Contamination

The following conflicting comments are from various public health and academic sources. The comments below are both ***positive*** *and* ***negative*** *about amalgam. Interested readers are advised to go to PubMed or Google Scholar to find additional information.*

- **There is significant controversy on this topic,** which complicates making decisions.
- **The FDA and the ADA support amalgam** as a safe and effective material *(2013).*
- **Estimates in 2011** are that there are 180 million Americans with over 1 billion amalgam restorations in place *(Richardson).*

  According to the EPA, dental practices discharge 3.7 tons of mercury to Publicly-Owned Treatment Works facilities each year, and dental practices are stated to be the number one contributor.
- **Amalgams contain about 50% mercury,** which many claim is inert in the mouth, but others claim health challenges.
- **Mercury is emitted** during placement and removal of amalgam and during chewing.
- **Over a lifetime, dietary sources of mercury** are far higher than would ever be received from the presence of amalgam fillings in the mouth.
- **Many groups question the safety of amalgam.**
- **Alleged health challenges** include neurobehavioral deficits, kidney damage, reproductive health problems, and numerous other maladies.
- **In 1991, the United States Food and Drug Administration concluded** that "none of the data presented show a direct hazard to humans from dental amalgams."

Recognizing the Controversies: Where are We Now with Amalgam?

- It is unlikely that the amalgam controversy will calm soon, but it is apparent that amalgam will eventually be banned.
- Dentists will be removing amalgams and contaminating water supplies for decades to come.
- Get an amalgam separator.
- Learn how to proficiently place alternatives to amalgam.
- Stay informed on this controversial subject.

Is Amalgam a Systemic or Environmental Hazard? *(Continued from page 5)*

Amalgam Contribution to Overall Health Problems and Environmental Mercury Contamination *(continued)*

- **Norway and Sweden have banned dental amalgam** *(Norway Ministry of Environment 2007; Sweden Ministry of Environment 2009).* Germany and Canada advise against its use in pregnant women and children *(PHS 1997).*
- **The World Health Organization estimates** that minimal absorbed mercury comes from amalgam restorations during service *(1–22 micrograms per day with most incurring doses of less than 5 micrograms per day -- IPCS 2003).*
- **The United Nations Environment Programme reports** that 10% of global mercury use is for dental amalgams, and the World Health Organization reports that healthcare facilities, including dental offices, account for as much as 5% of total mercury emissions in waste water.
- **Critics of amalgam note** that cremation of dental fillings is an additional source of air pollution, contributing about 1% of total global emissions.
- **Resin-based composite restorations** are more difficult to place than amalgam and do not serve as long as amalgam.
- **The World Health Organization has recommended that amalgam should be "phased out."**
- ***It appears that amalgam separators will be mandated in the USA by mid-2016 by the EPA.***

How Do Amalgam Separators Work?

The most popular types have the following characteristics:

- Dental waste goes into the vacuum line in your operatories.
- The amalgam separator is located between the operatories and the vacuum pump.
- The separator is usually located in the equipment room.
- The separator filters the debris from the vacuum line.
- A staff person should be observing the collection of debris. When collector is full or every 12 months, a new filter is placed in the Acadia and Hg5 units. The Amalgam Collector is usually emptied and recycled every 3–4 years.

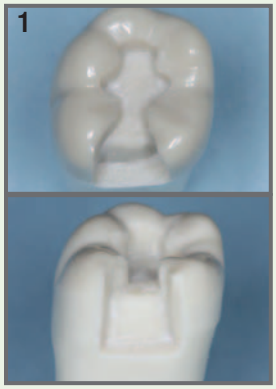
Example Amalgam Separators

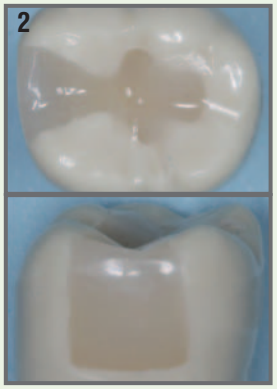
- There were over 30 brands reported in the CR survey.
- The three brands in the table below were the most reported ones.

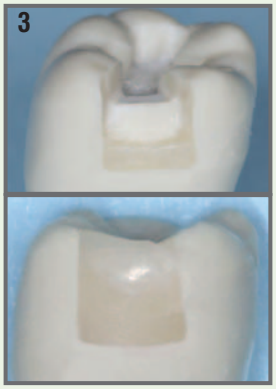
Brand *Company*	Acadia *Air Techniques*	Hg5 *Solmetex*	The Amalgam Collector *R&D Services*
Photo			
Price	$1343–$1648	$860–$2860	$625–$1295
Serves	Up to 10 ops	Up to 20 ops	Up to 12 ops
Cost of filter kit and recycling	$531 annually	$330 annually	$150 *(empty holding tank every 3–4 years)*

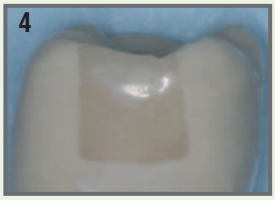
All three products provide certificate of proper disposal of debris.

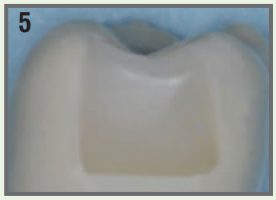
Alternative Restorative Techniques for Amalgam











1. **Amalgam is preferred by some dentists in large class II preparations such as those shown in this example.** They feel that amalgam is the only adequate direct material choice. However, dentists in geographic areas where amalgam is not used have learned to place composite adequately in such preparations. All examples shown were placed in similar large preps.
2. **Resin-based composite such as shown is currently the most used material for class II restorations.** The material used in this example is Filtek Supreme Ultra. Some dentists prefer amalgam in large preparations.
3. **A preventive amalgam alternative such as this dual material example can be used in situations where future carious activity is expected in the depth of the box form or in deep relatively inaccessible box forms.** This example shows cariostatic resin-modified glass ionomer *(RMGI)* placed one or two mm deep in the bottom of the box form. This material is light cured before placing composite in the remainder of the preparation, allowing subsequent immediately placed composite to fill the remainder of the preparation. Example RMGI products are: Fuji II LC, Ketac Nano, and Riva HB. Conventional chemical curing glass ionomer could be used in a similar manner.
4. **RMGI materials proven for many years to have cariostatic activity may be used as the entire restoration in primary teeth and in some permanent teeth needing optimum cariostatic restorative material.** The material shown is a newly revised form of Ketac Nano, which is much easier to place than previous versions because of increased viscosity. It polishes to a smooth surface. If placed in adult Class II locations, a veneer of composite resin on the occlusal surface is recommended. Conventional glass ionomer, such as Fuji IX, Equia, or Chemfil, could be used in a similar manner.
5. ***First Look:* A relatively new material, ACTIVA *(Pulpdent),* is gaining popularity and research support as a preventive material.** It is neither a RMGI or a conventional composite resin. Research on this product states the calcium and phosphorus in the material show marginal seal over time in the mouth.

CR Conclusions:

- Amalgam use is both supported and condemned, and such opinions and allegations will continue.
- Health challenges related to amalgam are controversial and not without criticism on both sides of the question. This situation will also continue.
- There is no doubt that dental amalgams contribute to environmental mercury contamination.
- Dental amalgam waste is only one of the sources of potential environmental mercury contamination.
- Get an amalgam separator if you do not have one; they will soon be required.
- Learn alternatives for amalgam use. Dentists living where amalgam is banned have learned to do so.
- ***Reduce or eliminate amalgam use.***

Products Rated Highly by Evaluators in CR Clinical Trials *(Continued)*

Glass-Ceramic Primer that Eliminates need for Hydrofluoric Acid Etch

Monobond Etch & Prime
Ivoclar Vivadent

$150/5-gram bottle
($31.91/ml)

Glass-ceramic restorations *(e.max and others)* are typically prepared for bonding by etching the restoration internal with hydrofluoric acid and then applying a silane coupling agent. However, hydrofluoric acid etching is unpopular because of its caustic potential. Monobond Etch & Prime is a single-component solution that etches and silanates glass-ceramic surfaces in one step. CR bond strength testing demonstrated a strong initial bond.

Advantages:
- Safer than hydrofluoric acid etch
- Reduced potential to over-etch e.max
- Etches and silanates in one step

Limitations:
- Not indicated for intraoral application for repairs
- Long-term clinical bond is being established

CR Note:
- Most indicated for dental labs and in-office milling concept. Not for use on zirconia restorations.

CR Conclusions: 86% of 21 CR Evaluators stated they would incorporate Monobond Etch & Prime into their practice. 90% rated it excellent or good and worthy of trial by colleagues.

Low-Cost Highspeed Air Turbine Handpiece with Excellent Concentricity, Small Head, and Light Weight

Evolve Highspeed Handpiece
AG Neovo Technology

$499/Handpiece
(coupler not included)

Evolve Highspeed Handpiece is designed with a tungsten carbide chuck that is resistant to wear which helps maintain concentricity and precise cutting over the life of the handpiece. The mini-head model *(E-6110K)* tested is lightweight *(49 grams)* and has a small head for access. Additional features include: push button chuck, ceramic ball bearings, bright light with LED swivel connector, and two-year warranty.

Advantages:
- Smooth, precise cutting
- Small size and light weight
- Cost

Limitations:
- Swivel action is a little tight
- Long-term clinical durability is being established

CR Conclusions: 83% of 24 CR Evaluators stated they would incorporate Evolve Highspeed Handpiece into their practice. 83% rated it excellent or good and worthy of trial by colleagues.

Dual-Cure Core Material with Active-Connect-Technology *(ACT)*

Visalys Core
Kettenbach

$79/Kit
($7.90/ml)

Dual-cure core build-up material with a special formulation that is compatible with both light-cured and dual-cured adhesives without an additional activator. Available in dentin and white shades in a 5-ml dual-barrel syringe and 25-ml cartridge. Exhibits good flow, minimal surface oxygen inhibition layer, and bisphenol A free.

Advantages:
- Flows well from dispenser for bulk fill
- Good colors for dentin match or contrast with white
- Cured material cuts easily for refining of core
- Easy-to-use dispensing

Limitation:
- A few Evaluators prefer core material with a condensable consistency

CR Conclusions: 100% of 23 CR Evaluators stated they would incorporate Visalys Core into their practice. 100% rated it excellent or good and worthy of trial by colleagues.

Temporary Occlusal Splint designed for Quick Fabrication

QuickSplint
QuickSplint

$260/Kit
(12 splint kit)

Occlusal splint designed for quick fabrication and short-term use as an anterior bite plane and night guard. This ready-to-use tray is custom lined with a rigid VPS material and is used for transitional oral therapy for relief from TMD, bruxism, clenching, or grinding of teeth. QuickSplint is ideal for immediate treatment of TMD; relief of bruxism related headaches and pains; and protecting new restorations from bruxism or clenching.

Advantages:
- Quick and easy to fabricate
- Provides relief at earlier stage than waiting for lab fabrication of splint
- Comfortable to patients
- Can be affordable

Limitation:
- Tray did not fit all anterior arches

CR Note:
- Intended for short-term use only; long-term use may cause tooth extrusion and malocclusion

CR Conclusions: 73% of 22 CR Evaluators stated they would incorporate QuickSplint into their practice. 82% rated them excellent or good and worthy of trial by colleagues.

Gordon J. Christensen
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Are Your Class II Resin-Based Composites Serving Well? *(Addendum)*

Survey Results: Clinician Ratings of Class II Resin-Based Composite Brands

The following table shows averaged clinician-issued ratings of select key characteristics of reported brands of Class II resin-based composites in a recent CR survey. Products are listed in descending order of how many "Excellent" ratings they received, then alphabetically within each grouping. Brands with few responses not included. Ratings may be inflated since surveyed clinician bias is often naturally present for their preferred products.

Brand, Manufacturer	Surveyed Users	Durability	Margin Adaptation	Ease of Placement	Stickiness	Viscosity	Radiopacity	Minimal White Lines at Margin	Smoothness at Placement	Smoothness after Months in Service	Color Match	Ease of Finish and Polish
SonicFill 2, *Kerr*	**92**	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent–Good	Excellent–Good	Excellent
Venus Pearl, *Heraeus*	11	Excellent	Excellent	Excellent–Good	Excellent–Good	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Estelite Sigma Quick, *Tokuyama*	**51**	Excellent	Excellent	Excellent	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent	Excellent	Excellent	Excellent
Venus Diamond, *Heraeus*	26	Excellent–Good	Excellent	Excellent	Excellent–Good	Excellent–Good	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Clearfil Majesty *(various), Kuraray*	22	Excellent	Excellent	Excellent	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent	Excellent
Vit-l-escence, *Ultradent*	10	Excellent	Excellent	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent	Excellent–Good	Excellent	Excellent
Tetric EvoCeram, *Ivoclar Vivadent*	**51**	Excellent	Excellent–Good	Excellent	Excellent–Good	Excellent	Excellent	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good
Esthet-X HD, *Dentsply*	37	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent
Filtek Supreme Ultra, *3M*	**413**	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent
SureFil High Density Posterior, *Dentsply*	14	Excellent	Excellent–Good	Excellent	Excellent–Good	Excellent	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good
Tetric EvoCeram Bulk Fill, *Ivoclar Vivadent*	22	Excellent	Excellent–Good	Excellent	Excellent–Good	Excellent	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good
Z100, *3M*	11	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent	Excellent
Beautifil, *Shofu*	12	Excellent–Good	Excellent	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent–Good
Heliomolar HB, *Ivoclar Vivadent*	10	Excellent–Good	Excellent–Good	Excellent	Excellent	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good
Premise , *Kerr*	13	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent–Good
Filtek Bulk Fill Posterior, *3M*	40	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good
GrandioSO, *Voco*	23	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good
Herculite Ultra, *Kerr*	**59**	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good
Simile, *Pentron*	9	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good
Clearfil AP-X, *Kuraray*	10	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good
Filtek P60, *3M*	18	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good
Grandio, *VOCO*	15	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good
Heliomolar, *Ivoclar Vivadent*	**51**	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Good	Excellent–Good
Herculite XRV, *Kerr*	36	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good
TPH Spectra, *Dentsply*	**57**	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good
Filtek Z250, *3M*	42	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good

Green products received the highest overall clinical satisfaction rating.
Purple numbers are more statistically significant due to comparatively higher number of responses.

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At the completion of this test, participants should be able to:

- Evaluate Class II restorative materials
- Identify and advise patients who suffer from dry mouth; understand the root causes of this symptom
- Discuss the controversy surrounding the use of amalgam as a dental restorative material

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CE Self-Instruction Test—March 2016 *Check the box next to the most correct answer*

1. Current Class II resins evaluated had the following characteristics, ***except:***
   - ❒ A. Wide range of cost—from about $6 to $64 per milliliter.
   - ❒ B. Various degrees of shrinkage stress with some exhibiting low stress levels.
   - ❒ C. High gloss retention for all brands for excellent esthetics over time.
   - ❒ D. Greater than 2mm depth of cure when polymerized with a high intensity light.

2. Which of the following is ***not*** suggested for minimizing white lines in Class II composite restorations?
   - ❒ A. Cure adequately using proper technique
   - ❒ B. Use a composite with low shrinkage stress
   - ❒ C. Avoid improper finishing which can lead to overheating
   - ❒ D. Place a flowable resin over the white lines to mask their presence

3. Which of the following symptoms may indicate dry mouth?
   - ❒ A. Saliva and buccal mucosa feels sticky to gloved finger, etc.
   - ❒ B. Increased rate of cervical lesions and other tooth decay
   - ❒ C. Difficulty chewing and swallowing, especially dry foods
   - ❒ D. All of the above

4. Which of the following treatments is ***not*** suggested to treat dry mouth?
   - ❒ A. Prescription medications *(prilocarpine, cevimeline, etc.)*
   - ❒ B. Alcohol containing mouthwashes *(Lysterine, Scope, etc.)*
   - ❒ C. Behavior changes *(drink water frequently, adjust medications, etc.)*
   - ❒ D. Over-the-counter products *(Biotène rinses, lozenges, etc.)*

5. Amalgam separators:
   - ❒ A. Remove up to 80% of the mercury/amalgam debris.
   - ❒ B. Are not necessary in some offices because many dental units have debris filters on them.
   - ❒ C. Are soon to be required in the USA.
   - ❒ D. Are usually located in the dental operatory.

6. Amalgam:
   - ❒ A. Is the only successful restorative material for some clinical situations.
   - ❒ B. Has been banned in some countries.
   - ❒ C. Has been proven to be a significant health hazard.
   - ❒ D. Has shorter clinical longevity than composite.

7. MonoBond Etch & Prime:
   - ❒ A. Is a two-component etching and priming product for glass-ceramic restorations.
   - ❒ B. Etches and silanates glass ceramic restorations in one step.
   - ❒ C. Etches and silanates zirconia restorations in one step.
   - ❒ D. Has universal indications for all full-ceramic restorations.

8. Evolve Highspeed Handpiece has the following desirable features:
   - ❒ A. Low cost and two-year warranty
   - ❒ B. Light weight
   - ❒ C. Small head for intraoral access
   - ❒ D. All the above

9. Visalys Core is formulated:
   - ❒ A. To have a packable consistency.
   - ❒ B. To bond exclusively with Kettenbach adhesives.
   - ❒ C. To be light cured only.
   - ❒ D. To have bond compatibility with light-cure and dual-cure adhesives.

10. Quicksplint is designed for:
    - ❒ A. Quick and easy fabrication.
    - ❒ B. Immediate treatment of some forms of TMD.
    - ❒ C. Transitional oral therapy for relief of TMD, bruxism, clenching, and grinding.
    - ❒ D. All of the above

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