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Many factors contribute to achieving an optimal restoration, including selecting the right cement. The type of restoration (i.e., veneers vs. crowns), the restorative material used, tooth preparation design, necessary bond strength, clinical implications (inflamed soft tissue, isolation, etc.), retentive vs. non-retentive implications and the desired esthetic outcome all determine what cement will work best.

Depending on the clinical requirements and material selection, dentists may place restorations using either conventional or adhesive cementation techniques. Conventional cementation combines preparation design, such as retention/resistance form to lute restorations to the underlying tooth structure. Adhesive cementation, on the other hand, produces a micromechanical and chemical bond between the tooth structure and the restoration. Dentists therefore need a thorough understanding of not only the restorative material used in the fabrication of a dental restoration, but also the cementation options and protocols for predictable clinical outcomes.

Conventional cements

Conventional cements lute restorations with underlying tooth structure by creating a hardened cement layer between the restoration and the tooth. Conventional cements most notably include zinc polycarboxylate, glass ionomers, resin-modified glass ionomers and zinc phosphate cements. These materials provide limited-to-no chemical bond with the tooth structure; hence, retentive preparation designs should be taken into consideration. Clinicians use these cements to lute high-strength ceramics and metal-based restorations. The physical and mechanical properties of cements varies, depending on their chemistry. The zinc polycarboxylate cement consists of metal oxides and polyacrylic acid. The dry mixture is mostly used as a powder, which is mixed with water for processing. The complicated setting reaction takes place by the reaction of metal oxides with the polyacrylic acid. The comparatively high solubility of the cement and mild pulpal reaction is a substantial disadvantage. Contrary, glass-ionomer cements consists of fluoroaluminosilicate glass and liquid containing polyacrylic, itaconic acid and water. They demonstrate the advantage of being able to release fluoride ions. Setting reaction takes place with the help of an acid-base reaction.

Clinical experiences with glass-ionomer cements have been gathered for more than 20 years, however it produces low retention rates and hence is indicated for retentive tooth preparations. The resin-reinforced glass-ionomer cements were formed by replacing part of the polyacrylic acid in conventional glass ionomer cements with hydrophilic methacrylate monomers. This group of luting agents includes a number of hybrid cements, the physical and clinical properties of which vary strongly, depending on the composition of the individual components. Their adhesion to the tooth structure is often weak, and when applied to moist dentin, produce little post-cementation thermal sensitivity.

Adhesive resin cements

Adhesive resin cements are superior options for all-ceramic restorations. They are methacrylate-based and consist of monomers and inorganic filler particles. Their setting reaction is based on a cross-linking of the polymer chains, which is initiated chemically (self-cure resin cements) and/or by light (dual-cure or light-cure resin cements) and provides chemical bonding between the tooth and the indirect restoration. These resin cements demonstrate high mechanical properties (greater wear resistance and resistance to the oral environment) and offer outstanding aesthetics given the wide choice of shades.

Generally, adhesive resin cements require the tooth preparation to be etched and rinsed, and then conditioned with an adhesive bonding agent and cured. Etching removes the smear layer and demineralizes the tooth surface, whereas the bonding agent forms an interpenetrating network with free collagen fibers (the hybrid layer). Adhesive resin cements have significantly superior mechanical properties; however, when proper isolation can’t be achieved, conventional cements are recommended.

Adhesive cements are further classified according to the following curing options:

- Self-cure resin cements (chemical cure).
- Dual-cure resin cements (chemical and light cure).
- Light-cure resin cements (light cure only).

Dual-cure and light-cure resin cements require light energy for complete polymerization of cement. However, restorations made of metals, metal alloys and opaque ceramics, such
as traditional Zirconia oxide, are impervious to light, contraindicating the use of dual-cure and light-cure resin cements for cementation. As such, self-cure resin cements are indicated in these clinical conditions.

By comparison, the cementation of highly esthetic restorations, such as veneers in the anterior region, requires materials that ensure long-term color stability for high quality esthetics. One option is to use amine-free resin cements.

**Self-adhesive resin cements**

Self-adhesive resin cements combine some of the advantages of resin cements with the convenience of conventional cements, including moderate level bond strengths. These cements don’t require the application of conditioners or bonding agents on the prepared tooth surface, making the system easy to use and error-prone. However, given the comparatively lower bond strength and mechanical properties, these cements are not highly recommended for low strength glass ceramics.

**Preparation design and restorative materials**

The preparation design and restorative material largely determine what type of cement is used. Preparation design is significant in cement selection. Depending on the inclination/taper of the axial wall of the prepared tooth in relation to the longitudinal axis of tooth, the preparation design is generally classified as retentive or non-retentive. Depending on the height of the prepared tooth (>4mm), the preparation design is classified as a short preparation. Retentive preparations feature an inclination/taper between 4 to 8 degrees, with a longitudinal axis of tooth. This feature provides additional mechanical retention, which facilitates the cementation of a restoration, either using adhesive or conventional cementation techniques.

While adhesive cementation is known to provide a strong bond and good marginal seal, the luting forces of conventional cement are sufficient to lute restorations with retentive tooth prep design due to additional mechanical retention achieved by the tooth preparation design. At the same time, non-retentive preparations feature an inclination/taper in excess of 8 degrees and lack retentive features. Given their limited or no-chemical bonding properties, conventional cements are not ideal for this clinical scenario. Rather, adhesive resin cements are recommended due to their ability to chemically bond with the restoration and tooth.

The restorative material used also determines cement selection. Indirect restoratives include:

- Metal and metal-based (metal alloys and porcelain-fused-to-metal restorations).
- Intermediate-strength ceramic (feldspathic, leucite-reinforced and fluorapatite restorations).
- High-strength ceramic (lithium disilicate, alumina and zirconia restorations).
- Indirect composite (reinforced composites)

Intermediate strength glass ceramics, such as those with a high glassy content, obtain additional support from adhesive bonding and must be adhesively cemented using resin cements. Therefore, feldspathic, leucite-reinforced and fluorapatite ceramic restorations should be cemented with adhesive resin cements.

**Speaking the language**

Because different cements are suited to different clinical situations, dentists require a thorough understanding of their attributes and limitations — including restoration type (veneer, crown, inlay, onlay), restorative material (low or high strength, or opaque), tooth prep (retentive or non-retentive) and conditions such as isolation — in order to select the material best suited to their practice.

Adhesive resin cements are recommended for all clinical situations, except when an ideal isolation cannot be maintained. Conventional cements are considered highly versatile. And light-cured resin cements are indicated for thin veneers due to their high color stability, while self-cure resin cements are ideal for opaque restorations, such as metals or opaque thick zirconia restorations.

A clinician looking to achieve an intermediate bond strength and ease-of-use can use self-adhesive resin cements.

**Editor’s note:** First Impressions would like to thank Ivoclar Vivadent for its assistance with this article.
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Chances are you spend a lot of time in your car. Here’s some automotive-related news that might help you appreciate your home-away-from-home a little more.

**Arizona accident**
The death in March of a pedestrian hit by a self-driving car in Arizona “is a sad reminder of the dangers of overreliance on autonomous and semi-autonomous vehicle technology,” said Dr. Richard Harkness, CEO of ADEPT Driver, a developer of crash-avoidance training programs. “In this heartbreaking case, a driver was behind the wheel, but did not override the technology that missed seeing the pedestrian who was killed.” ADEPT Driver offers neuro-cognitive training that allows the driver to quickly scan the driving environment and identify hazards, he said. “When operating autonomous or semi-autonomous vehicles, the driver must be ready to quickly and without warning scan, detect hazards and take control of the vehicle. If your brain is not trained to do this specific task, chances are the crash will happen before you recognize it.”

**Dunkin’ Donuts mobile ordering**
Your family physician may tell you not to overdo the donuts, but when you have no options for a quick breakfast before a call, there’s always Dunkin’ Donuts. Dunkin’s On-the-Go Mobile Ordering is now available through the Google Assistant, on iPhones and Android phones. DD Perks® Rewards members can use the Google Assistant, Google’s voice assistant technology, on their iPhones and Android phones to place a mobile order for coffee, beverages, baked goods and breakfast sandwiches, and then speed past the line in store for pick-up. Guests who have a DD Perks account and a Google account can link both, with all ordering and payments happening within Dunkin’ Donuts’ mobile platform. Guests can order from saved Favorites and items previously ordered via the Dunkin’ Mobile® App. To get started, guests need simply say, “Hey Google, talk to Dunkin’ Donuts.”
Who’s driving?
Roughly a third of recent high school graduates have ridden in a motor vehicle with a substance-impaired driver, according to a study by researchers at the National Institutes of Health and other institutions. The study found that during the first two years after high school graduation, 23 percent of young adults had ridden with a marijuana-impaired driver at least once, while 20 percent had ridden with an alcohol-impaired driver, and 6 percent had ridden with a driver impaired by glue or solvents or harder, illicit drugs, such as amphetamines, opioids or cocaine. The authors noted that having ridden with an impaired driver in the past was linked to a higher risk of driving while impaired and of riding with an impaired driver in the future. Other factors that increased the risk for riding with an impaired driver were living alone and not attending a four-year college. For young adults in the study who attended a four-year college, living on campus increased their risk of riding with an impaired driver. The authors called for enhancements to informational programs that educate young people on the risks of riding with impaired drivers.

Sunroof regulations coming?
A dozen years ago, 18-year-old Liza Hankins was thrown through the closed sunroof of her sport-utility vehicle during a crash and paralyzed, according to a recent article in the *New York Times*. Her family sued the truck’s maker, Ford, claiming it had failed to live up to its safety responsibilities. Ford won the case after it pointed out that no government regulations required a sunroof — even a closed one — to keep someone inside a vehicle in a crash. Twelve years later, no such regulations exist, even as more buyers are opting for the sunroof option and more carmakers are introducing larger, panoramic sunroofs, reports the newspaper. Some automakers have taken steps to make sunroofs safer by using laminated safety glass, while gadgets now in the works could help limit sunroof ejections during rollovers. And a new test created by researchers at the National Highway Traffic Safety Administration could mean the federal government is laying the groundwork for regulations governing sunroofs.

New drivers’ skills
A UCLA researcher asked instructors from a Los Angeles driving school to rate students’ driving skills on a scale of 1 to 4, and the researchers analyzed the results based on several variables. Among males, the older the student, the worse his driving skills score. There was a similar trend among female drivers, but it was not as significant. A history of playing any kind of organized sport was linked to better driving skills among both men and women. Men and women who played sports scored 2.66 and 2.43, respectively, while men and women who had not played organized sports had average scores of 1.94 and 1.60. Previous studies have shown that participating in organized sports improves spatial perception. Meanwhile, playing video games showed no relationship to driving abilities. The authors expected the opposite, because earlier research has shown that playing action video games improves spatial cognition.

Remote control drivers
While major technology and car companies are teaching cars to drive themselves, Phantom Auto in Mountain View, Calif., is working on remote control systems, often referred to as teleoperation, reports the *New York Times*. In one demonstration, Ben Shukman, a software engineer for Phantom Auto, sat in front of a phalanx of video screens in Mountain View, Calif. Using a live, two-way video connection along with the kind of steering wheel and pedals usually reserved for video games, he was driving a Lincoln MKZ in Las Vegas, hundreds of miles away. Many see teleoperation as a necessary safety feature for the autonomous cars of the future. California was scheduled to allow companies to test autonomous vehicles without a safety driver – as long as the car can be operated remotely – starting in April. ■

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Editor’s Note: Technology is becoming an integral part of the day-to-day business of sales reps. In this department, *First Impressions* will profile the latest developments in software and gadgets that reps can use for work and play.

**QUICKBYTES**

**One word: Encryption**

When your laptop is stolen, your personal information is accessible to anyone, even if you have a password, reports the *New York Times*. But you can protect your data with encryption. And it’s pretty easy, even for techno-Neanderthals. Some Windows 10 devices come with encryption turned on by default. If your Windows laptop doesn’t support Device Encryption, use Windows’ other built-in encryption tool, BitLocker. All modern Macs (since about 2003) have a feature called FileVault, which encrypts your entire system drive. But don’t lose the key you create. If bad guys can’t get into your computer without the key, you can’t either.

**Controlling hand tremors**

For people with hand tremors and irregular hand movements caused by Parkinson’s disease, essential tremor, spinal cord injuries, or just old age, using utensils can turn an enjoyable meal into a frustrating experience, reports Medgadget. Liftware (part of Alphabet’s life sciences research division) hopes to resolve that frustration. The company’s two products — Liftware Steady and Liftware Level — are both specialized eating utensils consisting of a handle and a detachable utensil head (available in soup spoon, normal spoon, fork, or spork options). Liftware Steady’s handle has an on-board computer that detects tremors and then...
adjusts the utensil head to move in the opposite direction, while Liftware Level has internal motors that can adjust its position to accommodate larger movements such as hand or arm twists. As a result, both devices keep their utensil heads level in the face of unintentional movements. Liftware was founded in 2010 and was acquired by Verily, Alphabet Inc.’s life sciences research division, in 2014.

**Hands-free camera**
This could get creepy, but if you’re a parent with young kids or grandkids, you might really go for it. Google introduced Google Clips ($250), a pretty tiny, hands-free camera designed to help you capture more spontaneous moments of kids, pets and others around you. That’s because the camera takes pictures on its own. That’s right, you don’t have to click a button (though you can if you want). Rather, you set the camera down; point it at, say, your two kids putting together Legos; and the camera decides when the scene gets interesting enough — or adorable enough — to capture in a short clip. Clips syncs wirelessly and in seconds from the camera to the Google Clips app for Android or iOS. Swipe to save or delete your clips, or choose an individual frame to save as a high-resolution still photo. Clips is said work best at home with family and friends, as the camera learns to recognize the faces of people that matter to you and snaps accordingly.

**A suitable smartphone**
You can spend $700 or $1000 on an Apple or Samsung smartphone, and you’ll get a great camera, vibrant display, frequent updates, maybe even facial recognition. But if you’re cheap, you can get a good phone for as low as $200, according to Wirecutter, a product review website owned by the New York Times. Wirecutter’s top budget phone is Motorola’s Moto G5 Plus ($230), which has a high-quality camera, a good 5.2-inch screen, a fast fingerprint sensor and plenty of storage. Huawei’s $200 Honor 7X has a better camera and bigger screen than the Moto G5 Plus, but it runs on an older version of the Android operating system, called Nougat. And if you’ve just gotta have an iPhone, Apple still sells the iPhone 6, which it introduced in 2015, for $450 (if through Apple).

**Smart deadbolts**
Door hardware maker Schlage® said that its Schlage Sense Smart Deadbolt was expected to work with Google Assistant this spring. With the Google Assistant on Google Home, users will be able to lock the door or check if the door is locked by saying, “OK Google, lock my door,” or “OK Google, is my door locked?” Beyond Google Home, users can also ask Google Assistant on an iOS or Android™ smartphone. This integration will come as an addition to the Schlage Sense Smart Deadbolt’s existing compatibility with Amazon Alexa®. Alternatively, users may choose to set up the Schlage Sense deadbolt with Apple HomeKit™ and use Siri® to command the deadbolt on their iPhone®, iPad® or iPod touch®.

**The smallest, slimmest charger**
WAFR — said to be the world’s smallest and slimmest wireless power bank and AC charger — uses Nano SD technology and interchangeable AC plug modules to charge users phones anywhere in the world. Compatible with all iPhones and Android devices, the device was expected to be sold at most major retail box stores and carriers this spring, including Apple, Best Buy, Target, Walmart, Costco, Verizon, AT&T, Sprint, T-Mobile, and US Cellular. The device is said to be ultra-slim (7mm) and can fit in a user’s shirt pocket.

**What’s the weather?**
AccuWeather for the Google Assistant is a new app said to make it easy to access weather forecasts as well as warnings using natural language commands. The app allows people to ask simple weather- and forecast-related questions, such as “Do I need an umbrella?” or “When will the snow stop?” It is available on all Google Assistant-enabled devices, including speakers like Google Home, Android phones, through the Google Assistant iPhone app, Apple TV, head-phones, and more.

**Custom athletes**
Medical technology firm Hologic is teaming up with the University of Minnesota to help coaches and professional trainers tailor athletes’ bodies to their specific sport or position, reports the Worcester Business Journal. The agreement has Hologic as the exclusive provider of Dexalytics, a Minnesota company borne out of research from the University of Minnesota, which offers cloud-based software to provide measurements beyond traditional data of body fat. Together with Hologic’s Horizon DXA system, the companies hope to be able to compare the body composition of athletes against predetermined sport and position-specific standards, helping trainers and medical professionals target their work and identify baseline body types when returning from injuries and understand how the human body changes over the course of a sports season.
Get some sleep
Getting insufficient sleep and working while fatigued have become commonplace in the modern 24/7 workforce, with more than 37 percent of workers sleep-deprived, according to the National Healthy Sleep Awareness Project. Sleepiness not only throws you off your game with customers, but it doesn’t mix well with driving. The National Transportation Safety Board estimates that fatigue has been a contributing factor in 20 percent of its investigations over the last two decades. And in February, the AAA Foundation for Traffic Safety released a research brief estimating that drowsy driving is involved in up to 9.5 percent of all motor vehicle crashes. Projections from the AAA Foundation indicate that drowsy driving causes an average of 328,000 motor vehicle accidents in the U.S. each year, including 6,400 fatal crashes.

Meditative lighting
Speaking of sleep, iHome says its Zenergy — a bedside sleep therapy machine — can help you sleep restfully and wake energized, reports Tribune News Service. The $100 device is designed with flame-free candles to deliver meditative lighting and sound therapy, like the natural sounds of the ocean, nature and storms.
Workout headphones
After testing 143 sets of headphones and considering an additional 90, Wirecutter calls the JLab Epic Sport the best pair of wireless workout headphones for most people. They are said to sound good, fit comfortably, stay out of your way during rigorous workouts, and offer 12-hour battery life. Wirecutter’s testing showed that these earbuds should withstand abuse, sweat, and moisture when used properly, plus they’re backed by a one-year warranty and responsive customer service.

Pelvic floor disorders
Experts estimate that one of every three women in the United States has a pelvic floor condition, which can lead to problems with bladder or bowel control, according to the National Institutes of Health. But because so many women don’t tell their doctor, the condition is probably much more common. Treatment options may include dietary changes, physical therapy, medications, medical devices, or surgery. NIH is funding studies to develop new and improved treatments. Lower your risk of pelvic floor issues by: 1) maintaining a healthy weight; 2) avoiding constipation and straining by getting enough fiber and fluids in your diet; 3) avoid tobacco smoke and triggers of a long-term cough; 4) do Kegel exercises regularly to keep pelvic floor muscles toned. Men can benefit from Kegel exercises as well.

AEDs work
Victims of cardiac arrest have a greater likelihood of survival when a bystander used an automated external defibrillator (67 percent) rather than wait for emergency medical services to shock the heart (43 percent), according to an NIH-funded study published in Circulation. In addition, people were more likely to survive with minimal disability after cardiac arrest (57 percent for AED from a bystander versus 33 percent for AED initiated by emergency medical services). The more time that elapsed before emergency medical services arrived, the larger the benefit of bystanders using an AED. “We estimate that about 1,700 lives are saved in the United States per year by bystanders using an AED,” Dr. Myron Weisfeldt of Johns Hopkins University is quoted as saying. A previous analysis of 2005 to 2009 data by the team found that about 500 additional lives could be saved each year in the U.S. and Canada if bystanders used AEDs. Because of increased availability of AEDs and their increased use by bystanders, an estimated 3,459 people having a cardiac arrest could be saved each year by bystander AED use.

Sickle cell investigation
Forty sites are participating in a National Institutes of Health-funded trial investigating a potential cure for sickle cell disease, reports the Atlanta Journal-Constitution. During a bone marrow transplantation procedure, which has proved successful with younger patients, the recipient undergoes chemotherapy to destroy their own bone marrow and ward off rejection. That’s then replaced intravenously with closely matched marrow from a healthy donor. The trial will enroll 200 patients between the ages of 15 and 40. About 60 will get a transplant, ideally from a closely matched sibling. The remaining participants for whom a suitable donor can’t be identified will go into a comparison group and receive the current standard of care for two years. The trial seeks to determine if bone marrow transplantation leads to better outcomes for older sickle cell patients. Approximately 100,000 Americans have the disease, according to NIH. Most are of African ancestry or identify themselves as black. About one in every 365 black children is born with sickle cell disease.

Diet quality, not quantity
A study published in the Journal of the American Medical Association found that people who cut back on added sugar, refined grains and highly processed foods while concentrating on eating plenty of vegetables and whole foods — without worrying about counting calories or limiting portion sizes — lost significant amounts of weight over the course of a year, reports The New York Times. The strategy worked for people whether they followed diets that were mostly low in fat or mostly low in carbohydrates. And their success did not appear to be influenced by their genetics or their insulin-response to carbohydrates, a finding that casts doubt on the increasingly popular idea that different diets should be recommended to people based on their DNA makeup or on their tolerance for carbs or fat. The research lends strong support to the notion that diet quality, not quantity, is what helps people lose and manage their weight most easily in the long run.
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