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## This Won't Hurt a Bit

### Dental Disease Tragedy

More than anything, people remember Deamonte Driver's smile. The 12-year-old Clinton, Maryland, boy would grin when he got to school, sometimes after working on cars with his granddad. He'd smile when he played football or made mischief with his classmates, even when he was nervous or scared. "He was just sunshine, and he would draw you in," says Laurie Norris, an attorney with the Public Justice Center in Baltimore, who worked for months to help Deamonte's mother, Alyce, find a dentist to treat her children.

But Deamonte and his family had little to smile about in early January, when he was admitted to Southern Maryland Hospital Center with a severe headache. After two surgeries, doctors had diagnosed a brain infection and removed its source: **an abscessed tooth**. For weeks afterward, Deamonte seemed to be on the mend, working with physical and occupational therapists to regain full use of his right arm and leg, which the brain infection and surgery had impaired. But on February 25, the infection struck again. By the time Alyce Driver made it to the hospital early that morning, her son was gone.

"I don't think anyone would have imagined that in 2007 we'd have children who would die of dental disease in the United States," says Kathleen Roth, DDS, president of the [American Dental Association](#). Deamonte had no obvious symptoms until the headache that sent him to the emergency room, but it's clear he died in large part because he didn't regularly see a dentist, who could have caught his tooth infection before it spread. Basic dental care would also have helped Deamonte's ten-year-old brother, DaShawn, who needed six teeth pulled and suffered from painful, oozing sores that made his cheek swell.

At the time, Alyce Driver had five boys, no job (although she was training for construction work) and little money. When she got in touch with Norris, she had been trying for months to find a dentist who accepted Medicaid to treat her children.

### Oral Health and Your Body

While Deamonte's tragic death is a rare case, dental disease in America is not. Untreated tooth decay in preschoolers has actually risen since the early 1990s, according to an April report from the U.S. Centers for Disease Control and Prevention. Nine in ten Americans have tooth decay, and one in 20 middle-aged adults and one in four adults over 60 have no teeth at all.

There's mounting evidence that your oral health affects your entire body. The millions of Americans with periodontal disease may have a higher risk of heart disease, diabetes, lung infections and preterm births. Recent studies have shown a link between periodontal disease and pancreatic cancer. And infected teeth and gums left untreated can lead to

dangerous, even life-threatening infections of the neck, blood, lungs and brain, like the one Deamonte had.

It's clear that "without oral health, you're not healthy," says Lawrence Tabak, DDS, director of the National Institute of Dental and Craniofacial Research.

Prevention is the cheapest and best way to avoid problems, of course. But luckily, improving your dental health improves your overall health too. Researchers reported in *The New England Journal of Medicine* this year that treating advanced gum disease lowered blood pressure, thereby reducing the risk of heart disease. And now a wave of technological innovation is making dental treatment safer, faster and more comfortable than ever before.

## **Stopping Cavities Before They Start**

A decade ago, most dentists looked for cavities, and when they found one, they filled it. But "replacing the tooth structure with a filling is never as good as your own tooth structure," says Domenick Zero, DDS, director of the Oral Health Research Institute at Indiana University School of Dentistry. Now dentists are starting to spot tooth decay early enough to stop cavities in their tracks. Several devices help. The most popular is Diagnodent (and the newer Diagnodent Pen, left). Marketed by KaVo Dental Corporation in Lake Zurich, Illinois, the instrument shines a tiny laser beam over a tooth's surface and detects the differences in reflected light between healthy and decaying enamel. But dental plaque and sealants can also trigger the device, which could lead to overtreatment.

In a few years, there may be a better detection method. A CAT scan-like technology called optical coherence tomography, now in the prototype stage, will create a holographic image of the entire mouth on a computer screen. Telltale tiny white dots on teeth signal microscopic pits in the enamel, which could be sealed or treated to prevent cavities and restore the natural teeth.

Soon dentists may also be able to kill tooth-decay bacteria harmlessly with a device by CurOzone that delivers a quick pulse of ozone. European dentists already use the device, known in the United States as HealOzone, but the FDA is reserving judgment until clinical trials prove its effectiveness.

Meanwhile, dentists can help prevent cavities by giving their patients prescription-strength, high-fluoride toothpaste that alters chemical conditions in saliva, providing minerals that help re-form and harden enamel. Fluoride varnishes may work as well, but the FDA has not yet approved them to treat tooth decay. Other popular products contain xylitol, a sugar substitute derived from birch bark, which starves the bugs that rot teeth. Xylitol is now available in candies, gums, mints and even wipes for babies' mouths. Clinical trials suggest, but do not prove, that it helps rebuild enamel.

## **Laser Improvements**

Lasers, too, can make visits to the dentist easier. Two types of soft-tissue lasers have been used since the early 1990s to minimize bleeding and infection during minor gum surgery. Hard-tissue lasers, which the FDA approved in 1997, can vaporize the damaged tooth tissue inside a cavity while leaving healthy tissue intact, thereby preserving more of the tooth than a dental drill can. And experimental lasers that can do still more are on the way, says Donald Coluzzi, DDS, of the University of California, San Francisco, past president of the Academy of Laser Dentistry.

One method, called Photo-Activated Disinfection (PAD), could help dentists treat periodontal disease by wiping out tissue-destroying bacteria in hard-to-reach tartar below the gum line. First, they would add a blue dye to the space between tooth and gum, which would make bacteria sensitive to light. Then they'd shine a red laser beam that leaves just one in 10,000 bugs standing. The British company Denfotex already markets this technology to prevent the recurrence of root canal infections. Dr. Coluzzi predicts that it will soon help periodontists save gum, teeth and bone—without surgery.

## **Broken Tooth Repair**

Few dental operations happen in a garage. But California race car engineer Craig Jull needed a new tooth fast. Jull and a team of mechanics were working with Jesse James, host of the Discovery Channel show *Monster Garage*, to pull off one of the show's trademark mechanical makeovers, converting a 1964 Lincoln Continental into an open-road racer. While Jull reshaped the car's body, a fast-spinning grinder caught his shirt, rode up to his face and snapped off an incisor. The team had just seven days to complete the car makeover, so Jull kept working, at one point calling his injury "a flesh wound" through a jack-o'-lantern smile.

On day six of the makeover, Gary Glasband, DDS, of Long Beach strode into the garage and snapped pictures of Jull's mouth with a small camera. Then he sat down in front of a piece of dental equipment that looked like a PC on wheels, tapped at a keyboard and scrutinized a three-dimensional image of Jull's broken tooth on the screen.

Within minutes, he had designed a crown that would fit Jull's broken tooth perfectly. Fifteen minutes after that, an attached milling unit had carved the crown out of a block of solid, tooth-colored ceramic. Dr. Glasband fine-tuned the shape, donned a mask and gloves, and glued the crown to Jull's tooth in less than a minute. The mechanic was good to go. The technology that Dr. Glasband used is called CEREC.

New ways to reattach teeth that have been broken, fractured or knocked loose mean that they can be saved more often and replaced more easily. Traditionally, dentists had just two options with a broken tooth like Jull's. They could reattach it if the patient had been lucky and smart enough to recover the broken tooth, stick it in milk or saliva, and hightail it to a dentist. More often, they would replace it with a temporary crown, then months later, a permanent crown.

Today, though, dentists can rebuild broken teeth in one visit, using composite, a hard plastic resin that contains minerals and re-creates the color and hardness of a real tooth. The quickest method might be the GlasSpan Single Use Trauma Kit, introduced last February, which uses braided glass fibers and plastic resin to splint a loose or broken tooth to its neighbors, allowing it to reattach. It takes a dentist less than ten minutes, compared with the two hours to secure a tooth the old-fashioned way, with orthodontic wire. Jonathan Scharf, DMD, the Exton, Pennsylvania, dentist who founded GlasSpan, has used the kit to help a seven-year-old girl whose four front teeth came loose when she fell face-first onto the pavement.

## Making Implants Easier

Implants are substitutes for tooth roots lost to decay or periodontal disease. Each is a titanium screw within a screw. The outer screw is implanted in the jawbone (the lower) or the maxilla (the upper). The inner screw supports a crown the way a post supports a mailbox.

Traditionally, dentists slice open gums, drill into bone and sometimes transplant bone (the patient's own, from another area, such as the hip; from a bone bank; or an artificial type) so there's enough on which to anchor the implant. Mini-implants such as IMTEC's MDI and Dentatus's Anew reduce the need for bone grafting, a painful, invasive procedure, because they're just half the diameter of full-size implants, or about the width of a wooden toothpick.

Another new method gives patients implants quickly, and with fewer office visits and less use of the scalpel. Until now, getting implants meant at least two surgeries and months of dental visits: one to screw the devices into bone; another, three months later, to take an impression for a denture; and another to surgically uncover the implants and fit the denture or crown. Nobel Biocare's widely advertised Teeth-in-an-Hour system, introduced in the United States in 2005, still requires several preliminary visits, but implants and dentures are placed the same day, sometimes within an hour.

That all sounded great to Hady Koraym, 47, of Baltimore. By the time Koraym, an electrical engineer, showed up at the University of Maryland Dental School, he had lost all but six of his teeth to advanced periodontal disease. At the Dental School, Debora Armellini, DDS, made a plaster replica of Koraym's mouth and used that to make a clear plastic replica of the denture he would end up wearing. Koraym then underwent a recently introduced type of dental CAT scan known as cone-beam computed tomography. This three-dimensional image of the patient's mouth is far more precise than traditional x-rays and reduces radiation exposure too.

Dr. Armellini sent the image to Nobel Biocare's Göteborg, Sweden, laboratories, where

technicians fashioned a plastic mold of Koraym's gum with precisely positioned holes to guide a surgeon's drill. Dr. Armellini and Liene Molly, DDS, installed Koraym's upper implants and teeth on February 22, and his lower implants and teeth a week later. For the first time in years, Koraym has a full mouth of functional teeth. "I look good, and I feel more confident," he says.

Some dentists worry that Teeth-in-an-Hour implants, which lack the initial three-month healing period of traditional implants, may not bond to bone well enough to keep them stable, says Eugene Antenucci, DDS, a spokesman for the Academy of General Dentistry. "The technology is not time proven, but the results seem to be very good," he adds.

## **Something to Smile About**

Implants help anchor crowns and bridges in the mouths of millions of Americans. But because gum disease erodes bone, there's often not enough left in which to place the implants. Dentists of the future may be able to grow the patient's own bone.

The FDA recently approved two compounds that stimulate bone to regrow: GEM 21S from BioMimetic Therapeutics in 2005 and Medtronic's Infuse Bone Graft in March. Soon dental implants may release their own growth factors to help build bone. Ulf Wikesjo, DMD, professor of periodontics at the Medical College of Georgia, and his collaborators at Wyeth Pharmaceuticals and Nobel Biocare have developed one such implant and are conducting a small clinical safety trial.

Could we grow our own teeth someday too? The National Institutes of Health is optimistic: This summer the agency launched a \$5 million effort to build a human tooth from scratch. Already scientists have made some significant advances. Last year, a team led by Songtao Shi, DDS, of the University of Southern California School of Dentistry used stem cells from human wisdom teeth to engineer a tooth root and ligament in the jawbone of a pig. Similar tissue-engineered roots could one day replace implants, and eventually scientists hope to grow replacement teeth we can use for a lifetime.

## **Better Living Through Dentistry**

Composite is just one of several materials that are providing patients with lifelike tooth replacements. All-porcelain crowns have been replacing older models that have metal underneath the porcelain, which often gives the crowns a grayish tone. The latest porcelain veneers—thin, custom-made false fronts—can cover up worn-down, chipped or discolored teeth to make them look better. Veneers typically require dentists to grind enamel from your tooth so it won't look too bulky, but Lumineers, introduced in 2005 by Den-Mat Corporation, are half the width of a regular veneer—thin enough to install without grinding.

Cosmetic products like Lumineers are exploding in popularity, and nearly 40 percent of general practices report a 15 percent growth in cosmetic dental procedures performed to

enhance smiles, such as porcelain veneers, bleaching and bonding. This means that surprising numbers of people are heading to the dentist not because they have to but because they want to. Who would have imagined that?