New treatments on the horizon should make a trip to the dentist less stressful

No More Drilling!

BY LISA FIELDS

DOROTHY SANFORD doesn't mind so much when her dentist says that she has a cavity, because there's no Novocaine injection or uncomfortable drilling in her future. Instead, Sanford's dentist uses a laser to painlessly remove decay and bond filling to her tooth. The cutting-edge procedure has made traditional fillings a faint, unpleasant memory for the 77-year-old Florida resident.

"It's like night and day, compared to the old experience," Sanford says. "There's no discomfort, and you're done before you know it. I think it's the wave of the future."

Dentists and researchers worldwide are striving to make minimally invasive dental procedures like this widely available. "We really hope we can change the dynamic for many patients, in terms of coming to the dentist," says Nigel Pitts, director of King's College London's Dental Innovation and Translation Centre. "The more we can do to take away injections and drills, the easier it is to fight the Victorian image of a torture chamber."

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Within a few years, your dentist may offer treatments like these:

Painless cavity treatments

Some patients have cavities treated by laser, like Sanford, but this isn't widely available yet. Lasers cost 30,000 euros, and dentists need special training.

"Not more than 5 to 10 percent of dentists across Europe use lasers for cavity preparation," says Andreas Moritz, president of the International Society for Oral Laser Applications. But this is changing. "The younger generation of dentists is coming up, and they feel convinced that this is a real benefit."

Ninety percent of patients who've had cavities filled by drill and laser prefer lasers. Dentists prefer them, too; they provide greater precision.

"The surface of the tooth drilled by laser is better than a conventionally etched cavity," says Moritz, who is also dean of the Medical University of Vienna's dentistry clinic. "You create a perfect surface for bonding without destroying structures within the tooth."

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Another minimally invasive treatment, which could reach patients within three years, is electrically accelerated and enhanced remineralization. Instead of drilling away decay, the procedure uses electrical current to painlessly "push" minerals into the tooth, which repairs damage, reversing decay without the need for fillings. Says Nigel Pitts, "We're putting back in the exact same minerals that came out, calcium and phosphate. We accelerate what nature does to rebuild that natural tooth enamel."

Healthier root canals

During traditional root canals, diseased pulp is surgically removed and an artificial substance is inserted. But researchers believe that they can get pulp to regenerate with stem cell injections. Such treatment is a decade away.

"We fill the root canal system with stem cells, usually carried by some kind of scaffolding materials," says George Huang, director of bioscience research at The University of Tennessee Health Science Center. "What we learned from larger animal studies is the pulp tissue will regenerate in a matter of a few months. The tooth is

going back to the original normal state with minimal filling on it."

Lasers can also aid root-canal treatments. "The wavelength of the laser beam is going into the root canal and killing the bacteria there," Moritz says. "No irrigant is able to reach this bacteria inside the root, but due to the physical properties of light, it's killing bacteria in the depths of the teeth."

Strengthening implant infrastructure

Dental implants have become popular in the past decade, outpacing dentures. Researchers are working to help implants stay better-anchored to the jaw.

"New materials to prevent bone resorption and/or to augment missing bone will be the focus of the industry," says Christian Berger, president of the European Association of Dental Implantologists in Bonn, Germany.

Nanotechnology is one possible solution. Researchers at UCLA have found that nanodiamond particles (tiny diamond bits that are imperceptible to the naked eye) can improve bone growth around implants. They may be introduced by injection or oral rinse, rather than surgery.

Occasionally, dentists use 3D printer technology to create custom implants. This may become a trend in the future. "3D printer technology might play a role," Berger says, "but superior materials have to be invented which allow us to produce the complete restoration by 3D printing."

> ***"The wavelength of the laser beam is going into the root canal and killing bacteria there."***

Sometimes, extraction is necessary before implantation. Extraction will remain the same, but lasers may improve healing. "When you do the irrigation of the wound with lasers, then it's a very good healing, because you have an activation of the root healing," Moritz says.

Stem cell researchers are working to regenerate teeth, which could be used for implants.

"For regenerating the whole tooth, one approach is to implant a bioengineered tooth bud—transplant it in the mouth and have it erupt through the gum," Huang says. "The other possibility is to let the bioengineered tooth bud grow into a whole tooth elsewhere and then implant it into the jaw."

Reducing TMJ pain

Some people who clench their teeth develop TMJ, which causes jaw pain and headaches. Patients often seek help from dentists.

Researchers use Botox injections (which cause temporary paralysis) to immobilize problematic muscles. Only a handful of patients have received this treatment, but more could see Botox-inspired relief over time. "So far it's only used for extreme cases," says Jukka Meurman, president-elect of the International & American Associations for Dental Research. "My colleagues are quite optimistic that it really helps."

Lasers may improve TMJ pain, by removing tissue that causes discomfort. Doctors, more likely than dentists, would perform such a procedure, Moritz says.

Avoiding dental work

Although dental procedures are becoming kinder and gentler, it's best to avoid the dentist's chair (besides checkups) whenever possible. Good oral hygiene can help.

"All dental diseases can be easily prevented," says Meurman, head physician at Helsinki University Hospital's department of oral and maxillofacial diseases. "You brush your teeth, you floss your teeth, you eat sensibly, you won't get these diseases. If you forget brushing your teeth, you get the dental diseases."

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