

New Technologies in Dental Practice

Jay Garlitz, DMD
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My Presentation is available at www.gatordental.com

So don't worry about taking notes. Enjoy the presentation and go to the "For Professionals" section of my Web site to review the material.

What are new Technologies in Dental Practice?

A screenshot of a Google search results page for the query "new technologies in dental practice". The search bar shows the query and the search button. Below the search bar, there are several search results listed, including "COLLEGE OF DENTISTRY" and "New Technologies in Dental Practice". The page also shows a "Sponsored Links" section with "New Dental Practice" and "New Technologies".

What about Future Technologies in Dental Practice?

A screenshot of a Google search results page for the query "future technologies in dental practice". The search bar shows the query and the search button. Below the search bar, there are no search results displayed, and a message states "Your search - 'future technologies in dental practice' - did not match any documents." There are also suggestions provided, such as "Make sure all words are spelled correctly" and "Try different keywords".

A screenshot of a Google search results page for the query "new technologies in dentistry". The search bar shows the query and the search button. Below the search bar, there are several search results listed, including "Layers in Dentistry V", "New Technologies in Dentistry", and "BC Work - Futures - Occupational Profile". The page also shows a "Sponsored Links" section with "New Technologies".

Dentistry 2010 or Pulp Fiction?
Written by Jay H. Garlitz, D.M.D. (Consulting Editor) for "Today's PDA" March 1998

Dental Tech-Assistant
Hard to come by and highly valued, an important staff member. Bred of dental assistant workover in the last century, became a trained staff member in the last decade. Duties range from organizing data to being involved in interactive marketing. Hard to believe this auxiliary position did not exist when the millennium started. The Dental Profession has transformed into a high tech juggernaut while still maintaining the warm, compassionate character of it's past life. Effective dental techno-assistant team-members utilize their talents in allowing the dentist to benefit from a world with fingertip interaction while affording them the ability to concentrate on quality care for the patient.

The Patient
Television, printed media, mail service, computers and telephone technologies merged to create a megapolis of the digital age. Patients utilize electronic agents to search out their needs and desires. Information and access is their domain. Technologies that push information to the home multi-media center has replaced traditional advertising to a great extent. The plethora of programming choices in the entertainment realm has competitive from the interactive world of information access, which is equally cherished by the average citizen. Choosing a personal dentist can be as simple as evaluating the information provided by each office, while never leaving home. Multi-media accobales of each office fill the screen with words of comfort and knowledge, portraying the personality of each dentist. Total quality of care and marketing includes electronic support such as personalized answers to inquiries, patient education materials, home care instructions and at home consultations. Twelve years brings so much change to the dental landscape...

The Dental Landscape

Insurance modalities changed to processing and remuneration at the time of care, with instant information access obtained from this real time world. Payments and financing for care are handled immediately and by a key stroke. Universal data standards for charting and digital radiographic exchange exist, which includes data access of records including digital radiography from central storage sites. Traditional hampies and dental exist but are active microprocessor controlled devices. Laser use is common. Research in the areas of bio-technology, biomimetics, molecular biology, genetic engineering and nanotechnology has yielded practical treatments for many oral maladies. Implant dentistry includes implants from biologically derived sources. Prevention modalities dominate. Replacement therapy has provided the populace at high caries risk with a strain of non-cariogenic *Streptococcus Mutans* (no acid production). Dentists are very busy, even with these changes in the tools made available for use in practice of general dentistry.

The Practice of General Dentistry

The vast majority of dental care is still provided by general practitioners. Today's FDA and JADA reach the office in electronically interactive form. Continuing Education is a plethora of distance learning course choices, all available on your home or office Multimedia center. Dentists tend to share facilities to utilize expensive technologies efficiently. Each dentist has their own staff which works in shifts. This allows every patient the pleasure and of having a personal dentist with a traditional relationship, with the convenience of expanded hours. The dental team adapts to a schedule which varies, allowing them more flexibility in their personal lives. Record keeping is paperless, and smart. Clinical decision making software automatically makes suggestions. Clinical data collection is aided by electronic digital assistants. Entry is voice actuated by small hand held units which update the main office computer with wireless transfer. Even periodontal probing is accomplished digitally, with the use of force standardized electronic probes. Advances in computing power and digital radiography allows affordable three dimensional analysis of dental structures, including comparisons of decay and bone loss over time. Consultations are accomplished in the operatory. Getting to know patients well is no longer a problem for the specialists.

The Specialists

Complete access to all records allows specialists and their staff the ability to get to know their patient and relate to them on a level previously only possible between the patient and their primary provider. Oral surgeons, perio-dontists and prosthodontists utilize biomedically produced oral tissues, including tooth buds for implantation. Periodontists identify localized offending organisms by virtue of their DNA, and selectively target them. Endodontics has "smart" instrumentation and obturation, through canals negotiated and mechanically prepared by endodontists using digitally aided devices, microprocessor controlled heating of gutta purcha to fill a canal system scanned and. Pediatric dentists have better pain control, laser drills, bacterial replacement therapies and virtual dental education (brushing instructions) programs. Ortho-dontists benefit better diagnostic tools and from longitudinal evaluation of bone density changes and tooth movement, with more controlled force application.

Far-Fetched?

The purpose of this article is not to predict the future, but to pique your interest. Many of these changes are already underway and beginning to be available. Research in many of these areas is taking place at the College of Dentistry at the University of Florida. Dentistry as a career may evolve rapidly in a short period of time. The half-life of current dental knowledge and business practice may shorten as modern technology becomes an integral component of every day life. Hermit no longer, timid souls who avoided microprocessors may comply gladly as by 2010 barely any daily task allows segregation from the electronic world.

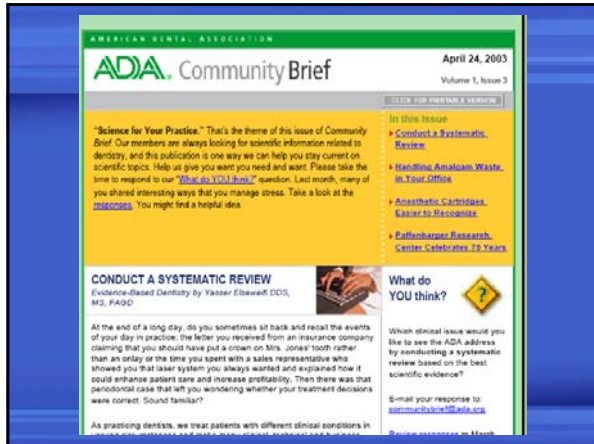
Why Use New Dental Technologies?

- Improve patient care
- Be more efficient or productive
- Enhance patient communication
- Gain patient confidence
- Maximize your quality of life
- and many more reasons...

Issues and Concerns

- Can the technology support it's cost of implementation?
- Will it viable for a period of time long enough to gain a ROI
- Wall St. or Madison Ave. driven?
- Does your office design require modification?
- Patient perception

So What's New?



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Where are these being developed?

- Seattle, Washington?
- Silicon Valley?
- Research Triangle, NC?
- Route 128 Boston?
- Gainesville-Alachua 441 Corridor, FL ?

ABSTRACT

ARTICLE 1

Why integration is key for dental office technology

TITUS K.L. SCHLEVER, D.M.D., Ph.D.

"The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it."
—Mark Weiser* (1982-1999), creator of the "ubiquitous"

Background. Information technology, or IT, devices and applications for dental practice have multiplied tremendously during the last two decades. While many of these innovations can bring significant benefits to clinical practice, integrating them into a smooth working environment is a significant challenge.

Methods. The author reviewed the level of integration of different IT-related products for dental practice and analyzed the consequences for work flow and ergonomics. He identified practical examples for different levels of integration among dental technology products.

Results. The integration of hardware devices and software applications in the

The last several decades have seen significant development of new technologies in dentistry. Information technology, or IT, has been a particular hotbed of innovation. The number of computer-based devices and functions in the dental office has skyrocketed.

As a result, the offices of many technology-minded dentists look like miniature technology parks. On the hardware side, computer workstations, network cables and the server infrastructure blanket the practice. Meanwhile, the clinical operator may have one or two computers to access the practice management system, a stand-alone computer-assisted design/computer-assisted manufacturing, or CAD/CAM, device; an intraoral camera; digital radiology equipment; and any number of specialized devices (for example, caries detection sensors [such as DIAGNOdent, KaVo America, Lake Zurich, Ill.] and computerized periodontal probes [such as the Florida Probe, Florida Probe Corp., Gainesville, Fla.]). On the software side, things are similar. Many dentists use several programs for practice

The screenshot shows the Florida Probe website with a navigation bar at the top containing links for 'What's New', 'Products', 'Request a Quote', 'Technical Support', 'Publications', and 'Probe Integration'. The main content area features several news items with dates and headlines, such as '07/01/04 - New Extended Warranty!', '03/01/04 - New Feedback Design with "Think Buttons"', and '12/14/04 - Free New Informational CD-ROM available!'. There is also a 'Product Registration' section and a search bar.

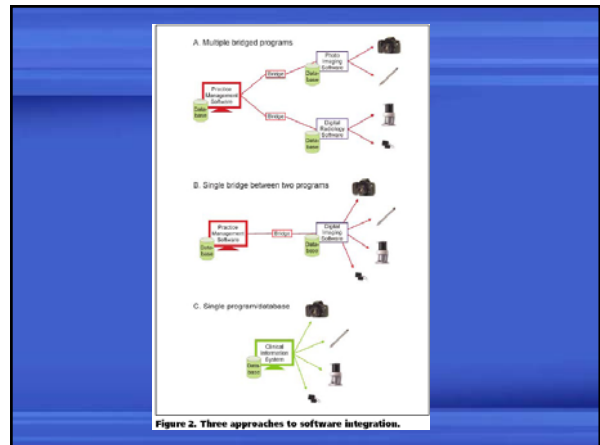


Figure 2. Three approaches to software integration.

Each program is connected to the main practice management system, or PMS, with a software bridge. In practice, the bridge has only two functions: to allow the user to start or switch to the imaging application from the PMS (usually by pressing a button or choosing a menu item), and to permit the imaging application to display the same patient record as the PMS. This system involves a multitude of databases and user interfaces, and thus increases the chance of failures and/or incompatibilities, as well as the cognitive overhead for the user. Part B of Figure 2 illustrates the most common approach to software integration between PMSs and imaging applications today. The PMS connects to a single imaging application, which manages images from all types of imaging devices. Many imaging applications, such as CDR (Schick Technologies, Long Island City, N.Y.), DentalEye (DentalEye AB, Spanga, Sweden) and ViperSoft, employ this approach. While the potential problems and inefficiencies are fewer than those associated with the first approach, they are not eliminated. Part C shows the optimal approach, which maintains

all information in a single clinical information system using one database. Few dental software applications on the market have implemented this model. Both the Dentrix Digital Office (Figure 3) and EagleSoft (Patterson Dental) are exceptions. Both programs use a single database for all patient data, including free text, numbers, dates and images.

Task-oriented information integration. The last type of integration to be discussed here, task-oriented information integration, still is quite rare and is a near-term challenge for the dental IT industry. Task-oriented information integration begins with three seemingly simple questions:

- What information is needed to complete a particular task?
- How should the information display be designed?
- How should computer-based functions support completing the particular task?

Most software is designed by programmers or engineers, who typically do not apply a philosophy

THE OUTLOOK FOR INTEGRATION

As this article has shown, integration in dental practice is extremely important, but also very difficult to accomplish. The number and variety of devices, components and software applications makes the dental operator a complex environment. Useful integration will occur only with significant investments in research and development by the dental industry as a whole. However, the payoff is significant. Integration not only increases efficiency, but also has the potential to improve patient outcomes. When dentists spend less time on making their "technology park" work, they will have more time to focus on what is really important: improving the oral and general health of their patients. The good news is that several large dental companies have begun to focus on integration as a key objective of their research and development efforts. But collectively we are at only the beginning of the road to full integration.

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The proximal surface disposable mouthpiece is placed over the tooth in question allowing light to be shined from one surface, through the tooth, and captured on the opposite side using a camera in the DIFOTI handpiece.

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NYTimes.com » Health

Bacteria Enlisted for New Trials on Dental Health

By ANDREW POLLACK
Published November 30, 2004

Can genetically engineered bacteria prevent tooth decay? A small biotechnology company is about to take the first step toward answering that question.

The company, Oragenics, is expected to announce today that it has received permission from the Food and Drug Administration to conduct the first clinical trial in which genetically modified bacteria will be put into people's mouths.

The new bacteria, which are genetically neutered so they do not make the acid that eats away at teeth, would be designed to replace the acid-producing bacteria already present in most mouths.

"The idea is simply to use good bacteria to fight bad bacteria," said Jeffrey D. Hillman, the chief scientific officer at Oragenics, based in Alachua, Fla.

Dr. Hillman says that if it all works as planned, people might eventually receive a single painless five-minute treatment, in which a dentist would rub the bacteria on their teeth, and

At top, the teeth of a rat on a high sugar diet. The tooth in the bottom panel have received therapy.

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Probiotics Technology

Background: Probiotics employ naturally occurring bacteria to confer a health benefit when administered in adequate amounts. Probiotics are widely accepted in Japan and Europe and acceptance in the United States is growing. The users of yogurt containing live Lactobacillus cultures to promote digestive health, remove odors, support vaginal and urinary tract health are examples of common probiotic applications. Dr. Helman has capitalized on his extensive research to create a probiotic product that is believed to maintain dental and periodontal health. We filed a patent application for this technology in August of 2003. Organics owns the patent rights to this technology.

Technical Background: We have identified three natural strains of bacteria that, when consumed in a single mixture, can be employed as a probiotic product for the maintenance of dental and periodontal (gum) health. Our laboratory and animal studies have demonstrated the ability of these organisms to maintain a healthy oral environment by creating a healthy balance of oral bacteria, including a reduction in the numbers of bacteria that are the causative agents of periodontal disease and tooth decay.

Pre-Clinical Studies: Our research has shown that certain types of natural bacteria naturally present in dental plaque can prevent the growth of bacteria that are widely believed to be responsible for periodontal disease. The beneficial bacteria are called *Streptococcus oralis* and *Streptococcus sobrius*. These bacteria have been shown to inhibit the growth of disease-causing bacteria both in the laboratory and in animal models of infection. Analysis of data from a number of laboratories indicates that the presence of *S. oralis* and *S. sobrius* promoted a good indication of the health of the gums, when these bacteria are absent from sites in the gums, the sites are much more prone to disease. In order to maintain a healthy balance of bacteria in the gums, Organics plans to produce a probiotic product that contains a mixture of *S. oralis* and *S. sobrius*.

Most human tooth decay has been shown to be caused by *Streptococcus mutans* that has an affinity to adhere to tooth surfaces and convert sugar in their diet to lactic acid. The lactic acid erodes the mineral in enamel and dentin, weakening the tooth and ultimately resulting in decay. Our research has led to the discovery of a particular strain of *Streptococcus mutans* that is naturally deficient in its ability to produce lactic acid and cause tooth decay. Because *Streptococcus mutans* is very closely related to *S. mutans*, we hypothesized that teeth treated with this beneficial strain could significantly reduce the numbers of tooth decay causing *S. mutans* competing for nutrients and attachment sites on the tooth surface. This hypothesis has been tested in laboratory animals and was confirmed. Therefore, the Organics' products will contain a mixture of three natural bacteria that include lactic acid deficient *Streptococcus mutans* strain for the maintenance of dental

Technology to mimic Mother Nature
Researchers look to tap into a whole world of possibilities

By Ian Howard Wilson, Globe Correspondent | August 22, 2005

If imitation is the sincerest form of flattery, then Mother Nature is smiling broadly. The science of imitating nature — an approach called biomimetics — is reaching out in deeper and more varied ways that ultimately seek to improve current technologies or create completely new ones.

Biomimetics work includes copying lab-grown tissue inspired by the real thing into the body to fix organs, and building robots that process information more like humans do, in order to better identify objects.

Scientists also attempt to lift processes from the human body, such as how it heals itself, and introduce these processes into man-made objects. Think of self-healing T-shirts that would put the TV repairer out of business.

Biomimetics, or the mimicking of biological processes, is nothing new. The Eiffel Tower is a famous example. Its base is said to have been inspired by the load-carrying ability of the femur bone. And Velcro? It was inspired by the sticky hooked portion of plant burrs. These well-known man-made objects took their inspiration from nature.

But now the approach is being shunk, taking advantage of the explosion in the understanding and tools of biomolecular science and the interchange of varied disciplines such as engineering, biology, computer science, and chemistry. Researchers are better able to understand what is happening in nature at the micro and nano levels, and to copy these processes for specific uses.

"There has been tremendous hope in using nature as an inspiration," said Paul Popopol, a partner with Altus Venture, a technology and life sciences venture capital firm in Waltham. "The question is figuring out how real the application is. The concept is a very good one."

The idea, explained Gordon Vajkai-Nawroth, associate director of the Tissue Engineering Resource Center, operated by Tufts University and MIT, is to lift ideas from nature.

You work in a circle. Lift a recipe, find out how well you have mimicked nature, go back and tweak the recipe again and again until you have something that works, she said.

For Vajkai-Nawroth, a tissue engineer who is also a biomimetic engineering professor at Columbia University, a main focus is trying to replicate the environment found inside a human heart in order to coax cells into growing into heart muscle. Through collaborations with companies, she hopes to develop a heart patch that could be laid

Civil and Genetic Approaches To Enamel Biomimetics

Granting Organization: National Institute of Dental and Craniofacial Research
Grant Dates: 01/09 to 03/09/2003
Grant No.: 5R01DE13045-02
Funding: Unrestricted
Principal Investigator: Malcolm L. Dewald, D.D.S., Ph.D.
Study Professor:
Department: Basic Sciences
Phone: (212) 462-3278
Fax: (212) 462-2981
Email: mdewald@ninds.nih.gov
URL: <http://www.ninds.nih.gov/funding/craniofacial/>
Home: CDA 140 1507

Abstract: Teeth are tissue composites in which each tissue performs a unique matrix whose protein composition is developmentally distinct from one another. The outer covering of teeth is a highly ordered, acellular bioceramic called enamel. Enamel is built upon dentin, a cellular but disordered bio-tissue.

We predict that hierarchical gene expression for dental proteins results in a sequential hierarchy. In this application we will require information about enamel structural hierarchy needed to produce an enamel biomimetic. The proteins template dentin for subsequent phases will be analyzed in vitro using recombinant proteins to create proteins. The unique identifier between enamel and dentin, the dentin enamel junction (DEJ), plays a role in both as the homeostatic interface of the tooth. Presently there is a paucity of information about DEJ development, the proteins contributing to formation and the organization of these proteins yielding an interface between materials of such disparate hierarchical properties.

To produce an enamel biomimetic requires the ability to recapitulate the DEJ. We will test the hypothesis that DEJ formation is dependent upon the expression of specific genes encoding structural proteins that redesign structure of the

Dentigenix bringing biology to dentistry

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Dentigenix Inc. is engaged in the discovery and development of therapies to regenerate dental tissue. The company is a wholly-owned subsidiary of Qualcor-Vivadent, Inc. the world's leading manufacturer of quality dental products.

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 Agreement with Boston Biomedical Institute could lead to commercialization of a method for regenerating teeth from an individual's own cells. See implications for future of dentistry and medical industries.

Dentigenix' whole tooth regeneration program intends to grow new permanent natural teeth as alternatives for conventional prosthetic devices such as dentures and dental implants.

In the United States, Europe and Japan, over 200 million people have some form of edentulism (missing one or more teeth) that could benefit from dental reconstructive implant therapy. In the United States alone, approximately 200,000 dental reconstructive implant procedures are performed on an annual basis. While dental implants can be an effective cosmetic solution, there are limitations to the size of patient population that are eligible for artificial implants. Dental implants require sufficient amounts of residual high quality bone that may not be available. As a rigid synthetic device, dental implants do not function in the same way that natural teeth do. Dentigenix has found that many dental implant patients, given a choice, would prefer a natural regenerated tooth over artificial dental implants available today.

Dentigenix' whole tooth regeneration approach will be based on the intellectual property that the Company currently licenses from various institutions. Dentigenix is the exclusive licensee for whole tooth intellectual property developed at The Forsyth Institute, Massachusetts General Hospital, and Harvard University. The Company expects that its technology platform will lead to the development of a groundbreaking whole tooth regeneration process that would dramatically change the current clinical landscape in dentistry.

Press Release
Regenerated Tooth Technology

...granted an exclusive option by three Boston biomedical institutions: **The Forsyth Institute Harvard School of Dental Medicine (HSDM) / Harvard Medical School (HMS) Massachusetts General Hospital (MGH)** to further the development of a technology that could lead to commercialization of a method for regenerating teeth from an individual's own cells."

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 NovaBone Products, LLC
 NovaBone® - Resorbable Bone Graft Substitute

JUL 25 2002

510(k) Summary 4/24/02
NovaBone® - Resorbable Bone Graft Substitute

1. Submitter Information:
 Name: NovaBone Products, LLC
 Address: One Progress Boulevard, #33
 Alachua, FL 32615
 Telephone: (386) 462-7660
 Facsimile: (386) 418-1636
 Contact: David M. Gaiser

2. Name of Device:
 Trade Name: NovaBone – Resorbable Bone Graft Substitute
 Common Name: Osteoconductive Bone Void Filler
 Synthetic Resorbable Bone Graft Material

KOR1336
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NOVABONE
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510(k) Summary
PerioGlas - Bioglass Bone Graft Particulate

02/03/04

1. Submitter Information:
Name: NovaBone Products, LLC
Address: 13709 Progress Boulevard, #33
Alachua, FL 32615
(352) 462-7660
Telephone: (352) 418-1636
Facsimile: David M. Gaisser
Contact:

2. Name of Device:
Trade Name: PerioGlas - Bioglass Bone Graft Particulate
Common Name: Osteoconductive Bone Void Filler
Synthetic Resorbable Bone Graft Material

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RTI News

April 26, 2005
RTI Closes On Private Placement Of 2.8 Million Shares

RTI announced that it has completed a private placement of its common stock with a group of accredited investors. Pacific Growth Equities, LLC acted as the placement agent for the transaction.

allografts: human bone, tendon, ligament, skin, heart valve) takes from one person to transplant into another.

autografts: animal-derived tissue (venise or protein) that is transplanted to a human recipient.

Regeneration Technologies, Inc., a leader in science and safety, processes and sterilizes human tissue into allograft implants for orthopedic, oral maxillofacial, urinary and cardiovascular surgeries. Allograft implants can be easily used to repair and promote the healing of a wide variety of bone and other tissue defects.

RTI's innovations continuously raise the bar of science and safety in the allograft industry - from being the first company to offer pre-processed bone implants for spinal surgeries, to inventing the BioCleanse™

Regeneration
TECHNOLOGIES, INC.

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Allografts: Oral/Dental Allografts: Demineralized Bone Matrix

REGENAFIL™ RT Allograft Paste

Used to fill small gaps in bones of the maxillofacial area.

REGENAFORM™ Allograft Paste

Regenaform paste can be moulded into unique shapes and packed into larger maxillofacial bone gaps.

REGENAFORM™ RT Allograft Paste

Regenaform paste can be moulded into unique shapes and packed into larger maxillofacial bone gaps.

Imaging Sciences

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In the News

LCAT Breaks Barriers
LCAT Design Innovations
Nucleation and new application software for the LCAT.

LCAT on NBC Nightwatch
"Imaging Innovator - LCAT was recently featured on the NBC evening news 'HealthWatch' segment and presented to over 40 news stations nationwide."

Executive Order
New Technology System
Reduces Scan Radiation Than Traditional Systems.

Medical Imaging
Imaging Sciences International and Video Medical Systems, Inc. come to terms on a two-year agreement.

Orthodontic Products
"Compact Tomography System"

Click here for more news coverage

Imaging Sciences Inc.
2700 North Point Blvd.

LCAT Cone Beam 3-D Dental Imaging System

Reduce costs while delivering better results

Imaging Sciences International
The technology and design of the LCAT puts advanced in-office imaging within the realm of an expanding universe of practices. Those that want to place themselves at the center of patient care by providing a full continuum of services from diagnosis to treatment.

Please view [LCAT in 3 EyeWitness News](#) and view coverage in [S&P's](#) [C.R. ADC News](#)

The LCAT's **Cone Beam 3-D Dental Imaging System** provides high-definition, digital imaging at reduced cost with less radiation to the patient and a total scan time of only 20 seconds. The LCAT's computer controlled software delivers quick & easy reconstruction of critical anatomical information typically in under 1 minute. Please review the [LCAT™ 3-D Imaging System](#) and [LCAT Product Lines](#).

It's small footprint and ergonomic design allows practices to adjust

D4D
Dental Technologies

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Leading Technology Development

- 3D Digitizing & Modeling
- Advanced Laser Optics
- Precision Milling

TECHNOLOGY SPOTLIGHT

The Evolution4D Dental Office System combines the IntraOral Digitizer and the Design Center software to create a powerful chairside dental CAD/CAM system.

We are D4D Technologies, a leading edge technology development company that is redefining 3D digitizing, optics, and precision milling. It is our mission to be the leading provider of innovative, customer driven, digital dental technologies. It is our goal to revolutionize the dental industry through a suite of paradigm-shifting technologies.

By leveraging our advances in 3D digitizing, optics, software, and precision milling, we have created CAD/CAM technology that aims to revolutionize the way dentists and laboratories fabricate crowns and bridges. The Company's flagship product, the Evolution4D, provides customers with the greatest accuracy, versatility, ease of use, and time savings with decreased costs and increased profitability.

Our core value proposition is to provide products that significantly increase dental professionals' revenues, productivity and patient satisfaction.

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