

# digital

international magazine of digital dentistry

## research

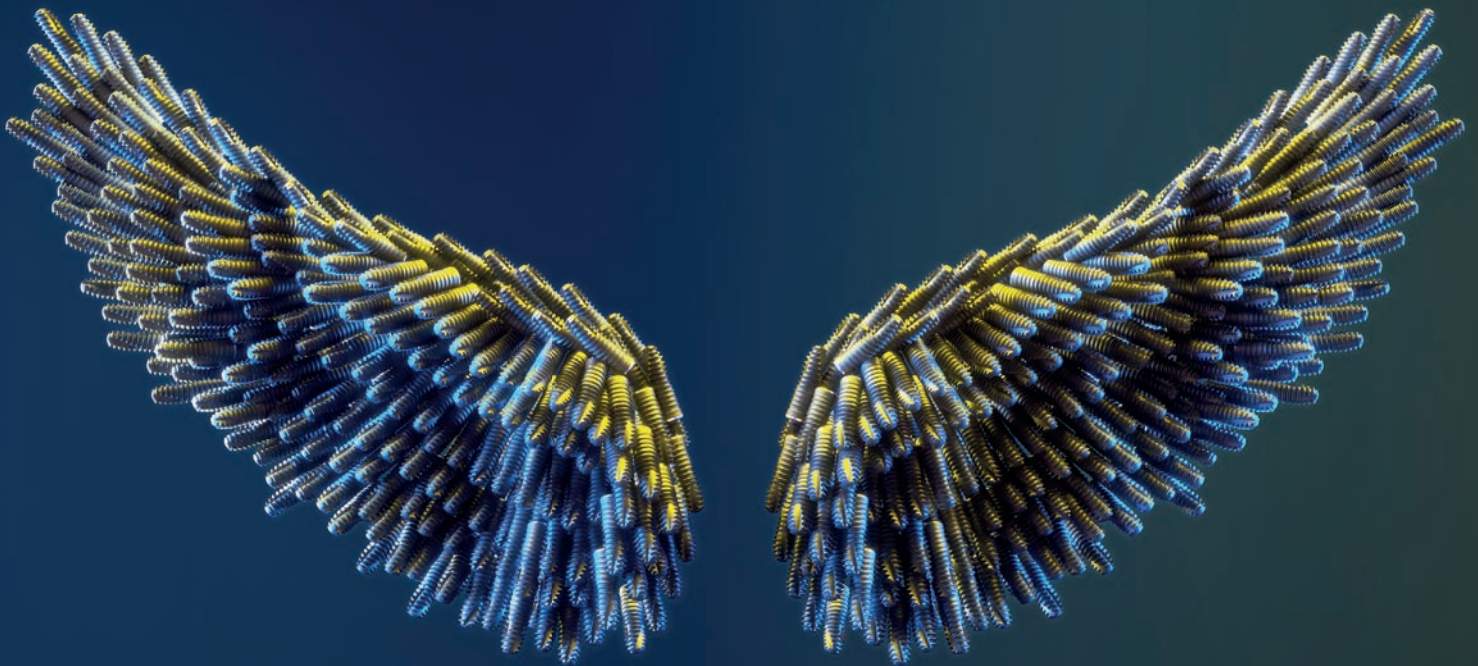
Immediate or delayed loading  
in the fully edentulous maxilla

## case report

An aesthetic, minimally invasive restoration  
using a fully digital workflow

## opinion

How to master intra-oral scanning



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Dr Scott D. Ganz

Editor-in-Chief



## Have you noticed?

**Have you noticed** changes in your everyday world since the pandemic? Has the practice of dentistry changed in your region of the world? Have you instituted new protocols for safety or sterilisation or added additional protective equipment for patients and staff? Have you taken extra continuing education courses which deal specifically with pandemic-related issues?

The pandemic has had a great impact on the world of dentistry, and it appears that the actual impact differs greatly depending on where you practise. One area that has affected many in the US is the hiring of employees, including front desk personnel, dental assistants, dental hygienists and dental laboratory technicians. This may hold true for urban or suburban areas, where finding the right employee at the right salary can be a difficult task. In many instances, staff will require specific training to learn new skills or to enhance existing ones. This training is an investment for the practice.

When there is a shortage of staffing, all aspects of the clinical practice can be affected, and perhaps we have overlooked the impact on the digital workflows that now play a major role in the treatment of patients. When we think of the current digital workflow for any type of dental practice, who is responsible for completing the necessary tasks? Who has been designated for taking

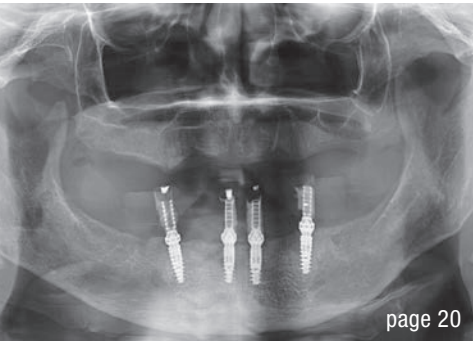
intra-oral scans, CBCT scans and digital radiographs and for managing the resin tanks for the 3D printer? Usually, it is not the clinician but one of the trained staff.

Is this a serious problem? Ask Dr Roger Levin, one of the most well-known practice management consultants. In an article published in February in *Dental Economics*, he was quoted as stating: "It's no secret that dentistry has been dealing with an unprecedented staffing shortage for the past several years, and its effect has been widespread." "For the first time in dental history," said Dr Levin, "we are noting numerous practices that have lower production and revenue because they cannot properly staff or hire skilled staff members."

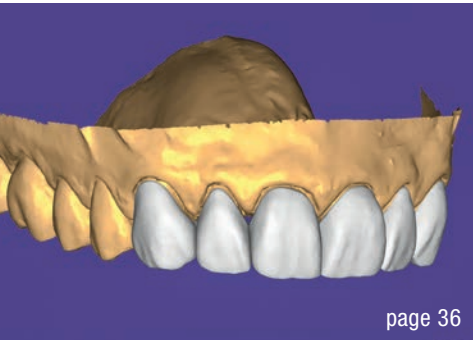
While we at Dental Tribune International continue to present state-of-the-art procedures, protocols and digital technology within our pages, we must also be aware of what is happening within our chosen industry which may have a direct impact on maintaining high standards of patient care and overall practice success. Please enjoy the latest issue of **digital**. We welcome your comments.

Respectfully submitted,

Dr Scott D. Ganz  
Editor-in-Chief



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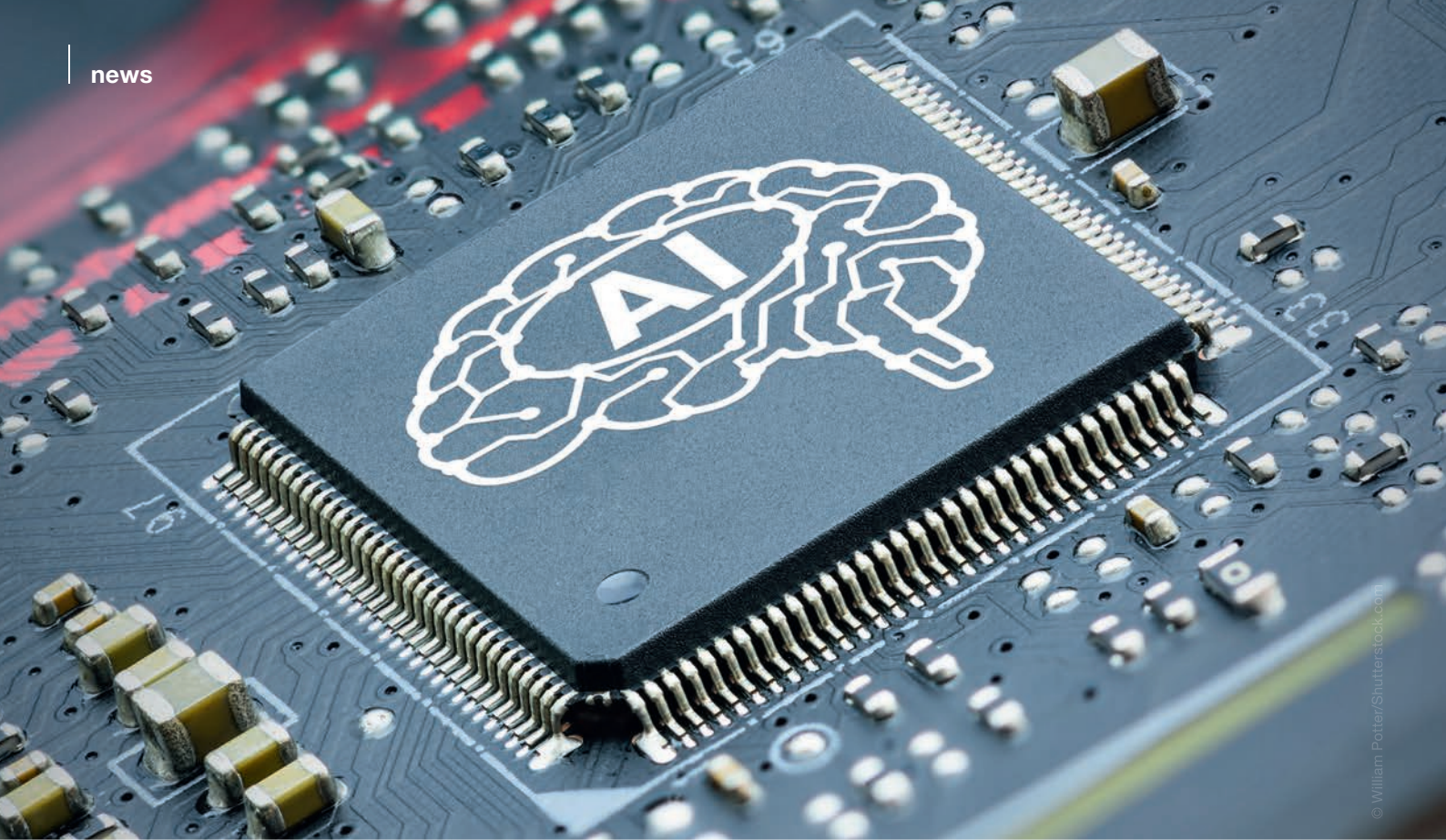


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# Researchers developing novel AI platform for dental disease identification

By Iveta Ramonaite, *Dental Tribune International*

**Dental disease identification** is often cumbersome and time-consuming. To assist dental professionals in better detecting dental problems, researchers in the UK are currently developing an artificial intelligence (AI) model for the recognition of dental abnormalities in anatomical structures.

The project aims to provide a comprehensive solution for collecting and annotating dental radiographs and has recently received £1.55 million (€1.79 million) in grant funding from the National Institute for Health and Care Research.

The project is being led by the University of Surrey in partnership with King's College London, Royal Surrey NHS Foundation Trust and the Oral Health Foundation. Discussing its relevance, Dr Yunpeng Li, one of the two project leads and a senior lecturer in AI at the University of Surrey, commented in a press release: "The technology could save valuable time and money if rolled out more

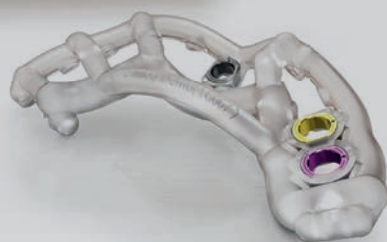
widely, enabling dentists to have abnormalities pop up in front of them and read radiograms with higher accuracy."

"This next phase of the project is incredibly exciting as we work collaboratively to build a working prototype suitable for real-life clinical settings. Efforts so far have included gathering a representative set of annotated radiograms and training a custom-built AI model on dental disease detection. We look forward to comprehensive outcomes over the next few years," he added.

To be trusted by dental professionals as a reliable tool, the system first needs to achieve a high degree of accuracy. Dr Owen Addison, professor of oral rehabilitation at King's College London and the joint project lead, noted: "AI systems that support more accurate diagnosis and clinical decision-making will help patients, but they must be trustworthy. We look forward to supporting this project by providing dental expertise and consideration of the needs of end users."

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[1] Semper-Hogg, W, Kraft, S, Stiller, S et al. Analytical and experimental position stability of the abutment in different dental implant systems with a conical implant-abutment connection Clin Oral Invest (2013) 17: 1017  
[2] Semper Hogg W, Zulauf K, Mehrhof J, Nelson K. The influence of torque tightening on the position stability of the abutment in conical implant-abutment connections. Int J Prosthodont 2015;28:538-41

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# Tracking periodontal disease with electronic dental records may enhance diagnosis and treatment

By Franziska Beier, Dental Tribune International

**Despite advances** in periodontal disease research and treatments, it remains a growing health issue in the US. To address this topic, researchers from Regenstrief Institute and the Indiana University School of Dentistry in Indianapolis have developed algorithms to track periodontal disease changes through electronic dental records. This method could help dental professionals follow disease progression and diagnose the disease early—when it is potentially still reversible—and thereby reduce the risk of other systemic diseases associated with periodontal disease.

For their study, the researchers used data on 28,908 patients who had received a comprehensive oral evaluation at the dental school's clinics between 2009 and 2014. They developed two algorithms to extract periodontal disease-related information from the patients' electronic dental records and to classify them into three groups—patients with disease progression, patients with disease improvement and patients with no disease change. The algorithms were applied to the 15 years of electronic dental record data to generate the final patient cohorts. Both algorithms showed a high accuracy of 98%, and they have been made publicly available for use by other researchers.

"Gum disease, which is typically underdiagnosed, is reversible if caught at an early stage before it has affected underlying structures and adversely impacted tooth support. Enabling dentists to track the disease using both the information in clinical notes and the periodontal charting data contained in a patient's electronic dental record can enable diagnosis and hope," said co-author Dr Thankam Thyvalikakath, head of the institutions' joint Dental Informatics programme, in a press release.

She added: "We are here to develop and establish a culture of documenting and diagnosing cases in a structured manner as is done in medicine."

The high usage of electronic dental record systems to document patient care information provides a significant opportunity to study the clinical course of periodontal disease and the influence of risk factors. "I think the advantage of our approaches is that, using routinely collected data, we can automate and monitor gum disease treatments and changes that are visible only clinically, so we can catch gum disease at an early, potentially reversible, stage. This contrasts with other approaches that leverage only radiographs, which only show advanced gum disease," said Dr Thyvalikakath.

The authors concluded that their study demonstrated the viability of using longitudinal electronic dental record data to track periodontal disease changes and that their algorithms were successful in classifying the three different patient cohorts using the data. This approach can be used to study the clinical course of periodontal disease using artificial intelligence, including machine learning methods.

In addition, Dr Thyvalikakath commented on the importance of tracking periodontal disease for an interdisciplinary treatment approach: "There is a bidirectional relationship between certain risk factors and gum disease. For example, having diabetes increases risk of periodontal disease and having periodontal disease negatively affects the course of diabetes. A similar relationship exists between cardiovascular disease and periodontal disease. Recognising, monitoring, and treating gum disease is an important part of overall patient health."

*Editorial note: The study, titled "Developing automated computer algorithms to track periodontal disease change from longitudinal electronic dental records", was published on 8 March 2023 in the special issue Advances in Biomedical and Dental Diagnostics Using Artificial Intelligence of Diagnostics.*



# Study uses artificial intelligence for gingivitis detection

By Iveta Ramonaite, Dental Tribune International

The applications of artificial intelligence (AI) in dentistry have been widely explored in recent years. However, a recent study is one of the first to employ AI to detect gingivitis, enabling monitoring of the effectiveness of patients' plaque control. The technology has the potential for improving the early detection and prevention of oral and systemic diseases associated with periodontal disease.

In the study, the researchers trained and tested a novel AI model on a data set of over 567 intra-oral photographs of gingiva with varying degrees of inflammation. They found that the AI algorithm can accurately (>90%) analyse patients' intra-oral photographs to detect signs of inflammation, such as redness, swelling and bleeding along the gingival margin.

Lead researcher Dr Walter Yu-Hang Lam, a clinical assistant professor in prosthodontics at the University of Hong Kong, commented: "Many patients [...] only seek dentists to alleviate

pain when their teeth are at the end stage of dental disease, in which tooth loss is inevitable, and only expensive rehabilitative treatments are available."

According to Dr Reinhard Chun-Wang Chau, a clinical research coordinator in restorative dental sciences at the University of Hong Kong, using intra-oral photographs in conjunction with AI technology could allow patients to see which areas they had not cleaned well and seek dental care earlier.

The researchers now plan to make the technology accessible to elderly and underserved communities to improve their oral health outcomes and reduce healthcare disparities.

*Editorial note: The study, titled "Accuracy of artificial intelligence-based photographic detection of gingivitis", was published on 26 April 2023 in the International Dental Journal, ahead of inclusion in an issue.*

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