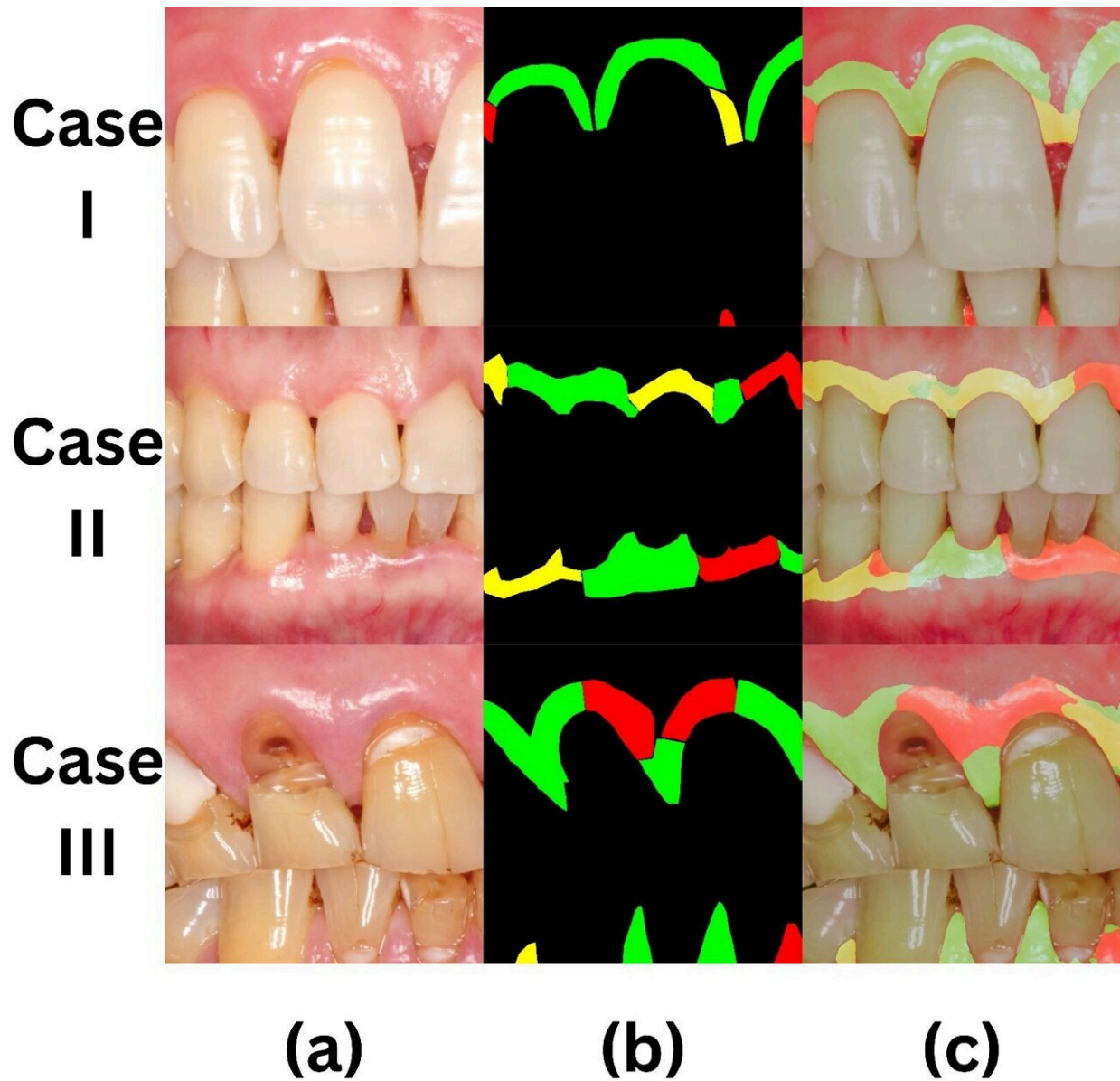# Dentistry team uses artificial intelligence for early detection of gum inflammation

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Three cases illustrating dentist's visual examination (b) and AI's detection (c) of gum problems (a) Intraoral photograph (b) Health status labeled by a calibrated dentist (green=healthy, red=diseased, yellow=questionable) (c) AI detection results. Credit: Faculty of Dentistry, HKU

A study led by researchers at the Faculty of Dentistry of the University of Hong Kong (HKU), in collaboration with multiple international institutions has successfully demonstrated the use of artificial intelligence (AI) in detecting gum inflammation, also known as gingivitis, from intraoral photographs.

This cutting-edge technology can revolutionize early detection and prevention of oral and systemic diseases linked to gum inflammation, such as tooth loss, cardiovascular diseases, and diabetes.

The study, published in the *International Dental Journal*, shows that AI algorithms can analyze patients' intraoral photographs to detect signs of inflammation like redness, swelling, and bleeding along the gum margin with more than 90% accuracy, matching the visual examination of a dentist. This innovative technology enables population-wide monitoring of gum health and paves the way for more personalized dental care.

The study was conducted by researchers from the HKU Faculty of Dentistry, the Department of Computer Science at Hong Kong Chu Hai College, the School of Information Engineering at Guangdong University of Technology, and the Faculty of Dentistry at The National University of Malaysia. It involved developing and testing an AI model using a dataset of over 567 images of gums with varying degrees of inflammation and is one of the first to explore the use of AI in detecting gum inflammation.

Dr. Walter Yu-Hang Lam, the study's leading HKU researcher, emphasizes the significance of the findings for the early detection and management of gum disease.

"Many patients do not attend regular dental check-ups, and they only seek dentists to alleviate pain when their teeth are at the end stage of dental diseases, in which tooth loss is inevitable, and only expensive rehabilitative treatments are available. Our study shows that AI can be a valuable screening tool in detecting and diagnosing gum disease, one of the key indicators of periodontal disease, allowing earlier intervention and better health outcomes for the population," he said.

The use of AI in dentistry has been gaining momentum in recent years, with researchers exploring various applications of the technology, from detecting cavities to predicting treatment outcomes to biomimetic design of artificial teeth. The use of AI in gum inflammation detection is a promising development that could revolutionize how gum disease is detected, treated, and even prevented.

Dr. Reinhard Chun-Wang Chau, an HKU co-investigator of the team, pointed out the benefits of using intraoral photographs in conjunction with AI technology and said, "Based on these intraoral photographs, patients can address the area that they did not clean well and seek dentist' help at an earlier stage."

The collaborative nature of this study is a testament to the power of interdisciplinary research and knowledge exchange. By bringing together experts from different fields and regions, the researchers can develop an AI model that could accurately detect gum inflammation, with important implications for public health and well-being.

For the project's next stage, Dr. Lam plans to utilize the AI system for community services, making the technology more accessible to elderly

and underserved communities, with the aim of improving oral health outcomes and reducing health disparities.

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