

# Artificial intelligence and the dental practitioner



## Claire Berry

takes a closer look at dentistry's move into artificial intelligence

**A**rtificial Intelligence (AI) is a revolutionary concept and development in technology that, although isn't something new, is evolving and developing all the time. We live in an age of 'if you can imagine it, someone somewhere can make it happen'. Technology is now at heights we never thought was even possible with AI being used within medical diagnosis, financial trading, robot control and even replacing man power. It is now routinely seen in industries such as finance, healthcare and transport to name a few.

Artificial intelligence is next level technology that can further progress and even think like a human and have 'thought processes' like humans do. The use of complex software and algorithms allows machines to recognise input data, even about behaviours and create logical cognitive conclusions. It is now no longer the place of science fiction, it's the place of science fact.

Artificial intelligence is defined as 'the theory and development of computer systems able to perform tasks normally requiring human intelligence such as visual perception, speech recognition, decision making and translation between languages'.<sup>1</sup> Whereas

smart technology devices are defined as 'an electronic gadget that is able to connect, share and interact with its user and other smart devices'.<sup>2</sup> In a very simple and brief way to describe how AI works it is basically a machine that is fed large amounts of data which it processes, allowing the software to 'learn' from patterns it sees in the data.

Already seen in many aspects of medicine and healthcare, it was only a matter of time before we were thinking of the ways in which AI and smart technology can further enhance our lives in the dental industry. What better way than to use it in healthcare to predict problems before they arise, detect disease and use it to help with reliable medical diagnosis? Could this save the NHS millions in preventative care or even save lives? Can it detect, predict and prevent better than a human would?

### In our profession

How could this translate into the dental industry? A field of expertise where it is well-documented that intra-oral issues can cause more widespread general problems or be markers of systemic or general disease.

Within healthcare an area where AI could be invaluable is in medical imaging such as X-rays. Within X-ray images there lies rich sources of information and data. AI tools can then use this data to identify when there are any differences in the images it is seeing. In dental imaging this can be used to help identify and diagnose dental caries, endo

lesions, mouth cancer, periodontal disease and various other pathologies.

The speed with which it can be done is another factor that may be appealing. Being able to detect issues within seconds in a busy clinical setting is extremely desirable, not to mention a tool that would aid hygienists and therapists – for example – who can take the radiographs but then cannot diagnose. By being able to reliably notice changes in bone density or bone levels associated with periodontal disease it may be able to assist in treatment planning and detection. In the treatment of peri-implantitis early intervention in detecting bone changes can help prevent failure of said implants. Oral cancer may be more easily and reliably detected using imagery analysis which may potentially save lives.

Already in practice, CEREC AI with Omnicam can produce dental prostheses such as crowns, bridges, veneers, inlays and orthodontic appliances but also uses AI technology within the process to deliver high quality and precise results allowing for optimal treatment. The possibilities are endless, enhancing our profession chairside, improving treatment planning and ultimately increasing reliability.

### At home

Concepts like these are great in the dental setting, but can we use AI to develop oral hygiene aids that can also further help our patients at home?

At present, we're restricted to only being able to aid those who we see directly in clinic. We spot the issues during intra-oral examinations and perio assessments, and then we have the ability to help these individuals. Yet 51.3% regularly see an NHS dentist, so 48.7% do not.<sup>3</sup> The motivated half of the adult population are lucky enough to have access to care. They also have access to advice about better cleaning and at-home self-care in order to prevent disease.

What if we could have access to technology at home that could detect inflammatory markers and predictive signs of gingival and perio disease? What if we could have access to technology that could detect where we are missing and help patients clean better between dental and hygienist appointments? What if we had access to technology that advised us based on what it can detect during your regular tooth brushing routine?

And what if this technology already exists?

Oral B have been looking at how this kind of advanced and smart technology can be integrated into their products to improve the oral hygiene of patients. They have created the Genius X which will be launched later this year. Using AI, developers have created a brush that now doesn't require facial recognition to detect where the brush is sitting and which quadrant the user is in, which is what the previous Genius 9000 required. Using data collated from thousands of users to determine every single possible method, angle, style and technique of brushing and alongside smart connectivity between the brush and an app on a smart device it can sense exactly where patients are brushing, if they use too much pressure, the time in which they have stayed in each sextant and where they are not brushing adequately enough.

This is AI software and smart technology in a toothbrush. It asks patients about bleeding,

giving advice to the user when it is noted. The phone doesn't have to be near the brush, you can go to it when you think you have finished cleaning and use the data collated from your session to return to where you have missed (should you have missed an area).

It doesn't just stop there – it can even tell the user to visit their dentist or hygienist for further advice. Is a toothbrush now connecting consumers with clinicians? What a way to ensure the prevention of developing issues taking preventative dentistry to a new level. Who knows what the future holds for being able to directly link users with the ability to know whether or not they need to see their dental or medical health provider sooner and prevent issues from developing further.

### Additional benefits

If we considered putting the mouth back in the body, this could do amazing things to help with diseases where periodontal inflammation and inflammatory markers are documented as playing a role in wider health issues. Alzheimer's, heart disease, diabetes instability and preterm or low birth weight are issues commonly known by people in the dental and medical field to be associated with periodontitis, but not commonly known by the wider public.

With the fast-paced nature of change, who knows what the future holds for the profession. A toothbrush that can physically detect bleeding without the need to ask the user and ask you to make an appointment with your dental care professional based on detecting it. Reliable diagnosis of radiographs and medical imaging without the need for human clinical judgement.

Other concepts Oral B are currently working on include daily saliva testing in your own home that may be able to pick up on high cortisol levels suggesting high stress levels, nutritional deficiencies and

even the prevalence of certain bacteria that are associated with periodontal disease. With this kind of technology in the making it can bring together users and clinicians to eradicate prolonged issues that can be prevented before bigger problems may occur. Connecting users to medical professionals in this way can only be a great thing and I welcome these advances. At the moment though, this level of sophistication is achievable but not readily available. It seems AI and advanced technology can enhance our profession in a way that it is proving to enhance other industries. Being able to also use this technology to improve the dental and overall health of our patients is a great move towards the ideals of preventative dentistry. We live in a very exciting time, so who knows what the bathroom may look like in the future.

### References

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