The use of robotics in dentistry

By Dr Steen Sindet-Pedersen, UAE

Following the developments in industrial robot technology, robotics has found its way into the medical field and is used in a range of surgical disciplines. The main purpose of the use of robots is to increase the precision, quality and safety of surgical procedures. The first surgical robot was introduced in 1992 but the technology had its first major breakthrough when the Da Vinci robot was approved by the US Food and Drug Administration (FDA) in 1997. Since then, it has found widespread use in surgery. A large number of indications for this robot, which mainly consists of a number of robotic arms with video cameras, were approved by the FDA once the safety and efficacy of the technology had been documented. It can cut, clamp, coagulate and suture using minimally invasive procedures. The robot is controlled by a surgeon sitting in a control box away from the patient, from where he or she is able to control any action of the robot based on 3-D images of the surgical field inside the patient produced by the video cameras, which can be magnified several times. For example, Da Vinci robot surgery is the most frequently used option nowadays for prostatectomy in the US.

Robotics is not yet used in dentistry even though all the necessary technologies have already been developed and could easily be adapted. Some of the technologies are already used in dentistry, such as image-based simulation of implant surgery followed by the use of surgical guides, and creating digital impressions of preparations using an intra-oral scanner, after which a milling device produces the restoration, but we have not yet seen any robot able to prepare teeth for crowns, inlays or bridges.

Such a robot would fundamentally be a dental drilling device coupled with a navigation device to determine the correct position of the device in relation to the patient. The robot would either be operated directly by a dentist or be programmed to perform its functions based on imaging data (CT scan). Finally, an intra-oral scanner would be used to make digital impressions. This data would then be transferred to the lab to produce temporary crowns or bridges in a very short time using a milling machine and to manufacture the final restorations in much shorter time than with conventional procedures.

Robotics could offer dentistry improved accuracy, predictability, safety, quality of care and speed of treatment. One might wonder why robots have not yet been introduced to dentistry, as the functions needed are relatively simple. An explanation could be that robotics in dentistry is an example of a disruptive technology, meaning that the current manufacturers of dental equipment might fear a negative effect on their current business and the alienation of dentists, as robots might be seen as a threat to dental professionals.

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