

Advancing technologies in ceramic implantology—AI sets new milestones in dental treatments

An Interview with Dr Shepard DeLong, Lotus Dental Wellness, USA

Artificial Intelligence (AI) in dentistry has started to bloom in recent years. From a dental perspective, applications of AI can be classified into diagnosis, decision-making, treatment planning, and prediction of treatment outcomes. Computer programs for dental use are becoming more and more intelligent, accurate, and reliable. We had the great opportunity to interview Dr Shepard DeLong about his approach, findings, and experience with AI in dentistry and oral implantology.

The integration of AI in dentistry can have various effects on the dentist–patient relationship. From your perspective: what are the major benefits of using AI in the dental practice?

I had the opportunity to use an AI diagnostic tool with one of my patients yesterday. I asked, “How does it make you feel to see me using artificial intelligence as an aid in my diagnosis of your health?” Immediately the patient said,

“I think it is a good thing...as long as, you are taking your own experience and knowledge to interpret what it means. I reassured them that was the case and that when AI is used with care and expertise it is becoming an invaluable tool. Actually, the biggest benefit I see is that I am less likely to miss a meaningful finding, and it greatly enhances trust between doctor and patient.

Have you experienced improvements for even more individualised and personalised treatment plans ever since you implemented AI to your daily routines?

Our doctors and patients at Lotus Dental Wellness have all experienced the benefits of cutting-edge technology for almost a decade. Each patient already receives very individualised care with every case and treatment. AI only enhances our sensitivity and ability to stay true to a preventative, minimally invasive, accurate diagnostic, and treatment workflow. Now if it is not used, patients will ask for it. Some of the data is still anomalous so it can be overwhelming or hard to explain. Overall, it adds value for me, and my patients.

Does it save time? How efficient is the use of AI in your routines?

Yes, it saves time because it draws out and quantifies findings that may otherwise be unremarkable. In the case of periodontitis and bone loss, I found myself making different treatment recommendations after seeing numbers with CEJ to crest measurements being visible on “routine radiographs”. The severity of caries is as well now quantified, so decision making is facilitated, as well as risk.

Can AI tools help in addressing dental anxiety or fear among patients? How do patients perceive the trustworthiness of AI-driven diagnostic and treatment recommendations?

I think the key here is that care, compassion, and the goal of improving wellbeing drive the entire doctor–patient interaction when it is functioning properly. With the aid of AI, trust no longer relies solely on a doctor’s personality, or powers of persuasion, both of which are pretty irrelevant to quality of care. Much of what drives patient fear



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and anxiety is the loss of control or confidence that what is being done is the right thing. AI helps with that.

Please let us dig a bit deeper into the clinical aspects and benefits of your work and your routines in your clinic. We know that you are using robotic surgery aid. What is it exactly that you implemented? What are specific challenges in oral surgery utilising a robot?

This question strikes close to home. I pour my soul into advancing technology for the dental industry. In almost every way, the quality of care, the beauty of form and the “nuts and bolts” of strength and function have been enhanced with digital workflows. The ease of operating has increased for our doctors and our practice has a “cult-like” following of believers. Good ergonomics and long-term well-being of doctors and the dental team are part of our core values. Robotic surgery is the latest addition, and we utilise robotics for implant placement. Our commitment is not only to electronic, digital or AI-driven tech, but to biotech and biomaterials advancement. We are the only team in the world dedicated to the placement and restoration of Zirconia dental implants utilising dynamic navigation, and robotic assistance on all but the unavoidable freehand cases.

The challenges are still great. Its 8 p.m. and I literally just finished a dual-arch ceramic implant case which, after much planning, the robotic workflow had to be abandoned. This can happen. Time, cost, new obstacles are all part of the puzzle, but we have gotten glimpses of the future. Terms like “ultra-precision” started to pop up as we planned in robotic software, then we are able to make micro-modifications during surgeries and the results have been fantastic. For the early adopters that have made their way through CEREC or digital dentistry, CBCT, guided and ceramic implantology...we can already see the other side.

Does AI contribute to the diagnostic phase of treatment planning in oral surgery? How do AI algorithms assist in analysing patient data, such as CT scans or 3D imaging, for optimal implant placement?

I would lean heavily on companies like 3DDX, Immersive Touch, Cad-Ray, or Anatomage, to do segmentation and deeper use of CBCT data. Implant positioning for the varied ceramic systems I use still requires significant thought and prosthetic “tweaking” so that our placement and restoration is near ideal. There are some tools in use within YOMI plan software, things like auto segmentation of the sinus cavity to aid in sinus lifts, but the software is not yet predictably mapping for us yet. Nerve segmentation is still through third party software or radiology services.

And how does the incorporation of dental robots enhance the precision and efficiency of oral surgery procedures?

This is something that I got great perspective on last year at the Mayo Clinic's first conference on Robotics and

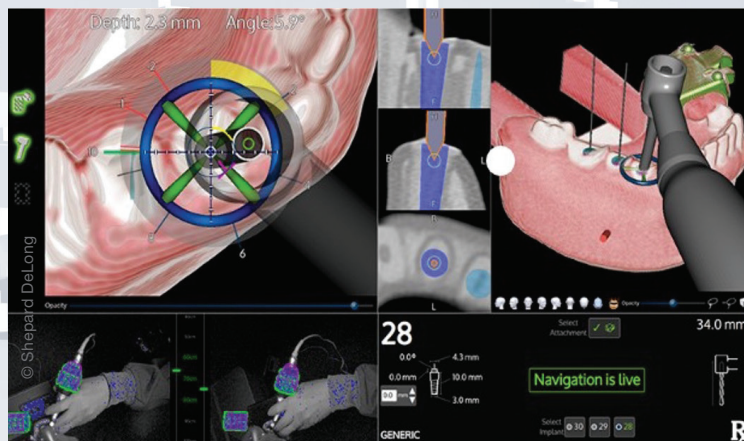


Robotic Surgery conducted by Dr Shepard DeLong and Dr Travis G. Hunt.

Advanced Surgical Technologies. Other surgical specialties were discussing the overwhelming adoption of robotics in enhancing patient outcomes. Freehand skills, static guides, dynamic navigation all can lead to excellent outcomes, but robotics allows a less skilled surgeon to perform at or near the level of the best, especially when mentored, and it demands that doctors keep learning, practicing so that the results continue to improve. I've been using the term “ultra-precision” to describe some of what I was seeing, during surgery, and even more impressively, during restoration of zirconia dental implants placed utilising robotics.

We have learned that the implementation of dental robots worked wonderful with general implant material. You are using zirconia implants. What are the differences, what are the challenges—for both the surgeon and the robot-based system? Are there any?

It has been a remarkable year and a half! We have now placed four ceramic implant systems: SDS, CeraRoot, Zeramex/Nobel, and Z-Systems, successfully and fully guided. It was laborious to get all the companies to work together to put the sizes and shapes into the software as fast as possible and yet, we placed a lot of implants while calculating all the data the software didn't have right yet. Other challenges include carrier systems and fixture mounts that are not retentive enough, or too retentive.



tive to deal with the rigidity and freedom of a robotic arm and incorporated dental handpiece. Also, driver lengths, hand-based carriers, and low maximum torque values added to the challenges.

How does AI play a role in selecting the most suitable zirconia implant size, shape, and placement for each patient?

At this point, AI plays a negligible role in implant selection. I know this will come. As talk to text and AI can code, we will trend towards an automated, ultra-precise, surgical and restorative plan. For now, it is a lot of thought, experience and care that goes into making each case a success.

In what ways can AI assist in real-time decision-making during the surgery itself, considering factors like bone density and tissue response?

This is where the “haptic guidance” of the Yomi robot as well as the freehand feel of the X-Guide allows the surgeon to feel the bone. Visualisation of the surgical site with physical guidance is where Yomi shines. During surgery with the X-Guide the surgeon’s eyes must be on the screen, with Yomi you get both, freehand tactile feel, haptic feedback, and you can use real-time visual observations to modify surgery towards achieving great outcomes.

How are ethical concerns addressed, such as patient consent, data security, and the responsible use of AI in the context of oral surgery? Have you faced any issues on that?

Thank you for asking. Almost all our patients have been very receptive of Yomi, it was preceded by X-Guide, and my previous commitment to place ceramic implants exclusively. There is regulatory clearance on all these products and devices, and yet we encounter the unknown and untested when using all of them together. This is where new connections, new workflows, and ultimately, new solutions to human health problems will come from. We have a thorough understanding of risk, and believe

privacy, autonomy, and informed consent are all paramount in modern medicine. There will be new standards of care. It is up to us to define them.

We seem to have entered the era of new and exciting discoveries in dentistry. Please share this journey with us and give us a few concluding words.

I know that the readers of *ceramic implants* will take what I have said here with a proverbial “grain of salt” or a bit of healthy caution. I think that is wise. Let experience guide your wisdom and opinion. After you see something intriguing, promising even, follow your own intuition and go where it leads. If we utilise new ideas and technology while allowing our human knowledge and hearts to guide what to do, the results are going to build a new reality. This is just the beginning, AI, robotics, ceramic implants, the future we are creating is already here. When we see solutions, I think we must share. I will look forward to continuing our conversation and journey!

about the interviewee



Dr Shepard DeLong is a 3rd generation dentist in Portland, Oregon, USA. He holds a BS from Portland State University, DMD from Oregon Health and Sciences University and completed a General Practice Residency at The Queen’s Medical Center in Honolulu, Hawaii. He is a member of AMED, IAOCI, EACim, IAOMT, and has served as a mentor for CEREC-doctors. He was formerly an associate at the first LEED certified, high-tech, eco-friendly practice in the US. He is on the forefront of digital evolution, and development of novel technological workflows in dentistry. He has a part-time position at Pure Health Dentistry on the island of Maui, Hawaii and owns Lotus Dental Wellness, in Lake Oswego, Oregon. He is a residency site director for the MSc Implantology programme at the University of Jacksonville, and lectures on ceramic implantology, robotics, lasers, and digital dentistry. His latest project has been sharing the profound advantages of combinational technologies for the health of both doctor and patient. He can be reached at drdelong@lotusdentalwellness.com.

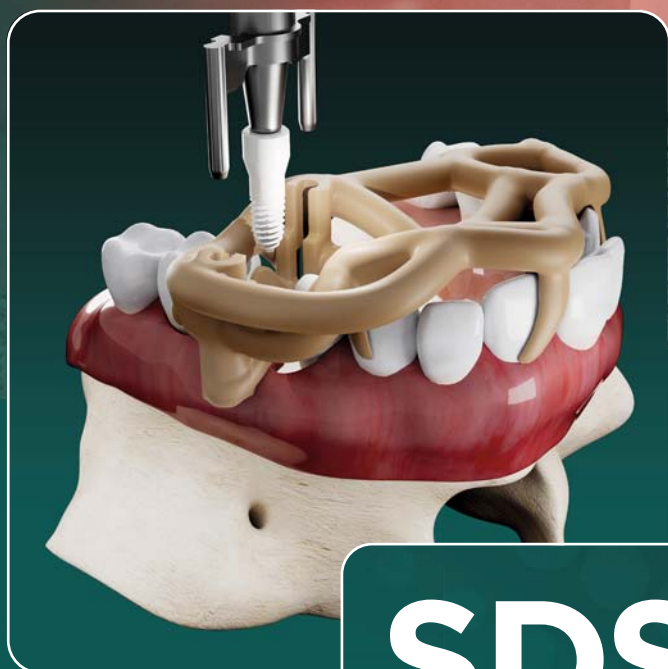
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