Acta Scientific Dental Sciences (ISSN: 2581-4893)

Volume 6 Issue 4 April 2022

Editorial

The Dental CAD/CAM Transition: is it About Knowledge or Material?

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Received: January 24, 2022

Published: March 01, 2022

This article aims to share solutions for a free first* access to the digital dentistry world, while guiding you to knowledge available for free on internet to start now. It is possible to set foot in digital dentistry before investing in CAD/CAM equipment, in order to to better choose your equipment later.

A lot of practitioners describe cost as the first obstacle to join the world of CAD/CAM, while it is clearly possible for dentists, not necessarily equipped with CAD/CAM, to use digital technologies before investing, in order to be able to better choose their equipment later.

Dental CAD/CAM is not limited to the chairside. To make a crown in 1h30 you will need to have all the equipment at your practice. But this is not a summary of the CAD/CAM world. Beside the time gain, Cad/cam is bringing a whole new world of possibilities.

To do CAD/CAM (design and computer-aided manufacturing) the mandatory tool is a computer. The patient arrives at the dental clinic, we create a "copy" of the patient on the computer, the treatment is virtual, then "brought" to the real world. A good summary would be: From patient to computer, and back to patient. (Figure 1).

Figure 1

Note that all dental CAD/CAM machines are just tools allowing the entry and exit of the computer, so the computer remains the main tool. Summarizing the passage on computer to a series of "next" means missing the richness of this technology.

There are three types of dental CAD/CAM equipment

1. The acquisition equipment allowing computer entry

- An intraoral scanner: **https://www.youtube.com/watch?v=1Jzp_tp4nxE**
- A cone beam: **https://www.youtube.com/watch?v=I7N4a9V97BE**
- A facial scanner: **https://www.youtube.com/watch?v=DGdPK5EUmSQ**
- A Mod Jaw for recording mandibular kinetics: **https://www.youtube.com/watch?v=6g8DhbM5JgM**

These are all acquisition devices, getting information from the patient inside the computer. It is comfortable, but not essential to possess this equipment. What matters is what you do with this information once on the computer. Without acquisition equipment to start, it is possible to send a plaster model to your dental technician and ask him for 3D STL file. He will use for that a laboratory scanner that most of dental technicians do have today: **https://www.youtube.com/watch?v=bMTr1tWyvpA** and your technician would just e-mail you the 3D STL file obtained representing your patient impression.

A facial scanner is now very accessible thanks to iPhone applications such as Bellus, which also exists in camera at modest price that can be connected to any smartphone or tablet:

https://www.youtube.com/watch?v=QONGdQ3QiFE

If the patient does have Dicom images, obtained from a Cone Beam or a X-Ray Scanner, those images can be used as 3D files by software described later.

2. The software on computer allowing the CAD: Computer Aided Design

Once information gathered on the computer, Thanks to software these 3D files can be superimposed on the computer, giving in 3D: the face of the patient with his teeth, his gums, his bone and his mandible moving with every tooth contact possible. This offers unprecedented diagnostic and treatment possibilities, but for this it is essential to master the passage on the computer.

Software made by dental companies like 3Shape or Dentsply Sirona are designed to be easy to use by dentists. Many steps are automated, offering the advantage of a simplified use. Some other software that are harder to learn offer many more freedom (no s), like software made by ZirkonZahn or Exocad often used by dental technicians in order to be able to offer prostheses meeting different expectations of dentists, bigger software like those do take more time to handle but offer way more possibilities.

Last but not least, there are many software that you can download for free today to use 3D in a free way only limited by your knowledge, this free software does have unlimited power and possibilities compared to those offered by dental industry today. When made for dentistery software are easier to use, with less buttons and more automated actions for dental. But for free you can have the whole unlimited software power if you know how to use it. by getting help from dental tutorials available on youtube for exemple, you can discover some of these software available now for free on internet

- Meshmixer: essential and widely used in dentistry. It is a free software that allows different actions on 3D STL files, virtually replacing plaster, wax resin and ceramic, allowing to realize in 3D all that we are used to do with a plaster model in our hands. You can check one of many "How to tutorials" as this one **https://www.youtube.com/watch?v=C4B5URTo9Vw**.
- Blue sky: Free software where you need to pay small price to save and extract STL Files instead of buying the software, it allows implant planning: **https://www.youtube.com/watch?v=KqU3tpfglfM** or planning orthodontic treatment with aligners: **https://www.youtube.com/watch?v=OFFdjZ2Uoyo**.
- Gom inspect: Allowing precise measurements as matching in space and comparison of 3D files: **https://www.youtube.com/watch?v=6qgR65ptZ2Y**.
- Invesalius: Allowing the creation of printable STL files from DICOM X-ray images: **https://www.youtube.com/watch?v=Ffj-2nPv0x4&t=185s**

- Blender: A giant free 3D software. The complexity of its handling testifies that today the real challenge in dental CAD/CAM is not a material investment, but our ability to integrate a new field in our practice, and master it in order to make the most of it for our patients. **https://www.youtube.com/watch?v=6lUrIqgWttQ**

3. The manufacturing material allowing the CAM: Computer Aided Manufacturing

Once the virtual work is done, it needs to be brought to life through Manufacturing:

At this stage, if you are not equipped, you can still count on your dental technician who can manufacture your 3D creations in different materials, just by emailing the STL File you made.

Putting a first foot in CAD/CAM this way allows you to approach the field, in order to be able to choose the material that suits your practice the most.