

Computer Aided Technology in Complete Denture Construction between Trials and Application

Abdel Salam Ezzat^{1,2*}

¹Department of Prosthodontics, Alexandria University, Egypt

²Department of Prosthodontics, King Abdel Aziz University, Saudi Arabia

***Corresponding Author:** Abdel Salam Ezzat, Department of Prosthodontics, Alexandria University, Egypt, King Abdel Aziz University, Saudi Arabia.

Received: May 17, 2015; **Published:** June 25, 2015

Abstract

The construction of complete dentures by the conventional method needs many clinical and laboratory steps in the dental office and the dental laboratory.

The accuracy of fit of these dentures was matter of discussions along the past many years. The use of CAD / CAM nowadays said to have the ability to make the process simpler and solve the associated problems with the conventional method. The purpose of this historical dental review is to give junior researchers an idea about this new technology and to analyze the literature on CAD/CAM technology.

Keywords: CAD/CAM: Conventional complete denture; MMR: maxillo mandibular relations; AMD: anatomical measuring device; OVD: occlusal vertical dimension; CR: centric relation; edentulism; CT: Cone beam; MO: micro-organisms

Literature Review

The acronym CAD means computer aided design Software to determine the dimensions of an object, while The CAM program directs the construction process. In 1994, Maeda, *et al.* [1] are credited with the first published scientific report on the concept of using, computer-aided technology to fabricate complete dentures. The CAD/CAM technology used before for construction of on lays, inlays, crowns & fixed bridges and partial dentures but not in complete denture constructions [1,2].

Later on several factors governed the extend and spread of this technology in complete dentures construction; [3] stated that, the increased aging population in US, the increased demands of complete dentures are two main factors. The reduced number of dental laboratory technician in US [4,5] was another factor plus the easily duplication of complete dentures due to the stored digital data and ability of better quality control with this technology [5].

In 1997, Kawahata, *et al.* [6], explored the concept of digitally duplicating Existing dentures and milling them by using a CNC milling machine (computerized numerical control) which is a machine uses images from a digital file to create an object by machining (cutting/ milling) to remove material and achieve the desired geometry. In another clinical study conducted by Kanazawa, *et al.* [7], a cone beam (CT) was used to measure the complete denture and the artificial teeth. The 3D complete denture image was fabricated using 3D CAD software; also the artificial teeth were factored out and a 3D denture base image was obtained. An acrylic resin block is then cut to fabricate an acrylic complete denture base. The artificial teeth were bonded to the base using resin cement. They concluded that, there was slight deviation between the master 3D denture and the 3D data of the fabricated acrylic denture.

Citation: Abdel Salam Ezzat. "Computer Aided Technology in Complete Denture Construction between Trials and Application". *EC Dental Science* 1.5 (2015): 202-204.

Goodacre., *et al.* [8] mentioned, it is anticipated the same for this technology the clinical impression procedures described in this article recorded the morphology of the intaglio and cameo surfaces of complete denture bases and also identifies muscular and phonetic locations for the placement of prosthetic denture teeth. This information can then be scanned, the teeth and base forms virtually established, and the resulting data exported to a milling machine for fabrication of the denture bases. In addition to the development of clinical procedures that record the required morphology, the prototype 3D Tooth Arrangement Program described in this article indicates that CAD programs can be developed whereby prosthetic teeth are arranged virtually as part of the CAD/CAM fabrication of complete dentures. In 2013 Mathew T., *et al.* [9] explored the commercial fabrication systems of CAD/CAM complete denture Ava Dent and Dentca* systems and concluded that Ava Dent uses laser scanning and computer technology. Teeth are arranged and bases formed using proprietary software. The bases are milled from pre-polymerized pucks of resin. Dentca uses computer software to produce virtual maxillary and mandibular edentulous ridges, arrange the teeth and form bases. The dentures are fabricated using conventional processing technique. In 2013, systematic review conducted by Mathew., *et al.*[9] using Pubmed search strategy concludes that both commercial manufacturing systems allow fabrication of complete dentures in two clinical appointments. The first clinical appointment: Systematic data gathering impressions, occlusal vertical dimension (OVD), maxilla mandibular relationships (MMR) and tooth selection. The second appointment: Denture insertion and adjustments. In 2014, Infante., *et al.* [10] proposed a technique to fabricate CAD/CAM complete denture using AMD (anatomic measuring device) to record OVD (occlusal vertical Dimension), CR (centric relation) and lip support flowed by scanning maxillary and mandibular impressions then milling of denture base by using a preformed cylinder of acrylic resin followed by chemically bonding of denture teeth into the base.

Discussion

Discussing the results of these most recent articles revealed that:

A complete digital impression of the edentulous arches as performed has not yet been researched. The systematic review did not identify any case reports or clinical trials on dentures which were fabricated with computer-aided technology.

Most articles described unique theoretical constructs for the production of a prototype denture and it was not clear whether the denture was used for treatment purposes or not.

Prospective clinical trials are necessary to validate this technique. This could affect dental educations, patients care, researches and public health worldwide [5]. Further modifications are needed in processing the three dimensions data to avoid teeth deviation on constructing dentures by CAD/CAM technology. Most of these studies proved that it is possible to fabricate complete denture by this new technology but there is slight difference between prosthetic teeth and sockets on denture base which might cause deviation, further modifications are needed in processing the three dimensions data [7].

Comparing between the traditional and the CAD/CAM technology in complete denture construction found in the dental literatures, The main disadvantages in dentures constructed by traditional method is the lack of adaptation (intimate fit) of the denture base with the underlying tissues due to the polymerization shrinkage [5] the frequent clinical visits & laboratory steps and the inability to create optimal duplicate complete dentures, while the main advantages of the new CAD/CAM technology is the ease obtaining of duplicate prosthesis, the two clinical visits, the minimal porosity in the finished dentures which reduces the presence of MO (micro-organisms) especially *Candida Albicans* and an optimal occlusal scheme can be developed with minimal occlusal adjustment [5].

Conclusions

The most obvious of this technology is lack of try in stage which is very essential for denture success.

Denture constructed by CAD/CAM method needs further clinical evaluations.

Modifications are needed in processing the three dimensions data.

Further researches on edentulism can be standardized in the coming future.

Bibliography

1. Maeda Y, *et al.* "A CAD/CAM system for removable denture. Part 1 fabrication of complete dentures". *International Journal of Prosthodontics* 7.1 (1994): 17-21.
2. Inokoshia M., *et al.* "Evaluation of a complete denture trial method applying rapid prototyping". *Dental Materials Journal* 31.1 (2012): 40-46.
3. Douglas CW., *et al.* "Will there be a need for complete dentures in the united states in 2020?" *Journal of Prosthetic Dentistry* 87.1 (2002): 5-8.
4. Hill EE and Breeding LC. "Who is teaching the undergraduate prosthodontics in the US dental schools, 2007?" *Journal of Prosthodontics* 18.2 (2009): 195-198.
5. Bidra AS., *et al.* "Computer-aided technology for fabricating complete dentures: Systematic review of historical background, current status, and future perspectives". *Journal of Prosthetic Dentistry* 109.6 (2013): 361-366.
6. Kawahata N., *et al.* "Trial of duplication procedure for complete dentures by CAD/CAM". *Journal of Oral Rehabilitation* 24.7 (1997): 540-548.
7. Kanazawa M., *et al.* "Trial of a CAD/CAM system for fabricating complete dentures". *Dental Materials Journal* 30.1 (2011): 93-96.
8. Goodacre CJ., *et al.* "CAD/CAM fabricated complete dentures: Concepts and clinical methods of obtaining required morphological data". *Journal of Prosthetic Dentistry* 107.1 (2012): 34-46.
9. Mathew T., *et al.* "CAD/CAM Complete denture: A Review of tow commercial fabricating system". *Journal of California Dental Association* 41.6 (2013): 407-416.
10. Infante L., *et al.* "Fabricating complete dentures with CAD/CAM technology". *Journal of Prosthetic Dentistry* 111.5 (2014): 351-355.
11. *Dentca-CAD/CAM Denture; Dentca Inc. Available at: <http://www.dentca.com>
12. *Ava Dent Digital Dentures; Global Dental Science LLC. Available at: <http://www.avadent.com>

Volume 1 Issue 5 June 2015

© All rights are reserved by Abdel Salam Ezzat.