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Application of CAD/CAM in Dental Medicine: Case report

I.Boujoual, B. Mbarki, and A. Andoh

Unit of fixed prosthodontics

University Hospital Center Ibn Rochd

Hassan II University

Casablanca

Abstract

The computer aided design/computer aided manufacturing CAD/CAM technology has gained lately so much popularity in the field of dentistry because it helps shorten the treatment time and provide comfort for the patient and also stronger restoration with better aesthetic results.
This paper means to illustrate this procedure and its advantages, through a case report and a little literature review.
A 40 years old woman showed an aesthetic embarrassment due to the loss of her first maxillary right premolar, she claimed an aesthetic restoration with a short duration of treatment, and refused neither a surgical approach nor a removable prosthesis.

Key words *: CAD/CAM, Zirconia bridge, Marginal integrity, Dental materials.*

1. INTRODUCTION

Recently the advances in digital technologies revolutionized the practices in dentistry generally and particularly in fabricating prosthetic restorations. The advent of CAD/CAM technologies has enabled the prosthodontists and laboratories technicians to create aesthetic durable and biocompatible restorations [1-2].

In 1972, François Duret, a French dental surgeon, has proposed to extrapolate this concept to the realization of dental prosthetic restorations.

The CAD/CAM process can be divided into three main phases that are: scanning, designing and milling. The scanning phase can be done by using an intra-oral camera directly in the chair side system (direct CAD/CAM: All is done in the dental office) or by digitizing the plaster models with a scanner in the laboratory (In the indirect approach) [3-4].

1.1 Direct Semi-direct and Indirect CAD/CAM:

As mentioned before, CAD/CAM can be classed based on the chain of production into:

1.2. Direct CAD/CAM:

Also called “In office system” or “Chair-side system”. Without a laboratory step, the dentist operates all the chain of fabrication, he starts by digitizing directly with an intra-oral camera the dental structures into 3D virtual model, then after realizing the computer aided conception with the appropriate software he ends with the fabrication properly said by using the chair-side milling machine within a single appointment [5].

This approach gives more comfort and gain of time, so the patient comes to the office and can leave it the same day with a prosthetic restoration.

1.3. Semi-direct CAD/CAM:

The dentist realizes the intra-oral optical impression visualizes the 3D virtual model and sending to the technician via internet (as a universal STL file). The dental technician carries out the fabrication of the working model by stereolithography or machining,

then the design and manufacture, and returns the finished prosthetic piece to the cabinet for assembly.

1.4 Indirect CAD/CAM

The dentist achieves the elastomeric impression classically using trays and impression materials, and then sends it to the laboratory where the technician casts it to a plaster model and digitizes it by using a 3D scanner. Subsequently, all the CAD/CAM chain is processed in the laboratory, by achieving the conception and then the milling of the final restoration directly or just the framework and aesthetic porcelain is added for individualization and characterization of the restoration [6].

1.5 Advantages of the CAD/CAM comparing to the conventional manufacturing of prosthesis:

The CAD/CAM allows:

- Milling and use of high quality materials combining biocompatibility to resistance (ex: zircone, titane…)
- More precision and accuracy of the restorations, by avoiding the distortions and shrinkage due to the conventional method of casting metals…
- More strength of the prosthesis and a better longevity
- More aesthetics by the use of all ceramic restorations with a high resistance and a good toughness
- Simplification and shortening the treatment duration and the manufacturing laboratory process
- Less cost of the restorations and less human resources needed in the laboratory.

2. Case report:

L. S. 40 years old woman, showed an aesthetic embarrassment due to the loss of her first maxillary right premolar, she claimed an aesthetic restoration with a short duration of treatment, and refused neither a surgical approach nor a removable prosthesis.
The Patient has received previously an orthodontic treatment with extractions of 15 and 25. The 16 had a defective composite restoration and the patient was of great aesthetic requirement so we chosen an All-ceramic bridge with zirconia framework to ally strength to aesthetics.

Figure 1-a and 1-b : Initial view of the maxillary arch of the patient showing the edentation of the 14

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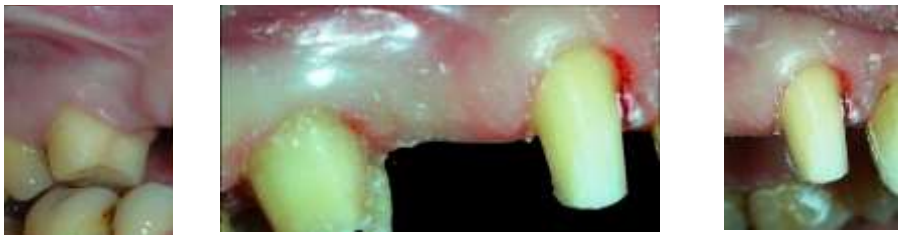

Figure 2a-b-c : Teeth minimally-invasive preparations

Figure 3 : Polyvinylsiloxanes one time impression

Figure 4 : Scanning of the plaster model casted from the impression

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Figure 5a-b : 3D visualisation of the virtual model after scanning

Figure 6 : Conception and design of the future framework, with an increased width of connexions for more strength

Figure 7a-b: Milling phase of the zirconia framework

Figure 8 : Layering the framework with a cosmetic ceramic

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Figure 9a-b : Zirconia framework bridge (all ceramic restoration)

Figure 10 : Final result after cementation of the bridge restoration

Figure 11: Patient regaining her confidant smile and satisfaction

CONCLUSION

The CAD/CAM technology has simplified the manufacturing of fixed prosthesis with a better precision quality in shorter treatment duration. It also combines better aesthetics and more resistance thanks to new materials application (such as zirconia frameworks) all with exceptional biocompatibility and longetivity. However, it has the disadvantage of the high initial cost of CAD/CAM systems and the requirement for supplementary training.

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REFERENCES

1. Todorović A 2005 The application pf CAD/CAM technology in dental prosthetics, Belgrade
2. Ritter A V 2002 Chairside CAD/CAM in Dentistry, JERD 15(2)
3. Miyazaki T, Hotta Y, Kunii J, Kuriyama S and Tamaki Y 2009 A review of dental CAD/CAM: Current status and future perspectives from 20 years of experience, Dental Materials Journal 28, 44-56
4. Joda T and Buser D 2016 Digital implant dentistry - a workflow in five steps, URL: http://www.dental-tribune.com/htdocs/uploads/printarchive/editions pp 16-20
5. I Susic, M TRavar, M Susic ,the application of CAD / CAM technology in Dentistry innovative ideas in science
6. Davidowitz G., Philip G. Kotick, The Use of CAD/CAM in Dentistry July 2011Volume 55, Issue 3, Pages 559–570 DOI: https://doi.org/10.1016/j.cden.2011.02.011
7. Duret F.,Blouin JL, Duret D. CAD-CAM in dentistry, November 1988Volume 117, Issue 6, Pages 715–720, DOI: https://doi.org/10.14219/jada.archive.1988.009
8. Mantri S.S. Bhasin A. Cad/Cam In Dental Restorations: An Overview, June 2010, DOI: 10.5368/aedj.2010.2.3.123-128.pdf
9. Puri S. Comprehensive dentistry using chairside cad/cam technology: a case report. Dent Today. 2009;28(4):92, 94, 96. 11.

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