Korean Academy of Esthetic Dentistry

A Various Applications of CAD/CAM Customized Abutment on Implant Fixed Restorations

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Introduction

The fixed restorations could be cement-retained or screw-retained to the implant abutments.

The advantage of screw-retained is the easiness of retrieval when the dentist may need to remove the implant prosthesis for hygiene, design modification, fracture repairs, and abutment-screw tightening.

However, screw-retaind restorations require precise implant position for the screw-access hole. Also, it is hard to obtain passivity of screw-retained frameworks due to the error in the laboratory process.

Cement-retained implant restorations have some advantages, such as good esthetics and simple fabrication, occlusion and reduced cost.

Unfortunately, little evidence demonstrates predictable retrievability of various provisional luting agents when cementing two components together.

These cases report a new design of customized abutment using CAD/CAM technology which could give a retrievability to the cement-retained restorations.

Materials and Methods

Vincent Prestipino et al reported a practical approach for retrieving cement-retained, implant-supported restorations on QDT 2001. They applied similar ideas to gold-casting customized abutments. But the concept could not be popular because the lab fee cost too much now.

The first design of the slot placed customized abutment manufactured by CAD/CAM techniques originated from the cooperation between the dentist and the dental CAD designer. Trials and errors were required to fully understand the concept of the slot placed abutment design.

A Practical Approach for Retrieving
Cement-Retained, Implant-Supported Restorations

Vincent Prestipino, DDS*/Abraham Ingber, DDS**/Joseph Kravitz, DDS, MS***/
George M. Whitehead, DDS****

Fig. 1. Vincent Prestipino et al reported a practical approach for retrieving cement-retained, implant-supported restorations on QDT 2001.

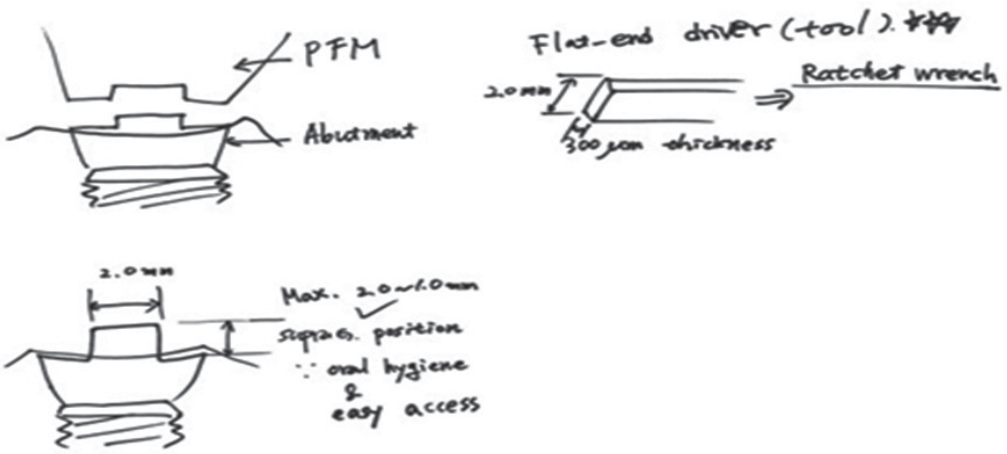

Fig. 2. Illustration of slot placed customized abutment at the marginal area of the crown-abutment interface, which receives the end of a flat-end driver that will be rotated.

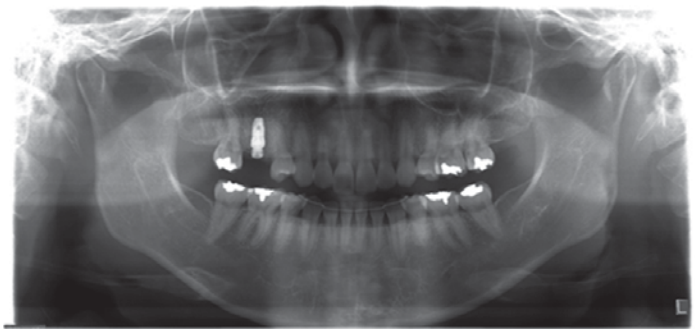

Fig. 3. Implant fixture installed on the upper 1st molar

Fig. 4. Deviations from the optimal position and angulation can lead to an unfavorable restoration. Customized abutment can help to overcome this situation.

For customized abutment, new dental CAD/CAM techniques are employed for preparation design with the supra-gingival margin on the mid-marginal position of the lingual/palatal surface of the abutment.

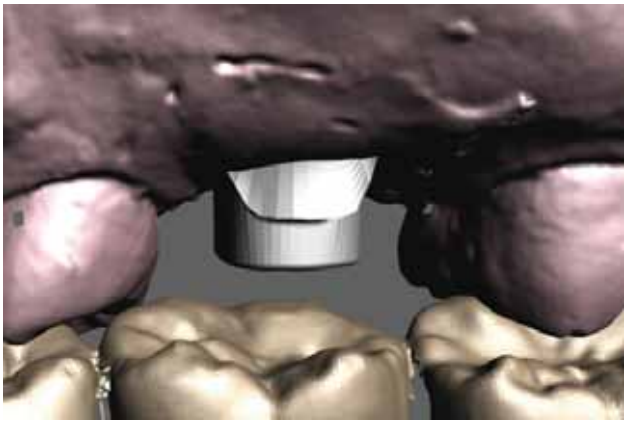

Fig. 5. Palatal view of the CAD/CAM customized abutment on the 3D Viewer.

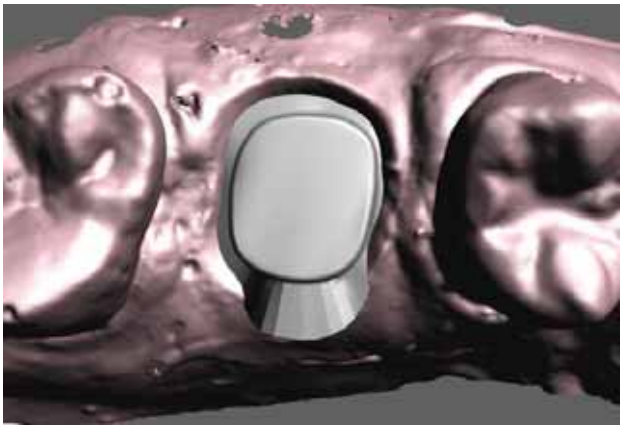

Fig. 6. Abutment design is confirmed by the dentist/ dental technician via e-mail.

Fig. 7. Titanium customized abutment with a supra-gingival margin is designed to lift off the restoration.

Fig. 8. Deep shoulder should be prepared to receive the flat-end slot driver.

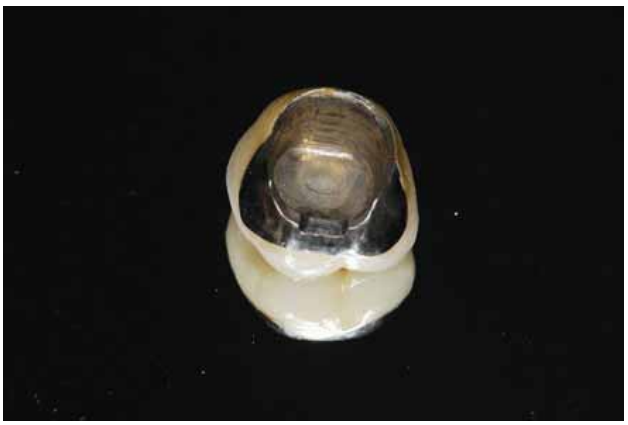

Fig. 9. A slot placed at the marginal area of the crown-abutment interface.

Fig. 10. Various flat-headed drivers used in the clinic.

Fig. 11. Insert a flat-headed driver to the rachet wrench

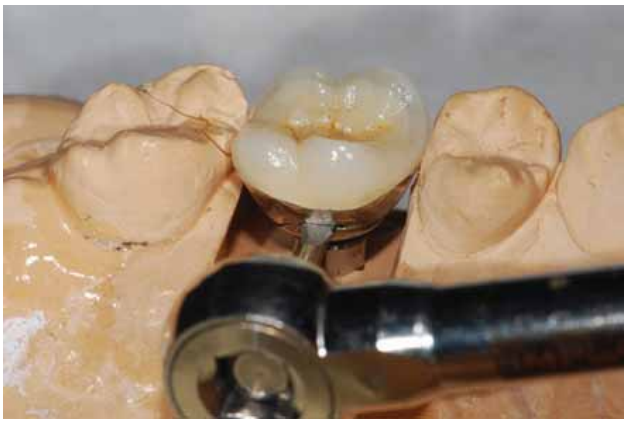

Fig. 12. The tip of the driver is placed within the slot for retrieval.

Fig. 13. "lift off" of the crown from the abutment with the rotation of the driver.

Fig. 14. Customized abutment is delivered intraorally.

Fig. 15. Occlusal view of the customized abutment.

Fig. 16. The shoulder of supra-marginal area is at least 2mm in width.

Fig. 17. PFM crown on the customized abutment is cemented.

Fig. 18. The customized abutment could decrease the fracture of veneering porcelain on the crown.

Fig. 19. Look at the slot, the crown-abutment gap is approximately 300-500 micron.

The crown is cemented to the abutment with the cement of choice. The lingual slot provides a vent hole for the cement to ensure complete seating of the crown.

Whenever crown removal is desired, a mechanical torque driver will provide greater rotational control force. Pressure is applied to the driver into the crown abutment complex slot, and the driver is rotated, thus lifting the crown off the abutment. The repair or maintenance can be performed and the abutment and crown cleaned and re-cemented with the cement of choice.

RCS abutment was named to indicate the unique concept of CAD/CAM customized abutment design. The term RCS is the abbreviation of Retrievable Cement-type Slot.

Fig. 20. The tip of the driver is placed within the slot between the abutment and crown.

Another case of RCS abutment on the multiple fixed restoration as follows.

Fig. 21. Initial photo. Severe alveolar bone loss was seen.

Fig. 22. Mn 2nd Molar was lost and bony atrophy.

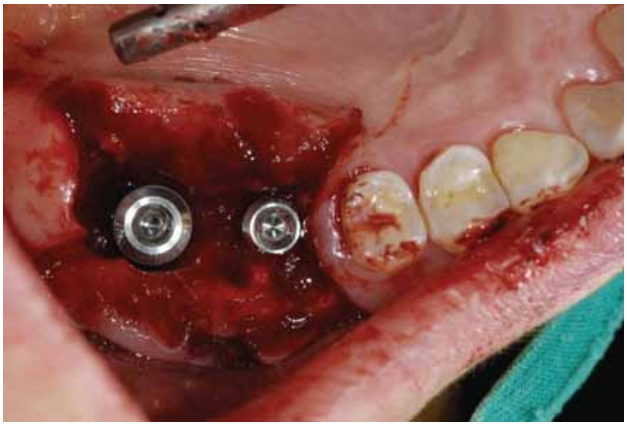

Fig. 23. After tooth extraction, GBR was done and the fixture installation was performed later.

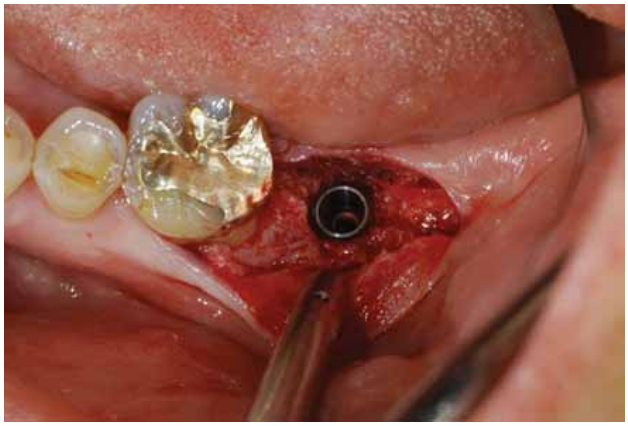

Fig. 24. Fixture was installed carefully to achieve a good position.

Fig. 25. Provisional restorations were delivered to obtain the subgingival contour.

Fig. 26. Screw hole should be located at the centre of the occlusal table.

Fig. 27. Gum sculpting and soft tissue healing was obtained by provisional restorations.

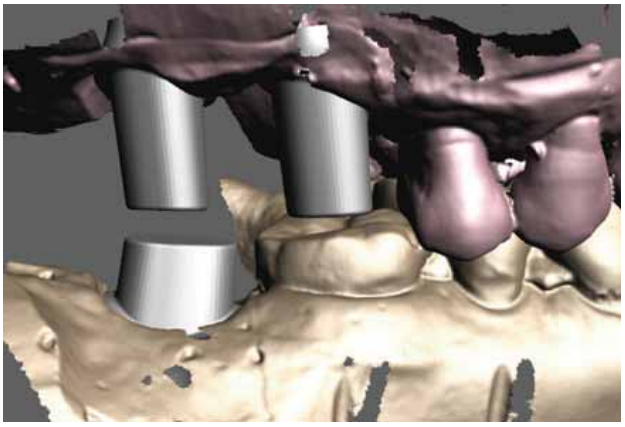

Fig. 28. After final fixture level impressions, stone models for customized abutments were made. At the CAD/CAM center, models were scanned by optical 3D model scanner. The abutments design was performed on the 3D CAD S/W by the digital dental designer.

Fig. 29. The adequate supra/sub-gingival contour of the abutment result from the efficient CAD/CAM design system.

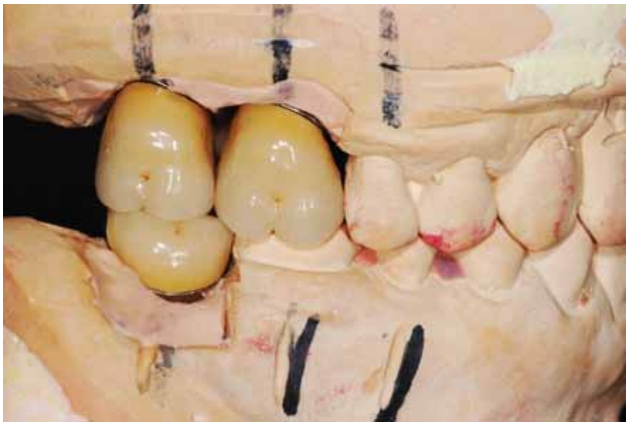

Fig. 30. After confirmation of the intraoral try-in of the manufactured customized abutments. Conventional PFM crowns were made.

Fig. 31. The critical contour determines the margin of the restoration.

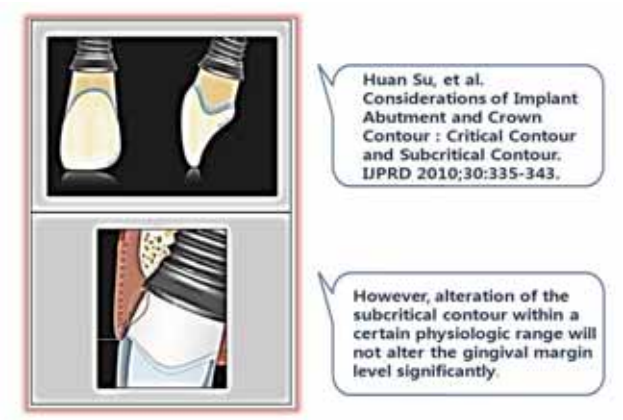

Fig. 32. Critical contour and subcritical contour are different elements to make a customized abutment.

Fig. 33. Uniform margins were shown around the crowns.

Fig. 34. RCS customized abutments were assembled intraorally.

Fig. 35. Deep shoulder is the key of the RCS customized abutment.

Fig. 36. The customized abutments with proper size, angle, and position are delivered intraorally.

Fig. 37. Harmonious implant restorations could be obtained by the co-operation of the patient, dental technician, dentist.

Fig. 38. After cementation, excess cement was easily removed because it had a uniform, shallow margin.

Fig. 39. The CAD/CAM customized abutment is the key to the finest restoration in the implant dentistry, now and the future.

Results

The use of this RCS technique is for a retrieval of the restoration on the abutment whenever it is necessary. The fabrication of the crown with slot is similar to the conventional method of other dentist and technician.

However, the difference between the conventional cement-type restoration and the RCS restoration is the selection of especially designed customized abutment manufactured by CAD/CAM technique easily and economically

Conclusion

A simple, economic, and predictable RCS abutment method that gives the dentist to get all of the advantages of the custom-made, cement-retained implant abutment technique and to ensure retrievability of the prosthesis

Cooperation between the dentist and the laboratory technician is always required to maximize the successful esthetic and functional outcome of the implant restoration.