Fixed Conometric Retention with CAD/CAM Conic Coupling Abutments and Prefabricated Syncone Caps: A Case Series

The conometric retention system was proposed and described as a predictable alternative to retain fixed implant-supported complete dentures and, more recently, to retain fixed partial restorations. Currently available studies describe a technique based on the Ankylos (Dentsply) implant system and stock conic coupling abutments. The purpose of this case series study is therefore to demonstrate the possibility of using Atlantis computer-aided design/computer-assisted manufacture technology to produce Conus abutments (Dentsply) and using the fixed conometric retention with other implant brands for which appropriate stock conic coupling abutments are not available. Int J Periodontics Restorative Dent 2018;38:277–280. doi: 10.11607/prd.3161

Materials and Methods

This case series included 12 partially edentulous patients planned to receive one, two, or four Straumann Bone Level implants (Institut Straumann) in the maxilla or mandible. Implants were placed following the
manufacturer’s protocol in healed sites. After 2 to 3 months, implant-level impressions were taken using regular open-tray impression copings (Institut Straumann) and poly-ether material (Impregum Penta, 3M ESPE) in a custom tray (Megatray, Megadenta).

A master cast with implant analogs was created (Chemirock H, Chemident) using a pink-colored condensation polysiloxane (Perma-dyne, 3M ESPE) to simulate soft tissues. The master cast and a wax-up of the ideal restoration were used with Atlantis (Dentsply) to fabricate Conus abutments. Conus abutments are available for different implant systems and are milled to perfectly fit Ankylos tapered SynCone caps (Dentsply). This avoids the need for the clinician to choose stock abutments and make them parallel to each other intraorally as with SynCone abutments. Instead, the custom abutments are already perfectly parallel and have the desired subgingival emergence profiles and heights. Atlantis CAD/CAM Conus abutments permit a maximum abutment angle correction of 30 degrees, modifying the subgingival portion and keeping the same shape in the coronal part to always maintain the same retention with the SynCone caps.

The dental laboratory technician received the Conus abutment, placed it on top of it a prefabricated Ankylos tapered SynCone cap, and prepared the metal framework (V1, 8853), leaving a space of 80 μm for the resin cement. The clinician tried in the patient’s mouth the engaging abutments (Figs 1 and 2) with a positioning jig, placed the SynCone caps on top, and engaged them firmly with gentle tapping (Figs 3 and 4). A resin cement (RelyX, 3M ESPE) was then used to cement the caps to the framework intraorally, and the prosthesis was removed and sent back to the dental laboratory. The abutments were tightened with a torque control ratchet and were removed from the patient’s mouth.

The dental laboratory applied composite resin or ceramic over the framework. If composite resin (Signum Composite, Heraeus Kulzer) was chosen, the clinician received a prosthesis ready to be placed intraorally by gentle tapping without any cement. If ceramic (Initial MC, GC) was chosen, the clinician needed to cement the prosthesis to the Syn-Cone caps again because the cement is burned during ceramization (Figs 5 and 6).

All patients enrolled in a maintenance program including dental visits and professional oral hygiene every 6 months.

All prostheses had a minimum follow-up of 18 months. During this time, the prosthesis was removed twice for professional oral hygiene. Removal of the prosthesis was always possible by lateral tapping using a wood stick and a mallet. The conometric connection was then reactivated by gentle tapping with the handle of the mirror, always without the use of any luting agent (Figs 7 to 9).

Results

A total of 12 patients (10 men and 2 women; average age 63 years, range 51 to 81 years) were consecutively enrolled in this case series study.

A total of 27 Straumann Bone Level implants and Atlantis Conus abutments were positioned. Implants were rehabilitated with 3 single crowns, 5 two-unit fixed partial
dentures (FPDs), 5 three-unit FPDs, and 1 full-arch implant-supported prosthesis.

No detachments of the prostheses were reported during the 18-month evaluation period. At every dental visit, the rehabilitations were checked for signs of peri-implant inflammation, radiographic signs of bone loss, fractures, and mobility of the prosthesis or of abutments. No implant failures or prosthetic complications were detected during the 18-month follow-up period.

Discussion

Based on the results of this and previous studies, the conometric system can provide a fixed connection between implants and dental prostheses.\textsuperscript{4–6} One advantage of the conometric system is easy prosthesis removal by the clinician to check the peri-implant soft tissues status and to perform professional oral hygiene in a comfortable way. In fact, no cement or retention screws are provided for prosthesis retention.\textsuperscript{4} Avoiding cement eliminates risks of peri-implant inflammation or peri-cementitis. The absence of a screw hole permits ideal occlusion and reduces the risk of porcelain chipping and the time required to remove the prostheses without reducing retrievability.\textsuperscript{7–10}

The reliability of the retention of the conometric system has been demonstrated for fixed implant-supported complete dentures and, more recently, for fixed partial restorations.\textsuperscript{4,5} In these studies, however, only one implant system has been used in combination with two types of stock conic coupling abutments. Therefore, it is reasonable to ask whether the conometric connection can be used effectively with other implant brands. This case series shows how the conometric connection can be replicated with other implant systems through the use of CAD/CAM technology. This technique simplifies the procedure and ensures equally satisfactory results in terms of retention and retrievability. Preparing conic coupling abutments using CAD/CAM avoids the difficult procedure of choosing the right angulated abutment and placing it with
the ideal rotation and parallelism in the patient’s mouth. Moreover, it shows how a conometric retention can also be used with implants that do not have available appropriate stock conic coupling abutments.

Following this protocol, CAD/CAM conic coupling abutments can be used on single crowns, fixed partial dentures, and fixed total rehabilitation.

Conclusions

This case series study provides further evidence that fixed conometric retention is a valid alternative to cement-retained and screw-retained systems. Compared to previous studies, it demonstrates that this technique can be used with a different implant system than that of the original protocol. Furthermore, the use of CAD/CAM technology for the production of conic coupling abutments spares the clinician the difficult task of choice and parallel placement of the abutments. However, more long-term studies and larger sample sizes are needed to confirm these results.

Acknowledgments

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References