Occlusal reconstruction with implant crown pair prostheses. Case report

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Abstract

Occlusal reconstruction of both arches was performed using splinted implant crown pairs. Each pair of crowns was luted to parallel implant abutment pairs and these were screwed and glued into approximately parallel pairs of implant bodies. Paralleling of holes for implant body pairs was performed using a precision guiding device.

Key words: Implants, crown reconstruction, precision guiding device, parallel implant bodies, splinted crown pairs.

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Introduction

Occlusal reconstruction with implant crowns is a demanding biological, surgical, aesthetic, functional and mechanical undertaking.

This case report outlines the technology and occlusally orientated concepts which formulated this reconstruction.

Case report

A 55-year-old male caucasian required a full clearance of the remaining dentition and placement of full upper and lower dentures. The dentures were worn sparingly over six months. A request for implant prostheses that did not look like dentures was made.

The existing dentures were relined in the usual manner. A centric relation record was taken, the dentures were mounted on an articulator and equilibrated. The dentures were duplicated in clear acrylic resin and plaster models of the fitting surface of the duplicated dentures were made.

Precision guiding devices

The duplicated dentures were used as a substructure for the fabrication of two precision guiding devices (Fig. 1). Each guiding device was made by drilling an access hole approximately 3 mm diameter through the long axis of the acrylic tooth forms of all anterior teeth, first premolars and first molars, using a steel flat fissure 2.3 mm diameter, laboratory bur.

With each duplicate denture seated on its plaster model, a steel flat fissure 1 mm diameter bur was placed through each access hole and a further hole was drilled in the centre of each ridge. The mandrel of each drill, 2.35 mm in diameter, was used for sighting the centre of the axis of each tooth with the centre of each ridge. This was performed by repeated drilling of the plaster until the cutting edge of the bur was stable in the plaster while the mandrel was centrally positioned in each tooth.

As well, these mandrels were further positioned in parallel pairs, namely, 11/21, 12/13, 22/23, 14/16, 24/26, 31/41, 32/33, 42/43, 34/36 and 44/46, and the pairs linked together with wire and cyanoacrylate glue. The mandrel pairs were lubricated with petroleum jelly and placed back in their holes. Self-cure acrylic resin was placed in each hole of the duplicate dentures and around each mandrel.

After setting, the mandrels were withdrawn from the guiding devices and excess acrylic resin trimmed. The holes were lubricated with oil so that each mandrel could move freely. The acrylic resin below the tooth forms on the facial was removed until a window was formed (Fig. 1).

Four additional holes, 2.3 mm diameter, were drilled in the region of the gingival papillae between 33/34, 36/37, 43/44 and 46/47 teeth of the guiding device from buccal to lingual surfaces.

Surgical phase

Facial flaps were raised starting one to two millimetres lingual to the crest of ridges.

The lower precision guiding device was splinted around the body of the mandible with four stainless steel wires. Each wire was passed through holes made in the 33/34, 36/37, 43/44 and 46/47 regions of the device adjacent to the floor of mouth and mucobuccal fold and then around the body of the mandible and tied off intraorally (Fig. 1).

Steel flat fissure and round burs, 2.3 mm in diameter, were used to drill pilot holes in the jaws. The mandrels, 2.35 mm in diameter, of these drills were passed snugly through the holes in the guiding devices for accurate drilling of pilot holes. Viewing and irrigation of each drill

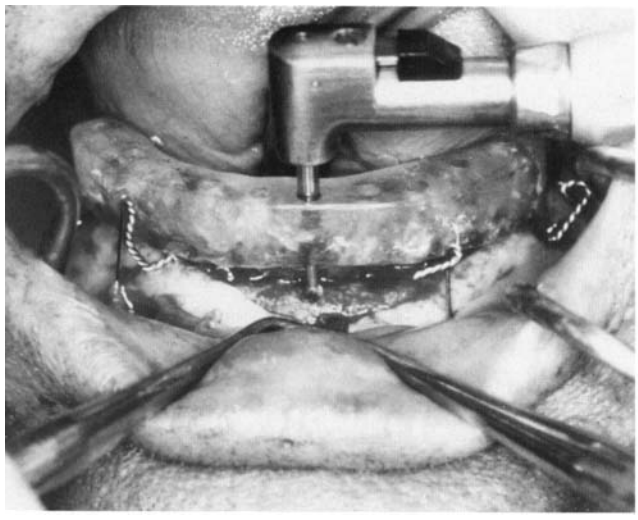

Fig. 1.–Anterior view of a mandibular precision guiding device stabilized to the body of the mandible with stainless steel sutures. This illustrates a long shank bur fitting snugly into the device for precise placement of a pilot hole in the mandible.

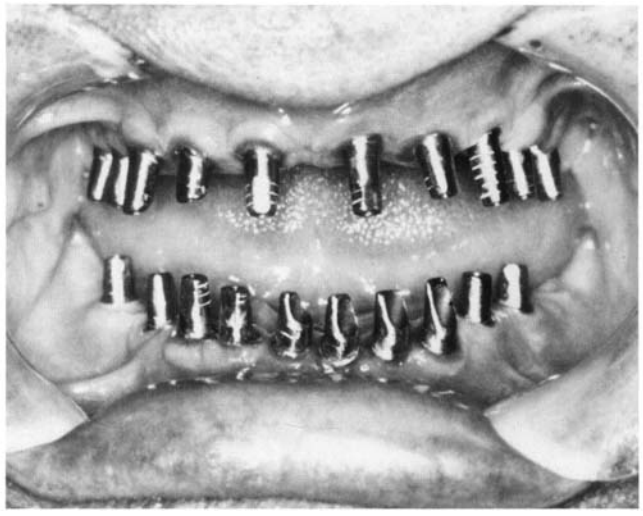

Fig. 2.–Anterior view of 20 implant abutments prepared in 10 parallel pairs. The pairs were in the following generic groups, namely, central incisors, lateral incisor and canine, and first premolar and molar. Note the 15° angled 31/41 and 32/33 abutments.

site was accessed through the facial window of each guiding device.

After placing the pilot holes the guiding devices were removed. The holes were widened with paddle drills prior to fitting either 3.25 mm or 4.00 mm diameter hydroxyapatite-coated titanium implant bodies.*

Sinus lift operations were performed in the usual manner. The implant bodies 14, 16, 24 and 26 were placed through the ridge and below the raised sinus cavity membranes. Autogenous hip bone graft fragments were packed around each body and against the sinus membranes.

The flaps were sutured in the usual manner and six months allowed for osseointegration. Thereafter, surgical exposure of the implant bodies was performed in the usual manner and healing caps were fitted.

Prosthodontic phase

Three weeks after placement of the healing caps, titanium implant abutments* were selected for each implant body. All abutments were a fixed straight type except that the 31, 32, 33 and 41 bodies required 15° angled abutments.

The axial walls and margins of each abutment were prepared extraorally with a high speed drill using a 1.2 mm tungsten carbide tapered bur.† Each abutment was screwed into an implant body analogue and embedded in an acrylic resin block. Each margin was a sloping shoulder type and was placed 0.5 to 1.0 mm subgingivally. The following abutment pairs were prepared parallel to each other 11/21, 12/13, 22/23, 14/16, 24/26, 31/41, 32/33, 42/43, 34/36 and 44/46 (Fig. 2).

All access holes in the abutments were filled with a visible light-cured periodontal wound dressing,‡ and after setting were drilled level with the contour of each abutment.

Retraction cord was placed and an antisialogue medication was used prior to taking impressions in a poly-

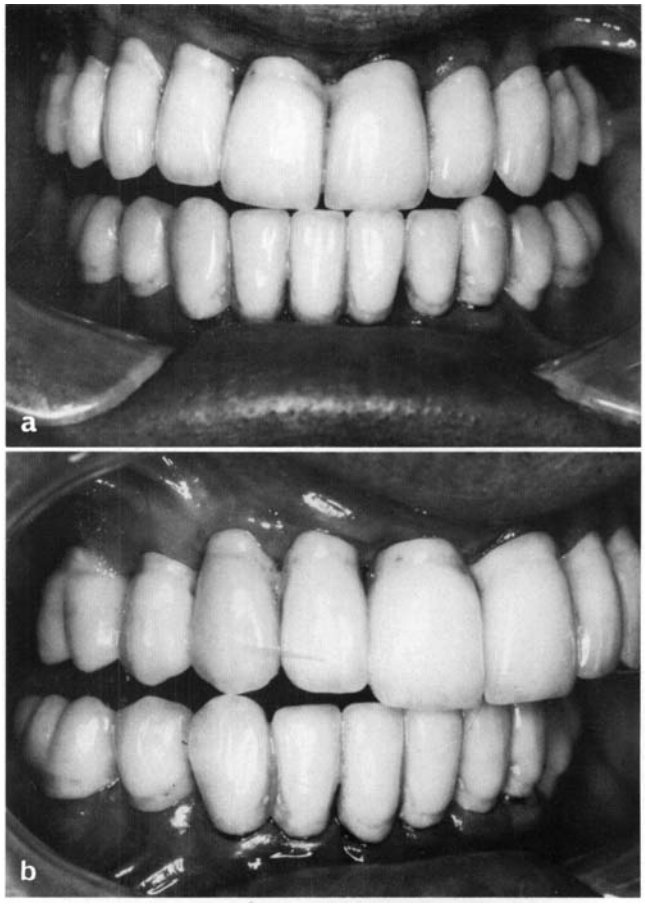

Fig. 3.–a, Anterior view of protrusive occlusion with only the central incisors on protrusive path and disclusion of other teeth. b, Lateral view of a steep right canine rise and disclusion of other teeth.

*Integral Omniloc. Calcitek, Carlsbad, CA, USA.
†Komet. Lemgo, Germany.
‡Barricaid. Caulk, Milford, DE, USA.

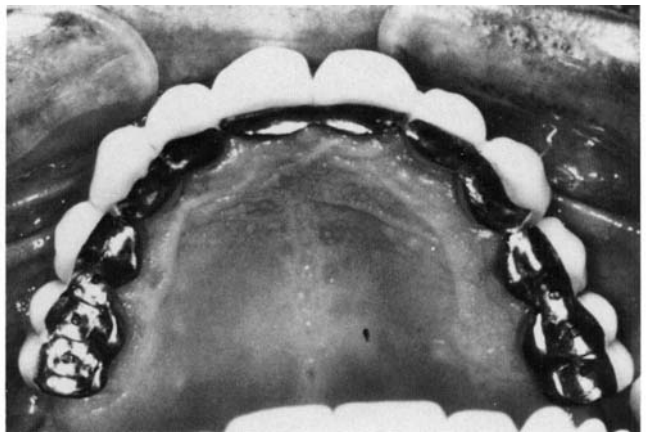

Fig. 4.–Occlusal view of the 5 maxillary splinted implant crown pairs illustrating the palatal two-thirds of the occlusal table in metal. Note, the metal palatal supporting cusps and Clayton centric stops.

sulphide impression material§ with oleic acid retarder. Full arch impressions of the abutments were taken and were silverplated.

Pairs of splinted porcelain fused to metal crowns were made for the 11/21, 12/13, 22/23, 14/16, 24/26, 31/41, 32/33, 42/43, 34/36 and 44/46 abutments (Fig. 3a, b). The lower crowns were made with porcelain occlusal surfaces, whereas the upper crowns had metal on the palatal two-thirds of the occlusal surfaces. Centric stops were designed in accordance with Clayton's centric stop technology but without the proprioceptive incline contacts[1] (Fig. 4).

A fully adjustable articulator set from readings taken using an electronic pantograph‖ was used to develop this occlusal scheme.

The dressing material in each access hole of the abutments was removed with a Hedström endodontic file. All abutments were then removed and screwed back into their respective implant bodies along with an anti-vibration glue.¶ All crowns were luted to their abutments with a fortified zinc-oxide eugenol cement.** The occlusion was verified with articulating film†† so that centric relation and centric occlusion were coincident; the protrusive path was guided off the central incisors and steep canine rises were developed[2] (Fig. 3a, b).

Two months after cementation a computer occlusal analyser‡‡ was used to aid in further equilibration of centric stops following oral function.

§Permlastic. Kerr, Romulus, MI, USA.
‖Pantronic. Denar, Anaheim, CA, USA.
¶Ceka Bond. Ceka, Antwerpen, Belgium.
**ZOE 22 00. Caulk, Milford, DE, USA.
††Accufilm 2. Parkell, Farmingdale, NY, USA.
‡‡T-Scan. Tekscan Inc., Boston, MA, USA.

Discussion

The design of the reconstruction was based on the precise placement of implant bodies in parallel pairs so that corresponding splinted implant crown pairs could be made with ease.

Splinted crown pairs were chosen so that loosening of abutment screws would be difficult because rotation of a screwed abutment is unlikely if it is linked to another abutment and vice versa. The selection of which abutments to pair was based on the four major mandibular movements and ideal occlusal schemes, that is, each central incisor prosthesis supporting the mandible in protrusive path, each lateral incisor and canine prosthesis supporting the mandible in lateral excursion and each first premolar and molar prosthesis supporting the mandible in centric occlusion/relation.

Porcelain occlusion tables were placed for the lower crowns, whereas all-metal centric stops were used for the upper crowns. This was done so that an aesthetic result could be achieved for the lower arch while allowing swaging of the metal surface to occur in the upper crowns during occlusal loading. The author has observed that this burnishing is ideal for monitoring occlusal faceting thus simplifying occlusal adjustment. It is believed that this scheme will promote longevity. The anti-vibration glue was used to further prevent loosening of screws and to seal the cavity of the screw housing from gross bacterial plaque. The use of the luting cement was to allow retrievability of each splinted prosthesis.

Conclusion

An occlusal reconstruction of both arches was performed with splinted implant crown pairs. The reconstruction was designed to minimize screw loosening, seal the screw housing, gain support between pairs of implant bodies in different mandibular movements, and allow retrievability of each prosthesis.

Acknowledgements

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