Short Communication

The Prosthodontic Restoration of a Self-Inflicted Gunshot Maxillofacial Defect: A Short-Term Follow-up Case Report

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A self-inflicted gunshot maxillofacial defect was restored with dental implants and various attachments. Following mandibular surgical reconstruction, a fixed full-arch implant-supported prosthesis was fabricated. The maxillary defect was restored with an obturator retained with bar-clip and ball attachments. Crowns with an unfavorable crown-to-root ratio were used to rectify a compromised unilateral interocclusal space. Functional rehabilitation was achieved without any pathologic sequelae and maintained over a 1-year observation period. Provision of a fixed implant-retained mandibular prosthesis opposing a specific design for a maxillary obturator provided short-term and optimistic prognosis in the management of a serious traumatic injury. *Int J Prosthodont 2007;20:85–88.*

In a suicide attempt with a firearm placed under the chin, the angle between the gun barrel and the extended head often determines the nature of the maxillofacial defect, which may include nasal, orbital, or labial extraoral tissue deficits.[1] The resultant compromise in esthetics, mastication, deglutition, and speech may not be readily prosthetically rectified because of inadequate obturator retention, poor control of oral fluids, inadequate diet, and the difficulty of restoring facial support. The treatment's overall outcome is frequently determined by the prostheses' retentive properties.[2]

The present clinical report describes the restoration of an extensive self-inflicted gunshot maxillofacial defect by combining the use of osseointegrated implants and different attachment designs.

Materials and Methods

A 24-year-old man presented with a self-inflicted maxillofacial defect involving the symphyseal region, premaxilla, hard palate, nose, and mandibular lip. The nose and symphyseal defect were surgically reconstructed with autogenous grafts, while the palatal defect, including the premaxilla, was planned for pros-

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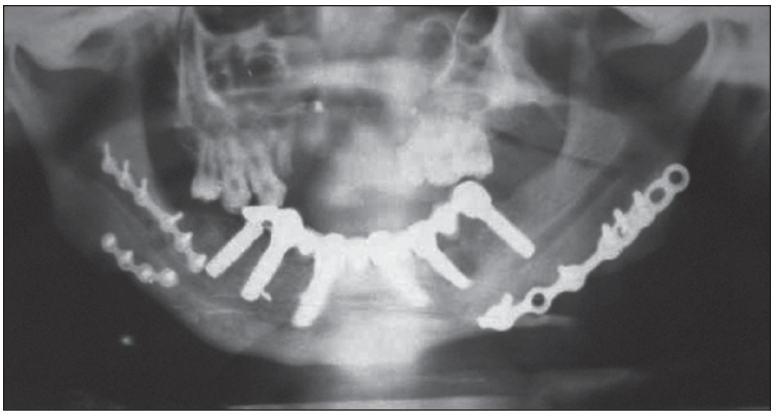

Fig 1 Radiographic view of mandibular rehabilitation with symphyseal bone grafting and osseointegrated dental implants.

Fig 2 Median palatal defect including the anterior maxilla and prepared maxillary molar teeth.

thetic treatment. While the remaining maxillary molars were intact, the displaced left side of the maxillary arch was misaligned relative to the patient's clinically determined occlusal plane, with a unilaterally increased interocclusal distance of approximately 8 mm. The patient's edentulous mandibular state combined with a mandibular lip deficiency compromised food intake and oral fluid control, resulting in complications regarding nourishment. An attempt to address the functional problem with a clasp-retained maxillary obturator and a mandibular complete denture proved unsuccessful. Clinical examination, diagnostic images, and a trial waxup on study casts were used to determine the feasibilty and desirability of specific surgical and prosthodontic rehabilitative procedures. The grafted mandibular region was judged to be suitable for implant placement,[3] while the maxillary deficit was considered a better candidate for prosthetic treatment alone, because of the size of the premaxillary and palatal defect.

Six osseointegrated dental implants (Swiss-Plus, Zimmer Dental), 12 mm long and 4.1 mm in diameter, were placed in the grafted symphyseal right premolar and left molar regions of the mandible. After an osseointegration healing period, an implant-supported, full-arch fixed prosthesis was fabricated and inserted (Fig 1). Only the right maxillary molars were in contact with the prosthesis in centric occlusion because of the 8-mm left-side vertical introcclusal space (VIS), which had resulted from the injury. Regrettably, a preoperative clinical photograph was not available for publication.

It was decided that prosthetic compensation for the VIS discrepancy was essential. Therefore, the choices were to design *(1)* a bulkier obturator on the superiorly placed left maxillary teeth segment or *(2)* a less bulky obturator that would require crowns on the maxillary teeth with unfavorable crown-to-root ratios for retentive support. In the former method, the obturator would be 3-dimensionally bulkier on the left side than the right, and would likely be heavier, harder to stabilize, and more vulnerable to adverse and destabilizing lateral forces. The alternative design offered a far less bulky obturator, but risked adverse force transmission to the crowned left maxillary molars, which showed an "elongated" morphology.[4] Consequently, a clip retainer matrix was designed on the left portion of the bar, and a ball attachment was planned for the right portion. The presumption was that such a retentive design would reduce the risk of excessive occlusal forces.[5,6]

The maxillary teeth were prepared for crowns (Fig 2) and a master cast was fabricated (Begostone, Bego). The occlusal surface of the first molar coping was waxed (Degussa) 6 mm thicker occlusally, while the second molar was made 2 mm thicker. The wax copings were cast, and a dolder bar waxup (Bredent Snap Attachment System, Smith Dental Prosthetics) was placed between the right and left cast copings. The wax

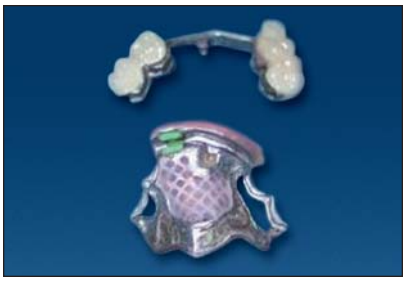

Fig 3a Maxillary right and left metal-ceramic crowns connected with Dolder bar.

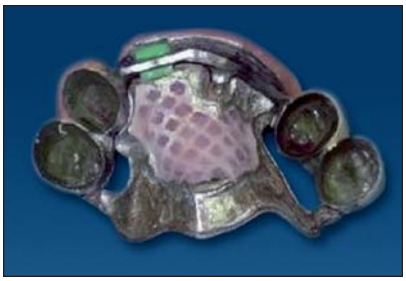

Fig 3b Bar-clip and ball-attachment patrices located in their matrices within the obturator.

Fig 3c Frontal view of completed prosthesis assembly.

patrix of the ball attachment was located on the right portion of the bar, and this assembly was cast (Viron 99, Bego) and soldered between the maxillary copings. Pink ceramic material (IPS d.SIGN, Ivoclar Vivadent) was formed on the left cervical aspect of the copings at a level equal to that of the right maxillary gingival margin. This provided a matching and symmetric gingival exposure, which was necessary because the left maxillary molar crowns were veneered with both tooth-colored and gingiva-colored replacement porcelain. The tooth-colored porcelain (IPS d.SIGN, Ivoclar Vivadent) was designed to simulate canine morphology on the elongated occlusal portions of the maxillary left first molar coping and make contact with the opposing fixed prosthesis.[4] After firing and glazing, the substructure was placed in the mouth, and a final impression was made for the fabrication of the obturator framework. Following the casting of the framework (Biosil-F, Degussa), occlusal records were obtained, acrylic resin teeth were set up, and a final intraoral trial assessment was performed. Necessary adjustments to ensure a group function articulation were carried out and the laboratory prosthetic phase was completed (Figs 3a to 3c). Finally, the maxillary crowns with the bar splint–retained obturator were cemented (Ketac-Cem, 3M ESPE) (Fig 4).

Results

A follow-up evaluation was performed 1 year post-treatment, and no pathologic changes were observed. In fact, nearly all of the patient's functional requirements had been addressed, with the exception of oral fluid control, which was still problematic due to the mandibular lip deficiency.

Fig 4 Intraoral view of the obturator and the implant-supported fixed full-arch prosthesis in centric occlusion.

Discussion

The unilateral VIS of 8 mm necessitated a prosthetic design that combined alternative retention options. A bar-clip attachment was used to provide higher retention on the effected side, and a ball attachment was used to enable some freedom of movement and prevent the transmission of harmful forces to the left side[5,6] while compensating for the unilateral large interocclusal space with "elongated" crowns.[4] It may be argued that this design could theoretically increase the effect of harmful lateral forces, and that the alternative design, using regular copings on the left maxillary teeth and an obturator that "overdentured" the left abutments, would be a more traditional and rational approach. The authors' clinical judgement is presented for debate via this publication; however, it should be noted that the 1-year clinical examination and radiographs showed that the obturator was stable and the teeth and implants asymptomatic, with no clinical or radiographic evidence of pathologic changes.

Conclusion

This case report's short observation period demands a very cautious interpretation of the merits of the clinical rationale used to address this specific patient's oral rehabilitative needs. The maxillary obturator design used to compensate for both the morphologic and symmetric deficits, along with osseointegrated dental implants in the surgically reconstructed mandible, appeared to fulfill most of the functional requirements of the patient, at least in the short-term observation period.

References

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Literature Abstract

Evaluation of blending effect of composites related to restoration size

The purpose of this study was to evaluate the influence of restoration size on blending, initial color difference, and translucency of resin composites on the blending effect of resin composites. Four sets of 10-mm-diameter resin composite disks were made: single composite (1CS) and 2-composites (2CS) (2-mm-, 4-mm-, and 6-mm-diameter inner resin composites). The outer ring mimicked hard dental tissue with different cavity sizes. Five shades of commercial resin composites were studied. The lighter of the resin composite specimens was used as the inner composite in 2CS and shifted toward the darker composite—the smaller the diameter of the inner composites the greater the shift. Six observers (4 dental clinicians and 2 scientists) did visual color assessments without any color deficiency in a D50 lighting booth. Observers compared 1 2CS or 2 1CS at a time. Results were expressed in a 1 to 5 scale: 1: mismatch/totally unacceptable, 2: poor match/hardly acceptable, 3: good match/acceptable, 4: close match/small difference, and 5: exact match/no difference in color. The blending effect was calculated as a difference in mean score (mean category values) for a 2CS and corresponding 1CS pair. Color and translucency for 1CS were measured using a spectrophotometer. Linear regression was used to determine correlation coefficients among visual assessments as well as among visual assessments and color difference metrics. The mean scores by observer ranged from 1.1 to 1.8 and was 1.3 (0.6 SD) for all observers together. Corresponding mean scores for 2CS ranged from 2.2 to 2.6 and was 2.4 (1.4 SD) for all observers. This confirmed the existence of blending effect with some resin composites. Blending effect increased with a decrease in restoration size, decrease in color difference, and increase in specimen translucency.

Paravina RD, Westland S, Imail FH, Kimura M, Powers JM. *Dent Mater* 2006;22:299–307. **References:** 36. **Reprints:** Dr Rade Paravina, Department of Restorative Dentistry and Biomaterials, The University of Texas Dental Branch at Houston, 6516 MD Anderson Boulevard, DBB 465 Houston, TX 77030 3402. E-mail: rparavina@uth.tmc.edu—*Alvin G. Wee, OSU College of Dentistry, Columbus, OH*