

Oral Rehabilitation of Severe Dentoalveolar Trauma: A Clinical Report

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This clinical report describes the oral rehabilitation of an adult male who suffered severe dentoalveolar trauma as a result of a motor vehicle accident. The specific objectives of this treatment were to restore esthetics and masticatory function. Treatment included removal of fractured roots, placement of multiple endosseous implants, and placement of anterior and posterior metal-ceramic crowns and fixed partial dentures. Three year clinical examination revealed no pathology associated with the rehabilitation. The patient's esthetic and functional expectations were successfully achieved.

Key Words: oral rehabilitation, oral and maxillofacial trauma, implant dentistry

CLINICAL REPORT

A 30-year-old white man reported to the emergency department after a trailer hitch fell from a vehicle in front of him, entering his windshield while traveling on the highway and striking him in the face (Figure 1). The patient's past medical history was unremarkable. He was evaluated and stabilized via Advanced Trauma Life Support protocol. Oral and Maxillofacial Surgery was consulted for facial injuries and the following exam was noted. The patient was alert and oriented, responding to command. No internal organ, orthopedic, or spinal injuries were found. Gross examination of the head and neck region was significant for a full thickness lip and chin laceration to the oral cavity from the lower lip slightly off midline to the chin region where it became stellate (Figure 2a and b).

Maxillary and mandibular right anterior dentoalveolar fractures involving the molars, premolars, canines, and incisors crossing the midlines were noted. There was significant communication of the segments with tooth mobility. There were no other

indications of facial fractures noted; ocular and auricular exam were normal. These skeletal injuries were confirmed via computerized tomography. The patient was subsequently taken to the operating room for debridement of multiple fragments of teeth and comminuted alveolar bone, open reduction, and internal fixation of the maxillary right and dentoalveolar fracture segment, extraction of teeth numbers 4, 5, 6, 7, 8, 9, 10, 21, 22, 23, 24, 25, 26, 27, 28, 29, and 30, and closure of facial lacerations.

Three months after the accident the patient was referred for a prosthodontic evaluation. The patient's primary concern included the need for replacement of the missing masticatory system. Of equal importance to his primary concern was to have highly esthetic replacement restorations. A detailed medical, dental, and social history did not reveal any contraindications to dental therapy. The patient indicated previous orthodontic therapy approximately 10 years prior to the accident. The patient requested and received clinical photographs from the previous orthodontist to be utilized by the prosthodontist and laboratory technician during the rehabilitation phase of therapy.

Clinical and radiographic examination revealed missing teeth numbers 4, 5, 6, 7, 8, 9, 10, 21, 22, 23, 24, 25, 26, 27, 28, 29, and 30 (Figures 3 and 4). No caries existed on remaining teeth. Tooth number 15 had small amalgam restorations. Moderate plaque

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FIGURES 1 AND 2. FIGURE 1. Position of trailer hitch in patient's passenger seat post accident. **FIGURE 2a AND b.** Initial soft tissue injury.

and calculus was present on most remaining teeth. Staining of plaque and calculus resulted from use of 0.12% chlorhexidine gluconate oral rinse (PerioGard, Colgate Oral Pharmaceuticals, Inc, New York, NY) that was removed upon scaling and prophylaxis.

The patient was not experiencing any pain or sensitivity with the exception of the chin scar bands

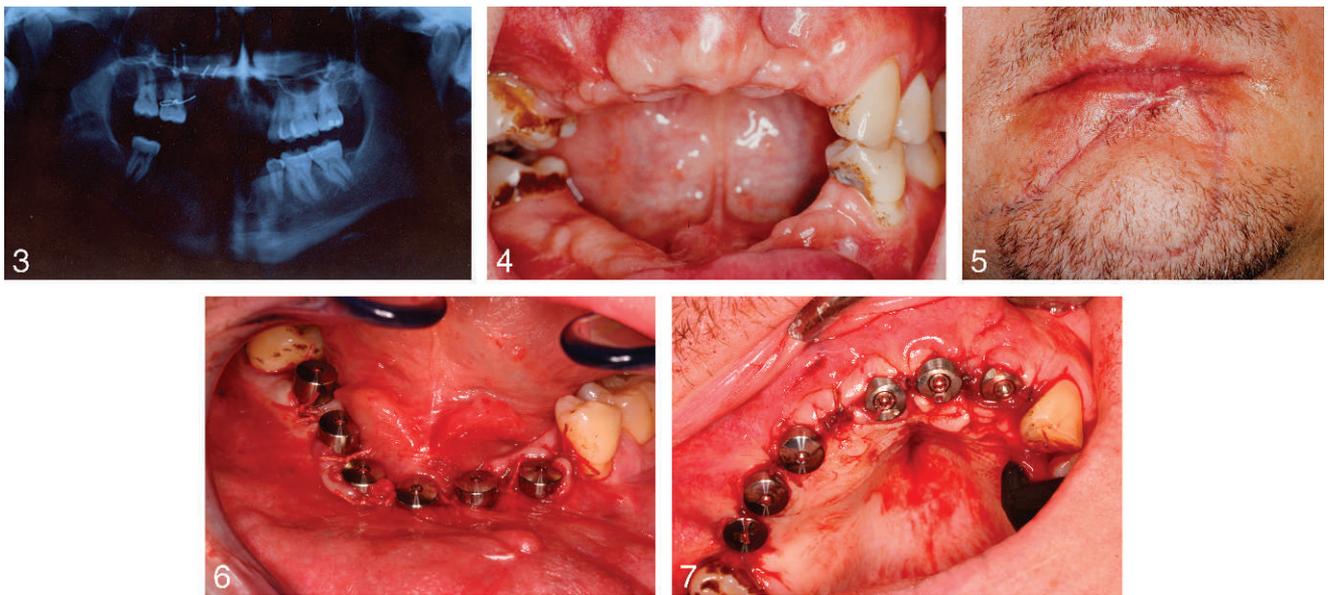
(Figure 5). These chin scar bands extended from the inferior border of the chin to the vermilion border of the lower lip. The scar bands caused the lower lip to be retracted to the right during speech and smiling. The scar bands also restricted the depth and width of the mandibular labial vestibule. In addition, the patient demonstrated a low maxillary smile/lip line.

Maxillary and mandibular complete arch impressions were obtained using irreversible hydrocolloid (Jeltrate, Alginate, Fast Set, Dentsply International Inc, York, Pa) impression material. Diagnostic casts were fabricated from Type IV dental stone (Silky Rock, Whip Mix Corporation, Louisville, Ky) and articulated on a semi-adjustable articulator (Model 3140 Articulator, Whip Mix) utilizing a face-bow transfer (Model 9185 Quick Mount Face-Bow, Whip Mix) and interocclusal records (Take 1 Bite, Kerr Corporation, Orange, Calif). The centric relation position and maximum intercuspation position were coincident. The mutually protected occlusal scheme was developed through a diagnostic waxing.

A treatment plan was developed along with various treatment alternatives and was presented to the patient. The treatment options included: (1) multiple implants and multiple fixed restorations (ie, fixed partial dentures [FPDs] and crowns); (2) multiple implants and removable partial dentures (RPDs); (3) conventional RPDs without implant support; (4) a combination of options 1, 2, and 3; and (5) no treatment.¹⁻³ Risks, benefits, alternatives, and fees were explained to the patient, and all of the patient's questions were answered. The patient selected the treatment option of multiple implants with multiple fixed restorations for both maxillary and mandibular arches.

Reconstruction began with a cortical cancellous bone graft from the patient's iliac crest to the maxilla. Cortical blocks of bone were removed from the patient's hip and were cut with rongeurs and reciprocating saw to intimately fit maxillary alveolar ridge defects. These bone blocks were secured in place using 2.0-mm diameter by 10-mm length titanium screws. Cancellous bone (marrow) from the hip was then packed around the cortical bone filling in gaps to smooth the reconstructed ridge. Mucosa was closed with 3-0 resorbable polyglactin suture.

At this time, tooth number 3 was noted to have minimal bone support and was extracted. Six



FIGURES 3–7. **FIGURE 3.** Panoramic radiograph (preprosthetic treatment). **FIGURE 4.** Frontal view of teeth and ridges in maximum intercuspation (pretreatment). **FIGURE 5.** Frontal view of chin with scar bands (preprosthetic treatment). **FIGURE 6.** Immediate postoperative view of placement of mandibular implants. **FIGURE 7.** Immediate postoperative view of placement of maxillary implants.

endosseous implants (Standard Implants, Straumann, Andover, Mass) were simultaneously placed in the mandible using a surgical guide fabricated from the diagnostic waxings in sites: 22, 24, and 25 (3.3 mm × 14 mm SLA, PLUS, Straumann); 27 and 29 (4.1 mm × 12 mm SLA, RN, Straumann); and 30 (4.8 mm × 12 mm SLA, RN, Straumann) (Figure 6).

After 3 months of osseous integration, titanium abutments were placed as follows: (1) 5.5-mm solid abutments for numbers 22 and 24 (RN solid abutment, Straumann); (2) 15° angled abutments for numbers 25 and 27 (RN synOcta 15° angled abutment, Straumann); and (3) 4.0-mm solid abutments for numbers 29 and 30 (RN solid abutment, Straumann). A torque of 35 Ncm was applied to each abutment utilizing the manufacturer's torque delivery system (torque control device and ratchet, Straumann). The access openings of abutments number 25 and 27 were closed with a cotton pellet and composite resin (Fermit-N, Ivoclar Vivadent, Amherst, NY). The mandibular implant abutments were provisionally restored with 2 laboratory processed 3-unit fixed partial dentures (nos. 22–24 and 25–27) and two single crowns (nos. 29 and 30) (Biotemps, Glidewell Laboratories Inc, Newport Beach, Calif) lined with methyl methacrylate acrylic resin (Alike, Temporary C & B Resin, GC America Inc,

Alsip, Ill) and cemented with zinc oxide eugenol (TempBond, Kerr).

Following 5 months of graft healing, new maxillary diagnostic impressions were obtained, and new diagnostic waxings were fabricated opposing casts of the mandibular provisional fixed restorations. Six endosseous implants (Standard Implants, Straumann) were placed in the maxillary sites: 3 (4.8 mm × 12 mm SLA, RN, Straumann); 4 and 6 (4.1 mm × 12 mm SLA, RN, Straumann); 8 and 10 (3.3 mm × 12 mm SLA, PLUS, Straumann); and 9 (3.3 mm × 10 mm SLA, PLUS, Straumann), utilizing a surgical placement guide generated from the new maxillary diagnostic waxings (Figure 7). All implants and grafts healed without signs of infection or other complication.

After allowing 4 months of osseous integration, titanium abutments were placed as follows: (1) 5.5-mm solid abutments for implant sites 3, 6, and 8 (RN solid abutment, Straumann); and (2) 4.0-mm solid abutments for implant sites 5, 9, and 10 (RN solid abutment, Straumann). A torque of 35 Ncm was applied to each implant abutment using the manufacturer's torque delivery system (torque control device and ratchet, Straumann). The maxillary implant abutments were provisionally restored with 1 laboratory processed fixed partial denture (nos. 6–8) and 4 single crowns (nos. 3, 4, 9, and 10)

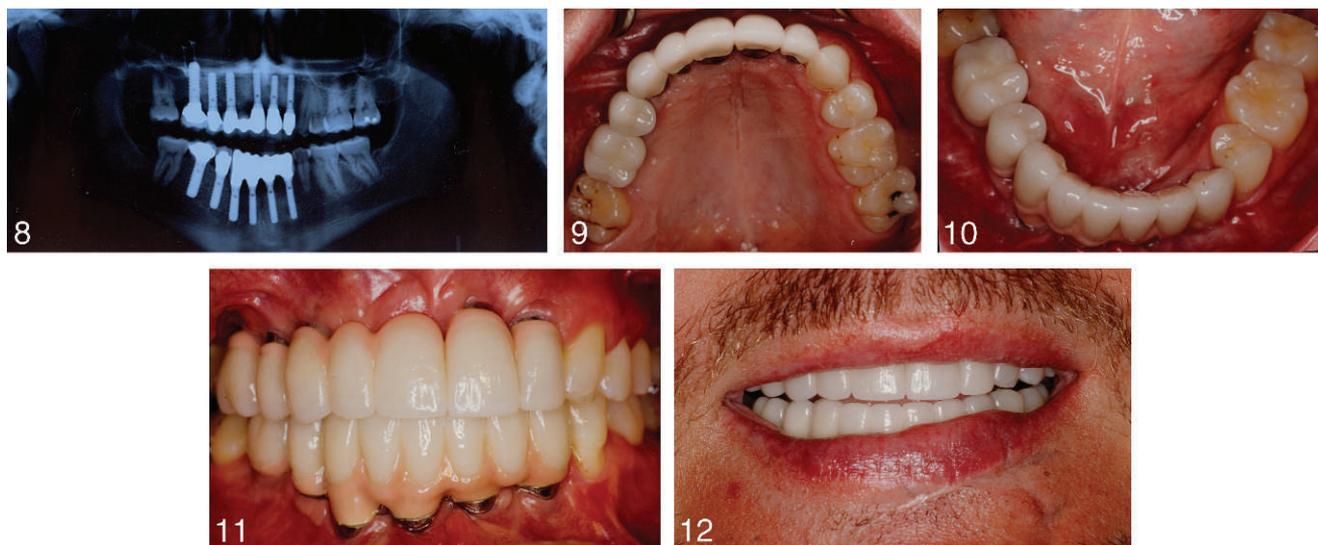


FIGURE 8–12. **FIGURE 8.** Panoramic radiograph (posttreatment). **FIGURE 9.** Maxillary occlusal view (posttreatment). **FIGURE 10.** Mandibular occlusal view (posttreatment). **FIGURE 11.** Frontal view of the teeth in maximum intercuspation (posttreatment). **FIGURE 12.** Frontal view of patient in smile.

(BioTemps, Glidewell Laboratories Inc) lined with methyl methacrylate acrylic resin (Alike, Temporary C & B Resin, GC America) and cemented with zinc oxide eugenol (TempBond, Kerr). The patient's phonetics and esthetics were satisfactorily reestablished. The patient wore the provisional restorations for 3 months successfully and without complications.

In order to satisfy the patient's esthetic concerns he elected to whiten his remaining natural dentition while he was evaluating the function and esthetics of the provisional restorations. Maxillary and mandibular custom-fitted tooth-whitening trays (Sof-Tray Sheets, Ultradent Products, Inc, South Jordan, Utah), with reservoirs placed according to manufacturer's instructions (Ultradent LC Block-Out Resin, Ultradent Products), were fabricated from new diagnostic casts (Silky Rock, Whip Mix). The patient was instructed how to properly load the tray with the 10% carbamide peroxide tooth-whitening agent (Opalescence PF, Ultradent Products) and was given nocturnal wear instructions. The patient whitened the natural teeth for 1 month and then discontinued use of the tooth-whitening agent in order to stabilize the color.

One month after the tooth whitening procedures, the final shade selection was determined (VITA Toothguide 3D-MASTER, VITA Zahnfabrik, Bad Säckingen, Germany). After careful evaluation of the phonetics and esthetics, irreversible hydrocolloid

impressions (Jeltrate, Alginate, Fast Set, Dentsply International) were obtained and poured in Type IV dental stone (Silky Rock, Whip Mix). A custom incisal guide table was fabricated from acrylic resin (Pattern Resin LS, GC America).

Definitive impressions of the maxillary and mandibular anterior implants were obtained using polyvinyl siloxane impression material (Extrude and Extrude Extra, Kerr). Working casts were generated from Type IV die stone (Jade Stone, Whip Mix) and mounted onto the articulator using interocclusal records (Take 1 Bite, Kerr). One maxillary 3-unit fixed partial denture, 2 single crowns, and 1 mandibular 6-unit fixed partial denture replacing the maxillary and mandibular anterior teeth were fabricated (Jelenko Collegiate Heraeus Kulzer, Inc, Armonk, NY; Ceramco II, Dentsply International, Inc), tried-in, and cemented (ImProv, Alvelogro, Inc, Union, Wash).

After establishing the anterior guidance, definitive impressions of the posterior maxillary and mandibular implants were obtained using polyvinyl siloxane impression material (Extrude and Extrude Extra, Kerr). Working casts were generated from Type IV die stone (Jade Stone, Whip Mix) and mounted onto the articulator using interocclusal records (Take 1 Bite, Kerr). Four posterior metal-ceramic crowns replacing the right maxillary and mandibular second premolars and first molars were fabricated (Jelenko Collegiate Heraeus Kulzer; Ce-

ramco II, Dentsply International), tried-in, adjusted, and cemented (ImProv, Alvelogro) (Figures 8 through 11).

For long-term success, a laboratory-processed maxillary stabilization splint was prescribed for nighttime use. Oral hygiene instructions were emphasized, and the patient demonstrated he could clean around all of the prostheses and implants satisfactorily. Recall evaluations at 3-month intervals for the first year and then 6-month recalls for 2 subsequent years did not reveal any pathology. The patient did not experience any sensitivity or other complications associated with the oral rehabilitation. The patient's functional and esthetic expectations were successfully achieved (Figure 12).

DISCUSSION

Although the patient responded very well to implant therapy and subsequent fixed restorations, oral hygiene has remained a unique challenge for the patient with regard to the mandibular anterior implants. The existing chin scar bands were so tight at the base of the chin, rendering it difficult to retract the lip adequately in order to effectively and easily cleanse the implants with a standard adult toothbrush. A pediatric toothbrush (Oral B, Procter and Gamble, Cincinnati, Ohio) in addition to an end-tufted brush (Oral-B, Procter and Gamble) allowed the patient to more easily access the implants with the restricted labial vestibule. Osseous mandibular ridge augmentation prior to endosseous implant placement may have improved that oral hygiene challenge by relocating the implants superiorly and more distantly from the chin scar band.

SUMMARY

This clinical report described the oral rehabilitation of an adult male patient who had experienced significant maxillofacial trauma due to a motor vehicle accident resulting in the loss of multiple maxillary and mandibular teeth. The successful oral rehabilitation was managed with ridge augmentation of the maxilla and placement of multiple maxillary and mandibular endosseous implants. These osseous integrated implants were restored with multiple anterior metal-ceramic FPDs and multiple anterior and posterior single metal-ceramic crowns.

ABBREVIATIONS

FPD: fixed partial dentures

RPD: removable partial dentures

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