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Surgical and Prosthodontic Treatment of a Patient with Significant Trauma to the Middle and Lower Face Secondary to a Gunshot Wound: A Clinical Report

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Abstract

Large defects of dentofacial structures may result from trauma, disease (including neoplasms), and congenital anomalies. The location and size of the defects are related to difficulties that patients report relative to speech, mastication, swallowing, facial esthetics, and self-image. This article reports on the evaluation and treatment of a patient who suffered significant trauma to the lower and mid-face secondary to a gunshot injury. It describes the initial presentation, life-saving procedures, and subsequent bone grafts, implant placement, and prosthetic treatments required to rehabilitate the patient to a condition that closely approximated his preoperative condition. This clinical report confirms that no matter the degree of complexity involved in treating the results of significant facial trauma, successful treatment is dependent on thorough physical and radiographic examinations, development of the appropriate diagnoses, and treatment based on sound prosthodontic and surgical principles.

Large defects of dentofacial structures may result from trauma, disease (including neoplasms), and congenital anomalies. The location and size of the defects are related to difficulties patients experience with speech, mastication, swallowing, facial esthetics, and self-image.[1-4] Patients who suffer from these facial defects often require multiple reconstructive surgeries over an extended period of time. Blood supply to the surgical sites may impact the postoperative results. Osseous and soft tissue contours may sometimes deviate significantly from normal. These patients may also demonstrate signs and symptoms consistent with anxiety, depression, or posttraumatic stress disorder.[5]

Treatments for major facial trauma are generally divided into three categories: life-saving procedures, surgical reconstruction, and definitive prosthodontic treatment. Numerous methods have been proposed for surgical reconstruction of panfacial trauma.[6-11] The so-called bottom-up and inside-out, or more recently, top-down and outside-in, methods have been used for treatment and debated among surgeons.[7,8] Advances in facial-trauma management, including computerized tomography (CT), have enabled surgeons to visualize and successfully reconstruct complex panfacial injuries. Restoration of both preinjury facial esthetics and function is the goal of reconstructive surgery. An organized approach to these injuries begins at the maxillary and mandibular arches with progression to the vertical mandible. The naso-orbital-ethmoidal complex should be stabilized to the cranium and bone grafted when indicated. The zygomatic complex is related medially, and orbital reconstruction is then performed. The facial architectural restoration is completed at the Lefort I level. Adherence to this protocol enables surgeons to obtain reproducibly good results, even with the most extensive facial dislocations.[7]

Rigid fixation (ORIF) has also advanced in the field of oral and maxillofacial trauma reconstruction.[9] Despite excellent predicable results with various ORIF protocols, considerable debate still occurs in cases involving the traumatic avulsion of large volumes of hard and soft tissues. With severely comminuted jaw fractures, particularly of the mandible, stripping the periosteum from fractured, small pieces of remaining bone, for ORIF, may be counterproductive to achieving continuity of the mandible.[10,11]

The purpose of this article is to report on the evaluation and treatment of a patient who suffered significant trauma to the lower and mid-face secondary to a gunshot wound. This clinical report will briefly describe the patient's initial emergency room presentation, triage, and treatment for life-threatening injuries. The subsequent treatments with multiple surgeries,

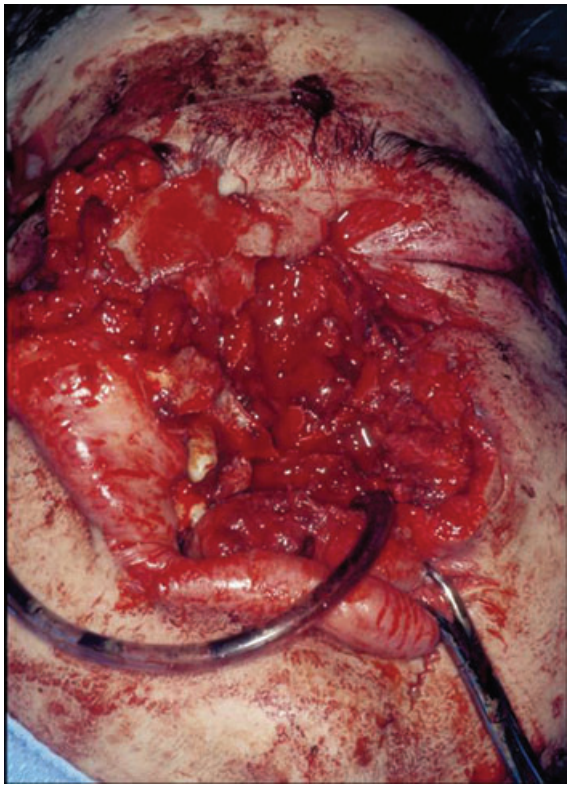

Figure 1 Preoperative photograph of the patient described in this report after being stabilized in the Emergency Ward. Note the extensive loss of hard and soft tissues in the middle and lower thirds of the face.

grafts, compromised nonoptimal endosseous implant placement, prosthodontic treatment, and plastic surgery procedures will also be illustrated.

Clinical report

A 17-year-old malepatient presented to the Emergency Ward (EW) of the Gundersen Lutheran Medical Center, LaCrosse, WI, by helicopter, 45 minutes after extensive facial trauma from a self-inflicted gunshot wound (Fig 1). The patient's airway was stable, and he was not intubated at the time of EW admission. He had been hemodynamically stable during transportation. As per initial advanced trauma and life-support guidelines (ATLS), the patient was then intubated and studies were performed.[10,12]

CT of the head and neck region was negative for intracranial penetration or other injury. The cervical spine had no radiographic or clinical signs of trauma. Fine cut (1 mm) axial and reconstructed coronal, sagittal, and 3D CT images were obtained for diagnostic and treatment-planning purposes. Radiographic studies showed extensive middle and lower face comminuted fractures with avulsion of multiple anterior teeth, hard palate, alveolar bone, nasal bone, nasal septum, and the maxillary and ethmoid sinuses. Zygomatic arches were intact bilaterally. The medial and lateral sides and floors of both orbits were violated.

The patient was taken to the operating room, where a tracheotomy and a percutaneous endoscopic gastronomy (PEG) were performed. Comprehensive evaluation of the hard and soft tissue injures to the face demonstrated significant avulsion of osseous and soft tissues. Given the extent of the comminuted fractures, a decision was made to not further disrupt the blood supply by stripping the periosteum from the segments with rigid fixation (ORIF) bone plates. A segmental arch bar and Ivy Loupes were placed to establish the occlusal vertical dimension (OVD). At this time, the patient's posterior teeth were in occlusion bilaterally. This was considered to be consistent with the patient's original OVD (Fig 2). The medial canthal ligaments were partially avulsed along with portions of the nasal and frontal bones. Twenty-five gauge transnasal wires were placed to reapproximate the medial canthal ligaments bilaterally. Intraoral and extraoral soft tissues were extensively explored, debrided, and closed. The patient's wounds were closed, and the remaining segments of the comminuted fractures in the maxilla and mandible were left with intact periosteum for consolidation. The patient was then taken to the intensive care unit (ICU) in a stable condition (Fig 3).

Reconstructive surgery with definitive prosthetic treatment planning began 15 months after the initial hospitalization. Due to the extensive loss of bone and soft tissue, including a major portion of the upper lip, and scarring with the loss of the anterior vestibules, the patient was unable to wear transitional removable partial dentures (RPDs). Reconstructive surgeries consisted of iliac bone grafts to the maxilla and mandible, followed by osseous healing [13-19] (Fig 4). Plastic surgical procedures were to be completed at the conclusion of prosthodontic treatment and included auricular cartilage grafting, paramedian forehead tube pedicle flap, and nasal tip revision.

Diagnostic prosthodontic procedures were accomplished after the bone grafts healed. Diagnostic casts and conventional record bases were made for the diagnostic articulator mounting, prior to the construction of diagnostic wax patterns (wax/acrylic resin denture bases and denture teeth) (Figs 5 and 6).

Trial dentures were fabricated to identify the optimal location of the missing teeth for construction of surgical guides prior to the placement of endossous implants. The OVD was maintained, consistent with the postoperative (surgical) condition. Esthetics, in terms of the amount of incisal display during speaking, smiling, and at rest, were not a significant consideration in maintaining the OVD, due to the large amount of soft tissue avulsion associated with the original trauma. It was likely that more maxillary teeth would be visible at rest for this patient postoperatively (surgical and prosthetic) than would have been visible prior to the injury. The centric relation record was made with some difficulty as the mandibular left posterior segment had healed with a lingual inclination, and the mandibular left first molar had to be extracted approximately 5 months after the original presentation secondary to loss of attachment and mobility. The maxillary right first premolar was no longer in occlusion. In hindsight, this tooth should have been extracted and replaced with an endosseous implant. Even with multiple surgeries and perioral scarring, there was still a significant amount of interocclusal clearance between the jaws (Fig 7).

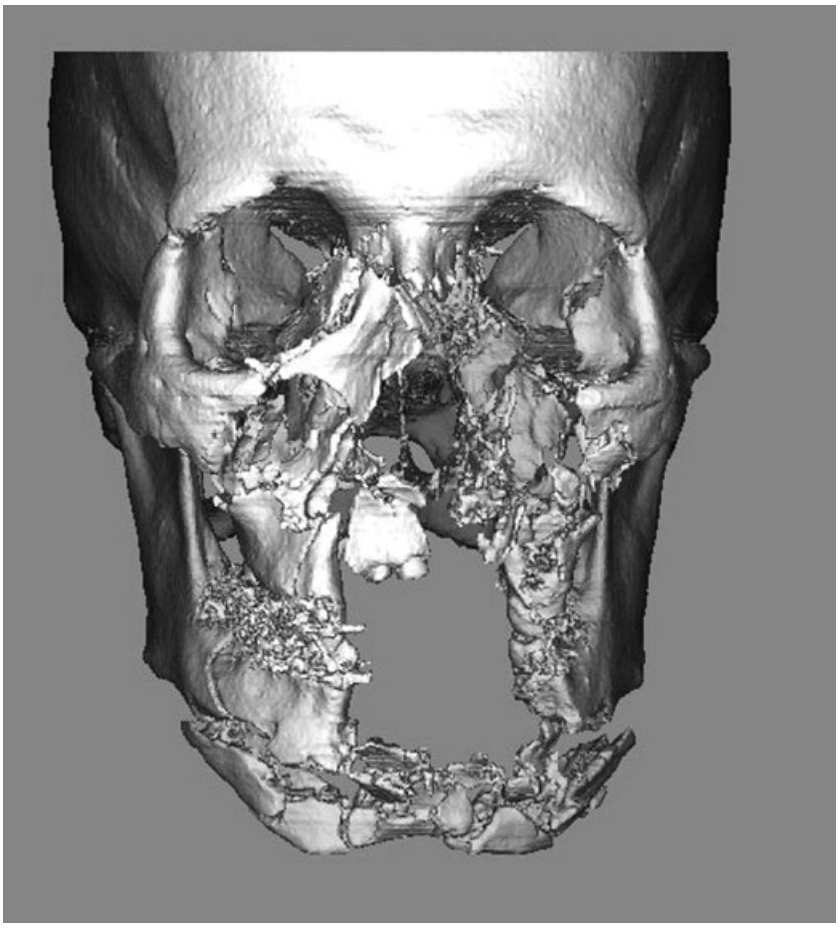

Figure 2 Reformatted CT scan of this patient's facial skeleton after the initial surgical procedures that included stabilization of the posterior segments. Note the significant loss of bone from the anterior maxilla and mandible, as well as the numerous comminuted mandibular segments.

Prosthodontic classification

The American College of Prosthodontists has developed a classification system for partially edentulous patients based on diagnostic findings.[20] Four classes were identified with Class I representing uncomplicated clinical situations and Class IV representing complex clinical situations. Each class was differentiated by specific diagnostic criteria: location and extent of the edentulous areas, condition of abutment teeth, occlusion, and characteristics of the residual ridges.

Location and extent of edentulous areas

Due to the significant amount of hard and soft tissue loss in the anterior maxilla and mandible, and the quality of the soft tissues covering the edentulous ridges, this patient was identified as having severely compromised edentulous areas, because it was thought that implant placement into the preexisting edentulous areas would result in a nonoptimal implant placement and require a high level of patient compliance regarding oral hygiene and patient adaptation.

Condition of abutments

As a result of the trauma, this patient's potential abutment teeth were assessed to have poor long-term prognoses due to their positions within the dental arches, the size/location of the edentulous ridges, and the dental/skeletal malocclusions. The teeth themselves were not deficient in terms of the remaining tooth structure; they were deemed compromised because of the amount of bone loss suffered as a direct result of the trauma and the location of the defects.

The mandibular left first molar was originally thought to be a viable tooth. It subsequently lost a large portion of its periodontal attachment, and developed acute irreversible pulpitis and mobility. It was extracted secondary to what was considered to be a hopeless prognosis. The maxillary right first premolar was asymptomatic and originally in a satisfactory position. During the healing process, it moved and was noted to be slightly above the occlusal plane relative to the opposing mandibular premolars. In hindsight, this tooth should have been extracted and replaced with an endosseous implant to more optimally restore the maxillary right posterior segment.

Occlusion

This patient was classified as having substantially compromised occlusal characteristics, because the occlusal scheme anterior to the mandibular right premolars had to be reestablished. The OVD was not altered from the immediate postoperative condition relative to the right posterior quadrants, because it was

Figure 3 Postoperative photograph of the patient as he left the operating room 6 hours after admission.

thought to be relatively stable. The anterior occlusion was missing.

Residual ridge characteristics

The edentulous ridges were characterized by the need for surgical revision of the supporting structures to permit adequate prosthodontic function.[21] There was adequate bone volume for implant placement in both jaws. The quality of the bone was unknown at this time. The quality of the soft tissues covering both edentulous areas was poor. The soft tissues were mucosa and nonkeratinized, and the depths of the vestibules were basically nonexistent. The vestibular tissues were coincidental with the maxillary palatal and mandibular lingual tissues, respectively. The potential for this patient to wear conventional removable prostheses was considered to be poor. There was not enough ridge height or width to resist lateral displacement for conventional RPDs. There were also psychosocial considerations that needed to be assessed relative to removable prostheses and the patient's self-image. The patient was adamant in his request that he not be treated with definitive RPDs.

Prosthodontic classification

This patient was classified as Class IV because of the severely compromised location and extent of the edentulous areas. The remaining natural teeth were not considered to be adequate to serve as abutments for removable or fixed partial dentures. The occlusion required rehabilitation due to the absence of the anterior teeth, and the residual edentulous ridges were severely compromised.

Comprehensive surgical and prosthodontic treatment plan

Due to the extensiveness of the patient's injuries, specifically the amount of horizontal and vertical bone loss in the maxillary anterior segment, the need for lip support, the lack of stable abutment teeth, and the lack of sufficient posterior occlusal contacts on the left side, implants would be required to support and retain a removable overdenture prosthesis in the maxilla. An overdenture was planned for the maxillary prosthesis, because the viable bone for implant placement was significantly palatal to the planned location of the maxillary teeth, and the patient required a significant amount of lip support. Due to the amount of upper lip lost, the patient could only achieve oral competence with slight straining. Lip competence is typically

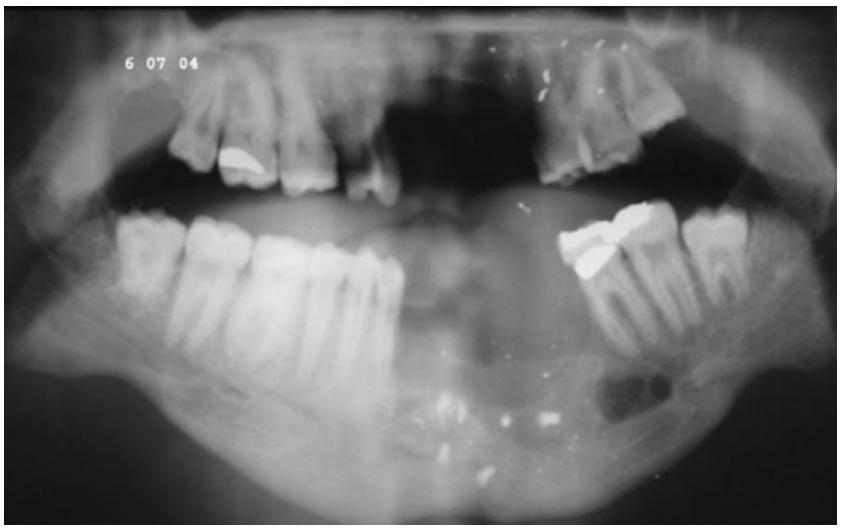

Figure 4 Panoramic radiograph 26 months posttrauma, just prior to mandibular implant placement.

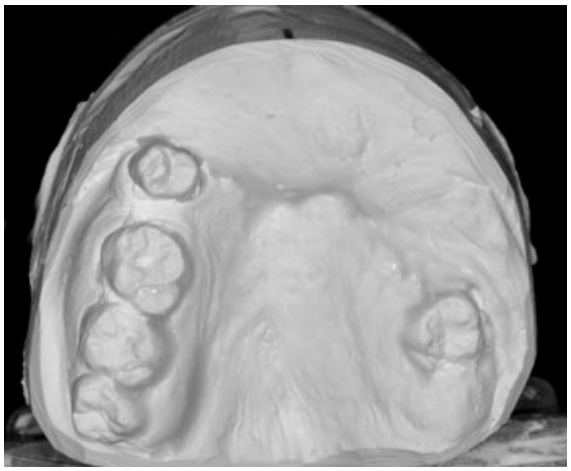

Figure 5 Maxillary diagnostic cast after osseous healing, before implant placement. Note the lack of vestibular depth in the anterior segment.

Figure 7 Lateral cephalometric radiograph taken 18 months posttrauma prior to the extraction of the maxillary right canine and right first premolar. Note the relative prominence of the lower lip and the amount of interocclusal distance between the anterior jaws.

one of the significant factors in determining vertical dimension. In this case, lip competence was not thought to be obtainable with the patient at rest. While lip competence was desirable at the selected OVD, the lack of lip competence as a mitigating factor to success in this case was not considered to be significant in determining esthetics and OVD or rest positions. If lip competence was considered to be essential for success in this case, the OVD could have been reduced by adjusting and/or restoring the posterior teeth. A fixed implant-retained maxillary prosthesis was contraindicated secondary to the location of the supporting bone, the need for lip support, phonetics, and oral hygiene procedures.[22,23] For strength and additional retention and stability, a secondary casting that fitted precisely over the primary bar was planned for the removable maxillary overdenture prosthesis.[24]

A screw-retained, implant-supported fixed prosthesis was planned for the mandibular edentulous segment because the requisite bone for implant placement was much closer to normal, relative to the planned prosthetic arch form, and there was minimal need for lip support. Esthetics relative to space between the inferior borders of hybrid prostheses and mandibular edentulous ridges are generally not a concern. A screw-retained design was chosen for the mandibular prosthesis to permit easier access to the abutments for oral hygiene procedures as well as retrievability for prosthetic maintenance.[22]

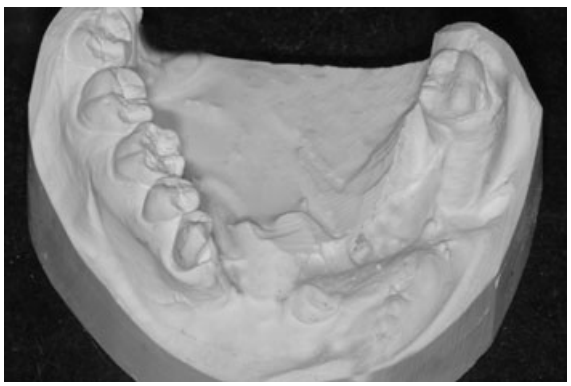

Figure 6 Mandibular diagnostic cast after osseous healing, before implant placement. Note the lack of a definitive residual ridge and vestibular extensions. The mandibular left first molar had been extracted several months prior to this photograph, secondary to the loss of attachment and mobility.

The patient also suffered from a loss of tongue volume and function. It was estimated that approximately 10% of the anterior and anterior lateral tongue volumes were lost. The patient suffered some disability in terms of phonetics, especially prior to prosthetic replacement of the missing teeth, bone, and soft tissue. It also should be noted that he was not able to adapt to any type of transitional RPDs following the trauma and surgeries. Lewandowski reported on misarticulation following surgery for malignancies in the oral cavity.[25] Although the present clinical report illustrates the net result of a gunshot wound to the mid-face, the functional results were thought to be similar to patients who lost tongue function secondary to tumors.

Lewandowski reported that the underlying cause in his case series was dysfunction of the tongue due to partial or total resection, consequences of mandibular resection together with the oral cavity floor, or dysfunction of the lower lip. Anatomic alterations revealed themselves as shifts in the points of contact between structures of the articulation system noticeable on palatograms or linguograms.

In a study reported by Sun et al, the size of tongue tumors (T1, T2, T3) and the site of excision (anterior, middle, posterior) were responsible for significant differences between patients with T1- and T3-sized tumors ($p < 0.05$).[26] The speech intelligibilities of the patients with tumors in the anterior tongue were significantly lower than those with tumors in the middle or posterior tongue regions ($p < 0.05$). Patients with preservation of the tip of the tongue or floor of the mouth had higher intelligibilities ($p < 0.05$). They concluded that for patients after glossectomy within the range of 1/2 or less of the tongue, the tumor site or excision extent of the tongue followed by the tumor size may be key factors in determining the postoperative articulation intelligibility. In the present case, the design of the

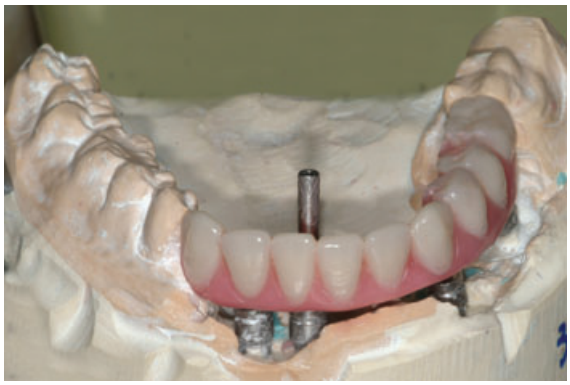

Figure 8 Laboratory facial occlusal view of mandibular waxed screw-retained prosthesis. The anterior incisal plane was at the same level (horizontal) as the posterior occlusal plane.

Figure 10 Maxillary intraoral occlusal image of five implants. Note the palatal positions of the implants relative to the arch form of the remaining natural teeth and the quality of the mobile mucosal tissues stretched with the lip retractors.

mandibular prosthesis and the arrangement of the mandibular artificial teeth were made consistent with the preexisting arch form and locations of the remaining mandibular teeth.

Treatment

Five maxillary and four mandibular implants were placed with two-stage surgical protocols. The mandibular implants were placed in the first surgical procedure; the maxillary implants were placed in a second, later procedure. All implants integrated without incident. The mandibular implants were placed consistent with the planned locations of the teeth in the trial denture set-up and the surgical guides. The long-term prognoses of the endosseous implants in this case were thought to be less than prognoses that have been established for endosseous implants placed into healed edentulous sites.[27] At the time of this report (3 years after implant placement), all the implants have remained viable with less than 1 mm of bone loss noted on yearly radiographs.

The mandibular prosthesis was constructed first, since the anterior maxilla required additional healing time due to additional bone grafting at the time of implant placement. Abutments were placed (IOL Abutments, Biomet 3i, Palm Beach Gardens, FL),

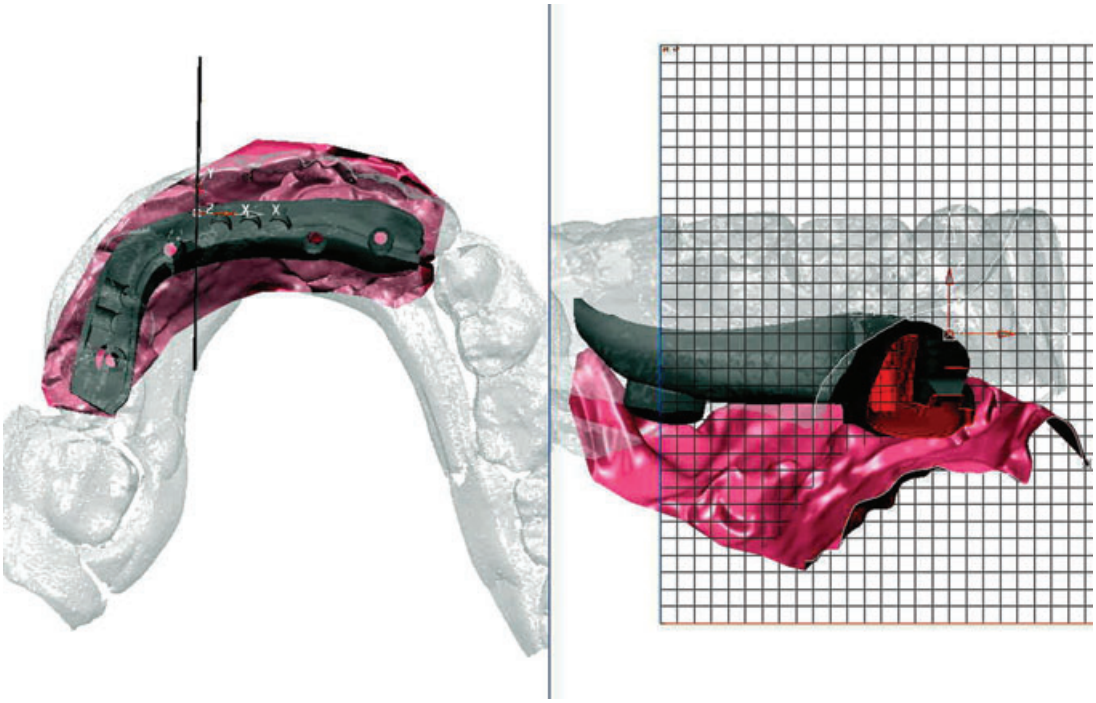

Figure 9 JPEG images of the CAD/CAM design for the mandibular framework. The location of the teeth in the wax denture can be visualized and verifies that the entire framework will be contained within the confines of the mandibular prosthesis. The screw access openings were lingual to the facial surfaces of the denture teeth in the prosthesis.

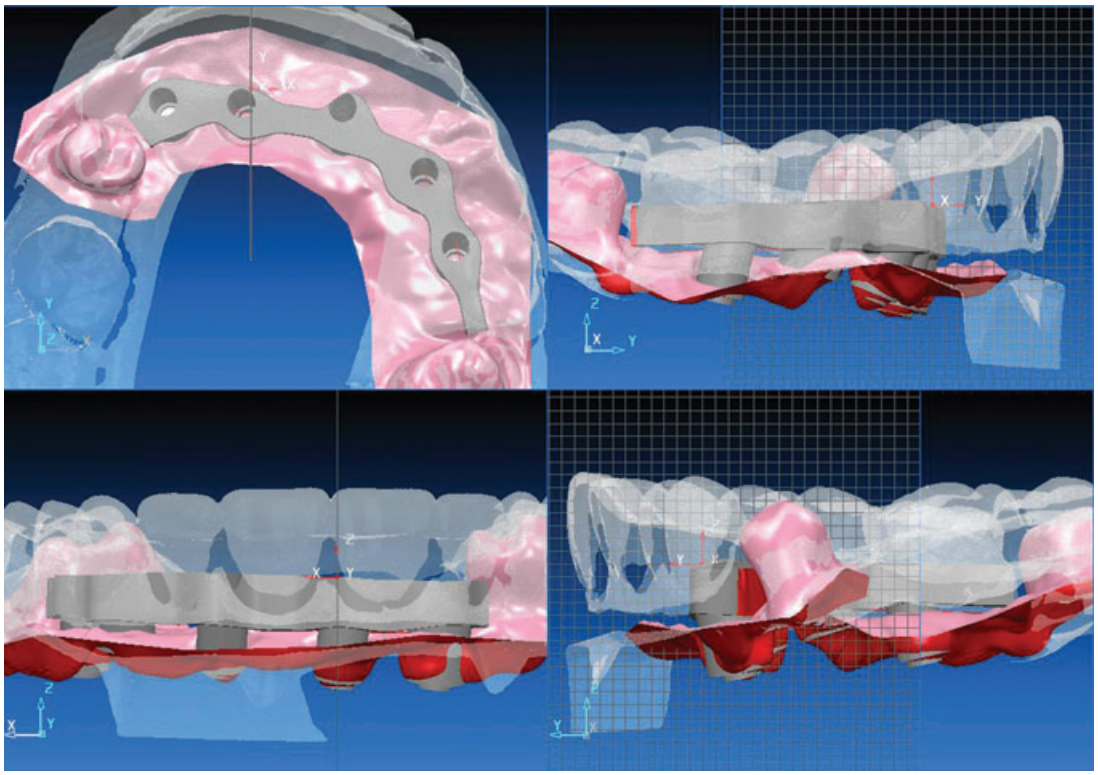

Figure 11 JPEG images of the CAD/CAM design for the maxillary primary bar. The location of the teeth in the wax denture can be visualized and verifies that the entire primary bar will be contained within the confines of the maxillary overdenture.

and abutment level impressions were required due to the significant amount of soft tissues covering/surrounding (4 to 6 mm) the mandibular implants. The mandibular anterior incisal plane was determined by identifying the level of the posterior occlusal plane (retromolar pads) and extending it anteriorly (Fig 8). Twenty-degree acrylic resin posterior teeth were used (Justi® Blend®, American Tooth Industries, Oxnard, CA).

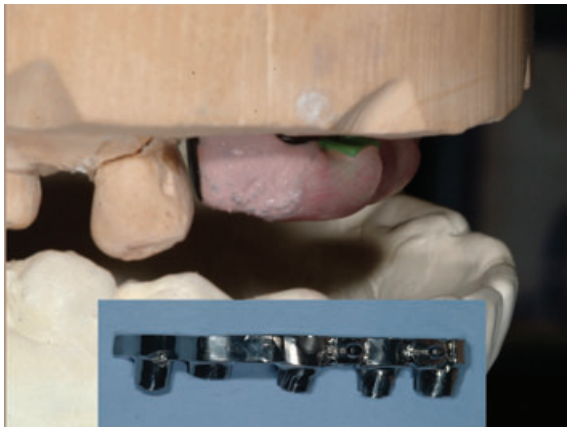

Figure 12 Laboratory image of the articulated casts. The maxillary cast has both the primary bar and secondary casting in place. The milled bar is offset in the bottom of the image.

The centric relation record, as defined by the *Glossary of Prosthodontic Terms*,[28] was difficult to obtain due to trauma, surgical procedures, and residual defects the patient experienced. The goal of the jaw relation records was to obtain a predictable jaw relationship at the predetermined OVD.

The mandibular wax denture and master cast were scanned for a CAD/CAM titanium alloy framework (CAM StructSURE Precision Milled Bar, Biomet 3i) (Fig 9). The mandibular prosthesis was finished in a conventional fashion and inserted.

The maxillary implants were placed into the viable bone in the anterior maxilla; however, their locations were palatal to optimal implant positions as determined by the trial dentures and the surgical guide because the quality and quantity of bone in the anterior segment was deficient despite bone grafting. The implants were placed approximately 8 to 10 mm apart (Fig 10).

The periimplant soft tissue depths of the maxillary implants were normal (2 to 3 mm) compared to the mandibular periimplant tissues, and implant level impressions were made for fabrication of the master cast and verification index. A wax trial denture was fabricated and tried in for patient approval relative to the overall esthetic results, including lip support and incisal display at rest and smiling. At the selected OVD, lip competence was obtained with effort on the patient's part. The jaw relation record was verified. The casts and wax dentures were scanned, and a CAD/CAM framework was designed (CAM StructSURE Precision Milled Bar) (Fig 11). The maxillary primary bar was designed with a 2° taper and machined from a solid blank of titanium alloy (Fig 12).

Figure 13 Laboratory images of the maxillary wax implant prosthesis prior to processing. The mandibular prosthesis (mandibular cast) was completed first to accommodate the increased healing time required for the second maxillary bone grafting procedures. The posterior attachment is in the locked, or "in," position (center: anterior; lower left: right posterior segment; lower right: left posterior segment).

The bar was designed to be used with two anterior Bredent 2.2 VKS-OC Stud-head screws (XPdent Corporation, Miami, FL) that screwed directly into the tapped sites prepared after the bar was milled. These attachments are designed for use in multiple clinical situations and the female, plastic portions of the attachments are replaceable chairside.

The posterior attachment was a 6-mm SwissLoc attachment (Attachments International, Burlingame, CA). This SwissLoc NG Next Generation attachment consisted of an extracoronal locking pin/plunger designed to prevent lift-off, a common problem reported with bar overdentures. The design incorporated positive in-and-out positions, which prevented the attachment from disengaging unintentionally during function. It was

Figure 14 Maxillary intraoral occlusal image with the primary bar in place. The two anterior attachments are visible on the labial surface of the anterior segment.

Figure 15 Lateral clinical image with the maxillary primary bar in place. Note the amount of horizontal distance between the bar and the labial surfaces of the mandibular screw-retained, implant-supported fixed prosthesis.

Figure 16 Anterior clinical view of centric occlusion with both prostheses in place. The large horizontal discrepancy between the location of the maxillary implants and the optimal location of the artificial teeth has been compensated for with the maxillary overdenture.

screwed directly into the preexisting tapped site in the primary bar.

The secondary casting was fabricated with type IV gold alloy (North Shore Dental Laboratories, Lynn, MA). Frameworks were tried in and noted to fit well. The maxillary prosthesis was entirely implant supported and did not feature any palatal coverage or tooth support. The palatal portion of the maxillary prosthesis was contoured to be consistent with the contours of the patient's posterior palate. These contours were arbitrary, and the patient was advised that adjustments could be required to optimize his phonetics with the prosthesis in place. The maxillary overdenture prosthesis was completed in a conventional fashion (Figs 13–20). When the patient returned for the 2-week postinsertion clinical appointment, he reported minimal difficulties in adapting to the prostheses while speaking and chewing. He reported that he was extremely pleased with the esthetic and functional results.

This patient has been followed for 3 years and is comfortable with the prosthetic and surgical rehabilitation. He has experienced no long-term significant problems regarding mastication, oral hygiene, or phonetics. There has been minimal bone loss visualized around the implants in both jaws (Fig 21). His long-term prognosis relative to the osseointegrated implants and prosthetics is thought to be favorable.

Figure 17 Clinical image with both prostheses in place. The patient did not have lip competence at rest.

Figure 18 Full-face image of the patient at the established OVD with a forced effort to establish lip competency.

Discussion

Surgical correction of facial defects may be hampered from the lack of adequate quality and quantities of hard and soft tissues.[6,11] Trauma to the mid-face (hard palate, maxillary sinus,

Figure 19 Clinical image of the partially edentulous maxilla with the overdenture prosthesis in place. Note the atypical contours of the palatal soft tissues.

Figure 20 Profile views of the patient with the prostheses in place 2 weeks postprosthesis insertion. The patient still had to strain slightly to obtain lip competence at rest (rest vertical dimension, left; smiling, right). The anterior/posterior deficiency of the mid-face has been compensated for with the labial flange and tooth positions of the maxillary overdenture prosthesis. The esthetic result in the right posterior maxillary quadrant was slightly compromised due to the retention of the maxillary first premolar.

nasal cavity, zygomatic processes, infraorbital rims) may result in varying degrees of maxillary defects, depending on the velocity and etiology of the injury. Due to the anatomic complexity of the mid-facial region and the almost endless potential for defect size, shape, and location, there are an unlimited number of potential disconfigurations, and there is no universally accepted definition of panfacial fractures in the literature. Aramany has published a classification of these defects.[14] Markowitz and Manson have also described panfacial trauma.[15] Applying no one definition or classification, the patient presented in this article had no frontal bone defect, yet otherwise had severely comminuted facial fractures bordered superiorly by the naso-orbito-etmoid complex and continuing throughout the mid-face to the inferior extent of the mandible.

Trauma to the mandible can be just as challenging to clinicians as maxillary defects, depending on the volume and location of the defect(s). The muscles of mastication and facial expression attach to the mandible in an extremely complex fashion and also give form to the lower third of the face. Discontinuity defects have the potential to impact negatively on any one of a number of critical functions associated with these structures. This case was particularly challenging because of the loss of significant amounts of bone and soft tissue, along with loss of vestibular depth in both jaws. This raised the level of difficulty in providing the patient with adequate amounts of bone and soft tissue prior to definitive prosthodontic treatment. Another challenge was that the quality of the intraoral tissues was not ideal in that the tissues surrounding the implant abutments were quite mobile and nonkeratinized.

Debate also exists over where and when to begin treatment in panfacial trauma.[7-10] In this case, the surgical protocol consisted of debridement and primary closure, healing, multiple

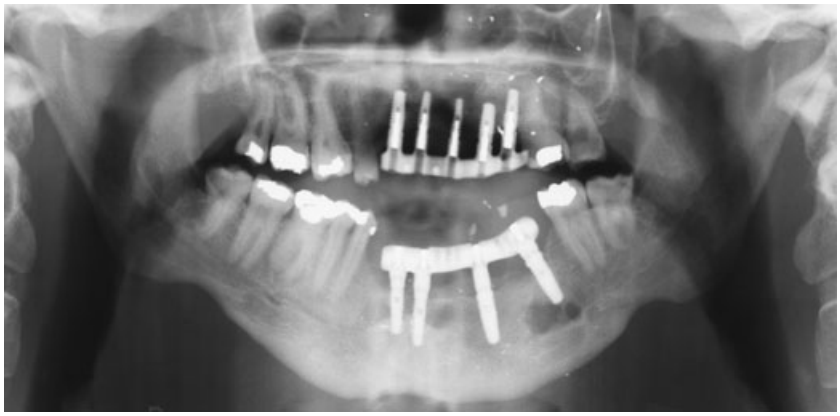

Figure 21 Panoramic radiograph 3 years postocclusal function. All implants have stable bone levels, without radiolucencies.

bone grafts, and additional healing prior to the placement of endosseous implants.

Authors have also differed on the methods of fixation of severe, comminuted mandibular fractures.[16-19] With extensive avulsion-type injuries, rigid fixation of severely comminuted fractures has been problematic. In this case, decisions were made to minimize the risk of infection and decrease the operating time by obtaining closure without rigid fixation.

This case demonstrated the importance of a team approach in comprehensive treatment planning. Initially, the foremost concern was that the patient be stabilized. This was prior to deciding on the definitive surgical and prosthetic treatment plans required to complete the rehabilitative treatment. This patient is now approximately 5 years post-trauma and approximately 3 years post-prosthodontic reconstruction. None of the attachments have had to be replaced. The implants and prosthetic treatments have remained stable, and the long-term prognosis for continued success is good.

Review

This clinical report illustrated the devastating injuries secondary to a self-inflicted gunshot wound to the face. The patient survived the life-threatening injuries while receiving excellent trauma and surgical care immediately posttrauma. Numerous surgeries were required to provide satisfactory bases for long-term prosthodontic success. Endosseous implants were placed into the available, viable maxillary and mandibular bone and became osseointegrated. The patient was restored with a primary maxillary bar, retained by screws in the endosseous implants, and a maxillary overdenture prosthesis. The mandibular defect was restored with a screw-retained, implant-supported fixed prosthesis. Both prostheses have been viable for over 3 years.

Despite the clinical success of the treatment noted above, there were several compromises that had to be taken into consideration: the mid-face was deficient horizontally, including lack of soft tissue volume (lips); complete lip competence was not achieved without straining by the patient; an end-to-end anterior tooth arrangement was used to decrease the upper lip volume; the maxillary primary implant-retained bar was not in the position of the maxillary anterior teeth, but was within the anterior articulation zone of the anterior hard palate; and there was a loss of tongue volume and tongue mobility secondary to the original injury. Fortunately in this case, the patient proved to be quite adept at adapting to the compromises noted above, and continues to function without phonetic deficits. The long-term prognosis for this patient is acceptable, both in terms of continued survival of the endosseous implants and the prostheses.

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